

# Terms of Reference for the Bowen Gas Project Environmental Impact Statement (EIS)

Proposed by Arrow Energy Pty Ltd

November 2012



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

© The State of Queensland (Department of Environment and Heritage Protection) 2012

If you need to access this document in a language other than English, please call the Translating and Interpreting Service (TIS National) on 131 450 and ask them to telephone Library Services on +61 7 3224 8412.

This publication can be made available in an alternative format (e.g. large print or audiotape) on request for people with vision impairment; phone +61 7 3224 8412 or email <library@ehp.qld.gov.au>.

November 2012

# Contents

Executive summary .....	1
Glossary of terms.....	1
<b>1 Introduction.....</b>	<b>2</b>
1.1 Project proponent.....	2
1.2 Project description .....	2
1.3 Project objectives and scope .....	2
1.4 The EIS process .....	2
1.5 Public consultation process.....	4
1.6 Project approvals.....	4
1.7 Accredited process for controlled actions under Commonwealth legislation .....	5
<b>2 Project need and alternatives .....</b>	<b>6</b>
2.1 Project justification.....	6
2.2 Alternatives to the project .....	6
<b>3 Description of the project .....</b>	<b>7</b>
3.1 Location .....	7
3.2 Construction.....	8
3.3 Operations .....	8
3.4 Infrastructure requirements.....	10
3.5 Waste management .....	11
3.6 Rehabilitation and decommissioning .....	13
<b>4 Environmental values and management of impacts .....</b>	<b>14</b>
4.1 Climate .....	16
4.2 Land .....	17
4.3 Transport .....	23
4.4 Waste .....	26
4.5 Water .....	27
4.6 Air .....	32
4.7 Noise and vibration.....	36
4.8 Ecology .....	37
4.9 Cultural heritage .....	42
4.10 Social values .....	43
4.11 Health and safety .....	47
4.12 Economy.....	48

4.13	Hazard and risk .....	49
4.14	Siting and management of petroleum activities—constraints analysis .....	51
4.15	Cross-reference with the terms of reference .....	51
<b>5</b>	<b>Matters of national environmental significance.....</b>	<b>52</b>
<b>6</b>	<b>Environmental management plan .....</b>	<b>54</b>
<b>7</b>	<b>Commitments not included in the EM plan .....</b>	<b>54</b>
<b>8</b>	<b>References .....</b>	<b>54</b>
<b>9</b>	<b>Recommended appendixes .....</b>	<b>55</b>
	A1. Final terms of reference for this EIS.....	55
	A2. Regulatory approvals.....	55
	A3. The standard criteria.....	55
	A4. Specialist studies.....	55
	A5. Research .....	55
	A6. Study team .....	55
	A7. Consultation report .....	55
	A8. Schedule 4 of the EPBC Regulations.....	55

## Introduction

### Arrow Energy Pty Ltd

Arrow Energy Pty Ltd (Arrow) is a Queensland-based wholly owned subsidiary of Arrow Energy Holdings Pty Ltd, a 50/50 joint venture between a subsidiary of Royal Dutch Shell Plc (Shell) and a subsidiary of PetroChina Company Limited (PetroChina). Arrow has been operational in Queensland since 2004 when it commissioned its first coal seam gas (CSG) operations. The joint venture took ownership of Arrow in August 2010.

Arrow is an emerging leader in CSG development. Arrow operates gas projects at Moranbah in the Bowen Basin, and around Dalby in the Surat Basin. Arrow's five producing projects currently account for more than 20 per cent of Queensland's energy needs.

Arrow is seeking to develop additional gas reserves in the Bowen Basin for growing domestic and overseas gas markets. The Shell and PetroChina investment in Arrow provides significant gas field development expertise, established liquefied natural gas (LNG) technology, production and supply experience, and industry and market knowledge.

### Current Bowen Basin activities

Arrow's current petroleum operations in the Bowen Basin are located approximately 400 kilometres (km) south of Townsville and 170 km west of Mackay. The Moranbah Gas Project (MGP) is one of the largest operating coal seam gas projects in Australia.

Arrow's Moranbah Gas Processing Facility comprises inlet gas conditioning, four 2.6 megawatt (MW) reciprocating gas engine compressor units, a triethylene glycol gas dehydration unit, and export gas metering and monitoring. The facility is used to process gas for transport via the North Queensland Gas Pipeline which delivers gas to markets in Townsville including Queensland Nickel Industries, Copper Refineries and the Townsville Power Station. Total gas production for the year ended 30 June 2010 was 17.32 petajoules (PJ).

### The Bowen Gas Project

Arrow is seeking to expand its operations in Queensland's Bowen Basin with a major CSG development and production project.

The proposed Bowen Gas Project is expected to assist in meeting the growing demand for gas supply, including domestic and export markets. The area covered by the project extends approximately 100 km north, 70 km east, and 120 km south-east of Moranbah in Central Queensland, an area in which Arrow Energy holds a number of petroleum exploration and production tenures. The project also includes a smaller parcel of tenements in the Blackwater area.

The Bowen Gas Project includes Arrow's authority to prospect (ATP) 1103, 1031, 1025, 759 (part) and authority to prospect application (ATPA) 742 and 749. The project will be Arrow's largest development program in the Bowen Basin to date.

The Bowen Gas Project refers to the proposed construction and operation activities for the CSG fields outlined above and specifically does not include:

- current exploration or appraisal activities in the Bowen Gas Project development area
- ongoing exploration and production activities for Arrow's Moranbah Gas Project
- Arrow's current activities for supply of natural gas to the domestic market from the Moranbah Gas Project.

Development within the Bowen Gas Project will be staged over the life of the project and areas subdivided into development regions allowing a phased approach to development. Further developments are planned as domestic and export expansion opportunities arise in the energy market.

In most cases, wells are designed for a 15 to 20 year lifespan with production expected to decrease after peak rate is achieved following initial dewatering. Once depleted, it is expected that the wells will be decommissioned in line with industry and government standards, with new wells in new locations drilled to maintain production needs.

Throughout the life of the Bowen Gas Project, design, construction, operation and decommissioning/rehabilitation phases may progress concurrently at different locations within the project area. For example, development of a new gas field may occur up to 15 years prior to a neighbouring gas field.

In addition to providing ongoing supply to the domestic gas market, Arrow is presently pursuing an export LNG market opportunity, through the Arrow Energy LNG Project at Curtis Island near Gladstone. Gas produced by the Bowen Gas Project will be piped to the proposed Curtis Island LNG Plant or used within the domestic market. The LNG plant and the transmission pipeline to it are subject to separate environmental approval processes and are not included in the Bowen Gas Project.

Before the Bowen Gas Project can proceed, Arrow must gain approval from the Queensland and Commonwealth governments. Regulatory authorities must be satisfied Arrow's activities have been properly assessed, and that appropriate measures are in place to avoid or minimise environmental impacts. To do this, Arrow will prepare an environmental impact statement (EIS) that examines the entire development.

The project was determined to be a controlled action under the Commonwealth's *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) on 15 June 2012 (EPBC 2012/6377). The controlling provisions for the project under the EPBC Act are listed threatened species and communities (sections 18 and 18A) and listed migratory species (sections 20 and 20A). Queensland's EIS process has been accredited for the assessment under the EPBC Act in accordance with the Bilateral Agreement between the Commonwealth of Australia and the State of Queensland (2004 and 2012).

Information on the assessment of projects under the EPBC Act, including referrals and public notices, can be found on the Australian Government's Department of Sustainability, Environment, Water, Population and Communities (SEWPaC) website at [www.environment.gov.au](http://www.environment.gov.au).

## **Overview of coal seam gas approvals process and environmental framework**

CSG field development is progressive, extending over the life of the project which would be at least 30 years. Unlike conventional gas resources, CSG resources are extensive, requiring widespread field development to recover the resource. The yield from target coal seams is variable across the gas field. This leads to uncertainty about the precise number, timing and location of wells required to dewater the coal seams and extract the gas. Prior to considering environmental and social constraints, selection of the ideal location of infrastructure required to treat the coal seam gas water and process the gas is also uncertain, being driven by exploration results and optimisation of well placement and water and gas gathering systems.

The lack of certainty about the preferred location of infrastructure is an issue for the environmental impact statement because the specific impacts at any specific location cannot be fully determined. However, they can be described based on the typical impacts of CSG project activities. With that knowledge, greater certainty about potential impacts can be achieved by identifying those areas that are not amenable to certain types of development and if they were developed, how development should proceed. This is achieved through the identification of constraints to development and the establishment of environmental management controls that should apply to project activities in constrained areas.

Known as an environmental framework, this approach is an internal process developed by the proponent for avoiding and managing environmental impacts in the planning phase and in the construction and operation phases through the application of environmental controls that reflect the sensitivity or vulnerability of environmental values. Constraints mapping, an integral part of the environmental framework, is informed by the environmental impact statement and guides site and route selection that seeks to avoid and minimise impacts, thereby protecting environmental values.

The assessment process that would facilitate approval of the project reflects the phased approach to development of CSG fields. It progressively demands more detailed information to inform decisions about whether the project should proceed, under what conditions and whether requisite environmental authorities and permits should be granted, and under what conditions.

Each stage of the assessment process provides opportunities for interested and affected people to comment on the information provided by the proponent and the approvals sought. Public notification and comment requirements are embodied in each aspect of the approvals process as shown in Figure 1. The public notification and comment requirements of each aspect of the approvals process are outlined below.

The scope and adequacy of an **environmental impact statement (EIS)** is subject to public notification and comment. Comments will be sought on both the draft terms of reference and the EIS itself. The Chief Executive of the Department of Environment and Heritage Protection (EHP) then considers all submissions in finalising the terms of reference and preparing the EIS assessment report. The EIS assessment report will assess the adequacy of the EIS; the adequacy of any environmental management plan; makes recommendations about the suitability of the project; set out the conditions under which the project should proceed and provide direction to government agencies and regulatory authorities for the assessment and conditioning of environmental authorities and permits required subsequently by the proponent to construct and operate the project.

An **environmental authority under the EP Act**, is required to commence construction and operation on a petroleum lease. The proponent may apply for an environmental authority or amend an existing environmental authority. An environmental authority sets out the detailed conditions under which a project must be constructed and operated within a petroleum lease. Detailed information is required to enable an application to be assessed by EHP and is typically presented in an environmental management plan, or similar document prepared as part of the EIS or as part of the application. An application for an environmental authority must be published and public comment invited. EHP considers any submissions in assessing the application and determining the conditions that apply to the project activities.

A proponent must have a valid environmental authority before a **petroleum lease (PL)** can be granted by Department of Natural Resources and Mines (DNRM). PL applications must be published and public comment sought prior to grant of the lease. An initial development plan, which typically covers the first five years of development, must be submitted with the application. The initial development plan would contain detailed information about the nature and extent of activities to be carried out under the lease. Subsequent development plans would provide detailed information about subsequent development of further petroleum leases and changes to authorised development. DNRM must consider any submissions in deciding whether to grant the lease and any conditions.

Arrow proposes to stage applications for petroleum leases and the associated environmental authorities (or amendments to environmental authorities) throughout development of the project, as additional petroleum leases are required to support gas field development. This staged process will mean that the development concept has matured and additional information on the development will be made available (for example, locations of major infrastructure such as integrated processing facilities) to interested and affected people, the broader public and the administering authority when each of these applications is made.

The proponent must also negotiate a **conduct and compensation agreement** under the *Petroleum and Gas (Production and Safety) Act 2004* with landowners on whose land the petroleum activities will be carried out. Negotiation of the agreement provides an opportunity to landowners to raise concerns specific to their property and to reach agreement with the proponent on where, how and when development will occur of their property. The proponent is required to provide detailed information about the proposed activities, the location and timing of activities, the measures to manage impacts, rehabilitation and compensation. Negotiation of compensation includes access to dispute resolution and the Land Court, if agreement cannot be reached through the normal process.

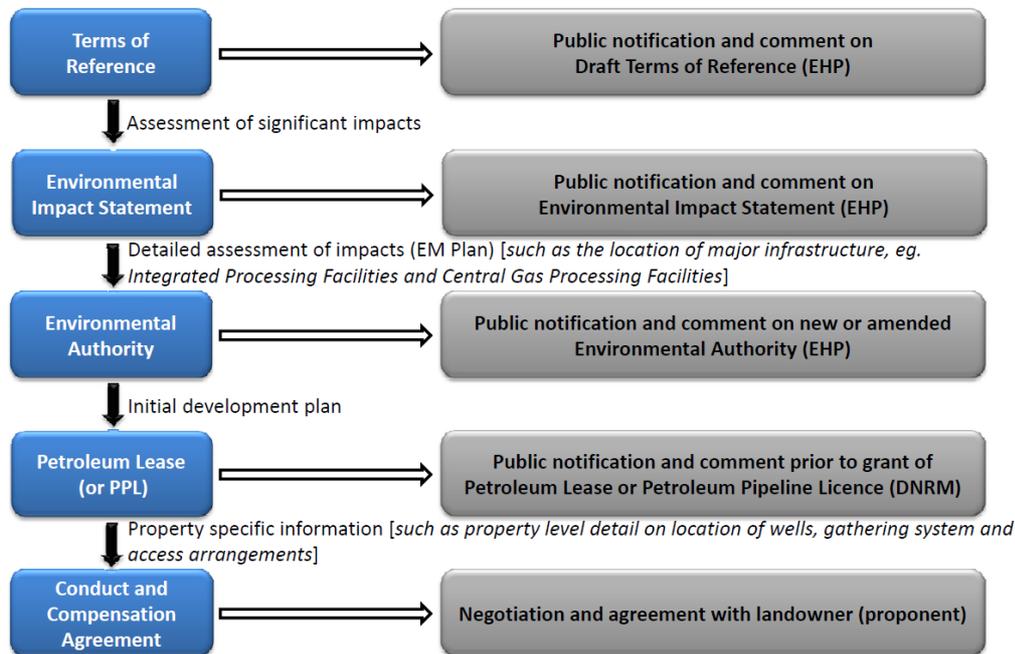


Figure 1 Approvals process for petroleum activities

### Siting of petroleum activities

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. However, as required under the *Environmental Protection Act 1994* (EP Act), the EIS must provide enough information about the impacts of the project to help the administering authority decide whether the project should proceed and, for the purposes of the bilateral assessment for the EPBC Act process to provide the Commonwealth Environment Minister sufficient information to make a decision about the project.

