Galilee Basin Power Station project

Terms of reference for an environmental impact statement

April 2013

Contents

Preamble

About the project

Galilee Power Pty Ltd proposes to develop the Galilee Basin Power Station project (the project), which has been declared a 'coordinated project' by the Coordinator-General.

The proposed power station would be a 900-megawatt (MW) clean coal-fired power station near Alpha in Central Queensland. Stage 1 would be developed initially to 450 MW with a second 450 MW module to be added as demand requires. The proposed power station would be situated 30 kilometres north-west of Alpha and immediately to the east of Waratah Coal's proposed mine in the Galilee Basin. Galilee Power is a fully owned subsidiary of Waratah Coal Pty Ltd.

The project proposes up to 1000 construction jobs and 60 operational jobs. Initial investment is estimated at $1.25 billion.

The power station proposes to utilise waste coal from Waratah Coal's tenements as power station feedstock. Additionally, the project proposes carbon dioxide (CO_2) capture, transport and sequestration and the use of integrated gasification combined-cycle technology.

The project components to be assessed include:

- 900 MW clean coal-fired power station (comprising two 450 MW units)
- CO_2 pipeline
- geosequestration area, including details of any concurrent coal seam gas extraction by Waratah Coal.

Purpose of this document

These terms of reference (TOR) set out the matters to be addressed in an environmental impact statement (EIS) for the project.

On 11 September 2009, the Coordinator-General declared the project to be a 'coordinated project' under section 26(1) (a) of the *State Development and Public Works Organisation Act 1971* (Qld) (SDPWO Act). This declaration initiated the statutory environmental impact assessment procedure of Part 4 of the SDPWO Act, which requires the proponent to prepare an EIS for the project.

The declaration of the project does not indicate support for or approval of the project by the Coordinator-General or the Queensland Government. Rather, it is a requirement for the project to undergo a rigorous EIS process.

The TOR must be read in conjunction with *preparing an environmental impact statement: Guideline for proponents*, which explains the following:

- the target audience for the EIS
- stakeholder consultation requirements
- document format
- copy requirements.

The guideline is available from **www.dsdip.qld.gov.au** or from the EIS project manager.

Australian Government assessment

The project has not yet been referred to the Commonwealth Minister for Sustainability, Environment, Water, Population and Communities to determine whether the project is a 'controlled action' under the *Environment Protection and Biodiversity Conservation Act 1999* (Cwlth) (EPBC Act). The minister's decision on whether the project impacts on matters of national environmental significance (MNES) may alter the environmental assessment process (for example, the minister may choose to conduct a separate assessment process under the EPBC Act). This TOR does not relate to MNES.

Coordinator-General's report

At the conclusion of the EIS process, the Coordinator-General will prepare a report evaluating the EIS (Coordinator-General's report). If the report states conditions under the following Queensland Acts, the Coordinator-General is required to provide the responsible minister(s) with a copy of the report:

- *Mineral Resources Act 1989*
- *Environmental Protection Act 1994* (EP Act)
- *Petroleum and Gas (Production and Safety) Act 2004*
- *Greenhouse Gas Storage Act 2009*.

Content of the EIS

The EIS should follow the format and content outlined in this TOR. Discuss any proposed change to the overall structure of the EIS documents with the EIS project manager.

1. Executive summary

The executive summary should convey the most important and preferred aspects and options relating to the project in a concise and readable form. It should use plain English, avoid jargon, be written as a stand-alone document and be structured to follow the EIS. It should be easy to reproduce and distribute on request to those who may not wish to read or purchase the whole EIS.

The executive summary should include:

- project title
- proponent's name and contact details
- a discussion of any relevant projects previously undertaken by the proponent, if applicable, and the proponent's commitment to effective environmental management
- a concise statement of the aims and objectives of the project
- the legal framework for the project, decision-making authorities and advisory agencies
- an outline of the background and need for the project, including the consequences of not proceeding with the project
- an outline of the alternative options considered and reasons for selecting the proposed development option
- a brief description of the project (pre-construction, construction, operational activities and decommissioning) and the existing environment, using visual aids where appropriate
- an outline of the principal environmental impacts predicted and the proposed environmental management strategies, commitments and rehabilitation strategies to minimise the significance of these impacts
- a discussion of the cumulative impacts in relation to social, economic and environmental factors of associated infrastructure projects proposed within the region
- detailed maps of the proposed project location and any other critical figures.

2. Glossary of terms

Provide a glossary of technical terms, acronyms, abbreviations and references.

3. Introduction

Clearly explain the function of the EIS, why it has been prepared and what it sets out to achieve. Include an overview of the structure of the document.

3.1 Project proponent

Describe the proponent's experience, including:

- the nature and extent of business activities
- experience and qualifications

- environmental record, including a list of any breach of relevant environmental laws during the previous ten years
- the proponent's environmental, health, safety and community policies.

3.2 Project description

Briefly describe the key elements of the project with illustrations or maps. Summarise any major associated infrastructure requirements. Provide detailed project descriptions in Section 4 (refer to page 5).

The Project Description needs to describe the output of the generator and the connection infrastructure.

3.3 Project rationale

Describe the specific objectives and justification for the project, including its strategic, economic, environmental and social implications, technical feasibility and commercial drivers. Discuss the status of the project in a regional, state and national context. Explain the project's compatibility with relevant policy, planning and regulatory frameworks.

3.4 Relationship to other projects

Describe how the project relates to other major projects (of which the proponent should reasonably be aware) that have been, are being undertaken or that have been proposed or approved in the area potentially affected by the project.

As a result of this assessment, there may be opportunities to co-locate existing or proposed infrastructure, enabling efficiency gains and mitigating environmental and property impacts. Where co-location may be likely (e.g. with groundwater level monitoring equipment), outline opportunities to coordinate or enhance impact mitigation strategies. Discuss the opportunities in sufficient detail to enable the reader to understand the reasons for preferring certain options or courses of action and rejecting others.

3.5 Project alternatives

Describe feasible alternatives including conceptual, technological and locality alternatives to the proposed project and the consequences of not proceeding with the project (including any impacts that would be avoided). Detail the criteria used to determine the alternatives and provide sufficient detail to convey why certain options or courses of action are preferred and why others are rejected (including the 'no action' option). Discuss the interdependencies of project components, particularly in regard to how any infrastructure requirements relate to the viability of the project.

This information is required to assess why the scope of the project is as it is and to ensure that the environmentally sustainable design principles and sustainable development aspects were considered and incorporated during the project's scoping phase.

3.6 The environmental impact assessment process

3.6.1 Methodology of the EIS

Provide an outline of the environmental impact assessment process, including the role of the EIS in the Coordinator-General's decision making process. Include information on

relevant stages of EIS development, statutory and public consultation requirements and any interdependencies that exist between approvals sought. The information in this section is required to ensure:

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

3.6.2 Objectives of the EIS

Provide a statement of the objectives of the environmental impact assessment process. The structure of the EIS can then be outlined and used to explain how the EIS will meet its objectives. The purpose of the EIS is to:

- provide public information on the need for the project, alternatives to it, assess options and make informed decisions for its implementation
- present the likely effects of the project on the natural, social and economic environment
- demonstrate how environmental impacts can be avoided, managed or mitigated and the offsets for any residual impacts
- provide information to formulate the project's environmental management plan (EMP).

3.6.3 Submissions

Inform the reader how and when properly made public submissions on the EIS will be addressed and taken into account in the decision-making process. Indicate points in subsequent approval processes for the project (for example, 'material change of use' (MCU) applications under the *Sustainable Planning Act 2009* (SPA)) where submitters may have appeal rights. The EIS project manager can assist with preparing information on the submissions process.

3.7 Public consultation process

3.7.1 Overview

The public consultation process should provide opportunities for community involvement and education. It may include interviews with individuals, public communication activities, interest group meetings, printed material and other mechanisms to encourage and facilitate active public consultation. The public consultation processes (community engagement) for all parts of the EIS should be integrated.

Consultation with advisory agencies should be the principal forum for identifying legislation, regulations, policies and guidelines relevant to the project and EIS process.

3.7.2 Consultation plan

Develop and implement a comprehensive and inclusive consultation plan with the stakeholder groups identified in section 2.4 of *Preparing an EIS: Guideline for proponents*.

The consultation plan should identify broad issues of concern to local and regional community and interest groups and address issues from project planning through commencement, project operations and decommissioning. The consultation plan should identify:

- the stakeholders to be targeted
- the types of consultation and communication activities to be undertaken
- timing of activities
- how consultation activities will be integrated with other EIS activities and the project development process
- consultation responsibilities
- communication protocols
- reporting and feedback arrangements
- how results of consultation will be considered by the proponent and integrated into the EIS process.

3.7.3 Public consultation report

Include, as an appendix, a public consultation report detailing how the public consultation plan was implemented, and the results. It must include:

- a list of stakeholders identified, including the Australian and Queensland governments, local government agencies, and/or the affected parties (as defined by the EP Act)
- criteria for identifying stakeholders and methods used to communicate with them
- details of the activities conducted to date and the future consultation strategies and programs, including those during the operational phase of the project (also outlined and included in the EMP)
- a summary of the issues raised by stakeholders and the means by which the issues have been addressed
- details of how consultation involvement and outcomes were integrated into the EIS process
- details of how consultation outcomes will be integrated into future site activities (including opportunities for engagement and provision for feedback and action if necessary).

3.8 Project approvals

3.8.1 Legislation and approvals

List and describe Australian, state and local legislation, approvals and plans relevant to the planning, approval, construction and operation of the project.

Identify the relevant approval agency for each of the approvals required.

3.8.2 Relevant plans

Outline the project's consistency with the existing national, state, regional and local planning framework that applies to the project location. Refer to all relevant statutory and non-statutory plans, planning policies, guidelines, strategies and agreements.

3.8.3 Environmentally relevant activities

Briefly describe each ERA under the EP Act and associated activities that are to be carried out in connection with the project. Present a detailed description of each ERA in Section 5, Environmental values and management of impacts. Provide details of the impact on land, water, air, noise and any other identified environmental values, as well as a detailed description of the waste generated from each ERA and its quantity, characteristics, handling, storage, management and intended treatment and disposal.

4. Project description

Describe the project through its lifetime of pre-construction, construction, operation and potentially decommissioning. The project description also allows further assessment of which approvals may be required and how they may be managed through the life of the project.

4.1 Overview of the project

Provide an overview of the project to put it into context. Include:

- a rationale explaining the selection of the preferred operating scenario, including details such as cost, environmental impacts, and the operational efficiencies of each option
- a description of the key components of the project including the use of text and design plans where applicable
- if coal seam gas extraction is proposed as part of the geosequestration process, it will need to be reflected in all relevant sections of the EIS, including the location of extraction wells, impact on environmental values and cumulative impacts. The coal seam gas extraction process and potential impacts must be described separately from other project components so the potential impacts can be assessed.
- a summary of any environmental design features of the project
- location of connection and network assets, and identification of customers (e.g. direct customers or sale through the National Electricity Market (NEM). Depending on how the generator is to be connected, describe matters associated with the construction of a substation and transmission line
- proposed technologies, including where such technologies are successfully used, the stage of development and the likelihood and impact of failure to introduce such technologies and the likely risks and impacts associated with geosequestration need to be clearly stated in qualitative and quantitative terms, intentions for long-term monitoring (post decommissioning) of the success of otherwise of the sequestration of carbon dioxide must be discussed.
- the expected cost, timing, and overall duration of the project, including details of and justification for, any staging of the development.

