

Santos GLNG Gas Field Development Project

Terms of reference for an environmental impact statement

March 2013

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Preamble

About the project

Santos Limited, herein referred to as Santos GLNG (the proponent), proposes to develop the Santos GLNG Gas Field Development Project (the project). The project involves the development of coal seam gas (CSG) reserves across 35 petroleum tenements comprising an area of 11 190 square kilometres (km²) within the Bowen and Surat basins, in south-east Queensland. Supporting infrastructure, such as power distribution and pipeline networks, may also be required between these tenements.

The project tenements are located across the four local government areas of Maranoa, Western Downs, Banana and Central Highlands and adjacent to the population centres of Roma, Wallumbilla, Taroom, Wandoan, Injune and Rolleston.

The project supports the Santos Gladstone Liquefied Natural Gas Project (the GLNG project) (approved by the Coordinator-General in 2010). That project comprised gas field development (2650 production wells and associated infrastructure), a liquefied natural gas (LNG) export facility on Curtis Island near Gladstone, and a 420-kilometre long high pressure gas transmission pipeline (GTP) to transport the gas from the gas fields to the LNG facility.

Produced gas would be transported through the GLNG high-pressure Gladstone Transmission Pipeline (GTP) to the LNG export facility at Curtis Island, near Gladstone, for shipping to international markets. The project may also supply gas to third parties including domestic and/or export customers.

Typical activities associated with the project will include drilling and the completion of gas production wells and underground gas storage injection wells, gas gathering, treatment, compression and transmission, water management (gathering, storage, transmission and end use, including treatment, where necessary), power supply and generation, and construction and operation of support infrastructure such as access roads, quarries, and accommodation, communication, storage and maintenance facilities. The maximum number of production wells is estimated to be 6100.

The project forecasts a peak construction workforce of approximately 1700 people and an operational workforce of about 200 people and represents a multi-billion dollar capital investment over the 20+ year life of gas field development.

For further information on the project, refer to the project initial advice statement, which can be viewed at: www.dsdip.qld.gov.au/resources/project/santos-glng/santos-glng-project-ias.pdf

Purpose of this document

This TOR sets out the matters to be addressed in an environmental impact statement (EIS) for the project.

On 15 November 2012, the Coordinator-General declared the project to be a 'significant project' under section 26(1) (a) of the *State Development and Public Works Organisation Act 1971* (Qld) (SDPWO Act). This declaration initiated the statutory

environmental impact assessment procedure of Part 4 of the SDPWO Act, which requires the proponent to prepare an EIS for the project.

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

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

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

The guideline is available from www.dsdip.qld.gov.au or from the EIS project manager (refer to page 7 for contact details).

The draft terms of reference (TOR) was released for public and advisory agency comment from 15 December 2012 to 4 February 2013. Thirty-five submissions were received—26 from advisory agencies and 9 from private organisations and individuals.

Australian Government assessment

On 3 December 2012, Commonwealth Environment Minister determined the project is a 'controlled action' under the EPBC Act, due to the likely potential impacts on matters of national environmental significance (MNES) (reference number EPBC 2012/6615).

The Australian Government and the State of Queensland have agreed the EIS will be prepared pursuant to the bilateral agreement, which sets out the Commonwealth and State requirements for the purposes of the Australian Government's assessment under Part 8 of the EPBC Act. It aims to minimise duplication of environmental assessment processes, allowing the Commonwealth Environment Minister to rely on the Queensland process to reach a conclusion about an action under the EPBC Act.

The EIS must address potential impacts on the controlling provisions identified when the project was determined to be a controlled action.

Coordinator-General's report

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

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

As the project is a 'controlled action' under the EPBC Act, the Coordinator-General will provide a copy of the report to the Commonwealth Environment Minister.

Project proponent

Santos GLNG is undertaking the development of the project on behalf of the same joint venture arrangement between the international petroleum and gas corporations as established for the GLNG Project, namely Santos Limited (30 per cent), Petroliam Nasional Berhad (PETRONAS: 27.5 per cent), Total (27.5 per cent) and Korean Gas Corporation (KOGAS: 15 per cent).

The contact details for the proponent are:

Name: Santos Limited
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Address: Level 22, 32 Turbot Street, Brisbane QLD 4000
GPO Box 1010, Brisbane Qld 4001
Tel +61 7 3838 3000
Fax +61 7 3838 3350
Email info@glng.com.au
Web www.glng.com.au

Contact information

For information about the EIS process for the project, contact:

EIS Project Manager—Santos GLNG Gas Field Development Project
Coordinated Project Delivery
PO Box 15517
City East Qld 4002

Tel +61 7 3898 0259
Fax +61 7 3225 8282
Email SantosGLNG-GFDP@coordinatorgeneral.qld.gov.au
Web www.dsdip.qld.gov.au/assessments-and-approvals/santos-glng-gas-field-development-project.html

Content of the EIS for State matters

This section details the matters to be assessed by the Coordinator-General on behalf of the State of Queensland.

The EIS should follow the format and content outlined in this TOR. Discuss any proposed change to the overall structure of the EIS documents with the EIS project manager (refer to page 7 for contact details).

1. Executive summary

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

The executive summary must include:

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

2. Introduction

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

2.1. Project proponent

Describe the proponent's and each joint venture partner's experience, including:

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

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

2.2. Project description

Briefly describe the key elements of the project with illustrations or maps. This should include the provision of digital map data in GIS format (ArcView Shapefiles and Mapinfo format with the associated metadata for the project footprint. Summarise any major associated infrastructure requirements. Provide detailed project descriptions in Section 3 of this TOR.

2.3. Project rationale

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

2.4. Relationship to other projects

Describe how the project relates to other major projects (of which the proponent should reasonably be aware) that have been or are being undertaken, or that have been proposed or approved in the area potentially affected by the project. The consideration of proposals would be limited to those projects which are in the public arena during the period of preparation of this EIS, and for which a proponent can be readily identified and project information and other baseline information sourced.

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

2.5. Project alternatives

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

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

2.6. The environmental impact assessment process

2.6.1. The EIS process

Provide an outline of the environmental impact assessment process, including the role of the EIS in the Coordinator-General's decision making process. Include information on relevant stages of EIS development, statutory and public consultation requirements and any interdependencies that exist between approvals sought. The information in this section is required to ensure:

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

2.6.2. Assessment framework

CSG field development is progressive, over the life of the project (20+ years). Unlike conventional gas resources, CGS resources are extensive, requiring dispersed field development to recover the resource and 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 coals seams and extract the gas.

The lack of certainty about the preferred location of infrastructure is an issue for the EIS 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.

An appropriate level of detail must be delivered to determine the potential impacts of the project and must be sufficient to:

- deliver a statement of the potential maximum impact and nature of the impact on all ecological values resulting from foreseeable project activities after effective mitigation measures have been applied. This must include defining and committing to any 'no go' areas or situations to be avoided and, for the balance of the areas, identifying the maximum predicted impact on each ecological value. The EIS must contain a commitment not to exceed the stated maximum impact for each value, supported by appropriate protocols, independent audits and reporting on conformance
- present constraints mapping that will indicate the constraints and potential for petroleum activities to occur on any individual lot of land in the project area (where feasible, and utilising appropriate mapping scales). The constraints assessment must be provided in electronic form, and be presented to allow easy interrogation and interpretation, including:
 - all mapped layers and information about weighting of values, hierarchy of constraints and the priority of layers (if relevant) and rationale behind the constraints values (which can be traced to the data that was used to delineate the areas)

- inputs for the constraint mapping, including data source, currency and accuracy
- information that allows for interpretation of worst case potential impacts.
- indicate conceptually the locations of all major infrastructure (for example, compression facilities, major pipelines and water treatment facilities) required for project stages
- grouping by type of constraint, i.e. social, economic and environmental
- indicate connections with approved GLNG infrastructure, where possible.
- assess the potential availability of adequate offset areas for those values subject to a requirement for offset and for which land-based offsets are proposed
- provide details about the scope of site work proposed after the EIS is completed, including:
 - a conceptual development sequence, staging and estimated rate of development
 - the type of activities that will trigger field-based studies or surveys, monitoring and measurement of background environmental values
 - the general methodology for any field-based studies, monitoring or surveys
 - how mapping of areas and defining of constraints will be revised over the life of the project based on findings of pre-development surveys
 - how maintenance of a rolling tally of impacts on all values as the project proceeds will be achieved and demonstration of compliance with the commitment to maximum area of impact
 - ongoing management of securing offsets required for specific impacts
 - compliance monitoring, reporting and auditing measures.

The main EIS report needs to be supported by appendices containing relevant data, technical reports and other sources of the EIS analysis. The predictions of environmental impacts are to be based on scientifically supported studies, with the scientific reliability of investigations and predictions to be indicated, including the estimated degree of certainty, wherever appropriate. As such, the EIS is to provide assessable outputs for consideration.

For each phase of the project, sufficient information must be provided to formulate the project's environmental management plan (EM Plan), develop relevant conditions and facilitate related approvals, such as environmental authorities.

It is considered highly desirable that an indicative operational plan for the first phase of the development (of not less than one year and not greater than three years), be submitted as part of this EIS process to indicate to the community the early stages of development of the project.

2.6.3. Objectives and structure of the EIS

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

- provide public information on the need for the project, alternatives to it, assess options and make informed decisions for its implementation.

- present the likely effects of the project on the natural, social and economic environment.
- demonstrate how environmental impacts can be avoided, managed or mitigated and identify the offsets that may be required for any residual impacts.
- 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
- describe the methodology to be used to assess the potential impacts of the project and how the assessment can be used to deliver a comprehensive statement of environmental impact for the project and accurately and effectively mitigate future impacts
- demonstrate how the approach to assessment would be applied throughout the life of the project to determine specific locations of activities, to avoid impacts and to identify the mitigation measures that would be applied to minimise any unavoidable impacts.

2.6.4. Submissions

Inform the reader how and when properly made public submissions on the EIS will be addressed and taken into account in the decision-making process. Indicate points in subsequent approval processes for the project for submission opportunities. This section will also describe the process by which directly affected persons are consulted and provided with an opportunity and right to respond to project plans.

The EIS project manager can assist with preparing information on the submissions process.

2.7. Public consultation process

2.7.1. Consultation plan

Develop and implement a comprehensive and inclusive consultation plan with the stakeholder groups identified in section 2.4 of *Preparing an EIS: Guideline for proponents* available from: www.dsdip.qld.gov.au/resources/guideline/cg/eis-guideline-for-proponents.pdf

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

- the stakeholders to be targeted
- the types of consultation and communication activities to be undertaken
- timing of consultation activities
- how consultation activities will be integrated with other EIS activities, the project development process and related projects/s
- consultation responsibilities
- communication protocols

- reporting and feedback arrangements
- how results of consultation will be considered by the proponent and integrated into the EIS process.

2.7.2. Public consultation report

Include, as an appendix, a public consultation report detailing how the public consultation plan was implemented during the EIS process, the results, and detail the proposed future consultation. The report must include:

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

2.8. Project approvals

2.8.1. Legislation and approvals

List and describe (in table format), all Australian, State and local legislation, approvals, permits, licences, and authorities relevant to the planning, approval, construction and operation of the project. Outline the triggers for the application of each of these requirements and clearly identify the relevant jurisdiction and approval agency.

Explain the project's compatibility with relevant policy, planning and regulatory frameworks.

2.8.2. Relevant plans and policies

Outline the project's consistency with the existing national, state, regional and local planning framework that applies to the project location. Refer to all relevant statutory and non-statutory plans, state and regional planning or other policies, environmental protection policies, planning schemes, regional, resource or socio-economic plans, agreements and any associated guidelines.

2.8.3. Environmentally relevant activities

Briefly describe the likely ERAs under the EP Act and associated activities that are to be carried out in connection with the project. Present a detailed description of each ERA in Section 4, Environmental values and management of impacts and provide details of the impact on land, water, air, noise and any other identified environmental values identified.

2.8.4. Accredited process for controlled actions under Commonwealth legislation

The EIS will be developed pursuant to the bilateral agreement between the Commonwealth and Queensland governments for the purposes of the Australian Government's assessment under Part 8 of the EPBC Act. The EIS must address potential impacts on the MNES that were identified when the project was determined to be a controlled action.

3. Project description

The EIS will need to recognise 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 EIS will describe the proposed infrastructure types and associated project requirements, typical layouts and maximum sizes of infrastructure, typical construction methods, maximum case facility configurations and specifications, and project activities, which are to form the basis for the impact assessment, and development of an appropriate management and mitigation framework to be implemented during later field planning and development. Where the precise locations of infrastructure can not be defined in the EIS, discuss the reasons for this and assumptions made for the purposes of impact assessment, and outline when (approval and/or development stage), and to what level of detail, location information on all infrastructure will be made available to regulators, landowners and the public.

Describe the project through its lifecycle of construction, operation to decommissioning and rehabilitation. The project description allows further assessment of which approvals may be required and how they may be managed through the life of the project.

3.1. Ongoing evaluation and exploration activities

Describe the extent and nature of ongoing exploration or geological/geo-technical evaluation within the project area over the life of the project, as authorised by existing petroleum tenements and associated approvals. This information is to be provided for thoroughness, even though gas field exploration and appraisal activities are not considered to form part of the scope of the project EIS and approvals.

3.2. Spatial information requirements

Where possible, spatial information collected, collated, modelled or presented for the EIS must also be provided separately as a spatial layer in an ESRI Geodatabase for review as a part of the EIS. All spatial data should include basic metadata outline its source, currency and accuracy. Each layer should contain appropriate attributes that describe the data and data collected for the EIS and where possible, should be supplied in a format that is compatible with the internal datasets of the Department of Environment and Heritage Protection (DEHP).

3.3. Overview of the project

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

- a description of the key components of the project including the use of text and project area overview map/s and conceptual plans
- a summary of primary environmental design features or constraints associated with the project area
- the expected cost, timing, and overall duration of the project, including broad details of, and justification for, any staging of the development.

