

# Terms of reference

## Terms of reference for an environmental impact statement

### Final terms of reference for the Dugald River Project EIS

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## Background

OZ Minerals Australia Limited (100% owned by OZ Minerals Limited following the merger of Zinifex Limited and Oxiana Limited) proposes to develop a base metals mine located approximately 85 kilometres north-east of Mt Isa and 60 km north-west of Cloncurry, in north-western Queensland. The project consists of MDLs 79 & 363 and MLs 2467-71, 2477-82, 2496-99, 2500-02, 2556-59, 2596, 2599, 2601, 2638, 2684-85, 7496, 90047, 90049 & 90050-51.

OZ Minerals Australia Limited proposes a zinc/lead/silver mining operation using mechanised underground technology and, potentially, conventional open cut methods. The expected mine life would be 16+ years with a mining rate of 2,000,000 tonnes a year (t/y) of zinc/lead/silver ore and production of 450,000 t/y of concentrate. An option exists for copper mining and concentrate production at rates yet to be determined, but in addition to, the above zinc/lead/silver stream rates.

Ephemeral watercourses in the eastern section of the Project drain in an easterly direction emptying into the Dugald River. In the western section of the Project, ephemeral creeks drain into Cabbage Tree Creek, which is a tributary of the Leichhardt River. The Dugald River runs adjacent to the Project site and is a tributary of the Flinders River which flows into the Gulf of Carpentaria 450km from the Project site. Water use downstream of the site consists of stock watering.

These Terms of Reference (TOR) addresses the Environmental Impact Statement (EIS) for the proposal in accordance with section 41 of the *Environmental Protection Act 1994*.

# CONTENT OF THE EIS

## Executive summary

The function of the executive summary is to convey the most important aspects and options relating to the project to the reader in a concise and readable form. It should use plain English and avoid the use of jargon and esoteric terms. The structure of the executive summary should follow that of the EIS, and focus strongly on the key issues and conclusions.

## Glossary of terms

A glossary of technical terms, acronyms and abbreviations should be provided.

## 1. Introduction

The function of the introduction is to explain why the EIS has been prepared and what it sets out to achieve. In particular, the introduction should address the level of detail of information required to meet the level of approval being sought (for example, whether the proponent is seeking only a preliminary approval or a full approval with all permits). It should also define the audience to whom it is directed, and contain an overview of the structure of the document. Throughout the EIS, factual information contained in the document should be referenced.

### 1.1 Project proponent

Provide details of the project proponents, including details of any Joint Venture partners.

### 1.2 Project description

A brief description of the key elements of the project should be provided and illustrated. Any major associated infrastructure requirements should also be summarised and mapped. Detailed descriptions of the project should follow in Section 3.

A brief description should be provided of studies or surveys that have been undertaken for the purposes of developing the project and preparing the EIS. This should include reference to relevant baseline studies or investigations undertaken previously.

### 1.3 Project objectives and scope

Provide a statement of the objectives which have led to the development of the project and a brief outline of the events leading up to the project's formulation, including alternatives, envisaged time scale for implementation and project life, anticipated establishment costs and actions already undertaken within the project area.

Describe the current status of the project and outline the relationship of the project to other developments or actions that may relate whether or not they have been approved. The consequences of not proceeding with the project should also be discussed.

### 1.4 The environmental impact statement (EIS) process

The purpose of this section is to make clear the methodology and objectives of the Environmental Impact Statement (EIS) under the relevant legislation.

#### 1.4.1 Methodology of the EIS

This section should provide a description of the EIS process steps, timing and decisions to be made for relevant stages of the project. This section should also indicate how the consultation process (which will be described in detail in section 1.5) would integrate with the other components of the impact assessment, including the stages, timing and mechanisms for public input and participation. The information in this section is required to ensure:

- relevant legislation is addressed;
- readers are informed of the process to be followed; and
- stakeholders are aware of any opportunities for input and participation.

### **1.4.2 Objectives of the EIS**

Having described the methodology of the EIS, a succinct statement should be made of the EIS objectives. The structure of the EIS can then be outlined as an explanation of how the EIS will meet its objectives. The reader should be able to distinguish the EIS as the key environmental document providing advice to decision makers considering approvals for the project.

While the terms of reference provide guidance on the scope of the EIS studies, they should not be seen as exhaustive or limiting. It is important for proponents and their consultants to recognise that there cannot be perfect knowledge in advance of undertaking an EIS of what the EIS studies may find. If it transpires during the preparation of the EIS that previously unforeseen matters not addressed in the terms of reference are found to be relevant to the assessment of impacts of the proposal, those matters should be included in the EIS.

In addition, it is essential that the main text of the EIS should address all relevant matters concerning environmental values, impacts on those values and proposed mitigation measures. No relevant matter should be raised for the first time in an appendix or the draft Environmental Management Plan (EM Plan).

When considering whether an impact is or is not significant, the proponent should take account of both the intensity of the impact and the context in which it would occur.

In brief, the EIS objectives should be to provide public information on the need for and likely effects of the project, to set out acceptable standards and levels of impacts (both beneficial and adverse) on environmental values, and demonstrate how environmental impacts can be managed through the protection and enhancement of the environmental values. Discussion of options and alternatives and their likely relative environmental management outcomes is a key aspect of the EIS.

The role of the EIS in providing the project's draft EM Plan should also be discussed, with particular reference to the EM Plan's role in providing management measures that can be carried over into conditions that would attach to any approval(s), environmental authorities and permits for the project.

The cumulative impacts of the proposal must be considered over time or in combination with other (all) impacts in the dimensions of scale, intensity, duration or frequency of the impacts. Cumulative impacts on the environmental values of land, air and water and cumulative impacts on public health and the health of terrestrial, aquatic and marine ecosystems should be discussed in the relevant sections. This assessment may include air and water sheds affected by the proposal and other proposals competing for use of the local air and water sheds.

The EIS is a public document. Its purpose is not only to provide information to regulatory agencies, but also to inform the public of the scope, impacts and mitigation measures of the proposal. As such, the main text should be written in plain English avoiding jargon as much as possible. Additional technical detail may be provided in appendices. The main text should not assume that a reader would have a prior knowledge of the Study area. It should not be necessary for the reader to have visited the site to understand the issues involved in the proposal.

### **1.4.3 Submissions**

The reader should be informed as to how and when public submissions on the draft EIS will be addressed and taken into account in the decision-making process.

Interested and Affected Persons should be made aware of how submissions on the EIS will be addressed and taken into account in the decision making process. The EIS should inform the reader about how to make submissions, provide contact details and what form the submissions should take; and when submissions must be made to gain standing for any appeal process.

## **1.5 Public consultation process**

An appropriate public consultation program, developed to the satisfaction of the Queensland Environmental Protection Agency (EPA), is essential to the impact assessment. This section should outline the methodology that will be adopted to identify and mitigate socio-economic impacts of the project. Information about the consultation that has already taken place and the results of such consultation should be provided.

The submission of a list of affected persons and interested persons as well as a statement of how the proponent proposes to consult with those persons is a statutory requirement of the EIS process in the *Environmental Protection Act 1994* (See section 7).

The public consultation program should provide opportunities for community involvement and education. It may include interviews with individuals, public meetings, interest group meetings, production of regular summary information and updates, and other consultation mechanisms to encourage and facilitate active public consultation.

The public consultation process should identify broad issues of concern to local community and interest groups and should continue from project planning through commissioning, project operations and final decommissioning. Refer to the EPA guideline *Issue Identification and Community Consultation*.

Traditional Owners of the Project area and associated Infrastructure are to be listed as Affected Persons.

Consultation with Traditional Owners will occur in order to conduct cultural heritage assessments of the Project area and infrastructure areas and develop Cultural Heritage Management Plans as described in Section 4.8. Cultural heritage surveys and reporting of any results will be conducted in accordance with the Traditional owner wishes.

Specific and tailored consultation will be conducted with groups that have a direct interest in the Project including Traditional Owners, the owners of the Roseby Homestead, Department of Communities and the Queensland Environmental Protection Agency.

The community consultation program should provide information to Interested and Affected Persons regarding the progress of the Project, environmental information, and how community feedback has/can be incorporated into the Project.

## **1.6 Project approvals**

### **1.6.1 Relevant legislation and policy requirements**

This section should explain the legislation and policies controlling the approvals process. Reference should be made to the Queensland *Environmental Protection Act 1994*, *Integrated Planning Act 1997* and other relevant Queensland laws. Any requirements of the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC) should also be included.

Local Government planning controls, local laws and policies applying to the development should be described, and a list provided of the approvals required for the project and the expected program for approval of applications.

This information is required to assess how the legislation applies to the proposal, which agencies have jurisdiction, and whether the proposed impact assessment process is appropriate.

### **1.6.2 Planning processes and standards**

This section should discuss the project's consistency with existing land uses or long-term policy framework for the area (e.g. as reflected in local and regional plans), and with legislation, standards, codes or guidelines available to monitor and control operations on site. This section should refer to all relevant State and regional planning policies. This information is required to demonstrate how the proposal conforms to State, regional and local plans for the area.

## **1.7 Accredited Process for Controlled Actions**

The proponent considers that it is not likely that this Project will impact on matters of National Environmental Significance (NES), and has not been referred to the Commonwealth Department of Environment, Water, Heritage and Arts under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC).

Consequently, the Queensland EIS process will not be accredited for the assessment of the project under Part of 8 of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC). However, if at a later stage it is found necessary to refer the project to the Commonwealth and if it is declared a controlled action, impacts on matters of NES will be assessed under a separate process.

## **2. Project need and alternatives**

### **2.1 Project justification**

The justification for the project should be described, with particular reference made to the economic and social benefits, including employment and spin-off business development, which the project may provide. The status of the project should be discussed in a regional, State and national context.

The justification needs to be balanced with potential for negative environmental and social impacts.

### **2.2 Alternatives to the project**

Describe feasible alternatives, including conceptual, technological and locality alternatives to the project, and discussion of the consequences of not proceeding with the project. Alternatives should be discussed in sufficient detail to enable an understanding of the reasons for preferring certain options and courses of action and rejecting others. Comparative environmental impacts of each alternative should be summarised.

The interdependencies of the proposal components should be explained, particularly in regard to how each of any industrial developments, or various combinations of industrial developments, and any infrastructure requirements relate to the viability of the proposal. Should water supply, power, transport and/or storage infrastructure be included as an element of the proposal, this section should include a description of and rationale for such infrastructure.

Reasons for selecting the preferred options should include technical, commercial, social and natural environment aspects. In particular, the principals of Ecologically Sustainable Development (ESD), best practice environmental management and sustainable development should be included. The relationship of options chosen for waste management and any emissions produced should be detailed. This information is required to assess why the scope of the proposal is as it is and to ensure that the ESD principles and sustainable development aspects have been considered and incorporated during the scoping and planning of the proposal.

### **3. Description of the project**

The objective of this section is to describe the project through its lifetime of construction and operation and decommissioning. This information is required to allow assessment of all aspects of a proposal including all phases of the proposal from planning, construction and operation through to decommissioning and post closure. It also allows further assessment of which approvals may be required and how they may be managed through the life of the proposal.

The location of the study area for the EIS should be clearly defined and described in maps at suitable scales. This area should include the location of all on site works and activities, areas of proposed buffers and areas where off-site impacts or influences from the proposed project may occur and will be investigated.

#### **3.1 Location**

##### **3.1.1 Regional context**

The regional context of the proposal should be described and illustrated on maps at suitable scales.

##### **3.1.2 Local context**

The local context of the proposal should be described and illustrated on maps at suitable scales. Real property descriptions of the Project area should be provided.

Local context information to be provided will include:

- Land tenures;
- Mining and exploration tenures;
- Present land uses and Planning Scheme zonings;
- Surrounding industries and other land uses;
- Features of State and National environmental Significance;
- Locations and layout of new structures;
- Location of all existing and proposed road and rail infrastructure;
- Photo images at appropriate scales;
- The location of watercourses and groundwater resources; and
- The location of any transport corridors such as roads, power lines and pipelines.

#### **3.2 Construction**

The extent and nature of the project's construction phase should be described. The description should include the type and methods of construction, the construction equipment to be used and the items of plant to be transported onto the construction site. Any staging of the proposal should be described and illustrated showing site boundaries, development sequencing and timeframes.

#### **3.3 Operations**

The location and nature of the processes to be used should be described in the text and illustrated with maps, diagrams and artist's impressions as required. Operational issues to be addressed should include, but may not be limited to:

- a description of plant and equipment to be employed;
- the capacity of plant and equipment, and

- chemicals to be used.

Concept and layout plans should be provided highlighting proposed buildings, structures, plant and equipment associated with the processing operation. The nature, sources, location and quantities of all materials to be handled, including the storage and stockpiling of raw materials, should be described.

Indicative process flow-sheets should be provided showing material balances for the processing plant, and the anticipated rates of inputs, along with similar data on products, wastes and recycle streams.

### **3.3.1 Location and tenure**

Maps at suitable scales should be provided showing the precise location of the project area, and in particular:

- the location and boundaries of land tenures, in place or proposed, to which the project area is or will be subject;
- the location and boundaries of the project footprint showing all key aspects including excavations, stockpiles, areas of fill, watercourses, plant locations, water storages, buildings, bridges, culverts, hardstands, car parks, etc; and
- the location of any proposed buffers surrounding the working areas.

Consideration should be given to providing a rectified air photo enlargement to illustrate components of the project in relation to the land and mining tenures and natural and built features of the area.

A recent (<2 years old) rectified photo enlargement should be included.

### **3.3.2 Mine life and resource base**

Specific details should be provided of the following:

- the proposed mine life and an outline of the mineral resource base (further detail should be provided in section 4.2.1.2, Geology); and
- the quantity of mineral to be mined annually including any proposed ramping of production or staging of development.

