Terms of Reference for an Environmental Impact Statement

Gladstone LNG Project (Santos)

Under Part (4) of the Queensland *State Development and Public Works Organisation Act 1971*

August 2008

Queensland the Smart State

Queensland Government
The Coordinator-General

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Abbreviations

The following abbreviations have been used in this document:

ACH Act	*Aboriginal Cultural Heritage Act 2003 (Qld)*
AHD	Australian height datum
CAMBA	China-Australia Migratory Bird Agreement
ANZECC	Australian and New Zealand Environment and Conservation Council
GPC	Gladstone Ports Corporation
CHMP	Cultural Heritage Management Plan
CO2	Carbon dioxide
CG	The Coordinator-General of the State of Queensland
CSG	Coal seam gas
CQSS2	Central Queensland Strategy for Sustainability – 2004 and Beyond
DEHWA	Australian Department of Environment, Heritage, Water and the Arts
DLGSR	Queensland Department of Local Government, Sport and Recreation
DIP	Queensland Department of Infrastructure and Planning
DMR	Queensland Department of Main Roads
DME	Queensland Department of Mines and Energy
DNRW	Queensland Department of Natural Resources and Water
DPI&F	Queensland Department of Primary Industries & Fisheries
DTRDI	Queensland Department of Tourism, Regional Development and Industry
EIS	Environmental Impact Statement, as defined by Part 4 of the *State Development & Public Works Organisation Act 1971*
EMP	Environmental Management Plan
EP Act	*Environmental Protection Act 1994 (Qld)*
EPA	Queensland Environmental Protection Agency
EPBC Act	*Environment Protection & Biodiversity Conservation Act 1999 (C'th)*
EPP	Environmental Protection Policy

ERA	Environmentally Relevant Activity
GLNG	Gladstone LNG Project
GQAL	Good Quality Agricultural Land in *State Planning Policy 1/92: Development and the Conservation of Agricultural Land*.
IAS	Initial Advice Statement, as defined by Part 4 of the *State Development & Public Works Organisation Act 1971*
IPA	*Integrated Planning Act 1997 (Qld)*
LAT	Lowest Astronomical Tide
JAMBA	Japan-Australia Migratory Bird Agreement
Mtpa	Million tonnes per annum
NCA	*Nature Conservation Act 1992 (Qld)*
MNES	Matters of National Environmentally Sensitive
NOx	Oxides of nitrogen
NRM	National Resource Management Plan
NTRB	Native Title Representative Body
RoW	Right-of-Way
Santos	Santos Ltd
SDPWO Act	*State Development & Public Works Organisation Act 1971 (Qld)*
SPP 1/03	State Planning Policy 1/03 Mitigating the Adverse Impacts of Flood, Bushfire and Landslide
TAL	Tonnes axle loading
ToR	Terms of Reference as defined by Part 4 of the *State Development & Public Works Organisation Act 1971*

Preface

1. Project background

Santos Limited proposes to develop a Liquefied Natural Gas (LNG) export facility at Gladstone in Central Queensland, Australia. The facility will allow Santos to commercialise its Queensland coal seam gas (CSG) resources and export the processed gas (in the form of LNG) to overseas markets. The facility will initially be constructed to produce three to four million tonnes per annum (Mtpa) of LNG, with the potential for future expansion to a nominal ten Mtpa. While Santos has identified preferred fields for the supply of gas and a preferred location for the LNG Liquefaction and Export Facility, the EIS will address environmental impacts associated with feasible alternative sites capable of substantially meeting the proposal's objectives.

The facility will be developed on Curtis Island (in the Hamilton Point area) in close proximity to the industrial deepwater port at Gladstone. The Project will source gas from Santos' CSG fields around the Comet Ridge and Roma project areas, with gas being transported to the Gladstone LNG (GLNG) facility via subsurface 425 km gas transmission pipeline(s).

2. The Project

The Project is predicted to cost approximately A$7 billion and to generate at the peak of the four year construction period approximately 3000 jobs and sustain over 200 jobs during operation. The Project will consist of the following key components:

- CSG field development;
- gas transmission pipeline construction; and
- LNG liquefaction and export facility development.

Coal Seam Gas Field Development

Santos outright as well as in joint venture owns and operates a number of existing CSG fields in the Comet Ridge and Roma project areas. These fields will be developed and expanded to provide sufficient gas supply to the LNG facility. Santos proposes to drill and complete enough development wells to supply approximately 5300 petajoules (PJ) (140 billion m^3) of CSG to the proposed LNG facility. This will likely equate to approximately 600 development wells prior to 2015 and possibly 1400 or more wells after 2015 (excluding exploration wells). In addition, installation of other operationally related infrastructure will be required including access roads, accommodation camps, water gathering networks, water management facilities, in-field gas gathering networks (to transport gas from the wells to field compression stations), field gas compression stations and pipeline compressor stations.

