Department of Environment
and Heritage Protection

Terms of Reference for the Red Dome Pit Extension Project Environmental Impact Statement (EIS)

Proposed by Mungana Goldmines Ltd

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Prepared by: Statewide Environmental Assessments Unit, Department of Environment and Heritage Protection

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Contents

Background

Mungana Goldmines Ltd is the proponent for the Red Dome Pit Extension (RDPE) Project. The project would be situated on the existing group of Red Dome and Mungana mining leases, at Mungana, 15 km west of Chillagoe in North Queensland. The existing tenures for this project are mining leases (ML) 4928, 4977, 5319, 5176 and 20640.

The project would focus on enlarging and deepening the existing, open-cut Red Dome Pit, which has been dormant from mining since 1997, although it has been used recently for the storage of water affected by other mining activities within the local group of mining leases.

The redevelopment of the pit would entail an initial open pit cut back around the circumference of the decommissioned Red Dome Gold Mine pit followed by underground mining with access from the pit. The enlarged pit would have a depth of 370 m and a surface area of 38.3 ha. The extended pit boundary would be close to the boundary of the Piano Cave section of the Chillagoe–Mungana Caves National Park. Open-cut mining would extract up to 3.8 million tonnes per year (Mt/y) of run-of-mine ore, averaging 2.3 Mt/y over the estimated 10 years of the life of the mine. After open-cut mining has reached its greatest feasible extent, mining activities would move into an underground operation to extract a further 2.4 Mt of ore.

Development would include a new mineral processing facility with the capacity to process 4 Mt/y of ore. To maintain a 4 Mt/y processing rate for the expected 10 year mine life, ore would also be sourced from a number of resources within the Red Dome and Mungana leases, including:

- the Mungana open pit
- the Mungana underground mine
- reprocessing of previous Red Dome heap leach material.

Tailings from the processing plant would be deposited in new cells adjacent to the existing tailings storage facility in the south-west area of the mining leases. New non-acid-forming and potential-acid-forming waste rock dumps would be constructed on areas previously disturbed by mining activities.

CONTENTS OF THE ENVIRONMENTAL IMPACT STATEMENT (EIS)

Executive summary

The executive summary conveys the Red Dome Pit Extension (RDPE) project's most important aspects and options to the reader in a concise and readable form. Use plain English and avoid the use of jargon and obscure 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

Provide a glossary of technical terms, acronyms and abbreviations before the main text of the EIS.

1 Introduction

Explain why the EIS has been prepared and what it sets out to achieve—in particular, the level of detail required to satisfy assessment of the approvals being sought. Define the audience of the EIS.

1.1 Project proponent

Provide details of the proponent of the RDPE, including details of any joint venture partners.

1.2 Project description

Provide and illustrate a brief description of the key elements of the RDPE. Summarise any major associated infrastructure requirements. Detailed descriptions of the project should follow in section 3.

1.3 Project objectives and scope

State the objectives that have led to the development of the RDPE and briefly outline 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 EIS process

The purpose of this section is to clarify methodology and objectives of the EIS under the relevant legislation.

1.4.1 Methodology of the EIS

Describe the EIS process steps, timing and decisions to be made for relevant stages of the RDPE. Provide a brief description of studies or surveys that have been undertaken to help develop the project and prepare the EIS. Describe any baseline studies or investigations used in the EIS that were undertaken before the EIS process started. Outline how the consultation process (which is to be described in detail in section 1.5) integrated 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
- people are aware of any opportunities for input and participation.

1.4.2 Objectives of the EIS

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

While the terms of reference guide 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 complete knowledge in advance of undertaking an EIS of what the EIS studies should find.

If it transpires while preparing the EIS that previously unforeseen matters not addressed in the terms of reference are found to be relevant to assessing potential impacts of the project, those matters are to be included in the EIS.

Also, it is essential that the main text of the EIS addresses all relevant matters concerning environmental values, impacts on those values and proposed mitigation measures. No relevant matter is to be raised for the first time in an appendix or the draft environmental management plan (EM plan).

The EIS assessment's depth and scope should be proportional to the values impacted and the scale of the impacts. 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.

The EIS is a public document. Its purpose is not only to provide information to regulatory agencies, but also to inform the public about the project's scope, impacts and mitigation measures. As such, the main text should be written in plain English and avoid jargon and undefined acronyms as much as possible. Additional technical detail may be provided in appendices. The main text should be written from the perspective that the reader has no prior knowledge of the project site and presented in such a way that the reader would not need to have visited the site to understand the issues described in the EIS.

In brief, the EIS objectives are 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 protecting and enhancing environmental values. A key aspect of the EIS is discussing options and alternatives and their likely relative environmental management outcomes.

It is necessary for all relevant sections of the EIS to provide details about the quality of the information given in the EIS, in particular:

- the source of the information
- how recent the information is
- how the reliability of the information was tested
- any uncertainties in the information.

The role of the EIS in providing the project's draft EM plan is also to be discussed, giving particular reference to the EM plan's role in providing management measures that can be carried over into conditions that would attach to any approvals, environmental authorities and permits for the project.

1.4.3 Submissions

The reader must be informed about how and when public submissions on the draft EIS can be made, and how they should be addressed and taken into account in the decision-making process.

1.5 Public consultation process

An appropriate public consultation program is essential to the impact assessment process. This section must outline the methodology that should be adopted to identify and mitigate social and economic impacts of the RDPE. Provide information about consultation that has already taken place and its results.

Submitting 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 under section 41 of the *Environmental Protection Act 1994*. Similar requirements, though non-statutory, are usually applied to EIS processes under other Queensland legislation.

The public consultation program should provide opportunities to educate and involve the community. It may include interviews with individuals, public meetings, interest group meetings, producing regular summary information and updates, and other means 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 Department of Environment and Heritage Protection (EHP) guideline Issue Identification and Community Consultation.

1.6 Project approvals

1.6.1 Relevant legislation and policy requirements

Explain the legislation and policies controlling the approvals process. The EIS should make reference to the Queensland *Environmental Protection Act 1994*, *Sustainable Planning Act 2009* (where applicable) and other potentially relevant Queensland laws. Include any requirements of the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*.

Identify all environmentally relevant activities that would be undertaken at the project site, including those that would otherwise require a development approval if the project was not covered by an environmental authority for a mining or petroleum activity.

If any potentially relevant legislation (such as the *Water Act 2000* for taking water, the *Nature Conservation Act 1992* for protected wildlife, or the *Vegetation Management Act 1999* for land clearing) is not applicable, this section of the EIS should explain why that is the case..

Describe local government planning controls, local laws and policies applying to the development, and provide a list of the approvals required for the project and the expected program for approval of applications. The description should include any requirements for workers' camps or villages.

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

Discuss the project's consistency with existing land uses or long-term policy framework for the area (for instance, as reflected in local and regional plans), and with legislation, standards, codes or guidelines available to monitor and control operations on site. 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 under Commonwealth legislation

The Red Dome project, including the additional mining activities associated with the Red Dome open pit, was referred by Kagara Ltd in 2006 to the then Commonwealth Department of the Environment and Heritage under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). On 3 April 2006, the Department of the Environment and Heritage determined the project to be not a controlled action provided that it is undertaken in a particular manner that the Commonwealth Government specified in its decision notice. This decision was confirm by the Department of Sustainability, Environment, Water, Population and Planning on 5 March 2012. Consequently, the project is not a controlled action under the Commonwealth's *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and there is no requirement for this EIS to address matters of national environmental significance.

2 Project need and alternatives

2.1 Project justification

Describe the justification for the RDPE, with particular reference to the economic and social benefits, including employment and spin-off business development that the project may provide. Discuss the status of the project in a regional, state and national context.

2.2 Alternatives to the project

Describe feasible alternatives, including conceptual, technological and locality alternatives to the RDPE, and discuss the consequences of not proceeding with the RDPE. Summarise the comparative environmental, social and economic impacts of each alternative, with particular regard to the principles of ecologically sustainable development (ESD). Discuss alternatives in sufficient detail to enable an understanding of the reasons for preferring certain options and courses of action and rejecting others.

Explain the interdependencies of the project's components, particularly 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 part of the project, describe and provide a rationale for such infrastructure.

This information is required to assess how the scope of the project was derived, and to ensure that the ESD principles and sustainable development aspects have been considered and incorporated during the scoping and planning of the project.

3 Description of the project

Describe the RDPE through its various stages, such as construction, operation and decommissioning. This information is required to allow complete assessment of a project from planning to its end-of-life. It also allows identification of approvals that may be required and how they may be managed through the life of the project. Maps or figures showing the position of features or boundaries should include latitudes and longitudes referenced on the Geocentric Datum of Australia 1994 (GDA94). These latitudes and longitudes should also be used in the text and tables to describe the locations of any features (such as discharge points) or boundaries that may be relevant to subsequent approvals. All features depicted on any maps or figures, such as watercourses and water storages, are to be clearly and consistently labelled throughout the EIS, including in all text and tables.

3.1 Location

3.1.1 Regional context

Describe the regional context of the RDPE and illustrate it on maps at suitable scales.

3.1.2 Local context

Describe the local context of the project and include real property descriptions of the project site and adjacent properties. Provide maps at suitable scales that show 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 should 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, power and water supply lines, buildings, roads, railways, bridges, weirs, culverts, hardstands, car parks, etc.
- the location of any proposed buffers surrounding the working areas.

Include a rectified aerial photo enlargement (preferably A3 size) to illustrate components of the RDPE in relation to the land and mining tenures, and natural and built features of the area.

3.2 Construction

Describe the extent and nature of the RDPE's construction phase. Describe the type and methods of construction, the construction equipment to be used and the items of plant to be transported onto the construction site. Also describe any staging of the project and illustrate site boundaries, development sequencing and timeframes.

3.3 Operations

Describe the location and nature of the project's operational phase, and illustrate the description as required with maps, diagrams and artist's impressions. Operational issues to be addressed would include, but not necessarily be limited to:

- a description of plant and equipment to be employed
- the capacity of plant and equipment
- chemical and physical processes
- chemicals to be used.

Provide concept and layout plans highlighting proposed buildings, structures, plant and equipment associated with the processing operation. Describe the nature, sources, location and quantities of all materials to be handled, including the storage and stockpiling of raw materials.

Provide indicative process flow-sheets 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 Tenements and tenures

Describe and illustrate any existing mining tenements, petroleum (including coal seam gas), geothermal and greenhouse gas tenures and licences overlying and adjacent to the RDPE site, and any proposed applications required for this project.

Describe in detail any issues related to the overlap of tenements and tenures for different resources or purposes, including the sequential exploitation of the resources or uses to which the tenements and tenures may be put.

3.3.2 Resource base and mine life

Summarise the results of studies and surveys undertaken to identify the mineral and natural resources required to implement the proposal (further detail should be provided in section 4.2.1.2 Geology). Describe the required location, volume, tonnage and quality of natural resources (such as land, water, timber, energy, etc.). Provide specific details of the following:

- the proposed mine life and an outline of the coal/mineral resource base, including the total thickness of seams or extent of the ore body
- the planned recovery of resources
- locations of any resources that would be sterilised by the planned activities
- the quantity of coal/mineral to be mined annually, including any proposed ramping of production or staging of development.

3.3.3 Mining methods and equipment

Provide specific details 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
- chemicals to be used, including hydraulic fluids used and released in underground operations
- explosives storage.

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

Provide specific details of the following:

- the proposed sequence and timing of mining of each ore body within the mining lease;
- the physical extent of excavations, location of stockpiles of overburden product and waste to be handled during the project's operation or left after mining ceases, including the rate of throughput of stockpiles of product, waste and overburden
- typical cross sections of the mine workings showing voids, surface profiles and geological strata
- the proposed progressive backfilling of excavations
- the area disturbed at each major stage of the project.

3.3.5 Workforce

Outline the workforce numbers to be employed by the project during its various phases, such as construction, commissioning, operation and decommissioning. Make comment on the anticipated basis of employment, such as permanent, contract, etc. A detailed profile of the workforce should be provided in the social values section of the EIS.

3.3.6 Workforce accommodation

Describe where personnel would be accommodated. In particular, describe and illustrate the number, size, locations and management of any workers camps or villages. The consequent impacts of constructing new or expanded accommodation should be addressed in the appropriate sections of the EIS even if the accommodation would be operated by a contractor.

3.3.7 Processing and products

Describe the quantities and characteristics of the products that would be produced on an annual basis. Provide indicative process flow-sheets showing material balances for the processing plant, and the anticipated rates of inputs, along with similar data on products, wastes and recycle streams.

3.3.8 Ongoing evaluation and exploration activities

Describe the extent and nature of any proposed ongoing exploration or geological or 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. Discuss any environmental design features of these facilities including bunding of storage facilities.

3.5 Infrastructure requirements

Describe with concept and layout plans, requirements for constructing, upgrading or relocating all infrastructure associated with the project. Show the locations of any necessary infrastructure easements on the plans, including infrastructure such as roads, rail (and the rail corridor), level crossings, bridges, tracks and pathways, dams and weirs, bore fields, power lines and other cables, wireless technology (such as microwave telecommunications), and pipelines for any services, whether underground or above.