### **3.3.3 Mining methods and equipment**

Specific details should be provided of the following:

- the mining type and methods to be used, including the major equipment to be used in the various components of the operation;
- the use of different techniques in areas of different topographic or geo-technical character; and
- chemicals to be used.

The description should refer to, and be complemented by, the figures previously presented in section 3.3.1 showing the locations of key aspects of the project. Additional figures should be provided if required.

### **3.3.4 Mine sequencing**

Specific details should be provided of the following:

- the proposed sequence and timing of mining of each ore body within the mining lease;
- The physical extent of excavations, location and detailed design of stockpiles and or dumps of waste rock and/or mineral reject to be handled during the project's operation or left after mining ceases. The description should include the rate of throughput of stockpiles of product, reject and waste rock;
- The proposed progressive backfilling of excavations; and

- The area proposed to be disturbed at each major stage of the project; and
- Information should also be provided on the sequencing of post closure and rehabilitation.

Information should also be provided on the workforce numbers to be employed in the facility's operations during its various phases (construction, commissioning, operation and decommissioning) and stages with a brief description of where those people may be accommodated and/or how they will be transported to the site. Comment should be made on the anticipated basis of employment (permanent, contract, etc).

### **3.3.5 Processing and products**

This section should describe the quantities and characteristics of the products produced on an annual basis. Indicative process flow-sheets should be provided showing material balances for the processing plant, and the anticipated rates of inputs, along with similar data on products, wastes and recycle streams.

### **3.3.6 Ongoing evaluation and exploration activities**

This section should describe the extent and nature of any proposed ongoing exploration or geological/geo-technical evaluation within the project area that may be required over the life of the project.

## **3.4 Product handling**

Describe and show on plans at an appropriate scale, the proposed methods and facilities to be used for product storage and for transferring product from the processing plant to the storage facilities and from the storage facilities to the transport facilities. Include discussion of any environmental design features of these facilities including bunding of storage facilities.

## **3.5 Infrastructure requirements**

This section should provide descriptions, with concept and layout plans, of requirements for constructing, upgrading or relocating all infrastructure in the vicinity of the project area. The matters to be considered include such infrastructure as roads, rail, bridges, tracks and pathways, dams and weirs, bore fields, power lines and other cables, wireless technology (e.g. microwave telecommunications), and pipelines for any services (whether underground or above).

### **3.5.1 Transport—road/rail/ship**

Describe arrangements for the transport of plant, equipment, products, wastes and personnel during both the construction phase and operational phases of the project. The description should address the use of existing facilities and all requirements for the construction, upgrading or relocation of any transport related infrastructure.

Provide details of proposed use of rail for transport of materials, products or wastes to or from the Project area. In relation to shipping of products, details of the number of ships and their size should be documented.

Provide drawings of proposed new accesses onto any State-Controlled Road. Any required road works are to be in accordance with Main Roads *"Road Planning and Design Manual"*.

Information should be provided on road, rail, sea and air transportation requirements for both construction and operations phases, including:

- the volume, composition (types and quantities), origin and destination of goods to be moved including construction materials, plant, raw materials, wastes, hazardous materials, finished products;
- the volume of traffic generated by workforce personnel, visitors and service vehicles;
- method of movement (including vehicle types and number of vehicles likely to be used);
- anticipated times at which movements may occur;

- details of vehicle traffic and transport of heavy and oversize indivisible loads (including types and composition);
- the proposed transport routes;
- need for increased road maintenance and upgrading;
- describe the usage patterns of the existing road, rail and civilian aviation networks and facilities in the vicinity of the Project; and
- provide details of the proposed use of aviation facilities for the transport of personnel to and from the Project area for construction and operations.

## **3.6 Energy**

The EIS should describe all energy requirements, including electricity, natural gas, and/or solid and liquid fuel requirements for the construction and operation of the proposal. The locations of any proposed easements or mining lease corridors should be shown on the infrastructure plan.

Energy conservation should be briefly described in the context of any Commonwealth, State and local government policies.

### **3.6.1 Water supply and storage**

The EIS should provide information on water usage by the project, including the quality and quantity of all water supplied to the site. In particular, the proposed and optional sources of water supply should be described (e.g. bores, any surface storages such as dams and weirs, municipal water supply pipelines).

Estimated rates of supply from each source (average and maximum rates) should be given. Any proposed water conservation and management measures should be described.

Determination of potable water demand should be made for the project, including the temporary demands during the construction period. Details should be provided of any existing town water supply to meet such requirements. If water storage and treatment is proposed on site, for use by the site workforce, then this should be described.

A description of the testing and treatment regime for potable water should be documented. Reference to Australian Drinking Water Guidelines is recommended.

### **3.6.2 Stormwater drainage**

A description should be provided of the proposed stormwater drainage system and the proposed disposal arrangements, including any off-site services.

Provide a description and map of the proposed mine and processing plant stormwater drainage system and the proposed disposal arrangements, including any off-site discharge points. This should include the consideration of placement of waste rock dumps and tailing storage and/or disposal site(s) with relation to natural drainage lines. The need for and design of sediment control structures downstream of disturbance areas and strategies for diverting clean water away from disturbed or contaminated areas should be described.

If roads, pipelines or other infrastructure are proposed to cross-waterways on the project then this infrastructure and its design should be discussed in this section.

Provide a description of the contaminants of concern on the project.

### **3.6.3 Sewerage**

This section should describe, in general terms, the sewerage infrastructure required by the project. If it is intended that industrial effluent or relatively large amounts of domestic effluent are to be discharged into an existing sewerage system, an assessment of the capacity of the existing system to accept the effluent should be provided in Section 4.3 'Waste'. For industrial effluent, this should include detail of the physical and chemical characteristics of the effluent(s).

Provide an assessment of impacts from the selected disposal option (i.e. irrigation / discharge) on the receiving environment. The daily quality and quantity must be identified and QLD recycling guidelines taken into consideration.

### **3.6.4 Telecommunications**

The EIS should describe any impacts on existing telecommunications infrastructure (such as optical cables, microwave towers, etc.) and identify the owners of that infrastructure.

### **3.6.5 Accommodation and other infrastructure**

A description should be provided of any other developments directly related to the project not described in other sections, such as:

- Accommodation options and locations under consideration (on site and off site);
- Processing options under consideration if not mentioned elsewhere;
- Fuel storage areas;
- Equipment hardstands and maintenance area; and
- Technical workshops and laboratories.

## **3.7 Waste management**

### **3.7.1 Character and quantities of waste materials**

Provide an inventory of all wastes to be generated by the proposal during the construction, operational and decommissioning phases of the project. In addition to the expected total volumes of each waste produced, include an inventory of the following per unit volume of product produced:

- the tonnage of raw materials processed;
- the amount of resulting process wastes; and
- the volume and tonnage of any re-usable by-products.

Schematic diagrams, which for the operational phase may be simplified versions of those provided in section 3.3, should be provided for each distinct stage of the project (e.g. construction/site preparation, commissioning, operation and decommissioning) indicating the processes to be used and highlighting their associated waste streams (i.e. all waste outputs: solid, liquid and gaseous), including recycling efforts, such as stockpiling and reusing topsoil. The schematic diagrams, or an associated table, should cross-reference the relevant sections of the EIS where the potential impacts and mitigation measures associated with each waste stream are described.

The physical and chemical characteristics of waste material from the process plant should be provided.

Having regard for best practice waste management strategies and the Environmental Protection (Waste) Policy, the proposals for waste avoidance, reuse, recycling, treatment and disposal should be described in the

appropriate sub-section below. Information should also be provided on the variability, composition and generation rates of all waste produced at the site and processing plant.

Cleaner production waste management planning should be detailed especially as to how these concepts have been applied to preventing or minimising environmental impacts at each stage of the proposal. Details on natural resource use efficiency (e.g. energy and water), integrated processing design, co-generation of power and by-product reuse as shown in a material/energy flow analysis should be presented.

This information is required to enable the resource management agencies and other stakeholders to assess the efficiency of resource use, and allocation issues.

### **3.7.1.1 Air emissions**

Describe in detail the quantity and quality of all air emissions (including particulates, fumes and odours) from the project during construction and operation. Particulate emissions include those that would be produced by any industrial process, or disturbed by wind action on stockpiles and conveyors, or by transportation equipment (e.g. trucks, either by entrainment from the load or by passage on unsealed roads).

Emissions should include point source emissions and fugitive emissions for the Project area.

The methods to be employed in the mitigation of impacts from air emissions should be described in section 4.6.

### **3.7.1.2 Excavated Waste**

This section should describe and show the location, design rationale (e.g. why is it being constructed in this way) and methods for constructing dumps for waste rock. The location of the dumps should be shown on a map relative to topography and other natural features of the area including geology, geological structures (e.g. faults, springs / wetlands). The following should be detailed and discussed:

- an estimated tonnage and/or volume of waste rock to be produced annually and during the life of the project;
- details of methodology and results of waste rock characterisation that includes the potential quantity, variability and net acid producing potential of the mined waste rock material through static testing (metals analysis, sulphides, pH, conductivity, net acid generation (NAG) and acid neutralising capacity (ANC), etc), and tests that show likely outcomes under field conditions for example, kinetic testing where waste rocks are likely to generate acid. Sampling should be representative with profiles of all geological units included and based on accepted statistical procedures. The sample regime and testing methodology to be used should take into account recognised guidelines such as those issued by Environment Australia (1997) and the USEPA (1992) and DME Technical Guidelines (1995) to demonstrate confidence in characterisation data for each geological unit; Characterisation should also specify the PAF / NAF tonnage and any associated mineralisation;
- the timing of the generation of different waste types and their placement;
- evaluation of various methods of waste rock disposal including the design details for those methods such as treatment, materials blending (or mixing or co-disposal with tailings) capping, lining, encapsulation, and configuration and justification for chosen method(s);
- provide details of any contingency planning for failure of management systems. Describe how back up systems will be implemented (e.g. catchment of WRD reports to pit void);
- measures to ensure geotechnical stability of the waste dumps, particularly the management of drainage; and
- provide a description of how acid mine drainage or neutral mine drainage will be addressed.

### **3.7.1.3 Tailings Disposal**

This section should describe the tailings waste produced by preparation and/or processing plants and the proposed methods for its disposal. Describe alternative options for tailings disposal including the proposed

location, site suitability and volume of any tailings storage and/or disposal site(s), including the method of construction.

Describe the approximate quantity of tailings to be produced by the project and its processing plant annually for the life of the mine. Tailings characterisation information should also be presented in this section, including:

- physical properties of the tailings solids (including specific gravity, soils settling characteristics, mineralogy and general geotechnical properties);
- geochemical properties of the tailings solids using static testing (ANC, Net Acid Production Potential (NAPP), NAG etc) and kinetic testing where necessary; and
- chemical properties of tailings pore water including pH, conductivity, major cations and anions, and any chemical species in sufficient quantity that is likely to be reactive and/or toxic.

The significant part of this discussion should be the description of a tailings management strategy for the project, outlining the significant components of the strategy, including tailings storage and/ or disposal site(s). Consideration of disposal into voids should be given and discussed. Describe the timing and staging for development of each tailings storage and/or disposal site to accommodate the life-of-mine tailings production. This should cover significant construction phase activities and the key aspects of the system operation, including tailings deposition scheduling, management and opportunities for progressive rehabilitation.

Justification should be provided for the selection of preferred storage and/ or disposal site(s) based on the geological, physical and environmental setting of each site. The location, layout, significant features and environmentally sensitive areas of each site should be discussed (e.g. mapping of pre-existing drainage lines). This should also take into account the relevant characteristics of the tailings and any economic restrictions to locating the storage and/ or disposal site(s).

The construction of tailings storage and/disposal site(s) walls should be described with regards to construction materials and design. In particular the base of the tailings storage facility and liner/leak detection systems should be described in detail. Consideration should be given to bunding of tailings pipelines for potential spillage containment.

Describe the strategies to monitor and manage seepage into ground and surface waters taking into account inferred hydraulic conductivity and fractured rock in the location. The location of the storage and/or disposal site with regard to adjacent creeks and rivers should be described.

Describe the proposed capping design and rehabilitation strategy of the tailings disposal facility.

#### **3.7.1.4 Solid waste disposal**

Describe the quantity and quality of solid wastes other than waste rock and tailings, and the proposed methods of their disposal. The proposed landfill location options, site suitability, dimensions and volume of any landfill and how it will be managed and monitored, including its method of construction, should be shown.

#### **3.7.1.5 Liquid waste**

A description should be presented of the origin, quality and quantity of wastewater and any immiscible liquid waste originating from the project. Particular attention should be given to the capacity of wastes to generate toxic, acid, and saline or sodic wastewater. A water balance for the project and processing plant is required to account for the estimated usage of water and include expected volumes of liquid waste.

The EIS may need to consider wastewater from the following areas and their method of disposal, treatment and reuse:

- groundwater from excavations (e.g. groundwater dewatered from open cut pits);

- rainfall directly onto disturbed surface areas;
- run-off from roads, plant and industrial areas, chemical storage areas;
- drainage (i.e. run-off plus any seepage or leakage) from waste rock dumps, stockpiles and the tailing storage and/ or disposal site(s);
- tailings storage site(s) return water;
- seepage from other waste storages;
- water usage for:
  - process use,
  - dust suppression, and
  - domestic purposes;
  - evaporation;
  - domestic sewage treatment - disposal of liquid effluent and sludge; and
  - water supply treatment plant - disposal of wastes.

Detail how wastewater discharges are avoided, minimised, recycled and treated as much as practicable as required under Section 15 of the Environmental Protection (Water) Policy 1997.