4.2 Spatial data requirements

The proponent should make available to advisory agencies appropriate GIS layers (which include project boundaries, elements and associated infrastructure) for use in further GIS analysis. Data should include appropriate information within the layer to clearly identify different aspects of the infrastructure and project elements.

GIS data provided to government agencies must be accompanied by a description of the spatial data, metadata for that data, projection and the datum used to prepare the maps and/or electronic shape files.

Electronic shape-files should include detail about the extent of disturbance and the location of infrastructure within the mining leases and off-site for related infrastructure. This should be provided in a format compatible with ArcGIS.

4.3 Location

Describe, using maps at suitable scales, the regional and local context of the project and all associated infrastructure. Provide real property descriptions of the project. Maps should show the precise location of the project area, in particular the:

- location and boundaries of current or proposed land tenures that the project area is or will be subject to, and details of the ownership of that land
- location, boundaries, and area and size of the project footprint, including easement widths and access requirements
- location and size of any proposed buffers surrounding the project area (for construction and operation)
- including location of existing infrastructure such as *the* State Controlled Road network*, and local roads as relevant to the site*
- location of infrastructure relevant to the project, including but not limited to, the state-controlled road network, local roads and railways
- interference and waterway barrier works (including stream diversions) within or across watercourses and floodplain areas, including wetlands
- location of any proposed site offices and accommodation sites.

4.4 Construction phase

Provide a detailed staging plan and approximate timeframes for the project's construction activities.

Provide an estimate of the number and roles of persons to be employed during the construction phase of the project.

Provide the following information on the pre-construction, construction and commissioning of the project, including detailed plans, drawings and maps.

Describe all pre-construction activities, including nature, scale and timing of:

- land acquisitions required, be it in full or as easements, leases
- vegetation clearing
- site access
- earthworks
- interference with watercourses and floodplain areas, including wetlands
- site establishment requirements for construction facilities, including access measures, movement of materials and equipment, and expected size, source and control of the construction workforce accommodation, services (water, sewerage, communication, energy, medical, waste disposal, recreation) and safety requirements
- temporary works

- upgrade, relocation, realignment, deviation of or restricted access to roads and other infrastructure
- equipment to be used.

4.4.1 Program of works

Describe all the construction elements of the project, including:

- an indicative construction timetable, including expected commissioning and start-up dates and hours of construction
- major work programs for the construction phase, including an outline of construction methodologies
- construction equipment to be used
- construction inputs, handling and storage including an outline of potential locations for source of construction materials
- major hazardous materials to be transported, stored and/or used on site, including environmental toxicity data and biodegradability
- clean-up and restoration of areas used during construction, including camp site(s) and storage areas.

4.4.2 Commissioning

Describe the commissioning process including the associated environmental impacts.

This should include the commissioning methodologies for any water supply pipeline with consideration of the risk of inter-basin transfer of non-indigenous and noxious fish, other fauna and flora.

4.5 Operational phase

Provide full details of the operation for all elements of the project, including:

- a description of the project site, including concept and layout plans of buildings, structures, plant and equipment to be employed
- nature and description of all key operational activities
- the capacity of the project equipment and operations
- estimated numbers and roles of persons to be employed during the operational phase of the project
- summary of traffic generation information/transport requirements for the operations and associated facilities for the project, including the movement of workers.

4.6 Associated infrastructure

Detail, with the aid of concept and layout plans, requirements for new infrastructure or upgrading/relocating existing infrastructure to service the project. Consider infrastructure such as transportation (road/rail/air/ship), water supply and storage, energy supply, telecommunications, stormwater, waste disposal and sewerage.

Describe:

- all infrastructure required to be constructed, upgraded, relocated or decommissioned for the construction and/or operation of the project, such as resource extraction areas, access roads, power supply, connection to sewerage or water supply
- the design and construction standards to be met (for example, waterway crossings should be designed to meet the requirements of the Fisheries Act and where relevant, self-assessable codes for minor or temporary water barrier works)
- alternative approaches or the opportunity to obtain materials from alternative sources.

4.6.1 Design of water resources infrastructure

Water storage infrastructure (the dam wall)

Describe the process and criteria used to select the preferred design and construction techniques, including:

- full supply level (FSL) and details of any staging or prospects for future expansion
- maximum (final) crest height and spillway height, including height above stream bed
- length and width of crest
- storage capacity, maximum depth, average depth, area of inundation at FSL, dead storage level, area of any buffer required, including a description of the flood margin and means of its determination, length of river bed (and tributaries) inundated
- estimated water yields and the associated reliability, security and risk of failure of water supply from the dam (with appropriate allowances for environmental requirements)
- general design of outlet works including siting, capacity, off-take level and ability to regulate flows, aquatic fauna exclusion and protection systems
- spillway design, including gate specification, if included
- details of any energy dissipaters at the downstream foot of the barrier
- details of any provision for incorporating a fishway or other fish transfer mechanism in the design, should it be required, and its effect on the viability of the proposed project
- details of the physical form of the stream bed within 200 metres of the downstream foot of the barrier.

Water distribution infrastructure

Describe the process and criteria used to select the preferred design and preferred construction techniques, including:

- the method of extracting and/or releasing water from the storage
- any treatment methods proposed
- if distribution is by pipe:
  - provision for route refinement and right of way
  - pipeline design parameters, including capacity and design life
  - above-ground facilities—physical dimensions and construction materials for surface facilities along the pipeline route, including information on pipeline markers
  - the location and/or frequency of (if applicable) cathodic protection points, off-take valves, pump stations, balance tanks, control valves (isolation points), pigging

facilities and any other project facilities and linkages to existing water supply infrastructure along the pipeline route

– design measures to prevent inter-basin transfer of aquatic flora and fauna.

Other infrastructure

Describe:

- all other infrastructure required to be constructed, upgraded, relocated or decommissioned for the construction and/or operation of the project, such as resource extraction areas, access roads, power supply, connection to sewerage or water supply, including infrastructure for contingency water supplies
- the design and construction standards to be met (for example, waterway crossings should be designed to meet the requirements of the *Fisheries Act 1994* (Qld) and in consultation with the Department of Agriculture, Fisheries and Forestry)
- alternative approaches or the opportunity to obtain materials from alternative sources.

4.7 Decommissioning and rehabilitation

Describe the options, strategies and methods for progressive and final rehabilitation of the environment disturbed by the project, including:

- developing a preferred rehabilitation strategy with a view to minimising the amount of land disturbed at any one time
- illustrating the final topography of any excavations, waste areas and dam sites on maps at a suitable scale
- describing the means of decommissioning the project—in terms of removing equipment, structures and buildings—and the methods proposed for stabilising the affected areas
- discussing options and methods for disposing of wastes generated by demolishing project infrastructure, including sufficient detail for their feasibility and suitability to be established
- discussing future land tenure arrangements post-decommissioning of the project
- developing a proposed staging plan for rehabilitation.

Include the impacts of the preferred rehabilitation strategy in the appropriate subsections of Section 5.

Refer to infrastructure that is not intended to be decommissioned. In this situation, describe the entity to which the infrastructure is intended to be transferred, and the proposed environmental management regimes.

5. Environmental values and management of impacts

Detail the environmental protection and mitigation measures incorporated in the planning, construction, rehabilitation, commissioning, operations and decommissioning of all facets of the project. Measures should prevent, or if not possible, minimise environmental harm and maximise environmental benefits of the project. Identify and describe preferred measures in more detail than other alternatives.

The objectives of the following subsections are to:

- describe the existing environmental values of the area that may be affected by the project, using background information and/or new studies to support statements (include reference to all definitions of environmental values set out in relevant legislation, policies and plans)
- describe the potential adverse and beneficial impacts of the project on the identified environmental values and the measures taken to avoid, minimise and/or mitigate those impacts
- describe any cumulative impacts on environmental values caused by the project, either in isolation or in combination with other known existing or planned projects
- present objectives, standards and measurable indicators that protect the identified environmental values
- examine viable alternative strategies for managing impacts (present and compare these alternatives in view of the stated objectives and standards to be achieved)
- discuss the available techniques to control and manage impacts in relation to the nominated objectives.

Additionally, in regard to the use of forest products and quarry materials, the following approach is required.

5.1 Forest products

The proponent must identify if commercial quantities of State-owned forest products, administered under the *Forestry Act 1959*, are likely to be interfered with (i.e. cleared, destroyed, etc).

Additionally, the proponent should identify if commercial quantities of privately owned forest is likely to be interfered with, and if so, how the proponent will facilitate a timber salvage operation for the local timber industry before any project-related work commences.

5.2 Quarry materials

Identify if State-owned quarry material, administered under the Forestry Act, will be used. The proponent must identify where such quarry material could possibly be sterilised or restricted from utilisation (including offsets and loss of access for existing operations authorised under the Forestry Act).

Describe how infrastructure will be designed to avoid or minimise adverse impacts to currently exploited or other commercial deposits of quarry materials authorised under the Forestry Act.

Where negative impacts of the project cannot be avoided or adequately minimised or mitigated, present proposals to offset impacts in accordance with the Queensland Government Environmental Offsets Policy (Environmental Protection Agency 2008a).

The mitigation measures and monitoring programs, identified in this section of the EIS, should be used to develop the EMP(s) for the project. For more information, refer to Section 11 (page 42).

5.3 Climate, natural hazards and climate change

Describe the climatic conditions that may affect management of the project. This includes a description of the vulnerability of the project area to seasonal conditions, extremes of

climate (for example, cyclones) and natural or induced hazards (including bushfire). Provide a risk assessment (as part of the requirements of Subsection 8.1 of this TOR) and management plan detailing these potential climatic threats to the construction, and operation of the project. Include the following:

- a risk assessment of changing climate patterns that may affect the viability and environmental management of the project
- the preferred and alternative adaptation strategies to be implemented
- commitments to working cooperatively, where practicable, with government, other industry and other sectors to address adaptation to climate change.

Address the most recent information on potential impacts of climatic factors in the appropriate sections of the EIS.

5.3.1 Flood management

Due to the location of the site, a comprehensive flood study should be included in the EIS that includes:

- quantification of flood impacts on properties surrounding and external to the project site from redirection or concentration of flows
- identification of likely increased flood levels, increased flow velocities or increased time of flood inundation as a result of the development
- identification of the risk of noxious or non-indigenous fish being released into waterways during flood conditions (e.g. from water storages).

The flood study should address any requirements of local or regional planning schemes for flood affected areas. The study report should include details of all calculations along with descriptions of base data, any potential for loss of flood plain storage, and triangulated surface meshes produced in terrain modelling software. Reference must be made to any studies undertaken by the local council in relation to flooding.

5.4 Land

Detail the existing land environment values for all areas associated with the project. Describe the potential for the construction and operation of the project to change existing and potential land uses of the project sites and adjacent areas.

5.4.1 Land use and tenure

Description of environmental situation

Identify, with the aid of maps:

- land tenure, including reserves, tenure of special interest (such as protected areas and forest reserves), existing and proposed gas infrastructure, water pipelines, powerlines and transport corridors, including local roads, state-controlled roads and rail corridors
- existing land uses and facilities surrounding the project
- distance of the project from residential and recreational areas
- declared water storage catchments
- location of the project in relation to environmentally sensitive areas.