In addition to operationally related infrastructure, the EIS should consider the impact on environmental values of all exploration activities relating to the expansion of the CSG field including drilling of appraisal wells and other activities associated with exploration activities and production testing.

Gas Transmission Corridor

A 425 km long underground gas transmission pipeline corridor will accommodate one or more pipelines for the delivery of the gas from the CSG resources to the LNG facility over the first phase of the Project. The transmission pipeline(s) is anticipated to have a nominal diameter 650–800 mm and an expected operating pressure of approximately 5-15 megapascals.

Initial capacity will ensure 3-4 Mtpa of LNG production at the LNG facility, with staged expansions achieved by intermediate boost compression and/or pipeline duplication to achieve the final configuration for 10 Mtpa LNG production.
The EIS should consider the air and noise emissions from compressor stations established along the pipeline to achieve the required boost compression and from other pipeline related infrastructure.

The transmission pipeline crossing of Port Curtis to Curtis Island will consider a range of crossing techniques including horizontal directional drilling, laying the pipe on the seabed or in a trench in the seabed, or above water (associated with a proposed bridge joining Curtis Island to the mainland).

LNG Liquefaction and Export Facility
The proposed LNG facility will be located on Curtis Island in the Hamilton Point area, which is situated approximately 5 km north-east of the City of Gladstone. Access to the site will be via a bridge linking Curtis Island (Laird Point area) with the mainland (Friend Point area). A new access road is also proposed to be built on the western side of Curtis Island, as well as on the mainland linking the bridge with the existing regional road network. The LNG facility components may include, but are not limited to:

- inlet separation / filtration / treatment to remove pipeline debris and liquids;
- gas treatment to remove major components within the gas stream that are detrimental to the process of liquefaction of natural gas, including carbon dioxide, water and other contaminants;
- refrigeration and liquefaction;
- LNG storage tank(s) with vapour recovery;
- marine facilities (including a LNG tanker loading jetty and associated dredging);
- utilities including water, fuel systems, control systems and power generation;
- flares including a plant flare, tank flare, and/or jetty flare; and
- supporting facilities (e.g. construction accommodation, roads and bridge).

The components above will be addressed under five EPBC referrals; all of which have been declared controlled actions under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act):

- EPBC 2008/4057 development of a natural gas liquefaction and export park with a 10 million tonne capacity;
- EPBC 2008/4058 construction of marine facilities including a jetty, materials offloading facility and channel dredging;
- EPBC 2008/4059 development of coal seam gas resources across around 2 million hectares in the area around Roma, Queensland;
- EPBC 2008/ 4060 construction of a bridge, road and services corridor to access the LNG plant; and
- EPBC 2008/ 4096 gas transmission pipeline and route option.

Santos will be required to liaise with the Coordinator-General and other nominated parties to determine the scope of the study areas for the bridge, road corridor linking Curtis Island to the mainland, and the marine dredging required by the Project.

3. The Proponent

The project Proponent is Santos Limited (Santos), a major Australian oil and gas exploration and production company with CSG interests in Queensland, and interests and operations in every major Australian petroleum province and interests in Indonesia, Papua New Guinea, Vietnam, India, Kyrgyzstan, Bangladesh and Egypt. Contact details for the Proponent are as follows:

Santos Limited
Ground Floor, Santos Centre
60 Flinders Street
Adelaide South Australia 5000
Attn: Mr. Rick Wilkinson

4. Administrative procedures for these Terms of Reference

On 10 July 2007, the Proponent prepared and lodged an Initial Advice Statement (IAS) for the Project with the Coordinator-General (CG). The IAS provides an outline of the proposed Project, including the Project rationale and its potential impacts.

On 16 July 2007, the CG declared the Project to be a 'significant project for which an EIS is required', pursuant to s.26 (1) (a) of the *State Development Public Works Organisation Act 1971* (SDPWO Act).

On 31 March 2008, the Australian Government Minister for the Environment, Heritage and the Arts determined that EPBC 2008/4057, 4058, 4059, and 4060 were 'controlled actions' under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) due to the likely potential impacts on matters of national environmental significance (MNES). EPBC 2008/4096 was determined on 14 April 2008 to also be a 'controlled action' due to the likely potential impacts on MNES.