### **3.8 Rehabilitation and decommissioning**

This section should describe the options, strategies and methods for progressive and final rehabilitation of the environment disturbed by the proposal. The strategic approach to progressive and final rehabilitation should be described. A preferred rehabilitation strategy should be developed with a view to minimising the amount of land disturbed at any one time. The final topography of any excavations, waste areas and dam sites should be shown on maps at a suitable scale. Justification of the need for and use of final voids will be described. The strategic approach to progressive and final rehabilitation should be described. Post mining land suitability of the various land use shall also be described.

The strategies and methods presented for progressive and final rehabilitation of disturbed areas should demonstrate compliance with relevant government guidelines. Land suitability assessment should follow the Technical Guidelines for the Environmental Management of Exploration and Mining in Queensland, 1995, considering Best Practice environmental management. In particular, the strategies and methods should have the following objectives:

- mining and rehabilitation should aim to create a landform with land use capability and/or suitability similar to that prior to disturbance unless other beneficial land uses are pre-determined and agreed;
- mine wastes and disturbed land should be rehabilitated to a condition that is self-sustaining, or to a condition where the maintenance requirements are consistent with an agreed post-mining land use; and
- surface and ground waters that leave the lease should not be degraded to a significant extent. Current and future water quality should be maintained at levels that are acceptable for users downstream of the site and protect environmental values.

Provide a description of infrastructure that is proposed to be left for landholder post mine land use. Provide a description of the process that will be used for reaching agreement on which infrastructure will remain post mine life.

The means of decommissioning the project, in terms of the removal of plant, equipment, structures and buildings should be described, and the methods proposed for the stabilisation of the affected areas should be given. Information should be provided regarding decommissioning and rehabilitation of the plant site, removal of processing plant, rehabilitation of concrete footings and foundations, hardstand areas and storage tanks (including any potential for reuse of these facilities). Options and methods for the disposal of wastes from the

demolition of plant and buildings should be discussed in sufficient detail for their feasibility and suitability to be established.

A description of selective overburden/waste rock material handling requirements necessary to ensure construction of rehabilitated landform soil profiles with desirable physical and chemical properties should be presented.

A description of topsoil management should consider transport, storage and replacement of topsoil to disturbed areas. The minimisation of topsoil storage times (to reduce fertility degradation) should also be addressed.

Proposals to divert creeks during operations, and, if applicable, for the reinstatement of the creeks after operations have ceased, should be provided. Where dams are to be constructed, proposals for the management of these structures after the completion of the project should be given. Also, the final drainage and seepage control systems and long-term monitoring plans should be described.

A description should be given of the removal of any waterway barriers that will not be required after the cessation of mining operations.

Surface and groundwater's should be suitable for use for future generations incorporating Environmental Values Water Quality Objectives. Also waters should meet requirements outside the proposed foot print not just "off lease".

Consideration should be given to the use of threatened plant species that naturally occur on the Project area, during any landscaping and revegetation of the Project area.

A post mine closure plan should be described including discussion of the strategies for the use of analogue sites or other methods to propose success and completion criteria. This should include how desired species composition, distribution and percentage cover criteria will be monitored and how achievement of the criteria will be assessed. The final topography of any excavations, waste areas and final voids should be shown on maps at suitable scale. Describe the final depth of excavations and design of waste dumps and tailing storage and/ or disposal sites.

Detail of the impacts of the preferred rehabilitation strategy should be discussed in the appropriate subsections of Section 4 (Environmental Values and Management of Impacts) particularly with regard to such issues as final landform stability (section 4.2.2), rehabilitation of flora (section 4.8.2) and the long-term quality of water in any final voids (section 4.4.2). Implications for the long-term use and fate of the site should also be addressed, particularly with regard to the on-site disposal of waste and the site's inclusion on the Environmental Management Register or Contaminated Land Register. The aim for decommissioning and rehabilitation should be as near to practicable zero foot print.

## 4. Environmental values and management of impacts

The functions of this section are:

- to describe the existing environmental values of the area which may be affected by the proposal. Environmental values are defined in section 9 of the Environmental Protection Act 1994, environmental protection policies and other documents such as the ANZECC 2000 guidelines and South East Queensland Regional Water Quality Management Strategy. Environmental values should be described by reference to background information and studies, which should be included as appendices to the EIS;
- to describe the potential adverse and beneficial impacts of the proposal on the identified environmental values. Any likely environmental harm on the environmental values should be described;
- to describe any cumulative impacts on environmental values caused by the proposal, either in isolation or by combination with other known existing or planned sources of contamination;
- to present environmental protection objectives and the standards and measurable indicators to be achieved; and
- to examine viable alternative strategies for managing impacts. These alternatives should be presented and compared in view of the stated objectives and standards to be achieved. Available techniques, including best practice, to control and manage impacts to the nominated objectives should be discussed. This section should detail the environmental protection measures incorporated in the planning, construction, operations, decommissioning, rehabilitation and associated works for the proposal. Measures should prevent, or where prevention is not possible, minimise environmental harm and maximise socio-economic and environmental benefits of the proposal. Preferred measures should be identified and described in more detail than other alternatives.

Environmental protection objectives may be derived from legislative and planning requirements which apply to the proposal including Commonwealth strategies, State planning policies, local authority strategic plans, environmental protection policies under the *Environmental Protection Act 1994*, and any catchment management plans prepared by local water boards or land care groups. Special attention should be given to those mitigation strategies designed to protect the values of any sensitive areas and any identified ecosystems of high conservation value within the area of possible proposal impact.

This section should address all elements of the environment, (such as land, water, air, waste, noise, nature conservation, cultural heritage, social and community, health and safety, economy, hazards and risk) in a way that is comprehensive and clear. To achieve this, the following issues should be considered for each environmental value relevant to the project:

- environmental values affected: describe the existing environmental values of the area to be affected including values and areas that may be affected by any cumulative impacts (refer to any background studies in appendices - note such studies may be required over several seasons). It should be explained how the environmental values were derived (e.g. by citing published documents or by following a recognised procedure to derive the values);
- impact on environmental values: describe quantitatively the likely impact of the proposal on the identified environmental values of the area. The cumulative impacts of the proposal must be considered over time or in combination with other (all) impacts in the dimensions of scale, intensity, duration or frequency of the impacts. In particular, relevant State planning policies, environmental protection policies, national environmental protection measures and integrated catchment management plans should be addressed;
- cumulative impacts on the environmental values of land, air and water and cumulative impacts on public health and the health of terrestrial, aquatic and marine ecosystems must be discussed in the relevant sections. This assessment may include air and water sheds affected by the proposal and other proposals competing for use of the local air and water sheds;
- where impacts from the proposal will not be felt in isolation to other sources of impact, it is recommended that the proponent develop consultative arrangements with other industries in the proposal's area to undertake cooperative monitoring and/or management of environmental parameters. Such arrangements should be described in the EIS;

- environmental protection objectives: describe qualitatively and quantitatively the proposed objectives for enhancing or protecting each environmental value. Include proposed indicators to be monitored to demonstrate the extent of achievement of the objective as well as the numerical standard that defines the achievement of the objective (this standard must be auditable). The measurable indicators and standards can be determined from legislation, support policies and government policies as well as the expected performance of control strategies. Objectives for progressive and final rehabilitation and management of contaminated land should be included;
- control strategies to achieve the objectives: describe the control principals, proposed actions and technologies to be implemented that are likely to achieve the environmental protection objectives; include designs, relevant performance specifications of plant. Details are required to show that the expected performance is achievable and realistic; Describe whether an environmental management system will be implemented for the site;
- monitoring programs: describe the monitoring parameters, monitoring points, frequency, data interpretation and reporting proposals;
- auditing programs: describe how progress towards achievement of the objectives will be measured, reported and whether external auditors will be employed. Include scope, methods and frequency of auditing proposed;
- management strategies: describe the strategies to be used to ensure the environmental protection objectives are achieved and control strategies implemented e.g. continuous improvement framework including details of corrective action options, reporting (including any public reporting), monitoring, staff training, management responsibility pathway, and any environmental management systems and how they are relevant to each element of the environment;
- information quality: information given under each element should also state the sources of the information, how recent the information is, how any background studies were undertaken (e.g. intensity of field work sampling), how the reliability of the information was tested, and what uncertainties (if any) are in the information;
- use a range of methods to identify impacts (including talking to Affected Persons and groups and identifying their perceptions of the impacts (both positive and negative));
- identify strategies to enhance the positive and mitigate and manage the negative impacts of the proposal; and
- be informed by consultation with impacted communities and stakeholders, including Traditional Owners.

It is recommended that the final TOR and the EIS follow the heading structure shown below. The mitigation measures, monitoring programs, etc., identified in this section of the EIS should be used to develop the environmental monitoring program for the project (see section 5).

## 4.1 Climate

This section should describe the rainfall patterns (including magnitude and seasonal variability of rainfall), air temperatures, humidity, wind (direction and speed) and any other special factors (e.g. temperature inversions) that may affect management of the proposal including air quality within the region of the proposal. Climatic data must be relevant, reflecting the conditions of the local area and collected over a significant period. Extremes of climate (droughts, floods, cyclones, etc) should also be discussed with particular reference to water management at the proposal site. The vulnerability of the area to natural or induced hazards, such as floods and bushfires, should also be addressed. The relative frequency and magnitude of these events should be considered together with the risk they pose to management of the project.

The potential impacts due to climatic factors should be addressed in the relevant sections of the EIS. The impacts of rainfall on soil erosion should be addressed in Section 4.2. The impacts of storm events on the capacity of waste containment systems (e.g. site bunding/stormwater management and tailings storage facilities) should be addressed in Section 4.4 with regard to contamination of waterways, and in Section 4.3 with regard to the design of the waste containment systems. The impacts of winds, rain, humidity and temperature

inversions on air quality should be addressed in Section 4.5. Climatic data from the Study area must be incorporated into any environmental modelling for the site (e.g. air dispersion modelling).

## **4.2 Land**

### **4.2.1 Description of environmental values**

This section describes the existing environment values of the land area that may be affected by the proposal. It should also define and describe the objectives and practical measures for protecting or enhancing land-based environmental values, describe how nominated quantitative standards and indicators may be achieved, and how the achievement of the objectives will be monitored, audited and managed.

#### **4.2.1.1 Topography/geomorphology**

Maps should be provided locating the project in both regional and local contexts. The topography of the proposal site should be detailed with contours at suitable increments, shown with respect to Australian Height Datum (AHD). Significant features of the locality should be included on the maps. Such features would include any locations subsequently referred to in the EIS (e.g. the nearest noise sensitive locations) that are not included on other maps in Section 4.2. Commentary on the maps should be provided highlighting the significant topographical features.

#### **4.2.1.2 Geology**

The EIS should provide a description, map and a series of cross-sections of the geology of the proposal area, with particular reference to the physical and chemical properties of surface and sub-surface materials and geological structures within the proposed areas of disturbance. Geological properties that may influence ground stability (including seismic activity, if relevant), occupational health and safety, rehabilitation programs, or the quality of wastewater leaving any area disturbed by the proposal should be described. It is recommended that the geological properties relating to potential landslide be addressed for the various phases of the project. In locations where the age and type of geology is such that significant fossil specimens (such as of dinosaurs or their tracks) may be uncovered during construction/operations, the EIS should address the potential for significant finds.

A structural geology map with proposed infrastructure locations superimposed is required to assess suitability (e.g. TSF located above a major fault).

#### **4.2.1.3 Mineral resources**

The EIS should provide a summary of the results of studies and surveys undertaken to identify and delineate the mineral resources within the project area (including any areas underlying related infrastructure).

The location, tonnage and quality of the mineral resources within the project area should be described in detail as indicated below. The mineral resources should be estimated and reported in accordance with the *Australasian Code for Reporting of Mineral Resources and Ore Reserves* (the JORC Code - available at [www.jorc.org/main.php](http://www.jorc.org/main.php)).

In addition, maps (at appropriate scales) should be provided showing the general location of the project area, and in particular:

- the location and real extent of the mineral resources to be developed or mined;
- the location and boundaries of mining tenures, granted or proposed, to which the project area is, or will be subject;
- the location of the proposed mine excavation(s);
- the location and boundaries of any Project areas;

- the location and boundaries of any other features that will result from the proposed mining including waste rock dumps, water storage facilities and other infrastructure;
- the location of any proposed buffers, surrounding the working areas; and
- any part of the resource not intended to be mined and any part of the resource that may be sterilised by the proposed mining operations or infrastructure.

#### 4.2.1.4 Resource Utilisation

The EIS should analyse the effectiveness of the mining proposal in achieving the optimum utilisation of the mineral resources within the project area and consider its impacts on other resources. It should demonstrate that the mining proposal will 'best develop' the mineral resources within the project area, minimise resource wastage and avoid any unnecessary sterilisation of these or any other of the State's coal, mineral, and petroleum (including gas and coal seam methane) resources that may be impacted upon or sterilised by the mining activities or related infrastructure.

#### 4.2.1.5 Soils

A soil survey of the sites affected by the proposal should be conducted at a suitable scale, with particular reference to the physical and chemical properties of the materials that will influence erosion potential, storm water run-off quality, rehabilitation and agricultural productivity of the land. Information should also be provided on soil stability and suitability for construction of proposal facilities.

Soil profiles should be mapped at a suitable scale and described according to the *Australian Soil and Land Survey Field Handbook* (McDonald et al, 1990) and *Australian Soil Classification* (Isbell, 1996). An appraisal of the depth and quality of useable soil should be undertaken. Information should be presented according to the standards required in the *Planning Guidelines: the Identification of Good Quality Agricultural Land* (DPI, DHLGP, 1993), and the *State Planning Policy 1/92: Development and the Conservation of Agricultural Land*.