Potential impacts and mitigation measures

Describe the potential changes to existing and potential land uses due to the construction and operation of the project. In particular, describe the following:

- impacts on project site and adjacent land uses and human activities and strategies for mitigation, such as those required by:
  - Relevant State Planning Policies
- possible effect on town planning objectives and controls, including local government zoning and strategic plans
- constraints to potential developments and possibilities of rezoning adjacent to the development area
- management of the immediate environs of the project including construction buffer zones
- proposed land use changes in any areas of high conservation value and information on how easement widths and vegetation clearance in sensitive environmental areas will be minimised
- potential issues involved in proximity and/or co-location of other current or proposed infrastructure services
- any land units requiring specific management measures.

5.4.2 Scenic amenity and lighting

Description of environmental values

Describe, in general terms, the existing character of the landscape and the general impression that would be obtained while travelling through and around it. Outline existing landscape features, panoramas and views that have, or could be expected to have, value to the community. Include information such as maps and photographs, particularly where addressing the following issues:

- major views, view sheds, outlooks, and features contributing to the amenity of the area, including assessment from private residences
- focal points, landmarks, waterways and other features contributing to the visual quality of the area and the project site(s)
- character of the local and surrounding areas including vegetation and land use.

Include any relevant World Heritage and National Heritage values of the area.

Potential impacts and mitigation measures

Describe the potential beneficial and adverse impacts of the project on landscape character and visual qualities of the site and the surrounding area. Explain what measures will be undertaken to avoid or mitigate the identified impacts.

Provide an assessment of all potential impacts of the project's lighting, during all stages, with particular reference to objectives to be achieved and management methods and strategies to be implemented to avoid or mitigate, such as:

- the visual impact at night
- the potential impact of increased vehicular traffic
- changed habitat conditions for nocturnal fauna and associated impacts.

5.4.3 Topography, geology and soils

Description of environmental values

Provide maps locating the project in state, regional and local contexts. The topography should be detailed with contours at suitable increments, shown with respect to Australian Height Datum. Include significant features of the landscape and topography, and accompanying comments on the maps.

Provide a description, map and a series of cross-sections of the geology of the project area relevant to the project components. Describe the geological properties that may influence ground stability, occupational health and safety, or the quality of stormwater leaving any area disturbed by the project. If sequestration is proposed, describe the geological properties that may influence permanent containment of carbon dioxide. In locations where the age and type of geology is such that significant fossil specimens may be uncovered during construction/operations, address the potential for significant finds.

A soil survey of the sites affected by the project must be conducted at a suitable scale, with particular reference to the physical and chemical properties of the materials that will influence erosion potential, stormwater run-off quality, rehabilitation and agricultural productivity of the land. Provide information on soil stability and suitability for construction of project facilities.

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. 2008) and *Australian Soil Classification* (Isbell & CSIRO 2002).

Undertake an appraisal of the depth and quality of useable soil. Assess each soil's agricultural land suitability in accordance with:

- *Guidelines for agricultural land evaluation in Queensland* (Department of Primary Industries 1990)
- *Planning guidelines: The identification of Good Quality Agricultural Land*, (Department of Primary Industries & Department of Housing, Local Government and Planning 1993)
- State Planning Policy 1/92: Development and the Conservation of Agricultural Land (Department of Primary Industries & Department of Housing, Local Government and Planning 1992).

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 will influence erosion potential, stormwater run-off quality, rehabilitation and agricultural productivity of the land. Provide geotechnical information on the soils' stability and suitability for construction of project facilities.

Identify any areas of land within the project study area identified as 'strategic cropping land or potential strategic cropping land' (SCL) as identified by the SCL Act trigger maps (available from **www.derm.qld.gov.au/land/planning/strategic-cropping/mapping.html**).

Potential impacts and mitigation measures

Provide details of any potential impacts to the topography or geomorphology associated with the project and proposed mitigation measures, including:

- a discussion of the project in the context of major topographic features and any measures taken to avoid or minimise impact to such, if required
- the objectives to be used for the project in any re-contouring or consolidation, rehabilitation, landscaping, and fencing.

Identify the possible soil erosion rate for all permanent and temporary landforms and describe the techniques used to manage the impact. Identify all soil types and outline the erosion potential (both wind and water). Include an assessment of likely erosion effects, especially those resulting from removing vegetation, and constructing retaining walls both on site and off site for all disturbed areas.

Indentify erosion management techniques to be used. Provide details of an erosion monitoring program (including rehabilitation measures for erosion problems identified during construction), and detail acceptable mitigation strategies. Summarise methods proposed to prevent or control erosion with regard to:

- the *Best Practice Erosion and Sediment Control; International Erosion Control Association* (2008)
- preventing soil loss in order to maintain land capability/suitability
- preventing degradation of local waterways.
- Discuss measures to manage soils and mitigate impacts for all site earthworks and construction activities.

Identify any areas within the project footprint likely to temporarily or permanently impact SCL and potential SCL. Where areas of identified SCL and potential SCL are likely to be permanently alienated by the project, address the requirements of the SCL Act as they apply to the components of the project, on consultation with the Department of Natural Resources and Mines (DNRM) to discuss undertaking the SCL assessment process defined by the SCL Act.

5.4.4 Land contamination

Potential impacts and mitigation measures

Discuss the management of any contaminated land and potential for contamination from construction, commissioning, operation and decommissioning, in accordance with the *Draft Guidelines for the Assessment and Management of Contaminated Land in Queensland* (Department of Environment 1998) and the National Environment Protection (Assessment of Site Contamination) Measure 1999 (Cwlth).

Describe strategies and methods to be used to prevent and manage any land contamination resulting from the project, including the management of any acid generation or management of chemicals and fuels to prevent spills or leaks.

Assess the possible degradation or contamination of land that could result from any aspects of the project. The assessment should not be limited to activities that would result in the land being entered on the Environmental Management Register or the Contaminated Land Register. 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 wastewater
- waste rock disposal
- tailings disposal
- fly-ash disposal.

State any intentions concerning the classification of land contamination after project completion.

5.5 Nature conservation

Detail the existing nature conservation values that may be affected by the proposal. Describe the environmental values in terms of:

- conservation of resources
- biological diversity, including habitat of endangered, vulnerable and near-threatened (EVNT) and special least-concern species
- integrity of landscapes and places including wilderness and similar natural places
- aquatic and terrestrial ecosystems.

Survey effort should be sufficient to identify, or adequately extrapolate, the floral and faunal values over the range of seasons, particularly during and following a wet season. The survey should account for the ephemeral nature of watercourses traversing the proposal area, and seasonal variation in fauna and flora populations. If ecological surveys are to be conducted at a future date, include details of proposed timing, survey methodology, and impact avoidance and mitigation measures.

Wherever possible, seek the involvement of the local Indigenous community in conducting field observations and survey activities, to identify the traditional and contemporary Indigenous uses of species.

Also outline the proposed strategies to avoid, or minimise and mitigate, impacts on the identified values within the project's footprint.

Identify key flora and fauna indicators for ongoing monitoring.

5.5.1 Sensitive environmental areas

Description of environmental values

On a map of suitable scale, identify areas that are environmentally sensitive within the study area in proximity to the project. This should include areas classified as having national, state, regional or local biodiversity significance, or flagged as important for their integrated biodiversity values. Refer to Queensland legislation and policies on threatened species and ecological communities.

Areas regarded as sensitive with respect to flora and fauna have one or more of the following features, and should be identified and mapped:

- important habitat of species listed under the NC Act
- regional ecosystems (REs) listed as 'endangered' or 'of concern' under state legislation

- good representative examples of remnant REs or REs that are described as having 'medium' or 'low' representation in the protected area estate as defined in the Regional Ecosystem Description Database (REDD) available at **www.ehp.qld.gov.au**
- sites containing near-threatened or bio-regionally significant species or essential, viable habitat for near-threatened or bio-regionally significant species
- areas or features identified as State significant biodiversity values, pursuant to the Queensland Biodiversity Offset Policy (version 1) (Department of Environment and Resource Management 2011c)
- sites containing common species that represent a distributional limit and are of scientific value or that contain feeding, breeding, resting areas for populations of echidna, koala, platypus and other species of special cultural significance
- sites of high biodiversity that are of a suitable size or with connectivity to corridors and protected areas to ensure survival in the longer term; such land may contain:
  - natural vegetation in good condition or other habitat in good condition (for example, wetlands)
  - degraded vegetation or other habitat that still support high levels of biodiversity or act as an important corridor for maintaining high levels of biodiversity in the area
- a site containing other special ecological values (for example, high habitat diversity and areas of high endemism)
- ecosystems that provide important ecological functions such as:
  - wetlands of national, state and regional significance
  - riparian vegetation
  - important buffer to a protected area or important habitat corridor between areas
- sites of palaeontologic significance such as fossil sites
- sites of geomorphological significance
- declared areas of high nature conservation value or areas vulnerable to land degradation under the VM Act
- remnant vegetation listed under the VM Act as containing endangered and of-concern regional ecosystems where clearing is likely to result in land degradation and a loss of ecosystem function and biodiversity.

Areas of special sensitivity include wetlands, wildlife breeding or roosting areas, any significant habitat or relevant bird flight paths for migratory species, bat roosting and breeding caves including existing structures such as adits and shafts, and habitat of threatened plants, animals and communities.

Potential impacts and mitigation measures

Discuss the impact of the project on species, communities and habitat of local, regional or state significance in sensitive environmental areas as identified above. Include human impacts and the control of any domestic animals introduced to the area.

Demonstrate how the project would comply with the following hierarchy:

- avoiding impact on areas of remnant vegetation and other areas of conservation value including the significant species habitat
- mitigating impacts through rehabilitation and restoration including, where relevant, a discussion of any relevant previous experience or trials of the proposed rehabilitation

- replacing or offsetting the loss of conservation values, where impacts cannot be avoided or mitigated.

Explain why the measures above may not apply in areas where loss would occur.

Discuss the boundaries of the areas impacted by the project within or adjacent to an ecological community, including details of footprint width. If the project area will impact upon sensitive environmental areas, including values subject to offset requirements, include reasons for the preferred alignment and the viability of alternatives.

Describe strategies for protecting Ramsar wetlands and discuss any obligations imposed by state or Commonwealth legislation or policies, or international treaty obligations (that is, China–Australia Migratory Bird Agreement (CAMBA), Japan–Australia Migratory Bird Agreement (JAMBA), Republic of Korea–Australia Migratory Bird Agreement (ROKAMBA)).

Provide details about the approvals that will be required under the NC Act and the VM Act for development made assessable under SPA. The EMP for the project should address the performance requirements of the relevant policies and regional vegetation management codes (refer to **www.derm.qld.gov.au/vegetation/regional_codes.html**).

Where relevant, this section should discuss environmental offset requirements in accordance with the Queensland Government Environmental Offsets Policy (Environmental Protection Agency 2008a) and take into account the applicable specific-issue offset policies.

Describe any departure from 'no net loss' of ecological values.

5.5.2 Terrestrial flora

Description of environmental values

Provide vegetation mapping for all relevant project sites, and for adjacent areas to illustrate interconnectivity. Mapping should also illustrate any larger scale interconnections between areas of remnant or regrowth vegetation where the project site includes a corridor connecting those other areas. Discuss any variances between site mapping and mapping produced by the Queensland Herbarium.