The proposed actions under the referrals were determined likely to have a significant impact on the following matters protected by the EPBC Act:

- EPBC 2008/4057: World Heritage (ss 12 and 15A), National Heritage Places (ss 15B and 15C), Listed threatened species and communities (ss 18 and 18A), Listed migratory species (ss 20 and 20A);
- EPBC 2008/4058: World Heritage (ss 12 and 15A), National Heritage Places (ss 15B and 15C), Listed threatened species and communities (ss 18 and 18A), Listed migratory species (ss 20 and 20A);
- EPBC 2008/4059: Listed threatened species and communities (ss 18 and 18A), Listed migratory species (ss 20 and 20A);
- EPBC 2008/4060: World Heritage (ss 12 and 15A), National Heritage Places (ss 15B and 15C), Listed threatened species and communities (ss 18 and 18A), Listed migratory species (ss 20 and 20A); and
- EPBC 2008/4096: World Heritage (ss 12 and 15A), National Heritage Places (ss 15B and 15C), Listed threatened species and communities (ss 18 and 18A), Listed migratory species (ss 20 and 20A).

As a consequence, the Project requires assessment and approval under the EPBC Act. The Australian Government has accredited the EIS process, to be conducted under the SDPWO Act, under a Bilateral Agreement between the Australian and Queensland Governments, pursuant to s.87(1)(a) of the EPBC Act.

This will enable the Environmental Impact Statement (EIS) to meet the impact assessment requirements under Australian and Queensland legislation. Representatives of State and Local Governments and other relevant authorities have been invited to act as Advisory Agencies for the EIS process, and have examined the IAS and commented on the draft Terms of Reference (ToR).

The IAS and draft ToR were been placed on public exhibition, inviting comments. The Department of Infrastructure and Planning (DIP) will manage the environmental impact assessment process for this Project on behalf of the CG.

Once finalised, Santos will prepare an EIS addressing the ToR. When the EIS meets the CG's requirements, a public notice will be placed in relevant newspapers. The notice will state where copies of the EIS can be viewed or purchased; the submission period, and where submissions should be sent. Santos may be required to prepare a Supplementary Report to the EIS to address specific matters raised in submissions.

At the end of the EIS phase, the CG will prepare a report assessing the EIS and other material, in accordance with section 35 of the SDPWO Act.

The CG Report will include an assessment and conclusion about the environmental effects of the Project, and any associated mitigation measures. Material that will be assessed includes: the EIS; properly made submissions, and other submissions accepted by the CG; and any other material the CG considers relevant to the Project, such as a Supplementary Report, comments and advice from Advisory Agencies and other entities, technical reports, and legal advice.

The CG Report will be provided to Santos and relevant Assessment Managers for any approval required for the Project.

The Project involves proposed Petroleum Authorities to Prospect, petroleum lease(s), pipeline licence(s) and/or petroleum facility licence(s) under the *Petroleum and Gas (Production and Safety) Act 2004 (*Qld*)* the CG's Report for the project may state conditions for the proposed lease or licence in accordance with Part 4, Division 6A of the SDPWO Act. If such conditions are included in the CG Report, the CG will give the Minister administering the Act under which the lease or licence is proposed to be granted a copy of the CG Report.

The Project involves a development approval for a material change of use under the development scheme for the Gladstone State Development Area, as assessed by the CG in accordance with the SDPWO Act. A material change of use for an Environmentally Relevant Activity and all development permits will be assessed under the *Integrated Planning Act 199*7. In accordance with Part 4, Division of the SDPWO Act, the CG Report may also state for the Assessment Managers one or more of the following:

- the conditions that must be attached to the development approval;
- that the development approval must be for part only of the development; and/or
- that the approval must be a preliminary approval only.

Alternatively, the CG Report must state for the Assessment Manager(s) that:

- there are no conditions or requirements for the Project; or
- the application for the development approval is refused.

5. Results of Consultation on these Terms of Reference

Submissions on the draft ToR were received from the following Departments, as well as from private individuals, corporations and environmental NCOs (not listed for confidentiality reasons):

- Australian Government Department of the Environment, Water, Heritage and the Arts;
- Queensland Department of Communities; Primary Industry & Fisheries; Natural Resources and Water; Mines and Energy; State Development; Emergency services; Regional Development Tourism and Industry, Sports & Recreation; Health; Main Roads; and Housing;
- Queensland Transport, EPA; Queensland Police Service; and
- The Roma, Dalby, Central Highlands and Gladstone Regional Councils and the Banana Shire Council.

Part A – Information and Advice on the Preparation of the EIS; and
Part B – Specific Requirements – Contents of the EIS.

The Project Manager for further inquiries is:

Mr Ainsleigh Reffold
Project Manager – Gladstone LNG Project (Santos)
Department of Infrastructure and Planning
Significant Projects Coordination
PO Box 15009 City East Qld 4002
tel +61 7 3405 5461
fax +61 7 3225 8282
Email: Ainsleigh.Reffold@dip.qld.gov.au

Part A Information and advice on preparation of the EIS

1 Introduction

These ToR are for an EIS for the Gladstone LNG Project proposed by Santos Ltd. The ToR has been prepared in accordance with the requirements of sections 29 and 30 of the SDPWO Act.