#### 4.2.1.6 Land use

The EIS should provide a description of current land tenures and land uses, including native title issues, in the proposal area, with particular mention of land with special purposes. The location and owner/custodians of native title in the area and details of native title claims should be shown.

Maps at suitable scales showing existing land uses and tenures, and the proposal location, should be provided for the entire proposal area and surrounding land that could be affected by the development. The maps should identify areas of conservation value in any locality that may be impacted by the proposal. The location of existing dwellings should be included.

Describe the land use suitability of the Project area in terms of the physical and economic attributes. The assessment should set out soil and landform subclasses assigned to soil mapping units in order to derive land suitability classes. The limitations and land suitability classification system to use is that in Attachment 2 of *Land Suitability Assessment Techniques in the Technical Guidelines for the Environmental Management of Exploration and Mining in Queensland (1995)*. Best practice environmental management should be applied in using DME technical guidelines and any new studies in this area that represent improvements on DME guidelines.

Provide a land suitability map of the proposed and adjacent area, and setting out land suitability and current land uses, e.g. for grazing of native and improved pastures and horticulture. Land classified as Good Quality Agricultural Land in the Department of Natural Resources' land classification system is to be shown in accordance with the planning guideline, *The Identification of Good Quality Agricultural Land*, which supports State Planning Policy 1/92.

#### **4.2.1.7 Infrastructure**

The location and owner/custodians of all tenures, reserves, roads and road reserves, railways and rail reserves, stock routes and the like, covering the affected land should be shown on maps of a suitable scale. Indicate locations of gas and water pipelines, power lines and any other easements. Describe the environmental values affected by this infrastructure.

#### **4.2.1.8 Sensitive environmental areas**

The proximity of the proposal to any environmentally sensitive areas should be shown on a map of suitable scale. Attachment 2 provides a listing of some sensitive areas that may be encountered. This section of the EIS should then identify whether any of those environmentally sensitive areas could be affected, directly and indirectly, by the proposal.

In particular, the EIS should indicate if the land affected by the proposal is, or is likely, to become part of the protected area estate, or is subject to any treaty. Consideration should be given to national parks, conservation parks, declared fish habitat areas, wilderness areas, aquatic reserves, heritage/historic areas or items, national estates, world heritage listings and sites covered by international treaties or agreements (e.g. Ramsar, JAMBA, CAMBA), areas of cultural significance and scientific reserves (see section 4.8 for further guidance on sensitive areas).

In addition, the Commonwealth's *Environment Protection and Biodiversity Conservation Act 1999* should be addressed and a determination should be made whether there are national environmentally significant matters relevant to this section that should be described.

#### **4.2.1.9 Landscape character**

This section should describe in general terms the existing character of the landscape that will be affected by the proposal. It should comment on any changes that have already been made to the natural landscape since European settlement. It should 'set the scene' for the description of particular scenic values in the following section on visual amenity. The difference being that this section describes the general impression of the landscape that would be obtained while travelling through and around it, while the visual amenity section addresses particular panoramas and views (e.g. from constructed lookouts, designated scenic routes, etc.) that have amenity value.

#### **4.2.1.10 Visual amenity**

This section should describe existing landscape features, panoramas and views that have, or could be expected to have, value to the community whether of local, regional, State-wide, national or international significance. Information in the form of maps, sections, elevations and photographs is to be used, particularly where addressing the following issues:

- major views, view sheds, existing viewing outlooks, ridgelines and other features contributing to the amenity of the area, including assessment from private residences in the affected area along the route;
- focal points, landmarks (built form or topography), gateways associated with Project area and immediate surrounding areas, waterways, and other features contributing to the visual quality of the area and the Project area;
- character of the local and surrounding areas including character of built form (scale, form, materials and colours) and vegetation (natural and cultural vegetation) directional signage and land use;
- identification of the areas of the proposal that have the capacity to absorb land use changes without detriment to the existing visual quality and landscape character; and
- the value of existing vegetation as a visual screen.

Construction of land forms (i.e. TSF/WRD) should suit and blend in with the surrounding naturally occurring landforms.

## 4.2.2 Potential impacts and mitigation measures

This section defines and describes the objectives and practical measures for protecting or enhancing the land-based environmental values identified through the studies outlined in the previous section. It should describe how nominated quantitative standards and indicators may be achieved, and how the achievement of the objectives will be monitored, audited and managed.

### 4.2.2.1 Land use suitability

The potential for the construction and operation of the proposal to change existing and potential land uses of the proposal site and adjacent areas should be detailed. Post operations, land use options should be detailed including suitability of the area to be used for agriculture, industry, or nature conservation. The factors favouring or limiting the establishment of those options should be given in the context of land use suitability prior to the proposal and minimising potential liabilities for long-term management.

The potential environmental harm caused by the proposal on the adjacent areas currently used for agriculture, urban development, recreation, tourism, other business and the implications of the proposal for future developments in the impact area including constraints on surrounding land uses should be described. If the development adjoins or potentially impacts on good quality agricultural land, then an assessment of the potential for land use conflict is required. Investigations should follow the procedures set out in the planning guideline, *The Identification of Good Quality Agricultural Land*, which supports State Planning Policy 1/92.

Outline incompatible land uses, whether existing or potential, adjacent to all aspects of the project, including essential and proposed ancillary developments or activities and areas directly or indirectly affected by the construction and operation of these activities should be identified and measures to avoid unacceptable impacts defined.

### 4.2.2.2 Land disturbance

A strategy should be developed with a view to minimising the amount of land disturbed at any one time. The strategic approach to progressive and final decommissioning should be described.

The different disturbance types on the project, the final land uses proposed for each, and analogue sites or other completion criteria proposed should be described using a table.

The methods to be used for the proposal, including backfilling, covering, re-contouring, topsoil handling and revegetation, should be described. Consideration should be given to the use of threatened plant species during any landscaping and revegetation from species within the local provenance (i.e. within 20kms from the mine site).

Proposals should be provided to divert creeks during construction or operations, and, if applicable, for the reinstatement of the creeks. Where dams and roads and other infrastructure are to be constructed, proposals for the management of these structures after the completion of the proposal should be given. A contour map of the area should be provided (if relevant). Also, the final drainage and seepage control systems and any long-term monitoring plans should be described.

Proposed decommissioning should be described in detail, including consolidation, revegetation, fencing, and monitoring. Information should be provided regarding decommissioning of any plant site, removal of processing plant, rehabilitation of concrete footings and foundations, hard stand areas, and storage tanks (including any potential for reuse of these facilities). Details should be provided for rehabilitation of any voids remaining after mining including land use, void water quality, safety access, stability of void walls and management post-mining.

Information on rehabilitation and decommissioning objectives, strategies and success criteria for the following land disturbances should be detailed:

- Final voids;
- Waste rock dumps;
- Processing plant;
- Infrastructure such as access roads, haul roads, the mine camps, offices, workshops, pipelines, storage areas; and
- Tailings storage and disposal sites.

Describe the methods to be used on disturbed areas for landform construction, selective material handling, soil profile construction, covering, drainage, recontouring, topsoil handling, revegetation, monitoring and maintenance. Describe plant species to be used in revegetation, including threatened species, and, where practicable give consideration to reinstating similar habitat in disturbed areas. Erosion and sediment control and weed management during topsoil storage and replacement should be described.

Discuss the strategies for the use of analogue sites or other methods to establish success and completion criteria. This should include how species composition, distribution and percentage cover criteria will be monitored and how achievement of the criteria will be assessed. The final topography of any excavations, waste areas and final voids should be shown on maps at a suitable scale. Describe the final depth of excavations and design of waste dumps and tailings storage and disposal sites.

A description of topsoil management should consider transport, storage and replacement of topsoil to disturbed areas. The minimisation of topsoil storage times (to reduce fertility degradation) should also be addressed. A description of erosion and sediment control could be deferred until section 4.2.2.4.

If geological conditions are conducive, the proponent should consider the possibility that significant fossil specimens (such as of dinosaurs or their tracks) may be uncovered during construction/operations and propose strategies for protecting the specimens and alerting the Queensland Museum to the find.

#### **4.2.2.3 Land contamination**

The EIS should describe the possible contamination of land from aspects of the proposals including waste, reject product, acid generation from exposed sulfidic material (waste rock dumps, plant site, contaminated ponds and tailings storage facility) and spills at chemical and fuel storage areas.

Detail how land allocated for any landfills and sewerage treatment sites will be managed and rehabilitated during the project life.

The means of preventing land contamination (within the meaning of the *Queensland Environmental Protection Act 1994*) should be addressed. Methods proposed for preventing, recording, containing and remediating any contaminated land should be outlined. Intentions should be stated concerning the classification (in terms of the Queensland Contaminated Land Register) of land contamination on the land, processing plant site and product storage areas after proposal completion.

A Preliminary Site Investigation (PSI) of the site consistent with the EPA's *Draft Guidelines for the Assessment and Management of Contaminated Land in Queensland* should be undertaken to determine background contamination levels. The results of the PSI should be summarised in the EIS and provided in detail in an appendix.

If the results of the PSI indicate potential or actual contamination, a detailed site investigation progressively managed in accordance with the stages outlined in Appendix 5 of the *Draft Guidelines for the Assessment and Management of Contaminated Land in Queensland* should be undertaken.

In short, the following information may be required in the EIS:

- mapping of any areas listed on the Environmental Management Register or Contaminated Land Register under the Environmental Protection Act 1994;
- identification of any potentially contaminated sites not on the registers which may need remediation; and
- a description of the nature and extent of contamination at each site and a remediation plan and validation sampling.

The EIS should address management of any existing or potentially contaminated land in addition to preventing and managing land contamination resulting from project activities. The Draft Guidelines for the *Assessment and Management of Contaminated Land in Queensland* can be downloaded from the EPA website at: [www.epa.qld.gov.au/environment/business/contaminated](http://www.epa.qld.gov.au/environment/business/contaminated)). Proponents should refer study proposals to the EPA for review prior to commencement (Consult with the Contaminated Land Section in the Queensland EPA).

#### **4.2.2.4 Soil erosion**

For all permanent and temporary landforms, erosion management techniques should be described. For each soil type identified, erosion potential (wind and water) and erosion management techniques should be outlined. An erosion-monitoring program, including rehabilitation measures for erosion problems identified during monitoring, should also be outlined. Mitigation strategies should be developed to achieve acceptable soil loss rates, levels of sediment in rainfall runoff and wind-generated dust concentrations.

The report should include an assessment of likely erosion effects for all disturbed areas such as:

- areas cleared of vegetation;
- waste rock dumps;
- stockpiles;
- dams, banks and creek crossings;
- the plant site, including buildings; and
- access roads or other transport corridors.

Methods proposed to prevent or control erosion should be specified and should be developed with regard to:

- preventing soil loss in order to maintain land capability/suitability; and
- preventing significant degradation of local waterways by suspended solids.

Erosion control measures should be developed into an erosion and sediment control plan for inclusion in the EM Plan.

#### **4.2.2.5 Landscape character**

Describe the potential impacts of the project landscape character of the site and the surrounding area. Particular mention should be made of any changes to the broad-scale topography and vegetation character of the area, such as due to waste rock dumps, excavated voids and broad-scale clearing.

Details should be provided of measures to be undertaken to mitigate or avoid the identified impacts.

#### **4.2.2.6 Visual amenity**

This section should analyse and discuss the visual impact of the proposal on particular panoramas and outlooks. It should be written in terms of the extent and significance of the changed skyline as viewed from places of residence, work, and recreation, from road, cycle and walkways, from the air and other known vantage points day and night, during all stages of the project as it relates to the surrounding landscape.

The assessment is to address the visual impacts of the project structures and associated infrastructure, using appropriate simulation. Sketches, diagrams, computer imaging and photos are to be used where possible to

portray the near views and far views of the completed structures and their surroundings from visually sensitive locations. Special consideration is to be given to public roads, public thoroughfares, and places of residence or work, which are within the line-of-sight of the project.

Detail should be provided of all management options to be implemented and how these will mitigate or avoid the identified impacts.

#### **4.2.2.7 Lighting**

Management of the lighting of the project, during all stages, is to be provided, with particular reference to objectives to be achieved and management methods to be implemented to mitigate or avoid:

- the visual impact at night;
- night operations/maintenance and effects of lighting on fauna and residents;
- the potential impact of increased vehicular traffic; and
- changed habitat conditions for nocturnal fauna and associated impacts.

#### **4.2.2.8 Transport**

The EIS should provide sufficient information to make an independent assessment of how the State-controlled and local government road networks, aviation facilities and air and sea ports will be affected. Sufficient information should also be provided to enable an independent assessment of how the rail network (including infrastructure) will be affected.

Details should be provided of the impacts on environmental values of any new roads or road realignments. The EIS should include detailed analysis of probable impact of identified construction and operational traffic generated by the project with particular reference to impacts on road infrastructure, road users and road safety. An assessment of wet and dry season access should be provided. A traffic and transport assessment is required in the EIS to address safety issues, emergency access and provide information on altered conditions.

The EIS needs to identify impacts on the State-controlled and local government road networks and to indicate clearly the corrective measures necessary to address adverse road impacts. This will require the proponent to compare the traffic situation and road conditions with, and without, the project. Information about the impacts and proposed measures for dealing with those impacts should be prepared by the proponent in close consultation with the local District Office of the Department of Main Roads.

Provide a road impact assessment report addressing both the construction and operational phase of the project. This report should cover accelerated reduction of road pavements and strategies are to be in accordance with *Main Roads Guideline for the Assessment of Road Impacts from Development*. In presenting road impact assessment findings, the EIS should clearly and logically detail all base data assumptions and methodologies used. If impact mitigation strategies are required, these are to be comprehensively tabled in a Road-Use Management Plan, along with timing and responsibilities for any required works.