Describe the terrestrial vegetation communities within the affected areas at an appropriate scale (maximum 1:10 000), with mapping produced from aerial photographs and ground-truthing, showing the following:

- location and extent of vegetation types using the regional ecosystem type descriptions in accordance with the REDD
- location of vegetation types of conservation significance based on regional ecosystem types and occurrence of species listed as endangered, vulnerable or near threatened under the Nature Conservation (Wildlife) Regulation 1994 (Qld) and subsequent amendments, as well as areas subject to the VM Act
- the current extent (bioregional and catchment) of protected vegetation types of conservation significance within the protected area estate (national parks, conservation parks, resource reserves, nature refuges and conservation reserves under the NC Act)
- any plant communities of cultural, commercial or recreational significance

- the location of any horticultural crops in the vicinity of the project area
- location and abundance of any known exotic or weed species.

Highlight sensitive or important vegetation types, including any riparian vegetation, and their value as habitat for fauna and conservation of specific rare floral and faunal assemblages or community types. The description should contain a review of published information regarding the assessment of the significance of the vegetation to conservation, recreation, scientific, educational and historical interests.

For each significant natural vegetation community likely to be impacted by the project, vegetation surveys should be undertaken at an appropriate number of sites, allowing for seasonal factors, and satisfying the following:

- the relevant regional vegetation management codes
- site data should be recorded in a form compatible with the Queensland Herbarium CORVEG database and HERBRECS
- the minimum site size should be 10 × 50 metres
- a complete list of species present at each site should be recorded
- the surveys to include species structure, assemblage, diversity and abundance
- the relative abundance of plant species present to be recorded
- any plant species of conservation, cultural, commercial or recreational significance to be identified
- specimens of species listed as protected plants under the Nature Conservation (Wildlife) Regulation, other than common species, are to be submitted to the Queensland Herbarium for identification
- the methodology in *Biocondition: A Condition Assessment Framework for Terrestrial Biodiversity in Queensland: Assessment Manual* (version 2.1) (Eyre et al. 2011) and *Ecological Equivalence Methodology Guidelines* (version 1) (Department of Environment and Resource Management 2011a) for sites possibly requiring offset considerations under the Policy for Vegetation Management Offsets (version 3) (Department of Environment and Resource Management 2011b) or Queensland Biodiversity Offset Policy (version 1) (Department of Environment and Resource Management 2011c).

Existing information on plant species may be used instead of new survey work, provided that the data is derived from previous surveys at the site consistent with the above methodology. The methodology used for flora surveys and the site specific survey information should be included in the appendices to the report.

The impact of pests e.g. the insect *Viteus vitifoliae* known as grapevine phylloxera or diseases of terrestrial plants, e.g. myrtle rust should be examined.

Potential impacts and mitigation measures

Describe the potential environmental impacts to the ecological values of the area arising from the construction, operation and decommissioning of the project including clearing, salvaging or removing vegetation. Discuss the indirect effects on remaining vegetation. Consider short- and long-term effects and comment on whether the impacts are reversible or irreversible.

For all components of the project, discuss:

- the potential impacts that clearing vegetation will have on listed species and communities in the extent of the proposed vegetation clearing
- Outline strategies to avoid, minimise, mitigate, and offset potential impacts of the project on terrestrial flora values (both on and offsite impacts)
- the ability of identified vegetation to withstand any increased pressure resulting from the project, and any measures proposed to mitigate potential impacts
- the methods to ensure rapid rehabilitation of disturbed areas following construction, including the species chosen for revegetation, which should be consistent with the surrounding associations
- any post-construction monitoring programs
- the potential environmental harm on flora due to any alterations to the local surface and groundwater environment, with specific reference to impacts on riparian vegetation or other sensitive vegetation communities
- a description of any foreseen impacts which increase the susceptibility of ecological communities and species to the impacts of climate change.

Outline how these measures will be implemented in the EMP for the project. Weed management strategies are required for containing existing weed species (for example, parthenium and other declared plants) and ensuring no new declared plants are introduced to the area. Refer to the local government authority's pest management plan and any strategies and plans recommended for the project area by Biosecurity Queensland. Discuss the strategies in accordance with provisions of the Land Protection (Pest and Stock Route Management) Act in the main body of the EIS and in the pest management plan within the EMP for the project.

5.5.3 Terrestrial fauna

Description of environmental values

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

- species diversity (that is, a species list) and abundance of animals of recognised significance
- any species that are poorly known but suspected of being rare or threatened
- habitat requirements and sensitivity to changes, including movement corridors and barriers to movement
- for each EVNT fauna present or likely to be present, quantify the extent of fauna habitat and habitat quality, including the classification of the habitat under applicable acts or classification systems
- the existence of feral or introduced animals of economic or conservation significance
- existence (actual or likely) of any species and communities of conservation significance in the study area, including discussion of range, habitat, breeding, recruitment feeding and movement requirements, and current level of protection (for example, any requirements of protected area management plans or threatened species recovery plans)

- habitat requirements and sensitivity to changes, including movement corridors and barriers to movement
- an estimate of commonness or rarity for the listed or otherwise significant species
- use of the area by migratory fauna
- records in a form compatible with the Wildlife Online database.

Present fauna data in columns titled: Number, collector, Start date, End date, Location, Latitude, Longitude, Zone, Easting, Northing, Datum, Precision (m), Altitude (m), Vegetation code, Slope, Aspect, Scientific name, Common name, Count, count type, Age code, Sex code, Breeding code, Identification method, Collector code, Specimen registration, Specimen location, Collection notes, vetting code.

The Department of Environment and Heritage Protection (DEHP) has supporting documents available which explain the above fields and codes.

Identify any species listed by the NC Act occurring in the project area. Identify any species listed by the 'Back on Track' species prioritisation methodology (refer to: **www.ehp.qld.gov.au/wildlife/prioritisation-framework/index.html**).

Indicate how well any affected communities are represented and protected elsewhere in the bio-region where the project occurs. Specify the methodology used for fauna surveys. Provide relevant site data to DEHP in a format compatible with the Wildlife Online database for listed threatened species (refer to: **www.ehp.qld.gov.au/wildlife/wildlife-online/index.html**).

Potential impacts and mitigation measures

Consider potential impacts on terrestrial fauna, relevant wildlife habitat and other fauna conservation values, including:

- impacts due to loss of range/habitat, food supply, nest sites, breeding/recruiting potential or movement corridors or as a result of hydrological change
- impacts on native species, particularly species of conservation significance
- cumulative effects of direct and indirect impacts
- threatening processes leading to progressive loss
- a description of any foreseen impacts that increase the susceptibility of ecological communities and species to the impacts of climate change.

Address any actions of the project or likely impacts that require an authority under the NC Act. Provide the following information on mitigation strategies:

- measures to avoid, minimise, mitigate and offset the identified impacts. Any provision for buffer zones and movement corridors, nature reserves or special provisions for migratory animals should be discussed and coordinated with the outputs of the flora assessment
- details of the methodologies that would be used to avoid injuring livestock and native fauna as a result of the project's construction and operational works, and if accidental injuries should occur, the methodologies to assess and handle injuries
- strategies for complying with the objectives and management practices of relevant recovery plans
- measures to rehabilitate disturbed areas, which incorporate provision of nest hollows and ground litter, where appropriate.

Outline how these measures will be implemented in the EMP for the project.

Address feral animal management strategies and practices. The study should develop strategies to ensure that the project does not contribute to increased encroachment of a feral animal species. Refer to the local government authority's pest management plan and any strategies and plans recommended for the project area by Biosecurity Queensland. Discuss the strategies in accordance with the provisions of the Land Protection (Pest and Stock Route Management) Act in the main body of the EIS and in the pest management plan within the EMP for the project. The pest management plan should also include a mosquito management plan in accordance with Queensland Health's "Guidelines to minimise mosquito and biting midge problems in new development areas."

There should be a statement on how the Project will mitigate the risk of introducing pest animals not present in the project area. The approach should be consistent with locally agreed priorities.

5.5.4 Aquatic biology and ecology

Description of environmental values

Describe the aquatic flora and fauna present, or likely to be present, in the areas affected by the project. Include:

- fish species, mammals, reptiles, amphibians, crustaceans and aquatic invertebrates occurring in the waterways within the affected area and any associated wetlands (as defined under section 5 of the Fisheries Act)
- any rare or threatened aquatic species
- exotic and pest organisms
- a description of the habitat requirements and the sensitivity of aquatic species to changes in flow regime, water levels and water quality in the project areas
- aquatic plants, including native, exotic and weed species
- aquatic habitat matrices including benthic substrate, and geomorphology of aquatic habitats
- habitat downstream of the project or potentially impacted due to associated lacustrine environments
- stream type
- any other state significant biodiversity values identified in the Queensland Biodiversity Offset Policy (version 1) (Department of Environment and Resource Management 2011c) that are not described elsewhere
- description of fish habitat at the site and upstream and downstream as far as the effect of the project will extend. This should include features such as distribution of pool and riffle formations: presence of snags; presence of overhanging vegetation; features of riparian vegetations (width, species, cover, continuity, height etc); presence of aquatic macrophytes; sediment type; river profile (bank width and depth); presence of sand and gravel bars; water quality. Indicate the relative proportion of these types of habitat in the system and comment on significance of the proportion that will be affected by the proposal.

- discussion of the sensitivity of fish habitat at the site and up and downstream of the site to disturbance, including potential disturbances and changes resulting from the proposed works (e.g. in water quality, flow regimes, water levels, proposed land use).
- a description of fish and crustacean species (recreational, commercial and other) at representative sites upstream, within the impounded area and downstream as far as the effect of the project will extend. This should include distribution, diversity, some population descriptors (e.g. size classes / length frequency) and relative abundance. Historical information (e.g. former distribution, diversities etc) should be included where available.
- details of the aquatic fauna sampling methods, sites, dates and times of sampling and flow conditions and water quality at the time(s) of sampling
- discussion of fish habitat requirements and usage at the site and up and downstream of the site, including life cycle, seasonal or flow related variations in those requirements
- fish movement requirements through the site need to be determined (including any seasonal changes to those requirements)
- a description of recreational and commercial fisheries at the site and up and downstream of the site.

Describe any wetlands listed by DEHP as areas of national, state or regional significance and detail their values and importance for aquatic flora and fauna species.

Potential impacts and mitigation measures

Discuss the potential impacts of the project on the aquatic species and ecosystems and describe proposed mitigation actions, including:

- proposed location, type and design of waterway barrier works (temporary and permanent) that would impact on aquatic resources, particularly fish movement, with an appropriately scaled map
- potential changes to downstream flow regime, stream geomorphology, and drought refuge habitat for aquatic and terrestrial species, and the likely effect of such changes on the on aquatic ecology, riparian vegetation and dependant species
- measures to avoid, minimise, mitigate and offset identified impacts of the project on aquatic flora and fauna values (on or downstream of the project sites)
- proposed stream diversions, causeway construction and crossing facilities, stockpiled material and other impediments that would restrict free movement of aquatic fauna
- alternatives to waterway crossings where possible
- measures to avoid fish spawning periods, such as seasonal construction of waterway crossings and measures to facilitate fish movements through water crossings
- offsets proposed for unavoidable, permanent loss of fisheries habitat
- methods to minimise the potential for introducing or spreading weed species or plant disease e.g. reference should be made to the possible application of the *Plant Protection Act 1989* as the whole of QLD is a pest quarantine area for grape phylloxera. The Project site transverses the Special Control Zone, which is designated as a phylloxera exclusion zone (refer map http://www.daff.qld.gov.au/4790_20983.htm#Grape).