3.5.1 Transport—road/rail/air/ship

Provide an overview of the arrangements for the transportation, importation or exportation of plant, equipment, materials, products, wastes and personnel during both the construction and operational phases of the RDPE. Describe the use of existing facilities and all requirements for the construction, upgrading or relocation of any transport-related infrastructure.

3.5.2 Energy

Describe all energy requirements, including electricity, natural gas, and/or solid and liquid fuel requirements for the construction and operation of the RDPE. Show the locations of any easements on the infrastructure plan. Energy conservation should be briefly described in the context of any Commonwealth, Queensland and local government policies.

3.5.3 Water supply and storage

Provide information on proposed water usage and storage by the project, including the quality and quantity of all water supplied to, or captured at, the site. In particular, describe the proposed and optional sources of water supply such as mine dewatering, capture of overland flow, taking from a watercourse, bores and associated pipelines, and any surface storages such as dams and weirs, water supply pipelines.

Discuss likely temporal changes in specific water quality parameters in mine-affected water storages under different scenarios (extended dry periods, holding times and recycling scenarios) at different project stages. Estimate the average and maximum rates of supply from each source for each phase of the project's life. Any proposed water conservation and management measures should be described.

Estimate potable water demand for the project, including the temporary demands during the construction period. Provide details of any existing water supply, including town water, which would meet the requirements. If water storage and treatment is proposed on site for use by the site workforce, describe the method of treatment and storage. Describe any waste streams from water treatment, and assess the potential impacts of disposal in the appropriate sections of the EIS.

3.5.4 Stormwater drainage

Provide a description of the proposed stormwater drainage system and the proposed disposal arrangements, including any off-site services. Illustrate the description with figures with contours at suitable intervals (one metre contours in areas of low relief) showing drainage pathways, including the separate pathways for the natural and mine-affected surface run-off respectively, any diversions of ephemeral waterways, and the locations and discharge points of sediment detention basins, and any other stormwater quality improvement devices.

3.5.5 Sewerage

Describe, in general terms, the sewerage infrastructure required by the RDPE. If it is intended that industrial effluent or relatively large amounts of domestic effluent are to be discharged into an existing sewerage system, provide in section 4.4 Waste an assessment of the capacity of the existing system to accept the effluent. For industrial effluent, this should detail the physical and chemical characteristics of the effluent.

3.5.6 Telecommunications

Describe any impacts on existing telecommunications infrastructure, such as optical cables and microwave towers, and identify the owners of that infrastructure.

3.5.7 Accommodation and other infrastructure

Describe any other developments directly related to the project not described in other sections, such as:

- camps, townships or residential developments
- fuel storage areas
- equipment hardstand and maintenance areas
- technical workshops and laboratories.

3.6 Waste management

Provide an inventory of all wastes to be generated by the RDPE 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
- the volume and tonnage of any re-usable by-products.

Provide schematic diagrams, which for the operational phase may be simplified versions of those provided in section 3.3, for each distinct stage of the project. These should indicate the processes to be used and highlight their associated waste streams. This applies to 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. Describe the physical and chemical characteristics, and the variability of composition and generation rates of each waste material.

Each subsection on waste management should assess how the proposed methods for waste management at each stage of the project achieve the highest possible level of waste management with regard to first avoiding the production of waste, then reusing or recycling waste, with disposal as the last option.

Describe how the project would achieve natural resource use efficiency (such as minimum use of energy and water, and minimum footprint on used land), integrated processing design, co-generation of power and by-product reuse as shown in a material/energy flow analysis. This information is required to enable the resource management agencies to assess the efficiency of resource use, and allocation issues.

3.6.1 Air emissions

Describe in detail the quantity and quality of all air emissions (including particulates, fumes and odours) from the RDPE during construction and operation. Particulate emissions include those that would be produced by any industrial process, including emissions from any stack, vent or operation of a batch process, or disturbance by wind action on stockpiles and conveyors, or by transportation equipment such as trucks or trains, either by entrainment from the load or by travel on unsealed roads.

3.6.2 Excavated waste

Describe the materials to be excavated as waste. Also, describe and illustrate the location, design and methods for constructing dumps for waste rock and any subsoil that should not be replaced in rehabilitation.

Estimate the tonnage and volume of waste rock and subsoil to be excavated during the various stages of operation. Estimates should be made for each separate rock and soil type. Describe the expected proportion and source of waste rock that is mineralised but currently uneconomical for processing.

Describe the chemical and physical properties of the waste rock and subsoil, and assess the properties that affect their erosion and leaching potential. Undertake the characterisation of the waste in accordance with the *Assessment and Management of Acid Drainage* guideline of the *Technical Guidelines for the Environmental Management of Exploration and Mining in Queensland* series (DME, 1995), and any other applicable best practice guidelines. The characterisation of waste rock and subsoil would include, but not necessarily be limited to: sulfides; metals; pH, conductivity and chloride of slurry samples; the Net Acid Producing Potential (NAPP), and Net Acid Generation (NAG) potential of the mined waste.

Discuss the potential for acid, neutral or alkaline drainage from waste dumps. Characterise the potential quality of leachate from the mined waste under field conditions, including contaminants such as sulfate, pH, chloride, metals, major cations and anions, and any chemical species (including those with the potential to bio-accumulate) present in sufficient concentration that is likely to cause environmental harm including nuisance. Predict and discuss the likely temporal variation in the quality and quantity or this leachate, including the influence of weathering and different management options across the life of the project. Provide cross-references in this section to those sections of the EIS that assess in detail the potential impacts of any direct or indirect discharge of leachate on downstream sensitive environments or users of receiving waters.

Use the estimated amounts and characteristics of excavated waste to develop appropriate measures for dealing with that waste, including designs for waste dumps, and alternatives for excavated waste disposal such as in-filling of voids, off-site options and treatment of contaminated soil. Assess the likely performance of the proposed waste disposal options with particular regard to:

- segregating and encapsulating sub-economic but mineralised rock and/or potentially acid-forming rock
- managing surface drainage and sub-surface leachate both during operations at the mine and after mining ceases (note: avoid placing dumps across drainage lines that would pond water behind the dump and cause infiltration)
- slope profiles and the stability and erosion potential of waste dumps
- the intended land use after mining ceases, and the land management and maintenance requirements for the subsequent landholder.

Illustrate the location and cross-sections of the proposed dumps on maps, drawings and diagrams relative to topography and other natural features of the area.

3.6.3 Tailings or fine rejects

Describe the methods and materials that would be used to produce tailings waste (tailings should be understood to include any fine reject material). State whether the methods to be used to produce and treat tailings would be novel

or established. For novel methods, describe the testing undertaken to determine if the method would be suitable for the proposed use. For established methods, provide examples of where the method has been, or is being, used and assess the equivalence of those examples to the proposed use.

Estimate the annual production of tailings waste at the various stages of the project.

Describe how the methods used to produce and treat tailings would be in accordance with the waste management hierarchy and the tailings management principles in the *Tailings Management Guideline* of the *Technical Guidelines for the Environmental Management of Exploration and Mining in Queensland* series, (DME, 1995).

Describe in detail the likely physical and chemical characteristics of the tailings waste and the likely chemical characteristics of waste water from the pressing plant, the decant water from any tailings storage facility (TSF), and the pore water and leachate from any dump containing tailings.

Describe and illustrate the proposed locations of any pits, dams, bunds or dumps that would be used for the disposal of tailings.

Assess the hazard category of any regulated dam, such as a TSF, giving consideration to the 'Manual for assessing hazard categories and hydraulic performance of dams' (DERM, February 2012) and the guideline 'Structures which are dams or levees constructed as part of environmentally relevant activities' (DERM, February 2012). Describe and illustrate the proposed design of any regulated dam, including any cells for non-flowable tailings within waste rock dumps (note: a shear strength of greater than 1000 pascals would generally be required of pastes suitable for dry tailings stacking, while pastes with lower shear strength must be contained in a regulated dam. However, the slumping and plastic properties of any tailings considered for disposal by dry stacking must be derived from tests on representative samples and reported in the EIS). Demonstrate that the design of any regulated dam has been produced by a suitably qualified and experienced engineer. Describe the source, and assess the suitability, of the materials to be used to construct containment systems. Describe any proposed staging of the construction for any TSF or disposal cells.

Conduct, and report on, a risk assessment and describe how it has been used to derive the design storage allowance for any regulated dams. Assess whether the proposed design and methods of disposal would minimise the potential hazards and risks, particularly in relation to the potential impacts of failure caused by mass release from structural failure or contaminant release from overflow. Also, assess whether the proposed design maximises site efficiency, such as by minimising the footprint.

If some form of co-disposal of fine and coarse rejects is proposed, describe the range of proportions, size fractions and mixing method that would produce a stable deposit.

Describe the proposed discharge locations and conditions for any TSF. Describe the flow path any discharge would take, illustrated on contour maps, and provide an overview of the potentially affected receiving environment with particular regard to downstream sensitive ecosystems or users of receiving waters. Discharge should be taken to mean any planned or unplanned overflow or release, any leachate, or any potentially contaminated runoff leaving a TSF. Assess in detail the potential impacts of any discharge on downstream sensitive environments or users of receiving waters in the appropriate sections of the EIS and cross-reference to them in this section.

Describe the proposed monitoring network and regime that would be used to detect any leak from the TSF.

Describe the proposed measures to be used to decommission any TSF or dump used for the disposal of tailings. Assess any legacy issues for the subsequent landholder.

3.6.4 Solid waste disposal

Describe the quantity and quality of solid wastes (other than waste rock, subsoil and tailings addressed in other sections) and the proposed methods of their disposal. Describe the proposed location, capacity and suitability of any landfill that would receive solid waste from the project. Describe and illustrate any proposed on-site landfill, including its dimensions, volume and method of construction.

3.6.5 Liquid waste

Describe the origin, quality and quantity of wastewater and any immiscible liquid waste that would be produced by the project other than that addressed in previous sections. Give particular attention to the capacity of wastes to

generate 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.

The EIS should consider the following effects:

- groundwater from excavations
- rainfall directly onto disturbed surface areas
- run-off from roads, plant and industrial areas, chemical storage areas
- drainage (run-off plus any seepage or leakage)
- seepage from other waste storages
- water usage for:
  - process use
  - dust suppression
  - irrigation
  - domestic purposes
- evaporation
- domestic sewage treatment – disposal of liquid effluent and sludge
- water supply treatment plant – disposal of wastes.

3.7 Rehabilitation and decommissioning

Describe the options, strategic approaches and methods for progressive and final rehabilitation of the environment disturbed by the RDPE. Develop a preferred rehabilitation strategy that would minimise the amount of land disturbed at any one time, and minimise the residual loss of land with ecological or productive value. Show the final topography of any excavations, waste areas and dam sites on suitably scaled maps.

Evaluate the compliance of the strategies and methods for progressive and final rehabilitation of disturbed areas with the objectives of the *Technical Guidelines for the Environmental Management of Exploration and Mining in Queensland* (DME, 1995) and the guideline *Rehabilitation Requirements for Mining Projects*. In particular, the strategies and methods are to have the following objectives:

- Mining and rehabilitation should aim to create a landform with the same or similar land use capabilities and/or suitability it had prior to the disturbance, unless other beneficial land uses are pre-determined and agreed.
- Mine wastes and disturbed land should be rehabilitated so that it is self-sustaining or to a condition where the maintenance requirements are consistent with an agreed post-mining land use.
- Surface and ground waters that leave the lease should not be degraded compared to their condition prior to the commencement of mining operations. Current and future water quality should be maintained at levels that are acceptable for users downstream of the site.

Describe the means of decommissioning the project by removing or reusing plant, equipment, structures, buildings, concrete footings and foundations, hardstand areas and storage tanks. Describe the proposed methods for stabilising the affected sites. Discuss options and methods for the disposal of wastes from the demolition of plant and buildings in sufficient detail for their feasibility and suitability to be assessed.

Describe any proposals to divert creeks during operations and, if applicable, the reinstatement of the creeks after operations have ceased. Rehabilitation would involve the re-establishment of vegetation communities along watercourses similar to the pre-cleared regional ecosystems in those areas. Where dams are to be constructed, describe proposals for the management of these structures after the completion of the project. Also, describe the final drainage and seepage control systems and long-term monitoring plans. Describe and illustrate where final voids and uncompacted overburden and workings at the end of mining would lie in relation to flood levels up to and including the ‘probable maximum flood level’ based on the Bureau of Meteorology’s ‘probable maximum precipitation’ forecast for the locality.

The description of topsoil management should address minimising topsoil storage times (to reduce fertility degradation) and the transportation, storage and replacement of topsoil to disturbed areas.

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 issues such as final landform stability (section 4.2.2), rehabilitation of plants (section 4.9.2) and the long-term quality of water in any final voids (section 4.5.2). This would include appropriate post-mining surface and groundwater quality and quantity monitoring regimes. 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 the Contaminated Land Register.