The EIS should provide details of the usage of any current or proposed rail infrastructure.

Provide information on product spill contingency plans and the adequacy of equipment and facilities to deal with possible spills for the transport nodes of the proposal. Indicate whether there is a need to update the plans based on increase in frequency of traffic and volumes to be transported.

### **4.3 Waste**

This section should complement other sections of part 4 of the EIS by providing technical details of waste treatment and minimisation, with proposed emission, discharge and disposal criteria, while other sections describe how those emissions, discharges and disposals would impact on the relevant environmental values.

The purpose of this format is to concentrate the technical information on waste management into one section in order to facilitate its transfer into the EM Plan.

#### **4.3.1 Description of environmental values**

This section should introduce and briefly describe the existing environment values that may be affected by the project's wastes. Refer to each of the waste streams described in section 3.7 and provide references to more detailed descriptions of the relevant environmental values in other sections of part 4 of the EIS.

#### **4.3.2 Potential impacts and mitigation measures**

The purpose of this section is to bring together a description of the preferred methods (and discuss any alternatives) to be used to deal with waste streams and outline their impacts. The full description of the magnitude and nature of impacts on particular environmental values due to the management of waste should be provided in the relevant sections of part 4 of the EIS.

This section defines and describes the objectives and practical measures for protecting or enhancing environmental values from impacts by wastes, describes how nominated quantitative standards and indicators may be achieved for waste management, and how the achievement of the objectives will be monitored, audited and managed.

As part of the description, this section should provide details of each waste in terms of:

- operational handling and fate of all wastes including storage;
- on-site treatment methods proposed for the wastes;
- methods of disposal (including the need to transport wastes off-site for disposal) proposed to be used for any trade wastes, liquid wastes and solid wastes;
- the potential level of impact on environmental values;
- proposed discharge/disposal criteria for liquid and solid wastes;
- measures to ensure stability of the waste rock dumps and tailings storage facilities should be described;
- methods to prevent, seepage and contamination of groundwater from the tailings' storage facility, stockpiles, and/or waste rock dumps should be given;
- market demand for recyclable waste (where appropriate) should be addressed;
- waste minimisation techniques processes proposed; and
- decommissioning of the site.

Having regard for the Environmental Protection (Waste) Policy, the EIS should indicate the results of investigation into the feasibility of using waste minimisation and cleaner technology options during all phases of the proposal. The EPA has also released draft guidelines covering aspects of waste management under this EPP, which should be addressed.

Waste minimisation and treatment, and the application of cleaner production techniques, should also be applied to gaseous wastes, particularly nitrogen oxides, sulfur oxides, particulates and carbon dioxide. Particular attention should be paid to measures, which will maximise energy efficiency and minimise internal energy consumption in the proposal.

Cleaner production waste management planning should be detailed especially as to how these concepts have been applied to preventing or minimising environmental impacts at each stage of the proposal. Details on natural resource use efficiency (e.g. energy and water), integrated processing design, co-generation of power and by-product reuse as shown in a material/energy flow analysis are required.

Proposals for waste and energy audits during the Project life are to be described.

## 4.4 Water resources

### 4.4.1 Description of environmental values

This section describes the existing environment for water resources that may be affected by the proposal in the context of environmental values as defined in such documents as the *Environmental Protection Act 1994*, Environmental Protection (Water) Policy 1997 (EPP (Water)), ANZECC 2000, Queensland Water Quality Guidelines, 2006, and the South East Queensland Water Quality Management Strategy. The definition of waters in the EPP (Water) includes the bed and banks of waters, so this section should address impacts on benthic sediments as well as the water column.

Where a licence or permit will be required under the *Water Act 2000* to take or interfere with the flow of water, this section of the EIS should provide sufficient information for a decision to be made on the application. Similarly, waterway barrier works may need approval under the *Fisheries Act 1994*, and if so should be addressed in the EIS.

#### 4.4.1.1 Surface waterways

A description should be given of the surface watercourses and their quality and quantity in the study area. This includes the on-site and off-site areas affected by the proposal with an outline of the significance of these waters to the river catchment system in which they occur. The description should include characterisation of the in-stream sediments as a baseline reference. Details provided should include a description of existing surface drainage patterns, and flows in major streams and wetlands. Also provide details of the likelihood of flooding, history of flooding including extent, levels and frequency, and a description of present and potential water uses downstream of the areas affected by the proposal. Flood studies should include a range of annual exceedance probabilities for affected waterways, where data permits.

The EIS should provide a quantitative description, with photographic evidence, of the geomorphic form and condition, of any watercourses likely to be affected by disturbance or stream diversion. The results of this description should form the basis for the planning and subsequent monitoring of rehabilitation of the watercourses during or after the operation of the proposal.

An assessment is required of existing water quality in surface waters and wetlands likely to be affected by the proposal. The basis for this assessment should be a baseline monitoring program, with sampling stations located upstream and downstream of the proposal. Complementary stream-flow and rainfall data should also be obtained from historical records (if available) to aid in interpretation.

The water quality should be described, including seasonal variations or variations with flow where applicable. A relevant range of physical, chemical and biological parameters should be measured to gauge the environmental harm on any affected creek or wetland system. As a minimum background levels of the main contaminants of concern (e.g. dissolved and total metals, such as lead, zinc and silver, salts) should also be obtained as a baseline measure.

Describe the environmental values of the surface waterways of the study area in terms of:

- Ecological and environmental values identified in the EPP (Water);
- sustainability, including both quality and quantity;
- physical integrity, fluvial processes and morphology of watercourses, including riparian zone vegetation and form; and
- any water resource plans, land and water management plans relevant to the affected catchment.

#### 4.4.1.2 Groundwater

The EIS should review the quality, quantity and significance of groundwater in the study area, together with groundwater use in neighbouring areas (i.e. other groundwater users are to be identified and assessed). Information on local and regional groundwater resources is to be provided. Any groundwater protection zones are also to be identified.

The review should include a survey of existing groundwater supply facilities (bores, wells, or excavations) to the extent of any environmental harm. The information to be gathered for analysis is to include:

- location;
- pumping parameters;
- draw down and recharge at normal pumping rates; and
- seasonal variations (if records exist) of groundwater levels.

A network of observation points which would satisfactorily monitor groundwater resources both before and after commencement of operations should be developed.

This section should include reference to:

Nature of the aquifer/s

- geology/stratigraphy - such as alluvium, volcanic, metamorphic;
- aquifer type - such as confined, unconfined; and
- depth to and thickness of the aquifers.

Hydrology of the aquifer/s

- depth to water level and seasonal changes in levels;
- groundwater flow directions (defined from water level contours) and flow rates;
- interaction with surface water;
- interaction with salt water;
- possible sources of recharge; and
- vulnerability to pollution.

The data obtained from the groundwater survey should be sufficient to enable specification of the major ionic species present in the groundwater, pH, electrical conductivity and total dissolved solids. Background levels of the main contaminants of concern (e.g. dissolved and total metals, such as lead, zinc and silver, salts) should also be obtained as a baseline measure.

Describe the environmental values of the underground waters of the Study area in terms of:

- ecological and environmental values identified in the EPP (Water);
- sustainability, including both quality and quantity; and
- physical integrity, fluvial processes and morphology of groundwater resources.

#### 4.4.2 Potential impacts and mitigation measures

This section is to assess potential impacts on water resource ecological and environmental values identified in the previous section. It will also define and describe the objectives and practical measures for protecting or enhancing water resource ecological and environmental values, to describe how nominated quantitative

standards and indicators may be achieved, and how the achievement of the objectives will be monitored, audited and managed.

The EIS should describe the possible environmental harm caused by the proposed proposal to environmental values for water as expressed in the EPP (Water).

Water management controls should be described, addressing surface and groundwater quality, quantity, drainage patterns and sediment movements. The beneficial (environmental, production and recreational) use of nearby surface and groundwater should be discussed, along with any proposal for the diversion of affected creeks during mine construction and operation, and the stabilisation and rehabilitation of those works. Monitoring programs should be described which will assess the effectiveness of management strategies for protecting water quality during the construction, operation and decommissioning of the proposal.

Key water management strategy objectives include:

- protection of important local aquifers and protection of their waters;
- maintenance of sufficient quantity and quality of surface waters to protect existing beneficial downstream uses of those waters (including maintenance of in-stream biota and the littoral zone); and
- minimisation of impacts on flooding levels and frequencies both upstream and downstream of the project.

Conduct a risk assessment for uncontrolled emissions to water due to system or catastrophic failure, implications of such emissions for human health and natural ecosystems, and list strategies to prevent, minimise and contain impacts.

#### **4.4.2.1 Surface water and water courses**

The potential environmental harm to the flow, stream sediment quality and the quality of surface waters from all phases of the proposal should be discussed, with particular reference to their suitability for the current and potential downstream uses, including the requirements of any affected riparian area or wetland and in-stream biological uses. The impacts of surface water flow on existing infrastructure should be considered. Refer to the *Environmental Protection (Water) Policy 1997* and *Water Act 2000*.

The hydrological impacts of the proposal should be assessed, particularly with regard to stream diversions, scouring and erosion, and changes to flooding levels and frequencies both upstream and downstream of the project. When flooding levels will be affected, modelling of afflux should be provided and illustrated with maps.

Quality characteristics discussed should be those appropriate to the downstream and upstream water uses that may be affected. Chemical and physical properties of any waste water (including concentrations of constituents) or seepage at the point of entering natural surface waters should be discussed along with toxicity of effluent constituents to flora and fauna and aquatic macroinvertebrates.

Reference should be made to the properties of the land disturbed and processing plant wastes, the technology for settling suspended clays from contaminated water, and the techniques to be employed to ensure that contaminated water is contained and successfully treated on the site.

In relation to water supply and usage, and wastewater disposal, the EIS should discuss anticipated flows of water to and from the proposal area. Where dams, weirs or ponds are proposed, the EIS should investigate the effects of predictable climatic extremes (storm events, floods and droughts) on: the capacity of the dams to retain contaminants; the structural integrity of the containing walls; and the quality of water contained, and flows and quality of water discharged. The design of all water storage facilities should follow the *Technical Guidelines on Site Water Management*.

The need or otherwise for licensing of any dams (including referable dams) or creek diversions, under the *Water Act 2000* should be discussed. Water allocation and water sources should be established in consultation with Department of Natural Resources and Water.

Having regard for the requirements of the *Environmental Protection (Water) Policy 1997*, the EIS should present the methods to avoid stormwater contamination by raw materials, wastes or products and present the means of containing, recycling, reusing, treating and disposing of stormwater. Where no-release water systems are to be used, the fate of salts and particulates derived from intake water should be discussed.

The Australian and New Zealand Environment and Conservation Council (ANZECC, 2000) *National Water Quality Management Strategy, Australian Water Quality Guidelines for Fresh and Marine Waters* and the *Environmental Protection (Water) Policy 1997* should be used as a reference for evaluating the effects of various levels of contamination.

Options for mitigation and the effectiveness of mitigation measures should be discussed with particular reference to sediment, acidity, salinity and other emissions of a hazardous or toxic nature to human health, flora or fauna.

The EIS should describe all disturbances to surface waterways, with particular attention to construction of waterway barriers including causeway crossings, infrastructure crossings, dams, weirs, and stream diversions that may have the potential to impact on fish passage across the barrier.

Where it is proposed that creeks will be diverted, the EIS should detail how rehabilitation will affect both the physical and ecological condition of the creek's bed and banks and the quality of water in it. Furthermore, the EIS should describe the monitoring that will be undertaken after decommissioning, and who will have responsibility for management measures and corrective action, to ensure that rehabilitated creeks do not degrade.

Sufficient data should be collected in order to determine local trigger values for surface waterways. Reference is also to be made to the Queensland Water Quality Guidelines (2006) and relevant EPA Operational Policies, such as 'Waste Water discharge to Queensland Waters'. In setting local trigger values, efforts must be made to consider the cumulative inputs from nearby inputs (e.g. Roseby Copper project).

#### **4.4.2.2 Groundwater**

The EIS should include an assessment of the potential environmental harm caused by the proposal to local groundwater resources.

The impact assessment should define the extent of the area within which groundwater resources are likely to be affected by the proposed operations and the significance of the proposal to groundwater depletion or recharge, and propose management options available to monitor and mitigate these effects. The response of the groundwater resource to the progression and finally cessation of the proposal should be described.

An assessment should be undertaken of the impact of the proposal on the local ground water regime caused by the altered porosity and permeability of any land disturbance or from the construction of surface landforms such as tailings disposal facilities, open pits and waste rock dumps.

An assessment of the potential to contaminate groundwater resources and measures to prevent, mitigate and remediate such contamination should be discussed.

#### **4.4.2.3 Dam Design**

In relation to water supply and usage, and wastewater disposal, the EIS should discuss anticipated flows of water to and from the proposal area. Where dams, weirs or ponds are proposed, the EIS should investigate the

effects of predictable climatic extremes (storm events, floods and droughts) on: the capacity of the dams to retain contaminants; the structural integrity of the containing walls; and the quality of water contained, and flows and quality of water discharged. The design of all water storage facilities should follow the technical guidelines on site water management.

The need or otherwise for licensing of any dams (including referable dams) under the *Water Act 2000* should be discussed. Water allocation and water sources should be established in consultation with Department of Natural Resources and Water.

## **4.5 Air**

### **4.5.1 Description of environmental values**

This section describes the existing air environment that may be affected by the proposal. The following topics may be addressed (note - the topics are not an exhaustive treatment of all possible air or impacts).