- monitoring aquatic biology health, productivity and biodiversity in areas subject to direct discharge
- determine the potential impacts of the proposal on fish habitat at the site and up and downstream of the site as far as the effect of the project will extend, including impacts on flow regime and riparian and floodplain hydrology and on features such as: riparian vegetation; aquatic flora; distribution of pool and riffle environments; water quality; in stream and bank (freshwater and estuarine) profiles; floodplain habitat (such as wetlands, water bodies) etc.
- determine the potential impacts (including cumulative impacts given existing development in the system) of the proposal on aquatic faunal communities (including fish) at the site and up and downstream of the site as far as the effect of the dam/weir will extend (including estuarine and near coastal aquatic communities). These should include:
  - impacts on reproduction
  - impacts on different life stages
  - impacts on movement up and downstream and between the waterway and floodplain including from changes in cues (water temperature, flow patterns), increased intervals between floodplain and river connectivity and from increased barrier effects of existing structures etc.
  - impacts on access to and availability of different habitats
  - impacts on population and community structure (including overall diversity)
  - impacts on conservation status.
- determine the potential for the introduction of or facilitation of movement of translocated or exotic or non-indigenous or noxious aquatic fauna (including fish and crustaceans) through the construction and operation of the proposed structure
- determine the potential impacts on commercial and recreational fisheries.

Address any actions of the project or likely impacts that require an authority under the relevant legislation, including the NC Act and/or the Fisheries Act. Outline how these measures will be implemented in the overall EMP for the project.

5.6 Water resources

5.6.1 Description of environmental values

Describe the quality and quantity of water resources in the vicinity of the project area, including:

- existing surface and groundwater in terms of physical, chemical and biological characteristics
- existing surface drainage patterns, flows, history of flooding including extent, levels and frequency and present water uses
- baseline details on water assets, including environments supported by those assets
- a site water balance for each asset, complemented by a regional water balance
- an assessment of how the proposed project will change both the site and regional water balances. The water balance analysis could include (but not necessarily be limited to) the following information:

  - existing usage and pattern of use, of the surface water and identified aquifer(s)
  - an assessment of regional water assets
  - critical dependencies of the identified aquifer(s) and extent of hydrological interconnectivity
  - an understanding of the structural and dynamic ground and surface water systems (including recharge and discharge)
  - an assessment of the quality of information and data for the identified systems.

Describe the environmental values of the surface waterways and groundwater of the affected area in terms of:

- Environmental Protection (Water) Policy 2009 (EPP (Water))
- *Australian and New Zealand Guidelines for Fresh and Marine Water Quality* (Australian and New Zealand Environment and Conservation Council & Agriculture and Resource Management Council of Australia and New Zealand 2000)
- *Queensland Water Quality Guidelines 2009* (Department of Environment and Resource Management 2009a)
- physical integrity, fluvial processes and morphology, including riparian zone vegetation and form, if relevant
- any impoundments (for example, dams, levees, weirs)
- hydrology of waterways and groundwater
- sustainability, including both quality and quantity
- dependent ecosystems
- existing and other potential surface and groundwater users, and average quantity of their take
- water resource plans relevant to the affected catchments.

If the project is likely to use or affect local sources of groundwater, describe groundwater resources in the area in terms of:

- geology and stratigraphy
- aquifer type—such as confined, unconfined
- depth to and thickness of the aquifers
- depth to water level and seasonal changes in levels
- groundwater flow directions (defined from water level contours)
- interaction with surface water
- possible sources of recharge
- potential exposure to pollution
- current access to groundwater resources in the form of bores, springs and ponds (including quantitative yield of water and locations of access)
- current estimated level of take from each aquifer and analysis of the current aquifer water level conditions (that is, under stress, or not under stress).

The groundwater assessment should also be consistent with relevant guidelines, including spatial and temporal monitoring, to accurately characterise baseline groundwater characteristics.

Groundwater

Should the project use groundwater, the following should be undertaken.

Review the quality, quantity and significance of groundwater in the project area, together with groundwater use in neighbouring areas and refer to relevant legislation or water resource plans for the region. The review should also provide an assessment of the potential take of water from the aquifer and how current users and the aquifer itself and any connected aquifers will be affected by the take of water.

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

- location
- pumping parameters
- draw down and recharge at normal pumping rates
- seasonal variations (if records exist) of groundwater levels
- develop a network of observation points that would satisfactorily monitor groundwater resources both before and after commencement of operations.

The data obtained from the groundwater survey should be sufficient to enable specification of the major ionic species present in the groundwater, pH, electrical conductivity and total dissolved solids.

5.6.2 Potential impacts and mitigation measures

Assess the project's potential impacts on 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, to describe how nominated quantitative standards and indicators may be achieved, and how the achievement of objectives will be monitored, audited and managed. Include the following:

- potential impacts on the flow and the quality of surface and groundwater from all phases of the project, with reference to their suitability for the current and potential downstream uses and discharge licences
- an assessment of all likely impacts on groundwater depletion or recharge regimes, including those caused by the altered porosity and permeability of any land disturbance
- potential impacts of surface water flow on existing infrastructure, with reference to the EPP (Water) and the Water Act
- chemical and physical properties of any wastewater (including stormwater at the point of discharge into natural surface waters), and the toxicity of effluent to flora and fauna
- potential impacts on other downstream receiving environments, if it is proposed to discharge water to a riverine system
- the results of a risk assessment for uncontrolled releases to water due to system or catastrophic failure, implications of such emissions for human health and natural ecosystems, and strategies to prevent, minimise and contain impacts
- an assessment of the potential to contaminate surface and groundwater resources and measures to prevent, mitigate and remediate such contamination

- assess and describe any potential for the project to impact on groundwater-dependent vegetation; describe avoidance and mitigation measures
- details of a monitoring program for the groundwater resources, using existing deep bores, to establish the base line yield and water quality of the supply from those bores.

Describe the response of the groundwater resource to the progression and finally cessation of the proposal.

Discuss the need or otherwise for licensing of any dams (including referable dams under the Water Supply (Safety and Reliability) Act 2008) or creek diversions, under the Water Act 2000. Information on water entitlements and water sources, including impacts on existing water entitlements, including water harvesting, should be established in consultation with DNRM.

Strategies should be adequately detailed to demonstrate best practice management and that environmental values of receiving waters will be maintained to nominated water quality objectives. Describe the monitoring programs that will assess the effectiveness of management strategies for protecting water resources during the construction, operation and decommissioning of the project. Establish strategies to ensure a safe potable water supply for the site. Outline how these strategies are incorporated into appropriate sections of the EMP.

Surface water and water courses

Assess the hydrological impacts of the proposal on surface water and water courses, particularly with regard to stream diversions, scouring and erosion, and changes to flooding levels and frequency of flooding, both upstream and downstream of the project. If flooding levels will be affected, modelling of afflux should be provided and illustrated with maps.

Discuss the need for authorisations for overland flow dams, creek diversions, surface and ground water sources, activities within watercourses and impacts on existing entitlements and allocations with DNRM. Discuss the need or otherwise for licensing of referable dams with DEHP.

Wastewater treatment

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

In relation to water supply and usage, and wastewater disposal, discuss anticipated flows of water to and from the proposal area. Where dams, weirs or ponds are proposed, investigate the effects of predictable climatic extremes (storm events, floods and droughts) on:

- the capacity of the water storages (dams, weirs, ponds) and the ability of these storages to retain contaminants
- the structural integrity of the containing walls
- relevant operating regime
- the quality of water contained
- flows and quality of water discharged.

The design of all water storage facilities should follow the technical guidelines on site water management.

Discuss the mitigation options and the effectiveness of mitigation measures, with particular reference to sediment, acidity, salinity and other emissions of a hazardous or toxic nature to human health, flora or fauna.

5.7 Air quality

5.7.1 Description of environmental values

Describe the existing air quality that may be affected by the project in the context of environmental values as defined by the EP Act and Environmental Protection (Air) Policy 2008 (EPP (Air)).

Discuss the existing local and regional air shed environment, including:

- background levels and sources of particulates, gaseous and odorous compounds and any major constituent
- pollutants (including greenhouse gases)
- baseline monitoring results, sensitive receptors.

Data on local meteorology and ambient levels of pollutants should be gathered to provide a baseline for later studies or for the modelling of air quality environmental harms.

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

5.7.2 Potential impacts and mitigation measures

Consider the following air quality issues and their mitigation:

- an inventory of air emissions from the project expected during construction and operational activities (including source, nature and levels of emissions)
- 'worst case' emissions that may occur during operation. If these emissions are significantly higher than those for normal operations, it will be necessary to separately evaluate the worst-case impact to determine whether the planned buffer distance between the facility and neighbouring sensitive receptors will be adequate
- ground level predictions should be made at any site that includes the environmental values identified by the EPP (Air), including any sites that could be sensitive to the effects of predicted emissions
- dust and odour generation from construction activities, especially in areas where construction activities are adjacent to existing road networks or are in close proximity to sensitive receivers
- climatic patterns that could affect dust generation and movement
- vehicle emissions and dust generation along major haulage routes both internal and external to the project site
- human health risk associated with emissions from project activities of all hazardous or toxic pollutants
- impacts on terrestrial flora and fauna.

Detail the best practice mitigation measures together with proactive and predictive operational and maintenance strategies that could be used to prevent and mitigate impacts.

Discuss potential air quality impacts from emissions, with reference to the National Environmental Protection (Ambient Air Quality) Measure 2003 (Cwlth) and the EPP (Air). If an emission is not addressed in these legislative instruments, discuss the emission with reference to its risk to human health, including appropriate health-based guidelines/standards.

5.8 Greenhouse gas emissions

5.8.1 Description of environmental situation

Provide an inventory of projected annual emissions for each relevant greenhouse gas, with total emissions expressed in 'CO_2 equivalent' terms for the following categories:

- scope 1 emissions—means direct emissions of greenhouse gases from sources within the boundary of the facility and as a result of the facility's activities (including emission from vegetation clearing)
- scope 2 emissions—means emissions of greenhouse gases from the production of electricity, heat or steam that the facility will consume, but that are physically produced by another facility.

Briefly describe method(s) by which estimates were made.

Use the *National Greenhouse Accounts (NGA) Factors* (Commonwealth of Australia 2012b) as a reference source for emission estimates, supplemented by other sources where practicable and appropriate. As a requirement of the NGA factors, estimates should include the loss of carbon sink capacity of vegetation due to clearing and any impoundments.

5.8.2 Potential impacts and mitigation measures

Discuss the potential for greenhouse gas abatement measures, including:

- the proposed measures (alternatives and preferred) to avoid and/or minimise direct greenhouse gas emissions
- how the preferred measures minimise emissions and achieve energy efficiency
- any opportunities to further offset greenhouse gas emissions through indirect means including sequestration and carbon trading.