3.4. Location

Describe, using maps at suitable scales, the regional and local context of the project and all associated infrastructure. Any spatial information collected and collated for the EIS must be included as a spatial layer for review. Maps, plans and text should be used to illustrate and/or describe the following:

- location and boundaries of current or proposed land tenures, including tenure numbers and status that the project area is, or will be subject to
- cadastral and local government area boundaries
- location of existing infrastructure relevant to the project, such as road networks, railways (including rail level crossings) and registered powerline easements
- location of significant natural features such as waterways (for example, rivers, streams, creeks, other water bodies and wetlands), and features of national and state environmental significance
- proposed infrastructure—for example, general arrangement plans to show the typical extent (size/footprint area), and where possible, layouts for key components of the project
- any proposed buffers surrounding typical facilities and infrastructure or construction areas.

Consideration must be given to providing rectified aerial photo enlargements (preferably A3 size) to illustrate the project areas in relation to the land and resource tenures, and natural and built features of the area. Where mapping and/or descriptions are provided in detail in other sections of the EIS, cross reference to those sections.

3.5. Construction phase

Describe all the field development and construction elements of the project, providing where applicable, typical plans and layout drawings:

- the extent and nature of the project's construction phase and any staging of the project development sequencing with indicative timeframes
- the type and potential sources of extractive materials
- approvals required for this stage
- pre-construction activities related specifically to the development of the project components and infrastructure
- indicative clearing or disturbance area requirements and/or sizes for each type of infrastructure type (where available)

- major work programs for the construction phase, including an outline of construction methodologies
- an indicative construction timetable, including expected start-up timeframes and likely hours of construction activities, for major project components.
- typical construction equipment to be used
- anticipated construction inputs, handling and storage including an outline of potential locations for major sources of construction materials
- major hazardous materials likely to be transported, stored and/or used on site in the project area, including environmental toxicity data and biodegradability
- major commissioning processes, where relevant, including associated environmental risks
- clean-up and restoration of areas used during construction, including accommodation facility site(s) and storage areas and partial rehabilitation of construction sites after they become operational.

3.6. Operational phase

Describe the nature, scale and duration of the operational phase and proposed maintenance activities for primary project components and typical infrastructure, and illustrate the description as required with plans, diagrams and artist's impressions. Operational issues to be addressed will include, but not necessarily be limited to:

- a description of standard or typical plant, individual process units and equipment to be used
- capacity of plant and equipment
- process flows for gas treatment and compression and coal seam water management
- details of materials to be handled, including the storage and stockpiling of raw materials and chemicals to be used in gas treatment and compression and water management.

Provide concept and layout plans highlighting proposed buildings, structures, plant and equipment associated with the project including typical coal seam water and gas compression facilities.

Provide indicative process flow charts for the project, for example illustrating gas compression and water treatment processes.

3.7. Typical infrastructure requirements

More detailed information of the matters discussed under this section may be required in accordance with other sections of this TOR. The EIS must include cross-references between subject matter related sections as appropriate.

Discuss requirements for new infrastructure and impacts associated with upgrading/relocating existing infrastructure to service the project. Descriptions should be supported with concept and layout plans and existing infrastructure owners should be identified where relevant. Matters to be considered should include:

- All infrastructure required to be constructed, upgraded, relocated or decommissioned for the construction and/or operation of the project such as:

- transportation (road/rail/air/ship)
- water supply and storage
- power lines and other cables
- bridges
- tracks and pathways
- dams and weirs
- bore fields
- telecommunications infrastructure (such as optical cables, microwave towers, mobile, telemetry and internet services) and wireless technology
- pipelines for any services (whether underground or above)
- stormwater
- waste disposal
- sewerage.

Discuss 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. Where known, detail the location, design and capacity of power generation and transmission infrastructure for construction and ongoing use. Where unknown, indicative data should be presented.

Discuss the standard of proposed stormwater treatment systems, including examples of quality improvement devices (sediment removal, gross pollutant traps) and potential discharge points (spread of flow and scour protection). Where applicable, provide outcomes of discussions with relevant state and local authorities concerning stormwater management options and mitigation strategies.

Where relevant, provide the design and construction standards required to be met (for example, waterway crossings should be designed to meet the requirements of the Fisheries Act and self-assessable codes for minor or temporary water barrier works).

Where possible, the source of the majority of construction materials and their associated haulage routes are to be identified. Alternative approaches, or the opportunity to obtain materials from alternative sources should also be considered.

3.7.1. Gas field and facility development

Detail is to be provided about:

- equipment and methods to be used to access the gas resource (drilling and well installation, stimulation etc.)
- equipment and processes for extracting the gas resource (dewatering wells and gas extraction)
- equipment and processes for taking the gas and water from the well head to gas and water facilities (gas/water separation and gathering networks)
- gas and water transmission pipelines, including any equipment needed for maintenance like pipe cleaning facilities
- major transport corridors (rail and road) potentially crossed by gas and water gathering and transmission pipelines as identified in points 3 and 4

- chemicals to be used during drilling or extraction operations
- gas facilities (design of gas treatment, compression, dehydration and flaring/venting)
- water storage and management (treatment, disposal and end uses)
- power generation facilities and power lines to provide electricity to wellhead, compression and treatment facilities.

The description should refer to, and be complemented by, figures, typical design drawings, maximum case facility configurations, pipeline design specifications and photos.

3.7.2. Accommodation and other infrastructure

Provide a description of any other developments directly related to the project not described in other sections, such as:

- accommodation facilities, townships or residential developments
- access roads
- fuel storage, workshops and maintenance areas
- stockpile and lay down areas
- borrow pits and quarries
- depots or offices.

3.8. Decommissioning and rehabilitation

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

- 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 and water pipelines used for gathering and transmission
- rehabilitating areas of associated infrastructure (access tracks, utility lines)
- decommissioning and rehabilitating gas treatment and compression facility sites
- decommissioning and rehabilitating water management facility sites and any associated storage, transfer, treatment and disposal ponds.

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

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 4.2.3) and rehabilitation of flora and habitat (section 4.10). Implications for the long-term use and fate of the various petroleum activity sites should also be addressed (where known), particularly with regard to the potential on-site disposal of waste and inclusion on the Environmental Management Register (EMR) or Contaminated Land Register (CLR) (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

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

The objectives of the following subsections are to:

- describe the existing environmental values of the area that may be affected by the project, using background information and/or new studies to support statements (include reference to all definitions of environmental values set out in relevant legislation, policies and plans)
- describe the potential adverse and beneficial impacts of the project on the identified environmental values. Where possible, impacts on environmental values must be described quantitatively 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
 - and the measures taken to avoid, minimise and/or mitigate those impacts
- describe any cumulative impacts on environmental values caused by the project, either in isolation or in combination with other known existing or planned projects. The cumulative impacts of the project must be considered over time or in combination with other (all impacts) in the dimensions of scale, intensity, duration or frequency of the impacts.

Present objectives, standards and measurable and auditable indicators that enhance or protect the identified environmental values.

Describe the control principles, proposed actions and technologies to be implemented that are likely to achieve the environmental protection objectives include designs, and relevant performance specifications of plant. Details are required to show that the expected performance is achievable and realistic. For the proposed safeguards and mitigation measures, provide a description and an assessment of the expected or predicted effectiveness and the statutory or policy basis.

Examine viable alternative strategies for managing impacts (present and compare these alternatives in view of the stated objectives and standards to be achieved). Discuss the available techniques to control and manage impacts in relation to the nominated objectives

Describe any computational model that may be 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.

Ensure maps or figures showing the position of features or boundaries 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 protected areas) or boundaries that may be relevant to subsequent approvals.

Provide information to show that measures have been taken to avoid and minimise potential adverse impacts of the project. Environmental offsets may be proposed to counterbalance any remaining loss of environmental values, consistent with the-relevant Queensland Government and/or Commonwealth offset policies.

Provide indicative details of monitoring programs, identifying relevant parameters, likely monitoring points, frequency, and data reporting requirements. Where possible, provide examples from existing CSG operations.

Describe the actions to be used to ensure control strategies are implemented. The mitigation measures and monitoring programs, identified in this section of the EIS, should be used to develop the EM Plan(s) and other relevant management plans for the project.

4.1. Climate, natural hazards and climate change

Describe the climatic conditions that may affect management of the project. This includes a description of the vulnerability of the project area to seasonal conditions, extremes of climate (for example, cyclones) and natural or induced hazards (including bushfire). Provide a risk assessment (as part of the requirements of this TOR, section 7, Hazard and risk), and management plan detailing these potential climatic threats to the construction, and operation of the project. Include the following:

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

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

4.2. Land

Detail the existing environment values of the land area that may be affected by the project. Describe the potential for the construction and operation of the project to change existing and potential land uses of the project area and adjacent areas.

4.2.1. Land use, land suitability and tenure

Description of environmental situation

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

Describe 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, and processes to manage associated overlapping tenure issues.

Identify with the aid of text and maps, including data in digital format:

- land tenure, including reserves, tenure of special interest (such as protected areas and forest reserves), existing and proposed gas infrastructure (where available), water pipelines, powerlines and transport corridors, including local roads, stock routes, state-controlled roads and rail corridors
- existing land uses within and surrounding the project area
- residential and recreational areas
- declared water storage catchments
- native title claimant areas (applications and determinations).

Potential impacts and mitigation measures

Describe the potential changes to existing and potential land uses due to the construction and operation of the project in context to relevant state planning policies and local planning schemes.

Include a high level assessment of the Strategic Cropping Land (SCL) policy framework under the *Strategic Cropping Land Act 2011* in accordance with the most recent DNRM information based on the document *Protecting Queensland's Strategic Cropping Land: A Policy Framework*, and describe what further assessments are required to identify SCL, minimise potential impacts, and the process for obtaining subsequent approvals under the Act.

Mitigation measures proposed for any potentially adverse impacts on stock route operations during the construction and operational phases of the development, including consultation with the DNRM Senior Lands Officer (Stock Routes) and local government stock route officer.

Any 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.

Mitigation measures proposed (including notification of owners), where commercial quantities of State-owned forest products, or private owned forest are identified as likely to be cleared or destroyed by project related activities.

Where state-owned quarry material is identified for project use, propose mitigation measures to avoid sterilisation or restricted utilisation of quarry materials (including offsets and loss of access for existing operations authorised under the *Forestry Act 1959*), and relevant notification processes.

Assess the possible effect on town planning objectives and controls, including local government zoning and strategic plans.

Discuss potential issues involved in proximity and/or co-location of other current or proposed infrastructure services, land use suitability of the project area, in terms of the physical and economic attributes (setting out soil and landform subclasses assigned to soil mapping units in order to derive land suitability classes, appropriate to the phase of the development). Discuss any land units requiring specific management measures.

4.2.2. Resource base, reserve life, extraction sequencing and utilisation

Summarise the results of studies and surveys undertaken to identify the gas resources within the project area (including any areas underlying related infrastructure) and delineate the gas resources that are to be developed as part of the project. 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).

The location, volume, and quality of gas resources should be described where available.

Mapping (at appropriate scales) and details should be provided for the following:

- the location and boundaries of petroleum tenures, granted or proposed, that comprise the project area
- the location and boundaries of the project tenements relative to tenements and features of related project(s), and existing operations, or those already under development
- any part of the resource not intended to be produced and any part of the resource that may be sterilised by the proposed production operations or infrastructure
- the proposed progression of development, sequencing and timing of gas extraction and planned recovery of resources across the project area
- the proposed life of field(s)
- the expected quantity of gas to be extracted annually, including any proposed ramping of production or staging of development.

Consider project impacts on other resources located within the project area.

With regard to resource stewardship, analyse the effectiveness of the proposal in achieving optimum utilisation of the gas resource and consider the impact of other resources. Describe how the project will best develop the gas resource, minimise wastage and avoid sterilisation of any other resources.

4.2.3. Topography, geology and soils

Description of environmental values

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

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

Soils of the project area should be described, with particular reference to the likely physical and chemical properties of the materials that may influence erosion potential, stormwater run-off quality, rehabilitation and agricultural productivity of the land. Provide information on soil stability and suitability for construction of project facilities.

Soil types should be mapped at a suitable scale and described according to the *Australian soil and land survey field handbook* (National Committee on Soil and Terrain 2009) and *The Australian soil classification* (Isbell & CSIRO 2002).

Develop procedural management plans for soil surveys, including ground surveys and laboratory analyses, in order to provide physical and chemical analysis of the soil types represented across the project area. The analysis should be undertaken to a depth appropriate for the project activity proposed.

Potential impacts and mitigation measures

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

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

Land disturbance

Develop a strategy that will minimise the amount of land disturbed at any one time. Describe the strategic approach to progressive rehabilitation of landforms and final decommissioning. Describe the methods to be used for the project, including backfilling, covering, re-contouring, topsoil handling and revegetation.

Describe the potential to disturb land that would impede or divert overland flow or waterways, and any subsequent reinstatement, during construction or operations.

Provide proposals to manage and maintain infrastructure such as dams, roads, levee banks, waterway diversions and other infrastructure which may remain upon project decommissioning. Management and maintenance arrangements should be supported by appropriate erosion and stability monitoring to substantiate long-term rehabilitation sustainability.

Assess the mitigation measures for land disturbance to be used for decommissioning project infrastructure, providing sufficient detail to decide their feasibility. In particular, 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.

Describe the strategy that will be used to manage topsoil, considering transport, storage and replacement of topsoil to disturbed areas. Also outline how soil from good quality agricultural land will be best used. Address the minimisation of topsoil storage times (to reduce fertility degradation). Describe erosion and sediment control measures, particularly in relation to managing sodic and saline overburden material (if any).