4 Environmental values and management of impacts

The functions of this section are to:

- Describe the existing environmental values of the area that may be affected by the RDPE. Environmental values are defined in section 9 of the *Environmental Protection Act 1994*, environmental protection policies and other documents such as the *Australian Water Quality Guidelines for Fresh and Marine Wa*ters (ANZECC & ARMCANZ, 2000). Environmental values may also be derived following recognised procedures, such as described in the ANZECC & ARMCANZ 2000 guidelines. Environmental values should be described referring to background information and studies, which should be included as appendices to the EIS.
- Describe the potential adverse and beneficial impacts of the project on the identified environmental values.
- Describe any cumulative impacts on environmental values caused by the project, either in isolation or by combination with other known existing or planned development or sources of contamination.
- Propose environmental protection objectives and commitments. All environmental protection commitments must be measurable and auditable.
- 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. Discuss available techniques, including best practice, to control and manage impacts to the nominated objectives. This section should also detail the environmental protection measures to be used in the planning, construction, operations, rehabilitation and decommissioning stages of the project and any associated works. Measures to prevent, or where prevention is not possible, minimise environmental harm and maximise social, economic and environmental benefits of the project. Preferred measures are to be identified and described in more detail than other alternatives.
- Describe any computational model used to make predictions of impacts and/or outcomes of mitigation measures. The description should address the inputs, assumptions, limitations, sensitivities, accuracy and precision of the model.

Any maps or figures showing the position of features or boundaries should use latitudes and longitudes on the GDA94 datum. Latitudes and longitudes on the GDA94 datum should also be used in the text to describe the locations of any features (such as discharge points) or boundaries that may be relevant to subsequent approvals.

Environmental protection objectives may be derived from legislative and planning requirements that 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 is to 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 is to address all elements of the environment, (such as land, water, coast, 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 background studies in appendices – note: such studies may be required over several seasons). Explain how the environmental values were derived, such as by citing published documents or by following a recognised procedure to derive the values.
- Impact on environmental values: describe quantitatively the likely impacts of the project on the identified environmental values of the area, including:
  - a detailed assessment of the nature and extent of the likely short term and long term impacts
  - a statement about whether any impacts are likely to be unknown, unpredictable or irreversible
  - an analysis of the significance of the impacts

  - any technical data and other information used or needed to make a detailed assessment of the impacts.
- The cumulative impacts of the project 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, address any requirements and recommendations of relevant state planning policies, environmental protection policies, national environmental protection measures and integrated catchment management plans.
- 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 watersheds affected by the project and other proposals competing for use of the local air and water sheds.
- Where impacts from the project would not be felt in isolation to other sources of impact, it is recommended that the proponent develop consultative arrangements with other industries in the project's area to undertake cooperative monitoring and/or management of environmental parameters. Describe such arrangements 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. Include objectives for progressive and final rehabilitation and managing contaminated land.
- Control strategies and mitigation measures to be used to achieve the objectives: describe the control principles, proposed actions and technologies to be implemented that are likely to achieve the environmental protection objectives; include designs, and relevant performance specifications of plant. Details are required to show that the expected performance is achievable and realistic.
- With regard to the project's proposed safeguards and mitigation measures, the EIS should include the following matters:
  - a description, and an assessment of the expected or predicted effectiveness, of the mitigation measures for dealing with the project's relevant impacts
  - any statutory or policy basis for the mitigation measures
  - the cost of the mitigation measures.
- Environmental offsets: Information is required to show that measures have been taken to avoid and minimise potential adverse impacts of the project. Environmental offsets may be proposed to counterbalance any remaining loss of environmental values, consistent with the specific-issue offset policies under the framework of the Queensland Government Environmental Offset Policy 2008, such as the Queensland Biodiversity Offset Policy (2011), and the draft *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) offsets policy.
- Monitoring programs: describe the monitoring parameters, monitoring points, frequency, data interpretation and reporting proposals.
- Management actions: describe the actions to be used to ensure the control strategies are implemented, such as by a 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.
- The environmental protection commitments developed in the main body of the EIS should all be included in a draft environmental management plan (EM plan) that provides the following information:
  - the framework for continuing management, mitigation and monitoring programs for the project's relevant impacts, including any provision for independent environmental auditing
  - the name of the entity responsible for endorsing or approving each mitigation measure or monitoring program

- a consolidated list of mitigation measures proposed to be undertaken to prevent, minimise or compensate for the project's relevant impacts, including mitigation measures proposed to be taken by the State, a local government or the proponent

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

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 project including air quality within the region of the project. Discuss extremes of climate (droughts, floods, cyclones, etc.) with particular reference to water management at the project site. Address the vulnerability of the area to natural or induced hazards, such as floods and bushfires. Consider the relative frequency and magnitude of these events 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, such as site bunding, stormwater management and tailings dams, should be addressed in section 4.5 with regard to contamination of waterways and in section 4.4 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 4.7.

4.1.1 Climate change adaptation

Climate change, through alterations to weather patterns and rising sea level, has the potential for long-term impacts on developments. Most developments involve the transfer to, or use by, a proponent of a community resource in one form or another, such as granting a non-renewable resource or the approval to discharge contaminants 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 assess the project's vulnerabilities to climate change and describe possible adaptation strategies for the activity including:

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

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

4.2 Land

4.2.1 Description of environmental values

Describe the existing environment values of the land area that may be affected by the RDPE. 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 achieving the objectives would be monitored, audited and managed.

4.2.1.1 Topography

Describe and illustrate the topography of the project site and the surrounding area, and highlight any significant features shown on the maps. Such features would include any locations subsequently referred to in the EIS (such as noise sensitive locations) that are not included on other maps in section 4.2. Maps should have contours at suitable increments (at least every metre in areas of low relief), shown with respect to Australian Height Datum (AHD) and drafted to the GDA 94 datum.

4.2.1.2 Land use

Describe and illustrate land uses in and around the project area in relation to current land tenures, show the location of existing dwellings, and make particular mention of any land with special attributes. Include any surrounding land that could be affected by the project. Show the location of any native title applications or determinations. Describe and illustrate the zoning of land in and around the project area according to any existing town or strategic plan.

4.2.1.3 Geology and geomorphology

Provide a description, map and a series of cross-sections of the geology of the project area at a regional and local level. The description of the geology and geotechnical conditions must be particularly detailed for the area between the existing pit and the national park boundary. Detailed cross-sections, or a relatively fine block model, must model the existing geology with sufficient precision to allow an assessment in the EIS of the likelihood of mining intersecting a cave connected to the national park. The description of the geological properties of the surrounding material must allow an assessment in the EIS of the likely rate of erosion of the lip of the pit towards the national park over the very long-term. Describe the geomorphology of the project site and the surrounding area. Make particular reference to the physical and chemical properties of surface and sub-surface materials and geological structures that could have an influence on, or be influenced by, the project's activities. Describe 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 project. Describe known sites of palaeontologic significance and address the potential for significant fossil finds in locations where the age and type of geology is such that significant specimens may be uncovered during construction or operations. Describe any sites of geomorphological significance, such as lava tubes or karst.

4.2.1.4 Mineral resources, ore reserves, petroleum and energy resources, and GHG storage resources

Provide a summary of the results of studies and surveys undertaken to identify and delineate the mineral resources, and ore reserves within the project area (including any areas underlying related infrastructure).

Report the mineral resources (measured, indicated or inferred) and ore reserves (proved or probable) in accordance with the Australasian Code for Reporting of Mineral Resources and Ore Reserves (the JORC Code – available at <www.jorc.org/main.php>) and the principles outlined in the Australian Guidelines for the Estimating and Reporting of Inventory Coal, Coal Resources and Coal Reserves (available at <www.jorc.org/pdf/coalguidelines.pdf>) and include the modifying factors and assumptions made in arriving at the estimates. Describe in detail the location, tonnage and quality of the mineral resources and ore reserves within the project area.

In addition, provide appropriately-scaled maps showing the general location of the project area, and in particular:

- the location and areal 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 would be subject
- the location of the proposed mine excavation(s)
- the location and boundaries of any project sites
- the location and boundaries of any other features that would result from the proposed mining, including waste/spoil dumps, water storage facilities and other infrastructure
- the location of any proposed buffers, surrounding the working areas

- 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.

Similarly report, to the extent practicable, on other resources related to the geology of the locality, including petroleum and energy resources (including geothermal), and any greenhouse gas (GHG) exploration permits or GHG leases. The description should include publicly available or searchable studies and surveys undertaken by other entities than the proponent.

4.2.1.5 Soils

Conduct a soil survey of the area that would be affected by the RDPE in accordance with section 6.1, *Compilation of Land Resources Inventory (LRI) – Pre Mining Studies*, of the *Land Suitability Assessment Techniques* in the *Technical Guidelines for the Environmental Management of Exploration and Mining in Queensland* (DME, 1995). Undertake soil tests and laboratory analyses of representative samples down the soil profile, with particular reference to the physical and chemical properties of the materials that would influence erosion potential, storm water run-off quality, rehabilitation and agricultural productivity of the land.

Describe, map and illustrate soil types and profiles according to the *Australian Soil and Land Survey Field Handbook* (National Committee on Soil and Terrain, 2009), *Guidelines for Surveying Soil and Land Resources* (McKenzie et al, 2nd Ed., 2008) and *Australian Soil Classification* (Isbell, 2002).

4.2.1.6 Land suitabilities

Provide an Agricultural Land Class map of the project site and the surrounding area according to Guideline 1 for SPP1/92: *The Identification of Good Quality Agricultural Land* (DPI/DHLGP, 1992).

Describe and map the land use suitabilities, and their classes, of the potentially affected area in accordance with the *Land Suitability Assessment Techniques* in the *Technical Guidelines for the Environmental Management of Exploration and Mining in Queensland* (DME, 1995).

Describe and illustrate the usual agricultural use of the land of the project site and the surrounding area.

4.2.1.7 Contaminated land

Describe and illustrate the nature and extent of any areas listed on the Environmental Management Register (EMR) or the Contaminated Land Register (CLR) under the *Environmental Protection Act 1994*, and any existing potentially contaminated sites that are not on the registers but the history of the site suggests may be present.

Conduct a preliminary site investigation consistent with the *Draft Guidelines for the Assessment and Management of Contaminated Land in Queensland*. If the results of the preliminary site investigation indicate potential or actual contamination, conduct 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*. The results of the site investigations should be summarised in the EIS and provided in detail in an appendix.

4.2.1.8 Infrastructure

Describe and show on suitably-scaled maps the location and owners or custodians of all infrastructure and easements on the potentially affected land, including roads and road reserves, railways and rail reserves, stock routes, and power lines. Indicate the locations of any buried gas or water pipelines, power lines, or telecommunication cables. Describe the environmental values affected by the existing infrastructure.

4.2.1.9 Environmentally sensitive areas

Describe and show on suitably-scaled maps the proximity of the project to any category A or B environmentally sensitive areas under the Environmental Protection Regulation 2008. In particular, indicate if the land affected by the project is, or is likely, to become part of the protected area estate, or is subject to any treaty.

4.2.1.10 Landscape character

Describe in general terms the existing character of the landscape that should be affected by the project. Comment on any changes that have already been made to the natural landscape since European settlement. This section 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.

4.2.1.11 Visual amenity

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:

- identifying elements within the proposal and surrounding area that contribute to their image of the town/city as discussed in the any local government strategic plan – city image and townscape objectives and associated maps
- 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 site and immediate surrounding areas, waterways, and other features contributing to the visual quality of the area and the project site
- 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 project that have the capacity to absorb land use changes without detriment to the existing visual quality and landscape character
- the value of existing vegetation as a visual screen.

4.2.2 Potential impacts and mitigation measures

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

4.2.2.1 Chillagoe-Mungana Caves National Park

Using the detailed model (required by section 4.2.1.3 of these TOR) of geology between the existing pit and the boundary of the Piano Cave section of the Chillagoe-Mungana Caves National Park, assess the potential for the project to impact on the surface or subsurface of the national park, with particular regard to karst caves and erosion of the pit margin towards the national park boundary.

Assess the requirement for suitable buffer distances to ensure that in the long-term, foreseeable future the operational or residual mining void would not intrude into the current boundary of the Piano Cave section of the Chillagoe-Mungana Caves National Park due to failure of the pit wall, or erosion or slumping of the lip of the pit.

Propose measures to avoid the intersection of the enlarged pit with a cave that connects into the national park, assess the risk of an unforseen intersection occurring, and propose feasible corrective measures to be undertaken if an intersection did occur.

4.2.2.2 Resource utilisation

With regard to resource stewardship, 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. Demonstrate that the RDPE would 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, petroleum (including gas and coal seam methane), geothermal, and GHG storage resources that may be impacted upon or sterilised by the mining activities or related infrastructure.

Describe how the company plans to manage low grade or currently uneconomic deposits or excavated material to ensure that this potential future resource is not sterilised. Also describe measures to ensure the minimal dilution of mineralised but currently sub-economic waste rock by non-mineralised waste rock. Provide details and maps of

expected residual or remnant resources within the project area including any low grade stockpiles, tailings and currently uneconomic material.

4.2.2.3 Land use and suitability

Assess the potential for the RDPE's construction and operation to change existing and potential land uses of the project site and adjacent areas. Detail the proposed land use options after mining ceases, including the suitability of the area to be used for primary production, industry, or nature conservation. Assess the factors favouring or limiting the establishment of those options compared to land use and suitability prior to construction of the project and assess the potential liabilities for long-term management.