A description of the existing air shed environment should be provided having regard for particulates. The background levels and sources of suspended particulates, including metal particulates such as lead, arsenic, cadmium and gases such as SO<sub>x</sub>, NO<sub>x</sub>, and any other major constituent of the air environment that may be affected by the proposal should be discussed.

Sufficient data on local meteorology and ambient levels of pollutants should be gathered to provide a baseline for later studies or for the modelling of air quality environmental harms within the air shed. Parameters should include air temperature, wind speed and direction, atmospheric stability, mixing depth and other parameters necessary for input to the models.

#### **4.5.1.1 Greenhouse gas emissions**

This section of the EIS should:

- provide an inventory of projected annual emissions for each relevant greenhouse gas, with total emissions expressed in 'CO<sub>2</sub> equivalent' terms;
- estimate emissions from upstream activities associated with the proposed project, including fossil fuel based electricity consumed; and
- briefly describe method(s) by which estimates were made.

The Australian Greenhouse Office Factors and Methods Workbook (available via the internet) can be used as a reference source for emission estimates and supplemented by other sources where practicable and appropriate.

### **4.5.2 Potential impacts and mitigation measures**

This section defines and describes the objectives and practical measures for protecting or enhancing environmental values for air, to describe how nominated quantitative standards and indicators may be achieved, and how the achievement of the objectives will be monitored, audited and managed. Information should be submitted on the use of new technologies to reduce air emissions from the stack(s) or other emission sources.

The objectives for air emissions should be stated in respect of relevant standards (ambient and ground level concentrations), relevant emission guidelines, and any relevant legislation, and the emissions modelled using a recognised atmospheric dispersion model. The potential for interaction between the emissions from the processing plant, and emissions in the air shed, and the likely environmental harm from any such interaction, should also be detailed.

The proposed levels of emissions should be compared with the *National Environmental Protection Measures (NEPM) for Ambient Air Quality (1998)*, and the Environmental Protection (Air) Policy (1998).

Where appropriate, the predicted average ground level concentrations in nearby areas should be provided. These predictions should be made for both normal and expected maximum emission conditions and the worst case meteorological conditions should be identified and modelled where necessary. Ground level predictions should be made at any residential, industrial and agricultural developments believed to be sensitive to the effects of predicted emissions. The techniques used to obtain the predictions should be referenced, and key assumptions and data sets explained. The assessment of the proposal's impact on air quality should include at least the following matters:

- the human health and ecological risk associated with emissions from the facility of all hazardous or toxic pollutants should be assessed whether they are or are not covered by the National Environmental Protection Council (Ambient Air Quality) Measure or the Environmental Protection (Air) Policy 1998; In particular major contaminants, such as emissions of lead, from all sources including excavation sites, open pits, waste rock dumps, processing circuits, stockpiles, storage facilities and tailings dams will need to be examined and assessed closely; Reference should be made the National Pollutant Inventory for reporting of air emissions on a yearly basis.
- detail the features of the proposal designed to suppress or minimise emissions, including dusts and odours;
- the assessment of proposed levels of emissions of dust, fumes and odours should include emissions during both normal and upset conditions. Consideration should be given to the range of potential upset condition scenarios and the air emissions that may be generated as a result;
- where there is no single atmospheric dispersion model that is able to handle the different atmospheric dispersion characteristics exhibited in the proposal area (e.g. sea breezes, strong convection, terrain features, temperature inversions and pollutant re-circulation), a combination of acceptable models will need to be applied;
- the limitations and accuracy of the applied atmospheric dispersion models should be discussed. The air quality modelling results should be discussed in light of the limitations and accuracy of the applied models;
- air quality predictions should be compared to the relevant goals in the National Environmental Protection Council (Ambient Air Quality) Measure and the Environmental Protection (Air) Policy 1998 goals; and
- air shed management and the contribution of the proposal to air shed capacity in view of existing and future users of the air shed for assimilation and dispersion of emissions.

Evaluate the impacts of gaseous and particulate emissions from construction and operational power generation at the Project area on air quality and the surrounding environment. Where appropriate, address both acute and cumulative impacts by considering the project in conjunction with existing emission sources within the region.

Assess the extent to which emissions from the proposed facility compare with best practice environmental management. Emissions should be compared to best practice emissions from equivalent mining/concentration operations, and to related emissions schedules such as those published by the NSW and Victorian environmental regulation agencies.

#### **4.5.2.1 Greenhouse gas abatement**

This section of the EIS should propose and assess greenhouse gas abatement measures. It should include:

- a description of the proposed measures (alternatives and preferred) to avoid and/or minimise greenhouse gas emissions directly resulting from activities of the project, including such activities as transportation of products and consumables, and energy use by the project;
- an assessment of how the preferred measures minimise emissions and achieve energy efficiency;
- an indication of how the preferred measures for emission controls and energy consumption compare with practice in the relevant sector of industry with a view to achieving best practice environmental management; and
- a description of any opportunities for further offsetting greenhouse gas emissions through indirect means.

Direct means of reducing greenhouse gas emissions could include such measures as:

- minimising clearing at the site (which also has imperatives besides reducing greenhouse gas emissions);
- integrating transport for the project with other local industries such that greenhouse gas emissions from the construction and running of transport infrastructure are minimised; and
- maximising the use of renewable energy sources.

Indirect means of reducing greenhouse gas emissions could include such measures as:

- carbon sequestration at nearby or remote locations, either:
  - above ground by such means as planting trees and other vegetation to achieve greater biomass than that cleared for the project; or
  - below ground by geosequestration; and
- carbon trading through recognised markets.

The EM Plan in the EIS should include a specific module to address greenhouse abatement. That module should include:

- commitments to the abatement of greenhouse gas emissions from the project with details of the intended objectives, measures and performance standards to avoid, minimise and control emissions;
- commitments to energy management, including undertaking periodic energy audits with a view to progressively improving energy efficiency;
- a process for regular review of new technologies to identify opportunities to reduce emissions and use energy efficiently, consistent with best practice environmental management;
- any voluntary initiatives such as projects undertaken as a component of the national Greenhouse Challenge Plus program, or research into reducing the lifecycle and embodied energy carbon intensity of the project's processes or products;
- opportunities for offsetting greenhouse emissions, including, if appropriate, carbon sequestration and renewable energy uses; and
- commitments to monitor, audit and report on greenhouse emissions from all relevant activities and the success of offset measures.

#### **4.5.2.2 Climate change adaptation**

Climate change, through alterations to weather patterns and rising sea level, has the potential to impact in the future on developments designed now. Most developments involve the transfer to, or use by, a proponent of a community resource in one form or another, such as the granting of a non-renewable resource or the approval to discharge pollutants to air, water or land. Therefore, it is important that the project design be adaptive to climate change so that community resources are not depreciated by projects that would be abandoned or require costly modification before their potential to provide a full return to the community is realised. Consequently, the EIS should provide an assessment of the Project's vulnerabilities to climate change throughout the construction, operation and decommissioning phases. The EIS should describe possible adaptation strategies for the activity including:

- a risk assessment of how changing patterns of rainfall and hydrology, temperature and extreme weather may affect the viability and environmental management of the project.
- the preferred and alternative adaptation strategies to be implemented; and
- commitments to undertaking, where practicable, a cooperative approach with government, other industry and other sectors to address adaptation to climate change.

The EPA recognises that predictions of climate change and its effects have inherent uncertainties, and that a balance must be found between the costs of preparing for climate change and the uncertainty of outcomes. However, proponents should use their best efforts to incorporate adaptation to climate change in their EIS and project design.

## 4.6 Noise and vibration

### 4.6.1 Description of environmental values

This section describes the existing environment values that may be affected by noise and vibration from the proposal.

If the proposed activity could adversely impact on the noise environment, baseline monitoring should be undertaken at a selection of sensitive sites affected by the proposal. Noise sensitive places are defined in the Environmental Protection (Noise) Policy 1997. Long-term measured background noise levels are required. The locations of sensitive sites should be identified on a map at a suitable scale. The results of any baseline monitoring of noise and vibration in the proposed vicinity of the proposal should be described.

Sufficient data on local meteorology and ambient noise levels should be gathered to provide a baseline for later studies. The daily variation of background noise levels at nearby sensitive sites should be monitored and reported in the EIS, with particular regard given to detailing variations at different periods of the night. Monitoring methods should adhere to accepted best practice methodologies, relevant EPA guidelines and Australian Standards, and any relevant requirements of the Environmental Protection (Noise) Policy 1997.

Comment should be provided on any current activities near the proposal area that may cause a background level of ground vibration (for example: major roads, quarrying activities, etc.).

### 4.6.2 Potential impacts and mitigation measures

This section defines and describes the objectives and practical measures for protecting or enhancing environmental values from impacts by noise and vibration, describes how nominated quantitative standards and indicators may be achieved for noise and vibration management, and how the achievement of the objectives will be monitored, audited and managed. The assessment of noise impacts should include matters raised in the document *The Health Effects of Environmental Noise – Other than Hearing Loss* published by the Health Council, 2004 (or later editions), ISBN 0 642 82304 9.

Information, including mapped noise contours from a suitable acoustic model, should be submitted based on the proposed generation of noise. The potential environmental harm of noise and vibration at all potentially sensitive places, in particular, any place of work or residence should be quantified in terms of objectives, standards and indicators to be achieved. Particular consideration should be given to emissions of low-frequency noise; that is, noise with components below 200Hz.

Proposed measures for the minimisation or elimination of impacts should be provided, including details and illustrations of any screening, lining, enclosing or bunding. A discussion should be provided of timing schedules for construction and operations with respect to minimising environmental nuisance and harm from noise.

Information should be supplied on blasting which might cause ground vibration or fly rock on, or adjacent to, the site with particular attention given to places of work, residence, recreation, worship and general amenity. The magnitude, duration and frequency of any vibration should be discussed. A discussion should be provided of measures to prevent or minimise environmental nuisance and harm. Blasting noise and vibration limits are provided in section 61 of the *Environmental Protection Regulation 1998*. Reference should also be made to the *EPA Guideline: Noise and Vibration from Blasting*.

## 4.7 Nature conservation

### 4.7.1 Description of environmental values

This section should describe the existing nature conservation of the proposal area and how these values may be affected by the proposed activity.

Describe the nature conservation values of nature conservation for the study area in terms of:

- species listed under the Nature Conservation Act 1992 or Environment Protection and Biodiversity Conservation Act 1999 which occur or potentially occur in the proposal area;
- how the proposed activity will likely impact listed species;
- the distribution of habitat for listed species;
- how this habitat will likely be impacted by the proposed activity;
- the distribution of 'of concern' or endangered regional ecosystems as listed under the Vegetation Management Act 1999 and the EPA's Biodiversity Status in the proposal area;
- how these 'of concern' or endangered regional ecosystems will likely be impacted by the proposed activity;
- how the proposed activity will likely impact water quality in riverine and other wetlands within, adjoining and adjacent to the project area; and
- how these impacts will be mitigated.

A discussion should be presented on the nature conservation values within the Study area. Habitat for listed species, environmentally sensitive localities including waterways, riparian zone, wilderness and habitat corridors should be described. The description should include a flora and fauna species list, a vegetation map at appropriate scale as advised below and an assessment of the significance of native vegetation to biodiversity conservation generally and threatened species, when considered at, from a local and regional and state scale.

The EIS should identify issues relevant to sensitive areas, or areas, which may have, low resilience to environmental change. Areas of special sensitivity include the marine environment and wetlands, wildlife breeding or roosting areas, any significant habitat or relevant bird flight paths for migratory species, bat roosting and breeding caves including existing structures such as adits and shafts, and habitat of threatened plants, animals and communities. Areas regarded as sensitive with respect to flora and fauna have one or more of the following features (and which should be identified, mapped, avoided or effects minimised):

- regional ecosystems listed as 'endangered' or 'of concern' under State legislation, and/or ecosystems listed as presumed extinct, endangered or vulnerable under the Commonwealth Environment Protection and Biodiversity Conservation Act 1999;
- ecosystems which provide important ecological functions such as: wetlands; riparian vegetation; buffer areas or important habitat corridor between areas;
- wetlands identified as having high ecological value as expressed in the EPP(Water) or identified through an equivalent ecological values assessment methodology such as AquaBAMM;
- good representative examples of remnant regional ecosystems or regional ecosystems which are poorly represented in protected areas;
- sites listed under international treaties such as Ramsar Wetlands and World Heritage areas;
- sites containing near threatened or bio-regionally significant species or essential, viable habitat for near threatened or bio-regionally significant species;
- sites in, or adjacent to, areas containing important resting, feeding or breeding sites for migratory species of conservation concern listed under the Convention of Migratory Species of Wild Animals, and/or bilateral agreements between Australia and Japan (JAMBA) and between Australia and China (CAMBA);
- sites containing common species which represent a distributional limit and are of scientific value or which contains feeding, breeding, resting areas for populations of echidna, koala, platypus and other species of special cultural significance;
- sites containing high biodiversity that are of a suitable size or with connectivity to corridors/protected areas to ensure survival in the longer term; such land may contain:
  - natural vegetation in good condition or other habitat in good condition (e.g. wetlands); and/or

- degraded vegetation or other habitats that still supports high levels of biodiversity or acts as an important corridor for maintaining high levels of biodiversity in the area;
- a site containing other special ecological values, for example, high habitat diversity and areas of high endemism;
- ecosystems which provide important ecological functions such as: wetlands of national, state and regional significance; riparian vegetation; and important habitat corridor between areas of significant diversity or threatened species habitat values;
- sites of palaeontologic significance such as fossil sites;
- sites of geomorphological significance, such as lava tubes or karst;
- protected areas which have been proclaimed under the *Nature Conservation Act 1992* and *Marine Parks Act 1982* or are under consideration for proclamation; and/ or
- areas of major interest, or critical habitat declared under the *Nature Conservation Act 1992* or high nature conservation value areas or areas vulnerable to land degradation under the *Vegetation Management Act 1999*.