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

Erosion and stability

For all permanent and temporary landforms, identify the possible soil erosion rates and describe erosion management techniques. For each soil type identified, erosion potential (wind and water) and erosion management techniques should be outlined. An erosion monitoring program, including rehabilitation measures for erosion problems identified during construction and/or 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 assessment should include a description of likely erosion and stability effects for all disturbed areas such as:

- areas cleared of vegetation
- dams, banks and creek crossings
- the facility sites, including buildings
- access roads or other transport corridors
- bores
- pipelines for gas or water
- stockpiles of soils or mud from well drilling; excavation works and pipeline works
- electricity transmission corridors.

Methods proposed to prevent or control erosion will be specified and developed with regard to the *Guideline: EPA Best Practice Urban Stormwater Management-Erosion and Sediment Control* (Environmental Protection Agency 2008a), and the long-term stability of disturbed areas:

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

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

4.2.4. Land contamination

Description of environmental values

Discuss the potential for land contamination within the project area from existing and past uses, based on land use history and the nature and quantity of any potential contaminants.

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

Provide a strategy to manage contaminated land that may be present prior to any disturbance, including management measures for dealing with previously unidentified contaminated land, prior to disturbance. Include:

- areas listed on the EMR or CLR under the EP Act
- a description of the nature and extent of contamination at the areas identified.

Potential impacts and mitigation measures

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

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

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

4.2.5. Scenic amenity and lighting

Description of environmental values

Describe in general terms, the existing character of the landscape in the project area, and the general impression that would be obtained while travelling through and around it.

Outline existing landscape features, panoramas and views that have, or could be expected to have, value to the community. Include information such as maps and photographs, particularly where addressing the following issues:

- major views, view sheds, outlooks, and features contributing to the amenity of the area. and high-level consideration of representative views, from private residences likely to be affected by the project.
- focal points, landmarks, waterways and other features contributing to the visual quality of the area and the project site(s).
- character of the local and surrounding areas including vegetation and land use.
- identification of the areas that have the capacity to absorb land use changes without detriment to the existing visual quality and landscape character.

Potential impacts and mitigation measures

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

Provide an assessment of all potential impacts of the project's lighting, during all project stages, such as:

- 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.

Detail objectives to be achieved and management methods and strategies to be implemented to avoid or mitigate the potential impacts due to lighting.

4.3. Transport – road/rail/air/ship

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

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

The transport section should utilise the road impact assessments completed for the GLNG project, as a key reference document (as applicable). Where detailed transport information can not be provided, indicative data based on empirical knowledge should be presented.

Consultation with the Department of Transport and Main Roads (DTMR), Queensland Police Service (QPS) and impacted local governments must be undertaken as early as possible to determine appropriate road transport routes and to identify any potential road transport issues.

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.

4.3.1. Transport activities and routes

Traffic generation

For each mode of transport and each phase of the project, provide traffic generation information (in a format acceptable to DTMR, such as ARMIS or similar) on:

- existing background traffic including volumes, composition, peak traffic and peak times along the transport routes to and from the project
- background traffic growth rates for the transport routes for all phases of the project

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

Where it is not possible to provide specific details of this nature, 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 treatment or water management facility) and summarise likely vehicle movements in tabular form.

Describe:

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

4.3.2. Infrastructure alterations

Detail:

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

Provide illustrations of road and rail networks at suitable scales. Maps shall include (but not be limited to) the following:

- existing local and state-controlled roads network systems, including those in state-controlled reserves, forests and conservation parks (such as State forests) where available, complete with road names
- location of existing towns and other built up areas
- location of the project area including tenement boundaries, with description of likely infrastructure to be installed and related traffic generation
- surrounding land uses including other major developments, such as planned commercial and industrial development areas.

In relation to air transport, describe the existing, new, and/or altered air fields and associated infrastructure that could be used by the project.

In relation to importing or exporting materials and products, identify the likely port(s) that would be used by the project and the likely routes from port(s) to the project area.

Potential impacts and mitigation measures

The assessment of state-controlled road impacts must be prepared in consultation with DTMR and in accordance with the *Guidelines for Assessment of Road Impacts of Development* (Department of Main Roads 2006). The assessment of local government road impacts must be in accordance with the relevant Council's guidelines. The assessment of traffic impacts is to include the transport arrangements for permanent and temporary workforce associated with all phases of the project.

Outline and cross-reference transport impacts associated with the project on amenity, human health and ecological values because of dust, noise, vibration and/or any other environmental effect.

With consideration of the area of the project and the dispersed nature of the associated infrastructure, assess project impacts on:

- local and state-controlled road networks, considering and summarising impacts in the context of the relevant jurisdiction, including key road and road/rail intersections, at project construction, operation and decommissioning stages
- the capacity, safety, local amenity, efficiency and condition of transport operations, services and assets from either transport or project operations, including an assessment of pavement life of the road network as a result of the project. Refer, where relevant, to the *Queensland Road Safety Action Plan 2010–2011* (Department of Transport and Main Roads 2010)
- any possible interruptions to transport operations
- the natural environment within the jurisdiction of an affected transport authority (for example, road and rail corridors)
- the nature and likelihood of product-spill to both land and marine environments during transport, if relevant
- possible driver fatigue for workers travelling to and from regional centres and key destinations
- any impacts on stock routes due to project activities
- access to transport for people with a disability
- transport and handling of hazardous substances and dangerous goods
- the cumulative impact of this project adding to the impact of other known proposed or current major projects impacting on the road network
- any existing public transport networks (assets and services)
- project impacts on school bus routes
- the incremental increase in shipping movements associated with the importation of construction materials
- 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).

Any impact to level crossings should be assessed using the Australian Level Crossing Assessment Model (ALCAM).

4.3.3. Transport impact management strategies

Discuss and recommend how identified impacts will be mitigated to maintain the safety, efficiency and condition of each mode. Mitigation strategies are to be prepared in close consultation with relevant transport authorities (including local government and QPS), consider those authorities' works program and forward planning, and be in accordance with the relevant transport authorities' methodologies and design manuals. Any residual impacts that cannot be avoided must be identified and quantified.

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

Mitigation strategies must include:

- consideration of any transport authority's works program and forward planning
- typical construction plans of potential transport infrastructure works in accordance with relevant and accepted authority standards and practices
- the responsible parties for any works
- estimates of typical costs
- details on the likely timing of the works
- the framework to be applied to identify and implement appropriate mitigation strategies for the project, as infrastructure locations are progressively determined
- consideration of over-dimensional /excess mass transport requirements
- a summary of relevant approvals and legislative requirements needed to implement mitigation strategies and transport infrastructure works required by the project.

Road/rail management planning

Outline:

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

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

Air service management planning

Describe the air services and their current capacity serving the region.

Estimate the project's requirements for air transport to and from these regions, and the services required to supply these projections (the likely additional number of flights, frequency and timing, particularly any increase in night arrivals or take-offs and the size

of aircraft should be described). Provide an assessment of the infrastructure needed to support the projected level of air services, 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).

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.

4.4. Waste

4.4.1. Waste generation

Provide an inventory of all waste to be generated, describing all sources, likely volumes and quality (where applicable) of waste associated with construction, operation and decommissioning of all aspects of the project. 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.

4.4.2. Waste management

Detail the proposed management of solid, liquid and gaseous waste. Provide details of waste treatment and minimisation. Assess the potential impact of all waste generated during construction and operation, with regard to the waste and resource management hierarchy under the *Waste Reduction and Recycling Act 2011* and best practice waste management strategies, the Environmental Protection (Waste Management) Policy 2000 and the Environmental Protection (Waste Management) Regulation 2000 (Qld). Information should also be provided on the variability, composition and generation rates of all waste produced.

Demonstrate that waste minimisation and cleaner production techniques and designs will be implemented at each stage of the project to prevent or minimise environmental impacts when selecting processes, equipment and facilities (in the context of the *Waste Reduction and Recycling Act*). Details on each subsection on waste management will assess how the proposed methods for waste management at each stage of the project achieve the highest possible level of waste management with regard to first avoiding the production of waste, then reusing or recycling waste, with disposal as the last option.

Discuss measures to improve natural resource use efficiency (for example, energy and water), integrated processing design, any co-generation of power and by-product re-use as shown in a material/energy flow analysis.

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

Air emissions: Describe the anticipated quantity and quality of all air emissions, including particulates, fumes and odours and likely fugitive CSG emissions, during the construction, operation and decommissioning stages of the project.

- Particulate emissions include those that would be produced by any industrial process, or disturbed by wind action on stockpiles and conveyors, or by transportation equipment (for example, trucks, either by entrainment from the load or by passage on unsealed roads), or as a result of gas flaring. These will also include exhaust and evaporative emissions originating from on-site mobile source activity.

Excavated and solid waste: Describe the excavated and solid waste generated by the project, and examine the likely volumes, chemical and physical properties. In particular, focus on:

- 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.
- design and methods for constructing dumps for waste rock and subsoil.
- potential sources of solid wastes (other than waste rock and subsoil addressed in other sections) and the proposed methods of their disposal

Liquid waste: Present a description of the potential sources of wastewater, including salt and brine from CSG water and any immiscible liquid waste originating from the project other than that addressed in other sections. Pay particular attention to the wastes that generate acid, and saline or sodic wastewater. The following impacts must be considered:

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

Potential impacts and mitigation measures

Detail the preferred methods (and discuss any alternatives) to be used to deal with waste streams and outline their impacts. The full description of the magnitude and nature of impacts on particular environmental values due to managing waste should be provided in the relevant sections of part 4 of the EIS.

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

Waste disposal and treatment plants that may be affected by this project will be identified. Describe whether new or upgraded facilities may be required for disposal and treatment of the waste generated by the project.

Provide details of each type of waste in terms of:

- the options available for avoidance and minimisation
- operational handling and fate of all waste including storage
- on-site treatment methods proposed for any waste
- methods of disposal (including the need to transport waste off site for disposal) proposed to be used for any trade, liquid or solid waste
- 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 waste storage areas and impoundments
- methods to prevent seepage and contamination of surface water or groundwater from stockpiles, storage areas, impoundments and/or dumps
- design criteria to be used to ensure that typical waste containment and/or storage facilities perform satisfactorily
- options available for using recycled materials
- waste minimisation techniques processes proposed
- measures to ensure wastes do not attract or propagate pests, disease vectors or vermin, and do not impact on public health
- market demand for recyclable waste (where appropriate)
- decommissioning of the site.

4.5. CSG water management

Information regarding CSG water generation and proposed management, including management of salts and brine, for the project must be included in the EM Plan.

The mandatory content requirements for an EM Plan in relation to the generation and management of CSG water, including salts and brine, are provided in sections 310D of the EP Act, and section 24AA of the Environmental Protection Regulation 2008 (EP Regulation).

Further guidance on the requirement is outlined in the 'Guideline to preparing an environmental management plan for coal seam gas activities' (DERM 2010b) and Coal Seam Gas Water Management Policy (DEHP 2012).

Detail should be provided around the likely volume, frequency and quality of water to be extracted, including an estimate of the total amount of water expected to be extracted over the life of the project.

This section must detail the strategy for management of CSG water produced as a by-product of extracting CSG.

In accordance with section 24AA of the EP Regulation, the EM Plan must not provide for using a CSG water evaporation dam in connection with carrying out a relevant CSG activity, unless the plan includes an evaluation of best-practice environmental management for CSG water and alternative ways for managing the water. The evaluation must show that there is no feasible alternative for managing the water other than a CSG water evaporation dam.

The guideline *Approval of Coal Seam Gas Water for Beneficial Use* (DERM 2010a) describes the minimum standards for different types of beneficial use.

4.6. Water resources

4.6.1. Water supply and storage

Provide information on proposed water usage and storage by the project including:

- identification and a description of the water demand for the project, whether supplied to, or captured by, the project, including potable water demands, and temporary demands during construction phase, where relevant
- a description of the proposed options for all water sources, and protection and monitoring systems required, including for potable water supply. Address water use by the project workforce and in accommodation facilities during construction and operations
- a description of the anticipated rates of supply from each source for each phase of the project's life
- a description of any proposed water conservation and management measures
- a description of any approvals and water allocations that the project may need under the *Water Act 2000* and/ or the *Sustainable Planning Act 2009*, commensurate with current water allocations and supply demands in the region
- details of any existing town water supply to meet emergency response requirements
- design measures to prevent inter-basin transfer of aquatic flora and fauna
- a description of how the project would adhere to, and be managed in accordance with, the relevant National Water Quality Management Strategy guidelines and State and local policies and guidelines. See: www.environment.gov.au/water/policy-programs/nwqms

Description of environmental values

Describe the quality and quantity of existing resources and environmental values of water that may be affected by the project.

Describe the environmental values of the surface waterways and groundwater of the affected area having regard to:

- Environmental Protection (Water) Policy 2009 (EPP (Water))
- *Australian and New Zealand Guidelines for Fresh and Marine Water Quality* (Australian and New Zealand Environment and Conservation Council & Agriculture and Resource Management Council of Australia and New Zealand 2000)

- *Queensland Water Quality Guidelines 2009* (Department of Environment and Resource Management 2009a)
- physical integrity, fluvial processes and morphology, including riparian zone vegetation and form, if relevant
- any impoundments (for example, dams, levees, weirs)
- hydrology of waterways and groundwater
- dependent ecosystems
- existing and other potential surface and groundwater users
- water resource plans relevant to the affected catchments.

Describe the quality of existing surface waters, overland flow, palustrine and lacustrine wetlands in the area potentially affected by the project and provide an outline of the significance of these waters to the river catchment system in which they occur. Include suitably scaled maps of catchments, watercourses, drainage pathways, wetlands, or sources of water supply potentially affected by the project, whether within or adjacent to the project area.

The EIS must contain a commitment to the development of a monitoring program to assess water quality, stream hydrology and geomorphology, where such values are likely to be, or potentially may be, significantly impacted by project activities, with sampling stations located upstream at reference sites and downstream of the project including sites closest to any proposed discharge points and at downstream locations that would be below any mixing zone. Sites for future monitoring will include permanent and semi-permanent water holes, weirs or reservoirs. Available complementary stream-flow data will also be obtained from historical records to help interpretation.