Assess the potential environmental harm caused by the RDPE on the adjacent areas currently used for agriculture, urban development, recreation, tourism, other business. Assess the implications of the project for future developments in the impact area, including constraints on surrounding land uses. Propose mitigation measures for any potentially adverse impacts on stock route operations during the construction and operational phases of the development. If the development adjoins or potentially impacts on good quality agricultural land, assess the potential for land use conflict. Investigations should follow the procedures set out in the guideline *The Identification of Good Quality Agricultural Land* (DPI & DHLGP, 1992), which supports State Planning Policy 1/92: *Development and the Conservation of Agricultural Land*.

Assess 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. Propose measures to avoid or mitigate adverse impacts.

4.2.2.4 Subsidence

Provide comprehensive surface subsidence predictions taking into account factors such as topographic variations and geological complexities, with a full description of the methodology and including an assessment of the accuracy and precision of the predictions. Show the results of the predictions on maps with one metre contour increments and a scale appropriate for assessment of surface subsidence impacts. Propose detailed mitigation measures for any significant impacts that would result from subsidence.

4.2.2.5 Land disturbance

Develop and detail a strategy to minimise the amount of land disturbed at any one time. The strategy should address progressive rehabilitation and final decommissioning with particular regard to the impacts in the short, medium and long-term timeframes. Describe the methods to be used for managing disturbed land, including backfilling, covering, re-contouring, topsoil handling and revegetation. However, a description of erosion and sediment control could be deferred to section 4.2.2.6. Any proposals to disturb land that would impede or divert overland flow or waterways, and any subsequent reinstatement, during construction or operations should be first described in this section. However, the potential impacts of interfering with flow on the quantity and quality of water resources, the final drainage and seepage control systems, and any long-term monitoring plans should be assessed and described in section 4.5.

In addition to assessing the operational phase of land disturbance, address the ultimate changes following implementation of the decommissioning and rehabilitation plan described in section 3.7. Detail the proposed long-term changes that would occur to the land after mining ceases compared to the situation before mining commences. Those changes should be illustrated on suitably scaled maps with contours at intervals sufficient to assess the likely drainage pattern for ground and surface waters (however, the assessment of the impacts on drainage and water quality should be provided in the water resources section of the EIS). Assess the proposed mitigation measures for land disturbance to be used on decommissioning the site in sufficient detail to decide their feasibility. In particular, address the long-term stability of final voids and spoil dumps, safety of access to the site after surrender of the lease, and the residual risks that would be transferred to the subsequent landholder.

Rehabilitation success criteria for land disturbance should be proposed in this section while rehabilitation success criteria for revegetation should be proposed in the section on ecology.

If geological conditions are conducive, the proponent should consider the possibility that significant fossil specimens may be uncovered during construction or operations and propose strategies to protect the specimens and alert the Queensland Museum to the find.

4.2.2.6 Land degradation or contamination

Assess the possible degradation or contamination of land that could result from any aspects of the RDPE. The assessment should not be limited to activities that would result in the land being entered on the EMR or the CLR. Rather, it should include any activity that could have a detrimental impact on land. Matters to be considered include:

- the long-term use for dust-suppression of water with sufficient dissolved salts to affect soil condition
- disposal to land of any waste water
- waste rock disposal;
- tailings disposal
- disturbance of any acid sulfate soils
- spills at chemical and fuel storage areas.

Propose measures that would prevent or remediate any degradation or contamination of land due to the proposed activities. Also, propose any measures required for the management and possible remediation of any existing contamination on the site.

Assess any activities or proposed contamination that would result in the land being newly entered on the EMR or the CLR. Also assess the consequences, particularly for the subsequent landholder, of any intention to leave the site on either register when mining ceases. Prepare a site management plan for any land remaining on the EMR or the CLR, and describe when, how and by whom it would be implemented.

4.2.2.7 Erosion and stability

For all permanent and temporary landforms, possible erosion rates and management techniques should be described. For each waste rock and 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. Develop and describe mitigation strategies that would 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 and stability effects for all disturbed areas such as:

- areas cleared of vegetation
- waste dumps
- stockpiles
- dams, banks and creek crossings
- the plant site, including buildings
- access roads or other transport corridors
- water supply pipeline and electricity transmission corridors.

Methods proposed to prevent or control erosion should be specified and developed with regard to (a) the long-term stability of waste dumps and voids; (b) preventing soil loss in order to maintain land capability/suitability, and (c) preventing significant degradation of local waterways by suspended solids. The mitigation measures should address the selective handling of waste rock and capping material to maximise long-term stability of final landforms in regard to slumping and erosion both on and below the surface. Erosion control measures should be developed into an erosion and sediment control plan for inclusion in the EM plan.

4.2.2.8 Landscape character

Describe the potential impacts of the RDPE on the landscape character of the site and the surrounding area. Make particular mention of any changes to the broad-scale topography and vegetation character of the area, such as due to spoil dumps, excavated voids and broad-scale clearing.

Provide details of measures to be undertaken to mitigate or avoid the identified impacts.

4.2.2.9 Visual amenity

Assess and discuss the visual impact of the RDPE on particular panoramas and outlooks. Assess the extent and significance of the changed skyline including views from places of residence, work, and recreation, from road, cycle and walkways, from the air and other known vantage points day and night, and during all stages of the project. Illustrate the visual impacts of the project structures and associated infrastructure using appropriate simulation. Use sketches, diagrams, computer imaging and photos to portray the near views and far views of the completed structures and their surroundings from visually sensitive locations.

Provide detail of how impacts on visual amenity would be mitigated or avoided.

4.2.2.10 Lighting

Assess the potential impacts of lighting during all stages of the project particularly regarding:

- the effects of night operations, maintenance or increased vehicular traffic on residents
- changed habitat conditions for nocturnal animals
- the attraction of animals to lights at night.

Propose measures to mitigate or avoid all potential impacts due to lighting.

4.3 Transport

The transport section of the EIS is to have separate subsections describing infrastructure associated with the various modes of transport, such as road, rail, air and sea.

4.3.1 Description of existing infrastructure and values

Provide details of the proposed use of existing infrastructure to transport materials, products or wastes to and from the project site. Provide details of any assets within the jurisdiction of any transport authority that could be impacted by the project. Also provide details, either in the transport section of the EIS or by cross-reference to other sections, of the environmental values that would be affected by the altered use of existing transport infrastructure or the construction of new or altered infrastructure.

For road and rail transport, separately describe in detail and illustrate the existing networks that would be used by the project. Describe and illustrate any stock routes potentially affected by the project.

In relation to air transport, describe the existing air fields and associated infrastructure that would be used by the project.

In relation to importing or exporting materials and products, identify any port that would be used by the project. Provide details of those ports, the size and types of vessels; the typical turnaround time for vessels; and the associated infrastructure that moves and stores material between the ships and the rail and/or road networks.

4.3.2 Potential impacts and mitigation measures

For each mode of transport and each phase of the RDPE, the EIS should describe the:

- proposed construction, realignment, structural alteration, or changed use of any access and haul roads and load-out facilities used by any transport associated with the project
- expected volumes, weights and destinations of materials, products, hazardous goods or wastes including the estimated number of heavy vehicles that are anticipated to travel from the mine site through Chillagoe and surrounding towns per day
- types of vehicles, rolling stock, vessels and craft to be used
- likely number and timing of trips and routes through the transport network.

Provide sufficient information to make an independent assessment of how transport infrastructure would be affected by each phase of the RDPE at a local and regional level. Similarly, provide sufficient information to make an independent assessment of how transport used by the project would impact on environmental values. In both cases, the impacts along the whole length of each affected route should be discussed and measures proposed to avoid or mitigate the impacts.

Details should be provided of the:

- results of any modelling of transport impacts
- assessment methodology used, including a summary of consultation undertaken with transport authorities regarding the scope of the impact assessment and methodology to be used
- base data assumptions, including an assessment of the current condition of the affected network and its performance
- possible interruptions to transport operations
- risks of spills of products or hazardous materials during transport, prevention measures to be used, and the requirements for dealing with any spills
- impacts of employee transport to and from the mine site, shops and services in Chillagoe, the air field, etc.
- impacts of project transport on tourism
- impacts on road safety and community amenity.

Assess any impacts on stock routes due to the project's activities. Propose mitigation measures for any disruptions to movement of travelling stock on stock routes. Outline, and cross-reference to more detailed descriptions with the EIS, the impacts of transport associated with the project on amenity, human health and ecological values as a result of dust, noise, vibration, and any other environmental effects.

The assessment of road impacts are to be in accordance with the latest version of the Department of Transport and Main Road's *Guidelines for Assessment of Road Impacts of Development*, available from the website: <www.mainroads.qld.gov.au>. Provide details of any heavy or oversized loads, including the number and type of vehicles, with a description of the likely timing and routes of those loads highlighting any vulnerable bridges or other structures along the proposed routes. Also provide details of the likely traffic to be generated by workforce personnel and service providers.

In relation to road impacts, the EIS must include an assessment of impacts on:

- the safety, efficiency and condition of road operations and assets, including driver fatigue
- any existing or proposed pedestrian cycle networks
- any existing public transport networks (assets and services)
- any existing rail networks
- watercourses and overland flows, and their interaction with the current and future road network (note: impacts on water values due to transport infrastructure should be outlined in the transport section of the EIS and cross-referenced to a detailed assessment in the water resources section).

In relation to the importation or export of materials and products, identify any aspects of the project that would increase the shipment of materials through any port. Provide details of the likely size and number of additional vessels that would use the port.

Assess any impacts on any port due to the import or export of materials or products.

In relation to air transport, describe the new, and/or altered air fields and associated infrastructure that would be needed for the project. Describe the likely additional number of flights, frequency, timing (particularly any increase in night arrivals or take-offs), and size of aircraft. Describe any features of the project that could impact on air transport, such as the placement of waste dumps, stacks or flares beneath flight paths.

If the works that could result in impacts, or the associated mitigation works for identified impacts, are the responsibility of the proponent then the EIS must fully assess those impacts, detail the mitigation works and carry the environmental protection commitments forward into the project's EM plan.

If the proponent should not be responsible for the works associated with the impacts the EIS must clearly identify the entity that should be responsible and what approvals would be needed. Nevertheless, in this case, the EIS must provide enough assessment of the likely impacts of all associated activities for the regulatory authorities to have confidence that approval of the project, subject to this EIS process, would not have unacceptable flow-on impacts due to necessary works farther down the transport chain.

Describe detailed measures to avoid or mitigate impacts on each transport mode. The mitigation measures would ensure the safety, efficiency and condition of each mode is maintained. These mitigation measures are to be prepared by the proponent in close consultation with the relevant transport authorities. Any residual impacts that cannot be avoided must be identified and quantified.

Mitigation strategies must include:

- consideration of any transport authority's works program and forward planning
- proposed construction plans of all required transport infrastructure works in accordance with relevant and accepted authority standards and practices
- the responsible parties for any works
- estimates of costs
- details on the timing of the works
- a summary of relevant approvals and legislative requirements needed to implement mitigation strategies and transport infrastructure works required by the project.

Describe potential impacts, and measures to avoid or mitigate impacts, on licensing and registration services in Chillagoe.

4.4 Waste

This section should complement other sections of section 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.

4.4.1 Description of environmental values

Briefly describe the existing environment values that may be affected by the RDPE's wastes. Refer to each of the waste streams described in section 3.6 and provide references to more detailed descriptions of the relevant environmental values in other sections of part 4 of the EIS.

4.4.2 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 managing waste should be provided in the relevant subsections of section 4 of the EIS.

Define and describe the objectives and practical measures for protecting or enhancing environmental values from impacts by wastes. Assess the management measures against the waste hierarchy, describe how nominated quantitative standards and indicators may be achieved for waste management, and how the achievement of the objectives would be monitored, audited and managed.

As part of the description, and except where issues related to waste have been addressed in section 3.6 (in which case reference should be made to the appropriate subsection), provide details of each waste with regard to:

- operational handling, storage, treatment, disposal and fate of all wastes
- any methods and locations to be used to transport and dispose of wastes off the project site
- hazards associated with the handling and storage of wastes
- the potential level of impact on environmental values
- proposed discharge/disposal criteria for liquid and solid wastes
- measures to ensure stability of the dumps and impoundments
- methods to prevent seepage and contamination of surface water or groundwater from stockpiles and/or dumps

- design criteria to be used to ensure that waste containment and/or storage facilities perform satisfactorily
- market demand for recyclable waste
- waste minimisation processes
- measures to ensure wastes does not attract or propagate pests, disease vectors or vermin, and do not impact on public health
- decommissioning of the site.

Consider the physical, geo-mechanical and chemical properties of waste rock in both fresh and weathered forms when determining their suitability for constructing stable slopes and developing measures to avoid acid generation from waste rock dumps and backfilling operations. Provide a detailed description of tailings disposal facilities stability, capping and rehabilitation, including hydraulic performance of the tailings disposal facilities during operation and post-decommissioning.

Describe options for removing or reducing cyanide from the waste streams entering tailings storage, and develop a preferred option. Provide predictions of the concentrations of cyanide, in total and in relevant chemical species, resulting from the preferred option for all components of the waste streams, including settled solids and supernatant effluent in tailings storage facilities.

