

Terms of Reference for the Ironbark Project Environmental Impact Statement (EIS)

Proposed by Origin Energy ATP 788P
Pty Ltd

April 2012

Prepared by: Statewide Environmental Assessments, Queensland Government.

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Introduction

Origin Energy ATP 788P Pty Ltd (Origin) is a wholly owned subsidiary of Origin Energy Limited (Origin Energy). Origin Energy is Australia's leading integrated energy company. Listed in the ASX Top 20, the company has more than 4000 employees. Origin Energy is a leading producer of gas in eastern Australia, the largest owner and developer of gas-fired electricity generation in Australia and a leading wholesaler and retailer of energy. Origin is Australia's largest energy retailer servicing 4.6 million electricity, natural gas and liquid petroleum gas (LPG) customer accounts across Australia, New Zealand and the Pacific.

Origin proposes to develop the coal seam gas (CSG) resources within Authority to Prospect (ATP) 788P, also known as 'Ironbark' near Tara in south central Queensland. The Ironbark Project (the Project) comprises the development of the CSG field within ATP 788P by the installation of up to 600 CSG wells and construction of up to two gas plants with field compression. First production of sales gas from the Project is targeted for 2014 at a rate of 50–60 terajoules per day (TJ/day) with the potential to increase sales gas production to a maximum rate of 120 TJ/day.

A sales gas pipeline will be constructed to connect gas plant infrastructure to the existing Darling Downs Pipeline (DDPL) in order to supply Origin Energy's portfolio of domestic customers including the Origin Energy owned Darling Downs Power Station (DDPS) near Dalby. The sale of gas from the Project to liquefied natural gas ventures which are currently proposed for Queensland is also possible.

The Project is located in South East Queensland approximately 300 km west of Brisbane and 150 km west of Toowoomba, within the Western Downs Regional Council area. Nearby towns include Tara to the south, Dalby to the east and Chinchilla to the north. ATP 788P is within the southern section of the Undulla Nose CSG province and is adjacent to existing developments operated by Origin Energy on behalf of Australia Pacific LNG. Notably, the Australia Pacific LNG Pty Ltd Condabri gas field (PLA 266) adjoins the north-western section of ATP 788P.

It is proposed to progressively develop the gas field over a timeframe of up to 40 years, which will ultimately require the following infrastructure:

- up to 600 wells
- underground gas and water gathering networks
- up to two gas plants with field compression
- a sales gas pipeline with an easement of up to 30 m width
- warehouses and administration buildings
- CSG water management infrastructure
- temporary and permanent accommodation facilities
- related infrastructure including access roads, telecommunications, and sewerage infrastructure.

The Project was referred under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* on 25 August 2011 (EPBC 2011/6091) and was determined to be a controlled action under that Act on 7 October 2011.

Executive summary

The executive summary conveys the project's most important aspects and options to the reader in a concise and readable form. Use plain English and avoid the use of jargon and obscure terms. The structure of the executive summary should follow that of the EIS and focus strongly on the key issues and conclusions. The executive summary should enable the reader to obtain a clear understanding of the project, its potential adverse and beneficial environmental, social and economic impacts, and measures to be implemented to avoid, minimise and mitigate any adverse impacts.

Glossary of terms

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

1 Introduction

Explain why the EIS has been prepared and what it sets out to achieve. In particular, the introduction should address the level of detail required to satisfy assessment of the approvals being sought. It should also define the audience of the EIS.

1.1 Project proponent

Provide details of the project proponents, including details of any joint venture partners.

1.2 Project description

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

1.3 Project objectives and scope

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

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

1.4 The EIS process

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

1.4.1 Methodology of the EIS

Describe the EIS process steps, timing and decisions to be made for relevant stages of the project. Provide a brief description of studies or surveys that have been undertaken to help develop the project and prepare the EIS. Describe any baseline studies or investigations used in the EIS that were undertaken before the EIS process started. Outline how the consultation process (which will be described in detail in section 1.5) integrated with the other components of the impact assessment, including the stages, timing and mechanisms for public input and participation.

The information in this section is required to ensure:

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

1.4.2 Objectives of the EIS

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

While the terms of reference guide the scope of the EIS studies, they should not be seen as exhaustive or limiting. It is important for proponents and their consultants to recognise that there cannot be complete knowledge in advance of undertaking an EIS of what the EIS studies may find.

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

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

The EIS assessment's depth and scope will be proportional to the values impacted and the scale of the impacts. When considering whether an impact is or is not significant, the proponent will take account of both the intensity of the impact and the context in which it would occur.

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

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

In all relevant sections of the EIS, provide the following details about the information given in the EIS:

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

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

1.4.3 Submissions

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

1.5 Public consultation process

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

Submitting a list of affected persons and interested persons, as well as a statement of how the proponent proposes to consult with those persons, is a statutory requirement of the EIS process under section 41 of the *Environmental Protection Act 1994*. Similar requirements, though non-statutory, are usually applied to EIS processes under other Queensland legislation.

The public consultation program should provide opportunities to educate and involve the community. It may include interviews with individuals, public meetings, interest group meetings, producing regular summary information and updates, and other means to encourage and facilitate active public consultation.

The public consultation process should identify broad issues of concern to local community and interest groups and should continue from project planning through commissioning, project operations and final decommissioning. This should include issues like timely public access to surface and ground water monitoring data. Refer to the DERM mining guideline *Issue Identification and Community Consultation*.

1.6 Project approvals

1.6.1 Relevant legislation and policy requirements

Explain the legislation and policies controlling the approvals process with reference to the Queensland *Environmental Protection Act 1994*, *Sustainable Planning Act 2009* and other potentially relevant Queensland laws. Include any requirements of the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*.

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

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

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

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

1.6.2 Planning processes and standards

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

1.7 Accredited process for controlled actions under Commonwealth legislation

The proposed project was determined to be a controlled action under the Commonwealth's *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) on 7 October 2011. The controlling provisions for the project, with regard to its potential impacts on matters of national environmental significance, are sections 16 and 17B (wetlands of international importance), 18 and 18A (listed threatened species and communities) and 20 and 20A (migratory species).

The EP Act process has been accredited under *An Agreement Between The Commonwealth And The State Of Queensland Under Section 45 Of The Environment Protection And Biodiversity Conservation Act 1999 Relating To Environmental Assessment* (the Bilateral Agreement) for the purposes of the Commonwealth's assessment of the project under Part 8 of the EPBC Act.

The EIS must assess the relevant impacts on matters covered by the controlling provisions and ensure that it gives enough information about the project and its relevant impacts to allow the Commonwealth Minister to make an informed decision whether to approve the project under the EPBC Act. Specific EPBC Act matters that must be addressed in the EIS are set out in section 6 and Schedule 1 of the Environmental Protection Regulation 2008, which mirrors Schedule 4 of the Commonwealth's Environment Protection and Biodiversity Conservation Regulations 2000.

Section 7 of the TOR outlines how the EIS will assess the relevant impacts on matters covered by the controlling provisions. The information should be provided as a stand-alone report in the EIS that fully addresses the matters relevant to the controlling provisions. To reduce overlap, cross referencing to other parts of the EIS may be used where required.

Matters to be discussed should include, but are not limited to, potential impacts of the action, along with proposed mitigation and/or compensation measures where relevant, in relation to the controlling provisions. In relation to the threatened species and communities listed under the EPBC Act, the issues must include but not be limited to:

Listed communities:

- Brigalow (*Acacia harpophylla* dominant and co-dominant) (endangered)
- The community of native species dependent on natural discharge of groundwater from the Great Artesian Basin (endangered)
- Coolibah—black box woodlands of the Darling Riverine Plains and the Brigalow Belt South Bioregions (endangered)
- Weeping myall woodlands (endangered)

Listed threatened species:

- Yakka skink, *Egernia rugosa* (vulnerable)
- Brigalow scaly-foot, *Paradelma orientalis* (vulnerable)
- Dunmall's snake, *Furina dunmalli* (vulnerable)
- South-eastern long-eared bat, *Nyctophilus corbeni*, (formerly *timoriensis*) (vulnerable)
- Large-eared pied bat, *Chalinolobus dwyeri* (vulnerable)
- Red goshawk, *Erythrotriorchis radiatus* (vulnerable)
- Australian painted snipe, *Rostratula australis* (vulnerable)
- Squatter pigeon, *Geophaps scripta scripta* (vulnerable)
- Collared delma, *Delma torquata* (vulnerable)
- Murray cod, *Maccullochella Peelii peelii* (vulnerable)

The information provided on these matters should be consistent with:

- relevant aspects of section 4.8 Ecology, including 4.8.1 Description of environmental values and 4.8.2 Potential impacts and mitigation measures; and
- any relevant publically available policy guidance or listing advice provided by the Commonwealth Department of Sustainability, Environment, Water, Population and Communities.

2 Project need and alternatives

2.1 Project justification

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

2.2 Alternatives to the project

Describe feasible alternatives, including conceptual, technological and locality alternatives to the project, and discuss the consequences of not proceeding with the project. Summarise the comparative environmental, social and economic impacts of each alternative, with particular regard to the principles of ecologically sustainable development (ESD), including the definition of ESD prescribed by section 3A of the EPBC Act. Discuss alternatives in sufficient detail to enable an understanding of the reasons for preferring certain options and courses of action and rejecting others.

Explain the interdependencies of the project's components, particularly how each of any industrial developments, or various combinations of industrial developments, and any infrastructure requirements relate to the viability of the proposal. Should water supply, power, transport and/or storage infrastructure be included as part of the project, describe and provide a rationale for such infrastructure.

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

3 Description of the project

Describe the project through its various stages, such as construction, operation and decommissioning. This information is required to allow complete assessment of a project from planning to its end-of-life. It also allows identification of approvals that may be required and how they may be managed through the life of the project. Maps or figures showing the position of features or boundaries will use latitudes and longitudes on the GDA94 datum. These latitudes and longitudes will also be used in the text to describe the locations of any features (such as discharge points) or boundaries that may be relevant to subsequent approvals.