Siting of CSG infrastructure is a process of progressive refinement informed by exploration, resource validation and gas field design to optimise recovery of economic reserves. It commences with the development of a reference case or conceptual layout that describes how wells, gathering systems and production facilities might be arranged to extract and process gas. This is typically presented as areas in which facilities might be developed, with the arrangement of gathering systems and wells within a typical grid arrangement i.e. a grid of wells at nominally 800 metre intervals. A preliminary development sequence is developed as part of this reference case to establish an indicative construction and drilling program. This preliminary reference case will be made available during the EIS and will inform the assessment of impacts, as it represents the worst case development scenario in terms of impact assessment.

The reference case would be updated after the concept select phase. At this stage a concept has been chosen to progress with into detailed design (front end engineering design (FEED)). The corresponding updated reference case would then be used to inform and update the EIS during the supplementary phase of the EIS process. This updated reference case would be similar to the initial basis of design that the detailed design process is based upon, and would describe in more detail how the gas fields would be laid out and developed. It would provide a greater level of detail about the number and capacity of production facilities, and confirms equipment type selection, as well as functional layouts of wells and gathering systems. Constraints mapping and the findings of the EIS would inform design of the functional layouts which take into consideration a range of factors, including technical feasibility, constructability, cost, and risk, as required by standards applicable to the design, construction and operation of petroleum and gas developments. The conceptual layout presented in the EIS would be refined to optimise the number of production facilities and wells and gathering systems required to recover the economic

reserves. Detailed design/front end engineering design (FEED) is an iterative process that is ongoing through the life of the project as gas reserves mature and actual production is realised. Hence the reference case and development sequence would be progressively optimised through the project life.

FEED informs detailed design of the early gas field layout which relies on access to land for information gathered in geotechnical investigations, confirmation of environmental constraints, and landowner consultation. At this stage details on proposed facility locations for the initial phases of development are determined and become a basis for the environmental authority application. An initial development plan facilitates detailed assessment of the impacts of construction and operation of the proposed infrastructure at the nominated sites which are presented in the environmental management plan (EM plan) prepared in support of an application for an environmental authority or an application to amend an existing environmental authority. The impact assessment presented in the EM plan validates the impact assessment presented in the EIS.

The EIS will describe the design process adopted by the proponent and provide details of further information to be provided, when the information will be available (approval, planning or development stage), how that information will inform the assessment of impacts, and how detailed information about the impacts and proposed management measures will be made available to assessment agencies, regulatory authorities and interested and affected people as well as the broader public.

The EIS will explain the design process in the context of the approvals process shown in Figure 1. An indicative development timeframe will be presented in the EIS and indicate the conceptual timing of production facilities and gas fields, as the preliminary reference case. Particular emphasis will be placed on the gas fields and petroleum leases to be brought into production, as part of the initial development plan. Where design has progressed and more detailed information is available, that information would be presented in the EIS or in the supplementary report to the EIS. The EIS would outline when detailed information regarding the development will be made available, as part of future environmental authority applications and/or during negotiation of conduct and compensation agreements with impacted landholders.

## Executive summary

The executive summary conveys the project's most important aspects and options to the reader in a concise and readable form. It should 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. 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.

The executive summary should include:

- the title of the project
- name and contact details for the proponent and a discussion of previous projects undertaken by the proponent and the proponent's commitment to effective environmental management
- a concise statement of the aims and objectives of the project
- the legal framework, decision-making authorities and advisory agencies
- an outline of the background to and need for the project, including the consequences of not proceeding with the project
- an outline of the alternative options considered and reasons for the selection of the proposed development option
- a brief discussion of the project (pre-construction, construction and operational activities) and the existing environment, utilising visual aids where appropriate
- an outline of the principal environmental impacts predicted and the proposed environmental management strategies (including waste minimisation and management) and commitments to minimise the significance of these impacts
- clear overview maps of the proposed project location.

Further, the executive summary should outline how the project meets the principles of ecologically sustainable development.

## Glossary of terms

A glossary of technical terms, acronyms and abbreviations should be provided before the main text of the EIS.

# 1 Introduction

The introduction should 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 meet the level of approval being sought. It should also define the audience to whom it is directed, and contain an overview of the structure of the document. Throughout the EIS, factual information contained in the document should be referenced.

## 1.1 Project proponent

Details of the project proponents should be listed, including details of any joint venture partners. This section should describe the experience of the project proponent, including the nature and extent of business activities, experience and qualifications, role and responsibilities and environmental record, including the proponent's environmental policy.

## 1.2 Project description

A brief description of the key elements of the project should be provided for all relevant petroleum activities for the project. Any major associated infrastructure requirements should also be summarised. Detailed descriptions of the project should follow in section 3.

This section should also describe how the project relates to other relevant existing or proposed projects and any interdependency between these projects.

## 1.3 Project objectives and scope

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

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

## 1.4 The EIS process

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

### 1.4.1 Methodology of the EIS

This section should provide a description of the EIS process steps, timing and decisions to be made for relevant stages of the project. A brief description should be provided of studies or surveys that have been undertaken to help develop the project and prepare the EIS. This should refer to relevant previous baseline studies or investigations. This section should also show how the consultation process (which will be described in detail in section 1.5) would integrate with the other components of the impact assessment, including the stages, timing and mechanisms for public input and participation.

The information in this section is required to ensure:

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

## 1.4.2 Objectives of the EIS

Having described the methodology of the EIS, a succinct statement should be made of the EIS objectives. The 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 impacts of the project, those matters will be included in the EIS.**

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

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

The EIS is a public document. Its purpose is to provide information to regulatory agencies and 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 should not assume that a reader would have prior knowledge of the project site and it should 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. It is necessary for all relevant sections of the EIS to provide details about the quality of the information given in the EIS, in particular:

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

The role of the EIS in providing the project's draft EM plan should also be discussed, with particular reference to the EM plan's role in providing management measures that can be carried over into conditions that would attach to any approvals, environmental authorities and permits for the project. The EM plan should also describe the standard operating procedures and site specific controls that will be implemented during the phases of the project—planning, design, construction, operation and progressive and final decommissioning/rehabilitation.

The EIS should outline when detailed information regarding the development will be made available, as part of future environmental authority applications and/or during negotiation of conduct and compensation agreements with impacted landholders.

## 1.4.3 Submissions

The reader should 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 should outline the methodology that will be adopted to identify baseline socio-economic conditions and to identify and address public, as well as interested and affected people's, concerns about the potential impacts of the project. Information about the consultation that has already taken place and its results should be provided.

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.

Consultation 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 and rehabilitation. Refer to the Department of Environment and Heritage Protection (EHP) guideline Issue Identification and Community Consultation.

An additional phase of public consultation may be required once specific environmental authorities are applied for and this section will also address how persons potentially affected by the activities proposed to be undertaken under that EA will be consulted.

## 1.6 Project approvals

### 1.6.1 Relevant legislation and policy requirements

This section should explain the legislation and policies controlling the approvals process. Reference should be made to the Queensland *Environmental Protection Act 1994*, *Sustainable Planning Act 2009* (where applicable) and other potentially relevant Queensland laws, such as

- *Petroleum and Gas (Production and Safety) Act 2004*
- *Water Act 2000*
- *Water Supply (Safety and Reliability) Act 2008*
- *Forestry Act 1959*
- *Transport Infrastructure Act 1994*
- *Vegetation Management Act 1999*
- *Nature Conservation Act 1992*
- *Strategic Cropping Land Act 2011*.

Identify all environmentally relevant activities that would be undertaken or required for the project, 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 or interfering with water, the *Nature Conservation Act 1992* for protected wildlife, or the *Vegetation Management Act 1999* for clearing) is not applicable, this section of the EIS should explain why.

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

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

## 1.6.2 Planning processes and standards

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

## 1.7 Accredited process for controlled actions under Commonwealth legislation

The project is a 'controlled action' (2012/6377) under the EPBC Act. SEWPaC has accredited Queensland's EIS process for the purposes of the Commonwealth assessment under the EPBC Act. The following matters of national environmental significance (MNES) were identified as the 'controlling provisions' when the project was declared a controlled action:

- listed threatened species and communities (sections 18 and 18A)
- listed migratory species (sections 20 and 20A).

The State's EIS 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 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. 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.

These terms of reference (TOR) outline how the EIS will assess the relevant impacts on matters of national environmental significance listed as controlling provisions. The information must be provided as a stand-alone report in the EIS that exclusively and fully addresses the matters relevant to the controlling provisions. Cross-referencing to other parts of the EIS should only be used where necessary.

The information provided on these matters must be consistent with any relevant publicly available policy guidance provided by SEWPaC.

Matters to be discussed in this stand-alone report or chapter must 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.

## 2 Project need and alternatives

### 2.1 Project justification

The justification for the project should be described, with particular reference to the economic and social benefits and costs to the community and other industries arising from the project, including employment and spin-off business development that the project may provide. The status of the project should be discussed in a regional, state and national context.

### 2.2 Alternatives to the project

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

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

Reasons for selecting the preferred options should include technical, commercial, social and natural environment aspects. In particular, the principles of ecologically sustainable development (ESD) and sustainable development should be included. The relationship of options chosen for managing waste and any emissions produced should be detailed.

This information is required to assess why the scope of the project was defined 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

This section aims to describe the project through its lifetime—planning, design, construction, operation and maintenance, and ongoing and final decommissioning and rehabilitation. This information is required to allow complete assessment of a project. It also allows further assessment of approvals that may be required and how they may be managed through the life of the project. Maps or figures showing the position of features or boundaries should use latitudes and longitudes on the GDA94 datum. These latitudes and longitudes should also be used in the text to describe the locations of any features that may be relevant to subsequent approvals. All features depicted on any maps or figures, such as watercourses and water storages, should be clearly and consistently labelled throughout the EIS, including all text and tables.

The EIS will need to discuss the uncertainty associated with the following aspects of implementing the project:

- timing of the development of the project
- nature and location of the project activities.

The uncertainty must be addressed in the description of the project and in fulfilling the requirements of sections 3.1 to 3.6.

### 3.1 Location

#### 3.1.1 Regional context

The regional context of the project should be described and illustrated on maps at suitable scales. Maps should show the project in relation to:

- major infrastructure including road and rail networks and infrastructure of major water service providers
- towns, sensitive receptors, etc.
- major watercourses and surface water bodies
- general topography.

#### 3.1.2 Local context

The EIS must assess the likely impacts of the proposed activities across the project area, including identifying potential areas to site infrastructure.

Accordingly, the local context of the project should be described and include cadastral information for properties within, and adjacent to, the project area. Maps, preferably with an air photo base, at suitable scales should be provided showing the location of the project area, and in particular:

- the location and boundaries of the project area
- the location and boundaries of land and resource tenures, in place or proposed, to which the project area is, or will be, subject
- the location of all existing activities already occurring within the project area that are to form part of the Bowen Gas Project, and the extent of disturbance for each activity
- potential areas for works and infrastructure associated with the project
- the locations of any adjacent project areas and tenures (of the proponent or otherwise), including any petroleum pipelines and facilities
- major transport corridors (including rail, rail level crossings and roads)
- estimates of how much clearing/disturbance is proposed within the environmentally sensitive areas

The maps included in this section should illustrate the project area in relation to the land and petroleum tenures and natural and built features of the area.

### **3.1.3 Relationship to other projects**

This section should describe how the project relates to, or integrates with, other relevant existing or proposed projects including gas field developments, pipeline and LNG projects that are not subject to this EIS process.

## **3.2 Construction**

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
- any major items of plant or infrastructure to be transported onto the construction sites
- methods and standards for crossing under rail and road corridors
- details of where construction personnel will be accommodated. In particular, describe and illustrate the number, size, locations and management of any workers camps or villages
- an indication of whether the proposed accommodation facilities would be likely to use existing infrastructure networks such as sewerage systems, electricity, water, communications etc.
- methods to be used to manage dust suppression during construction activities
- details of the type, estimated volumes and potential sources of extractive materials that will be needed for the construction of the project.

## **3.3 Operations**

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).

### **3.3.1 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.

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

### **3.3.2 Resource base, reserve life and extraction sequencing**

Summarise the results of studies and surveys undertaken to identify the gas resources required to implement the project. The location, volume, tonnage and quality of gas resources required should be described. Specific details should be provided for the:

- proposed progression of development across the project development area
- proposed life of field(s) and planned recovery of resources
- locations of any resources that would be sterilised by the planned activities

- quantity of resources to be extracted annually including any proposed ramping of production or staging of development
- proposed sequence and timing of extraction of the resource within the project area
- areas likely to be disturbed at each major stage of the project.