Indicate the results of investigating the feasibility of using waste minimisation and cleaner technology options during all phases of the project. Apply waste minimisation and treatment, and cleaner production techniques, to gaseous wastes, particularly methane, nitrogen oxides, sulfur oxides, particulates and carbon dioxide. Pay particular attention to measures that would maximise energy efficiency and minimise internal energy consumption in the project.

Detail cleaner production waste management planning especially how these concepts have been applied to prevent or minimise environmental impacts at each stage of the project. Provide details on natural resource use efficiency (such as energy and water), integrated processing design, and any co-generation of power and by-product reuse as shown in a material/energy flow analysis.

4.5 Water

4.5.1 Description of environmental values

Describe the existing resources and environmental values of water that may be affected by the RDPE. Environmental values should be defined according to the *Environmental Protection Act 1994*, Environmental Protection (Water) Policy 2009 (EPP(Water)), the *Australian Water Quality Guidelines for Fresh and Marine Waters* (ANZECC & ARMCANZ, 2000), the *Queensland Water Quality Guidelines 2009* (DERM, 2009) and the guideline *Establishing Draft Environmental Values and Water Quality Objectives* (EPA, 2002). Make reference to Queensland Wetland Mapping and any available Aquatic Conservation Assessments produced by the Queensland Government. The definition of waters in the EPP (Water) includes the bed and banks of waters, so this section of the EIS should address benthic sediments as well as the water column.

Develop and describe suitable water quality and resource indicators for measuring environmental values, and objectives that would protect the identified values.

Describe and illustrate the surface watercourses, overland flow, palustrine and lacustrine wetlands. The description must include suitably scaled maps of catchments, watercourses, drainage pathways, wetlands, or sources of water supply (such as farm dams) potentially affected by the project, whether on or off the project site. Describe, with supporting photographs, the geomorphic condition of any watercourses likely to be affected by disturbance or stream diversion. The results of this description would form the basis for the planning and subsequent monitoring of rehabilitation of the watercourses during or after the operation of the project.

Describe the hydrology of watercourses and overland flow in the project area and any downstream locations potentially affected by the project.

Provide details of the likelihood and history of flooding, including the extent, levels and frequency of floods in and around the project site. Flood studies must include a range of annual exceedence probabilities for potentially affected waterways, based on observed data if available or use appropriate modelling techniques and conservative

assumptions if there are no suitable observations. The flood modelling assessment must include local flooding due to short duration events from contributing catchments on site, as well as larger scale regional flooding including waterways downstream.

Describe present and potential users and uses of water in areas potentially affected by the project, including municipal, agricultural, industrial and recreational uses of water.

Describe the quality of surface waters in the area potentially affected by the project with an outline of the significance of these waters to the river catchment system in which they occur. The description should be based on a monitoring program, with sampling stations located upstream at background reference sites that would not be impacted and downstream of the project. Clearly identify and reference existing data obtained from other monitoring programs. Monitoring should include sites closest to the proposed release points and at downstream locations that would be below any mixing zone. Sites should include permanent and semi-permanent water holes, known aquatic habitat, weirs or reservoirs. Available complementary stream-flow data should also be obtained from historical records from the current stream gauging station network to help interpretation. Assess the suitability of these gauging stations for this assessment and future licensing conditions in accordance with the explanatory notes for Table 4 in the Model Water Conditions for Coal Mines in the Fitzroy Basin (DERM 2011), which are applicable to other mining activities, and identify alternative sites for gauging stations where necessary. Where data exists, describe the flow regime for the receiving environment using plots of flow (cumecs) versus flow duration (per cent) to identify the flow duration of event high-flow, base-flow and no-flow periods to characterise the receiving environment. Describe seasonal variations in water quality parameters and variations with flow. Estimate the event flow trigger for environmentally significant analytes in each receiving waterway based on this observed variation (plot flow against environmentally significant analytes). The event flow trigger is the flow at which environmentally significant analytes increase and begin to exceed the applicable high flow water quality objective. The event flow trigger can also be any flow above this point. This data should be used to condition the release of mine-affected water into the receiving environment. Measure a range of physical, chemical and biological parameters relevant to the potential environmental harm on any affected creek or wetland system. This would include, but not necessarily be limited to, water quality indicators likely to be affected by the project such as electrical conductivity, total and dissolved metals, turbidity, suspended sediments and pH. Relevant parameters may include those identified in the Model Water Conditions for Coal Mines in the Fitzroy Basin (DERM 2011). Biological indicators should include macro-invertebrate surveys undertaken at appropriate locations according to best practice methods. All sampling should be performed in accordance with the *Monitoring and Sampling Manual 2009 Version 2* (DERM, 2010) or the most current edition.

All water quality data is to be presented in a suitable format for assessment against relevant water quality objectives or guideline trigger values as described in the Queensland Water Quality Guidelines 2009 and the Australian Water Quality Guidelines (ANZECC and ARMCANZ 2000). This means that physico-chemical parameters should be presented as 50th percentiles and toxicants such as metals presented as 95th percentiles, together with data ranges and the limit of reporting as a minimum. All relevant metadata which would facilitate an assessment of the quality of this data set should be provided including number of samples, timing and frequency of sampling and any quality assurance and quality control undertaken (such as replicates, blanks and calibration).

Clearly and consistently distinguish between this EIS monitoring program for the baseline condition assessment from any monitoring programs required for future compliance assessment or as a component of the receiving environment monitoring program (section 4.5.2). The EIS should consider the intent of the Model Water Conditions for Coal Mines in the Fitzroy Basin (DERM, 2011) when designing these monitoring programs. Detailed mapping should be provided to illustrate the locations of each sampling site within these monitoring programs with respect to release points and gauging stations. The EIS must contain tables with the latitude and longitude (GDA94) for all release points, sampling sites and gauging stations relevant to these monitoring programs.

Describe the quality, quantity and significance of groundwater in the project area and any surrounding area potentially affected by the project's activities.

Describe the nature and hydrology of the aquifers of the potentially affected area, including:

- geology and stratigraphy
- aquifer type – such as confined, unconfined, karst or perched

- depth to, and thickness of, the aquifers
- the significance of the resource at a local and regional scale
- depth to water level and seasonal changes in levels
- groundwater flow directions (defined from water level contours)
- groundwater yield
- groundwater quality
- interaction with surface water
- interaction with saline water
- possible sources of recharge
- vulnerability to pollution.

The description should include a survey of existing groundwater supply facilities (bores, wells, or excavations) to the extent of any potential impacts. Include and analyse the following information:

- location of potentially affected bores or wells
- pumping parameters
- draw down and recharge at normal pumping rates
- seasonal variations (if records exist) of groundwater levels.

Develop and describe a network of observation points and a monitoring program that would satisfactorily monitor groundwater resources both before and after commencement of operations. The data obtained from the groundwater survey must be sufficient to enable specification of the major ionic species, pH, electrical conductivity, total dissolved solids and any potentially toxic or harmful substances.

4.5.2 Potential impacts and mitigation measures

For all phases of the RDPE, this section of the EIS must:

- assess potential impacts on the water resource environmental values identified in the previous section
- define and describe the objectives and practical measures for protecting or enhancing water resource environmental values
- describe how the achievement of the objectives would be monitored, audited and managed.

Describe and illustrate with maps, plans and cross-sections any proposal to divert creeks or undertake other in-stream works. Assess the potential impacts of in-stream works on hydrology and water quality, and propose measures for avoiding or mitigating the impacts and stabilising and rehabilitating any works.

Assess the hydrological impacts of the project, particularly with regard to the various components of flow that may be impacted by the project. The EIS must address: changes to catchment size or characteristics; changes to the direction or quantity of runoff in the local catchment and to accumulated downstream flows; scouring and erosion; and the consequent impacts of any subsidence. Any consequential impacts of changes to water flow or groundwater recharge on ecosystems and wildlife should be addressed in the ecology section of the EIS. When flooding levels would be affected, model the afflux and illustrate the predictions with maps. Describe and illustrate how an operating pit would be protected from flooding, and address the flood protection level of any final void without the need to maintain levees.

Describe the options for supplying water to the project, and assess the consequential impacts in relation to any water resource plan, resource operations plan and wild river declaration that may apply. Water allocation and water sources should be established in consultation with the relevant department. Where a licence or permit would be required under the *Water Act 2000* to take water or interfere with the flow of water, provide sufficient information and assessment for the administering authority to consider the suitability of approving any necessary works under the *Water Act 2000*. Similarly, provide sufficient assessment to consider any approval for waterway barrier works under the *Fisheries Act 1994*.

Describe in detail the proposed water management controls, addressing surface and ground water quality and quantity, drainage patterns (including the separation of natural and mine affected runoff) and sediment movements and quantity. Detail the water management infrastructure including, but not limited to, water storages, sedimentation dams, water treatment plants, levees, drains, diversions, containment channels, bunding, release points, monitoring points and any interconnections between these and the receiving environment using flow diagrams. Describe and illustrate: the locations, catchments, footprints, cross-sections and method of construction of any dams on the site; their flood immunity; the quality of water or waste water they would contain, and indicate their hazard category. Provide the design storage allowances for sediment dams and process or waste water dams, and demonstrate that the design has been produced by a suitably qualified and experienced engineer using current best practice. Propose measures to manage sediment dams and process or waste water dams and their discharge, and to decommission and rehabilitate the dams when their use ends.

Assess the potential impacts on local and downstream water quality and environmental values due to any controlled and uncontrolled release of mine affected water from the site. Describe the proposed quality, quantities and locations of waste water discharges. Use stream flow data, receiving environment monitoring data (background water quality condition assessment), and proposed release limits and rates to estimate in-stream dilution and water quality at different points downstream of the release. If sensitive receptors such as drinking water storages are located downstream, these should be identified and the assessment should extend at least to that point downstream. Consider periods of low-, medium- and high-flow in this assessment. Compare the predicted contaminant levels to the water quality objectives and provide an assessment of the assimilative capacity of the receiving waters. Assess the acute and chronic potential impacts of the release of mine affected waters (or other discharges) including the cumulative impacts to water quality and environmental values of the receiving environment due to discharges from other projects or industry.

Describe any proposed no-release water systems, assess the management and fate of contaminants in these, the risk of environmental harm due to a temporal decline in water quality, and propose mitigation measures for any potential impacts.

Describe and assess proposed measures to manage any leachate or seepage from tailings storages, either during operations or following decommissioning of the mine and its rehabilitation. Describe monitoring programs that would assess the effectiveness of management strategies for protecting water quality during the construction, operation and decommissioning of the project.

Conduct a risk assessment, based on conservative water quality estimates and hydrology, for uncontrolled emissions to water due to system or catastrophic failure, assess the potential impacts of such emissions on human health and natural ecosystems, and provide detailed measures to avoid or minimise impacts.

Assess the potential impacts on local groundwater resources and quality, and define the extent of the area where groundwater resources are likely to be affected by the proposed operations. Assess the potential impacts of the operations on groundwater draw-down, depletion or recharge, and propose management options to monitor and mitigate these effects. Assess the likely response of the groundwater resource after operation of the project, including the impacts of groundwater inflow to any residual void. Assess the potential impacts on the local ground water regime due to altered porosity and permeability from any land disturbance, such as subsidence. Assess the potential for project operations or residual effects to contaminate groundwater resources. Propose measures to avoid, mitigate and remediate any impacts on groundwater resources or quality.

4.6 Air

4.6.1 Description of environmental values

Describe the existing air environment and airshed that may be affected by the RDPE. Discuss the background levels and sources of contaminants including suspended particulates, oxides of sulfur or nitrogen, greenhouse gases, odorous compounds and any other relevant constituent, whether major or minor, of the air environment that may be affected by the project.

Provide sufficient data on local meteorology and ambient levels of contaminants to establish a baseline for later studies and for the modelling of air quality environmental impacts within the airshed. Parameters must include air

temperature, wind speed and direction, atmospheric stability, mixing depth and other parameters necessary for input to the models.

Describe and illustrate the locations of existing residences, places of work, schools, etc., agricultural or ecologically significant areas that could be impacted by emissions from the project.

Describe the environmental values, appropriate indicators and air quality objectives for the potentially affected air environment according to the Environmental Protection (Air) Policy 2008 (EPP(Air)). Assess whether any air quality objectives are needed in addition to those in the EPP(Air).

4.6.2 Potential impacts and mitigation measures

Describe all the project's potential sources of emissions to air and expected composition of the emissions. The description should include oxides of sulfur or nitrogen, volatile organic compounds, carbon monoxide and dioxide, particulates (including dust, PM_{10}, and $PM_{2.5}$), trace metals, odours and any toxic, persistent and/or hazardous substances that would be emitted by the project. Present the concentrations of all components of emissions at standard temperature and pressure, and provide the mass emission rate, exit velocity, volume flow rate and temperature at exit.

Provide a separate air emission inventory of any offsite activities directly associated with the project, including fugitive emissions such as from rail or road transport of product or waste.