Given the progressive nature of project development and associated design and location of infrastructure, this section will describe the decision making framework used to identify the most suitable type and location of infrastructure.

3.1 Location

3.1.1 Regional context

Describe the regional context of the project and illustrate it on maps at suitable scales. Describe existing infrastructure that has regional importance including aerodromes, roads (identifying state-controlled roads and local roads), railways and towns. Describe existing and proposed CSG and mining projects in the regional area.

3.1.2 Local context

Describe the local context of the project and include real property descriptions of the project site and adjacent properties. Provide maps at suitable scales that show the precise location of the project area, and in particular:

- the location and boundaries of land tenures, in place or proposed, to which the project area is or will be subject
- potential areas for works and infrastructure associated with the project

- major transport corridors (including road and rail).

Include a rectified aerial photo enlargement (preferably A3 size), at a scale of not smaller than 1:50 000, to illustrate components of the project in relation to the land and petroleum tenures, and natural and built features of the area.

3.2 Life cycle of the project

Describe the exploration, construction, operation and decommissioning/rehabilitation phases of the project, which may progress concurrently at different locations within the project area, throughout the life of the project.

3.2.1 Tenements and tenures

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

3.2.2 Resource base, reserve life and extraction sequencing

Summarise the results of studies and surveys undertaken to identify the gas resources required to implement the project. The gas resources should be described in accordance with the definitions and guidelines set forth in the 2007 Petroleum Resources Management System (PRMS) approved by the Society of Petroleum Engineers (SPE). Specific details should be provided for the following:

- the proposed progression of development across the project development area
- the proposed life of field(s) and planned recovery of resources
- locations of any resources that would be sterilised by the planned activities
- the estimated quantity of gas to be extracted annually, including any proposed ramping of production or staging of development.

3.2.3 Ongoing evaluation and exploration activities

Describe the extent and nature of any proposed ongoing exploration or geological or geo technical evaluation within the project area that may be required over the life of the project.

3.2.4 Gas field and facility development

Provide specific details for the following:

- equipment and methods to be used to access the gas resource (drilling and well installation, etc)
- equipment and processes for extracting the gas resource (dewatering wells and gas extraction)
- equipment and processes for taking the gas from the well head to gas and water gathering systems (gas/water separation, piping and compression)
- gas gathering and main transmission lines as well as link lines to distribution mains equipment needed for maintenance like pipe cleaning facilities
- details of major transport corridors (rail and road) crossed by gas gathering links and main transmission pipelines as identified above
- chemicals likely to be used during drilling or extraction operations
- details of gas processing facilities (design of gas compression, dehydration and flaring/venting)
- details of associated water management including storage, treatment and disposal
- details of power generation facilities to provide electricity to the compression, water treatment and wellhead facilities.

The description should refer to, and be complemented by, figures, design drawings, photos and maps.

3.2.5 Construction methods and equipment

The extent and nature of the project's construction activities should be described. The description should include:

- any requirements for early works
- proposed phasing of construction activities across the project area
- the type and methods of construction of facilities and associated infrastructure
- the construction equipment to be used
- methods and standards for crossing under rail and road corridors.

3.2.6 Typical infrastructure requirements

This section should provide descriptions of typical infrastructure requirements to support the project (in addition to those described in section 3.2.4). Descriptions should be supported with concept and layout plans (if available). Matters to be considered include infrastructure such as roads, rail, bridges, tracks and pathways, dams and weirs, bore fields, power lines and other cables, wireless technology (such as microwave telecommunications), and pipelines for any services (whether underground or above). Sources of the construction materials and their associated haulage routes will also need to be identified for the assessment purposes.

3.2.7 Workforce

Information should be provided about the workforce employed throughout the life of the project. Indicative workforce numbers and composition should be provided for the various phases.

The EIS should also provide a description of where employees would be recruited from, accommodation and/or transport to construction or operating sites. Comment should be made on the anticipated basis of employment (e.g. permanent, contract, etc).

3.2.8 Operations and maintenance activities

This section should describe typical operations and maintenance activities. Operational issues to be addressed should include, but may not be limited to:

- a description of plant and equipment to be used
- capacity of plant and equipment
- process flows for core products and by products
- details of materials to be handled, including the storage and stockpiling of raw materials and chemicals to be used.

Descriptions should be supported with figures (engineering drawings, concept and layout plans, photos, artist's impressions, etc).

3.3 Infrastructure requirements

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

3.3.1 Transport—road/rail/air/ship

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

3.3.2 Energy

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

3.3.3 Water supply and storage

Provide information on water usage by the project. Include an assessment of where water for construction and operations will come from and under what authority it will be taken.

Estimate potable water demand for the project, including the temporary demands during the construction period. The use of town water supply and on-site water storage and treatment for use by site workers should be described. Note that this section does not address extracting and managing water produced as a by-product of coal seam gas extraction.

3.3.4 Telecommunications

Describe any likely impacts on existing telecommunications infrastructure, such as optical cables and microwave towers.

3.3.5 Accommodation and other infrastructure

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

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

3.4 Waste management

Provide an inventory of all waste to be generated and identify reuse options over the full life cycle of the project. Waste streams (gaseous, liquid and solid) should be described according to the different types of petroleum activities. Descriptions should be supported with diagrams, schematic drawings and/or tabulated data. Details on waste streams should cross-reference the relevant sections of the EIS where the potential impacts and mitigation measures associated with each waste stream are described. The physical and chemical characteristics of waste material from the project should be provided.

Having regard for best practice waste management strategies and the Environmental Protection (Waste) Policy (EPP), the proposals for waste avoidance, reuse, recycling, treatment and disposal should be described in the appropriate sub-section below. Information should also be provided on the variability, composition and generation rates of all waste produced at sites and by processing.

Cleaner production, eco-efficiency and waste management planning should be detailed, especially how these concepts have been applied to preventing or minimising environmental impacts at each stage of the project. Detailed information on natural resource (energy, water, land) use efficiency measures such as integrated processing design, co-generation of power and by-product reuse as shown in a material/energy flow analysis should be provided. This information is required to enable the resource management agencies and other stakeholders to assess the efficiency of resource use, and allocation issues.

3.4.1 Solid waste disposal

Describe the typical quantity and quality of solid wastes and the proposed methods of their disposal.

3.4.2 Liquid waste

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

The EIS will consider the following effects:

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

3.4.3 Associated water management

This section must detail the strategy for management of associated water produced as a by-product of extracting coal seam gas. The following should be specifically addressed:

- chemical and physical properties of associated water
- likely volumes/rates and areas of production of coal seam gas water
- producing coal seam gas water over the full life cycle of the project
- storage of raw water
- methods for treatment of water
- physical and chemical properties of water after treatment
- proposed use of the treated water, a salinity risk assessment of this use and any other factors that may influence this use
- managing any contaminants/associated waste arising from treatment of water
- managing saline waste products.

Strategies for the management of associated water must take account of the cumulative impacts of the production, storage and use of associated water that will be produced by all CSG activities within each field (including adjacent tenements) so that the associated water can be managed in an environmentally sustainable manner.

Details should be provided on the proposed monitoring of storages used for raw water or saline waste products.

3.5 Rehabilitation and decommissioning

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

This section should describe the strategic approach and typical measures for:

- decommissioning wells that are proved not viable or from which gas supplies are exhausted

- rehabilitating drilling sites and well sites (in part after drilling and fully after cessation of production)
- rehabilitating and decommissioning gas pipelines used for gathering and transferring gas from the production fields to distribution mains
- rehabilitating areas of associated infrastructure (flow lines, access tracks, utility lines)
- decommissioning and rehabilitating gas processing/compression facility sites
- decommissioning and rehabilitating water treatment facility sites
- decommissioning and rehabilitating raw water, treated water, and wastewater dams.

A preferred rehabilitation strategy should be developed with a view to minimising the amount of land disturbed for a petroleum activity at any one time. Strategies and methods should have the following objectives:

- natural resource rehabilitation should aim to create a landform with the same or similar capabilities and/or suitability it had prior to the disturbance, unless other beneficial land uses are pre-determined and agreed upon (such as with the landholder).
- wastes and disturbed land should be rehabilitated to a condition that is self-sustaining or to a condition where the maintenance requirements are consistent with an agreed post-disturbance land use.
- the means of decommissioning different types of petroleum activities, in terms of removing plant, equipment, structures and buildings, should be described along with the methods proposed for stabilising the affected areas. Information should be provided on decommissioning and rehabilitating petroleum activity sites, removing processing plant, rehabilitating concrete footings and foundations, hardstand areas and storage tanks (including any potential for reuse of these facilities). Options and methods for disposing of wastes from the demolition of plant and buildings should include details on feasibility and suitability.
- the impacts of the preferred rehabilitation strategy should be discussed in the appropriate subsections of section 4 (environmental values and management of impacts) particularly with regard to issues such as final landform stability (section 4.2.2) and rehabilitation of plant communities and habitat (section 4.8.2). Implications for the long-term use and fate of the petroleum activity sites will also be addressed, particularly with regard to the on-site disposal of waste and the site's inclusion on the Environmental Management Register or the Contaminated Land Register (if applicable).
- the strategy should provide for monitoring of any decommissioned works for an appropriate period depending on the risk of environmental harm.

4 Environmental values and management of impacts

The functions of this section are to:

- Describe the existing environmental values of the area that may be affected by the project. Environmental values are defined in section 9 of the *Environmental Protection Act 1994*, environmental protection policies and other documents such as the *Australian Water Quality Guidelines for Fresh and Marine Waters* (ANZECC & ARMCANZ, 2000) and the controlling provisions listed in the EPBC Act referral decision for the project. Environmental values may also be derived following recognised procedures, such as described in the ANZECC & ARMCANZ 2000 guidelines. Environmental values will be described referring to background information and studies, which will be included as appendices to the EIS.
- Describe the potential adverse and beneficial impacts of the project on the identified environmental values.
- Describe any cumulative impacts on environmental values caused by the project, either in isolation or by combination with other known existing or planned development or sources of contamination.
- Propose environmental protection objectives and commitments. All environmental protection commitments must be measurable and auditable.