The objective of the ToR is to identify those matters that should be addressed in the EIS. The ToR is based on the outline of the proposed Project provided in the IAS.

In order to clarify the nature and level of investigations that are envisaged in the ToR, Santos should consult further with relevant government bodies (known as Advisory Agencies), peak organisations and community interest groups as necessary during the preparation of the EIS.

The ToR should not be interpreted as excluding from consideration any matters that: are currently unforeseen; may arise during ongoing scientific studies; or may arise from any changes in the nature of the Project during the preparation of the EIS, the community consultation process and associated documentation.

Culturally sensitive information should not be disclosed in the EIS or any associated documents and the disclosure of any such information should only be in accordance with the arrangements negotiated with the traditional custodians. Confidential information to be taken into consideration in making a decision on the EIS should be marked as such and be included as a separate attachment to the main report.

The EIS should address, as a minimum, the requirements as set out in these ToR.

2 EIS objective

The objective of the EIS is to ensure that potential environmental, social and economic impacts of the Project are identified and assessed and, where possible, state how any adverse impacts would be avoided. Direct, indirect and cumulative impacts must be fully examined and addressed. The Project should be based on sound environmental protection and management criteria.

The EIS should be a self-contained and comprehensive document that provides sufficient information for an informed decision on the potential impacts of the Project, and the management measures employed to mitigate adverse impacts. The EIS document should provide:

Affected persons - groups or persons with rights or interests in land, as defined under s.38 of the *Environmental Protection Act 1994* (EP Act): an outline of the effects of the proposed Project on that land, including access arrangements.

Interested persons – groups or persons as defined under s.43(3)(b) of the EP Act: a basis for understanding the Project, prudent and feasible alternatives, affected environmental values, potential impacts that may occur and measures to mitigate potential adverse impacts.

Advisory Agencies: a framework for decision makers to assess the environmental aspects of the Project, with respect to legislative and policy provisions, who will, based on that information, make an informed decision on whether the Project should proceed or not and if so, on what conditions, if any.

The Australian Government Minister for the Environment, Heritage and the Arts: information to determine the extent of potential impacts of the Project on matters of national environmental significance, in particular the controlling provisions under the EPBC Act:

- ss 12 and s.15a (world heritage);
- ss 15b and s.15c (natural heritage places);
- ss 18 and s.18a (listed threatened species and communities); and
- ss 20 and 20a (listed migratory species).

The Proponent: a mechanism by which the potential environmental impacts of the Project are identified and understood. Information to support the development of management measures including Environmental Management Plans (EMPs) to mitigate the adverse effects of residual environmental impacts of the development. Santos is required to address the ToR to the satisfaction of the CG before the EIS is made publicly available.

It should be noted that the CG does not evaluate the EIS until public notification is completed and the CG has obtained any other material that the CG considers relevant to the Project, including additional information or comment about the EIS and the Project from the Proponent.

Completion of the EIS in accordance with the final ToR does not mean the Project will be approved.

3 General EIS guidelines

The EIS is to provide stakeholders with sufficient information to understand the type and nature of the Project, the potential environmental, social and economic impacts, and the measures proposed by the Proponent to mitigate adverse impacts on the natural, built and social environment. It should be recognised that the Australian, State and Local Governments, special interest groups and the general public will have an interest in the EIS.

All phases of the Project should be described in the EIS including pre-construction, construction, operation and decommissioning, including final rehabilitation. Direct, indirect and to the extent possible, cumulative impacts should be identified and assessed with respect to the environmental values of the Project area. Specifically the EIS provides:

- an executive summary of the potential environmental impacts of the Project;
- an overview of the Proponent and its existing operations;
- a description of the entire Project, including associated infrastructure requirements;
- a description of feasible alternatives capable of substantially meeting the proposal's objectives;
- an outline of the various approvals required for the Project to proceed;
- descriptions of the existing environment, particularly where this is relevant to the assessment of impacts;
- measures for avoiding, minimising, managing and monitoring adverse impacts, including a statement of commitment to implement the measures;

- rigorous assessment of the risks of adverse and beneficial environmental impacts arising from the Project and relevant alternatives on environmental, social and economic values, relative to the 'no project' scenario;
- any information derived from baseline and predictive studies, the required extent of which will be commensurate to risks;
- a description of stakeholder consultation undertaken; and
- responses to issues raised during public and stakeholder consultation.