Use a recognised atmospheric dispersion model to predict the fate of all significant emissions. Use estimates of emission rates based on actual measurements from samples taken from similar facilities, preferably full-scale facilities operating elsewhere or otherwise from experimental or demonstration-scale facilities. Where this is not possible, use published emission factors and/or data supplied by manufacturers of process and control equipment. State all input parameters, data sets and assumptions used in the modelling in the main text of the EIS or an appendix. The model inputs should be as detailed as possible, reflecting any variation of emissions with time and including at least a full year of representative hourly meteorological data.

If there is no single atmospheric dispersion model that is able to handle the different atmospheric dispersion characteristics exhibited in the project area (such as sea breezes, strong convection, terrain features, temperature inversions and contaminant re-circulation), apply a combination of acceptable models.

Provide contour maps of predicted ground level concentrations and frequency contour plots for typical and maximum emissions under the expected range of meteorological conditions including the worst case. The averaging period for ground-level concentrations of contaminants modelled should be consistent with the relevant averaging periods for air quality indicators and goals in the Environmental Protection (Air) Policy 2008 and the National Environmental Protection (Ambient Air Quality) Measure. For example, the modelling of sulfur dioxide must be conducted for 1-hour, 24-hours and annual averaging periods.

Compare the predicted ground level concentrations to the air quality objectives, and best practice national and international source emission standards. Describe any situations where people, ecosystems or an agricultural use would experience concentrations above an objective. Assess the human health risk associated with emissions from the project for all contaminants whether or not they are covered by the National Environmental Protection (Ambient Air Quality) Measure or the EPP(Air). Assess potential impacts of emissions on ecosystems or agricultural uses of the environment.

Assess the potential cumulative impacts or interaction between the emissions from the project and other emissions in the airshed. For example, it may be necessary to evaluate whether nitrogen oxides and volatile organic compounds emissions from the project and other sources within the region would contribute to the generation of photochemical smog, or whether sulfur dioxide emissions would acidify rain or dew.

Describe airshed management and the contribution of the project to airshed capacity in view of existing and future users of the airshed for assimilation and dispersion of emissions.

If odour could be an issue, conduct odour impact assessment according to the guideline *Odour Impact Assessment from Developments*.

Identify worst case emissions that may occur at start-up, shut-down or during 'upset' operating conditions. If these emissions are significantly higher than those for normal operations, it should be necessary to evaluate the worst-

case impact, as a separate exercise to determine whether any planned buffer between the project and neighbouring sensitive receptors should be adequate

Describe the pollution control equipment and pollution control processes to be employed on the premises and the features of the project designed to suppress or minimise emissions, including dusts and odours. Describe the backup measures to be incorporated that would be activated in the event of failure of primary measures to minimise the likelihood of plant upsets and adverse air impacts.

Assess how the propose emission control processes accord with the management hierarchy for air emissions in the EPP(Air).

Describe how the air quality objectives would be achieved, monitored and audited, and how corrective action would be taken when needed.

4.6.2.1 Greenhouse gases

Provide an inventory of projected annual emissions for each relevant greenhouse gas, with total emissions expressed in 'CO_2 equivalent' terms. Estimate emissions from upstream activities associated with the proposed project, including the fossil fuel based electricity to be used. Briefly describe the methods used to make the estimates. The Australian Department of Climate Change and Energy Efficiency's National Greenhouse Accounts (NGA) Factors can be used as a reference source for emission estimates and supplemented by other sources where practicable and appropriate.

Assess the potential impacts of the project on the state and national greenhouse gas inventories and propose greenhouse gas abatement measures, including:

- 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
- a comparison of the preferred measures for emission controls and energy consumption with best practice environmental management in the relevant sector of industry
- a description of any opportunities for further offsetting greenhouse gas emissions through indirect means.

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)
- using less carbon-emitting transport modes or fuels
- integrating transport for the project with other local industries such that greenhouse gas emissions from the construction and running of transport infrastructure are minimised
- maximising the use of renewable energy sources
- carbon sequestration at nearby or remote locations.

Include a specific module to address greenhouse abatement in the draft environmental management plan. 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
- periodic energy audits with a view to progressively improving energy efficiency
- a process for regularly reviewing 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 by renewable energy uses
- commitments to monitor, audit and report on greenhouse emissions from all relevant activities and the success of offset measures.

4.7 Noise and vibration

4.7.1 Description of environmental values

Describe the existing environmental values that may be affected by noise and vibration from the RDPE. Environmental values and acoustic objectives for noise-sensitive receptors are defined in the Environmental Protection (Noise) Policy 2008 (EPP(Noise)).

If the proposed activity could adversely impact on the noise environment, undertake baseline monitoring at a selection of sensitive receptors potentially affected by the project. Sensitive receptors are defined in the EPP(Noise). Illustrate the locations of sensitive receptors on a suitably-scaled map. Describe the results of any baseline monitoring of noise and vibration in the proposed vicinity of the project, including long-term measured background noise levels that take into account seasonal variations.

Report the daily variation of background noise levels at nearby sensitive receptors, with particular regard to detailing variations at different periods of the night. Monitoring methods should adhere to accepted best practice methodologies, relevant guidelines and Australian Standards, and any relevant requirements of the Environmental Protection Regulation 2008 and the EPP(Noise).

Describe any current activities near the project area that may cause a background level of ground vibration (for example major roads, quarrying activities, etc.).

Develop and describe suitable indicators for measuring noise, and objectives that would protect the environmental values from significant noise and vibration impacts.

4.7.2 Potential impacts and mitigation measures

Using a suitable acoustic model, predict the likely generation of noise for different times of day under a range of climatic conditions, including the expected worse case. Describe the predictions using suitable indicators, and illustrate the predicted noise contours on suitably-scaled maps showing the locations of noise sensitive receptors. Assess the potential impacts of noise and vibration at all potentially sensitive receptors in comparison to the objectives and standards to be achieved. Give particular consideration to emissions of low-frequency noise; that is, noise with components below 200Hz. 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 enHealth Council, 2004 (or later editions), ISBN 0 642 82304 9. Assess the potential environmental impacts of noise and vibration on terrestrial animals and birds, including migratory species. Assess potential noise impacts on any nearby protected areas, particularly caves in the Piano Cave section of the Chillagoe-Mungana Caves National Park which could be impacted, addressing amenity as well as impacts on animals. Provide information on blasting that might cause ground vibration or fly rock on, or adjacent to, the site with particular attention given to the national park caves, places of work, residence, recreation and general amenity. Discuss the magnitude, duration and frequency of any vibration and assess the potential impacts on sensitive receptors. Reference should be made to the guideline: *Noise and Vibration from Blasting*.

Assess potential off-site noise and vibration impacts that could arise due to increased road or rail transportation directly resulting from the project.

Define and describe practical measures for protecting or enhancing environmental values from impacts by noise and vibration, including details and illustrations of any screening, lining, enclosing or bunding. Provide a discussion of timing schedules for construction and operations with respect to minimising environmental nuisance and harm from noise and vibration. Also, describe how the achievement of the objectives would be monitored, audited and corrective action taken when needed. A plan of caves derived from inspections and surveys should be used as part of any monitoring program. Describe how any complaints about noise or vibration would be managed and reported.

4.8 Ecology

4.8.1 Description of environmental values

Describe the existing ecological values that may be affected by the RDPE. Address those ecological values in terms of:

- terrestrial and aquatic ecosystems, and their interaction
- biological diversity
- the existing integrity of ecological processes, including habitats of threatened or near threatened species
- the integrity of landscapes and places, including wilderness and similar natural places.

The description of the ecological values of the areas likely to be affected by the project should be illustrated by maps, diagrams and photographs. The description should start by addressing the ecology of the regional area and progress to a detailed description of the project site and any localities that could be affected by project related activities, including downstream and down-wind areas that could be significantly impacted by emissions. The description of ecological values must account for seasonal changes.

For all locations that may be affected by any aspect of the project, provide suitably-scaled maps of terrestrial vegetation based primarily on field surveys with descriptions of the mapped ecosystems and any items of special interest. Map adjacent areas to illustrate interconnectivity, including any larger scale interconnections between areas of remnant or regrowth vegetation where the project site includes vegetation that facilitates animal movement between those other areas. Field surveys should use the Queensland Herbarium methodology and proformas in the latest version of the publication Methodology for Survey and Mapping of Regional Ecosystems and Vegetation Communities in Queensland (EPA, 2005), and survey a minimum of three sites, each at least 50 m by 10 m, within each defined (standard system) vegetation community.

The vegetation description and mapping, produced from aerial photographs and field surveys, and having a minimum scale of 1:10 000, must cover at least the following matters:

- location and extent of vegetation types using regional ecosystem type descriptions in accordance with the Regional Ecosystem Description Database
- category A or B environmentally sensitive areas under the Environmental Protection Regulation 2008
- any areas of state, regional or local significance identified in an approved Biodiversity Planning Assessment produced by the Queensland Government
- critical habitat within the meaning of the *Nature Conservation Act 1992*
- vegetation mapped as essential habitat
- remnant or regrowth vegetation, particularly essential regrowth habitat, high value regrowth, or a regrowth watercourse
- sensitive or important vegetation types, including riparian vegetation
- wetlands
- wildlife breeding or roosting areas
- sites in, or adjacent to, areas containing important resting, feeding or breeding sites, or flight paths for migratory species listed under the Convention of Migratory Species of Wild Animals, and/or bilateral agreements between Australia and Japan (JAMBA), Australia and China (CAMBA), or Australia and the Republic of Korea (ROKAMBA)
- sites containing common species that represent a distributional limit and are of scientific value or contain feeding, breeding, resting areas for populations of species of special cultural significance
- sites containing high biodiversity that may be dependent for their long-term survival or function on connectivity with other nearby areas of habitat
- a site containing other special ecological values, for example, high habitat diversity and areas of high endemism

- bat roosting and breeding caves, including existing structures such as adits and shafts
- habitat of threatened or near threatened animals
- the condition of vegetation and its habitat value, particularly in relation to the conservation of any threatened and near threatened plant and animal species, assemblages or community types
- a complete list of species present at each site
- species of protected plants highlighting those listed as threatened or near threatened under the Nature Conservation (Wildlife) Regulation 2006
- any other plant communities or species of conservation, cultural, commercial or recreational significance
- areas that may have low resilience to environmental change
- location and abundance of any pest, weed or exotic species
- any areas that would be subject to the *Vegetation Management Act 1999*.

Plants that could not be identified during the survey should be submitted to the Queensland Herbarium for identification. Specimens of plant species of conservation significance, including those listed as protected plants under the Nature Conservation (Wildlife) Regulation 2006, other than common species, should be submitted to the Queensland Herbarium with sufficient information to enable their lodgement as voucher specimens.

Weeds, particularly declared plants under the *Land Protection (Pest and Stock Route Management) Act 2002* should be shown on a map at an appropriate scale. In addition to field surveys, Biosecurity Queensland's Annual Pest Distribution Survey data and predictive pest maps (Department of Agriculture, Fisheries and Forestry website) and the Queensland Herbarium's naturalised flora data, local government area pest management plans should be used to source the occurrence of pest plants in the project area.

The plant and animal surveys should address species structure, assemblage, diversity and abundance. Surveys must be sufficient to identify, or adequately extrapolate, the plant and animal values over the range of seasons, particularly during and following a wet season. In tropical areas, a major part of the survey effort should be undertaken between 1 February and 31 March, assuming the wet season follows a typical pattern. The survey should account for the ephemeral nature of watercourses traversing the project area, and seasonal variation in animal populations. Existing information on plants and animals may be used to supplement new survey work provided that the existing data are still current and have been derived from previous surveys at the site that were consistent with current best practice methodologies. Methodologies used for plant and animal surveys must be specified in the appendices to the EIS.

Undertake a comprehensive vertebrate animal survey of the project area at a sampling intensity that supports the scale of vegetation mapping (i.e. 1:10 000 or better). Surveys of terrestrial wildlife must be conducted in a manner that is sensitive to effects of seasonality and the different activity patterns and habitat use by species under different seasonal conditions.

Describe the terrestrial and riparian animals occurring in the areas affected by the project, noting the broad distribution patterns in relation to vegetation, topography and substrate. The description of the animals present or likely to be present in the area should address:

- a list of animal species, their diversity and abundance
- the existence of any threatened, near threatened or otherwise noteworthy species or communities in the study area, including discussion of range, habitat, breeding, recruitment, feeding and movement requirements, and current level of protection (such as any requirements of protected area management plans)
- any species that are poorly known but suspected of being threatened or near threatened
- habitat requirements and their sensitivity to changes
- movement corridors and barriers to movement
- the use of the area by migratory birds, nomadic birds, bats, and arboreal and ground-dwelling animals
- feral, pest or exotic animals.

In addition to the species found in the field survey, provide an indicative list of all other known or likely species within a 100 km area around the project site and the local bioregion, highlighting any threatened or near threatened

species. Correlate the occurrence of animals of conservation significance to mapped vegetation units or habitats to facilitate the development of measures for their protection. Indicate how well any affected communities are represented and protected elsewhere in the province where the site of the project occurs.