Reference should be made to both State and Commonwealth endangered species legislation and the proximity of the area to any World Heritage property.

The Queensland *Vegetation Management Act 1999* and EPA Biodiversity Status listing of regional ecosystem status and the findings of any regional vegetation management plan should also be referenced.

The occurrence of pest plants and animals in the project area should be described.

Key flora and fauna indicators should be identified for future ongoing monitoring. Surveys of flora and fauna need to be conducted in both the wet and dry seasons to reflect seasonal variation in communities and to identify migratory species. The EPA's guidelines for *Fauna and Flora Assessment in EIA* provide further details. The EPA should be consulted on the scope of any biological studies before they are undertaken.

#### **4.7.1.1 Listed Species and Species of Special and Ecological Note**

Describe the nature/biodiversity conservation values of the Study area.

This description should include, but not be limited to:

- a list of flora and vertebrate fauna listed under either the *Nature Conservation Act 1992* (NCA) or *Environment Protection and Biodiversity Conservation Act 1999* (EPBC), known to or which potentially occur in the subject area. This list should advise the likelihood of potential taxa occurring within the subject area;
- a discussion stating the habitat requirements of all taxa in this list, and the distribution and quality of this potential habitat within the subject area;
- a discussion of the likely impacts of the proposed operation on potential habitat for listed taxa known to or potentially occurring in the subject area;
- a discussion of the significance of these likely impacts on listed species habitat values which addresses potential impacts on listed species populations in the local area and south west Gulf Plains and eastern North West Highlands bioregions (Queensland Bioregions). Where these impacts are determined to be significant, appropriate mitigation measures should be advised;
- a discussion of near threatened or bio-regionally significant species or essential, viable habitat for near threatened or bio-regionally significant species which may occur in the subject area;
- a discussion of populations of common or listed species which represent a distributional limit for that species; and
- a description of sites of palaeontologic significance such as fossil sites.

#### 4.7.1.2 Terrestrial flora

A map of vegetation at a scale of 1:25 000 should be provided for the subject area. This map should:

- use the EPA's regional ecosystem type descriptions in accordance with the Regional Ecosystem Description Database [REDD] available at the EPA's website;
- indicate the location of vegetation types which correspond to regional ecosystems listed as 'of concern' or endangered under the *Vegetation Management Act 1999* (VMA) or the EPA 'Biodiversity Status' listing;
- detail the location of ecosystems which provide important ecological functions such as wetlands and associated riparian vegetation; and
- the location and abundance of exotic or weed species should be described.

A discussion should be presented describing likely and potential impacts upon vegetation determined to be consistent with types listed as 'of concern' or endangered under the VMA or the EPA's Biodiversity Status. This discussion should address the significance of these potential impacts in a bioregional context. Where these impacts are likely to be significant, mitigation measures should be advised.

When mapping vegetation:

- All species listed as common which are recorded during the survey/mapping of vegetation should be presented in an appendix to the main report.

#### 4.7.1.3 Terrestrial fauna

A comprehensive vertebrate fauna survey should be conducted for the subject area. This survey effort should include a wet season survey and a dry season survey. Data on listed species collected during these surveys should be represented as described in section 4.7.1.1. Data for common species should be represented as a general species list in an appendix to the main report.

#### 4.7.1.4 Aquatic biology

If no biota surveys/studies have previously been conducted in and downstream of the project area, the aquatic flora and fauna occurring in the areas affected by the proposal should be described, noting the patterns and distribution in the waterways and/or associated lacustrine and marine environments.

The description of the aquatic flora and fauna should be spatially extensive (including upstream and downstream) of the Project area and should include a review of current and previous studies of the aquatic biology in the project area and other relevant areas within the region. If little or no information exists describing the aquatic biology, for all or some of the aquatic environments, then data must be collected using both qualitative and quantitative methods to describe the aquatic flora and fauna within the areas potentially affected by the proposed project.

The patterns and distribution in the waterways and/or associated lacustrine and marine environments should be described and mapped at an appropriate scale and representative sampling locations determined for baseline and on-going monitoring programs.

The EIS studies should establish a detailed baseline to be used for future monitoring programs as part of an on-going environmental management plan (EMP) for the proposed development.

The description should consider temporal variability in the distribution of the aquatic biota related to the seasonality of the aquatic environments in the project area.

The description of the fauna and flora present or likely to be present in the area should include, but not be restricted to:

- Aquatic habitats and environments, including riparian habitats,
- Aquatic substratum including, benthic, edge and substratum associated with aquatic and riparian flora,
- Aquatic plants including, benthic, floating and emergent macrophytes, and
- Aquatic fauna including, fish, crustaceans and other aquatic invertebrates, and aquatic dependent mammals, reptiles, amphibians.

The EIS should include a list of all known and potential rare, endangered, threatened or otherwise noteworthy species or assemblages present, or likely to be present and dependent on the aquatic environments of the project area, including species important for recreation and commercial fisheries. A detail profile of each species or assemblage should be included with a discussion of the species range, habitat, breeding, recruitment, feeding and movement requirements. The profile should include a risk assessment of threats to the populations of each rare, endangered, threatened or otherwise noteworthy species or assemblage and an evaluation of the potential impacts of the proposed development. The occurrence of aquatic biota of conservation significance should be geocoded to mapped vegetation units or habitats, which can then be used to identify areas with important fauna values in adjoining areas affected by the project.

#### **4.7.2 Potential impacts and mitigation measures**

This section defines and describes the objectives and practical measures for protecting or enhancing nature conservation values, describes how nominated quantitative standards and indicators may be achieved for nature conservation management, and how the achievement of the objectives will be monitored, audited and managed.

The EIS should address any actions of the project or likely impacts that require an authority under the *Nature Conservation Act 1992*, and/or would be assessable development for the purposes of the *Vegetation Management Act 1999*.

The discussion should cover all likely direct and indirect environmental harm due to the project on flora and fauna particularly sensitive areas as listed below (also see Attachment 2). Terrestrial and aquatic environments should also be covered. Also include human impacts and the control of any domestic animals introduced to the area.

Strategies for protecting the World Heritage Property, and any rare or threatened species should be described, and any obligations imposed by State or Commonwealth legislation or policy or international treaty obligations (i.e. JAMBA, CAMBA) should be discussed.

Strategies for collecting and preserving any significant fossils should be described.

Include a discussion of the impacts on environmental values of any new waterway barriers to be constructed for transport purposes, particularly causeway structures and low level crossings. These discussions should focus on potential impact of the barrier on fish passage and include discussion of mechanisms to avoid the impact.

The potential environmental harm to the ecological values of the area arising from the construction, operation and decommissioning of the project including clearing, salvaging or removal of vegetation should be described, and the indirect effects on remaining vegetation should be discussed. Short-term and long-term effects should be considered with comment on whether the impacts are reversible or irreversible. Mitigation measures and/or offsets should be proposed for adverse impacts. Any departure from no net loss of ecological values should be described.

The potential environmental harm on flora and fauna due to any alterations to the local surface and ground water environment should be discussed with specific reference to environmental impacts on riparian vegetation or other sensitive vegetation communities. Measures to mitigate the environmental harm to habitat or the inhibition of normal movement, propagation or feeding patterns, and change to food chains should be described.

The provision of buffer zones and movement corridors, and strategies to minimise environmental harm on migratory, nomadic and aquatic animals should be discussed.

Weed management strategies are required for containing existing declared weed species and ensuring no new declared plants are introduced to the area. Feral animal management strategies and practices should also be addressed. The study should develop strategies to ensure that the project does not contribute to increased encroachment of a feral animal species. Reference should be made to the local government authorities pest management plan when determining control strategies. The strategies for both flora and fauna pest species should be discussed in the main body of the EIS and provided in a working form in the Environmental Management Plan (EM Plan) for the project.

A detailed monitoring program should be outlined for each Nature Conservation component described in 4.7 as part of an on-going environmental management plan (EM Plan). Monitoring programs should be designed and built from baseline information collected during the EIS studies.

Rehabilitation of disturbed areas should incorporate, where appropriate, provision of nest hollows and ground litter.

The EIS should develop a broad range of rehabilitation acceptance criteria including criteria defining floristic characteristics, such as composition, cover and species diversity.

## **4.8 Cultural heritage**

### **4.8.1 Description of environmental values**

This section describes the existing cultural heritage values that may be affected by the proposal. Describe the environmental values of the cultural landscapes of the Study area in terms of the physical and cultural integrity of the landforms.

#### **4.8.1.1 Indigenous Cultural Heritage**

A cultural heritage study may be required that will describe indigenous cultural heritage sites and places, and their values. Any such study must be conducted by an appropriately qualified cultural heritage practitioner and must include the following:

- liaison with relevant indigenous community/communities concerning:
  - places of significance to that community (including archaeological sites, natural sites, story sites etc);
  - appropriate community involvement in field surveys;
- any requirements by communities and /or informants relating to confidentiality of site data must be highlighted. Non-indigenous communities may also have relevant information;
- a systematic survey of the proposed development area to locate and record indigenous and non-indigenous cultural heritage places;
- significant assessment of any cultural heritage sites/places located;
- the impact of the proposed development on cultural heritage values;
- a report of work done which includes background research, relevant environmental data and methodology, as well as results of field surveys, significance assessment and recommendations; and
- a permit to conduct the research and survey will be required under the provisions of the *Aboriginal Cultural Heritage Act 2003* and/or the *Queensland Heritage Act 1992*.

Cultural heritage surveys and reporting of any results will be conducted in accordance with the Traditional Owners wishes. This may include or exclude a cultural heritage practitioner being involved in the surveys. Results of cultural heritage surveys may also need to be kept confidential.

#### 4.8.1.2 Non-Indigenous Cultural Heritage

A Historic Assessment should be conducted as part of EIS process specific to Non-indigenous cultural heritage sites. This includes a thorough investigation of known or potential sites of historical significance for the range of non-indigenous activities (pastoral, mining and market gardening history) which may have occurred in the area. It is also to broaden its scope to include possible minority group cultural sites associated with non-indigenous immigration patterns associated for the region such as Afghan or Chinese history.

The Historic Assessment and plan is to address potential impact of all aspects of the range of activities such as exploration through to construction and mining methods and provide mitigation measures which could be adopted to address emerging issues. Within this document realistic timeframes need to be identified and incorporated to gain appropriate approvals from the relevant authorities.

The Historic Assessment is to be written in plain language and provide a clear management plan for operation and operational employees. This is to include reference to underpinning legislation such as *Queensland Heritage Act 1992* and the Commonwealth Heritage Acts such as the *Environmental Protection and Biodiversity Conservation Act 1999* and the *Protection of Movable Cultural Heritage Act 1986* by which heritage sites and discoveries are protected. Contact details for relevant Agencies which administer Non-Indigenous cultural heritage places should be incorporated and clear practical guidelines set out for contractor induction information.

Community groups engaged in the process should be expanded to include the museum in Cloncurry (Mary Kathleen Museum) and members of the Cloncurry Historical Society as well as any other historical groups in the region. This is in addition to the Southern Gulf Catchments Group as a member of the National Heritage Trust. This will ensure more robust engagement with a broader geographical community occurs and enable a more comprehensive overview to be developed.

#### 4.8.2 Potential impacts and mitigation measures

This section defines and describes the objectives and practical measures for protecting or enhancing cultural heritage environmental values, describes how nominated quantitative standards and indicators may be achieved for cultural heritage management, and how the achievement of the objectives will be monitored, audited and managed.

The environmental harm to cultural heritage values in the vicinity of the project should be managed under a Cultural Heritage Management Plan (CHMP) developed specifically for the project. The CHMP will provide a process for the management of cultural heritage places both identified and sub-surface at the Project areas. It is usual practice for the CHMP to be based on information contained in archaeological and/or anthropological reports on the survey area and cultural reports and/or information from affiliated traditional owners. The CHMP should address and include the following:

- a process for including Aboriginal/Torres Strait islander people associated with the development areas in protection and management of indigenous cultural heritage;
- processes for mitigation, management and protection of identified cultural heritage places and material in the project areas, including associated infrastructure developments, both during the construction and operational phases of the project;
- provisions for the management of the accidental discovery of cultural material, including burials;
- the monitoring of foundation excavations and other associated earthwork activities for possible sub-surface cultural material;
- cultural awareness training or programs for project staff; and
- a conflict resolution process.

The development of the CHMP should be negotiated with the lead government agency and all stakeholder representatives, and where there is a role or responsibility identified for the EPA, such as managing the EIS process under the EP Act, it should be party to the discussions.

Any collection of artefact material as part of a mitigation strategy will need to be done by an appropriately qualified cultural heritage practitioner holding a permit under provisions of the *Aboriginal Cultural Heritage Act 2003*. The EPA regional manager should be consulted for the provision of general advice including the appropriate conduct of cultural heritage surveys and the necessary permits.

In the case of multiple Traditional Owner groups a separate Cultural Heritage Management Plan will need to be developed for each group.

Cultural heritage surveys and reporting of any results will be conducted in accordance with the Traditional owner wishes, which may include keeping the results of the surveys confidential.

Aspects of the above matters may be referred to the Land and Resources Tribunal and some may also involve native title considerations.

## **4.9 Social**

### **4.9.1 Description of environmental values**

This section describes the existing social values of communities and groups that may be affected by the proposal.

Information on Indigenous and non-Indigenous communities will be reported separately to differentiate societal values and characteristics where required.