The main EIS document needs to be supported by appendices containing relevant data, technical reports and other sources of the EIS analysis. In preparing the EIS, the approach to be adopted requires that:

- predictions of environmental impacts are based on scientifically supported studies;
- the EIS is to present all technical data, sources or authority and other information used to assess impacts;
- the methods used to undertake any specialist studies are outlined, together with any relevant assumptions and professional or scientific judgements;
- the scientific reliability of investigations and predictions is indicated, including the estimated degree of certainty or, if possible, statistical confidence wherever appropriate;
- proposed measures to mitigate and manage identified issues are described and evaluated; and
- residual impacts that are not quantifiable are described qualitatively, in as much detail as reasonably practicable.

The assessment of environmental impacts needs to encompass both potential impacts on, and uncertain risks to, the environment. The level of investigation of potential impacts or particular risks needs to be proportionate to both the severity of the potential consequences of possible events and the likelihood of those events occurring.

Specific types of relevant impacts requiring investigation are set out in Part B. However, the EIS will need to address other issues or aspects that may emerge during the investigations and preparation of the EIS.

The EIS should state the criteria adopted in assessing the proposed Project and its impacts, such as compliance with relevant legislation, policies, standards, community acceptance and maximisation of environmental benefits and minimisation of risks.

The level of analysis and detail in the EIS should reflect the level of significance of the expected impacts on the environment. Any prudent and feasible alternatives should be discussed and treated in sufficient detail, and reasons for selection of the preferred option should be clearly identified.

Where possible, information provided in the EIS should be clear, logical, objective and concise, so that non-technical persons may easily understand it. Where appropriate, text should be supported by maps and diagrams.

Factual information contained in the document should be referenced wherever possible. Where applicable, aerial photography and/or digital information (e.g. of Project site, pipeline and road corridors, etc) should be presented.

The term ‘detail’ and ‘discuss’ should be taken to include both quantitative and qualitative matters as practicable and meaningful. Similarly, adverse and beneficial effects should be presented in quantitative and/or qualitative terms as appropriate. Should Santos require any information in the EIS to remain confidential, this should be clearly indicated, and separate information should be prepared on these matters.

The term ‘Project’ includes all activities undertaken on lands covered by the proposed CSG fields, pipeline corridor, compression station facilities, LNG facility and any right-of-way necessary for construction purposes and supporting infrastructure associated with the Project. Ultimately, it is the Proponent’s responsibility to ensure that adequate studies are undertaken and reported.

4 Stakeholder consultation

The Proponent must undertake a comprehensive and inclusive program of consultation with government agencies, key stakeholders and interested parties. The consultation program must provide stakeholders with the opportunity to obtain information about the Project, to raise issues and express their concerns, and to receive feedback on how the Proponent intends to address the issues and mitigate adverse impacts of the Project.

Consultation with the Advisory Agencies should be the principal forum for identifying legislation, regulations, policies and guidelines relevant to the Project and EIS process. Where appropriate, information bulletins can be used to disseminate information to a wider audience. These bulletins can also be used to inform stakeholders of the Proponent’s progress in the EIS process and on specific investigations.

The Proponent is encouraged to provide opportunities for the general public to obtain information about, and comment on, the Project through public information sessions.

5 General EIS format

The EIS should be written in a format matching the ToR or include guidelines (preferably as an appendix) describing how the EIS responds to the ToR. There should be clear demarcation between material in the EIS that refers to the separate project components (gas field, gas pipeline, bridge and infrastructure to Curtis Island, LNG plant and port facility development) to allow assessment agencies and other readers to differentiate the project components. The EIS documentation is to include appendices containing:

- a copy of the final ToR;
- a list of persons, interest groups and agencies consulted during the EIS;
- a list of Advisory Agencies consulted with an appropriate contact; and
- the names of, and work done by, all personnel involved in the preparation of the EIS.

Maps, diagrams and other illustrative material should be included in the EIS to assist in the interpretation of the information.

The EIS should be produced on A4-size paper capable of being photocopied, with maps and diagrams on A4 or A3 size. The EIS should also be produced on CD ROM. CD ROM copies should be in ADOBE®PDF format. All compression must be down-sampled to 72 dpi (or ppi). PDF documents should be no larger than 2 MB in size. Text size and graphics files included in the PDF document should be of sufficient resolution to facilitate reading and enable legible printing. The EIS should also be produced in a format suitable for placement on the internet.

Part B: Specific Requirements – Contents of the EIS

The EIS report should include the following sections, but need not be limited to these sections or structure.

Executive summary

The executive summary should be written as a separable document, able to be reproduced on request and distributed to interested parties, who may not wish to read or purchase the EIS as a whole. The executive summary should use plain English and avoid the use of jargon and esoteric terms.

The structure of the executive summary should generally follow that of the EIS, but focus on key issues to enable the reader to obtain a clear understanding of the Project and its potential adverse and beneficial environmental, social and economic impacts and the management measures to be implemented by Santos to mitigate adverse impacts.

The executive summary should include:

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

Glossary of terms

A glossary of technical terms and acronyms should be provided.