5.9 Noise and vibration

5.9.1 Description of environmental values

Describe the existing noise and vibration environment that may be affected by the project in the context of the environmental values defined by the Environmental Protection (Noise) Policy 2008 (EPP (Noise)). Refer to the following documents:

- *Noise Measurement Manual* (Environment Protection Agency 2000)
- *Guideline: Noise and vibration from blasting* (Environmental Protection Agency 2006)
- *Guideline: Planning for Noise Control* (Environmental Protection Agency 2004)

- *Australian Standard AS 2187.2-2006 Explosives – Storage and Use, Part 2 Use of Explosives* (Standards Australia 2006).

Identify sensitive noise receptors adjacent to all project components and estimate typical background noise and vibration levels based on surveys at representative sites. Discuss the potential sensitivity of such receptors and nominate performance indicators and standards.

5.9.2 Potential impacts and mitigation measures

Describe the impacts of noise and vibration generated during the pre-construction, construction, operational and decommissioning phases of the project. Noise and vibration impact analysis should include:

- the levels of noise and vibration generated, including noise contours, assessed against current typical background levels, using modelling (such as Environmental Noise Model or SoundPLAN) where appropriate
- impact of noise, including low frequency noise (noise with components below 200 Hz) and vibration at all potentially sensitive receivers (for example, residences, social and public infrastructure, such as health, recreational and educational facilities, roads) compared with the performance indicators and standards nominated above in Section 5.9.1
- impact on terrestrial, avian and aquatic fauna
- proposals to minimise or eliminate these effects, including details of any screening, lining, enclosing or bundling of facilities, or timing schedules for construction and operations that would minimise environmental harm and environmental nuisance from noise and vibration
- options for sensitive receptors that are otherwise unable to achieve a satisfactory internal noise level for the preservation of health and wellbeing as identified within the EPP (Noise).

5.10 Waste

5.10.1 Waste generation

Identify and describe all sources, likely volumes and quality (where applicable) of waste associated with pre-construction, construction, operation and decommissioning of all aspects of the project. Refer to regulated waste listed in Schedule 7 of the Environmental Protection Regulation 2008 (Qld). Describe:

- waste generated by delivery of material to site(s)
- all chemical and mechanical processes conducted on the construction sites that produce waste
- the amount and characteristics of solid and liquid waste produced on site by the project
- hazardous materials to be stored and/or used on site, including environmental toxicity data and biodegradability.

5.10.2 Waste management

Detail the proposed management of solid and liquid waste. Assess the potential impact of all waste generated during construction and operation, with regard for best practice waste management strategies, the Environmental Protection (Waste Management) Policy 2000 and the Environmental Protection (Waste Management) Regulation 2000 (Qld). Provide details of each type of waste in terms of:

- the options available for avoidance and minimisation
- operational handling and fate of all waste including storage
- on-site treatment methods proposed for any waste
- describe the fly-ash waste produced during power generation and proposed methods for its disposal
- describe alternative options for fly-ash disposal including the proposed location, site suitability and volume of fly-ash storage and/or disposal site including the method of construction and measures to minimise attraction of vermin, insects and pest animals
- approximate quantity of fly-ash to be produced annually, also present fly-ash characterisation information
- describe the construction of the fly-ash storage facility with regards to the construction material and design and how the fly-ash storage facility complies with relevant codes for the construction of such containment systems
- methods of disposal (including the need to transport waste off site for disposal) proposed to be used for any trade, liquid or solid waste
- the potential level of impact on environmental values
- measures to ensure stability of the waste storage areas and impoundments
- methods to prevent seepage and contamination of groundwater from stockpiles, storage areas and impoundments
- measures to minimise attraction of vermin, insects and pests
- options available for using recycled materials
- market demand for recyclable waste (where appropriate)
- decommissioning of the construction site.

5.11 Transport

Present the transport assessment in separate reports for each project-affected mode (road, rail, air and sea) as appropriate for each phase of the project. These assessment reports should provide sufficient information to allow an independent assessment of how existing transport infrastructure will be affected by project transport at the local and regional level.

The transport assessment should use the *Guidelines for Assessment of Road Impacts of Development (GARID) (*Department of Main Roads 2006) which will address consultation, methodology, existing and future transport infrastructure, development profile, pavement impact assessment, transport operation assessment, safety review and consolidated transport impacts.

5.11.1 Existing infrastructure

Describe the extent, condition and capacity of the existing transport infrastructure on which the project will depend.

5.11.2 Transport activities and routes

Freight

Provide a summary of all the freight tasks (inputs and outputs, including wastes) associated with all phases of the project. The summary will be in tabular form (or other suitable format) and include for each freight task:

- tonnage/volume
- proposed transport methodologies (modes, vehicle types, payloads)
- estimates of the number of discrete trips required for each task
- origins of inputs and destinations of outputs (including wastes).

Cross-reference to the relevant section in the EIS where the task is fully described and/or assessed.

Traffic generation

For each mode of transport and each phase of the project, provide traffic generation information on:

- existing background traffic including volumes, composition, peak traffic and peak times along the transport routes to and from the project
- background traffic growth for the transport routes for all stages of the project life
- the construction of any project-related plant and utilities within or impacting on the jurisdiction of any transport authority
- the stages, timing and duration of each stage/phase and how these impact on the transport-related infrastructure
- comparison of the traffic situation and road conditions with and without the project
- expected volumes of project inputs and outputs of transported raw materials, plant, construction materials and operational equipment, waste, hazardous goods and finished products for all phases of the project
- the movements of project inputs and outputs through the local and regional transport network (including number and type of vehicles, mode, volume, composition, trip timing and routes)
- traffic generated by workforce personnel including visitors (volume, composition, timing and routes)
- likely heavy, oversize and indivisible loads (volume, composition, timing and routes) highlighting any vulnerable bridges and structures along proposed routes.

Describe:

- access locations (existing and proposed) to state-controlled roads
- locations of proposed road-crossing points of existing and proposed rail infrastructure associated with the project.

5.11.3 Potential impacts and mitigation measures

Impact assessment reports should include details of the adopted assessment methodology (for impacts on roads: the road impact assessment report in accordance with the *GARID*. Assessment of traffic impacts is to include the transport arrangements for permanent and temporary workforce associated with all phases of the project.

Assess project impacts on:

- local and state-controlled road networks, including key road and road/rail intersections, at project construction, operation and decommissioning stages. Any impact to level crossings should be assessed using the Australian Level Crossing Assessment Model (ALCAM) this shall include traffic generated by construction and operational workforce personnel including visitors (volume, composition, timing and routes) and likely accommodation facilities including possible bussing strategies to manage peak hour travel from major accommodation centres
- capacity, safety, local amenity, efficiency and condition of transport operations, services and assets from either transport or project operations, including an assessment of pavement life of the road network as a result of the project. Refer, where relevant, to the *Queensland Road Safety Action Plan 2010–2011* (Department of Transport and Main Roads 2010)
- possible interruptions to transport operations
- the natural environment within the jurisdiction of an affected transport authority (for example, road and rail corridors)
- the nature and likelihood of product-spill during transport, if relevant
- driver fatigue for workers travelling to and from regional centres and key destinations where relevant
- any existing or proposed strategies for public passenger transport and active transport and address, where relevant, requirements of Part 2A of the Transport Planning and Coordination Act
- access to transport for people with a disability
- transport and handling of hazardous substances and dangerous goods
- the cumulative impact of this project adding to the impact of other known proposed or current major projects impacting on the road network.

5.11.4 Infrastructure alterations

Detail:

- any proposed alterations or new transport-related infrastructure and services required by the project (as distinct from impact mitigation works)
- construction of any project-related plant and utilities, within or impacting on the jurisdiction of any transport authority.

5.11.5 Transport impact management strategies

Discuss and recommend how identified impacts will be mitigated so as to maintain safety, efficiency and condition of each mode. These mitigation strategies are to be prepared in close consultation with relevant transport authorities (including local government, Department of Transport and Main Roads (DTMR) and the Queensland Police Service

(QPS), consider those authorities' works program and forward planning, and be in accordance with the relevant transport authorities' methodologies and design manuals.

Findings of studies and transport infrastructure impact assessments should be an input into preparing a transport management plan.

Road/rail management planning

Outline:

- procedures for assessing and agreeing on the scope of required mitigation works with road/rail corridor managers (for example, maintenance or upgrades), including any associated works, such as sourcing water and gravel
- strategies to minimise the effects of project transport on existing and future public road or rail corridors
- steps to be taken to prevent access from public roads/rail corridors to the project sites
- strategies to maintain safe access to public road/rail reserves to allow road/rail/pipeline maintenance activities
- process for decommissioning any temporary access to road/rail reserves, for example, stockpile sites.

Findings of studies and transport infrastructure impact assessments should be an input into preparing a draft road-use management plan. Conditions of approval for transport management impacts should also be detailed in the EMP.

5.12 Indigenous cultural heritage

Unless an exemption applies under section 86 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 project manager must be made aware of the progress of the CHMP approval process and of any related issues that should be addressed in the Coordinator-General's EIS evaluation report.

5.13 Non-Indigenous cultural heritage

5.13.1 Description of existing non-Indigenous cultural heritage values

Include a cultural heritage study/survey that describes non-Indigenous cultural heritage sites and places, and their values.

Describe the significance of artefacts, items or places of conservation or non-Indigenous cultural heritage value likely to be affected by the project and their values at a local, regional, state and national level.

Any such study should be conducted by an appropriately qualified cultural heritage practitioner and should include the following:

- review of:
  - the Australian Heritage Places Inventory
  - the Queensland Heritage Register and other information regarding places of potential non-Indigenous cultural heritage significance
  - any local government heritage register

  - any existing literature relating to the heritage of the affected areas
- liaison with relevant community groups/organisations (for example, local historical societies) concerning places of non-Indigenous cultural heritage significance located or identified
- locations of culturally and historically significant sites, shown on maps, which could potentially be impacted by the project
- a constraints analysis of the proposed development area to identify and record non-Indigenous cultural heritage places.

5.13.2 Potential impacts and mitigation measures

Provide an assessment of any likely effects on sites of non-Indigenous cultural heritage values.

Provide strategies to mitigate and manage any negative impacts on non-Indigenous cultural heritage values and enhance any positive impacts.

As a minimum, investigation, consultation, impact assessment, management and protection strategies must satisfy statutory responsibilities and duties of care.

6. Social values and management of impacts

6.1 Community engagement

Consistent with national and international good practice, and with regard to local and regional strategies for community engagement, the proponent should undertake a community engagement strategy to 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 in the EIS the community engagement processes used to conduct open and transparent dialogue with stakeholders. Discuss engagement strategies and processes, including how complaint resolution will be addressed, for all stages of the project.

6.2 Workforce profile

The social impact assessment 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 at **www.skills.qld.gov.au/Functions/Coordinated-Projects.aspx**

Supply issues and strategies

- Analysis of relevant local, state and national workforce profiles and labour supply strategies and proposed programs for:
  - recruitment and attraction
  - population groups (including Indigenous people, women, secondary school students and unemployed and underemployed)
  - unskilled and semi-skilled labour requirements

- structured training (apprenticeships, traineeships, graduates)
- analysis of impact on local community workforce.

The fact sheet on Skills Queensland's website (**www.skills.qld.gov.au/Functions/Coordinated-Projects.aspx**) provides essential information, contact and program details to develop the workforce management plan.

6.3 Potential impacts

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 outcomes of community engagement processes. Furthermore:

- 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 the following:
  - Indigenous peoples including cultural property issues
  - 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.