- Examine viable alternative strategies for managing impacts. These alternatives will be presented and compared in view of the stated objectives and standards to be achieved. Discuss available techniques, including best practice, to control and manage impacts to the nominated objectives. This section will detail the environmental protection measures to be used in the planning, construction, operations, rehabilitation and decommissioning stages of the project and any associated works. Measures will prevent, or where prevention is not possible, minimise environmental harm and maximise social, economic and environmental benefits of the project. Preferred measures will be identified and described in more detail than other alternatives.
- Describe any computational model used to make predictions of impacts and/or outcomes of mitigation measures. The description will address the inputs, assumptions, limitations, sensitivities, accuracy and precision of the model.

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

Environmental protection objectives may be derived from legislative and planning requirements that apply to the proposal including Commonwealth strategies, state planning policies, local authority strategic plans, environmental protection policies under the *Environmental Protection Act 1994*, and any catchment management plans prepared by local water boards or land care groups. Special attention will be given to those mitigation strategies designed to protect the values of any sensitive areas and any identified ecosystems of high conservation value (including those used by EPBC listed threatened species, ecological communities and migratory species) within the area of possible impact by the project.

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

- Environmental values affected: describe the existing environmental values of the area to be affected including values and areas that may be affected by any cumulative impacts (refer to background studies in appendices – note: such studies may be required over several seasons). Explain how the environmental values were derived, such as by citing published documents or by following a recognised procedure to derive the values.
- Describe quantitatively the project's impacts on the identified environmental values of the area including:
 - a detailed assessment of the nature and extent of the likely short term and long term impacts
 - a statement about whether any impacts are likely to be unknown, unpredictable or irreversible
 - an analysis of the significance of the impacts
 - any technical data and other information used or needed to make a detailed assessment of the impacts.
- The cumulative impacts of the project must be considered over time or in combination with other (all) impacts in the dimensions of scale, intensity, duration or frequency of the impacts. In particular, address any requirements and recommendations of relevant state planning policies, environmental protection policies, national environmental protection measures and integrated catchment management plans.
- Cumulative impacts on the environmental values of land, air and water and cumulative impacts on public health and the health of terrestrial, aquatic and marine ecosystems must be discussed in the relevant sections. This assessment may include air and watersheds affected by the project and other proposals competing for use of the local air and water sheds.
- Where impacts from the project will not be felt in isolation to other sources of impact, it is recommended that the proponent develop consultative arrangements with other industries in the project's area to undertake cooperative monitoring and/or management of environmental parameters. Describe such arrangements in the EIS.

- Environmental protection objectives: describe qualitatively and quantitatively the proposed objectives for enhancing or protecting each environmental value. Include proposed indicators to be monitored to demonstrate the extent of achievement of the objective as well as the numerical standard that defines the achievement of the objective (this standard must be auditable). The measurable indicators and standards can be determined from legislation, support policies and government policies as well as the expected performance of control strategies. Include objectives for progressive and final rehabilitation and managing contaminated land.
- Control strategies to achieve the objectives: describe the control principles, proposed actions and technologies to be implemented in order to achieve the environmental protection objectives; include designs, and relevant performance specifications. For each mitigation measure describe and assess:
 - expected or predicted effectiveness
 - statutory or policy basis
 - cost
 - any provision for independent environmental auditing.
- Environmental offsets: Information is required to show that measures have been taken to avoid and minimise potential adverse impacts of the project. Environmental offsets should be proposed to counterbalance any remaining loss of environmental values, consistent with the specific-issue offset policies under the framework of the Queensland Government Environmental Offset Policy 2008 and the draft *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) offsets policy.
- Monitoring programs: describe the monitoring parameters, monitoring points, frequency, data interpretation and reporting proposals.
- Auditing programs: describe how progress towards achieving the objectives will be measured, reported and whether external auditors will be employed. Include scope, methods and frequency of auditing proposed.
- Management strategies: describe the strategies to be used to ensure the environmental protection objectives are achieved and control strategies implemented, such as by a continuous improvement framework, including details of corrective action options, reporting (including any public reporting), monitoring, staff training, management responsibility pathway, and any environmental management systems and how they are relevant to each element of the environment.
- Information quality: information given under each element will also state the sources of the information, how recent the information is, how any background studies were undertaken (e.g. intensity of field work sampling), how the reliability of the information was tested, and what uncertainties (if any) are in the information.
- It is recognised that development of the gas field will cause many small, discrete disturbances that are spread over a large area and occurring over a 30 plus year timeframe. Where appropriate, impact assessment studies in this area might be staged with Phase 1 studies being reported in the EIS and consisting of; preliminary desktop assessments, reconnaissance field survey, and development of protocols for ongoing detailed assessment as disturbance areas are defined. The later phase assessment work, Phase 2 work (which may need to be undertaken post EIS), might include processes such as the implementation of the protocols developed in Phase 1.

It is recommended that the EIS follow the heading structure shown below. The mitigation measures, monitoring programs, etc identified in this section of the EIS will be used to develop the EM Plan for the project (see section 5).

4.1 Climate

Describe the rainfall patterns (including magnitude and seasonal variability of rainfall), air temperatures, humidity, wind (direction and speed) and any other special factors (e.g. temperature inversions) that may affect management of the project including air quality within the region of the project. Discuss extremes of climate (droughts, floods, cyclones, etc) with particular reference to water management at the project site. Address the vulnerability of the area to natural or induced hazards, such as floods and bushfires. Consider the relative frequency and magnitude of these events together with the risk they pose to management of the project.

The potential impacts due to climatic factors will be addressed in the relevant sections of the EIS. The impacts of rainfall on soil erosion will be addressed in section 4.2. The impacts of storm events on the capacity of waste containment systems, such as site bunding, stormwater management and tailings dams, will be addressed in section 4.5 with regard to contamination of waterways and in section 4.4 with regard to the design of the waste containment systems. The impacts of winds, rain, humidity, and temperature inversions on air quality will be addressed in section 4.6.

4.1.1 Climate change adaptation

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

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

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

4.2 Land

4.2.1 Description of environmental values

Describe the existing environmental values of the land area that may be affected by the project. Define and describe the objectives and practical measures for protecting or enhancing land-based environmental values, describe how nominated quantitative standards and indicators may be achieved, and how achieving the objectives will be monitored, audited and managed.

4.2.1.1 Topography

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

4.2.1.2 Land use

Describe and illustrate land tenures and uses in and around the project area in relation to current land tenures, show the location of existing dwellings, and make particular mention of any land with special attributes, such as good quality agricultural land (GQAL), strategic cropping land (SCL) or irrigation suitability. Identify any properties where irrigation enterprises are undertaken. Include any surrounding land that could be affected by the project. Show the location of any native title applications or determinations. Describe and illustrate the zoning of land in and around the project area according to any existing town or strategic plan.

4.2.1.3 Geology and geomorphology

Provide a description, map and a series of cross-sections of the geology of the project area. Describe the geomorphology of the project site and the surrounding area. Make particular reference to the physical and chemical properties of surface and sub-surface materials and geological structures that could have an influence on, or be influenced by, the project's activities. Describe geological properties that may influence ground stability (including

seismic activity, if relevant), occupational health and safety, rehabilitation programs, or the quality of wastewater leaving any area disturbed by the project. Describe known sites of palaeontologic significance and address the potential for significant fossil finds in locations where the age and type of geology is such that significant specimens may be uncovered during construction or operations. Describe any sites of geomorphological significance.

4.2.1.4 Resources and reserves

Provide a summary of the results of studies and surveys undertaken to identify and delineate the gas resources within the project area. The location and quality of the CSG resources within the project area should be described including assumptions made in arriving at the estimates. The resources should be estimated and reported in accordance with the SPE-Petroleum Resources Management System.

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

- the location and areal extent of the gas resources to be developed
- the location and boundaries of petroleum tenures, granted or proposed, to which the project area is, or will be subject
- the location and boundaries of any project sites
- the location and boundaries of any other features that will result from the proposed gas production, including, water storage facilities and other infrastructure
- the location of any proposed buffers, surrounding the working areas
- any part of the gas resource not intended to be extracted and any part of the resource that may be sterilised by the proposed production operations or infrastructure.

4.2.1.5 Soils

Conduct a soil survey of the area that would be affected by the project at a suitable scale, with particular reference to the physical and chemical properties of the materials that will influence erosion potential, storm water run-off quality, seepage losses from from water storages, rehabilitation and agricultural productivity of the land. For pipeline routes, undertake the analysis and classification at least to the depth of excavation. Information should also be provided on soil stability and suitability for the various types of petroleum activities to be undertaken.

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

4.2.1.6 Land suitabilities

Provide a land suitability map of the proposed project area, setting out land suitability and current land uses, such as grazing of native and improved pastures, cropping (including horticulture) and irrigation. Land classified as good quality agricultural land in DERM's land classification system is to be shown in accordance with the planning guideline, *The Identification of Good Quality Agricultural Land*, which supports State Planning Policy 1/92. Identify potential strategic cropping land using existing DERM trigger maps, in accordance with the provisions of the *Strategic Cropping Land Act 2011*.

4.2.1.7 Contaminated land

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

Conduct a preliminary site investigation consistent with DERM's Draft Guidelines for the Assessment and Management of Contaminated Land in Queensland. If the results of the preliminary site investigation indicate potential or actual contamination, conduct a detailed site investigation progressively managed in accordance with the stages outlined in Appendix 5 of the Draft Guidelines for the Assessment and Management of Contaminated Land in Queensland. The results of the site investigations should be summarised in the EIS and provided in detail in an appendix.