1 Introduction

The introduction should clearly explain the purpose of the EIS, to whom it is directed and contain an overview of the structure of the document.

1.1 Project Proponent

This section should describe the relevant experience of Santos, including nature and extent of business activities, and environmental history, including the Santos (and where accessible Petronas) environmental policies.

1.2 Project description

This section should provide a brief description of the key elements of the Project including the coal seam gas field development plan, gas transmission corridor and LNG facility, as well as associated infrastructure requirements with specific locations illustrated on maps.

1.2.1 Relationship to Other Projects

This section should describe how the Project relates to other relevant existing or proposed projects, where details of such proposed projects are provided by the DIP to Santos or otherwise published. In particular, mention should be made of any expansion of facilities at the Port of Gladstone advised by the DIP or otherwise published, and any interdependency between these projects and GLNG.

In particular, the section should refer to the relationship between the Project and other LNG export projects planned for the Gladstone region and undergoing separate assessment and to existing CSG field activities operated by Santos or other companies.

1.3 Project objectives and scope

This section should provide a statement of the objectives of the proposal and a brief outline of the events leading up to the proposal's formulation. Information should be provided on the envisaged time scale for implementation, Project life and actions already undertaken within the Project areas.

1.4 Project need, costs and benefits

1.4.1 Need for the Project

The EIS should describe the justification for the Project in a local, regional, state and national context. This section should also describe:

- expected local, regional, state or national benefits;
- the Project's technical feasibility; and
- the rationale and justification for the Project in relation to any relevant published or DIP advised policy or regulatory framework.

1.4.2 Costs and Benefits of the Project

This section should summarise:

- the economic costs and benefits to other industries and the wider community, Queensland and Australia arising from the Project; and
- regional social impacts including employment, skills development and any workforce accommodation issues arising from the Project.

1.5 Alternatives to the Project

The EIS should describe any prudent and feasible conceptual, technological and locality alternatives to the Project, or specific elements of the Project (e.g. alternative usages for CSG). The consequences of not proceeding with the Project must also be discussed.

Alternatives should be discussed in sufficient detail to justify the ultimate selection of the preferred option and what criteria were used to determine Curtis Island as the preferred location. Compliance with government policy should be included in this discussion. Reasons for selecting preferred options should be delineated in terms of technical, commercial, social and natural environment aspects.

In particular, the principals of Ecologically Sustainable Development (ESD) and sustainable development should be included. This information is required to assess why the scope of the proposal and to ensure that the ESD principles and sustainable development aspects have been considered and incorporated during the scoping and planning of the proposal.

This discussion of alternatives is to include a review of onshore and offshore alternatives (e.g. current SDA) and the potential location(s) for disposal or reuse of the dredge spoil (as per the requirements of the National Ocean Disposal Guidelines for Dredged Material (NODGDM-DEH 2002).

1.6 The Environmental Impact Assessment process

1.6.1 Methodology of the EIS

This section should provide an outline of the approvals process, including the environmental impact assessment process, and any associated licence or permit application processes. It should include information on the relevant stages of the approvals process, statutory and public consultation requirements and any interdependencies that exist between the approvals sought. This section should also make clear the objectives of the EIS process under the SDPWO Act and development approval under IPA and EP Act and the development scheme for the Gladstone State Development Area in accordance with the SDPWO Act. In addition, the issuing of environmental authorities under the *Petroleum and Gas (Production and Safety) Act 2004* and development approvals under IPA and EP Act.

This section should include a description of the impact assessment process steps and timings and decisions to be made for relevant stages of the Project.

In particular, this section should outline mechanisms in the process for public input. It should be noted that it is necessary for the Proponent to undertake public consultation as part of the impact assessment process.

1.6.2 Objectives of the EIS

This section should provide a statement of the objectives of the environmental impact assessment process, detail how the relevant legislation will be addressed and highlight that the EIS is the key environmental document for providing advice to decision makers considering approvals for the Project. It should be highlighted that the purpose of the EIS is to:

- provide public information on the need for, and likely environmental, economic and social impacts of the Project;
- set out acceptable standards and levels of impacts (both beneficial and adverse) on environmental values;
- demonstrate how environmental impacts can be managed through the protection and enhancement of the environmental values; and
- demonstrate the relationship of environmental management, planning documentation, conditions, approvals and environmental authorities to the Project.

1.6.3 Submissions

Interested and affected persons should be made aware of how and when submissions on the EIS will be addressed and taken into account in the decision-making process. The EIS should inform the readers on:

- how to make submissions;
- what form the submissions should take; and
- when submissions must be made.

1.7 Public consultation process

This section should outline the public consultation process that has taken place during EIS preparation and the results of such consultation. It should outline any further opportunities for public input on the EIS.