Describe seasonal variations in water quality and variations with flow. Monitoring of ephemeral streams will primarily focus on all times of natural flow. Report on a range of physical, chemical and biological parameters relevant to the potential environmental harm on any affected creek or wetland system. This will include but not necessarily be limited to water quality and biological indicators likely to be affected by the project such as electrical conductivity, dissolved metals, turbidity, suspended sediments and pH and macro invertebrates

Provide detail of:

- existing surface water in terms of physical, chemical and biological characteristics
- the geomorphic condition of any watercourses likely to be affected by disturbance or stream diversion to the extent that such information is available
- a description of the hydrology of watercourses and overland flow in the project area and potential downstream impacts
- the development and description of suitable water resource and quality indicators for measuring environmental values, and objectives that would protect the identified values
- baseline details on water resources, including environments supported by those resources
- a high-level regional water balance

- an assessment of how the proposed project may change the regional water balance. The water balance analysis could include (but not necessarily be limited to) the following information:
 - usage of the surface water and identified aquifer(s)
 - an assessment of regional water resources
 - an understanding of the structural and dynamic ground and surface water systems (including recharge and discharge)
 - different rainfall scenarios, e.g. extended dry/low rainfall periods
 - an assessment of the quality of information and data for the identified systems
- mapping of flood risk areas for major creeks. The flood risk area identifies that further flood investigation must be carried out for any critical infrastructure (including critical access routes) located within the flood risk area during later stages of the project approval process. The flood risk area will be defined by reference to a single extreme flood event that will be verified or derived from flood studies, topographical data, observed flood data and, if required, flood modelling
- how the potential for flooding would affect access to proposed infrastructure and the ability to undertake mitigation strategies.
- impacts on the present and potential users and water uses in areas potentially affected by the project, including municipal, agricultural, industrial and recreational uses

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

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

- critical dependencies of the identified aquifer(s) and extent of hydrological interconnectivity
- geology and stratigraphy
- aquifer type – such as confined, unconfined, karst or perched
- depth to, and thickness of, the aquifers
- the significance of the resource at a local and regional scale
- depth to water level and seasonal changes in levels
- groundwater flow directions (defined from water level contours)
- groundwater yield
- groundwater quality
- interaction with surface water
- interaction with saline water
- possible sources of recharge
- vulnerability to pollution.

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

- details of potentially affected bores or wells

- current estimated level of take from each aquifer and analysis of the current aquifer water level conditions (that is, under stress, or not under stress).
- pumping parameters
- draw down and recharge at normal pumping rates
- seasonal variations (if records exist) of groundwater levels.

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

Potential impacts and mitigation measures

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

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

Describe, and illustrate with plans and cross-sections typical creek diversions or other in-stream works that may be required for the project. Assess the potential impacts of in-stream works on hydrology and water quality, and propose measures for avoiding or mitigating the impacts and stabilising and rehabilitating any works.

Describe the hydrological impacts of the project, particularly with regard to the various components of flow that may be impacted by the project.

Address changes to catchment size or characteristics, changes to the direction or quantity of runoff in the local catchment and to accumulated downstream flows, scouring and erosion, and the consequent impacts of any subsidence. Any consequential impacts of changes to water flow or groundwater recharge and discharge on ecosystems and wildlife will be addressed and cross referenced in the ecology section of the EIS.

Describe how operations would be protected from flooding.

Describe the options for supplying water to the project, and assess the consequential impacts in relation to any water resource plan, resource operations plan and wild river declaration that may apply. Water allocation and water sources will be established in consultation with Department of Natural Resources and Mines. Describe the circumstances under which a licence or permit may be required under the Water Act 2000 to take water or interfere with the flow of water or circumstances where approval for waterway barrier works under the Fisheries Act 1994 may apply.

Describe the proposed water management controls, addressing surface and ground water quality and quantity, drainage patterns and sediment movements. Describe and illustrate the catchments, typical footprints, cross-sections and method of construction of any dams that may be required, their flood immunity, and the quality of water or waste water they would likely contain. Provide concept design storage allowances for sediment dams and process or waste water dams, and demonstrate that the allowance has been

produced using current best practice. Propose measures to manage sediment dams and process or waste water dams and their discharge, and to decommission and rehabilitate the dams when their use ends.

Describe the potential impacts on local and downstream water quality due to any controlled discharges. Describe the proposed quality and quantities of typical waste water discharges. Assess options for controlled discharge under times of natural stream flow that would ensure that adequate flushing of waste water is achieved. Describe the acute and chronic potential impacts of discharges including the cumulative impacts with other discharges from other projects or industry.

Describe any proposed no-release water systems, assess the management and fate of contaminants, and propose mitigation measures for any potential impacts.

Describe monitoring programs, which will assess the effectiveness of management strategies for protecting water quality during the construction, operation and decommissioning of the project. The monitoring programs must specify in detail what parameters will be monitored and how long monitoring will persist after construction, operation and decommissioning. Water management triggers and action plans must be informed by acceptable standards, such as the National Water Quality Management Strategy.

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

Utilising the Office of Groundwater Impact Assessment (OGIA) regional model for the Surat Cumulative Management Area or a similar model, assess the potential impacts on local groundwater resources and quality, and define the extent of the area where groundwater resources are likely to be affected by the proposed operations. Assess the potential impacts of the operations on groundwater draw-down, depletion, recharge, or interconnection between aquifers, and impacts on environmental values including groundwater users and springs. Propose management options to monitor and mitigate these effects under Chapter 3 of the *Water Act 2000*. Describe the potential impacts on the local ground water regime due to altered porosity and permeability from any land disturbance, such as subsidence. Assess the potential for project operations, including stimulation activities, or residual effects to contaminate groundwater resources. Propose measures to avoid, mitigate and remediate any impacts on groundwater resources.

Cumulative impacts to groundwater should be assessed in accordance with the Queensland Surat Cumulative Management Area (DNRM, 2012) and Mineral Council of Australia's Water Accounting Framework for the Minerals Industry (Minerals Council of Australia, 2012).

4.6.2. Independent Expert Scientific Committee on Coal Seam Gas and Large Coal Mining Development

Queensland is a signatory to the Council of Australian Governments (COAG) National Partnership Agreement on Coal Seam Gas and Large Coal Mining Development (NPA). The NPA requires CSG development proposals undergoing environmental impact

assessment that are likely to have a significant impact on water resources to be referred to an Independent Expert Scientific Committee (IESC)

Accordingly, the Coordinator-General is likely to refer this project to the IESC. Therefore, in addition to the information described in section 4.6, the proponent must provide a stand-alone document to the Coordinator-General that includes details of the projects potential impact on water resources. The document must be provided when the EIS is lodged.

The document must be prepared in accordance with the *Independent Expert Scientific Committee Information Guidelines for Proposals Relating to the Development of Coal Seam Gas and Large Coal Mines where there is a Significant Impact on Water Resources*, available from www.environment.gov.au/coal-seam-gas-mining/project-advice/pubs/iesc-information-guidelines.pdf. All fields in the 'request for advice checklist' must be completed. The current template document being used by the Office of Water Science in SEWPaC for the 'request for advice' to the IESC will be provided to the proponent by the Office of the Coordinator-General prior to the finalisation of EIS documents.

4.7. Air quality

Description of environmental values

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

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

- background levels and sources of contaminants including suspended particulates, oxides of sulfur and nitrogen, greenhouse gases, odorous compounds and any other constituent, whether major or minor, of the air environment that may be affected by the project
- baseline monitoring results.

Provide sufficient data on local meteorology and ambient levels of contaminants to provide a baseline for later studies and/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.

Describe the typical sensitive receptors, agricultural or ecologically significant areas that occur in the project area that may be impacted by emissions from the project.

Potential impacts and mitigation measures

Consider the following air quality issues and their mitigation:

- an inventory of air emissions from the project expected during construction and operational activities (including source, nature and levels of emissions). The description will include:
 - oxides of sulfur and nitrogen
 - volatile organic compounds

- carbon monoxide and dioxide
 - particulates (including dust, PM10, and PM2.5)
 - trace metals
 - odours
 - any toxic, persistent and/or hazardous substances that would be emitted by the project.
- Provide model input data for all air pollutants for both point source and fugitive emission sources. For point source emissions, present concentrations at standard temperature and pressure. Include relevant information on mass emission rates, stack gas exit velocities and temperatures, stack heights, and volume flow rates.
 - Provide a separate air emission inventory of any offsite activities directly associated with the project, including fugitive emissions such as from rail or road transport of product or waste.
 - Using a recognised atmospheric dispersion model, predict the fate of all significant air emissions. Use estimates of emission rates based on actual measurements from samples taken from similar facilities, preferably full-scale facilities operating elsewhere or otherwise from experimental or demonstration-scale facilities. Where this is not possible, use published emission factors and/or data supplied by manufacturers of process and control equipment. State all input parameters, data sets and assumptions used in the modelling in the main text of the EIS or an appendix. The model inputs will be as detailed as possible, reflecting any variation of emissions with time and including at least a full year of representative hourly meteorological data. Provide stack parameters such as stack height, diameter, temperature, exit velocity and volume flow rate.
 - If there is no single atmospheric dispersion model that is able to handle the different atmospheric dispersion characteristics exhibited in the project area (such as sea breezes, strong convection, terrain features, temperature inversions and contaminant re-circulation), apply a combination of acceptable models.
 - Provide figures showing predicted ground level concentrations as a function of distance from pollutant source for typical and maximum emissions using appropriate meteorological data. The averaging period for ground-level concentrations of contaminants modelled will be consistent with the relevant averaging periods for air quality indicators and goals in the Environmental Protection (Air) Policy 2008 and the National Environmental Protection (Ambient Air Quality) Measure.
 - Compare the predicted ground level concentrations to the air quality objectives, and best practice national and international source emission standards. Describe any situations where people, ecosystems or an agricultural use would experience concentrations above an objective. Describe the potential human health risk associated with emissions from the project for all contaminants whether or not they are covered by the National Environmental Protection (Ambient Air Quality) Measure or the EPP (Air). Assess the potential impacts on ecosystems or agricultural uses of the environment.
 - Assess the potential cumulative impacts between the emissions from the project and other emissions in the airshed on regional air quality.

- Describe airshed management and the contribution of the project to airshed capacity in view of existing and future users of the airshed for assimilation and dispersion of emissions.
- If odour could be an issue, conduct odour impact assessment according to the DEHP guideline Odour Impact Assessment from Developments.
- Assess emissions from the maximum case scenario, such as the proposed largest compression facility, to determine the minimum distance from source to receptor that complies with relevant air quality objectives. Assess the maximum or worst case emissions from the plant during shut down, namely maximum flaring.
- Describe the typical pollution control equipment and pollution control processes that may be employed and the features of the project designed to suppress or minimise emissions, including dusts and odours. Describe the backup 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.
- 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.

4.8. Greenhouse gases

Provide an inventory of projected annual emissions for each relevant greenhouse gas (including carbon dioxide and methane), with total emissions expressed in 'CO₂ equivalent' terms for the following categories:

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

Briefly describe method(s) by which estimates were made. *The National Greenhouse Accounts (NGA) Factors* (Commonwealth of Australia 2012) may be used as a reference source for emission estimates, supplemented by other sources where practicable and appropriate. As a requirement of the NGA factors, estimates should include the loss of carbon sink capacity of vegetation due to clearing and impoundment.

Potential impacts and mitigation measures

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

- the proposed measures (alternatives and preferred) to avoid and/or minimise direct greenhouse gas emissions, including such activities as transportation of products and consumables, and energy use by the project
- how the preferred measures minimise emissions and achieve energy efficiency
- any opportunities to further offset greenhouse gas emissions through indirect means including sequestration and carbon trading.

- a comparison of the preferred measures for emission controls and energy consumption with best practice environmental management in the relevant sector of industry

Estimate emissions from upstream activities associated with the proposed project, including the fossil fuel based electricity to be used. Briefly describe the methods used to make the estimates. Means of reducing greenhouse gas emissions could include such measures as:

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

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

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

4.9. Noise and vibration

Description of environmental values

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

- *Noise Measurement Manual* (Environment Protection Agency 2000)
- *Guideline: Noise and Vibration from Blasting* (Environmental Protection Agency 2006)
- *Guideline: Planning for Noise Control* (Environmental Protection Agency 2004)
- *Australian Standard AS 2187.2-2006 Explosives – Storage and Use, Part 2 Use of Explosives* (Standards Australia 2006).

If the proposed activity could adversely impact on the noise environment, describe the likely background conditions in each of the potential development areas.

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

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

Potential impacts and mitigation measures

For each phase of the project, using a suitable acoustic model, predict the likely generation of noise for different times of day under a range of climatic conditions, including the expected worse case. Outline how the DEHP Guideline Prescribing Noise Conditions for Environmental Authorities for Petroleum and Gas Activities will be applied.

Noise and vibration impact analysis should include:

- the predicted levels of noise and vibration to be generated, assessed against current typical background levels, using modelling (such as Environmental Noise Model or SoundPLAN), where appropriate
- potential environmental impacts of noise and vibration on terrestrial, avian and aquatic fauna, including migratory species
- proposals to minimise or eliminate these effects, including details of any screening, lining, enclosing or bunding of facilities, or timing schedules for construction and operations that would minimise environmental harm and environmental nuisance from noise and vibration
- options for sensitive receptors that are otherwise unable to achieve a satisfactory internal noise level for the preservation of health and wellbeing as identified within the EPP (Noise).
- describe how the achievement of the objectives will be monitored, audited and corrective action taken when needed.
- describe how any complaints about noise or vibration would be managed and reported.