Describe the aquatic plants and animals occurring in the areas affected by the project, noting the patterns and distribution in the waterways and any associated wetlands and lacustrine environments. The description of the plants and animals present or likely to be present in the area should at least include:

- fish species, mammals, reptiles, amphibians, crustaceans and aquatic invertebrates occurring in the waterways within the affected area, and/or those in any associated lacustrine environment
- aquatic plants
- aquatic and benthic substrate
- habitat downstream of the project, or potentially impacted due to currents in associated lacustrine environments.

Conduct a desktop assessment of the potential for stygofauna to occur within the zone of influence of the project proposal, and a pilot study in accordance with the Western Australian Environmental Protection Authority – Guidance for the Assessment of Environmental Factors No. 54a (August 2007), or any more recent publication that supersedes that guideline. If the desktop assessment and pilot study identify potentially significant stygofauna values, provide a description to order or family taxonomic rank of the presence and nature of any stygofauna occurring in groundwater likely to be affected by the project. Sampling and survey methods should follow best practice, such as that published by the Western Australian Environmental Protection Authority – Guidance for the Assessment of Environmental Factors no.54 (December 2003) and No. 54a (August 2007), or any more recent publication that supersedes that guideline.

Develop and describe suitable indicators for measuring ecological values, and objectives that would protect the environmental values, including maintenance of the integrity of cave ecology in the areas adjoining and surrounding the mining lease area, from significant adverse impacts.

4.8.2 Potential impacts and mitigation measures

Assess the potential impacts on the ecological values of the area arising from the construction, operation and decommissioning of the RDPE including clearing, salvaging or removal of vegetation. Cover terrestrial and aquatic environments, including any potentially impacted benthic communities, seagrass beds and mangroves. Assess the potentially significant environmental impacts on any plants and animals, whether on or off the project site, due to any alterations to the local surface and ground water environment.

Specifically assess any potential impacts on a category A or B environmentally sensitive area and propose measures to avoid impacts.

If available, provide electronic shape-files in a format compatible with ArcGIS indicating the boundary of the project area and detailing the extent of proposed vegetation clearing in relation to surrounding vegetation both within the project area and in any off-site area to be used for project related infrastructure.

Assess the indirect impacts on remaining vegetation, such as those due to edge effects, reducing vegetation area below a viable size, or reductions in connectivity. Similarly, indirect impacts on animals should be assessed, such as the reduction of a habitat area below a viable size or increased predation due to reduced cover. Short-term and long-term effects should be considered with comment on whether the impacts are reversible or irreversible.

Describe the potential impacts on stygofauna of any changes in the quality, level or quantity of groundwater, and describe any mitigation measures that may be applied.

Assess the capacity of the environment to assimilate discharges or emissions. Assess the potential impacts due to chronic, low-level exposure to contaminants or the bio-accumulation of contaminants.

Assess the potential impacts on animals of wastes at the site, particularly those related to any form of cyanide or other toxicants in supernatant water of a tailings storage facility. Propose measures to prevent harm to wildlife.

Describe and assess the potential impacts of any actions of the project 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 assessment and supporting information should be sufficient for the administering authority to decide whether an approval should be granted and developing recommended conditions.

Propose practical measures for protecting or enhancing ecological values, and assess how nominated quantitative standards and indicators may be achieved for nature conservation management. In particular, address measures to protect or preserve any threatened or near threatened species.

Describe measures that would adequately mitigate potential impacts on habitats that would inhibit animal movement, propagation or feeding patterns, or change food chains. Specifically address any obligations imposed by Queensland or Commonwealth legislation or policy or international treaty obligations, such as JAMBA, CAMBA or ROKAMBA. Assess the need for buffer zones and the retention, rehabilitation or planting of movement corridors, and propose measures that would avoid waterway barriers or mitigate their construction and operation. Assess works in a waterway considering *Waterway Barrier Works Development Approvals*, Queensland Primary Industries and Fisheries Fish Habitat Management Operational Policy FHMOP 008, 2009.

Identify and quantify any potential net loss of environmental values. Propose environmental offsets that would counterbalance the remaining loss of environmental values. Proposed environmental offsets should be consistent with the requirements set out in any applicable specific-issue offset policies under the framework of the Queensland Government's Environmental Offset Policy (2008). Specific-issue offset policies that should be considered are:

- Queensland Biodiversity Offset Policy (DERM, 2011)
- Policy for Vegetation Management Offsets (DERM, 2009).

Propose detailed measures to prevent new weed and pest animal species entering, spreading and establishing in the protected area, prevent and limit the spread of existing weed and pest animals, and control of existing populations. This should include a risk assessment of high biosecurity risk species and their sites, and the development of threat mitigation plans for them, such as clean down and inspections at high risk sites. The biosecurity management strategies should include mitigation measures relevant to protecting any potentially affected primary production areas. When determining control strategies, reference should be made to the latest Biosecurity Queensland's Annual Pest Distribution Survey data, published biosecurity management strategies, local government pest management plans and any applicable model local laws dealing with locally declared pest plants and animals. Include all management measures for pest plants and animals in a biosecurity management plan, which should form part of the project's draft EM plan.

Propose measures for the progressive rehabilitation of disturbed areas, including rehabilitation success criteria that would be used to measure the progress. Describe how the achievement of the objectives would be monitored and audited, and how corrective actions would be managed. Proposals for the rehabilitation of disturbed areas should incorporate, where appropriate, provision of nest hollows and ground litter.

4.9 Cultural heritage

4.9.1 Description of environmental values

For non-indigenous historical heritage, a study should be undertaken of the known and potential historical cultural and landscape heritage values of the area potentially affected by the RDPE. The study should be undertaken by a suitably qualified or experienced person, and as a minimum, include the following elements:

- A desktop assessment reviewing all sources of information on non-indigenous historical cultural and landscape heritage values within the region of the project site, including:
  - the Queensland Heritage Register, for places already protected under the *Queensland Heritage Act 1992*
  - local government heritage registers, lists or inventories
  - results of previous cultural and landscape heritage studies conducted in the region
  - appropriate national and international guidelines for the descriptions of sites, places and regions.
- A physical archaeological investigation of the area potentially affected by the project (based on the results of the desktop assessment) that addresses:

  - all types of historical heritage places located within the project area including built, archaeological and non-indigenous cultural landscape values
  - the discovery and protection of any previously unidentified archaeological artefacts or archaeological places during the course of the archaeological investigation in accordance with Part 9 of the *Queensland Heritage Act 1992*.
- An investigation of whether the area potentially affected by the project includes places and locales of possible State or local heritage significance, including:
  - An assessment of places of potential heritage significance against the criteria contained in Division 1 of the *Queensland Heritage Act 1992*
  - Consultation with appropriate academic historians and with local history organisations about the history of the area and potential for physical evidence of this history within the RDPE area.
  - Notification to the Cultural Heritage Branch of EHP of any places or locales that are of potential state or local heritage significance not currently on the state or local heritage register.

4.9.2 Potential impacts and mitigation measures

4.9.2.1 Indigenous cultural heritage

Unless an exemption applies under s86 of the *Aboriginal Cultural Heritage Act 2003*, a Cultural Heritage Management Plan (CHMP) must be prepared in accordance with the requirements of Part 7 of that Act. The gazetted Cultural Heritage Management Plan Guidelines may assist in the development of the CHMP. The EIS Coordinator must be made aware of the progress of the CHMP approval process and of any related issues that should be addressed in the EIS assessment report.

4.9.2.2 Non-Indigenous historical cultural heritage

The potential impacts on non-Indigenous historical cultural and landscape heritage values and their avoidance or mitigation should be addressed in a management plan. The historical heritage management plan should specifically address identified values and provide a process for managing yet undiscovered values should they become apparent during development of the project.

The development of a historical heritage management plan should be negotiated with the Cultural Heritage Branch of EHP, local history organisations and other relevant groups.

The historical heritage management plan should as a minimum address the following issues:

- processes for mitigating, managing and protecting identified historical cultural heritage values during excavations of the construction, operational, rehabilitation and decommissioning phases of the project
- recognition and protection of:
  - view lines to and from heritage places including natural features
  - cultural landscapes
- proactive ways of conserving the heritage places
- processes for reporting, as required by section 89 of the *Queensland Heritage Act 1992*, the discovery of any archaeological artefact not previously identified in the historical cultural heritage study
- procedures for collecting any artefact material, including appropriate storage and conservation
- the provision of a cultural heritage awareness program that also provides contractors and company staff with a plain English, short manual that is easy for them to understand and take away for future reference.

The training should be provided during the site induction, and should address the legislative requirements and practical measures for the recognition, reporting and preservation of cultural heritage material. A plain English manual summarising the training should be given to all site workers for their future reference.

The historical heritage management plan should be incorporated into the project's draft EM plan.

4.10 Social values

Conduct a social impact assessment (SIA) in consultation with staff of Significant Projects Coordination Branch, Department of State Development, Infrastructure and Planning (DSDIP). Matters to be considered are detailed in the following subsections.

4.10.1 Description of existing social values

4.10.1.1 Social and cultural area

Define the social and cultural values within the project's area of influence, including the local, district, regional and state level as appropriate, taking into account the:

- potential for social and cultural impacts to occur
- location of other relevant proposals or projects
- location and types of physical and social infrastructure, settlement and land use patterns
- social values that might be affected by the project, including integrity of social conditions, liveability, social harmony and wellbeing, and sense of community
- Indigenous social and cultural characteristics, such as areas under native title rights or application.

4.10.1.2 Community engagement

Consistent with national and international good practice, and with regard to local and regional strategies for community engagement, the proponent should engage at the earliest practicable stage with likely affected parties to discuss and explain the project, and to identify and respond to issues and concerns regarding social impacts.

Detail the community engagement processes used to conduct open and transparent dialogue with the community. Such processes should include, but not be limited to, community reference group forums. Include the project's planning and design stages and future operations including affected local and state authorities. Engagement processes should consider social and cultural factors, customs and values, and linkages between environmental, economic, and social impact issues.

Discuss engagement strategies and processes, including how complaint resolution should be addressed, for all stages of the project.

4.10.1.3 Social baseline study

Undertake a targeted baseline study of the people residing in the project's social and cultural area,to identify the project's social issues, potential adverse and positive social impacts, and strategies and measures developed to address the impacts. The social baseline study should be based on qualitative, quantitative, and participatory methods. It should be supplemented by community engagement processes, and reference relevant data contained in local and state government publications, reports, plans, guidelines and documentation, including regional plans and,where available, community plans.

Describe and analyse a range of demographic and social statistics determined relevant to the project's social and cultural area including:

- major population trends/changes irrespective of the project
- total population (the total enumerated population for the social and cultural area and full-time equivalent transient population), 18 years and older
- estimates of population growth and population forecasts for the proposals
- family structures
- age and gender distributions
- education, including schooling levels
- health and wellbeing measures
- cultural and ethnic characteristics

- Indigenous population including age and gender
- income including personal and household
- labour force by occupation and industry
- housing costs (monthly housing repayments (per cent of dwellings in each category), and weekly rent (per cent dwellings in each category), housing tenure type and landlord type, household and family type
- housing availability and affordability: the rental market (size, vacancy rate, seasonal variations, weekly rent by percentage dwellings in each category); the availability and typical costs of housing for purchase; monthly housing repayments by percentage dwellings in each category; and the availability of social housing
- disability prevalence
- the social and economic index for areas, index of disadvantage—score and relative ranking
- types and prevalence of crime, including domestic violence
- any other indicators determined through the community engagement process as relevant.

The social baseline study should also take account of and address issues such as:

- the social infrastructure including community and civic facilities, services and networks (for definition see South East Queensland Plan 2009–2031 (Department of Infrastructure and Planning, 2009))
- settlement patterns including the names, locations, size, history and cultural aspects of settlement in the social and cultural area
- identity, values, lifestyles, vitality, characteristics and aspirations of communities in the social and cultural area, including Indigenous communities
- land use and land ownership patterns including:
  - rural properties, farms, croplands and grazing areas including on-farm activities near the proposed activities
  - the number of families directly and indirectly affected by the project including Indigenous traditional owners and their families, property owners, and families workers either living on the property or workers where the property is their primary employment
- use of the social and cultural area for forestry, fishing, recreation business and industry, tourism aquaculture, and Indigenous cultural use of flora and fauna.

Cross reference this section with 4.13 (Economy).

4.10.1.4 Workforce profile

The SIA should include a profile of the workforce that describes the following:

Workforce demand

The estimated composition of workforce by occupation, project stage and duration (including any planned construction prior to final investment decision) using the template provided on the Skills Queensland website www.skills.qld.gov.au (select the ‘functions’ tab then click on ‘significant projects’).

Supply issues and strategies

An analysis of relevant local, state and national workforce profiles and labour supply; and strategies and proposed programs for:

- recruitment and attraction
- population groups (including Indigenous people, secondary school students and unemployed and underemployed)
- unskilled and semi-skilled labour requirements
- structured training (apprenticeships, traineeships, graduates)
- analysis of the impact on local community workforce.