The public consultation program should provide opportunities to encourage and facilitate active community involvement. The public consultation process should identify broad issues of concern to local community and interest groups at all stages including Project planning, construction, commissioning, operations and final decommissioning.

The key objectives of the consultation program should be to:

- inform the different interest groups about the Project proposal;
- seek an understanding of interest group concerns about the proposal;
- explain the impact assessment research methodology, and how public input might influence the final recommendations for the Project;
- provide an understanding of the regulatory approval process; and
- seek local information and input into the Project.

The public consultation program should be incorporated into the EIS and provide ongoing opportunities for community involvement, feedback and education. Details should be provided on programs for public meetings, interest group meetings, production of regular summary information and updates any other consultation mechanisms for encouraging and facilitating active public consultation.

A list of affected persons and interested stakeholders, which includes information on consultation with each party, should be included.
Any indigenous component of the public consultation program should be guided by engagement that:

- is geographically specific;
- uses appropriate language and media; and
- takes into account the communication skill level of participants.

In particular, the EIS should describe:

- Santos' program for communicating and consulting with the public and stakeholder groups during the course of the EIS preparation and include the information provided and the methods for engaging with local stakeholders in the assessment of social and economic impacts; and

- the outcomes of consultation undertaken as part of specific impact studies, the issues and suggestions of stakeholders or members of the public (by theme and source, rather than individually) and the response made by Santos in the context of either the EIS studies or the refined proposal.

1.8 Project approvals

1.8.1 Relevant legislation and policy requirements

This section should identify the principal development approvals for the Project, and specify the legislation and policies controlling the approvals process. Reference should be made to the *Environmental Protection Act 1994*, *State Development and Public Works Organisation Act 1971*, *Transport Infrastructure Act 1994*, *Integrated Planning Act 1997, Petroleum and Gas* (*Production and Safety) Act 2004, Fisheries Act 1994, Vegetation Management Act 1999, Coastal Protection and Management Act 1995, Nature Conservation Act 1992, Marine Parks Act 2004* and other relevant Queensland laws, State Planning Policies and Water Resource Plans. Any requirements of the Commonwealth EPBC Act 1999, *Native Title Act 1993* or other relevant Commonwealth legislation should also be included. The additional processes for application/ amendment of other authorities, along with opportunities for public participation should also be described.

The *Transport Infrastructure Act of 1994*, the *Transport Planning and Coordination Act of 1994*, the *Transport Operations (Road Use Management) Act of 1995* and the Main Roads 'Guidelines for Assessment of Road Impacts of Development Proposals' should guide the Proponent when considering the impacts or mitigation measures for transport infrastructure and operations.

Local Government planning controls, local laws and policies applying to the project should be described, and a list provided of the approvals required for the project (including those related to the conduct of prescribed environmentally relevant activities) and the expected program for approval of applications.

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

1.8.2 Planning process and standards

This section should discuss the Project's consistency with existing land uses or long-term policy framework/s for the project area (e.g. as reflected in local and regional plans such as the central Queensland Strategy for Sustainability 2004 and beyond), and with legislation, standards, codes or guidelines available to monitor and control operations on site.

This section should refer to all relevant state and regional planning policies and should include:

- any planning controls, by-laws and policies relating to the study area/s and adjacent lands;
- details of all licences, planning and environmental approvals required or previously granted;
- regional strategies or plans that relate to the study area/s or proposal (existing or in preparation); and

- relationship to other significant developments (existing or proposed) in the study area/s or surrounding areas (where details of such proposed developments are provided by the DIP to Santos or otherwise published).

This should include an assessment of the Project's consistency with the Development Scheme for the Gladstone State Development Area, the Gladstone Ports Corporation Land Use Plan, as well as the Gladstone Regional Council and other relevant local authority planning schemes.

This information is required to demonstrate how the proposal conforms to state, regional and local plans for the area to demonstrate the minimising of environmental impacts through strategy planning for multi-user infrastructure and services.

In preparing the EIS, Santos should make reference to the Natural Resource Management Plan accredited by the Queensland and Australian Governments under the National Action Plan for Salinity and Water Quality and the Natural Heritage Trust for the respective catchments, where activities are planned, such as the Fitzroy Basin (CQSSII 2004, FBA). Reference should also be made to the appropriate Regional Planning Frameworks, such as CQA New Millennium. It is recommended that Santos consults with the regional NRM bodies that would have a broad range of NRM interests in the Project component areas.

1.9 Accredited process for controlled actions under Commonwealth Legislation

On 28 February 2008 and 13 March 2008, Santos lodged five separate EPBC referrals to cover the Project's components:

- EPBC 2008/4057 development of a natural gas liquefaction and export park with a 10 million tonne capacity;
- EPBC 2008/4058 construction of marine facilities including a jetty, materials offloading facility and channel dredging;
- EPBC 2008/4059 development of coal seam gas resources across around 2 million hectares in the area around Roma, Queensland;
- EPBC 2008/ 4060 construction of a bridge, road and services corridor to access the LNG plant; and
- EPBC 2008/ 4096 gas transmission pipeline and route option.