4.2.1.8 Infrastructure

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

4.2.1.9 Environmentally sensitive areas

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

Describe and show on suitably scaled maps the proximity of the project to any relevant matters of national environmental significance listed as controlling provisions for the project.

4.2.1.10 Landscape character

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

4.2.1.11 Visual amenity

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

- identifying elements within the proposal and surrounding area that contribute to their image of the town/city as discussed in the any local government strategic plan - city image and townscape objectives and associated maps
- major views, view sheds, existing viewing outlooks, ridgelines and other features contributing to the amenity of the area, including high-level consideration of representative views from near private residences likely to be affected by the project
- focal points, landmarks (built form or topography), gateways associated with project site and immediate surrounding areas, waterways, and other features contributing to the visual quality of the area and the project site
- character of the local and surrounding areas including character of built form (scale, form, materials and colours) and vegetation (natural and cultural vegetation) directional signage and land use
- identification of the areas of the project that have the capacity to absorb land use changes without detriment to the existing visual quality and landscape character
- high-level consideration of the function of existing vegetation as a visual screen.

4.2.2 Potential impacts and mitigation measures

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

4.2.2.1 Land use and suitability

The potential for the project's construction and operation to change existing and potential land uses of the project site and adjacent areas should be described. Post-operations land use options should be described, including the suitability of the area to be used for primary production, industry, or nature conservation.

Assess the factors favouring or limiting the establishment of those options compared to land use and suitability prior to construction of the project and assess the potential liabilities for long-term management.

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

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

4.2.2.2 Assess impacts on good quality agricultural land and strategic cropping land

A strategy should be developed that will minimise the amount of land disturbed at any one time. The strategic approach to progressively rehabilitating landforms and final decommissioning should be described with particular regard to the impacts in the short, medium and long-term timeframes. The methods to be used for the project, including backfilling, covering, re-contouring, topsoil handling and revegetation should be described.

A description of erosion and sediment control could be deferred to section 4.2.2.4. The strategy to address proposals to disturb land that would impede or divert overland flow or waterways, and any subsequent reinstatement, during construction or operations should be described in this section. Any long-term monitoring plans should be described.

The EIS should address changes following implementation of the decommissioning and rehabilitation plan described in section 3.5. The anticipated long-term changes that will occur to the land after petroleum activities cease compared to the situation before activities commenced should be described. Those changes should be illustrated on maps at a suitable scale with contours at intervals sufficient to assess the likely drainage pattern for ground and surface waters (the assessment of the impacts on drainage and water quality should be provided in the water resources section of the EIS). The mitigation measures for land disturbance to be used during decommissioning should be assessed in sufficient detail to decide their feasibility. In particular, the EIS should address the long-term stability of disturbed sites, safety of access to the site after surrender of the lease, and the residual risks that will be transferred to the subsequent landholder.

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

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

4.2.2.3 Land degradation or contamination

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 EMR or the CLR. Rather, it should include any activity that could have a detrimental impact on land.

The EIS should:

- identify the potential nature and frequency of contaminated sites in the project area and assess the likelihood of contaminated sites occurring within the areas likely to be disturbed by project activities
- provide a documented strategy for ameliorating the range of types of contaminated land likely to be present when developing well sites and other facilities
- provide a documented strategy for dealing with previously unidentified contaminated land when developing well sites and facilities consistent with DERM's draft guidelines for the assessment and management of contaminated land in Queensland

- describe the possible contamination of land from aspects of the project including waste, disposal to land of any waste water, use of saline water for dust suppression, and spills at chemical and fuel storage areas, including any activities or proposed contamination that would result in the land being newly entered on the EMR or the CLR
- provide a documented strategy for minimising the contamination of land through the life of the development (exploration, construction, operations and decommissioning)
- propose measures to remediate any degradation or contamination of land due to the proposed activities
- assess the consequences, particularly for the subsequent landholder, of any intention to leave the site on either register when mining ceases.

4.2.2.4 Erosion and stability

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

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

- areas cleared of vegetation
- dams, banks and creek crossings
- the plant site, including buildings
- access roads or other transport corridors
- gas and water supply pipelines
- electricity transmission corridors
- existing soil conservation works.

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

- the long-term stability of disturbed areas
- preventing soil loss in order to maintain land capability/suitability
- preventing significant degradation of local waterways by suspended solids
- siting infrastructure so as to avoid diversion/concentration of overland flows, especially on floodplains.

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

4.2.2.5 Landscape character

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

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

4.2.2.6 Visual amenity

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

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

4.2.2.7 Lighting

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

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

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

4.3 Transport

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

4.3.1 Description of existing infrastructure and values

The proposed use of existing infrastructure to transport materials, products or wastes to and from the project development area including consideration of optimal transport mode alternatives to limit transport impacts should be described. This will include, for all phases of the project, descriptions of:

- expected volumes of project inputs and outputs, wastes and hazardous goods; and
- how identified project inputs and outputs will be moved through the transport network (mode, volume, composition, trip timing, sources and routes and requirement for police supervision).

Also provide details, either in the transport section of the EIS or by cross-reference to other sections, of the environmental values that would be affected by the altered use of existing transport infrastructure or the construction of new or altered infrastructure. For road and rail transport, describe in detail and illustrate the existing networks that would be used by the project. Describe and illustrate any stock routes potentially affected by the project.

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

4.3.2 Potential impacts and mitigation measures

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

Details will be provided of the:

- results of any modelling of transport impacts
- assessment methodology used, including a summary of consultation undertaken with transport authorities regarding the scope of the impact assessment and methodology to be used
- base data assumptions, including an assessment of the current condition of the affected network and its performance
- possible interruptions to transport operations
- likelihood and nature of spills of products or hazardous materials during transport, prevention measures to be used, and the requirements for dealing with any spills
- evacuation routes for workers from work or accommodation sites if required due to flood, fire or incident.

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

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

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

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

The assessment of impacts on the rail network itself, or on environmental values affected by changes in rail traffic, such as due to dust, noise or vibration, will also consider the following matters:

- impacts on passenger transport and services
- impacts at interface points with other private and public transport pathways such as roadway level crossings or occupational crossings (i.e. those crossings which form part of private access pathways to and from residential or business sites)
- the requirements for any approvals needed for rail crossings by roads or other infrastructure and for access to/across/under the corridor during all phases of the project.

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

Assess any impacts on environmental values due to the need to redevelop or construct new airfields; and any impacts on amenity due to increased air traffic. The proposal and assessment should have regard to State Planning Policy 1/02: Development in the Vicinity of Certain Airports and Aviation Facilities. Assess any potential impacts on air safety, including the raising of landforms or the construction of stacks, flares or lighting within flight paths.

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

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

Describe detailed measures to avoid or mitigate impacts on each transport mode. These mitigation measures are to be prepared by the proponent in close consultation with the relevant transport authorities. Any residual impacts that cannot be avoided will be identified and quantified.

Mitigation strategies must include:

- consideration of any transport authority's works program and forward planning
- proposed construction plans of all required transport infrastructure works in accordance with relevant and accepted authority standards and practices
- the responsible parties for any works
- estimates of costs
- details on the timing of the works

- a summary of relevant approvals and legislative requirements needed to implement mitigation strategies and transport infrastructure works required by the project.

Also consider public transport requirements and links to, or development of, pedestrian and cycle networks.

4.4 Waste

This section will complement other sections of section 4 of the EIS by providing technical details of waste treatment and minimisation, with proposed emission, discharge and disposal criteria, while other sections describe how those emissions, discharges and disposals would impact on the relevant environmental values. The purpose of this format is to concentrate the technical information on waste management into one section in order to facilitate its transfer into the EM plan.

4.4.1 Description of environmental values

Briefly describe the existing environment values that may be affected by the project's wastes. Refer to each of the waste streams described in section 3.4 and provide references to more detailed descriptions of the relevant environmental values in other sections of part 4 of the EIS.

4.4.2 Potential impacts and mitigation measures

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

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

As part of the description, and except where issues related to waste have been addressed in section 3.4 (in which case reference will be made to the appropriate subsection), provide details of each waste with regard to:

- operational handling, storage, treatment, disposal and fate of all wastes
- any methods and locations to be used to transport and dispose of wastes off the project site
- hazards associated with the handling and storage of wastes
- the potential level of impact on environmental values
- proposed discharge/disposal criteria for liquid and solid wastes
- measures to ensure stability of the dumps and impoundments
- methods to prevent seepage and contamination of surface water or groundwater from stockpiles and/or dumps
- design criteria to be used to ensure that waste containment and/or storage facilities perform satisfactorily
- market demand for recyclable waste
- waste minimisation processes
- measures to ensure wastes does not attract or propagate pests, disease vectors or vermin, and do not impact on public health
- decommissioning of the site.

Provide details of waste management methods which demonstrate that waste minimisation and cleaner production techniques and designs have been implemented through the selection of process equipment and facilities to prevent or minimise environmental impacts. Apply waste minimisation and treatment, and cleaner production techniques, to gaseous wastes, particularly methane, nitrogen oxides, sulfur oxides, particulates and carbon dioxide. Pay particular attention to measures that will maximise energy efficiency and minimise internal energy consumption in the project.

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

4.5 Water

4.5.1 Description of environmental values

Describe the existing resources and environmental values of water that may be affected by the project. Environmental values will be defined by reference to the *Environmental Protection Act 1994*, Environmental Protection (Water) Policy 2009 (EPP(Water)), the Australian Water Quality Guidelines for Fresh and Marine Waters (ANZECC & ARMCANZ, 2000), the Queensland Water Quality Guidelines 2009 (DERM, 2009) and the guideline Establishing Draft Environmental Values and Water Quality Objectives (EPA, 2002). Make reference to Queensland Wetland Mapping and any available Aquatic Conservation Assessments produced by DERM. Include estuarine and marine waters if they could be impacted by the project, and also include relevant matters of national environmental significance listed as controlling provisions for the project, such as the Narran Lakes Nature Reserve Ramsar Site. The definition of waters in the EPP(Water) includes the bed and banks of waters, so this section will address benthic sediments as well as the water column.