### **3.3.3 Gas field and facility development**

Specific details should be provided about:

- equipment and methods to be used to access the gas resource (drilling and well installation, etc.)
- equipment and processes for extracting the gas resource (depressurisation wells and gas extraction)
- equipment and processes for taking the gas from the well head to gas and associated water gathering systems (gas/water separation, piping and compression)
- gas gathering and main transmission lines as well as link lines to main distribution mains including any equipment needed for maintenance like pipe cleaning facilities
- major transport corridors (rail and road) crossed by gas gathering links and main transmission pipelines as identified in points 3 and 4
- chemicals to be used during drilling or extraction operations
- gas processing facilities (gas compression, dehydration and flaring/venting)
- associated water management including storage, treatment and disposal
- associated power generation facilities and/or power supply to provide electricity to the compression, water treatment and wellhead facilities.
- a high level overall water balance for the proposed development, covering extraction of coal seam gas water, treatment and beneficial use or disposal options.

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

### **3.3.4 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 and activities that will be undertaken; for example, the number of drillers, construction workers, operations and maintenance personnel required to install and operate production wells, gas compression and water treatment facilities.

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

### **3.3.5 Workforce accommodation**

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

### **3.3.6 Processing and products**

This section should describe the quantities and characteristics of the products produced from various project activities annually. Data on products, waste and recycling streams should be provided.

### **3.3.7 Ongoing evaluation and exploration activities**

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

## 3.4 Infrastructure requirements

This section should provide descriptions of typical infrastructure requirements to support the entire life cycle of the project (in addition to those described in section 3.3.3). 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, import locations and their associated haulage routes will also need to be identified and illustrated for the assessment purposes.

### 3.4.1 Transport—road/rail/air/ship

Provide an overview of the arrangements for the transport of plant, equipment, products, wastes and personnel over the full life cycle of the project. The description should cover the use of any existing facilities and all requirements for the construction, upgrading or relocation of any transport-related infrastructure.

### 3.4.2 Energy

The EIS should describe all energy requirements, including electricity, natural gas, and/or solid and liquid fuel requirements for the full life cycle of the project. Energy efficiency and conservation should be briefly described in the context of any Commonwealth, Queensland and local government policies.

### 3.4.3 Water supply and storage

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

Describe any approvals and water allocations the project may need under the *Water Act 2000* for water supply and storage.

Note: this section does not address extracting and managing water produced as a by-product of coal seam gas extraction.

### 3.4.4 Stormwater drainage

Provide a description of the typical stormwater drainage system and the proposed disposal arrangements for the gas treatment facilities, including any off-site services.

### 3.4.5 Sewerage

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

### 3.4.6 Telecommunications

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

### 3.4.7 Accommodation and other infrastructure

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

- camps, townships or residential developments
- fuel storage areas

- equipment hardstand and maintenance areas
- technical workshops and laboratories
- depots or offices.

## 3.5 Waste management

Provide an inventory of all waste to be generated, and identify re-use 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 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. Details on natural resource use efficiency (such as energy and water), integrated processing design, co-generation of power and by-product reuse as shown in a material/energy flow analysis should be described.

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

### 3.5.1 Air emissions

Describe in detail the quantity and quality of all air emissions (including particulates, fumes and odours) from the project during construction and operation. Particulate emissions include those that would be produced by any industrial process, or disturbance by wind action on stockpiles and conveyors, or by transportation equipment (including trucks or trains, either by entrainment from the load or by travel on unsealed roads). This section should also address air emissions associated with the flaring of gas from gas wells production activities, including proposed methods to reduce and/or capture air emissions.

This is addressed under section 4.6, which requires an air emission inventory.

### 3.5.2 Excavated waste

The main wastes of concern are:

- cuttings generated during drilling of exploration wells and installing production wells
- topsoil generated while preparing well sites, roads and facility sites
- waste cut/fill materials generated during construction of raw water, treated water and waste water dams.

The likely volumes, chemical and physical properties, and strategies for each of these excavated wastes (and any other excavated waste) should be described.

### 3.5.3 Solid waste disposal

Describe the typical quantity and quality of solid wastes generated over the full life cycle of the project, at each project location (other than waste rock and subsoil addressed in other sections) and the proposed methods of their disposal. The proposed location, site suitability, approvals required, dimensions and volume of any landfill, including its method of construction and management, should be shown.

### 3.5.4 Liquid waste

A description should be provided of the origin, quality and quantity of wastewater and any immiscible liquid wastes generated over the lifecycle of the project. Particular attention should be given to the capacity of wastes to generate acid, and saline or sodic wastewater.

The EIS will consider the following effects:

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

### 3.5.5 Associated water management

This section details the strategy for management of associated water produced as a by-product of extracting coal seam gas. The following should be considered, consistent with the requirements of section 310D(5) of the *Environmental Protection Act 1994* and the Coal Seam Gas Water Management Policy June 2010:

- the quantity of coal seam gas water the application reasonably expects will be generated in connection with the carrying out of each relevant CSG activity
- the flow rate at which the applicant reasonably expects the water will be generated
- the quality of the water, including changes in the water quality that the applicant reasonably expects will happen while each relevant CSG activity is carried out
- the proposed management of the water including the use, treatment, storage or disposal of the water
- the measurable criteria (the management criteria) against which the applicant will monitor and assess the effectiveness of the management of the water including criteria for each of the following:
  - the quantity and quality of the water used, treated, stored or disposed of
  - protection of the environmental values affected by each relevant CSG activity
  - the disposal of waste, including, for example, salt, generated from the management of the water
- the action that is proposed to be taken, if any of the management criteria are not satisfied, to ensure the criteria will be able to be satisfied in the future.

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 associated water throughout the treatment process, storages used for raw water, treated water and saline waste products.

Details should be provided on the measurable criteria (management criteria) against which the applicant will monitor and assess the effectiveness of the associated water management. Measureable criteria should be included for:

- quality and quantity of associated water that is treated, stored, used (including beneficial use) and/or discharged to the environment
- protection of environmental values affected by each relevant CSG activity
- the disposal of wastes including brine generated from the management of water.

Details should be provided on the proposed management action(s) to be taken if any of the measurable criteria are not satisfied.

### 3.6 Rehabilitation and decommissioning

This section should detail 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 (flowlines, 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.
- Detail of the impacts of the preferred rehabilitation strategy should be discussed in the appropriate subsections of section 4 (environmental values and management of impacts) particularly with regard to such issues as final landform stability (section 4.2.2) and rehabilitation of flora and habitat (section 4.8.2). Implications for the long-term use and fate of petroleum activity sites should also be addressed, particularly with regard to the on-site disposal of waste and the site's inclusion on the Environmental Management Register or Contaminated Land Register (if applicable).
- Details of the strategy to continue 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 and New Zealand Guidelines for Fresh and Marine Water Quality (ANZECC 2000). Environmental values may also be derived following recognised procedures, such as described in the ANZECC 2000 guidelines. Environmental values will be described by reference 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. Any likely environmental harm on the environmental values should be described.
- 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. Provide commitments to avoid or mitigate the potential impacts associated with the project. 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. Available techniques, including best practice, to control and manage impacts to the nominated objectives should be discussed. 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 should prevent, or where prevention is not possible, minimise environmental harm and maximise socio-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 project, 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 government, regional natural resource management bodies, local water boards or land care groups. Special attention should be given to those mitigation strategies designed to protect the values of any sensitive areas and any identified ecosystems of high conservation value within the area of possible project impact.

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

- Environmental values affected: describe the existing environmental values of the area to be affected including values and areas that may be affected by any cumulative impacts (refer to background studies in appendices—note such studies may be required over several seasons). It should be explained how the environmental values were derived (such as by citing published documents or by following a recognised procedure to derive the values).
- Impact on environmental values describe the likely impacts of the project on the identified environmental values of the area, including:
  - a detailed assessment of the nature and extent of the likely short term and long term impacts
  - a statement about whether any impacts are likely to be unknown, unpredictable or irreversible

- an analysis of the significance of the impacts
- any technical data and other information used or needed to make a detailed assessment of the impacts.
- The cumulative impacts of the project must be considered over time or in combination with other impacts in the dimensions of scale, intensity, duration or frequency of the impacts. In particular, any requirements and recommendations of the Commonwealth, relevant state planning policies, environmental protection policies, national environmental protection measures and integrated catchment management plans should be addressed.
- Cumulative impacts on the environmental values of land, air and water and cumulative impacts on public health and the health of terrestrial, aquatic ecosystems must be discussed in the relevant sections. This assessment may include airsheds and watersheds affected by the project and other projects competing for use of the local air and watersheds.
- 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. Such arrangements should be described in the EIS.
- Environmental protection objectives: describe qualitatively and quantitatively the proposed objectives for enhancing or protecting each environmental value. Include proposed indicators to be monitored to demonstrate the extent of achievement of the objective as well as the numerical standard that defines the achievement of the objective (this standard must be auditable). The measurable indicators and standards can be determined from legislation, support policies and government policies as well as the expected performance of control strategies. Objectives for progressive and final rehabilitation and managing contaminated land should be included.
- Control strategies to achieve the objectives: describe the control principles, proposed actions and technologies to be implemented that are likely to achieve the environmental protection objectives; include designs, relevant performance specifications of plant. Details are required to show that the expected performance is achievable and realistic.
- With regard to the project's proposed safeguards and mitigation measures, the EIS should include:
  - a description, and an assessment of the expected or predicted effectiveness, of the mitigation measures for dealing with the project's relevant impacts
  - any statutory or policy basis for the mitigation measures.
- Environmental offsets: Information is required to show that measures have been taken to avoid and minimise potential adverse impacts of the project. A strategy to develop environmental offsets may be proposed to counterbalance any remaining loss of environmental values, consistent with relevant offset policies including the Queensland Government Environmental Offset Policy 2008, Queensland Biodiversity Offset Policy (2011), and the *Environment Protection and Biodiversity Conservation Act 1999* Environmental Offsets Policy (2012).
- 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.
- 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.
- The environmental protection commitments developed in the main body of the EIS should all be included in a draft environmental management plan (EM plan) that provides:
  - the framework for continuing management, mitigation and monitoring programs for the project's relevant impacts, including any provision for independent environmental auditing

- the name of the entity responsible for endorsing or approving each mitigation measure or monitoring program.
- a consolidated list of mitigation measures proposed to be undertaken to prevent, minimise or compensate for the project's relevant impacts.
- **Information quality:** information given under each element should also state the sources of the information, how recent the information is, how any background studies were undertaken (including intensity of field work sampling), how the reliability of the information was tested, and what uncertainties (if any) there are in the information.

Where detailed information about the location of infrastructure cannot be provided, the EIS must deliver a statement of the potential foreseeable maximum impact on all terrestrial ecology environmental values resulting from foreseeable project activities after effective mitigation measures have been applied.

The EIS should describe the design process adopted by the proponent and provide details of information to be provided following the EIS process, when the information will be available (approval, planning or development stage), how that information will inform the assessment of impacts, and how detailed information about the impacts and proposed management measures will be made available to assessment agencies, regulatory authorities, interested and affected people, and the broader community.

An indicative development timeframe should be presented in the EIS and indicate the conceptual timing of production facilities and gas fields, as the preliminary reference case. Particular emphasis should be placed on the gas fields and petroleum leases to be brought into production as part of the initial development plan. Where design has progressed and more detailed information is available, that information should be presented in the EIS or in the supplementary report to the EIS. The EIS should outline when detailed information regarding the development will be made available, as part of future environmental authority applications and/or during negotiation of conduct and compensation agreements with impacted landholders.

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 should be used to develop the environmental monitoring program for the project (see section 6).

## 4.1 Climate

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

The potential impacts due to climatic factors will be addressed in the relevant sections of the EIS. The impacts of rainfall on soil erosion should be addressed in section 4.2. The impacts of storm events on the capacity of waste containment systems (including site bunding/stormwater management) should be addressed in section 4.5 with regard to contamination of waterways and in section 4.4 with regard to the design of the waste containment systems. The impacts of winds, rain, humidity, and temperature inversions on air quality 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 potential to impact on developments designed now. Most developments involve the transfer to, or use by, a proponent of a community resource in one form or another, such as the granting of a non-renewable resource or the approval to discharge contaminants to air, water or land. Therefore, it is important that the project design be adaptive to climate change so that community resources are not depreciated by projects that would be abandoned or require costly modification before their potential to provide a full return to the community is realised. Consequently, the EIS should provide an

assessment of the project's vulnerabilities to climate change and describe possible adaptation strategies for the activity including:

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

While predictions of climate change and its effects have inherent uncertainties, a balance must be found between the costs of preparing for climate change and the uncertainty of outcomes.

Nevertheless, proponents should use their best efforts to incorporate adaptation to climate change in their EIS and project design.

## 4.2 Land

### 4.2.1 Description of environmental values

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

#### 4.2.1.1 Topography/geomorphology

The topography of the project area and any other potentially impacted area should be detailed with contours at suitable increments, shown with respect to Australian Height Datum (AHD) and drafted to the Geocentric Datum of Australia (GDA) 94 datum. Significant features of the locality should be included on the maps. Such features would include any locations subsequently referred to in the EIS (including the nearest noise sensitive locations) that are not included on other maps in section 4.2. Commentary on the maps should be provided, highlighting the significant topographical features.

#### 4.2.1.2 Land use

The EIS should describe current land tenures and land uses, including native title issues, in the project area, with particular mention of land with special attributes or that is used for special purposes. The location and owner/custodians of native title in the area and details of native title claims should be shown.

Maps showing existing land uses and tenures at a regional scale, and the project location, should be provided for the project area and surrounding land that could be affected by the development. The maps should identify areas of conservation value that may be impacted by the project. The location of existing dwellings and the zoning of all affected lands according to any existing town or strategic plan should also be mapped.