The assessment of noise impacts will include matters raised in the document *The Health Effects of Environmental Noise – Other Than Hearing Loss* published by the enHealth Council, 2004 (or later editions), ISBN 0 642 82304 9.

Provide information on blasting that might cause ground vibration or fly rock on, or adjacent to any blast site with particular attention given to potential impacts to typical sensitive receptors. Discuss the magnitude, duration and frequency of any vibration and assess the potential impacts on sensitive receptors. Reference will be made to the DEHP guideline: Noise and Vibration from Blasting.

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

4.9.1. Night-time surface works

Provide details of any night-time surface work that may be undertaken. Specifically include:

- the reasons why night-time work may be undertaken (for example, to avoid peak traffic periods, or to undertake work in a rail corridor)
- the likely duration of work (if known)
- typical hours of work
- the nature of the work to be undertaken
- the likely impact on residents and the associated mitigation measures to be undertaken
- the methods that will be used to communicate with affected residents.

4.10. Nature conservation

Description of environmental values

Based on the information collated in the following sections, a discussion must be presented on the ecological values of the areas likely to be affected by the project. The plant and animal communities including those that are rare or threatened, environmentally sensitive localities, waterways, wetlands, riparian zone, and littoral zone, rainforest remnants, old growth indigenous forests, wilderness and habitat corridors must be described.

Describe the ecological values in terms of:

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

For significant vegetation communities likely to be impacted by the project, identification of these values can be derived from state mapping validated by select aerial imagery and selected representative field survey, inclusive of methodologies previously accepted for the purposes of the EPBC Act 1999 Significant Species management plans, clearing permits under the NC Act 1992, or environmental authority conditions for the authorised Santos GLNG project.

The methodology used for value identification must be an accepted methodology and specified in appendices in the EIS. The methodology should be sufficient to identify, or adequately extrapolate, seasonality of values.

In certain circumstances previous flora and fauna field surveys undertaken within the project area may be sufficient to validate the findings of a desk-based assessment and to facilitate extrapolation of the significant floral and faunal values over the project area, or large portions thereof.

Previous field surveys may be used provided that existing data is still current and has been derived from previous methodologies consistent with best practice for the purpose of the survey when performed.

However, new field survey work within representative sites may be necessary to supplement previous studies and ongoing Santos GLNG project implementation surveys.

A description is to be provided of the circumstances that triggered field survey work as part of the EIS and that will trigger future survey work after the EIS has been completed. Survey methodologies are to be described, including the level of intensity, size, type and timing of surveys, including periods within which to best identify or observe species of interest.

Any new field surveys should satisfy the following, but are not limited to:

- relevant regional vegetation management codes
- site data should be recorded in a form compatible with the Queensland Herbarium CORVEG database and HERBRECS
- the minimum site size should be 10 x 50 metres
- a complete list of species present at each site should be recorded
- surveys to include species structure, assemblage, diversity and abundance
- relative abundance of plant species present to be recorded
- any plant species of conservation, cultural, commercial or recreational significance to be identified
- specimens of species listed as protected plants under the Nature Conservation (Wildlife) Regulation, other than common species, are to be submitted to the Queensland Herbarium for identification

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

4.10.1. Sensitive environmental areas

Description of environmental values

Describe and map the sensitive environmental areas within the project areas at an appropriate scale, with mapping produced from government data bases/maps, the project geographic information system or relevant databases, aerial photographs or other imagery (e.g. satellite, LiDAR), and data available from field surveys or monitoring, where relevant, showing the following:

- 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, (where such information is publicly known), and declared areas of major interest or critical habitat declared under the *Nature Conservation Act 1992*
- important habitats of species listed under the *Nature Conservation Act 1992* and/or *Commonwealth Environment Protection and Biodiversity Conservation Act 1999* as endangered, critically endangered, vulnerable or near threatened
- location and extent of vegetation types using DEHP's RE type descriptions in accordance with the Regional Ecosystem Description Database (REDD) available at www.ehp.qld.gov.au
- category A or B environmentally sensitive areas under the EP Regulation; and Category C environmentally sensitive areas as defined in the DEHP Guideline: *Preparing an environmental management plan for coal seam gas activities* or any other DEHP guideline that may be published for this purpose during the EIS period

- any part of the project area that is, or is likely, to become part of the protected area estate, or is subject to any treaty, where such information is publicly known. Identify any good representative examples of remnant REs or REs that are described as having 'medium' or 'low' representation in the protected area estate as defined in the REDD
- any areas of state, regional or local significance identified in an approved Biodiversity Planning Assessment produced by DEHP
- any areas that would be subject to the VM Act, including declared areas of high nature conservation value or areas vulnerable to land degradation, and remnant vegetation listed under the VM Act as containing endangered and of-concern REs where clearing is likely to result in land degradation and a loss of ecosystem function and biodiversity
- areas in, or adjacent to, areas containing important resting, feeding or breeding sites, or flight paths for migratory species listed under the Convention of Migratory Species of Wild Animals, and/or bilateral agreements between Australia and Japan (JAMBA), Australia and China (CAMBA), or Australia and the Republic of Korea (ROKAMBA)
- wildlife breeding or roosting areas, or areas likely to support wildlife breeding or roosting areas, including bat roosting and breeding caves or areas likely to support bat roosting or breeding caves, including existing structures
- areas containing or likely to contain common species that represent a distributional limit and are of scientific value or contain feeding, breeding, resting areas for populations of echidna, koala, platypus and other species of special cultural significance
- species of protected plants highlighting those listed as threatened or near threatened under the Nature Conservation (Wildlife) Regulation 2006
- areas or features identified as State significant biodiversity values identified in the most recent Queensland Government Offset Policy/ies
- ecosystems that provide important ecological functions such as:
 - wetlands of national, state and regional significance
 - riparian vegetation
 - important buffer to a protected area or important habitat corridor between areas
- vegetation mapped as essential habitat
- remnant or regrowth vegetation, particularly essential regrowth habitat, high value regrowth, or a regrowth watercourse
- sensitive or important vegetation types, including riparian vegetation
- in-land or coastal wetlands
- areas containing or likely to contain high biodiversity that may be dependent for their long-term survival or function on connectivity with other nearby areas of habitat
- sites containing near-threatened or bio-regionally significant species or essential, viable habitat for near-threatened or bio-regionally significant species
- habitat or likely habitat of threatened or near threatened animals
- the condition of vegetation and its habitat value, particularly in relation to the conservation of any threatened and near threatened plant and animal species, assemblages or community types
- a site containing or likely to contain other special ecological values, for example, high habitat diversity and areas of high endemism

- any other plant communities or species of conservation, cultural, commercial or recreational significance
- areas that may have low resilience to environmental change
- sites of palaeontologic significance such as fossil sites
- sites of geomorphological significance

Provide a review of published information regarding the assessment of the significance of the vegetation to conservation, recreation, scientific, educational and historical interests.

Identify key flora and fauna indicators for ongoing monitoring.

Potential impacts and mitigation measures

Describe the potential environmental impacts to the ecological values of the area arising from the construction, operation and decommissioning of the project including clearing, salvaging or removing vegetation. Discuss the impact of the project on species, communities and habitat of local, regional or state significance in sensitive environmental areas as identified above. Discuss the indirect effects on remaining vegetation. Consider short- and long-term effects and comment on whether the impacts are reversible or irreversible.

Demonstrate how the project would comply with the following hierarchy:

- avoiding impact on areas of remnant vegetation and other areas of conservation value including the habitat of listed species
- mitigating impacts through rehabilitation and restoration including, where relevant, a discussion of any relevant previous experience or trials of the proposed rehabilitation
- replacing or offsetting the loss of conservation values, where impacts cannot be avoided or mitigated.

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

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

Describe strategies for protecting Ramsar wetlands and discuss any obligations imposed by state or Commonwealth legislation or policies, or international treaty obligations (that is, CAMBA, JAMBA, ROKAMBA).

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

Where relevant, this section should discuss environmental offset requirements in accordance with the most recent Queensland Government Offset Policy/ies

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

For all components of the project, discuss:

- the potential impacts that clearing vegetation will have on listed species and communities

- any management actions to minimise vegetation disturbance and clearance
- the ability of identified vegetation to withstand any increased pressure resulting from the project, and any measures proposed to mitigate potential impacts
- the methods to ensure rapid rehabilitation of disturbed areas following construction, including the species chosen for revegetation, which should be consistent with the surrounding associations
- any post-construction monitoring programs
- the potential environmental harm on flora due to any alterations to the local surface and groundwater environment, with specific reference to impacts on riparian vegetation or other sensitive vegetation communities.

Outline how mitigation measures will be implemented in the EM Plan for the project.

4.10.2. Terrestrial flora

Description of environmental values

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

Describe and map the terrestrial vegetation communities within the project areas at an appropriate scale, with mapping produced from government data bases/maps, the project geographic information system or relevant databases, aerial photographs or other imagery (e.g. satellite, LiDAR), and data available from field surveys or monitoring, where relevant, showing the following:

- any plant communities of, cultural, commercial or recreational significance not already described as a sensitive environmental area
- sites of high biodiversity value that are of a suitable size or with connectivity to corridors and protected areas to ensure survival in the longer term; such land may contain:
 - natural vegetation in good condition or other habitat in good condition (for example, wetlands)
 - degraded vegetation or other habitat that still support high levels of biodiversity or act as an important corridor for maintaining high levels of biodiversity in the area
- the location of any horticultural crops in the vicinity of the project area
- location and abundance of any known local and regional weed or pest species (including declared species under the *Land Protection (Pest and Stock Route Management) Act (Qld) 2002*. Environmental or problem weed species identified within Commonwealth, Queensland or local government pest management plans) should also be identified and discussed.
- the remnant vegetation occurring in the project area, including its proportion at sub-regional level to determine its value at subregional level.

Potential impacts and mitigation measures

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

Based on proposed project activities, predict the potential for indirect impacts on remaining vegetation, such as those due to edge effects, reducing vegetation area below a suitable size, or reductions in connectivity. Short-term and long term effects should be considered with comment on whether the impacts are reversible or irreversible.

For all components of the project, discuss:

- the potential impacts that clearing vegetation will have on listed species and communities
- any management actions to minimise vegetation disturbance and clearance
- the ability of identified vegetation to withstand any increased pressure resulting from the project, and any measures proposed to mitigate potential impacts
- the methods to ensure rapid rehabilitation of disturbed areas following construction, including the species chosen for revegetation, which should be consistent with the surrounding associations
- any post-construction monitoring programs
- the potential environmental harm on flora due to any alterations to the local surface and groundwater environment, with specific reference to impacts on riparian vegetation or other sensitive vegetation communities.

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

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

4.10.3. Terrestrial fauna

Description of environmental values

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

- species diversity (that is, a species list) and indicative abundance of animals of recognised significance
- the existence of any threatened, near threatened or otherwise noteworthy species or communities in the study area
- any species that are poorly known, but suspected of being rare or threatened

- habitat requirements and sensitivity to changes, including movement corridors and barriers to movement
- the existence of feral or introduced animals of economic or conservation significance
- existence (actual or likely) of any species and communities of conservation significance in the study area, including discussion of range, habitat, breeding, recruitment feeding and movement requirements, and current level of protection (for example, any requirements of protected area management plans or threatened species recovery plans)
- habitat requirements and sensitivity to changes, including movement corridors and barriers to movement
- an estimate of commonness or rarity for the listed or otherwise significant species
- use of the area by migratory fauna
- records in a form compatible with the Wildlife Online database.

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

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

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

Provide an indicative list of all other known or likely species within a 25km area around the project area, highlighting any threatened or near threatened species. Indicate how well any affected communities are represented and protected elsewhere in the bio-region where the project occurs.

Detail reporting requirements to provide DEHP with relevant site data in a format compatible with the Wildlife Online database for listed threatened species (refer to: www.ehp.qld.gov.au/wildlife/wildlife-online/index.html).

Potential impacts and mitigation measures

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

- impacts due to loss of range/habitat, food supply, nest sites, breeding/recruiting potential or movement corridors or as a result of hydrological change
- impacts on native species, particularly species of conservation significance
- cumulative effects of direct and indirect impacts
- threatening processes leading to progressive loss
- a description of any foreseen impacts that increase the susceptibility of ecological communities and species to the impacts of climate change.
- a prediction of the indirect impacts on animals, such as the potential for reduction of habitat area below a viable size or increased predation due to reduced cover.

- a description, where possible of the capacity of the environment to assimilate discharges or emissions. Assess the potential impacts due to chronic, low-level exposure to contaminants or the bio-accumulation of contaminants.
- potential impacts on animals of wastes at the site and measures to prevent harm to wildlife.

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

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

Address feral animal management strategies and practices. The study should develop strategies to ensure that the project does not contribute to increased encroachment of a feral animal species. Refer to the local government authority's pest management plan and any strategies and plans recommended for the project area by Biosecurity Queensland. Discuss the strategies in accordance with the provisions of the *Land Protection (Pest and Stock Route Management) Act* in the main body of the EIS and in the pest management plan within the draft EM Plan for the project.

Outline how all mitigation measures will be implemented in the draft EM Plan for the project.

4.10.4. Aquatic biology and ecology

Description of environmental values

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

- fish species, mammals, reptiles, amphibians, crustaceans and aquatic invertebrates occurring in the waterways within the affected area and any associated wetlands (as defined under section 5 of the Fisheries Act)
- any rare or threatened aquatic species
- a description of the species and habitats that could be impacted by changes in the flow regime of waters, water levels and water quality within the project area
- aquatic plants, including native, exotic and weed species
- any pest and/or exotic aquatic fish species
- aquatic and benthic substrate
- any other state significant biodiversity values identified in the most recent Queensland Government Offset Policy/ies that are not described elsewhere.