Describe and illustrate the surface watercourses, overland flow, palustrine and lacustrine wetlands. The description will include suitably scaled maps of catchments, watercourses, drainage pathways, and wetlands in the area affected by the project. Describe, with supporting photographs, the geomorphic condition of any watercourses likely to be affected by stream diversion. The results of this description will form the basis for the planning and subsequent monitoring of rehabilitation of the watercourses during or after the operation of the project.

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

Provide details of the likelihood and history of flooding, including the extent, levels and frequency of floods in and around the project area. Flood studies will include a range of annual exceedence probabilities for potentially affected waterways, based on observed data if available or use appropriate modelling techniques and conservative assumptions if there are no suitable observations.

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

Describe the quality of surface waters in the area potentially affected by the project. Available complementary stream-flow data will also be obtained from historical records to help interpretation. Describe seasonal variations in water quality and variations with flow.

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

- values identified in the Environmental Protection (Water) Policy 2009
- sustainability, including both quality and quantity
- physical integrity, fluvial processes and morphology of watercourses, including riparian zone vegetation and form
- any water resource plans, land and water management plans relevant to the affected catchment.

Surface water quality objectives should be determined after consideration of the Environmental Protection (Water) Policy 2009, ANZECC & ARMCANZ Water Quality Guidelines (2000), the Queensland Water Quality Guidelines (2009) and local reference data.

The EIS should assess the quality, quantity and significance of groundwater in the project area including:

- an overview of groundwater use in areas in or adjacent to the project area
- details of any springs or outflows of groundwater
- identification of intake areas for local and regional groundwater aquifers
- an assessment of the potential extent of impact caused by the project

- an assessment of baseline data from existing groundwater supply facilities (bores, wells, etc) within the proponent's current field development areas
- a process for, and commitment to, gathering baseline data from existing groundwater supply facilities (bores, wells, etc) for future field development areas.

The description will include a survey of existing groundwater supply facilities where accessible. Include and analyse the following information:

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

The information collected from the surveys will include:

- accurate location information (GPS)
- groundwater level (if access is available for a groundwater level probe)
- water quality samples for laboratory analysis (from operational bores with pumps)
- bore head gas concentrations
- bore construction and pump details
- photos of each bore.

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

This section of the EIS should address the nature and hydrogeology of the aquifers and provide a description of the:

- geology/stratigraphy—such as alluvium, volcanic, metamorphic
- aquifer type—such as confined, unconfined, karst or perched
- depth to and thickness of the aquifers
- the significance of the resource at a local and regional scale
- depth to water level and seasonal changes in levels
- groundwater flow directions (defined from water level contours)
- interaction with surface water
- possible sources of recharge
- vulnerability to pollution.

4.5.2 Potential impacts and mitigation measures

For all phases of the project, this section of the EIS will:

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

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

In relation to water supply and usage, and wastewater disposal, the EIS should discuss anticipated flows of water to and from the project area, including the source and quantity of water to be used during construction and operation. Where dams, weirs or ponds are proposed, the EIS should provide estimates of the intended capacity of the storages, and the source and quality of water they contain. The EIS should investigate the effects of predictable climatic extremes (storm events, floods and droughts) on: the capacity of the dams to retain contaminants; the structural integrity of the containing walls; the quality of water contained; and the flows and quality of water discharged. The design of all water storage facilities should follow the current technical guidelines for site water management.

The Australian Water Quality Guidelines for Fresh and Marine Waters (ANZECC& ARMCANZ, 2000)), Queensland Water Quality Guidelines for Fresh and Marine Waters (2009), and the Environmental Protection (Water) Policy 2009 should be used as a reference for evaluating the effects of various levels of contamination.

The proposed water management controls, addressing surface and ground water quality and quantity, drainage patterns and sediment movements should be described. The beneficial (environmental, production and recreational) use of nearby surface and groundwater should be discussed, along with any proposal to divert any affected creeks, and stabilising those works. Monitoring programs that will assess the effectiveness of management strategies for protecting water quality during the construction, operation and decommissioning of the project should be stated.

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

The impact assessment should define the extent of the area where groundwater resources are likely to be affected by the proposed operations. The impact assessment should assess the significance of the project to groundwater draw-down, depletion or recharge, potential for impacts across or from aquifer to aquifer, and propose available management options to monitor and mitigate these effects. The response of the groundwater resource to the progression and eventual cessation of the project should be described.

An assessment should be undertaken of the impact of the project on the local ground water regime caused by the altered porosity and permeability resulting from any land disturbance.

An assessment of the potential to contaminate groundwater resources including, but not limited to, surface storage of untreated associated water/residual brine and cross contamination between aquifers should be provided along with measures to prevent, mitigate and remediate such contamination.

An assessment of the potential for ground and surface water impacts to matters of national environmental significance listed as controlling provisions for the project should be provided, along with measures to mitigate any impacts. The assessment of impacts should be consistent with section 4.8 Ecology.

4.6 Air

4.6.1 Description of environmental values

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

Provide sufficient data on local meteorology and ambient levels of contaminants to establish a baseline for later studies and for the modelling of air quality environmental impacts within the airshed. Parameters will include air temperature, wind speed and direction, atmospheric stability, mixing depth and other parameters necessary for input to the models.

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

4.6.2 Potential impacts and mitigation measures

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

The emissions should be modelled using a recognised atmospheric dispersion model. The objectives for air emissions should be stated, and compared to the modelling results, in accordance with relevant standards (such as for stack or ground-level concentrations), relevant emission guidelines, and any relevant legislation. The potential for interaction between the emissions from the processing plant and emissions in the airshed, and the likely environmental harm from any such interaction, should also be detailed.

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

- an accurate description of the activities carried out on the project area
- an assessment of the effects of air emissions during construction and operations on air environmental values, particularly as they relate to human health
- a description of the pollution control equipment and pollution control techniques to be employed on the premises and the features of the project designed to suppress or minimise emissions, including dusts and odours
- a description of the back-up measures to be incorporated that will act in the event of failure of primary measures to minimise the likelihood of plant upsets and adverse air impacts
- an air emission inventory of the proposed activities
- a separate air emission inventory of any off-site activities directly associated with the project, including fugitive emissions such as from rail or road transport of product or wastes.

Provide a complete list of predicted emissions to the atmosphere. The list should address SO_x, NO_x, VOC, CO, CO₂, particulates (including dust), PM₁₀, PM_{2.5}, trace metals, odours and any toxic, persistent and/or hazardous substances that would be emitted by the project. Present the concentrations of all components of emissions at standard temperature and pressure, and provide the mass emission rate, exit velocity, volume flow rate and temperature at exit. Also, specify the predicted oxygen content of the flue gases. Where possible, estimates of emission rates should be based on actual measurements from samples taken from similar facilities, preferably full-scale facilities operating elsewhere or otherwise from experimental or demonstration-scale facilities. Where this is not possible, use published emission factors and/or data supplied by manufacturers of process and control equipment.

The proposed level of emissions must be compared with the best practice national and international source emission standards.

For other than insignificant emissions, undertake an impact assessment with relevant inputs of emissions and local meteorology using an air dispersion model to provide estimates of the likely impacts on the surrounding environment. The model inputs should be as detailed as possible, reflecting any variation of emissions with time and including at least a full year of representative hourly meteorological data. Provide stack parameters such as stack height, diameter, temperature, exit velocity and volume flow rate.

Evaluate the cumulative impacts of the proposed emissions on the receiving environment by considering the project in conjunction with existing and known likely future emission sources within the region. Describe airshed management and the contribution of the project to airshed capacity in view of existing and future users of the airshed for assimilating and dispersing of emissions.

Identify 'worst case' emissions that may occur at start-up, shut-down or during 'upset' operating conditions. If these emissions are significantly higher than those for normal operations, it will be necessary to evaluate the worst-case impact, as a separate exercise to determine whether any planned buffer distances between the facility and neighbouring sensitive receptors will be adequate

If odour could be an issue, conduct an odour impact assessment using the criteria described in the DERM guideline Odour Impact Assessment from Developments. The guideline sets out various approaches to assess potential impacts from development proposals, and provides for the use of air dispersion modelling as a tool to predict ground level odour concentrations. Comparison must be made with guideline values to determine the likelihood of adverse odour impacts.

The averaging period for ground level concentrations of contaminants that are modelled should be consistent with the relevant averaging periods for air quality indicators and goals in the Environmental Protection (Air) Policy 2008 and the National Environmental Protection Measure (NEPM) Air. For example, the modelling of sulfur dioxide must be conducted for one-hour, 24-hour and annual averaging periods.

Modelled air quality concentrations at the most exposed existing or likely future off-site sensitive receptors must be compared with the appropriate national and international ambient air quality standards including the Environmental Protection (Air) Policy 2008 and the National Environmental Protection Council (Ambient Air Quality) Measure.

To assess chemical species not listed in the EPP (Air), risk factors and best practice design criteria published by other jurisdictions could be used.

The human health risk of all hazardous or toxic contaminants associated with emissions from the facility should be assessed whether they are, or are not, covered by the National Environmental Protection Council (Ambient Air Quality) Measure or the Environmental Protection (Air) Policy 2008.

Where there is no single atmospheric dispersion model that is able to handle the different atmospheric dispersion characteristics exhibited in the project area (including strong convection, terrain features, temperature inversions and contaminant re-circulation), a combination of acceptable models will need to be applied.

The limitations and accuracy of the applied atmospheric dispersion models should be discussed.

Evaluate the extent to which any significant nitrogen oxides and volatile organic compounds emissions from the project and existing emission sources within the region will contribute to generating photochemical smog.