Describe the land use suitability of the affected area, in terms of the physical and economic attributes. The assessment should set out soil and landform subclasses assigned to soil mapping units in order to derive land suitability classes.

Provide a land suitability map of the proposed and adjacent area, and setting out land suitability and current land uses, such as grazing of native and improved pastures and horticulture. Land classified as good quality agricultural land in the 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.

Include a description, with the aid of maps and tables, of key resource areas and other significant existing extractive industries.

#### **4.2.1.3 Geology**

The EIS should provide a description, map and a series of cross-sections of the geology of the project area, with particular reference to the physical and chemical properties of surface and sub-surface materials and geological structures within the proposed areas of disturbance, including areas outside the project site that could be influenced by the project's activities (such as depressurisation). 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 should be described. In locations where the age and type of geology is such that significant fossil specimens (such as of dinosaurs or their tracks) may be uncovered during construction or operations, the EIS should address the potential for significant finds.

#### **4.2.1.4 Gas resources and reserves**

The EIS should provide a summary of the results of studies and surveys undertaken to identify and delineate the gas resources within the project area.

The location, quantity and quality of the gas resources and reserves within the project area should be described in detail as indicated below and include the modifying factors and assumptions made in arriving at the estimates.

The gas resources should be estimated and reported in accordance with the 2007 Petroleum Resources Management System approved by the Society of Petroleum Engineers (SPE-PRMS) and World Petroleum Council (WPC), American Association of Petroleum Geologists (AAPG) and Society of Petroleum Evaluation Engineers (SPEE).

In addition, maps (at appropriate scales) should be provided 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 production including water storage facilities and other infrastructure
- the location of any proposed buffers, surrounding the working areas
- any part of the resource not intended to be extracted and any part of the resource that may be sterilised by the proposed production operations or infrastructure.

The EIS should consider information on any known occurrences of economic mineralisation and extractive resources, petroleum and gas deposits within the project area and the potential impact of the project on these operations and associated tenements.

#### **4.2.1.5 Soils**

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

An assessment of the need for acid sulphate soil investigations should be carried out. If investigations and/or management of acid sulphate soils are required, these would be carried out according to the Queensland Acid Sulphate Soils Management Advisory Committee (QASSMAC) guidelines. The guideline to State Planning Policy 2/02: Planning and Managing Development Involving Acid Sulphate Soils should also be addressed (including identification, management and format of environmental management plans).

Soil profiles should be mapped at a suitable scale. Steps will be outlined to address potential soils impacts over the course of the project development in considering 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).

On-ground surveys and laboratory analyses should be conducted to provide physical and chemical analysis of soil types.

#### **4.2.1.6 Land suitabilities**

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

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

Describe and illustrate the usual agricultural use of the land of the project site and the surrounding area, including any crop rotations.

The project site falls within a strategic cropping land (SCL) western cropping zone, and the department's Trigger Map for Strategic Cropping Land in Queensland indicates the presence of SCL within the project area. The EIS should include an assessment of SCL in accordance with the *Strategic Cropping Land Act 2011* and its Regulations.

#### **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. Identify the potential nature and frequency of contaminated sites in project areas and assess the likelihood of contaminated sites occurring within the areas likely to be disturbed by project activities

#### **4.2.1.8 Infrastructure**

The location and owner/custodians of all existing tenures, reserves, roads and road reserves, railways, rail level crossings to be used and rail reserves, power lines, stock routes and the like, covering the project area should be shown on maps of a suitable scale. Indicate locations of proposed gas and water pipelines, power lines and any other easements.

#### **4.2.1.9 Environmentally sensitive areas**

The proximity of the project to any category A or B environmentally sensitive areas as defined under the Environmental Protection Regulation 2008 should be shown on a map of suitable scale. The proximity of the project to any of the following environmentally sensitive areas should also be provided:

- nature refuges as defined under the *Nature Conservation Act 1992*
- koala habitat areas as defined under the Nature Conservation (Koala) Conservation Plan 2006
- state forests or timber reserves as defined under the *Forestry Act 1959*
- declared catchment areas under the *Water Act 2000*
- resources reserves under the *Nature Conservation Act 1992*
- an area identified as 'essential habitat' or 'essential regrowth habitat' under the *Vegetation Management Act 1999* for a species of wildlife listed as endangered, vulnerable, rare or near threatened under the *Nature Conservation Act 1992*
- 'of concern' regional ecosystems identified in the database called 'RE description database' containing regional ecosystem numbers and descriptions
- threshold regional ecosystems as defined and listed in Appendix 6 of the Queensland Biodiversity Offsets Policy
- critically limited regional ecosystems as defined and listed in Appendix 5 of the Queensland Biodiversity Offsets Policy.

This section of the EIS should then identify whether any of those environmentally sensitive areas could be affected, directly or indirectly, by the project.

In particular, the EIS should indicate if the land affected by the project is, or is likely, to become part of the protected area estate, or is subject to any treaty.

#### **4.2.1.10 Landscape character**

This section should describe in general terms the existing character of the landscape that will be affected by the project. Landscape character in this context is defined as the distinct, recognisable and consistent pattern of elements that make one area unique or different from another, including any changes that have already been made to the natural landscape since European settlement. It should ‘set the scene’ for the description and assessment of potential impacts on views and 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, including any particular features or characteristics considered to contribute to the ‘sense of place’, while the visual amenity section addresses potential impacts on likely viewers (such as panoramas from constructed lookouts, designated scenic routes) that has amenity value.

#### **4.2.1.11 Visual amenity**

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

- identifying elements within the project and surrounding area that contribute to the image of the town/city or landscape as discussed in the any local government strategic plan—within city image and townscape/landscape objectives and associated maps
- important views, view sheds, existing viewing outlooks, ridgelines and other features contributing to the scenic amenity of the area
- high-level consideration of representative views, from 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 existing visual quality of the area and the project site
- character of the local and surrounding areas including character of settlement (pattern, scale, built form materials and colours) and landscape (natural and cultural vegetation) and land use
- identifying 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 visual function of existing vegetation including use as a visual screen.

### **4.2.2 Potential impacts and mitigation measures**

This section defines and describes the objectives and practical measures to protect or enhance the land-based environmental values identified through the studies outlined in the previous section. It should describe how nominated quantitative standards and indicators may be achieved, and how the achievement of the objectives will be monitored, audited and managed. Potential impacts pertaining to existing and proposed infrastructure such as roads, railways and rail level crossings, power lines, and stock routes shall be identified and mitigation strategies outlined.

#### **4.2.2.1 Resource utilisation**

With regard to resource stewardship, analyse the effectiveness of the proposal in achieving the optimum utilisation of the CSG resource within the project area and consider its impacts on other resources. Demonstrate that the proposal will best develop the CSG resources within the project area, minimise resource wastage and avoid any unnecessary sterilisation of these or any other of the state’s coal, mineral, petroleum (including gas and coal seam methane), geothermal, and GHG storage and extractive resources that may be impacted upon or sterilised by the proposed activities or related infrastructure.

#### 4.2.2.2 Land use and suitability

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

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

Describe the potential changes to existing and potential land uses due to the construction and operation of the project. In particular, describe the impacts on land uses and human activities within and adjacent to the project site and strategies for mitigation, such as those required by:

- State Planning Policy 1/12: Protection of Queensland's Strategic Cropping land (for planning and development assessment under the Sustainable Planning Act 2009)
- The *Strategic Cropping Land Act 2011* and Strategic Cropping Land Regulation 2011.

Outline incompatible land uses, whether existing or potential, on and 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. These should be identified and measures to avoid unacceptable impacts defined.

#### 4.2.2.3 Land disturbance

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 timeframes. The methods to be used for the project, including backfilling, covering, re-contouring, topsoil handling and revegetation, should be described.

However, a description of erosion and sediment control could be deferred to section 4.2.2.5. Any proposals to disturb land that would impede or divert overland flow or waterways, and any subsequent reinstatement, during construction or operations should be first described in this section. However, the potential impacts of interfering with flow on the quantity and quality of water resources should be assessed in section 4.5. Also, the final drainage and seepage control systems and any long-term monitoring plans should be described.

In addition to assessing the operational phase of land disturbance, the EIS should address the ultimate changes following implementation of the decommissioning and rehabilitation plan described in section 3.6. The EIS should detail the proposed long-term changes that will occur to the land after petroleum activities cease compared to the situation before activities commenced. Those changes should be illustrated on maps at a suitable scale and with contours at intervals sufficient to assess the likely drainage pattern for ground and surface waters (though 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 sites 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.

#### **4.2.2.4 Land contamination**

The EIS should:

- 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 the Queensland Government's draft guidelines for the assessment and management of contaminated land in Queensland
- provide a documented strategy for minimising the contamination of land through the life of the development (exploration, construction, operations and decommissioning).

The following information in relation to land contamination is required in the EIS:

- a description of the nature and extent of any contamination likely to occur in the project area
- a remediation plan (including validation sampling) to be undertaken prior to land disturbance if project works are proposed within a contaminated site.

The EIS should describe the possible contamination of land from aspects of the project including waste, and spills at chemical and fuel storage areas. Means of preventing and managing land contamination resulting from project activities should be described.

Assess any activities or proposed contamination that would result in the land being newly entered on the Environmental Management Register (EMR) or the Contaminated Land Register (CLR). Also assess the consequences, particularly for the subsequent landholder, of any intention to leave the site on either register when gas extraction ceases.

#### **4.2.2.5 Erosion and stability**

For all permanent and temporary landforms, possible 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, should also be outlined. Mitigation strategies should be developed to achieve acceptable soil loss rates, levels of sediment in rainfall runoff and wind-generated dust concentrations.

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

- areas cleared of vegetation
- stockpiles
- dams, banks and creek crossings
- the plant site, including buildings
- access roads or other transport corridors (including rail corridor and rail level crossings)
- bores
- pipelines for gas or water
- electricity transmission corridors.

Methods proposed to prevent or control erosion will be specified and will be developed with regard to (a) the long-term stability of disturbed areas, (b) preventing soil loss in order to maintain land capability/suitability and (c) preventing significant degradation of local waterways by suspended solids. Erosion control measures will be developed into an erosion and sediment control plan for inclusion in the EM plan.

Acid sulphate soils are characteristically found in coastal areas at elevations less than 5 m. They can also occur at higher elevations inland, where pyrite conditions are present, and where there are organically rich deposits on the edges of lakes and waterways. It is recognised that such conditions are highly unlikely to occur in the proposed development area. Managing acid sulphate soils should be based on assessment in accordance with the Guidelines for Sampling and Analysis of Lowland Acid Sulphate Soils (ASS) in Queensland 1998 and management and monitoring plans prepared in consultation with EHP officers.

#### **4.2.2.6 Landscape character**

Describe the potential impacts of the project upon the landscape character of the development area and the surrounding area. Particular mention should be made of any changes to the broad-scale topography and vegetation character of the area, such as due to broad-scale clearing.

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

#### **4.2.2.7 Visual amenity**

This section should analyse and discuss the visual impact of the project on views and visual amenity. It should be written in terms of the extent and significance of the changes to the view as experienced. Such views should be representative of public and private viewpoints, including places of residence, work, and recreation, from road, cycle and walkways, from the air and other known vantage points day and night and during all stages of the project as it relates to the surrounding landscape.

The assessment is to address the visual impacts of the project structures and associated infrastructure, using appropriate simulation. Sketches, diagrams, computer imaging and photos are to be used where possible to portray the near views and far views of the completed structures and their surroundings from visually sensitive locations including public roads, public thoroughfares, and places of residence or work, which are within the line of sight of the project.

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

#### **4.2.2.8 Lighting**

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

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

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

### **4.3 Transport**

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

#### **4.3.1 Description of existing infrastructure and values**

Provide details on 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. Also provide details, either in the transport section of the EIS or by cross reference to other sections, of the environmental values which would be affected by the altered use of existing transport infrastructure or the construction of new or altered infrastructure. The EIS should provide details of any project-related plant or utilities including gas pipelines, well infrastructure, gathering systems and overhead or underground power lines within, or impacting on, the jurisdiction of any transport authority. Also provide details of the likely traffic to be generated by workforce personnel and service providers.

For road and rail transport, describe the existing or new road and rail network that would be used by the project. Provide illustrations of the networks at suitable scales. Maps shall include (but not be limited to) the following:

- existing local and state-controlled roads network systems
- location of existing towns and sensitive receptors
- surrounding land uses including other major developments.

For each mode of transport and each phase of the project, the EIS should describe the expected volumes and weights of materials, products, hazardous goods or wastes, the likely number and timing of trips, the types of vehicles to be used and the routes. With consideration of the area of the project and the dispersed nature of the associated infrastructure, the description should include details of access roads, realignments, rail loops and loadout facilities, and level crossings used by any transport associated with the project. 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.

Where it is not possible to provide specific details of this nature, the EIS should provide an indication of the types of transport infrastructure and activity that could reasonably be expected for various petroleum activities (such as building a gas compression or water treatment facility).

In relation to air transport, describe the existing, new, and/or altered air fields and associated infrastructure that would be used by 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 flares beneath flight paths).

In relation to importing or exporting materials and products, the EIS should identify any aspects of the project that will increase the shipment of materials through any port. Details should be provided of the ports that would be used, the berths at those ports, likely size and number of vessels, and the associated infrastructure that moves and stores materials between the ships and the rail and/or road networks.