The social amenity and use of the proposal area and adjacent areas for rural, agricultural, forestry, fishing, recreational, industrial, educational or residential purposes should be described. Consideration should be given to:

- community infrastructure and services, access and mobility;
- population and demographics of the affected community including:
  - size, age, structure, gender composition, education level, residency, labour force, average income profile, health and wellbeing indicators and unemployment rates;
- local community values, vitality and lifestyles;
- on farm activities near the proposed activities;
- current property values;
- Typical rent for the area;
- Size, number and proportion of low income households;
- Household size;
- number of properties directly affected by the project; and
- number of families directly affected by the project, this should include not only property owners but also families of workers either living on the property or workers where the property is their primary employment.

Describe the social values for the affected area and nearby affected communities and populations in terms of the integrity of conditions, including amenity and liveability, harmony, and well being, sense of community, access to recreation, and access to social and community services and infrastructure.

Social, economic and cultural values are not as easily separated as physical and ecological values. Therefore it may be necessary for some material in this section to be cross-referenced with in section 4.8 Cultural Heritage and Section 4.11 Economy.

#### **4.9.2 Potential impacts and mitigation measures**

This section defines and describes the objectives and practical measures for protecting or enhancing social values, describes how nominated quantitative standards and indicators may be achieved for social impacts management, and how the achievement of the objectives will be monitored, audited and managed.

This section must also describe how and when information will be fed back to affected parties and how affected parties can be involved in the community consultation program throughout the life of the Project.

The social impact assessment of the project should consider the information gathered in the community consultation program and the analysis of the existing socio-economic environment, and describe the project's impact, both beneficial and adverse, on the local community. The nature and extent of the community consultation programs are to be described and a summary of the results incorporated in the EIS, with a description of how consultation feedback has identified and informed assessment of impacts and mitigation strategies."

The social impact assessment of the project is to be carried out in consultation with the Department of Communities. The assessment of impacts should describe the likely response of affected communities and identify possible beneficial and adverse impacts (both immediate and cumulative). These impacts should be considered both at the regional and local level.

The EIS should address the following matters:

- Include an assessment of impacts on local residents, current land uses and existing lifestyles and enterprises;
- Include an assessment of impacts on local and state labour markets, with regard to the source of the workforce. This information is to be presented according to occupational groupings of the workforce. In relation to the source of the workforce, information is required as to whether the proponent, and/or contractors, are likely to employ locally or through other means and whether there are initiatives for local employment opportunities;
- The EIS should address impacts of both construction and operational workforces and associated contractors on housing demand, community services and community cohesion;
- The assessment of impacts should take account of relevant demographic, social, cultural and economic profiles;
- Identify any new skills and training to be introduced in relation to the project. Adequate provision should be made for apprenticeship and worker training schemes. If possible, the occupational skill groups required and potential skill shortages anticipated should be indicated;
- Provide comment on how much service revenue and work from the project (e.g. provisioning, catering and site maintenance) would be likely to flow to existing communities in the area of the project, particularly if a fly-in, fly-out workforce is proposed;
- The EIS needs to identify positive and negative impacts arising from a Fly-In-Fly-Out roster and describe what practical measures can be taken to reduce any negative impacts on personnel. This may be done with reference to similar projects;
- In regard to affected indigenous and non-indigenous communities respectively, particular attention should be paid to the effects on:
  - the ability of both indigenous and non-indigenous people, to live in accordance with their own values and priorities;

- the use of and access to culturally important areas and landscapes;
- the access to existing human and commercial services and housing;
- the ability to participate in regional and local employment and training opportunities; and
- the new project workforce and their families.

For the construction and operational phases of the development, describe the effects of the proposal on local and regional residents, including land acquisition and relocation issues and property valuation and marketability, community services and recreational activities.

Discuss the potential environmental harm on the amenity of adjacent areas used for cropping, grazing, forestry, recreation, industry, education, aesthetics, or scientific or residential purposes. Describe the implications of the proposal for future developments in the local area including constraints on surrounding land uses.

The educational impacts of the proposed development are to be analysed and described, particularly in regard to:

- improved appreciation of conservation areas; and
- environmental education for the general public.

For identified impacts to social values, suggest mitigation and enhancement strategies and facilitate initial negotiations towards acceptance of these strategies. Practical monitoring regimes should also be recommended.

The level of information gathered and documented on the Traditional Owner communities and potential Project impacts will be in accordance with the wishes of the Traditional Owner groups. This will be determined during the consultation process for the cultural heritage surveys and the Cultural Heritage Management Plans.

## **4.10 Health and safety**

### **4.10.1 Description of environmental values**

This section describes the existing community values for public health and safety that may be affected by the proposal. For projects proposing air emissions, and/or those with the potential to emit odours, nearby and other potentially affected populations should be identified and described. Particular attention should be paid to those sections of the population, such as children and the elderly, that are especially sensitive to environmental health factors.

### **4.10.2 Potential impacts and mitigation measures**

This section defines and describes the objectives and practical measures for protecting or enhancing health and safety community values, describes how nominated quantitative standards and indicators may be achieved for social impacts management, and how the achievement of the objectives will be monitored, audited and managed.

The EIS should assess the effects on the project workforce of occupational health and safety risks and the impacts on the community in terms of health, safety, and quality of life from project operations and emissions. Any impacts on the health and safety of the community, workforce, suppliers and other stakeholders should be detailed in terms of health, safety, quality of life from factors such as air emissions, odour, dust and noise.

Map(s) should be provided showing the locations of sensitive receptors, such as, but not necessarily limited to residential areas, and centres of work (e.g. office buildings, factories and workshops). The EIS, illustrated by the maps, should discuss how planned discharges from the project could impact on public health in the short and long

term, and should include an assessment of the cumulative impacts on public health values caused by the proposal, either in isolation or by combination with other known existing or planned sources of contamination.

The EIS should address the project's potential for providing disease vectors. Measures to control mosquito and biting midge breeding should be described and include a vector control program in the EIS if needed. Any use of recycled water should be assessed for its potential to cause infection by the transmission of bacteria and/or viruses by contact, dispersion of aerosols, and ingestion (e.g. via use on food crops). Similarly, the use of recycled water should be assessed for its potential to cause harm to health via the food chain due to contaminants such as heavy metals and persistent organic chemicals. Practical monitoring regimes should also be recommended in this section.

Consideration should be given to food safety for the camp and food hygiene approval through Cloncurry Shire Council.

Details of appropriate access to health care, including emergency care for employees on site should be given.

## **4.11 Economy**

### **4.11.1 Description of environmental values**

This section describes the existing economic environment that may be affected by the proposal. The character and basis of the local and regional economies should be described including:

- economic viability (including economic base and economic activity, future economic opportunities, current local and regional economic trends, in particular drought and rural downturn etc); and
- historical descriptions of large-scale resource developments and their effects in the region.

### **4.11.2 Potential impacts and mitigation measures**

The function of this section is to define and describe the objectives and practical measures for protecting or enhancing economic values, to describe how nominated quantitative standards and indicators may be achieved for economic management, and how the achievement of the objectives will be monitored, audited and managed.

An economic analysis, including from national, state, regional and local perspectives as appropriate to the scale of the project. The general economic benefits from the project should be described.

At a level of detail appropriate to the scale of the project, the analysis is to consider:

- the significance of this proposal on the local and regional economic context;
- the long and short-term beneficial (e.g. job creation) and adverse (e.g. competition with local small business) impacts that are likely to result from the development;
- the potential, if any, for direct equity investment in the project by local businesses or communities;
- the cost to all levels of government of any additional infrastructure provision;
- implications for future development in the locality (including constraints on surrounding land uses and existing industry);
- the potential economic impact of any major hazard identified in section 4.12;
- the distributional effects of the proposal including proposals to mitigate any negative impact on disadvantaged groups;
- the value of lost opportunities or gained opportunities for other economic activities anticipated in the future; and
- impacts on local property values.

Attention should be directed to the long and short-term effects of the project on the land-use of the surrounding area and existing industries, regional income and employment and the state economy.

For identified impacts to economic values, suggest mitigatory and enhancement strategies and facilitate initial negotiations towards acceptance of these strategies. Practical monitoring regimes should also be recommended.

## **4.12 Hazard and risk**

### **4.12.1 Description of environmental values**

This section describes the potential environmental hazards and risk that may be associated with the proposal.

Detail the environmental values likely to be affected by any hazardous materials and actions incorporated in the proposal. The degree and sensitivity of risk should be detailed.

### **4.12.2 Potential impacts and mitigation measures**

This section defines and describes the objectives and practical measures for protecting the environment from hazards and risk, describes how nominated quantitative standards and indicators may be achieved for hazard and risk management, and how the achievement of the objectives will be monitored, audited and managed.

The EIS should provide an inventory for each class of substances listed in the Australian Dangerous Goods Codes to be held on site, and permitting required from Queensland Health such as permit for Sodium Cyanide, prior to operational use. This information should be presented by classes and should contain:

- chemical name;
- concentration in raw material chemicals;
- concentration in operation storage tank;
- U.N. number;
- packaging group;
- correct shipping name;
- maximum inventory of each substance;
- rate of usage.

Details should be provided of:

- safeguards proposed on the transport, storage, use, handling and on-site movement of the materials to be stored on-site;
- the capacity and standard of bunds to be provided around the storage tanks for classified dangerous goods and other goods likely to adversely impact upon the environment in the event of an accident; and
- the procedures to prevent spillages, and the emergency plans to manage hazardous situations.

A preliminary environmental hazard analysis should be conducted to assess both natural and induced hazards associated with the construction, operation and decommissioning of the Project in accordance with AS/NZS Risk Management Standard 4360:2004 for the Project and will incorporate:

- all relevant majors hazards both technological and natural;
- the possible frequency of potential hazards, accidents, spillages and abnormal events occurring;
- indication of cumulative risk levels to surrounding land uses;
- life of any identified hazards; and

- State Planning Policy 1/03 – Mitigating the Adverse Impacts of Flood, Bushfire and Landslide, where necessary

#### **4.13 Cross-reference with the terms of reference**

This section provides a cross reference of the findings of the relevant sections of the EIS, where the potential impacts and mitigation measures associated with the project are described, with the corresponding sections of the TOR.

## 5. Environmental management plan

The environmental management plan (EM plan) should be developed from the mitigation measures detailed in part 4 of the EIS. Its purpose is to set out the proponents' commitments to environmental management. That is, how environmental values will be protected and enhanced.

The EM plan is an integral part of the EIS, but should be capable of being read as a stand-alone document without reference to other parts of the EIS. For a mining project the EM plan must meet the content requirements of section 203 of the *Environmental Protection Act 1994*. The general contents of the EM plan should comprise:

- the environmental values likely to be affected by the mining activities
- the proponents' commitments to acceptable levels of environmental performance, including environmental objectives, i.e. levels of expected environmental harm, performance standards and associated measurable indicators, performance monitoring and reporting;
- impact prevention or mitigation actions to implement the commitments; and
- corrective actions to rectify any deviation from performance standards.

Through the EM plan, the EIS's commitments to environmental performance can be used as regulatory controls through conditions to comply with those commitments. Therefore, the EM plan is a relevant document for project approvals, environmental authorities and permits, and may be referenced by them. The EM plan may suggest conditions that will form the basis for developing the draft environmental authority.

## 6. References

All references consulted should be presented in the EIS in a recognised format.

## 7. Recommended appendices

### A1. Final terms of reference for this EIS

A copy of the final TOR should be included in the EIS. Where it is intended to bind appendices in a separate volume from the main body of the EIS, the TOR at least should be bound with the main body of the EIS for ease of cross-referencing. A summary, cross-referencing specific items of the TOR to the relevant section of the EIS, should also be provided in Section 4.14 of the EIS. For this purpose the TOR should be line numbered.

### A2. Development approvals

A list of the development approvals required by the project should be presented.

### A3. Study team

The qualifications and experience of the study team and specialist sub-consultants and expert reviewers should be provided.

### A4. The standard criteria

A brief summary should be presented of the proposal's compatibility with the standard criteria as defined by the *Environmental Protection Act 1994*, which include the principles of ESD and other relevant policy instruments. With regard to the principles of ESD, as listed in The National Strategy for Ecologically Sustainable Development, published by the Commonwealth Government in December 1992 (available from the Australian Government Publishing Service), each principle should be discussed and conclusions drawn as to how the proposal conforms. A life-of-project perspective should be shown.

### A5. Consultation report

The summary Consultation Report appendix for an EIS under the EP Act should commence by including the details of affected and interested persons, and the statement of planned consultation with those persons,

originally provided with the draft terms of reference. It should describe how 'interested' and 'affected persons,' and any 'affected parties' as defined in the EPBC Act, were identified.

A further list should be provided that includes the Commonwealth, state and local government agencies consulted, and the individuals and groups of stakeholders consulted.

The Consultation Report appendix should summarise the results of the community consultation program, providing a summary of the groups and individuals consulted, the issues raised, and the means by which the issues were addressed. The discussion should include the methodology used in the community consultation program including criteria for identifying stakeholders and the communication methods used.

## **A6. Specialist studies**

All reports generated on specialist studies undertaken as part of the EIS are to be included as appendices. These may include:

- geology;
- soil survey and land suitability studies;
- waterway hydrology;
- groundwater;
- flora and fauna studies;
- economic studies, CBA; and
- hazard and risk studies.

## **A7. Research**

Any proposals for researching alternative environmental management strategies or for obtaining any further necessary information should be outlined in an appendix.

### Disclaimer

While this document has been prepared with care, it contains general information and does not profess to offer legal, professional or commercial advice. The Queensland Government accepts no liability for any external decisions or actions taken on the basis of this document. Persons external to the Environmental Protection Agency should satisfy themselves independently and by consulting their own professional advisors before embarking on any proposed course of action.

## **Approved By**

SIGNED

Signature

20 August 2008

Date

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