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

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

Potential impacts and mitigation measures

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

- a description of potential waterway barrier works (temporary and permanent) that could impact on aquatic resources, particularly fish movement
- a description of possible stream diversions, causeway construction and crossing facilities, stockpiled material and other impediments that could restrict free movement of aquatic fauna
- alternatives to waterway crossings where possible
- measures to avoid fish spawning periods, such as seasonal construction of waterway crossings and measures to facilitate fish movements through water crossings
- offsets proposed for unavoidable, permanent loss of fisheries habitat
- methods to minimise the potential for introducing or spreading weed species or plant disease
- monitoring aquatic biology health, productivity and biodiversity in areas subject to direct discharge
- the project's potential to increase the susceptibility of aquatic ecological communities and species
- methods to minimise the potential for introducing or spreading pest and/or exotic aquatic fish species.

Address any actions of the project or likely impacts that require an authority under the relevant legislation, including the NC Act and/or the *Fisheries Act*. Assess works in a waterway considering Waterway Barrier Works Development Approvals and Queensland Primary Industries and Fisheries Fish Habitat Management Operational Policy FHMOP 008, 2009.

Provide details of the management methods that would avoid or minimise impacts on birds and fish, including migrations. In particular, present a discussion of existence (actual or likely) of any species and communities of conservation significance in the study area, including discussion of range, habitat, breeding, recruitment feeding and movement requirements, and current level of protection (for example, any requirements of protected area management plans or threatened species recovery plans).

Outline how these all mitigation measures will be implemented in the draft EM Plan for the project.

4.11. Indigenous cultural heritage

Description of existing Indigenous cultural heritage values

Describe the existing Indigenous cultural heritage values that may be affected by the project and the environmental values of the cultural landscapes of the affected area in terms of the physical and cultural integrity of the landforms.

Explain the significance of artefacts, items or places of Indigenous cultural heritage value likely to be affected by the project at a local, regional, state and national level.

Also describe how, in conjunction with the appropriate Indigenous people, subject to confidentiality requirements, the cultural heritage values were ascertained. This could include:

- the results of any Aboriginal cultural heritage survey undertaken
- the DNRM Aboriginal Cultural Heritage Register and Database
- any existing literature relating to Indigenous cultural heritage in the project area.

Potential impacts and mitigation measures

To the greatest extent practicable, significant cultural heritage areas should be avoided by the project.

Provide an assessment of potential effects on sites of Indigenous cultural heritage values.

Define and describe the objectives and practical measures for protecting or enhancing Indigenous cultural heritage environmental values. Describe how nominated quantitative standards and indicators may be achieved for cultural heritage management, and describe how the achievement of the objectives will be monitored, assessed and managed.

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

4.11.1. Cultural heritage management plan

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

As Santos GLNG has already concluded the development of the CHMPs that cover the entire project area and have been approved by the Department of Aboriginal & Torres Strait Islander & Multicultural Affairs, the existing CHMPs would be discussed with the Aboriginal groups affected by the Project, to ensure that issues related to the current proposed activities are addressed.

If a CHMP requires amendment when the EIS is submitted to the Coordinator-General, provide details of the proposed steps and timeframes for finalising the CHMP. CHMPs will remain confidential and are not required to be included in the EIS.

4.11.2. Native title

Identify areas covered by applications for native title claims or native title.

Santos GLNG has already concluded the development of the CHMPs that cover the entire project area and the chief executive of DEHP has approved them.

The DEHP EIS project manager would be made aware of the agreement to the CHMPs by the Aboriginal groups affected by the proposal, progress of the CHMP approval process and of any related issues that should be addressed in the Coordinator-General's evaluation report.

4.11.3. Non-Indigenous cultural heritage

Description of existing non-Indigenous cultural heritage values

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

The assessment of non-Indigenous cultural heritage should be conducted by an appropriately qualified cultural heritage practitioner and should include the following:

- review of:
 - the Australian Heritage Places Inventory
 - the Queensland Heritage Register and other information regarding places of potential non-Indigenous cultural heritage significance
 - any local government heritage register
 - any existing literature relating to the heritage of the affected areas
- liaison with relevant community groups/organisations (for example, local historical societies) concerning places of non-Indigenous cultural heritage significance located or identified, where those places may be impacted by project activities
- locations of culturally and historically significant sites, shown on maps, which could potentially be impacted by the project, subject to relevant confidentiality requirements
- spatial constraints analysis of the proposed development area to identify and record non-Indigenous cultural heritage places.

Potential impacts and mitigation measures

Address the potential impacts on non-Indigenous historical cultural and landscape heritage values and their avoidance or mitigation in a management plan. The historical heritage management plan (or other procedures and plans where relevant) will specifically address identified values and provide a process for managing yet undiscovered values (such as grave sites) should they become apparent during development of the project

The development of a historical heritage management plan should be negotiated with the Cultural Heritage Branch of DEHP, local history organisations and other relevant stakeholders. The historical heritage management plan should, as a minimum, address the following issues and be incorporated into the project's draft EM plan.

- processes for mitigating, managing and protecting identified or potential 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.
- process for consultation and liaison with landowners of identified or potential sites of cultural significance

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

5. Social values and management of impacts

Description of existing social values

Conduct a social impact assessment (SIA) in consultation with the Coordinated Project Delivery Division in the office of the Coordinator-General. Matters to be considered in the SIA are detailed in the following subsections and must be cross referenced where applicable with the requirements detailed under Section 6 Economies and management of impacts.

5.1. Social and cultural area

Define the project's social and cultural area of influence, including the local, district, regional and state level as relevant, 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 native title rights and interests, and cultural heritage (cross referenced to the relevant EIS section).

5.2. Community engagement

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

Detail the community engagement processes used to conduct open and transparent dialogue with stakeholders. Such processes should include, but not be limited to, community reference group forums. Include the project's planning construction,

operation, and decommissioning, including affected local and state authorities. Engagement processes should consider social and cultural factors, customs and values, and, where relevant, linkages between environmental, economic, and social impact issues.

Where appropriate, consideration should be given to coordinating local and/or regional community engagement processes with other major project proponents.

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

5.3. Social baseline study

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

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

- major population trends and changes occurring irrespective of the project, including where possible, the permanent and transient population
- total population (for the social and cultural area and full-time equivalent population)
- estimates of population growth and population forecasts resulting from the proposal, including likely resident and transient workers
- household/family structures
- age and gender distributions
- education, including schooling levels and qualifications, where such information is available
- health and wellbeing, including but not limited to mental health
- cultural and ethnic characteristics
- indigenous population, including age and gender
- income including personal and household, and where possible by permanent and transient residents
- labour force by occupation and industry
- housing costs monthly housing repayments (per cent of dwellings in each category) and weekly rent (per cent of 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

- crime, including domestic violence
- any other indicators determined through the community engagement process as relevant.

The social baseline study should take account of current social issues such as:

- the social infrastructure, including community and civic facilities, services and networks—for definition see *South East Queensland Regional 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
- the 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 properties directly affected by the project
 - the number of families directly and indirectly affected by the project including Indigenous traditional owners and their families, property owners, and families of workers either living on the property or workers where the property is their primary employment.
- use of the social and cultural area for forestry, fishing, recreation, business and industry, tourism, aquaculture, and Indigenous cultural use of flora and fauna.

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 outcomes of 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

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.

5.4. Workforce profile and demand

Describe the proposed workforce throughout the life of the project by project stage and activity, providing indicative workforce numbers and composition by occupation. Discuss any planned construction prior to final investment decision using the template provided at www.skills.qld.gov.au/Functions/Coordinated-Projects.aspx.¹

Discuss where employees will be recruited from, the anticipated basis of employment, proposed worker accommodation and transport to construction or operating sites.

5.4.1. Supply issues and strategies

- Analysis of relevant local, state and national workforce profiles and labour supply

¹ The fact sheet on Skills Queensland's website provides essential information, contact and program details to develop the workforce management plan and typical activities.

- strategies and proposed programs for:
 - recruitment and attraction
 - population groups (including Indigenous people, women, secondary school students and unemployed and underemployed)
 - unskilled and semi-skilled labour requirements
 - structured training (apprenticeships, traineeships, graduates)
 - analysis of impact on local community workforce, service sector (for business and industry) and local government.

5.5. Cumulative impacts

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

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

Impact mitigation measures and management strategies

Address direct, indirect and cumulative impacts from any existing projects and the proposed project including an assessment of the size, significance, and likelihood of these impacts at the local and regional level. Consider the following:

- 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, including employees and contractors. 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

5.6. Social issues action plan

This project does not require a Social Impact Management Plan (SIMP). It has been agreed with Coordinated Project Delivery Division and GLNG that a series of action plans linked to and utilising the framework for the existing GLNG approved SIMP will be provided.

The following action plans must be included:

- Workforce Management Action Plan
- Housing and Accommodation Action Plan
- Stakeholder Engagement Action Plan
- Local Industry Participation Plan (not applicable if the proponent chooses to adopt the principles of the Resources and Energy Sector Code of Practice for Local Content)
- Community Health and Well Being Action Plan

6. Economies and management of impacts

Description of potentially affected economies

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

- a map illustrating the local and regional economies (local government areas—LGAs) that could be potentially affected by the project
- appropriate statistics of economic activity, such as gross regional product and aggregate regional income
- trends in relevant economic indicators
- the economic value of existing resources that could be impacted or sterilised by the project
- local, regional and national governments' aspirations, objectives, strategies and policies for the economic and industrial sectors that may be affected
- economic viability of existing economies
- historical descriptions of large-scale resource developments and their effects in the region.

Potential impacts and mitigation measures

The potential impacts should consider local, regional, state and national perspectives as appropriate to the scale of the project. Describe the methods used, assumptions and sensitivity of the assessment. At a level of detail appropriate to the scale and type of project, the assessment will consider the following:

The assessment will consider potential and direct economic impacts including estimated costs (if material), on industry and the community, including:

- the separate phases of the project, such as construction, operation and after ceasing operations
- the effects of this project on the local and regional economies, including goods and services supplied to, or received from, local or regional markets
- the long and short-term beneficial (such as job creation) and adverse impacts (such as increased labour costs, or competition with local small business, service sector or government) that are likely to result from the development
- impacts on the economic value of existing resources
- stimulus, catalytic or second-order effects
- cumulative effects of the project in relation to other economic development opportunities
- a benefit-impact table that disaggregates the benefits and impacts or costs
- the potential, if any, for direct equity investment in the project by local businesses or communities
- the cost to all levels of government of any additional regulatory function or infrastructure provision, including appropriate data on the drivers of cost increases (e.g. population loads, housing numbers etc.)
- implications for future economic development in the locality (including constraints on surrounding land uses and existing industry)
- the potential economic impact of any major hazard identified in section 7.
- the distributional effects of the project including proposals to mitigate any negative impact on disadvantaged groups
- the value of lost opportunities or gained opportunities for other economic activities anticipated in the future
- economic impacts on local property values.
- the potential impact on the use of extractive resources from the vicinity of the project.
- the potential impact of the project on the domestic gas supply

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

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

6.1. Strategies for local participation

The proponent is bound by the provisions of the Queensland Govern's Local Industry Policy, as currently reported for the GLNG Project. The office of the Coordinator-General has accepted the Local Industry Participation Plan (LIPP) and reports developed for the GLNG Project, and acknowledge that the GLNG LIPP will be revised to include the specific requirements of this project.

Should the proponent choose to not continue with the current conditioned arrangements, the following will be required:

- notify the Coordinator-General, in writing, that they wish to amend or replace the local content conditions by adoption of the Queensland Resources and Energy Sector Code of Practice for Local content (the code)
- describe how the code will be adopted for the project.

7. Hazard and risk

7.1. Hazard and risk assessment

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

- accidents, spillages, fire and abnormal events that may occur during all stages of the project, including possible risk of occurrence
- potential wildlife hazards, natural events (for example, cyclone, storm surge, flooding, bushfire and landslide) and implications related to climate change.
- Undertake a preliminary risk assessment for all components of the project, as part of the EIS process in accordance with *Australia/New Zealand AS/NZS ISO 31000:2009 Risk management—Principles and guidelines* (Standards Australia/Standards New Zealand 2009) and *Managing environment-related risk* (HB203:2012) (Standards Australia 2012).

Assess the potential impacts and risks of both natural and induced emergency situations and counter disaster and rescue procedures in accordance with the *Disaster Management Act 2003*, as a result of the project on resources such as forests, water reserves, state and local government-controlled roads, rail level crossings, places of residence and work, and recreational areas.

Undertake a preliminary hazard analysis, conducted in accordance with appropriate guidelines for hazard analysis, and addressing:

- all relevant majors hazards both technological and natural including:
 - describing how State Planning Policy 1/03: Mitigating the Adverse Impacts of Flood, Bushfire and Landslide (Department of Local Government and Planning & Department of Emergency Services 2003) would be addressed in the context of managing flood impacts, including the siting requirements for worker accommodation
 - appropriate bushfire and hazard assessments suitable to the project that consider State Planning Policy 1/03: Mitigating the Adverse Impacts of Flood, Bushfire and Landslide (Department of Local Government and Planning & Department of Emergency Services 2003).
- external and on-site risks, including transport risks
- the possible frequency of potential hazards, accidents, spillages and abnormal events occurring
- indication of cumulative risk levels to other land uses within the project area.
- life of any identified hazards
- likely hazardous substances to be used, stored, processed, produced or transported and the likely rate of usage or production, including an inventory for significant

- chemical name
- chemical concentrations in raw material chemicals
- U.N. number
- packaging group
- correct shipping name
- anticipated maximum quantity stored
- safeguards proposed on the transport, storage, use, handling and on-site movement of the materials
- spill containment controls (such as bunding) and other measures for significant stores of classified dangerous goods and other hazardous materials likely to adversely impact upon the environment in the event of an accident
- procedures to prevent spillages and the emergency plans to manage hazardous situations.
- description of processes, and type of machinery and equipment used
- potential wildlife hazards such as snakes and disease vectors
- public liability of the State for private infrastructure and visitors on public land, in association with the project.