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

The EIS should 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, sufficient information should be provided to make an independent assessment of how transport used by the project will impact on environmental values. In both cases, the impacts along the whole length of each affected route should be discussed and measures proposed to avoid or mitigate the impacts. The following details should be provided:

- 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—this will include the use of the Australian Level Crossing Assessment Model (ALCAM) to assess impacts to level crossings
- 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.

The EIS should assess any impacts on stock routes due to the projects activities. Mitigation measures should be proposed for any disruptions to movement of travelling stock on stock routes. This section of the EIS should also outline, and cross-reference 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 should be in accordance with the latest version of the Department of Transport and Main Road's Guidelines for Assessment of Road Impacts of Development, available from the website [www.mainroads.qld.gov.au](http://www.mainroads.qld.gov.au).

Provide details of any heavy or oversized loads, including the number and type of vehicles, with a description of the likely timing and routes of those to be generated by workforce personnel and service providers. Where it is not possible to provide specific details of this nature, the EIS should provide an indication of the types of transport infrastructure and activity that could reasonably be expected for various petroleum activities (such as building a gas compression or water treatment facility).

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

- the safety, efficiency and condition of road operations and assets, including driver fatigue school bus routes, pavements, structures and so on
- 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 should 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 (due to dust, noise and vibration), will also consider the following matters:

- impacts at interface points with other private and public transport pathways such as roadway level crossings or occupational crossings (that is, those crossings that form part of private access pathways to and from residential or business sites)
- impacts on passenger transport and services
- requirements for any approvals needed for rail crossings by roads or other infrastructure.

The EIS should assess impacts on any port caused by the import of construction materials or equipment. Matters to be assessed should include the need for:

- new coastal works, such as berth construction or alteration, land reclamation, etc
- any dredging for shipping channels and swing basins
- new or altered stockpile areas
- new or altered, or increased use of existing, infrastructure to handle materials between ships and road or rail transport.

The EIS should assess any impacts of the project on existing air fields and associated infrastructure that would be needed for the project. The likely additional number of flights, frequency, timing (particularly any increase in night arrivals or take-offs), and size of aircraft should be described, along with any features of the project that could impact on air transport (like the placement of waste dumps, stacks or flares beneath flight paths).

The EIS should 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 project and assessment should have regard to State Planning Policy 1/02: Development in the Vicinity of Certain Airports and Aviation Facilities. With regard to air safety, matters to be assessed include 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 should 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 should clearly identify the entity that will be responsible and what approvals would be needed. Nevertheless, in this case, the EIS should 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.

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

- details on the timing of the works
- estimates of costs or evidence to demonstrate the feasibility of the proposed mitigation strategies
- the framework to be applied to identify and implement appropriate mitigation strategies for the project, as infrastructure locations are progressively determined
- a summary of relevant approvals and legislative requirements needed to implement mitigation strategies and transport infrastructure works required by the project.

The EIS should also consider public transport requirements and links to, or development of pedestrian and cycle networks.

## 4.4 Waste

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

### 4.4.1 Description of environmental values

This section should introduce and briefly describe the existing environment values that may be affected by the projects' wastes. Refer to each of the waste streams described in section 3.5 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 part 4 of the EIS.

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

As part of the description, unless issues related to excavated waste have been addressed in section 3.5 (in which case reference will be made to the appropriate subsection), this section should provide details of each waste in terms of:

- operational handling and fate of all wastes including storage
- on-site treatment methods proposed for the wastes
- methods of disposal (including the need to transport wastes off-site for disposal) proposed to be used for any trade wastes, liquid wastes and solid wastes
- 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.

The EIS should indicate the results of investigating the feasibility of using waste minimisation and cleaner technology options during all phases of the project. Waste minimisation and treatment, and applying cleaner production techniques, should also be applied to gaseous wastes, particularly methane, nitrogen oxides, sulphur oxides, particulates and carbon dioxide. Particular attention should be paid to measures that will maximise energy efficiency and minimise internal energy consumption by the project.

Cleaner production waste management planning should be detailed especially as to how these concepts have been applied to preventing or minimising environmental impacts at each stage of the project. 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 are required.

## 4.5 Water

### 4.5.1 Description of environmental values

This section describes the existing environmental values of water resources that may be affected by the project as defined or considered in such documents as the *Fisheries Act 1994*, the *Environmental Protection Act 1994*, Environmental Protection (Water) Policy 2009 (EPP (Water)), ANZECC 2000, the National Water Quality Management Strategy (NWQMS), the Queensland Government guidelines: Establishing Draft Environmental Values and Water Quality Objectives and the Queensland Water Quality Guidelines 2009. The definition of waters in the EPP (Water) includes the bed and banks of waters, so this section should address benthic sediments as well as the water column.

#### 4.5.1.1 Surface waterways

A description should be given of the surface watercourses, overland flow, and palustrine and lacustrine wetlands. The description should address their quality and quantity in the area affected by the project with an outline of the significance of these waters to the river catchment system in which they occur. Details provided should include a description of existing surface drainage patterns, and flows in major streams and wetlands. Also provide details of the likelihood of flooding, history of flooding including extent, levels and frequency, and a description of present and potential water uses downstream of the areas affected by the project. The description should include mapping, at a suitable scale, of any watercourses, drainage pathways, wetlands on a sub-catchment basis.

Flood studies should include a range of annual exceedance probabilities for affected waterways, based on observed data if available, or use appropriate modelling techniques and conservative assumptions if there are no suitable observations. The flood assessment should, where possible, include local flooding due to short-duration events from contributing catchments on site/s, as well as larger scale regional flooding including waterways downstream.

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

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.

An assessment is required of existing water quality in surface waters and wetlands likely to be affected by the project. The basis for this assessment should be a monitoring program, with sampling stations located upstream (that would not be impacted by the project/similar activity) and downstream of the project. Monitoring will include sites closest to the proposed discharge points and at downstream locations that would be below any mixing zone. Sites will include permanent and semi-permanent water holes, known aquatic habitat, weirs or reservoirs, where access can be secured. Complementary stream-flow data should also be obtained from historical records (if available) to aid interpretation.

If discharge of significant quantities of water to local waterways is proposed, and where data exists, describe the flow regime for the receiving environment using plots of flow (cumecs) versus flow duration (percentage) to identify the flow duration of event high-flow, base-flow and no-flow periods to characterise the receiving environment. Describe seasonal variations in water quality and variations with flow. Estimate the event flow trigger for environmentally significant analytes in each receiving waterway based on this observed variation (plot flow against environmentally significant analytes). The event flow trigger is the flow at which environmentally significant analytes increase and begin to exceed the applicable high flow water quality objective. The event flow trigger can also be any flow above this point. This data should be used in the following section of the EIS to determine the appropriate conditions for the release of associated water into the receiving environment.

All sampling should be in accordance with the recognised best methodology for the specific requirements of the sampling program, such as the Queensland Sampling Manual which is consistent with nationally accepted standard such as the National Water Quality Management Strategy (ANZECC and ARMCANZ, 2000b)

The water quality should be described, including seasonal variations or variations with flow where applicable, with an outline of the significance of these waters to the river catchment system in which they occur. Monitoring of ephemeral streams should focus primarily on all times of natural flow. A relevant range of physical, chemical and biological parameters should be measured to gauge environmental harm on any affected creek or wetland system. This will include but not necessarily be limited to water quality indicators likely to be affected by the project, such as electrical conductivity, total and dissolved metals, turbidity, suspended sediments and pH. Biological indicators should include macro-invertebrate surveys undertaken at appropriate locations according to best practice methods. Where representative sampling is not possible within the duration of the study (due to the seasonal idiosyncrasies of the regional climate) the assumptions made with respect to seasonal variation should be clearly stated. Assumptions must consider existing literature and other publicly available information. All sampling will be performed in accordance with the Monitoring and Sampling Manual 2009 Version 2 (DERM, 2010) or the most current edition.

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 and 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 EPP (Water), ANZECC & ARMCANZ Water Quality Guidelines (2000), the Queensland Water Quality Guidelines (2009) and local reference data.

#### **4.5.1.2 Groundwater**

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, including components that are required under section 379 of the Water Act such as:
  - location of the spring
  - assessment of connectivity between the spring and the aquifer over which the spring is located
  - predicted risk to the ecosystem and cultural and spiritual values of the spring because of a decline in water level of the aquifer
  - options available to prevent or mitigate impact.
- 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 and commitment for gathering baseline data from existing groundwater supply facilities (bores, wells, etc) for future field development areas
- target formation from which the bore is extracting water
- authorisation type (e.g. irrigation, stock and domestic, etc)

- estimated water extraction
- maps showing all water bores in the area (s. 376 d of Water Act).

A review of publicly available data on existing groundwater supply facilities should be undertaken. The information to be gathered for analysis should where available, include:

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

A monitoring program, including a network of observation points that would satisfactorily monitor groundwater resources both before and after commencement of operations, should be developed and described in the EIS.

This section of the EIS should address the nature and hydrology 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)
- groundwater yield
- groundwater quality
- interaction with surface water
- interaction with saline water
- possible sources of recharge
- vulnerability to pollution
- potential for existing interconnectivity between aquifers
- potential for interconnectivity between aquifers caused by and/or following drilling and stimulation activities
- potential for changes in water quality and water quantity in adjacent aquifers caused by and/or following drilling and stimulation activities.

Outline a strategy to develop 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, metals, alkalinity, hardness, dissolved gases and any potentially toxic or harmful substances that would not be removed by reverse osmosis treatment.

The EIS should describe the environmental values of the underground waters of the affected area in terms of the values identified in the Environmental Protection (Water) Policy.

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

This section is to assess potential impacts on water resource environmental values identified in the previous section. It will also define and describe the objectives and practical measures for protecting or enhancing water resource environmental values, to describe how nominated quantitative standards and indicators may be achieved, and how the achievement of the objectives will be monitored, audited and managed.

The EIS should describe the possible environmental harm caused by the proposed project to environmental values for water as expressed in the Environmental Protection (Water) Policy. The Queensland Government's operational policy Waste Water Discharge to Queensland Waters may be consulted for guidance on how discharge proposals will be assessed.

Where a licence or permit will be required under the *Water Act 2000* to take water or interfere with the flow of water, this section of the EIS should provide sufficient information and assessment for the administering authority to consider the suitability of approving any necessary works under the *Water Act 2000*. Similarly, waterway barrier works may need approval under the *Fisheries Act 1994* and compliance with the self-assessable codes for waterway barrier works (WWBW01 and WWBW02). If so, these should be addressed in the EIS.

Water management controls should be described, addressing surface and groundwater quality, quantity, drainage patterns and sediment movements. The beneficial (environmental, production and recreational) use of nearby surface and groundwater should be discussed, along with the 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 described.

Key water management strategy objectives include:

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

Conduct a risk assessment, based on conservative water quality estimates and hydrology, for uncontrolled emissions to water due to system or catastrophic failure, implications of such emissions for human health and natural ecosystems. Also provide detailed mitigation measures to prevent, minimise and contain impacts.

Provide an assessment of the potential for ground and surface water impacts on matters of national environmental significance listed as controlling provisions for the project, and propose measures to mitigate any impacts.

#### **4.5.2.1 Surface water and watercourses**

Assess the potential impacts to the environmental values of the surface water resource identified in section 4.5.1.1 . Define and describe the objectives and practical measures for protecting or enhancing the surface water resource environmental values. Provide a description of how the achievement of these objectives and practical measures will be monitored, audited and managed. 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*.

The hydrological impacts of the project should be assessed, particularly with regard to the various components of flow that may be impacted by the project. The EIS should address stream diversions (whether temporary or permanent), any changes to overland flows due to works or infrastructure; scouring and erosion, the consequent impacts of subsidence and changes to flooding levels and frequencies both upstream and downstream of the project. Any consequential impacts of changes to water flow (including variation in duration of low flow and no flow periods) or groundwater recharge should be addressed in the appropriate sections of the EIS. When flooding levels will be affected, modelling of afflux should be provided and illustrated with maps.

Provide a risk assessment of the potential impacts on surface waters (in the near-field or far-field) due to any controlled or uncontrolled discharges from the site. If controlled discharges are proposed, (a) stream flow data and information on discharge water quality (including any potential variation in discharge water quality) will be used in combination with proposed discharge rates to estimate in-stream dilution and water quality and (b) assessment should be provided of the available assimilative capacity of the receiving waters given existing background levels and other potential point source discharges in the catchment. Options for controlled discharge under times of natural stream flow should be investigated to ensure that adequate flushing of waste water is achieved.

Quality characteristics discussed should be those appropriate to the downstream and upstream water uses that may be affected, and should be supported by baseline data from local field studies of background water quality. Chemical and physical properties of any waste water (including concentrations of constituents) at the point of entering natural surface waters should be discussed along with toxicity of effluent constituents to human health, and plants and animals.

Reference should be made to the properties of the land disturbed and processing plant wastes, the technology for settling suspended clays from contaminated water, and the techniques to be employed to ensure that contaminated water is contained and successfully treated on the site. An assessment should be made of the potential impacts disposing of water from storages directly or indirectly to surface waterways.

In relation to water supply and usage, and wastewater disposal, the EIS should discuss anticipated flows of water to and from the project area. Where dams, weirs or ponds are proposed, the EIS should describe the intended capacity of the storages; 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 on site water management.

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

Assess the impacts on water resources of any dams and roads and other infrastructure related to the project and propose management measures for identified impacts.

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

The Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZECC 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.