Evaluate the extent to which any significant sulfur dioxide emissions from the project and existing emission sources within the region will contribute to generating acid rain or acidification of other atmospheric condensation, such as dew.

For any project that does not meet the Environmental Protection (Air) Policy 2008 air quality objectives, the proponent should undertake a risk assessment of the potential for adverse impacts off-site. Risk management strategies should be developed that identify options that will reduce exposure of local communities to levels of indicators that may be of concern and enable the proponent to meet the objectives of Environmental Protection (Air) Policy 2008.

4.6.2.1 Greenhouse gases

Provide an inventory of projected annual emissions for each relevant greenhouse gas, with total emissions expressed in 'CO₂ equivalent' terms for scope 1, scope 2 and readily identifiable scope 3 (as defined by the World Resources Institute/World Business Council for Sustainable Development Greenhouse Gas Protocol). In determining scope 3 emissions, the assessment should confine its consideration to direct associations such as product usage, fuel cycles, associated project fuel usage and third party infrastructure required to export product, provide essential services and manage wastes produced. Briefly describe the methods used to make the estimates. The Australian Department of Climate Change's National Greenhouse Accounts (NGA) Factors and current methodologies that underpin the National Greenhouse and Energy Reporting Scheme (National Greenhouse and Energy Reporting (Measurement) Determination 2008), other sources where practicable and appropriate, are to be referenced where appropriate for emission estimation.

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

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

Means of reducing greenhouse gas emissions could include such measures as:

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

Include a specific module to address greenhouse abatement in the draft environmental management plan. That module will include:

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

4.7 Noise and vibration

4.7.1 Description of environmental values

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

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

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

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

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

4.7.2 Potential impacts and mitigation measures

Using a suitable acoustic model, predict the likely generation of noise for different times of day under a range of climatic conditions, including the expected worse case. Describe the predictions using suitable indicators, and illustrate the predicted noise contours on suitably-scaled maps showing the locations of noise sensitive receptors. Assess the potential impacts of noise and vibration at all potentially sensitive receptors in comparison to the objectives and standards to be achieved. Give particular consideration to emissions of low-frequency noise; that is, noise with components below 200Hz. The assessment of noise impacts will include matters raised in the document *The Health Effects of Environmental Noise – Other Than Hearing Loss* published by the enHealth Council, 2004 (or later editions), ISBN 0 642 82304 9. Assess the potential environmental impacts of noise and vibration on terrestrial animals and birds, including migratory species (and relevant matters of national environmental significance listed as controlling provisions for the project). Assess potential noise impacts on any nearby protected areas addressing amenity as well as impacts on animals. Provide information on blasting that might cause ground vibration or fly rock on, or adjacent to, the site with particular attention given to places of work, residence, recreation, worship and general amenity. Discuss the magnitude, duration and frequency of any vibration and assess the potential impacts on sensitive receptors. Reference will be made to the DERM guideline: *Noise and Vibration from Blasting*.

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

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

4.8 Ecology

4.8.1 Description of environmental values

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

- terrestrial and aquatic ecosystems, and their interaction
- biological diversity
- the existing integrity of ecological processes, including habitats of threatened or near threatened species
- the integrity of landscapes and places, including wilderness and similar natural places
- matters of national environmental significance listed as controlling provisions for the project

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

For all locations that may be affected by any aspect of the project, provide suitably-scaled maps of terrestrial vegetation based primarily on field surveys with descriptions of the mapped ecosystems and any items of special interest.

Map adjacent areas to illustrate interconnectivity, including any larger scale interconnections between areas of remnant or regrowth vegetation where the project site includes vegetation that facilitates animal movement between those other areas. Field surveys will use the Queensland Herbarium methodology and proformas consistent with Version 3.1 of the publication *Methodology for Survey and Mapping of Regional Ecosystems and Vegetation Communities in Queensland* (EPA, 2005). Survey methodologies for threatened species and communities and migratory species listed under the EPBC Act must follow all relevant state and Commonwealth survey guidelines (e.g. *Survey Guidelines for Australia's Threatened Birds* (DSEWPaC)). The EIS should demonstrate how these surveys have been applied.

The vegetation description and mapping, produced from aerial photographs and field surveys, will be mapped at a suitable scale and cover at least the following matters:

- location and extent of vegetation types using DERM's regional ecosystem type descriptions in accordance with the Regional Ecosystem Description Database
- category A or B environmentally sensitive areas under the Environmental Protection Regulation 2008
- any areas of state, regional or local significance identified in an approved Biodiversity Planning Assessment produced by DERM
- critical habitat within the meaning of the *Nature Conservation Act 1992*
- vegetation mapped as essential habitat
- remnant or regrowth vegetation, particularly essential regrowth habitat, high value regrowth, or a regrowth watercourse
- sensitive or important vegetation types, including riparian vegetation and any marine littoral and subtidal zone
- in-land or coastal wetlands
- wildlife breeding or roosting areas
- sites in, or adjacent to, areas containing important resting, feeding or breeding sites, or flight paths for migratory species listed under the Convention of Migratory Species of Wild Animals, and/or bilateral agreements between Australia and Japan (JAMBA), Australia and China (CAMBA), or Australia and the Republic of Korea (ROKAMBA)
- sites adjacent to nesting beaches, feeding, resting or calving areas of species of special interest, such as marine turtles and cetaceans
- sites containing least concern species that represent a distributional limit and are of scientific value or contain feeding, breeding, resting areas for populations of echidna, koala, platypus and other species of special cultural significance
- sites containing high biodiversity conservation values that may be dependent for their long-term survival or function on connectivity with other nearby areas of habitat
- a site containing other special ecological values, for example, areas of high habitat diversity and areas of high endemism
- bat roosting and breeding caves, including existing structures such as adits and shafts
- habitat of threatened or near threatened animals
- the condition of vegetation and its habitat value, particularly in relation to the conservation of any threatened and near threatened plant and animal species, assemblages or community types
- species of protected plants highlighting those listed as threatened or near threatened under the Nature Conservation (Wildlife) Regulation 2006
- any other plant communities or species of conservation, cultural, commercial or recreational significance
- location and abundance of any pest, weed or exotic species
- any areas that would be subject to the *Vegetation Management Act 1999*
- location and extent of threatened ecological communities listed under the EPBC Act
- location and extent of habitat for listed threatened species listed under the EPBC Act.

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

Survey effort should be sufficient to identify, or adequately extrapolate, the plant and animal values over the range of seasons, particularly during and following a wet season. The survey will account for the ephemeral nature of watercourses traversing the project area, and seasonal variation in animal populations. Existing information on plants and animals may be used to supplement new survey work provided that the existing data are still current. Methodologies used for plant and animal surveys will be specified in the appendices to the EIS.

Vertebrate animal survey of the project area should be undertaken at a sampling intensity that supports the scale of vegetation mapping. Surveys of terrestrial wildlife will be conducted in a manner that is sensitive to effects of seasonality and the different activity patterns and habitat use by species under different seasonal conditions.

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

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

In addition to the species found in the field survey, provide an indicative list of other known or likely threatened or near threatened species (including threatened species under the EPBC Act) within the relevant provinces of the local bioregion. Correlate the occurrence of animals of conservation significance to mapped vegetation units or habitats to facilitate the development of measures for their protection. Indicate how well any affected communities are represented and protected elsewhere in the province where the site of the project occurs.

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

- fish species, mammals, reptiles, amphibians, crustaceans and aquatic invertebrates occurring in the waterways and wetlands within the affected area
- any threatened or near threatened species and their habitat (including threatened species under the EPBC Act)
- aquatic plants
- aquatic and benthic substrate
- water birds
- habitat downstream of the project, or potentially impacted due to currents in associated lacustrine environments.

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

Display survey results in appendices of the EIS.

4.8.2 Potential impacts and mitigation measures

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

Specifically assess any potential impacts on a category A or B environmentally sensitive area or matters of national environmental significance listed as controlling provisions for the project and propose measures to avoid impacts.

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

- regional ecosystems on freehold and leasehold land
- all native vegetation on State land.

Assess the indirect impacts on remaining vegetation (including habitat for matters of national environmental significance listed as controlling provisions for the project), such as those due to edge effects, reducing vegetation area below a viable size, or reductions in connectivity. Similarly, indirect impacts on animals should be assessed, such as the reduction of a habitat area below a viable size or increased predation due to reduced cover. Short-term and long-term effects should be considered with comment on whether the impacts are reversible or irreversible. Consideration of indirect impacts (at least in relation to controlling provisions for the purposes of the EPBC Act) must have regard to definitions of indirect impacts provided in *Significant Impact Guidelines 1.1: Matters of National Environmental Significance* (2009).

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

Assess the potential impacts on animals of wastes at the site. Propose measures to prevent harm to wildlife.

Describe and assess the potential impacts of any actions of the project that require an authority under the *Nature Conservation Act 1992*, and/or would be assessable development for the purposes of the *Vegetation Management Act 1999*.

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

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

Identify and quantify any potential net loss of environmental values. The EIS should provide an environmental offset strategy that would counterbalance the remaining loss of environmental values having regard to the requirements set out in any applicable specific-issue offset policies under the framework of the Queensland Government Environmental Offset Policy (2008) and any offsets policy published by the Commonwealth Department of Sustainability, Environment, Water, Population and Communities in relation to the EPBC Act. Specific-issue offset policies that will be considered are:

- Policy for Vegetation Management Offsets, DERM, 2009
- Queensland Biodiversity Offset Policy, Version 1, 3 October 2011
- Offsets for Net Benefit to Koalas and Koala Habitat, EPA, 2006.
- DSEWPac's Draft Offsets Policy, 'Use of Environmental Offsets under the *Environment Protection and Biodiversity Conservation Act 1999*'.