The assessment should outline the implications for, and the potential impact to other land uses in the project area, and should involve consultation with Department of Community Safety, Queensland Fire and Rescue Service, Queensland Police Service and Queensland Ambulance Service.

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

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

7.2. Health and safety

Description of public health and safety community values

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

Potential impact and mitigation measures

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

Assess the cumulative effects on public health values and occupational health and safety impacts on the community, workforce and regional health services from project operations and emissions. Recommend practical monitoring regimes and include relevant consultation with the appropriate regional health service providers.

7.3. Emergency management plan

Present management strategies for emergency prevention, minimisation, preparedness and response, and where relevant monitoring and detection and/or shut down for significant emergency issues identified in the risk assessment, including, but not necessarily limited to the following types of emergency:

- fire
- leaks and spills
- uncontrolled release of contaminants
- natural disasters

Outline strategies for emergency response plans and bushfire mitigation plans under the State Planning Policy 1/03: Mitigating the Adverse Impacts of Flood, Bushfire and Landslide (Department of Local Government and Planning & Department of Emergency Services 2003)

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

8. Cumulative impacts

Assess and describe cumulative impacts for each subject area within Section 4 Environmental values and management of impacts in combination with those of existing or proposed project(s) publicly known, or advised by the office of the Coordinator-General to be in the region, to the greatest extent practicable. Assess cumulative impacts with respect to both environmental values and geographic location (where known). In particular, address cumulative impacts in sensitive environmental areas identified in section 4.9.1 of this TOR.

Where possible, the proponent should work with other regionally based projects to manage (avoid or minimise) any adverse impacts to affected landholders.

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

9. Sustainable development

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

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

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

10. Environmental management plan

Provide an Environmental Management Plan (EM Plan) for the project as defined in the *Environmental Protection Act 1994 (Qld)* (EP Act) for Chapter 5A activities. Applications for a new or amended level 1 environmental authority (Chapter 5A activities) must be accompanied by an EM Plan as required by Section 310C of the EP Act. Chapter 5A activities include petroleum activities, such as CSG exploration and production.

The primary purpose of an EM Plan is to identify impacts on environmental values and in turn propose environmental protection commitments to help the administering authority decide the conditions of the environmental authority. The EM Plan is a crucial document in the assessment of applications for environmental authorities.

The EM Plan for a Chapter 5A activity must meet the mandatory content requirements of section 310D of the EP Act and section 24AA of the EP Regulation, including CSG water management.

The DEHP Guideline for preparing an environmental management plan for coal seam gas activities (DERM, 2010b) provides recommendations about the content that should be included in an EM Plan to assist in a streamlined assessment process and to reduce the need for the administering authority to issue information requests.

The EM Plan to be included in the EIS may be in draft EM Plan form, pending update after the EIS is completed, prior to making any subsequent application/s for new or amended Environmental Authorities, in relation to the project. The associated EM Plan must still include all regulatory requirements, project information, and potential impacts to environmental values.

The EM Plan should be developed from, and be consistent with, the information in the EIS, incorporating the relevant environmental and social mitigation measures detailed in the various sections of the EIS. The EM Plan will provide a framework for continuing management, monitoring, reporting, training and improvement and will address any provision for independent environmental auditing. It must be capable of being read as a stand-alone document without reference to parts of the EIS.

The general contents of the EM Plan should comprise:

- 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 proponent's commitments to acceptable levels of environmental performance, including environmental objectives, performance standards and associated measurable indicators, performance monitoring and reporting
- impact prevention or mitigation actions to implement the commitments
- corrective actions to rectify any deviation from performance standards

The proponent's commitments to environmental performance, as described in the EM Plan, can be included in the Coordinator-General's evaluation report as conditions, to ensure the commitments are met. 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 EM Plan should use 'commitment' language (e.g. will/must) wherever possible.

11. Commitments not included in the EM Plan

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

12. Conclusions and recommendations

Make conclusions and recommendations with respect to the project, based on the studies presented, the EM Plan, any Social Impact Action Plans and conformity of the project with legislative and policy requirements.

13. References

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

14. Appendices

Provide the following as appendices to the EIS:

- final TOR for this EIS
- TOR cross-reference table, which links the requirements of each section/subsection of the TOR with the corresponding section/subsection of the EIS, where those requirements have been addressed
- list the regulatory approvals required by the project.
- the consultation report, as described in Subsection 2.7.2 of this TOR.
- a list of the relevant qualifications and experience of the key study team members and specialist sub-consultants
- a glossary of technical terms
- a list of acronyms and abbreviations
- any reports of specialist studies undertaken as part of the EIS
- a copy of the proponent's corporate environmental policy
- a list of all commitments made by the proponent in the EIS, with cross-references to the relevant section in the EIS

- a copy of the proponent's land access protocols.

Contents of the EIS for matters of national environmental significance

1. Background and context

On 3 December 2012 the Commonwealth Environment Minister determined the project is a 'controlled action' under the EPBC Act, due to the likely potential impacts on matters of national environmental significance (MNES) (reference number EPBC 2012/6615). The controlling provisions under the EPBC Act are:

- wetlands of international importance (sections 16 and 17B)
- listed threatened species and communities (sections 18 and 18A)
- listed migratory species (sections 20 and 20A)

The EIS must be prepared pursuant to the bilateral agreement between the Commonwealth of Australia and the State of Queensland (Commonwealth of Australia 2012). This will enable the EIS to meet the impact assessment requirements under both Commonwealth and Queensland legislation. The project will require approval from the responsible Commonwealth minister under Part 9 of the EPBC Act before it can proceed.

The information provided on these matters must be consistent with the relevant aspects of other sections of the EIS, for example the section dealing with nature conservation. The proposed mitigation measures for managing impacts to MNES must be consistent with those proposed to cover matters regulated by the State.

Once the EIS has been prepared to the satisfaction of the Coordinator-General and MNES addressed to the satisfaction of the Australian Government, the EIS will be made available for public comment.

The proponent may be required by the Coordinator-General or the Commonwealth Environment Minister to provide additional material to address matters raised in submissions on the EIS.

At the conclusion of the environmental assessment process, the Coordinator-General will provide a copy of the EIS evaluation report to the Commonwealth Environment Minister, in accordance with Part 5, section 17(2) of the State Development and Public Works Organisation Regulation 1999.

After receiving the evaluation report and sufficient information about the relevant impacts of the action, the Commonwealth Environment Minister has 30 business days to decide whether or not to approve the taking of the action under the EPBC Act. The minister's decision is separate to the approval decisions made by Queensland state agencies and other agencies with jurisdiction on state matters.

Consideration should be given to any relevant policy statements available from the website of the Department of Sustainability, Environment, Water, Population and Communities, including in particular the *Matters of National Environmental Significance: Significant impact guidelines 1.1*, (Commonwealth of Australia 2009)

2. Contents of the EIS

2.1. General requirements

In accordance with Section 3.1 of Schedule 1 of the bilateral agreement, the EIS must:

- assess all the relevant impacts that the action has, will or is likely to have on the controlling provisions
- provide enough information about the action and its relevant impacts to allow the Commonwealth Environment Minister to make an informed decision whether or not to approve the action
- address the matters set out in Schedule 4 of the Environment Protection and Biodiversity Conservation Regulations 2000 (Cwlth) (EPBC Regulations).

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, and where unavoidable, such terms will be included in a glossary within the EIS.

This section should bring together assessments of impacts on MNES from other chapters (for example, water resources, flora and fauna, cultural heritage and cumulative impacts) and produce a stand-alone chapter in a format suited for assessment under the EPBC Act.

The draft EIS must enable interested stakeholders and the Minister to understand the potential consequences of the proposed action on relevant MNES. When assessing impacts on MNES, the following information must be provided for each controlling provision (wetland, community or species):

- discuss the known threats and those threats posed by the proposed action on the species, community or wetland. When describing the values of an area, reference should be made to the criteria through which the entity was listed and discussion of impacts be made against the criteria.
- clearly describe the methodologies used to determine the likely presence/absence of the relevant species or community.
- quantify and discuss potential direct, indirect and downstream impacts from the proposed action. Where conclusions are made based on technical reports located elsewhere in the EIS there should be sufficient information in this chapter to support the conclusions presented.²
- identify relevant matters on maps, which also illustrate the tenements within the project area, and including results of any surveys and vegetation and habitat analysis, as relevant.
- describe and assess effectiveness of avoidance and mitigation measures to deal with relevant impacts for relevant MNES.
- quantify and discuss potential residual impacts.

² Indirect and downstream impacts - Consideration of indirect and downstream 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)

- make an assessment of the level of impact and its acceptability, and provide a rationale for this assessment,
- for any residual significant impacts, the proponent must propose offsets (including an offsets strategy) to compensate for these impacts that are in accordance with the EPBC Act 1999 *Environment Offsets Policy* and associated Offsets Assessment Guide
- Note that 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 likely intensity, duration, magnitude and potential geographic extent of the impacts. The proponent should consider all these factors when determining whether an action is likely to have a significant impact on the environment.

The project should initially be assessed in its own right followed by an assessment of the cumulative impacts related to all known proposed similar developments in the region (including quantification of cumulative impact where possible) with respect to each controlling provision and all identified consequential actions.

Predictions of the extent of threat (risk), impact and the benefits of any mitigation measures proposed, should be based on sound science and quantified where possible. Reference all sources of information relied upon and provide an estimate of the reliability of predictions. Also identify and evaluate any positive impacts.

The EIS must take into consideration relevant departmental guidelines 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). Surveys conducted, or committed to be conducted for future site-specific assessments, must comply with relevant Commonwealth survey guidelines, unless adequate justification for alternative survey methodology can be provided.

The extent of any new field work, modelling or testing should be commensurate with risk and should be such that when used in conjunction with existing information, provides sufficient confidence in predictions that well-informed decisions can be made.

Project alternatives must be discussed in accordance with Schedule 4, section 2.01(g) of the EPBC Regulations.

The following content requirements are based on these matters and considerations, with the addition of directions specific to the proposed action and the receiving environment.

2.2. Specific requirements

2.2.1. Impacts on wetlands of international importance

Assess and discuss the potential impacts of all stages of the proposed development on any wetlands of international importance, considering direct, indirect and downstream impacts on the Narran Lakes Nature Reserve Ramsar site, and including:

- description of the location, extent and ecological characteristics and values of those wetlands that are potentially affected by the project

- any known current threats (destruction or substantial modification) to the wetland
- substantial and measurable changes to the hydrological regime of the wetlands, for example a substantial change to the volume, timing, duration or frequency of ground and surface water flows to and within the wetland
- the habitat or lifecycle of native species, including invertebrate fauna and fish species, dependent upon the wetland being seriously affected
- substantial and measurable change in the water quality of the wetlands—for example, a substantial change in the level of salinity, pollutants, or nutrients in the wetland; or water temperature that may adversely impact on biodiversity, ecological integrity, social amenity or human health
- invasive species that may be harmful to the ecological character of the wetlands, if introduced to or spread in the wetland.

Describe any mitigation measures proposed to protect or enhance impacts on the wetland site affected by the project.

2.2.2. Impact on a listed threatened species and communities

Describe the listed threatened species and ecological communities identified below (including EPBC Act status, distribution, life history and habitat).

Consider and assess the impacts to the listed threatened species and ecological communities prescribed below. Describe potential impacts and threats to any other listed threatened species and ecological communities that are found to be or may potentially be present in areas that may be impacted by the project, including consideration of potential downstream impacts. Provide estimates of the maximum potential area of disturbance which may result from project implementation. Identify which component of the project is of relevance to each listed threatened species or ecological community or if the threat of impact relates to consequential actions, resulting from the potential:

- decrease in the size of a population or a long-term adverse affect on an ecological community
- reduction in the area of occupancy of the species or extent of occurrence of the ecological community
- fragmentation of an existing population or ecological community
- disturbance or destruction of habitat critical to the survival of the species or ecological community
- disruption of the breeding cycle of a population
- modification, destruction, removal, isolation or reduction of the availability or quality of habitat to the extent that the species is likely to decline
- modification or destruction of abiotic (non-living) factors (such as water, nutrients or soil) necessary for the ecological community's survival
- introduction of invasive species that are harmful to the species or ecological community becoming established
- interference with the recovery of the species or ecological community, or
- inconsistency with a recovery plan.

Identify and evaluate any positive impacts.

Describe any mitigation measures proposed to reduce the impact on the listed threatened species and ecological communities and the anticipated benefit of proposed mitigation measures.

List of potential listed threatened ecological communities and species and their status

This list is not exhaustive and indicative only.