Options for mitigation of impacts to environmental values of the surface water resource and the effectiveness of these mitigation measures should be discussed with particular reference to sediment, acidity, salinity and other emissions of a hazardous or toxic nature to human health, plants and animals. Include measureable criteria for the effectiveness of mitigation and/or management measures to prevent or minimise impacts to surface water quality and aquatic ecosystem health. Provide details of the proposed management actions to be taken if any of the measurable criteria are not satisfied.

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

#### **4.5.2.2 Groundwater**

The EIS should include an assessment of any potential environmental impacts caused by the project to local groundwater resources.

The EIS should provide information relating to the project's target down hole pressures, well head pressure and expected typical water pressure regimes as required to inform the groundwater impact assessment.

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

For each aquifer affected (s. 76b of Water Act), provide:

- a description of the aquifer
- details of how the aquifer interacts with other aquifers
- details of water level change expected due to the exercise of rights
- a map showing the area of the aquifer where the water level is predicted to decline because of the exercise of underground water rights.

An assessment should be undertaken of the impact of the project on the local ground water regime caused by the altered porosity and permeability of 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. Measures to prevent, mitigate and remediate such contamination should also be discussed.

The impact assessment should include, but not be limited to:

- details of the measured hydrogeological data; and model parameters, uncertainties, and confidence/reliability
- a site and regional water balance which provides basin and catchment scale context for the proposed action
- surface water and groundwater quantity and quality fluxes, including impacts of the proposal on the water resource, water balance and solute balance
- regional cumulative impacts of the proposed project and other relevant existing and proposed projects (covering surface water, groundwater, geomorphological, hydrological and ecological impacts)
- projections of potential future water level impacts (including the immediately affected area which triggers the make good obligations)
- a strategy for impact minimisation on private bores and sub-regional water level/pressure in aquifers
- a spring impact management strategy
- mitigation and management measures to appropriately address identified risks
- a monitoring program (in accordance with s. 378 of the Water Act) including:
  - a network of observation points
  - the quantity of water produced or taken because of the exercise of underground water rights
  - changes in the water level and the quality of water due to the exercise of underground water rights
  - parameters to be measured
  - frequency of measurements.

Any proposed models should also be peer reviewed and publicly released.

## 4.6 Air

### 4.6.1 Description of environmental values

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

A description of the existing airshed environment should be provided, having particular regard for particulates and gaseous and odorous compounds. The EIS should discuss the background levels and sources of 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.

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

The environmental values of the airshed for the affected area(s) should be described in terms of 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

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

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.
- Provide an air emission inventory of the proposed activities, including site for all potential point, line, area and volume sources including fugitive emissions.
- Provide 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 emissions to the atmosphere. The list should address SO<sub>x</sub>, NO<sub>x</sub>, VOC, CO, CO<sub>2</sub>, particulates (including dust), PM<sub>10</sub>, PM<sub>2.5</sub>, 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 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. The model input parameters must be based on the actual stack conditions for the licence conditions. Provide stack parameters such as stack height, diameter, temperature, exit velocity and volume flow rate. Estimate ground level concentration (GLC) at the nearest sensitive receptor/s based on the averaging periods and percentiles specified in the relevant guidelines for the measured parameters. Results of the dispersion modelling must be presented as concentration contour plots and frequency contour plots. The predicted average ground level concentration should be made for both normal and expected maximum emission conditions and the worst case meteorological conditions should be identified and modelled where necessary. The techniques used to obtain the predictions should be referenced, and key assumptions and data sets explained.
- 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.

- 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 distance/s 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 Queensland Government 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 sulphur 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.
- 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 sulphur 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.
- Assess how the proposed emission control processes accord with the management hierarchy for air emissions in the EPP(Air).
- Describe how the air quality objectives would be achieved, monitored and audited, and how corrective action would be taken when needed.

#### **4.6.2.1 Greenhouse gas emissions**

##### **4.6.2.1.1 Greenhouse gas inventory**

This section of the EIS should:

- detail the applicable international, national and state regulatory framework for greenhouse gas emissions, and which regulations would apply to emission sources associated with the proposed development
- provide an inventory of projected annual emissions for each relevant greenhouse gas, with total emissions expressed in ‘CO<sub>2</sub> equivalent’ (using global warming potentials defined in current National Greenhouse and Energy Reporting (NGER) legislation) 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

- describe method/s by which estimates were made
- present the CO<sub>2</sub> equivalent emissions as a percentage of Queensland's and Australia's annual greenhouse gas emissions
- include intended audit and critical review procedures.

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) can be used as the reference source for emission estimation and supplemented by other sources where practicable and appropriate.

#### 4.6.2.1.2 Greenhouse gas abatement

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

- a description of the proposed measures (alternatives and preferred) to avoid and/or minimise greenhouse gas emissions directly resulting from activities of the project, including such activities as transporting 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.

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

- minimising clearing at the site (which also has imperatives besides reducing greenhouse gas emissions)
- using less carbon-emitting transport modes or fuels
- integrating transport for the project with other local industries such that greenhouse gas emissions from building and running transport infrastructure are minimised
- maximising the use of renewable energy sources.
- co-locating coal extraction with coal seam methane used for energy production.

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

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

The environmental management plan in the EIS should include a specific module to address greenhouse abatement. That module should include:

- commitments to abate 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 or research into reducing the lifecycle and embodied energy carbon intensity of the project's processes or products
- opportunities for offsetting greenhouse emissions, including, if appropriate, carbon sequestration and renewable energy uses
- 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

This section of the EIS should 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.

If the proposed activity could adversely impact on the noise environment, baseline monitoring will be undertaken at typical sensitive receptors. Sensitive receptors are defined in the Environmental Protection (Noise) Policy 2008. The locations of sensitive receptors will be identified on a map at a suitable scale. The results of any baseline monitoring of noise and vibration in the proposed vicinity of the project should be stated.

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 Queensland Government guidelines, Australian Standards, and any relevant requirements of the Environmental Protection Regulation 2008 and the Environmental Protection (Noise) Policy 2008.

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

### 4.7.2 Potential impacts and mitigation measures

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

Information, including mapped noise contours from a suitable acoustic model, should be submitted based on the proposed generation of noise. The potential environmental harm of noise and vibration at theoretical sensitive receptors should be quantified in terms of distance from noise source, objectives, standards and indicators to be achieved. Particular consideration should be given to emissions of low-frequency noise, which includes noise components below 200Hz.

The assessment must include an assessment of noise on any nearby protected areas, which are defined as a sensitive receptor in the EPP (Noise). The assessment of impacts on protected areas should address not only the amenity of the areas as required by the EPP (Noise), but also the impacts on animals.

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

Information should be supplied on blasting 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. The magnitude, duration and frequency of any vibration should be discussed. A discussion should be provided of measures to prevent or minimise environmental nuisance and harm. Reference should be made to the Queensland Government guideline: *Noise and Vibration from Blasting*.

The assessment should also address off-site noise and vibration impacts that could arise due to increased road or rail transport directly resulting from the project.

## 4.8 Ecology

### 4.8.1 Description of environmental values

This section describes the existing environmental values for biodiversity that may be affected by the project.

Describe the environmental values for biodiversity for the affected area in terms of:

- biological diversity, including populations of endangered, vulnerable, and near threatened (EVNT) species
- integrity of ecological processes, including habitats of EVNT species
- integrity of landscapes and places, including wilderness and similar natural places
- aquatic and terrestrial ecosystems.

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.

Survey effort should be sufficient to identify, or adequately extrapolate, the plant and animal values over the seasons, particularly during and following a wet season. The surveys should account for the ephemeral nature of watercourses traversing the project area, and seasonal variation in animal populations.

The EIS should identify sensitive areas, or areas that may have low resilience to environmental change, near the project or its associated activities. Areas of special sensitivity include wetlands, wildlife breeding or roosting areas, any significant habitat or relevant bird flight paths for migratory species, bat roosting and breeding caves including existing structures such as adits and shafts, and habitat of threatened plants, animals and communities.

Areas regarded as sensitive with respect to plants and animals have one or more of the following features (and which should be identified, mapped, avoided or effects minimised):

- protected areas, including nature refuges, which have been proclaimed under the *Nature Conservation Act 1992* and *Marine Parks Act 1982* or are under consideration for proclamation:
- critical habitat identified under the *Nature Conservation Act 1992*
- vegetation mapped as essential habitat
- sites listed under international treaties such as Ramsar wetlands and World Heritage areas
- important habitats of species listed under the *Nature Conservation Act 1992* and/or Commonwealth EPBC Act as presumed extinct, endangered, critically endangered, vulnerable or near threatened
- regional ecosystems listed as 'endangered' or 'of concern' under Queensland legislation, and ecosystems listed as endangered, critically endangered or vulnerable under the Commonwealth EPBC Act
- good representative examples of remnant regional ecosystems or regional ecosystems which are described as having 'medium' or 'low' representation in the protected area estate as defined in the regional ecosystem description database (REDD) available on the EHP website
- high-value regrowth vegetation
- sites containing near-threatened or bio-regionally significant species or essential, viable habitat for near threatened or bio-regionally significant species

- sites in, or adjacent to, areas containing important resting, feeding or breeding sites for migratory species of conservation concern listed under the EPBC Act, and/or Convention of Migratory Species of Wild Animals, and/or bilateral agreements between Australia and Japan (JAMBA), Australia and China (CAMBA), or Australia and the Republic of Korea (ROKAMBA)
- sites containing common species that represent a distributional limit and are of scientific value, or which contain feeding, breeding, resting areas for populations of echidna, koala, platypus and other species of special cultural significance
- sites containing high biodiversity that are of a suitable size, or with connectivity to corridors/protected areas to ensure survival in the longer term, such land that may contain:
  - natural vegetation in good condition or other habitat in good condition (including wetlands)
  - degraded vegetation or other habitats that still supports high levels of biodiversity or acts as an important corridor for maintaining high levels of biodiversity in the area
  - a site containing other special ecological values, for example, high habitat diversity and areas of high endemism
  - ecosystems that provide important ecological functions such as wetlands of national, state and regional significance, such as riparian vegetation, or an important buffer to a protected area, or important habitat corridor between areas
  - sites of palaeontologic significance such as fossil sites
  - sites of geomorphological significance, such as lava tubes or karst
  - other areas containing state significant biodiversity values as defined by the Queensland Biodiversity Offsets Policy 2011.

The Queensland *Vegetation Management Act 1999* (VMA) and the findings of any regional vegetation management plan should also be referenced.

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

#### **4.8.1.1 Terrestrial vegetation**

Provide a map of terrestrial vegetation at a suitable scale with descriptions of the units mapped. Sensitive or important vegetation types should be highlighted, including riparian vegetation, and their value as animal habitat and for conservation of specific threatened plant and animal assemblages or community types. The existence of EVNT species should be specifically addressed. Surveys will be sufficient to identify, or adequately extrapolate, the plant and animal values over the range of seasons, particularly during and following a wet season and should address species, structure, assemblage, diversity and abundance. The description should contain a review of published information regarding the assessment of the significance of the vegetation to conservation, recreation, scientific, educational and historical interests.

The location of any horticultural crops in the vicinity of the site should be shown. The existence of important local and regional weed species (including declared species under the *Land Protection (Pest and Stock Route Management) Act (Qld) 2002*, and environmental or problem weed species identified within Commonwealth, Queensland or local government pest management plans) should also be discussed.

Vegetation mapping should be provided for all relevant project sites including new transport infrastructure and irrigation land if relevant. Adjacent areas should also be mapped to illustrate interconnectivity.

Mapping should also illustrate any larger scale interconnections between areas of remnant or regrowth vegetation where the project site includes a corridor connecting those other areas.

The terrestrial vegetation communities within the affected areas should be described at an appropriate scale with mapping produced from aerial photographs and ground truthing, showing the following:

- location and extent of vegetation types using regional ecosystem type descriptions in accordance with the Regional Ecosystem Description Database and as used by the *Vegetation Management Act 1999*

- location of vegetation types of conservation significance based on regional ecosystem types and occurrence of species listed as protected plants under the Nature Conservation (Wildlife) Regulation 2006 and any subsequent amendments, as well as areas subject to the *Vegetation Management Act 1999*
- the current extent (bioregional and catchment) of protected vegetation types of conservation significance within the protected area estate (national parks, conservation parks, resource reserves, nature refuges)
- any plant communities of cultural, commercial or recreational significance should be identified
- location and abundance of any exotic or weed species (including declared species under the *Land Protection (Pest and Stock Route Management) Act 2002*, and environmental or problem weed species identified within Commonwealth, Queensland or local government pest management plans).

Within each defined (standard system) vegetation community that has been identified through extensive desktop study as being impacted or potentially impacted by the development, a minimum of three sites (numbers should be discussed with EHP) should be surveyed for plant species, as follows:

- site data shall be recorded using the Queensland Herbarium methodology and proformas in the latest version of the Methodology for survey and mapping of regional ecosystems and vegetation communities in Queensland, (DERM, 2005)
- the minimum site size should be 10 by 50 metres
- a complete list of species present at each site should be recorded
- the relative abundance of plant species present should be recorded
- any plant species of conservation, cultural, commercial or recreational significance should be identified.

Plants that could not be identified during the survey need to be submitted to the Queensland Herbarium for identification. Voucher specimens of plant species of conservation significance, including those listed as protected plants under the Nature Conservation (Wildlife) Regulation 2006, other than common species, are to be submitted to the Queensland Herbarium for identification and entry into the HERBRECS database. These specimens should be collected with sufficient information to enable their lodgement as vouchers. A full list of these species will be furnished in the report.

Existing information on plant species may be used instead of new survey work, provided that the data is derived from recent previous surveys at the site consistent with the above methodology. Methodology used for vegetation surveys will be specified in the appendices to the report.