Propose detailed measures to remove and control the introduction or spread of weeds, and feral or pest animals. This should include a risk assessment of high biosecurity risk species and their sites, and the development of threat mitigation plans for them, such as clean down and inspections at high risk sites. The biosecurity management strategies will include mitigation measures relevant to protecting any potentially affected primary production areas. When determining control strategies, reference will be made to the latest Biosecurity Queensland's Annual Pest Distribution Survey data, published biosecurity management strategies, local government pest management plans and any applicable model local laws dealing with locally declared pest plants and animals. Develop management strategies to ensure no new pests are introduced as a result of the project's activities. Include all management measures for pest plants and animals in a biosecurity management plan, which will form part of the project's draft EM plan.

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

4.9 Cultural heritage

4.9.1 Description of environmental values

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

- A desktop assessment reviewing all sources of information on non-indigenous historical cultural and landscape heritage values within the region of the project site, including:
 - the Queensland Heritage Register, for places already protected under the *Queensland Heritage Act 1992*
 - local government heritage registers, lists or inventories
 - results of previous cultural and landscape heritage studies conducted in the region
 - appropriate national and international guidelines for the descriptions of sites, places and regions.
- A physical archaeological investigation of the area potentially affected by the project (based on the results of the desktop assessment) that addresses:
 - all types of historical heritage places located within the project area including built, archaeological and non-indigenous cultural landscape values
 - the discovery and protection of any previously unidentified archaeological artefacts or archaeological places during the course of the archaeological investigation in accordance with Part 9 of the *Queensland Heritage Act 1992*.
- An investigation of whether the area potentially affected by the project includes places and locales of possible State or local heritage significance, including:
 - An assessment of places of potential heritage significance against the criteria contained in Division 1 of the *Queensland Heritage Act 1992*
 - Documented consultation with appropriate academic historians and with local history organisations about the survey methodology and scope
 - Notification to the Cultural Heritage Branch of DERM of any places or locales that are of potential State or local heritage significance not currently on the State or local Heritage register.

4.9.2 Potential impacts and mitigation measures

4.9.2.1 Indigenous cultural heritage

Unless an exemption applies under s86 of the *Aboriginal Cultural Heritage Act 2003*, a Cultural Heritage Management Plan (CHMP) must be prepared in accordance with the requirements of Part 7 of that Act. The gazetted Cultural Heritage Management Plan Guidelines may assist in the development of the CHMP.

DERM's EIS Coordinator must be made aware of the progress of the CHMP approval process and of any related issues that should be addressed in the EIS assessment report.

4.9.2.2 Non-Indigenous historical cultural heritage

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

The development of a historical heritage management plan will be negotiated with the Cultural Heritage Branch of DERM, local history organisations and other relevant stakeholders.

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

- processes for mitigating, managing and protecting identified historical cultural heritage values during excavations of the construction, operational, rehabilitation and decommissioning phases of the project
- recognition and protection of:
 - view lines to and from heritage places including natural features
 - cultural landscapes
- proactive ways of conserving the heritage places
- processes for reporting, as required by section 89 of the *Queensland Heritage Act 1992*, the discovery of any archaeological artefact not previously identified in the historical cultural heritage study
- procedures for collecting any artefact material, including appropriate storage and conservation
- historical cultural and landscape heritage awareness training or programs for project staff.

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

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

4.10 Social values

The description of social and cultural values potentially impacted by the project, and the assessment of the impacts on those values, will be conducted in consultation, through the EIS Coordinator, with the Social Impact Assessment Unit of the Department of Employment, Economic Development and Innovation. The proponent will engage at the earliest practical stage with stakeholders and potentially affected parties to discuss and explain the project, and to identify and respond to issues and concerns regarding social impacts. The stakeholder engagement processes will continue throughout the EIS and contribute to the identification of social and cultural values and to the assessment of impacts.

4.10.1 Description of existing social values

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

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

Undertake a targeted baseline study of the people in the project's social and cultural area to identify social values that may be impacted by the project. The social baseline study will be based on qualitative, quantitative, and participatory methods supported by stakeholder engagement processes.

It will reference relevant data contained in local and state government publications, reports, plans, guidelines and documentation, including regional plans and any available community plans.

The social baseline study should describe and analyse a range of demographic and social statistics determined relevant to the project's social and cultural area including:

- total enumerated population and the full time equivalent transient population
- existing or anticipated major population trends and changes irrespective of the project
- family structures
- age and gender distributions
- education, including schooling levels
- measures of community safety, health and wellbeing
- cultural and ethnic characteristics
- Indigenous population including age and gender
- personal and household income
- labour force by occupation and industry
- housing tenure type and landlord type for rental properties
- housing availability:
 - private ownership: number and percentage of houses for sale
 - rental market: size, vacancy rate and seasonal variations
 - availability of social housing
- housing costs:
 - private ownership: typical costs of houses for sale in project area and monthly housing repayments with percent of dwellings in each category published by the Australian Bureau of Statistics (ABS)
 - rental: weekly rent with percent dwellings in each category published by the ABS
- housing affordability separately for private ownership and rent
- household and family type
- disability prevalence, if relevant data can be made available by the Department of Communities
- the social and economic index for areas, index of disadvantage—score and relative ranking
- types and prevalence of crime, including domestic violence if relevant data can be made available by the Queensland Police Service
- any other indicators determined through the community engagement process as relevant.

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

- the social infrastructure including community and civic facilities, services and networks (for definition see South East Queensland Plan 2005–2026 Implementation Guideline No.5, <www.dip.qld.gov.au/resources/guideline/Implementationguideline5.pdf>)
- settlement patterns including the names, locations, size, history and cultural aspects of settlement in the social and cultural area
- identity, values, lifestyles, vitality, characteristics and aspirations of communities in the social and cultural area, including Indigenous communities
- land use and land ownership patterns including:
 - estimates of the number of properties potentially directly or indirectly affected by the project
 - rural properties, farms, croplands and grazing areas including on-farm activities near the proposed activities
 - properties used for other primary, secondary or tertiary industries

- residential acreage properties
- townships or other relatively small block residential areas
- the number of families potentially directly or indirectly affected by the project including Indigenous Traditional Owners and their families, property owners, and families of workers either living on the property or workers where the property is their primary employment
- use of the social and cultural area for forestry, fishing, recreation or tourism
- Indigenous cultural use of plants and animals.

4.10.2 Potential impacts and mitigation measures

Describe the stakeholder engagement processes and summarise their outcomes, including the response of Indigenous and non-Indigenous communities to the project.

Assess and describe the type, level and significance of the project's beneficial and adverse impacts on social and cultural values identified in the social baseline study and address issues raised in the stakeholder engagement processes. Assess the cumulative potential beneficial and adverse impacts of the project in relation to other major projects or known proposals in the social and cultural area. Discuss whether impacts would be felt at a local, regional or national level.

Assess the impacts in sufficient detail for local and state authorities to make informed decisions about the project's potential effect on their business and social infrastructure.

Provide separate profiles of the expected workforce for the construction, operational and decommissioning phases of the project that describe the:

- numbers and variations of personnel to be employed
- skills base of the required workforce
- likely sources of personnel, such as local, regional, national or overseas.

Provide an outline of the proponent's and contractors' recruitment schedules and their policies for recruitment of workers; describe initiatives for local employment business opportunities; and address the recruitment of women, Indigenous workers, people from culturally and linguistically diverse backgrounds and people with a disability. Outline training that would be provided to increase the skills levels of workers.

Assess the social and cultural impacts of recruiting and training the construction or operational workforces from within the host community and of bringing in workers from outside. If the project is likely to result in a significant increase in population of the area, then the proponent should consult the relevant state authorities and summarise the results of the consultation in the EIS.

Estimate the population growth due to the proposal, directly, indirectly (such as due to service industry growth) and cumulatively with other projects, providing detail on gender, age and any other relevant cohorts. Assess the potential impacts on:

- demographic patterns
- local, regional and state labour markets for separate occupational groupings of the workforce, particularly highlighting any potential skill shortages
- disruptions to existing lifestyles
- health and social wellbeing of families and communities
- social dysfunction, including use of alcohol and drugs
- crime and violence.

Assess the potential impacts of the project on vulnerable groups including women, children and young people, the aged and people with a disability.

Describe the social impacts of changes in land use, the alienation of property and loss of connection with the land, including the impacts and stresses associated with relocations.

Assess the impacts of construction and operational workforces, their families, and associated contractors on land, housing and accommodation availability and affordability. Assess the capability of existing housing and rental accommodation, including public housing, to meet any additional demands created by the project including direct impacts on disadvantaged groups and Indigenous people.

Estimate how much service revenue and wages from the project would be likely to flow to the project's social and cultural area, and assess the beneficial and adverse impacts of that financial inflow.

Describe the transport operations that would be used to move staff between their residences, dormitory camps and work sites. Modes of transport should be described in section 4.3, but this description should address the mix of privately-owned, public or chartered transport operators. Assess the potential social impacts of transport operations on the local and regional communities, including any road safety issues.

Propose measures, developed in consultation with relevant local authorities, state government agencies and stakeholders that would avoid, mitigate or offset any short, medium or long-term adverse impacts, particularly those on:

- housing affordability and availability, including the rental market, in the social and cultural area
- demographic changes in the profile of the region
- the capacity of social infrastructure to meet community needs, particularly in the areas of health, welfare, early childhood education and care, other education and training, policing and emergency services
- provision of education, training and employment opportunities for women, people with a disability, and Indigenous peoples.

Describe consultation with local and state authorities and stakeholders about their acceptance of proposed mitigation strategies and how practical management and monitoring regimes are proposed to be implemented.

Address worker accommodation and broader housing impacts as a result of worker accommodation requirements. The Major Resource Projects Housing Policy (Department of Employment Economic Development and Innovation 2011) sets out the core principles to guide the identification and assessment of accommodation and housing impacts and development of mitigation and management strategies.

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

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

4.11 Health and safety

4.11.1 Description of values

Describe the existing community values for public health and safety that may be affected by the project. Provide maps showing the proximity of the project to any potentially affected places of human residence, work or recreation including, but not necessarily limited to, kindergartens, schools, hospitals, aged care facilities, office buildings, factories and workshops. Projects that could discharge contaminants, even accidentally, into water bodies should identify and describe any downstream extraction for potable use.