6.3.1 Cumulative impacts

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, is 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 the office of the Coordinator-General, if they overlap the proposed project in the same timeframe as its construction period.

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.

6.4 Impact mitigation measures and management strategies

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 *Major resource projects housing policy* (Department of Employment, Economic Development and Innovation 2011b) sets out the core principles to guide the identification and assessment of accommodation and housing impacts and development of mitigation and management strategies
- 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, the unemployed, those with low socio-economic status and Indigenous peoples.

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.

7. Economies and management of impacts

7.1 Description of affected local and regional economies

Describe the existing economy in which the project is located and the economies materially impacted by the project. Include:

- a map illustrating the local and regional economies (local government areas—LGAs) that could be potentially affected by the project
- gross regional product or other appropriate measure of annual economic production
- demographic and employment profile of the study area as a whole and disaggregated by LGA. Include:
  - existing population (size, age, distribution)
  - existing community profiles of the LGAs directly affected by the project (household type, size, average income)
  - existing employment statistics (part-time/full-time, by occupation)
  - the regional economy's key industries and their contribution to regional economic income
- sufficient baseline economic data to underpin a comprehensive assessment of the direct, indirect, cumulative, costs and impacts of the project
- the key regional markets relevant to the project:
  - labour market
  - education and training markets
  - housing and land markets
  - construction services and building inputs market
  - regional competitive advantage and expected future growth.

With regard to the region's key industries and factor prices, provide information on:

- current input costs (for example, wage rates, building costs, housing rent)
- land values in the region by type of use.

7.2 Potential impacts and mitigation measures

The potential impacts should consider local, regional, state and national perspectives as appropriate to the scale of the project.

The analysis should describe both the potential and direct economic impacts including estimated costs, if material, on industry and the community, assessing the following:

- property values
- industry output
- employment
- the indirect impacts likely to flow to other industries and economies from developing the project, and the implications of the project for future development
- the distributional effects of the proposal including proposals to mitigate any negative impact on disadvantaged groups.

7.2.1 Strategies for local participation

The assessment of economic impacts should outline strategies to encourage participation by local industry and the local workforce, including:

- strategies for assessing the capacity and cost-effectiveness of sourcing goods and services from the regional and wider state economy during the pre-construction, construction, operation and rehabilitation phases of the project
- strategies for ensuring local suppliers of goods and services, and Indigenous businesses receive full, fair and reasonable opportunity to tender for work throughout the life of the project. Government-funded projects must prepare a Local Industry Participation Plan (LIPP) in accordance with the *Local Industry Policy – A Fair Go for Queensland* (Queensland Government, 2010) and its associated Guidelines. Private sector projects without government funding are recommended voluntarily to apply the Policy's principles, for example by preparing a LIPP and working with the Queensland Office of the Industry Capability Network (**www.icnqld.org.au**) to promote tender opportunities and identify capable local suppliers. Assistance with developing LIPPs and delivery strategies is available from the Industry Development unit of the Department of State Development, Infrastructure and Planning
- 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
- strategies adopting relevant government policy, relating to:
  - the level of training provided for construction contracts on Queensland Government building and construction contracts, with regard to the *Queensland Government Building and Construction Contracts Structured Training Policy*—the 10 per cent training policy (Skills Queensland 2008)
  - Indigenous employment opportunities—the *Indigenous Employment Policy for Queensland Government: Building and Civil Construction Projects*—the 20 per cent

policy (Department of Employment, Economic Development and Innovation 2008a) could be adopted or its implementation measures used as a guide or tool for engaging Indigenous workers.

7.2.2 Impact upon property management

Address the current and future management processes for adjacent properties that are likely to be impacted by the project during construction and/or operation. Mention the:

- impact of the project on existing agricultural land uses and management practices (for example, disruption to stockyards, fences, water points, sowing or harvesting of crops, movement of livestock, agricultural machinery and any loss of agricultural land)
- details on weed spread prevention regimes for existing agricultural land uses and management practices
- impact of the project on residential, commercial and industrial land uses, property values and property management practices
- range of measures required to mitigate real and potential disruptions to rural, residential, commercial and industrial property uses and management practices.

8. Hazard and risk

8.1 Hazard and risk assessment

Describe the potential hazards and risks to people and property that may be associated with the project, which may include but are not restricted to:

- identifying potential hazards, accidents, spillages, fire and abnormal events that may occur during all stages of the project, including possible risk of occurrence
- identifying all hazardous substances to be used, stored, processed or produced and the rate of usage
- potential wildlife hazards, natural events (for example, cyclone, storm surge, flooding, bushfire) and implications related to climate change.

Undertake a preliminary risk assessment for all components of the project, as part of the EIS process in accordance with *Australia/New Zealand AS/NZS ISO 31000:2009 Risk management—Principles and guidelines* (Standards Australia/Standards New Zealand 2009) and *Managing environment-related risk* (HB203:2012) (Standards Australia 2012). With respect to risk assessment, the EIS must:

- deal comprehensively with external and on-site risks including transport risks
- assess risks during the pre-construction, construction, operational and decommissioning phases of the project
- include an analysis of the consequences of each hazard on safety in the project area, examining the likelihood of both individual and collective consequences, involving injuries and fatalities to workers and to the public
- present quantitative levels of risks from the above analysis.

Provide details on the safeguards that would reduce the likelihood and severity of hazards, consequences and risks to persons, within and adjacent to the project area(s).

Present a comparison of assessed and mitigated risks with acceptable risk criteria for land uses in and adjacent to the project area(s).

Identify the residual risk following application of mitigation measures. Present an assessment of the overall acceptability of the impacts of the project in light of the residual uncertainties and risk profile.

Conduct a hazard identification study to identify the nature and scale of hazards that might occur during the construction and operation of the project. This would be expected to include hazards involving:

- construction accidents
- pipeline, processing unit or storage vessel rupture or loss of containment, and explosions and fires associated with such incidents
- release to the environment of liquid gaseous or particulate pollutants or any other hazardous material used, produced or stored on the site
- spills of materials during loading, unloading and transport
- the extent of heatflux and/or overpressure zones following hazard/ignition incidents (for example, in terms of 23 kW/m^2, 5 kW/m^2 heatflux and 35 kPa and 7 kPa overpressure end points)
- natural events such as cyclones, earthquakes, bushfires or local flooding.

A set of representative incident scenarios should be selected. This set should include credible event scenarios (for example, a catastrophic failure of a processing unit and the consequential explosion zone). This will require an evaluation of the likelihood of each scenario occurring in order to calculate the level of risk in surrounding areas due to the presence of the facility.

The risk analysis should include fatality and serious injury consequences, and present individual fatality risk contours at 0.5, 1, 5, 10, and 50 x 10^{-6} per year and injury risk contours at 10 and 50 x 10^{-6} per year. Risk contours should be presented on a suitably scaled location map.

In addition, the proponent must undertake a detailed risk assessment of the plant and associated operational activities to identify risks and mitigation measures to ensure containment within the site boundaries, so as not to impact on future industrial development on adjacent industrial land. Any identified impact on the project should also be extended to determine the resultant impact on the surrounding areas and community.

Assess the acceptability of the risk on site and to surrounding land uses by referring to nationally adopted risk criteria presented in the New South Wales Department of Urban Affairs and Planning's *Hazardous Industry Planning Advisory Paper No. 4: Risk Criteria for Land Use Safety Planning* (Department of Planning (NSW) 2008). Provide details of the methodology and results of each step described above.

8.2 Health and safety

8.2.1 Description of public health and safety community values

Describe the existing health and safety values of the community, workforce, suppliers and other stakeholders in terms of the environmental factors that can affect human health, public safety and quality of life, such as air pollutants, odour, lighting and amenity, dust, noise and water.

8.2.2 Potential impact and mitigation measures

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 for social impact management, and how the achievement of the objectives will be monitored, audited and managed.

Assess the cumulative effects on public health values and occupational health and safety impacts on the community, workforce and regional health services from project operations and emissions. Recommend any practical monitoring regimes in this section.

Include relevant consultation with the appropriate regional health service providers.

8.3 Electromagnetic fields

Assess the potential impacts of electric and magnetic fields (EMF) on the reception of electronic devices (including on the quality of satellite phones, cellular networks, UHF radio communication and the internet).

Detail the potential impacts of EMF in relation to both sensitive receptors and the workforce of the project. Describe the potential risk of EMF from the proposed transmission line on adult and child health in relation to scientific evidence and current international best practice standards. Any potential impacts to current land practices should also be detailed (including cropping and livestock).

Suitable measures should be described as to how impacts would be avoided or mitigated.

8.4 Emergency management plan

The development of emergency and evacuation planning and response procedures is to be determined in consultation with state and regional emergency service providers.

Provide an outline of the proposed integrated emergency management planning procedures (including evacuation plans, if required) for the range of situations identified in the risk assessment developed in this section. This includes strategies to deal with natural disasters during operation and construction including identification of key stakeholders.

Present preliminary information on the design and operation of proposed safety/contingency systems to address significant emergency issues delineated in the risk assessment, together with at least the following areas of emergency:

- fire prevention/protection
- leak detection/minimisation
- release of contaminants
- emergency shutdown systems and procedures
- natural disasters.

In addition, undertake an assessment of businesses that may be affected in the event of an emergency, including strategies to mitigate the impact on these businesses.

Provide information on an onsite drinking water incident notification system and for the provision of an alternate temporary potable water supply in the event of an incident (man made and/or natural) impacting on the water supply.

In regard to fires, outline strategies to manage the provision of:

- fire management systems to ensure the retention on site of fire water or other fire suppressants used to combat emergency incidents
- building fire safety measures for any construction or permanent accommodation
- details of any emergency response plans and bushfire mitigation plans under the State Planning Policy 1/03: Mitigating the Adverse Impacts of Flood, Bushfire and Landslide (Department of Local Government and Planning & Department of Emergency Services 2003)
- on-site firefighting equipment provided and the level of training of staff who will be tasked with emergency management activities
- detailed maps showing the plant outline, potential hazardous material stores, incident control points, firefighting equipment and the like
- an outline of any dangerous goods stores associated with the plant operations, including fuel storage and emergency response plans.

Present outlines of emergency planning and response strategies to deal with relevant incidents above, which have been determined in consultation with state and regional emergency service providers, and which show integration of emergency services into the plans.

Present plans for emergency medical response and transport and first aid matters with involvement of the relevant state agencies (such as the Queensland Ambulance Service, Queensland Fire and Rescue Service, Queensland Police Service and Emergency Management Queensland).

9. Cumulative impacts

Summarise the project's cumulative impacts and describe these impacts in combination with those of existing or proposed project(s) publicly known or advised by the office of the Coordinator-General to be in the region, to the greatest extent practicable. Assess cumulative impacts with respect to both geographic location and environmental, social and economic values. In particular, address cumulative impacts in sensitive environmental areas identified in section 5.5.1 of this TOR (refer to page 15).

Explain the methodology used to determine the cumulative impacts of the project, detailing the range of variables considered (including relevant baseline or other criteria upon which the cumulative aspects of the project have been assessed, where applicable).

10. Sustainable development

Provide a comparative analysis of how the project conforms to the objectives for 'sustainable development'—see the *National Strategy for Ecologically Sustainable Development* (Commonwealth of Australia 1992).