#### **4.8.1.2 Terrestrial wildlife**

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

- species diversity (in the form of a species list, including survey site lists) and abundance of animals, including amphibians, birds, reptiles and mammals
- habitat requirements and sensitivity to changes, including movement corridors and barriers to movement
- the existence of feral or exotic animals
- any threatened, near threatened or otherwise noteworthy species/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
- use of the area by migratory birds, nomadic birds, bats, and arboreal and ground-dwelling animals
- feral, pest or exotic animals.

A comprehensive vertebrate animal survey should be undertaken of the project area at a sampling intensity that supports the scale of vegetation mapping. Apart from the species recorded in the survey, an indicative list of all known and potential species and threatened species in the project area should be provided, by reference to the regional ecosystems within the project area and a 10 to 25 km buffer, and knowledge of species present in the local bioregion. The occurrence of wildlife of conservation significance should be geo-coded to mapped vegetation units or habitats, which can then be used in section 4.8.2 to propose areas to be protected or offset.

Surveys of terrestrial animals 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.

The EIS should indicate how well any affected communities are represented and protected elsewhere in the province where the site of the project occurs.

#### **4.8.1.3 Aquatic biology**

The aquatic plants and animals occurring in the areas affected by the project should be described, noting the patterns and distribution in the waterways and any associated wetlands and lacustrine and marine environments.

The description of the plants and animals present or likely to be present in the area should include:

- fish species, mammals, reptiles, amphibians, crustaceans and aquatic invertebrates, including exotic species, occurring in the waterways and wetlands within the affected area and potentially impacted habitat downstream of the project, including lacustrine and marine environments
- aquatic plants
- aquatic and benthic substrate.

Conduct a desktop assessment of the potential for stygofauna to occur within the zone of influence of the project proposal. The desktop study and a subsequent risk assessment will identify if there are any requirements for further detailed studies to assess potential impacts prior to project development. Such further studies will take account of the Western Australian Environmental Protection Authority – Guidance for the Assessment of Environmental Factors No. 53 (2003) and No. 54a (August 2007), or any more recent publication that supersedes these guidelines and in accordance with DNRM advice. Develop and describe suitable indicators for measuring ecological values, and objectives that would protect the environmental values from significant adverse impacts.

### **4.8.2 Potential impacts and mitigation measures**

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

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

The discussion should cover all likely direct and indirect environmental harm due to the project on plants and animals particularly in sensitive areas. Terrestrial and aquatic (marine and freshwater) environments should be covered and include human impacts and the control of any domestic animals introduced to the area.

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

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

The potential environmental harm to the ecological values of the area arising from building, operating and decommissioning the project, including clearing, salvaging or removing vegetation, should be described, and the indirect effects on remaining vegetation should be discussed. Short-term and long-term effects should be considered with comment on whether the impacts are reversible or irreversible. The environment's capacity to assimilate discharges/emissions should be assessed. The assessment should address the potential for impacts due to chronic, low-level exposure to contaminants or the bio-accumulation of contaminants.

Key plant, animal and ecosystem indicators should be identified for future monitoring.

The EIS should propose and describe in detail measures to be taken to avoid and minimise potential adverse impacts of the project on nature conservation and biodiversity values under a hierarchy of impact avoidance, impact minimisation, impact mitigation and biodiversity offsetting.

A biodiversity offsets strategy will be developed to characterise the ecological values that may require offsetting over the project duration to counter balance impacts that cannot otherwise be avoided, minimised or mitigated.

The biodiversity offsets strategy will outline steps required to develop specific property offset management plans in keeping with the requirements set out in the *Environment Protection and Biodiversity Conservation Act 1999* Environmental Offsets Policy 2012, and any applicable specific-issue offset policies under the framework of the Queensland Government Environmental Offset Policy (2008). Specific-issue offset policies that will be considered are:

- Queensland Biodiversity Offset Policy (DERM, 2011)
- Policy for Vegetation Management Offsets (DERM, 2011)
- Mitigation and Compensation for Works or Activities Causing Marine Fish Habitat Loss: Departmental Procedures, Fish Habitat Management Operational Policy, Queensland Department of Agriculture, Fisheries and Forestry, Marine fish habitat offset policy - FHMOP 005.2 2012.
- Offsets for Net Benefit to Koalas and Koala Habitat in the Nature Conservation (Koala) Conservation Plan 2006 and Management Program 2006 – 2016 (EPA, 2006).

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

The EIS should assess the potential impacts of wastes on animals at the site, particularly those related to any form of toxicants. Measures should be proposed to prevent harm. Providing buffer zones and movement corridors, and strategies to minimise environmental harm on migratory, nomadic and aquatic animals, should be discussed.

Consideration of the potential for recovery of millable timber on freehold land should be undertaken, with identification of how this consideration will be addressed during the development of the project,

Weed management strategies are required for containing existing weed species (including parthenium and other declared plants) and ensuring no new declared plants are introduced to the area. Feral animal management strategies and practices should also be addressed. The study should develop strategies to ensure that the project does not contribute to increased encroachment of a feral animal species or high biosecurity risk species. This should include a risk assessment of high biosecurity risk species and sites, and the development of threat mitigation plans for them, such as clean down and inspections at high-risk sites. Biosecurity management strategies should include mitigation measures relevant to protecting any potentially affected primary production areas. When determining control strategies, reference should be made to Biosecurity Queensland's Annual Pest Distribution Survey 2008 data, published biosecurity management strategies, Local Government Pest Management Plans and any applicable model local laws dealing with locally declared pest plants and animals.

The strategies for both plants and animals should be discussed in the main body of the EIS and provided in a working form in a Pest Management Plan as part of the overall EM plan for the project.

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

## 4.9 Cultural heritage

### 4.9.1 Description of environmental values

This section of the EIS should describe existing cultural heritage values that may be affected by the project, and include a description of the environmental values of the cultural landscapes of the affected area in terms of the physical and cultural integrity of the landforms.

Unless an exemption applies under s. 86 of the *Aboriginal Cultural Heritage Act 2003*, an Indigenous cultural heritage study must be undertaken in accordance with the requirements of part 7 of that Act.

An historical cultural heritage study will also be undertaken of the known and potential historical cultural heritage values of the affected area. The study will, as a minimum, include a desktop analysis and an archaeological investigation (such as a physical investigation) of the area potentially affected by the project.

This desktop component of the study should, as a minimum, review the following sources for information on historical cultural heritage values within the region of the project site:

- the Queensland Heritage Register, for places already protected under the *Queensland Heritage Act 1992*
- local government heritage registers, lists or inventories
- the results of previous cultural heritage studies conducted within the region of the project
- appropriate national and international guidelines for the descriptions of sites, places and regions.

The scope of the archaeological investigation should be based upon the results of the desktop analysis. The archaeological investigation is to be conducted by an appropriately qualified person, as required by the *Queensland Heritage Act 1992*, and should address all types of historical cultural heritage places located within the project area (including built, archaeological and cultural landscape values).

The discovery and protection of any previously unidentified archaeological artefacts or archaeological places during the course of the historical cultural heritage study must comply with part 9 of the *Queensland Heritage Act 1992*.

The EIS will include an assessment 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 EHP of any places or locales that are of potential state or local heritage significance not currently on the state or local heritage register.

### 4.9.2 Potential impacts and mitigation measures

This section defines and describes the objectives and practical measures for managing, protecting or enhancing cultural heritage values that may be affected by the project. It describes how practices may be implemented to appropriately manage those values, and how the achievement of the objectives will be monitored, audited and managed.

#### 4.9.2.1 Indigenous cultural heritage

Unless an exemption applies under s. 86 of the *Aboriginal Cultural Heritage Act 2003*, the potential impacts on Indigenous cultural heritage values in the vicinity of the project must be managed under a cultural heritage management plan (CHMP) developed and approved under part 7 of that Act.

Development of the CHMP should follow the guidelines gazetted under s. 85 of the *Aboriginal Cultural Heritage Act 2003*. EHP'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 heritage values and their avoidance or mitigation should also 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 should be negotiated with EHP and any other relevant interested and affected people.

The historical heritage management plan will at 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
- 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 the collection of any artefact material, including appropriate storage and conservation
- historical cultural heritage awareness training or programs for project staff.

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

## **4.10 Social values**

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

### **4.10.1 Description of social and cultural values**

#### **4.10.1.1 Social and cultural area**

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

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

#### **Community engagement**

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

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

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

#### 4.10.1.2 Social baseline study

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

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

- major population trends/changes irrespective of the project
- total population (the total enumerated population for the social and cultural area and full-time equivalent transient population), 18 years and older
- estimates of population growth and population forecasts for the proposals
- family structure
- age and gender distributions
- education, including schooling levels
- health and wellbeing measures
- cultural and ethnic characteristics
- Indigenous population including age and gender
- income including personal and household
- labour force by occupation and industry
- housing costs (monthly housing repayments (per cent of dwellings in each category), and weekly rent (per cent dwellings in each category), housing tenure type and landlord type, household and family type
- housing availability and affordability: the rental market (size, vacancy rate, seasonal variations, weekly rent by percentage dwellings in each category); the availability and typical costs of housing for purchase; monthly housing repayments by percentage dwellings in each category; and the availability of social housing
- disability prevalence
- the social and economic index for areas, index of disadvantage-score and relative ranking
- types and prevalence of crime, including domestic violence
- any other indicators determined through the community engagement process as relevant.

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

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

- use of the social and cultural area for forestry, fishing, recreation, business and industry, tourism, aquaculture, and Indigenous cultural use of flora and fauna.

Social, economic and cultural values are not as easily separated as physical and ecological values. Therefore it may be necessary for some material in this section to be cross-referenced with section 4.9, cultural heritage, and section 4.12, economy.

#### **4.10.1.3 Workforce profile**

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

##### **Workforce demand**

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

##### **Supply issues and strategies**

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

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

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

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

- Describe and summarise outcomes of community engagement processes including the likely response of the affected communities, including Indigenous people.
- Include sufficient data to enable affected local and state authorities to make informed decisions about the project's effect on their business and plan for the provision of social infrastructure in the project's social and cultural area. If the project is likely to result in a significant increase in the population of the area, then the proponent should consult the relevant management units of the state authorities and summarise the results of the consultations.
- Address direct, indirect and secondary impacts from any existing projects and the proposed project including an assessment of the size, significance, and likelihood of these impacts at the local and regional level.

Consider:

- key population and demographic shifts; disruptions to existing lifestyles, the health and social wellbeing of families and communities; social dysfunction including alcohol and drugs, crime, violence, and social or cultural disruption due to population influx
- the needs of vulnerable groups including women, children and young people, the aged and people with a disability
- Indigenous peoples, including cultural property issues

- local, regional and state labour markets during the construction and operational phases, with regard to the source of the workforce. Present this information according to occupational workforce groupings. Detail whether the proponent and/or contractors are likely to employ locally or through other means and whether there are initiatives for local employment business opportunities and how these workforce strategies relate and align to state and Commonwealth resource workforce planning, skill development and training strategies and policies
- proposed new skills and training related to the project including the occupational skill groups required and potential skill shortages anticipated
- how much service revenue and work from the project would be likely to flow to the project's social and cultural area
- impacts of construction and operational workforces, their families, and associated contractors on housing and accommodation availability and affordability, land use and land availability. Discuss the capability of existing housing and rental accommodation to meet any additional demands created by the project, including direct impacts on Indigenous people.

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

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

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

- recruitment and training of the construction and operational workforces and the social and cultural implications this may have for the host community, including if any part of the workforce is sourced from outside the social and cultural area
- housing and accommodation issues—the following core principles guide the identification and assessment of accommodation and housing impacts and development of mitigation and management strategies:
  - requirements for project workforce accommodation, considering housing market impacts
  - strategies to mitigate or manage negative impacts of project workforce accommodation and housing market impacts
  - clear and detailed strategy for accommodating project workforces
  - commitment to the liveability of resource communities
  - commitment to better linkages between land use, infrastructure delivery, economic development, environmental protection and affordable housing
  - development of mitigation and management strategies completed in close consultation and collaboration with key groups including state government agencies and local governments.
- demographic changes in the profile of the region and the associated sufficiency of current social infrastructure, particularly health and welfare, education, policing and emergency services
- adequate provision of education, training and employment for women, people with a disability, and Indigenous peoples.

The strategy for accommodating resource project workforces must describe:

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

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

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

#### **4.10.2.1 Social impact management plan**

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

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

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

The draft SIMP should incorporate a commitment to development of a draft workforce management plan (WMP). The WMP should:

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

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

## **4.11 Health and safety**

### **4.11.1 Description of values**

This section describes the existing community values for public health and safety that may be affected by the project. 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, nearby and other potentially affected populations should be identified and described.

Particular attention should be paid to those sections of the population, such as children and the elderly who are especially sensitive to environmental health factors.

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

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

The EIS should assess the impacts on the community in terms of health, safety, and quality of life from project operations and emissions. Any impacts on the health and safety of any members of the community should be detailed in terms of health, safety, and quality of life from factors such as air emissions, odour, dust and noise.

Maps should be provided showing the locations of sensitive receptors, such as, but not necessarily limited to, kindergartens, schools, hospitals, aged care facilities, residential areas, and centres of work (including office buildings, factories and workshops). The EIS will be illustrated by the maps and should discuss how planned discharges from the project could impact on public health in the short and long-term and also include an assessment of the cumulative impacts on public health values caused by the project, either in isolation or by combination with other known existing or planned sources of contamination.