For projects proposing air emissions, and/or those with the potential to emit odours, identify and describe nearby and other potentially affected populations. Pay particular attention to those sections of the population, such as children and the elderly who are especially sensitive to environmental health factors.

4.11.2 Potential impacts and mitigation measures

Assess the potential impacts on the community in terms of health, safety, and quality of life from project operations and emissions, including odour, dust and noise. Where relevant, the EIS should address the Queensland *Disaster Management Act 2003*. Assess potential impacts on public health in the short and long term, and the cumulative impacts on public health either in isolation or by combination with other known existing or planned sources of contamination. The assessment should address the potential contamination not only of public water supplies but also of private water sources such as rainwater tanks with roof collection.

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

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

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

4.12 Economy

4.12.1 Description of potentially affected economies

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

- appropriate statistics of economic activity, such as gross regional product and aggregate regional income
- trends in relevant economic indicators
- industries and businesses that could be beneficially or adversely affected by the project, their current and historical contribution to local, regional or national economies, and their current input costs
- local, regional and national governments' aspirations, objectives, strategies and policies for the economic and industrial sectors that may be affected, including the economic and employment objectives of the Queensland Government's Local Industry Policy – a Fair Go for Local Industry, updated October 2010
- economic viability

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

4.12.2 Potential impacts and mitigation measures

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

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

- the significance of this project on the local and regional economies
- the long and short-term beneficial (such as job creation) and adverse (such as increased labour costs, or competition with local small business) impacts that are likely to result from the development
- the potential, if any, for direct equity investment in the project by local businesses or communities
- the cost to all levels of government of any additional infrastructure provision

- implications for future development in the locality (including constraints on surrounding land uses and existing industry)
- the potential economic impact of any major hazard identified in section 4.13
- the distributional effects of the project including proposals to mitigate any negative impact on disadvantaged groups
- the value of lost opportunities or gained opportunities for other economic activities anticipated in the future
- impacts on local property values.

Define and describe the objectives and practical measures for avoiding or mitigating detrimental economic impacts or enhancing economic benefits, including enhancing local industry participation.

Describe how nominated quantitative standards and indicators may be achieved for economic management, and how the achievement of the objectives will be monitored, audited and managed.

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

4.13 Hazard and risk

Describe the potential hazards and risk to people and property that may be associated with the project as distinct from hazards and risk to the natural environment, which should be addressed in other sections of the TOR. When addressing natural hazards, particularly in regard to places where people work and live (such as accommodation camps), the EIS should consider the principles of natural hazard management in State Planning Policy 1/03 (SPP1/03), *Mitigating the Adverse Impacts of Flood, Bushfire and Landslide*, even if the development is exempt development under the *Sustainable Planning Act 2009*. SPP1/03 may not be applicable as a statutory instrument for exempt development, but it contains information that guides best practice for all development.

4.13.1 Description of values

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

4.13.2 Potential impacts and mitigation measures

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

Provide details of how essential services infrastructure will maintain its function during a natural or induced hazard such as flood or bushfire.

Provide an inventory for each class of substances listed in the Australian Code for the Transport of Dangerous Goods by Road and Rail to be held on-site. This information should be presented by classes and should contain:

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

Details should be provided of:

- safeguards proposed for the transport, storage, use, handling and on-site movement of the materials to be stored on-site
- the capacity and standard of bunds to be provided around the storage tanks for classified dangerous goods and other goods likely to adversely impact upon the environment in the event of an accident

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

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

- all relevant major hazards both technological and natural
- the possible frequency of potential hazards, accidents, spillages and abnormal events occurring
- indication of cumulative risk levels to surrounding land uses
- life of any identified hazards
- a list of all hazardous substances to be used, stored, processed, produced or transported
- the rate of usage
- description of processes, type of the machinery and equipment used
- potential wildlife hazards such as snakes and disease vectors
- public liability of the State for private infrastructure and visitors on public land.

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

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

4.14 Siting and management of petroleum activities—constraints analysis

Due to the nature of the proposal, the EIS will not be able to address the exact locations of all wells, pipelines and other associated infrastructure throughout the life of the project. The EIS will incorporate a constraints analysis to identify land where particular petroleum activities may and may not occur. The constraints analysis must use appropriate environmental, social and economic factors based on the values identified in the preceding sections of the EIS including in relation to matters of national environmental significance listed as controlling provisions for the project. Details of those factors must be provided in the EIS together with a description of the assumptions, methods and any weightings used in the constraints analysis. Details should be provided about the information and criteria used to inform site selection and decision-making on the siting of project activities, infrastructure and choice of construction method, as well as the standard operating procedures and site specific controls that will be applied (how, where and when) to the range of petroleum activities that may occur throughout the project area.

The resolution of the analysis must be sufficient to determine the potential for petroleum activities to occur on any individual lot of land in the project area. The EIS should detail both general environmental management methods for all petroleum activities and any specific environmental management methods that would apply to particular lots of land.

4.15 Cross-reference with the terms of reference

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

5 Environmental management plan

Provide an environmental management plan (EM plan) setting out the framework for continuing management, mitigation and monitoring programs as detailed in section 4 of the EIS and including any provision for independent environmental auditing. The purpose of the EM plan is to state the proponent's environmental protection commitments in a way that allows them to be measured and audited.

The EM plan is an integral part of the EIS, but must be capable of being read as a stand-alone document without reference to other parts of the EIS. For a petroleum project the EM plan must meet the content requirements of section 310D of the EP Act.

The EM plan will be used by the administering authority to develop conditions to apply to project approvals. Therefore, the EM plan is a relevant document for project approvals, environmental authorities and permits, and may be referenced by them. The EM plan may suggest conditions that will form the basis for developing the draft environmental authority.

6 Commitments not included in the EM plan

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

7 Assessment of EPBC matters

This chapter of the EIS will provide a stand alone assessment of the relevant impacts of the project on the controlling provisions and provide enough information about the project and its relevant impacts to allow the Commonwealth Minister to make an informed decision whether to approve the project under the EPBC Act. The information provided on these matters must be consistent with the relevant aspects of other sections of the EIS, for example that section dealing with ecology, and the proposed mitigation measures for matters of national environmental significance must be consistent with those proposed to cover matters regulated by the State.

The matters to be addressed in the EIS are set out in Schedule 4 of the Commonwealth's Environment Protection and Biodiversity Conservation Regulations 2000 (EPBC Regulations).

State the controlling provisions for the project, and describe the environmental values covered by the controlling provisions that have relevance for this project. For example, describe and illustrate the location and extent of habitat for threatened species and/or ecological communities listed under the EPBC Act that could be directly or indirectly impacted by the project.

Assess the direct, indirect and cumulative impacts (including downstream impacts) on matters covered by the controlling provisions. Propose avoidance or mitigation/management measures for direct and indirect significant impacts. A significant impact is an impact which is important, notable, or of consequence, having regard to its context or intensity. Whether or not an action is likely to have a significant impact depends upon the sensitivity, value, and quality of the environment which is impacted, and upon the intensity, duration, magnitude and geographic extent of the impacts. You should consider all of these factors and relevant publically available guidance documents (such as the *Significant Impact Guidelines 1.1: Matters of National Environmental Significance*) when determining whether an action is likely to have a significant impact on a matter of national environmental significance.

Mitigation measures that are specifically related to matters of national environmental significance should be included in a separate section of the project's EM plan or in the separate chapter or report for EPBC matters. It is a statutory requirement that that section should set out the framework for continuing management, mitigation and monitoring programs for the project's relevant impacts, including any provision for independent environmental auditing. It is also a statutory requirement that the plan should provide:

- the name of the entity responsible for endorsing or approving each mitigation measure or monitoring program

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

Any proposed environment management plans for matters of national environmental significance must include estimates of relevant impacts from the proposed action (such as habitat clearance, including estimates for individual listed species and ecological communities under the EPBC Act), and include appropriate measures to avoid or minimise impacts on the matters protected by the controlling provisions for the project. Methodology of estimates must be explained and justified.

For any residual impacts that are of sufficient magnitude, the proponent must propose offsets to compensate for these impacts that are in accordance with the Commonwealth environment department's current policy on offsets. Proposed offsets for EPBC protected matters must reflect the scale and intensity of the unavoidable impacts on each individual matter of national environmental significance. Proposed offsets must contain long-term conservation outcomes and demonstrate how these outcomes will be achieved. Any areas used as offsets must be permanently protected and managed (for example, through a perpetual conservation covenant) and appropriate surveying and assessment must be provided which verifies the suitability of the offset.

This section of the EIS should provide information on other requirements set out in Schedule 4 of the EPBC Regulations that have not been addressed in other sections of the EIS, such as details of the proponent's environmental record, including:

- any proceedings under a law of the Commonwealth or a State for the protection of the environment or the conservation and sustainable use of natural resources (an environmental law) against the proponent or the applicant for any permit under an environmental law for the project
- if the proponent is a corporation, details of the corporation's environmental policy and planning framework.

8 References

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

9 Recommended appendices

A1. Final terms of reference for this EIS

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

A2. Regulatory approvals

List the regulatory approvals required by the project.

A3. The standard criteria

Provide a brief summary of the project's compatibility with the standard criteria as defined by the *Environmental Protection Act 1994*, which include the principles of ESD and other relevant policy instruments and the principles of ESD prescribed by section 3A of the EPBC Act. With regard to the principles of ESD, as listed in the National Strategy for Ecologically Sustainable Development, published by the Australian Government in December 1992 (available from the Australian Government Publishing Service), discuss how the project conforms with each principle from inception to decommissioning.

A4. Specialist studies

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

A5. Research

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

A6. Study team

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

Disclaimer

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

10 Approved By

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Signature

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5 April 2012

Date

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