Consider the cumulative impacts (both beneficial and adverse) of the project from a life-of-project perspective, taking into consideration the scale, intensity, duration and frequency of the impacts to demonstrate a balance between environmental integrity, social development and economic development.

This information is required to demonstrate that sustainable development aspects have been considered and incorporated during the scoping and planning of the project.

11. Environmental management plan

Detail the EMPs for the construction and operational phases of the project. The EMP should be developed from, and be consistent with, the information in the EIS. The EMP must meet the requirements of section 203 of the EP Act, address discrete project elements and provide life-of-proposal control strategies. It must be capable of being read as a stand-alone document without reference to parts of the EIS.

The EMP must comprise the following components for performance criteria and implementation strategies:

- the proponent's commitments to acceptable levels of environmental performance, including environmental objectives, performance standards and associated measurable indicators, performance monitoring and reporting
- impact prevention or mitigation actions to implement the commitments
- corrective actions to rectify any deviation from performance standards
- an action program to ensure the environmental protection commitments are achieved and implemented. This will include strategies in relation to:
  - continuous improvement
  - environmental auditing
  - monitoring
  - reporting
  - staff training
  - where relevant, a rehabilitation program for land proposed to be disturbed under each relevant aspect of the proposal.

The recommended structure of each element of the EMP is shown below.

Element/issue	**Aspect of construction or operation to be managed (as it affects environmental values).**
Operational policy	The operational policy or management objective that applies to the element.
Performance criteria	Measurable performance criteria (outcomes) for each element of the operation.
Implementation strategy	The strategies, tasks or action program (to nominated operational design standards) that would be implemented to achieve the performance criteria and also include the implementation agency for each element of the EMP.
Monitoring	The monitoring requirements to measure actual performance (for example, specified limits to pre-selected indicators of change).
Auditing	The auditing requirements to demonstrate implementation of agreed construction and operation environmental management strategies and compliance with agreed performance criteria.
Reporting	Format, timing and responsibility for reporting and auditing of monitoring results.
Corrective action	The action (options) to be implemented in case a performance requirement is not reached and the person(s) responsible for action (including staff authority and responsibility management structure).

The proponent's commitments to environmental performance, as described in the EMP, may be included in the Coordinator-General's evaluation report as conditions, to ensure the commitments are met. Therefore, the EMP is a relevant document for project approvals, environmental authorities and permits, and may be referenced by them.

12. Conclusions and recommendations

Make conclusions and recommendations with respect to the project, based on the studies presented, the EMP and conformity of the project with legislative and policy requirements.

13. References

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

14. Appendices

Provide the following as appendices to the EIS:

- final TOR for this EIS
- TOR cross-reference table, which links the requirements of each section/subsection of the TOR with the corresponding section/subsection of the EIS, where those requirements have been addressed
- a list of the project approvals required by the project.
- the consultation report, as described in Subsection 3.7, (page 3).
- a list of the relevant qualifications and experience of the key study team members and specialist sub-consultants
- a glossary of technical terms
- a list of abbreviations
- any reports of specialist studies undertaken as part of the EIS
- a copy of the proponent's corporate environmental policy and planning framework document.
- a list of all commitments made by the proponent in the EIS, with cross-references to the relevant section in the EIS
- a copy of the proponent's land acquisition protocols.

Acronyms and abbreviations

Acronym/abbreviation	Definition
ACH Act	*Aboriginal Cultural Heritage Act 2003* (Qld)
AS/NZS	Australian standard/New Zealand standard
CAMBA	China–Australia Migratory Bird Agreement
CHMP	cultural heritage management plan
DEHP	Department of Environment and Heritage Protection, Queensland
DNRM	Department of Natural Resources and Mines
EIS	environmental impact statement
EMP	environmental management plan
EP Act	*Environmental Protection Act 1994* (Qld)
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999* (Cwlth)
EPP	environmental protection policy (water, air, waste, noise)
ERA	environmentally relevant activity
JAMBA	Japan–Australia Migratory Bird Agreement
MNES	matters of national environmental significance (under the EPBC Act)
NC Act	*Nature Conservation Act 1992* (Qld)
NGA	National Greenhouse Accounts
NT agreement	native title agreement
RE	regional ecosystem (for a definition, refer to the Glossary)
REDD	Regional Ecosystem Description Database
ROKAMBA	Republic of Korea–Australia Migratory Bird Agreement
SCL Act	*Strategic Cropping Land Act 2011* (Qld)
SDPWO Act	*State Development and Public Works Organisation Act 1971* (Qld)
SPA	*Sustainable Planning Act 2009* (Qld)
The proponent	Galilee Power Pty Ltd
TI Act	*Transport Infrastructure Act 1994* (Qld)
TOR	terms of reference
VM Act	*Vegetation Management Act 1999* (Qld)

Glossary

Term	Definition
afflux	A flow to or toward an area.
aquifer	A water bearing stratum of permeable rock, sand, or gravel, able to transmit substantial quantities of water.
assessable vegetation	Vegetation in which clearing is assessable development under Schedule 3, Part 1, Table 4, Item 1 of SPA.
Australian Height Datum (AHD)	A mapping system applied to Australia, which uses a datum, or agreed level, from which the heights of naturally occurring features can be measured; this level, to which the value of zero is given, is equivalent to the mean sea level for 1966–68 at thirty tide gauges around the coast of the Australian continent.
benthic substrate	Pertaining to the bottom of a body of water.
bilateral agreement	The agreement between the Australian and Queensland governments, which accredits the State of Queensland's EIS process. It allows the Commonwealth Environment Minister to rely on specified environmental impact assessment processes of the state of Queensland in assessing actions under the Environment Protection and Biodiversity Conservation Act 1999 (Cwlth).
biodiversity	Biodiversity is short for 'biological diversity'. It describes the natural diversity of native wildlife, together with the environmental conditions necessary for their survival and includes: a) regional diversity, that is, the diversity of the landscape components of a region, and the functional relationships that affect environmental conditions within ecosystems b) ecosystem diversity, that is, the diversity of the different types of communities formed by living organisms and the relations between them c) species diversity, that is, the diversity of species d) genetic diversity, that is, the diversity of genes within each species.
bunding	An artificial created boundary, usually in the form of an embankment used to prevent sediment and substances from entering a water steam or storage facility.
cathodic protection	Method of protection for iron and steel against electrochemical corrosion
community	An assemblage of interdependent populations of different species (plants and animals) interacting with one another, and living in a particular area.
controlled action	A proposed action that is likely to have a significant impact on a matter of national environmental significance; the environment of Commonwealth land (even if taken outside Commonwealth land); or the environment anywhere in the world (if the action is undertaken by the Commonwealth). Controlled actions must be approved under the controlling provisions of the EPBC Act.
controlling provision	The matters of national environmental significance, under the EPBC Act, that the proposed action may have a significant impact on.
coordinated project	A project declared as a 'coordinated project' by the Coordinator-General, under section 26 of the SDPWO Act. Formerly 'significant project'.

Coordinator-General	The corporation sole constituted under section 8A of the *State Development and Public Works Organisation Act 1938* and preserved, continued in existence and constituted under section 8 of the SDPWO Act.
CORVEG	Queensland Herbarium's site based floristic dataset containing field survey data
ecosystem	A biophysical environment containing a community of organisms.
effluent	Outflow of treated wastewater.
ephemeral	Transitory, short-lived.
endangered	A species is endangered if: • there have not been thorough searches conducted for the wildlife and the wildlife has not been seen in the wild over a period that is appropriate for the life cycle or form of the wildlife, or • the habitat or distribution of the wildlife has been reduced to an extent that the wildlife may be in danger of extinction, or • the population size of the wildlife has declined, or is likely to decline, to an extent that the wildlife may be in danger of extinction, or • the survival of the wildlife in the wild is unlikely if a threatening process continues.
endemism	The ecological state of being unique to a defined geographic location, such as an island, nation or other defined zone, or habitat type.
erosion	The process by which rocks are loosened, worn away and removed from parts of the earth's surface.
fluvial	Of, relating to, or inhabiting a river or stream.
geomorphorlogical	The form or shape of the landscape and the processes that modify or change it.
groundwater	Water found underground in porous rock or soil strata.
habitat	The biophysical medium or media occupied (continuously, periodically or occasionally) by an organism or group of organisms.
habitat corridor	A strip of habitat that facilitates fauna movement between otherwise isolated patches of habitat.
lacustrine environments	A lake or lake-like environment. Wetlands and deepwater habitats with all of the following characteristics: (1) situated in a topographic depression or dammed river channel; (2) lacking trees, shrubs, persistent emergent plants, mosses, or lichens with greater than 30% areal coverage; and (3) total area exceeds 8 ha (20 acres).
listed species	A plant or animal included in a schedule of vulnerable, rare or endangered biota, such as the schedules in the EPBC Act or the Nature Conservation (Wildlife) Regulation 2004 (Qld).
mitigation	The effort to eliminate or reduce impacts.
morphology	Form and structure of organisms without consideration of function.
native species	A species that is indigenous to Australia or an external territory, or periodically or occasionally visits.
native wildlife	Any taxon or species of wildlife indigenous to Australia.
natural environment	The complex of atmospheric, geological, and biological characteristics found in an area in the absence of artefacts or influences of a well-developed technological human culture.

palaeontologic	The study of fossils to determine the structure and evolution of extinct animals and plants.
permeability	The capacity of a material (rock) to transmit fluids (groundwater).
porosity	That fraction of total rock volume which is filled with water, gas, or oil.
proponent	The entity or person who proposes a coordinated project. It includes a person who, under an agreement or other arrangement with the person who is the existing proponent of the project, later proposes the project.
regional ecosystems (REs)	Regional ecosystems were defined by Sattler and Williams (1999) as vegetation communities in a bioregion that are consistently associated with a particular combination of geology, landform and soil.
regrowth	A young, usually even-aged forest stand that has regenerated after disturbance.
rehabilitation	Making the land useful again after a disturbance. It involves the recovery of ecosystem functions and processes in a degraded habitat.
remnant vegetation	Vegetation, part of which forms the predominant canopy of the vegetation: • covering more than 50 per cent of the undisturbed predominant canopy • averaging more than 70 per cent of the vegetation's undisturbed height • composed of species characteristic of the vegetation's undisturbed predominant canopy.
riparian	Pertaining to, or situated on the bank of, a body of water, especially a watercourse such as a river.
riparian zone	Located alongside a watercourse.
run-off	The amount of rainfall which actually ends up as stream flow, also known as rainfall excess.
sediment	Any usually finely divided organic and/or mineral matter deposited by air or water in non-turbulent areas.
sensitive receptor	Those locations or areas where dwelling units or other fixed, developed sites of frequent human use occur.
sodic soil	A sodic soil is defined as one in which more than 10–15 per cent of the clay's negative charge is balanced by sodium ions.
stratigraphy	Rock strata, especially the distribution, deposition, and age of sedimentary rocks.
terrestrial	Pertaining to land, the continents, and/or dry ground. Contrasts to aquatic.
under stress	Aquifer water level conditions as defined by DEHP
water asset	Water, or the rights or other claims to water, which the water report entity either holds, or for which the water report entity has management responsibilities, and from which an individual or organisation that is a water report entity, or a group of stakeholders of a physical water report entity, derives future benefits (as defined in Exposure Draft of Australian Water Accounting Standard 1 (2010)—Water Accounting Standards Board)

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