The EIS should provide an assessment of risk to the community arising from the operation of the project. This assessment should include consideration of controlled, uncontrolled and emergency situations arising from natural events such as bushfire, flood and extreme storms. 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.

The EIS should address the project's potential for providing disease vectors. Measures to control mosquito and biting midge breeding should be described, including measures to be used for any residual ponding after the project activities cease. Any use of recycled water should be assessed 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 health via the food chain due to contaminants such as heavy metals and persistent organic chemicals.

Describe the fatigue management plan, journey management plan and in vehicle monitoring system which will be implemented as part of the project.

## 4.12 Economy

### 4.12.1 Description of values

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

- appropriate statistics of economic activity, such as gross regional product and aggregate regional income
- industries and businesses that could be beneficially or adversely affected by the project, their current and historical contribution to local, regional or national economies, and their current input costs
- the economic value of existing resources that could be impacted or sterilised by the project
- economic viability (including economic base and economic activity, future economic opportunities, current local and regional economic trends)
- economic development in the region, with consideration of large-scale resource developments and their effects in the region
- local, regional and national governments' aspirations, objectives, strategies and policies for the economic and industrial sectors that may be affected.

The economic impact statement should include estimates of the opportunity cost of the project.

### 4.12.2 Potential impacts and mitigation measures

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

An economic analysis, including a cost-benefit analysis, should be presented from national, state, regional and local perspectives as appropriate to the scale of the project. The general economic benefits and impacts from the project should be described and include the methods used, assumptions and sensitivity of the assessment.

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

- the significance of this project on the local and regional economic context
- the long and short-term beneficial (such as job creation) and adverse (such as competition with local small business) impacts that are likely to result from the development
- impacts on the economic value of existing resources

- stimulus, catalytic or second-order effects
- cumulative effects of the project in relation to other economic development opportunities
- a benefit-impact table that disaggregates the benefits and impacts or costs
- the potential, if any, for direct equity investment in the project by local businesses or communities
- the cost to all levels of government of any additional infrastructure provision
- implications for future development in the locality (including constraints on surrounding land uses and existing industry)
- the potential economic impact of any major hazard identified in section 4.12
- the distributional effects of the 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.

Outline a strategy committing to the development of a local industry participation plan (LIPP) in accordance with the Local Industry Policy – A Fair Go for Local Industry (Qld Gov., 2010).

Consideration of the impacts of the project in relation to energy self-sufficiency, security of supply and balance of payments benefits may be discussed. Attention should be directed to the long and short term effects of the project on the land-use of the surrounding area and existing industries, regional income and employment and the state economy. The scope of any studies should be referred to the government for input before undertaking the studies.

## 4.13 Hazard and risk

This section of the EIS should 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 that should be addressed in other sections of the terms of reference. When addressing natural hazards, particularly in regard to places where people would work and live (such as an accommodation camp), the EIS should consider the principles of natural hazard management in State Planning Policy 1/03 (SPP1/03), *Mitigating the Adverse Impacts of Flood, Bushfire and Landslide*, even if the development is exempt development under the *Sustainable Planning Act 2009*. SPP1/03 may not be applicable as a statutory instrument for exempt development, but it contains information that guides best practice for all development..

### 4.13.1 Description of values

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

### 4.13.2 Potential impacts and mitigation measures

This section of the EIS should 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, such as ISO 31000:2009, *Risk Management Principles and Guidelines*.

This section should also define and describe the objectives and practical measures for protecting people and places from hazards and risk, describe how nominated quantitative standards and indicators may be achieved for hazard and risk management, and how the achievement of the objectives will be monitored, audited and managed.

An analysis is to be conducted into the potential impacts of both natural and induced emergency situations and counter disaster and rescue procedures as a result of the project on sensitive areas and resources such as forests, water reserves, state and local government-controlled roads, places of residence and work, and recreational areas. The degree and sensitivity of risk should be detailed.

The EIS should provide an assessment of risk to the community arising from the operation of the project. This assessment should include consideration of controlled, uncontrolled and emergency situations arising from natural events such as bushfire, flood and extreme storms. 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.

The EIS should provide an inventory for each class of substances listed in the Australian Dangerous Goods Codes to be held on-site. This information should be presented by classes and should contain:

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

Details should be provided of:

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

The proponent should develop an integrated risk management plan for the whole of the life of the project including construction, operation and decommissioning phases. The plan should include a preliminary hazard analysis (PHA), conducted in accordance with appropriate guidelines for hazard analysis (such as HAZOP Guidelines, NSW Department of Urban Affairs and Planning (DUAP)). The assessment should outline the implications for, and the impact on, the surrounding land uses, and should involve consultation with Department of Emergency Services, Queensland Fire and Rescue Authority, Queensland Police Service and Queensland Ambulance Service. The preliminary hazard analysis should incorporate:

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

The integrated risk management plan should include the following components:

- operational hazard analysis
- regular hazard audits
- information on how fire safety and, emergency events will be managed
- information on how the proponent will develop and maintain emergency response plan/s
- qualitative risk assessment
- preliminary information on construction safety management.

Where relevant, each of these components should be prepared in accordance with the relevant NSW DUAP Hazardous Industry Planning Advisory Paper (HIPAP).

## 4.14 Siting and management of petroleum activities—constraints analysis

Due to the nature of the proposal, it is accepted that 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 framework approach proposed by the proponent incorporates a constraints analysis to identify land where particular petroleum activities might and might not occur. The constraints analysis is an internal planning tool developed by the proponent to guide site and route selection; it is not suitable as a regulatory tool.

Details of the environmental, social and economic factors used by the proponent in the constraints analysis must be provided in the EIS together with a description of how they are informed by the environmental values identified in the preceding sections of the EIS. If an environmental value has not been used in the constraints analysis, the reasons for its exclusion should be presented in the EIS along with details of how, if applicable, it will be considered in gas field design. For example, how is noise is considered in site and route selection. .

Details should be provided about the accuracy of information, criteria and methodology used in the constraints analysis and as a consequence, the limitations and/or caveats that apply to interpretation of the analysis. The process for updating the constraints analysis to incorporate revised Queensland and Australian government datasets, and the results of any subsequent field surveys carried out after the EIS should be described, as well as information about how the analysis will be disseminated to design teams and incorporated in the design process. Maps showing the constraints analysis should be presented in the EIS at an appropriate scale so that interested and affected people gain an appreciation of the level of constraint imposed by the environmental values.

## 4.15 Cross-reference with the terms of reference

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

## 5 Matters of national environmental significance

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 as attached.

State the controlling provisions for the project under the EPBC Act, and describe the individual matters of national environmental significance 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.

The body of the draft EIS is to be written in a clear and concise style that is easily understood by the general reader. Technical jargon should be avoided wherever possible.

The draft EIS must enable interested and affected people and the Minister to understand the consequences of the proposed action on relevant matters of national environmental significance. When assessing impacts on matters of national environmental significance the following information must be provided for each relevant species, community, wetland or value:

- discuss the relevant species, community, wetland or value in respect of known threats and those threats posed by the proposed action
- quantify and discuss likely direct, indirect,<sup>1</sup> downstream<sup>2</sup> and cumulative<sup>3</sup> impacts from the proposed action
- describe and assess effectiveness of avoidance and mitigation measures to deal with relevant impacts and provide supporting information
- quantify and discuss residual impacts
- make an assessment on the level of impact and its acceptability, and provide a rationale for this assessment
- discuss any proposed offsets where there is a residual impact, or provide a rationale why residual impacts will not be compensated for.

The draft EIS must take into consideration relevant Commonwealth departmental guidelines, statements or policies (for example survey guidelines, species recovery plans and the EPBC Act Significant Impact Guidelines, available at [www.environment.gov.au/epbc/guidelines-policies.html](http://www.environment.gov.au/epbc/guidelines-policies.html)). Surveys conducted for the project must demonstrate that they comply with relevant Commonwealth survey guidelines, unless adequate justification for alternative survey methodology can be provided.

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 when determining whether an action is likely to have a significant impact on the environment.

---

<sup>1</sup> Consideration of indirect impacts for the purposes of the EPBC Act must have regard to definitions of indirect impacts provided in the Significant Impact Guidelines 1.1: Matters of National Environmental Significance (2009).

<sup>2</sup> Consideration of downstream impacts for the purposes of the EPBC Act must have regard to definitions of downstream impacts provided in the Significant Impact Guidelines 1.1: Matters of National Environmental Significance (2009).

<sup>3</sup> Cumulative impacts mean incremental impacts of the proposed action when combined with other past, present and reasonably foreseeable actions (both related and unrelated), such as cumulative impacts on destruction of habitat from increased mining in an area.

Mitigation measures that are specifically related to matters of national environmental significance should be included in a separate section of the project's environmental management plan. It is a statutory requirement that this 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 (e.g. habitat clearance, including estimates for individual listed species and ecological communities, where relevant) 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 an offsets strategy to compensate for these impacts that are in accordance with the Commonwealth's most recent policy on offsets. The proposed offsets strategy for EPBC Act protected matters must reflect the scale and intensity of the unavoidable impacts on each individual matter of national environmental significance. The proposed offsets strategy must provide steps for long-term conservation outcomes and demonstrate how these outcomes can be achieved. Any areas used as offsets must be permanently protected and managed and appropriate surveying and assessment must be provided which verifies the suitability of the offset.

This part of the EIS should also provide information on other requirements set out in Schedule 4 of the Environment Protection and Biodiversity Conservation Regulations 2000 that have not been addressed in other sections of the EIS, such 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
- information relating to the persons environmental record may also include any accreditations (for example ISO 14001), environmental awards, and other recognition for environmental performance.

A description of the relevant impacts of each alternative (with reference to section 2.2) on the matters of national environmental significance listed as controlling provisions for the project under the EPBC Act must be provided.

## 6 Environmental management plan

A preliminary environmental management plan (EM plan) should be developed from the mitigation measures detailed in part 4 of the EIS. Its purpose is to state the proponents' environmental protection commitments in a way that allows them to be measured and audited.

The preliminary EM plan is an integral part of the EIS, but will be capable of being read as a stand-alone document without reference to other parts of the EIS. The EM plan for a petroleum project must be consistent with the content requirements of section 310D of the *Environment Protection Act 1994* (Qld). The general contents of the EM plan should comprise:

- the relevant resource authorities for where the activities are proposed to be undertaken
- all of the activities proposed to be undertaken
- the land on which the activities are to be carried out
- the environmental values likely to be affected by the proposed activities
- the potential adverse and beneficial impacts of the activities on the environmental values
- the proponents' commitments to acceptable levels of environmental performance, including environmental objectives, that is, levels of expected environmental harm, performance standards and associated measurable indicators, performance monitoring and reporting
- any matters prescribed under an Environmental Protection Policy or regulation
- details of wastes to be generated and any waste minimisation strategy
- impact prevention or mitigation actions to implement the commitments
- corrective actions to rectify any deviation from performance standards.

The EM Plan should include a requirement to outline the process for the review; and update of environmental management plans that incorporate the stage of development, source and scale of impact over the life of the project, including progressive rehabilitation, decommissioning, rehabilitation, post-project rehabilitation, maintenance and monitoring.

Through the EM plan process, the EIS's commitments to environmental performance can be used to develop regulatory controls as 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.

The *Environmental Protection (Greentape Reduction) and Other Legislation Amendment Act 2012* will require similar information to be included in a plan of operations once the Act commences on 31 March 2013.

## 7 Commitments not included in the EM plan

This section of the EIS should summarise any commitments made by the proponent that are not included in the EM plan (such as a commitments to assist local council mitigate social impacts). It should be clear how and when the commitments will be fulfilled.

## 8 References

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

## 9 Recommended appendixes

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

A copy of the final TOR should be included in the EIS. Where it is intended to bind appendixes in a separate volume from the main body of the EIS, the TOR at least should be bound with the main body of the EIS for ease of cross-referencing. A summary, cross-referencing specific items of the TOR to the relevant section of the EIS, should also be provided in section 4.15 of the EIS. For this purpose the TOR should be line numbered.

### A2. Regulatory approvals

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

### A3. The standard criteria

A brief summary should be presented 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.

With regard to the principles of ESD, as listed in the National Strategy for Ecologically Sustainable Development, published by the Commonwealth Government in December 1992 (available from the Australian Government Publishing Service), each principle should be discussed and conclusions drawn as to how the project conforms. A life-of-project perspective should be shown.

### A4. Specialist studies

All reports generated on specialist studies undertaken as part of the EIS are to be included as appendixes.

### A5. Research

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

### A6. Study team

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

### A7. Consultation report

The summary consultation report appendix for an EIS under the *Environmental Protection Act 1994* should commence by including the details of affected and interested persons, and the statement of planned consultation with those persons, originally provided with the draft terms of reference. It should describe how 'interested' and 'affected persons,' and any 'affected parties' as defined in the EPBC Act, were identified.

A further list should be provided that includes the Commonwealth, Queensland and local government agencies consulted, and the individuals and groups of interested and affected people consulted.

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

### A8. Schedule 4 of the EPBC Regulations

All matters prescribed by Schedule 4 of the EPBC Regulations must be addressed in the EIS.

## **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.

### **Approved by:**

Lindsay Delzoppo  
Director, Statewide Environmental Assessments  
Department of Environment and Heritage Protection  
**Delegate of the Chief Executive**  
*Environmental Protection Act 1994*

### **Enquiries:**

Statewide Environmental Assessments  
Ph: 13 QGOV (13 74 68)  
Fax: (07) 3330 5754  
Email: [eis@ehp.qld.gov.au](mailto:eis@ehp.qld.gov.au)

Date: 2 November 2012