4.10.2 Potential impacts and mitigation measures

Assess and describe the type, level and significance of the project's social impacts (both beneficial and adverse) on the local and cultural area, based on the outcomes of the community engagement processes and the social baseline study, and addressing the following matters:

- Describe and summarise outcomes of community engagement processes including the likely response of the affected communities, including Indigenous people.
- Include sufficient data to enable affected local and state authorities to make informed decisions about the project's effect on their business and plan for the provision of social infrastructure in the project's social and cultural area. If the project is likely to result in a significant increase in the population of the area, then the proponent should consult the relevant management units of the state authorities and summarise the results of the consultations.
- Address direct, indirect and secondary impacts from any existing projects and the proposed project including an assessment of the size, significance, and likelihood of these impacts at the local and regional level. Consider:
  - key population and demographic shifts; disruptions to existing lifestyles, the health and social wellbeing of families and communities; social dysfunction including alcohol and drugs, crime, violence, and social or cultural disruption due to population influx
  - the needs of vulnerable groups including women, children and young people, the aged and people with a disability
  - Indigenous peoples, including cultural property issues
  - local, regional and state labour markets during the construction and operational phases, with regard to the source of the workforce. Present this information according to occupational workforce groupings. Detail whether the proponent and/or contractors are likely to employ locally or through other means and whether there are initiatives for local employment business opportunities and how these workforce strategies relate and align to state and Commonwealth resource workforce planning, skill development and training strategies and policies
  - proposed new skills and training related to the project including the occupational skill groups required and potential skill shortages anticipated
  - how much service revenue and work from the project would be likely to flow to the project's social and cultural area
  - impacts of construction and operational workforces, their families, and associated contractors on housing and accommodation availability and affordability, land use and land availability. Discuss the capability of existing housing and rental accommodation to meet any additional demands created by the project, including direct impacts on Indigenous people.

Evaluate and discuss the potential cumulative social impacts resulting from the project including an estimation of the overall size, significance and likelihood of those impacts. Cumulative impacts, in this context, are defined as the additional impacts on population, workforce, accommodation, housing, and use of community infrastructure and services, from the project, and other proposals for development projects in the area, which are publicly known or communicated by DSDIP, if they overlap the proposed project in the same timeframe as its construction period and the life of the proposed project's operational mine.

Discuss the concept of longitudinal cumulative impacts, or 'project fatigue', where the community in the study area has been subject to a number of large-scale construction projects in recent years.

For identified social impacts, social impact mitigation strategies and measures should be presented to address the:

- recruitment and training of the construction and operational workforces and the social and cultural implications this may have for the host community, including if any part of the workforce is sourced from outside the social and cultural area

housing and accommodation issues—the following core principles guide the identification and assessment of accommodation and housing impacts and development of mitigation and management strategies:

  - requirements for project workforce accommodation, considering housing market impacts.
  - strategies to mitigate or manage negative impacts of project workforce accommodation and housing market impacts.
  - clear and detailed strategy for accommodating project workforces.
  - commitment to the liveability of resource communities.
  - commitment to better linkages between land use, infrastructure delivery, economic development, environmental protection and affordable housing.
  - development of mitigation and management strategies completed in close consultation and collaboration with key groups including state government agencies and local governments.
- demographic changes in the profile of the region and the associated sufficiency of current social infrastructure, particularly health and welfare, education, policing and emergency services
- adequate provision of education, training and employment for women, people with a disability, and Indigenous peoples.

The strategy for accommodating resource project workforces must describe:

- projected size, nature and location of the workforce for the resource project (for preconstruction, construction and operational phases) including the projected proportion of workers who should fly, drive or ferry in and out
- towns and cities in which fly-in, fly-out or drive-in, drive-out employees are likely to be permanently residing
- plans for accommodating the proportion of the workforce who should not readily access local accommodation during pre-construction, construction and operational phases.

Describe any consultation about acceptance of proposed mitigation strategies, and how practical management and monitoring regimes would be implemented.

Discuss special strategies that might be deployed by the proponent during all stages of the project to mitigate 'project fatigue' impacts.

4.10.2.1 Social impact management plan

Provide a draft social impact management plan (SIMP) that promotes an active and ongoing role for impacted communities and local authorities through the project life cycle. The draft SIMP should cover:

- an overview of the project
- all proposed mitigation measures and benefit strategies
- action plans to implement mitigation measures and benefit strategies
- assignment of accountability and resources for mitigation measures and project benefits
- practical mechanisms to monitor and adjust mitigation measures and action plans
- ongoing updates to people on activities and commitments
- mechanisms to respond to public enquiries and complaints
- mechanisms to resolve disputes with community members
- community engagement processes including periodic review mechanisms.

For further information on preparing the SIMP, refer to Social impact assessment: Guideline to preparing a social impact management plan (Department of Infrastructure and Planning 2010).

The draft SIMP should incorporate a draft workforce management plan (WMP). The WMP should:

- consider skills needs for the project and identified shortages
- detail strategies to address the skills needs of the project
- detail strategies to address skill gaps and shortages
- describe how these strategies should support increased local and regional workforce participation.

More information, contact and relevant program details to assist development of the draft WMP can, at the time of writing, be obtained from a fact sheet on Skills Queensland's website www.skills.qld.gov.au (select the 'functions' tab then click on 'significant projects').

4.11 Health and safety

4.11.1 Description of values

Describe the existing community values for public health and safety that may be affected by the project. Provide maps showing the proximity of the project to any potentially affected places of human residence, work or recreation including, but not necessarily limited to, kindergartens, schools, hospitals, aged care facilities, office buildings, factories and workshops. Projects that could discharge contaminants, even accidentally, into water bodies should identify and describe any downstream extraction for potable use. For projects proposing air emissions, and/or those with the potential to emit odours, identify and describe nearby and other potentially affected populations. Pay particular attention to those sections of the population, such as children and the elderly who are especially sensitive to environmental health factors.

For any proposal to reuse stormwater, describe potential implications for human health and the procedures employed to prevent adverse health risks.

4.11.2 Potential impacts and mitigation measures

Assess the potential impacts on the community in terms of health, safety, and quality of life from project operations and emissions, including odour, dust and noise. Assess potential impacts on public health in the short and long term, and the cumulative impacts on public health either in isolation or by combination with other known existing or planned sources of contamination. The assessment should address the potential contamination not only of public water supplies but also of private water sources such as rainwater tanks with roof collection.

Assess the potential extent of contamination and public health risk should an extreme meteorological event, flood or catastrophic failure cause the release of toxic material from such infrastructure as tailings dams or chemical store. Describe strategies to notify relevant people during such an event.

Assess the project's potential for providing disease vectors. Propose measures to control mosquito and biting midge breeding, including measures to be used for any residual ponding after mining ceases, such as due to subsidence. Assess any proposed use of recycled water for its potential to cause infection by transmitting bacteria and/or viruses by contact, dispersion of aerosols, and ingestion (including via use on food crops). Similarly, the use of recycled water should be assessed for its potential to cause harm to human health via water supply or the food chain due to contaminants such as heavy metals and persistent organic chemicals.

Define and describe the objectives and practical measures for protecting or enhancing health and safety community values. Describe how nominated quantitative standards and indicators may be achieved, and how the achievement of the objectives should be monitored, audited and managed.

4.12 Economy

4.12.1 Description of potentially affected economies

Describe the existing local, regional or national economies that may be affected by the RDPE, including:

- appropriate statistics of economic activity, such as gross regional product and aggregate regional income
- trends in relevant economic indicators
- industries and businesses that could be beneficially or adversely affected by the project, their current and historical contribution to local, regional or national economies, and their current input costs
- the economic value of existing resources that could be impacted or sterilised by the project
- local, regional and national governments' aspirations, objectives, strategies and policies for the economic and industrial sectors that may be affected

- economic viability
- historical descriptions of large-scale resource developments and their effects in the region.

The economic impact statement should include estimates of the opportunity cost of the project and the value of ecosystem services provided by natural or modified ecosystems that would be disturbed or removed during development.

4.12.2 Potential impacts and mitigation measures

Provide an assessment from national, state, regional and local perspectives of the direct and indirect economic benefits and impacts of the RDPE. Describe the methods used, assumptions and sensitivity of the assessment.

At a level of detail appropriate to the scale of the project, the assessment should consider:

- the separate phases of the project, such as construction, operation and after ceasing operations
- the effects of this project on the local and regional economies, including goods and services supplied to, or received from, local or regional markets
- the long and short-term beneficial (such as job creation) and adverse impacts (such as increased labour costs, or competition with local small business) that are likely to result from the development
- impacts on the economic value of existing resources
- stimulus, catalytic or second-order effects
- cumulative effects of the project in relation to other economic development opportunities
- a benefit-impact table that disaggregates the benefits and impacts or costs
- 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 regulatory function or infrastructure provision
- implications for future economic development in the locality (including constraints on surrounding land uses and existing industry)
- the potential economic impact of any major hazard identified in section 4.14
- the distributional effects of the project 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
- economic impacts on local property values.

The assessment of economic impacts should outline strategies for local participation, including:

- strategies for assessing the cost effectiveness of sourcing local inputs from the regional economy during the construction, operation and rehabilitation phases of the project
- employment strategies for local residents, including members of Indigenous communities and people with a disability, including a skills assessment and recruitment and training programs to be offered
- demonstrating that capable and competitive local industry should be given full, fair and reasonable opportunity to tender for the supply of goods and services to the project.

Consider the impacts of the project in relation to energy self-sufficiency, security of supply and balance of payments benefits.

Define and describe the objectives and practical measures for avoiding or mitigating impacts or enhancing economic benefits. Describe how nominated quantitative standards and indicators may be achieved for economic management, and how the achievement of the objectives should be monitored, audited and managed.

4.13 Hazard and risk

Describe the potential hazards and risk to people and property that may be associated with the RDPE as distinct from hazards and risk to the natural environment, which should be addressed in other sections of the TOR. When addressing natural hazards, particularly in regard to places where people work and live (such as a mine's

accommodation camp), the EIS should consider the principles of natural hazard management in State Planning Policy 1/03 (SPP1/03), Mitigating the Adverse Impacts of Flood, Bushfire and Landslide, even if the development is exempt development under the *Sustainable Planning Act 2009*. SPP1/03 may not be applicable as a statutory instrument for exempt development, but it contains information that guides best practice for all development.

4.13.1 Description of values

Detail the values related to people and property that could be affected by any hazardous materials and actions associated with the project.

4.13.2 Potential impacts and mitigation measures

Describe the potential hazards and risk that may be associated with the project, including consideration of both natural (including cyclones) and man-made hazards. The assessment of risk should be in accordance with relevant standards.

Provide an inventory for each class of substances listed in the Australian Code for the Transport of Dangerous Goods by Road and Rail to be held on-site. 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.

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
- the procedures to prevent spillages and the emergency plans to manage hazardous situations.

Assess the potential impacts and risks of both natural and induced emergency situations and counter disaster and rescue procedures as a result of the project on resources such as forests, water reserves, state and local government-controlled roads, places of residence and work, and recreational areas. The assessment should outline the implications for and the impact on the surrounding land uses, and should involve consultation with Department of Community Safety, Queensland Fire and Rescue Service, Queensland Ambulance Service and Queensland Police Service. Undertake a preliminary hazard analysis, conducted in accordance with appropriate guidelines for hazard analysis, and addressing:

- 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
- a list of all hazardous substances to be used, stored, processed, produced or transported
- the rate of usage
- description of processes, type of the machinery and equipment used
- potential wildlife hazards such as crocodiles, snakes and disease vectors
- public liability of the State for private infrastructure and visitors on public land.

Develop an integrated risk management plan for the whole of the life of the project including construction, operation and decommissioning phases. The integrated risk management plan should include the following components:

- operational hazard analysis
- regular hazard audits
- fire safety, emergency
- response plans
- qualitative risk assessment
- construction safety.

4.14 Cross-reference with the terms of reference

Provide 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

Provide an environmental management plan (EM plan) that includes all the mitigation measures detailed in the various sections of the EIS, and provides a framework for continuing management, monitoring programs, and addresses any provision for independent environmental auditing. It should state the proponent's environmental protection commitments in a way that allows them to be measured and audited.

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*, whereas the EM plan for a petroleum project must meet the content requirements of section 310D of that Act.

The EM plan should be used by the administering authority to develop conditions to apply to project approvals. 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 should form the basis for developing the draft environmental authority.

6 Commitments not included in the EM plan

Summarise any commitments made by the proponent that are not included in the EM plan (such as a commitments to assist a local community group). It should be clear how and when the commitments should be fulfilled.

7 References

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

8 Recommended appendices

A1. Final terms of reference for this EIS

Provide a copy of the final TOR bound with the main body of the EIS. Other appendices can be provided in separate volumes.

A2. Regulatory approvals

List the regulatory approvals required by the RDPE.

A3. The standard criteria

Provide a brief summary of the RDPE'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 Australian Government in December 1992 (available from the Australian Government Publishing Service), discuss how the project conforms with each principle from inception to decommissioning.

A4. Specialist studies

Include all specialist study reports undertaken for the EIS as appendices.

A5. Research

Outline in an appendix any proposals for researching alternative environmental management strategies or for obtaining any further necessary information.

A6. Study team

In a separate appendix that should not be included in the public version of the EIS, describe the qualifications and experience of the study team, specialist sub-consultants and expert reviewers.

Approved by

Lindsay Delzoppo	28 August 2012
Signature	Date

Lindsay Delzoppo
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