- Brigalow (*Acacia harpophylla* dominant and co-dominant) —Endangered
- Coolibah—Black box woodlands of the Darling riverine plains and the Brigalow belt South bioregions—Endangered
- Natural grasslands of the Queensland Central Highlands and the Northern Fitzroy Basin—Endangered
- Semi-evergreen vine thickets of the Brigalow Belt (North and South) and Nandewar Bioregions—Endangered
- The community of native species dependent on natural discharge of groundwater from the Great Artesian Basin—Endangered
- Weeping Myall Woodlands— Endangered
- White Box -Yellow Box—Blakely's red gum grassy woodland and derived native grassland – Critically endangered
- *Adclarkia dawsonensis* – Boggomoss Snail – Critically Endangered
- *Botaurus poiciloptilus* —Australian bittern—Endangered
- *Erythrotriorchis radiatus*—Red goshawk —Vulnerable
- *Geophaps scripta scripta*—Squatter pigeon—Vulnerable
- *Lathamus discolor*—Swift parrot—Endangered
- *Neochmia ruficauda ruficauda*—Star finch (eastern), Star finch (southern) - Endangered
- *Poephila cincta cincta*—Black-throated finch (southern)—Endangered
- *Polytelis swainsonii*—Superb parrot—Vulnerable
- *Rostratula australis*—Australian painted snipe -Vulnerable
- *Turnix melanogaster*—Black-breasted button-quail—Vulnerable
- *Maccullochella peelii*—Murray cod—Vulnerable
- *Chalinolobus dwyeri*—Large-eared pied bat, large pied bat -Vulnerable
- *Dasyurus hallucatus*—Northern quoll—Endangered
- *Nyctophilus corbeni*—South-eastern long-eared bat—Vulnerable
- *Petrogale penicillata*—Brush-tailed rock-wallaby—Vulnerable
- *Phascolarctos cinereus* (combined populations of Qld, NSW and the ACT)—Koala—Vulnerable
- *Macrozamia fearnsidei*—Vulnerable
- *Macrozamia platyrhachis*—Endangered
- *Acacia curranii*—Curly-bark wattle—Vulnerable
- *Acacia wardellii*—Vulnerable
- *Aristida annua*—Vulnerable

- *Arthraxon hispidus*—Hairy-joint grass—Vulnerable
- *Cadellia pentastylis*—Ooline—Vulnerable
- *Calytrix gurlmundensis*—Vulnerable
- *Commersonia argentea*—Vulnerable
- *Daviesia discolour*—Vulnerable
- *Dichanthium queenslandicum*—King blue-grass—Vulnerable
- *Digitaria porrecta*—Finger panic grass—Endangered
- *Eriocaulon carsonii*—Salt pipewort, button grass—Endangered
- *Homopholis belsonii*—Vulnerable
- *Homoranthus decumbens*—Vulnerable
- *Phaius australis*—Lesser swamp-orchid—Endangered
- *Pterostylis cobarensis*—Cobar greenhood orchid—Vulnerable
- *Swainsona murrayana*—Slender darling-pea, Slender swainson, Murray swainson-pea – Vulnerable
- *Tylophora linearis*—Endangered
- *Delma torquate*—Collared delma—Vulnerable
- *Denisonia maculate*—Ornamental snake—Vulnerable
- *Egernia rugosa*—Yakka skink—Vulnerable
- *Furina dunmalli*—Dunmall's Snake—Vulnerable
- *Paradelma orientalis*—Brigalow scaly-foot—Vulnerable
- *Rheodytes leukops*—Fitzroy river turtle, Fitzroy tortoise, Fitzroy turtle—Vulnerable

2.2.3. Impact on a listed migratory species

Describe the listed migratory species identified below (including EPBC Act status, distribution, life history, habitat and the like).

Assess and describe the impacts to the listed migratory species identified below and any others that are found to be or may potentially be present in areas that may be impacted by the project. Identify which component of the project is of relevance to each species or if the threat of impact relates to consequential actions, resulting from potential:

- destruction, isolation or modification of habitat important to a migratory species
- introduction of invasive species in an important habitat that would be harmful to a migratory species
- disruption of the lifecycle (breeding, feeding, migration, or resting behaviour) of an ecologically important proportion of the population of a migratory species
- interference with the recovery of the species or ecological community, or
- inconsistency with a recovery plan.

Any positive impacts should also be identified and evaluated.

Describe and discuss any mitigation measures proposed to reduce the impact on migratory species and the anticipated benefit of proposed mitigation measures.

List of potential migratory species

This list is not exhaustive and is indicative only.

Migratory Birds

- *Apus pacificus*—Fork-tailed swift
- *Ardea alba*—Great egret, White egret
- *Ardea ibis*—Cattle egret
- *Calidris acuminata*—Sharp-tailed sandpiper
- *Calidris ferruginea*—Curlew Sandpiper
- *Haliaeetus leucogaster*—White-bellied sea-eagle
- *Hirundapus caudacutus*—White-throated needletail
- *Limosa limosa*—Black-tailed godwit
- *Merops ornatus*—Rainbow bee-eater
- *Monarcha melanopsis*—Black-faced monarch
- *Myiagra cyanoleuca*—Satin flycatcher
- *Rhipidura rufifrons*—Rufous fantail
- *Gallinago hardwickii*—Latham's snipe, Japanese snipe
- *Rostratula benghalensis (sensu lato)*—Painted snipe
- *Tringa nebularia*—Common Greenshank
- *Tringa stagnatilis*—Marsh sandpiper

Acronyms and abbreviations

Acronym/abbreviation	Definition
AAPG	American Association of Petroleum Gas
ACH Act	<i>Aboriginal Cultural Heritage Act 2003</i> (Qld)
AHD	Australian Height Datum
ALCAM	Australian Level Crossing Assessment Model
ARMIS	A Road Management Information System
AS/NZS	Australian standard/New Zealand standard
ARI	Average Recurrence Interval
BPA	Biodiversity planning Assessment
CAMBA	China–Australia Migratory Bird Agreement
CHMP	cultural heritage management plan
CORVEG	Queensland Herbarium’s site based floristic dataset containing field survey data
CSG	Coal Seam Gas
CWMP	CSG Water Management Plan
DEHP	Department of Environment and Heritage Protection, Queensland
DNPRSR	Department of National Parks, Recreation, Sport and Racing
DNRM	Department of Natural Resources and Mines
DTMR	Department of Transport and Main Roads
EA	environmental authorities
EIS	environmental impact statement
EM Plan	environmental management plan
EP Act	<i>Environmental Protection Act 1994</i> (Qld)
EPBC Act	<i>Environment Protection and Biodiversity Conservation Act 1999</i> (Cwlth)
EPP	environmental protection policy (water, air, waste, noise)
ERA	environmentally relevant activity
EVNT	endangered, vulnerable and near-threatened
FGSA	Future Gas Supply Area
FHMOP	Fisheries Fish Habitat Management Operational Policy
GARID	Guidelines for Assessment of Road Impacts of Development 2006
GLNG	Gladstone Liquefied Natural Gas
GTP	Gas Transmission Pipeline
HERBECS	Queensland Herbarium Plant Specimen Database-State-Computer-Science
IAS	initial advice statement
IESC	Independent Expert Scientific Committee
JAMBA	Japan–Australia Migratory Bird Agreement
LIPP	Local Industry Participation Plan

LNG	liquefied natural gas
MCU	material change of use
MNES	matters of national environmental significance (under the EPBC Act)
NPA	National Partnership Agreement on Coal Seam Gas and Large Coal Mining Development
NC Act	<i>Nature Conservation Act 1992 (Qld)</i>
NGA	National Greenhouse Accounts
NT Act	<i>Native Title Act 1993</i>
NT agreement	native title agreement
P&G Act	<i>Petroleum and Gas (Production and Safety) Act 2004</i>
PL	Petroleum Lease
QWC	Queensland Water Commission
RE	regional ecosystem (for a definition, refer to the Glossary)
REDD	Regional Ecosystem Description Database
ROKAMBA	Republic of Korea–Australia Migratory Bird Agreement
SCL Act	<i>Strategic Cropping Land Act 2011 (Qld)</i>
SDPWO Act	<i>State Development and Public Works Organisation Act 1971 (Qld)</i>
SEWPaC	Department of Sustainability, Environment, Water, Population and Communities
SIA	social impact assessment
SIMP	social impact management plan
SPA	<i>Sustainable Planning Act 2009 (Qld)</i>
SPE-PRMS	Petroleum Resources Management System approved by the Society of Petroleum Engineers
SPEE	Society of Petroleum Evaluation Engineers
SPP	State Planning Policy
The proponent	Santos Limited (referred to as Santos GLNG)
TI Act	<i>Transport Infrastructure Act 1994 (Qld)</i>
TOR	terms of reference
VM Act	<i>Vegetation Management Act 1999 (Qld)</i>

Glossary

Term	Definition
affected persons	As defined in the <i>Environmental Protection Act 1994</i> (s.38)
aquifer	A water bearing stratum of permeable rock, sand, or gravel, able to transmit substantial quantities of water.
assessable vegetation	Vegetation in which clearing is assessable development under Schedule 3, Part 1, Table 4, Item 1 of SPA.
Australian Height Datum (AHD)	A mapping system applied to Australia, which uses a datum, or agreed level, from which the heights of naturally occurring features can be measured; this level, to which the value of zero is given, is equivalent to the mean sea level for 1966–68 at thirty tide gauges around the coast of the Australian continent.
benthic substrate	Pertaining to the bottom of a body of water.
bilateral agreement	The agreement between the Australian and Queensland governments, which accredits the State of Queensland's EIS process. It allows the Commonwealth Environment Minister to rely on specified environmental impact assessment processes of the state of Queensland in assessing actions under the Environment Protection and Biodiversity Conservation Act 1999 (Cwlth).
biodiversity	Biodiversity is short for 'biological diversity'. It describes the natural diversity of native wildlife, together with the environmental conditions necessary for their survival and includes: <ul style="list-style-type: none"> a) regional diversity, that is, the diversity of the landscape components of a region, and the functional relationships that affect environmental conditions within ecosystems b) ecosystem diversity, that is, the diversity of the different types of communities formed by living organisms and the relations between them c) species diversity, that is, the diversity of species d) genetic diversity, that is, the diversity of genes within each species.
bunding	An artificial created boundary, usually in the form of an embankment used to prevent sediment and substances from entering a water stream or storage facility.
cathodic protection	Method of protection for iron and steel against electrochemical corrosion
community	An assemblage of interdependent populations of different species (plants and animals) interacting with one another, and living in a particular area.
controlled action	A proposed action that is likely to have a significant impact on a matter of national environmental significance; the environment of Commonwealth land (even if taken outside Commonwealth land); or the environment anywhere in the world (if the action is undertaken by the Commonwealth). Controlled actions must be approved under the controlling provisions of the EPBC Act.
controlling provision	The matters of national environmental significance, under the EPBC Act, that the proposed action may have a significant impact on.

Coordinator-General	The corporation sole constituted under section 8A of the <i>State Development and Public Works Organisation Act 1938</i> and preserved, continued in existence and constituted under section 8 of the SDPWO Act.
CORVEG	Queensland Herbarium's site based floristic dataset containing field survey data
ecosystem	A biophysical environment containing a community of organisms.
effluent	Outflow of treated wastewater.
ephemeral	Transitory, short-lived.
endangered	A species is endangered if: <ul style="list-style-type: none"> • there have not been thorough searches conducted for the wildlife and the wildlife has not been seen in the wild over a period that is appropriate for the life cycle or form of the wildlife, or • the habitat or distribution of the wildlife has been reduced to an extent that the wildlife may be in danger of extinction, or • the population size of the wildlife has declined, or is likely to decline, to an extent that the wildlife may be in danger of extinction, or • the survival of the wildlife in the wild is unlikely if a threatening process continues.
endemism	The ecological state of being unique to a defined geographic location, such as an island, nation or other defined zone, or habitat type.
erosion	The process by which rocks are loosened, worn away and removed from parts of the earth's surface.
fluvial	Of, relating to, or inhabiting a river or stream.
geomorphological	The form or shape of the landscape and the processes that modify or change it.
groundwater	Water found underground in porous rock or soil strata.
habitat	The biophysical medium or media occupied (continuously, periodically or occasionally) by an organism or group of organisms.
habitat corridor	A strip of habitat that facilitates fauna movement between otherwise isolated patches of habitat.
lacustrine environments	A lake or lake-like environment. Wetlands and deepwater habitats with all of the following characteristics: (1) situated in a topographic depression or dammed river channel; (2) lacking trees, shrubs, persistent emergent plants, mosses, or lichens with greater than 30% areal coverage; and (3) total area exceeds 8 ha (20 acres).
listed species	A plant or animal included in a schedule of vulnerable, rare or endangered biota, such as the schedules in the EPBC Act or the Nature Conservation (Wildlife) Regulation 2004 (Qld).
mitigation	The effort to eliminate or reduce impacts.
morphology	Form and structure of organisms without consideration of function.
native species	A species that is indigenous to Australia or an external territory, or periodically or occasionally visits.
native wildlife	Any taxon or species of wildlife indigenous to Australia.

natural environment	The complex of atmospheric, geological, and biological characteristics found in an area in the absence of artefacts or influences of a well-developed technological human culture.
palaeontologic	The study of fossils to determine the structure and evolution of extinct animals and plants.
permeability	The capacity of a material (rock) to transmit fluids (groundwater).
porosity	That fraction of total rock volume which is filled with water, gas, or oil.
proponent	The entity or person who proposes a significant project. It includes a person who, under an agreement or other arrangement with the person who is the existing proponent of the project, later proposes the project.
regional ecosystems (REs)	Regional ecosystems were defined by Sattler and Williams (1999) as vegetation communities in a bioregion that are consistently associated with a particular combination of geology, landform and soil.
regrowth	A young, usually even-aged forest stand that has regenerated after disturbance.
rehabilitation	Making the land useful again after a disturbance. It involves the recovery of ecosystem functions and processes in a degraded habitat.
remnant vegetation	Vegetation, part of which forms the predominant canopy of the vegetation: <ul style="list-style-type: none"> • covering more than 50 per cent of the undisturbed predominant canopy • averaging more than 70 per cent of the vegetation's undisturbed height • composed of species characteristic of the vegetation's undisturbed predominant canopy.
riparian	Pertaining to, or situated on the bank of, a body of water, especially a watercourse such as a river.
riparian zone	Located alongside a watercourse.
run-off	The amount of rainfall which actually ends up as stream flow, also known as rainfall excess.
sediment	Any usually finely divided organic and/or mineral matter deposited by air or water in non-turbulent areas.
sensitive receptor	Those locations or areas where dwelling units or other fixed, developed sites of frequent human use occur.
significant project	A project declared as a 'significant project' by the Coordinator-General, under section 26 of the SDPWO Act.
sodic soil	A sodic soil is defined as one in which more than 10–15 per cent of the clay's negative charge is balanced by sodium ions.
stratigraphy	Rock strata, especially the distribution, deposition, and age of sedimentary rocks.
terrestrial	Pertaining to land, the continents, and/or dry ground. Contrasts to aquatic.
under stress	Aquifer water level conditions as defined by DEHP

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