All five EPBC referrals have been declared controlled actions under the Australian Government's EPBC Act; as such the EIS will be developed pursuant to the Bilateral Agreement between the Australian and Queensland Governments for the purposes of the Australian Government's assessment under Part 8 of the EPBC Act. The EIS should address potential impacts on the MNES identified by the Minister for the Environment, Heritage and the Arts. As a minimum, the EIS should provide discussions addressing those issues relevant to the controlling provisions under sub-headings in the relevant sections.

In addition, a stand-alone report should be provided as a stand alone chapter (7.7) that fully addresses the issues relevant to the controlling provisions, with sub-sections for each of the EPBC referrals. The report should follow the following template outline:

- title of EPBC referral and number;
- description of the Project;
- explanation of the infrastructure the referral relates too;
- description of proposed action (as it would impact on MNES);
- description of the affected environment relevant to the controlling provisions (i.e. describe the features of the environment that are MNES protected under the EPBC Act);
- assessment of impacts on MNES and mitigation measures;
- conclusions; and
- references.

2 Description of the Project

This section should describe the Project and its components addressing construction, operation and decommissioning stages (including rehabilitation). Details should include:

- design parameters for aspects of the Project that may impact upon any endangered and threatened species;
- a program covering activities relating to design, construction, commissioning and operating activities; and
- an outline of any major transport routes impacted on by the supply of construction materials, equipment and personnel involved in the construction process.

Maps or figures showing the position of features or boundaries should use the GDA94 datum. The GDA94 datum should also be used in the text to describe the locations of any features (such as discharge points) or boundaries that may be relevant to subsequent approvals.

2.1 Location

2.1.1 Regional context

The national and regional context of the proposed project should be described and illustrated on maps at suitable scales. A map should be included at an appropriate scale that identifies the entire project footprint including LNG facility, gas transmission pipeline corridor, and coal seam gas fields and associated infrastructure. The maps should also illustrate:

- boundaries of local government areas;
- cadastral boundaries;
- location and purpose of any proposed easements; and
- clearly legible designated vehicle routes to service the pipeline within the road network and traversing private property.

2.1.2 Local context

The Project location should be described in detail in the local context. This may require a detailed description of each project component (i.e. LNG facility, marine facilities, road and services corridors, gas transmission pipeline and gas field development). The location of the port, areas within the port where construction is to take place, the area to be dredged, potential spoil disposal sites, and surrounding areas should be illustrated in maps at suitable scales.

Maps should show the precise location of the project area, and in particular:

- the location and boundaries of the project footprint, including the boundaries (existing and proposed) of petroleum leases, pipeline licences and petroleum facility licences;
- the location and boundaries of land tenures (in place or proposed) to which the project area is or will be subject;
- any mining and petroleum exploration leases in the region;
- planning scheme zonings;
- features of state and national environmental significance;

- existing and proposed infrastructure including urban development areas, other LNG facilities, public access limits to the proposed bridge and road works;
- the location and justification of any proposed buffer areas or buffer zones within and surrounding the project working areas; and
- the extent of vegetation clearing.

These features could be overlain on a rectified air photo or satellite enlargement to illustrate components of the Project in relation to the natural and built features of the area.

2.2 Construction

2.2.1 LNG facility construction

The extent and nature of the construction of the LNG facility should be described. The description should include the type and methods of construction, the construction equipment to be used and the items to be transported onto the construction site. Any staging of the Project should be described and illustrated showing site boundaries, development sequencing and timeframes.

The estimated numbers of people to be employed in the construction phase (including a labour histogram) should also be provided, with a brief description of where those people may be accommodated and/or how they will be transported to the site.

2.2.1.1 Onshore construction

The description of the extent and nature of the Project's onshore construction phase should include:

- type and methods of construction;
- the equipment to be used for the construction of the above;
- the items of plant and equipment to be transported to the site for construction;
- the volume of materials to be transported to the site, the location of the supply, method of and route for transport;
- extent of surface disturbance; and
- the expected length of the onshore construction phase, and staging of the proposal, with illustration/s showing site boundaries, development sequencing and timeframes.

A development permit will be required (subsequent to the EIS) for works which are located on State coastal land within the Curtis Coast Coastal Management District. Accordingly, detailed concept plans, consistent with the Environmental Protection Agency's (EPA) guideline 'Operational work on State coastal land' are required for works within the coastal management district.

2.2.1.2 Road infrastructure works

The extent and nature of proposed road and bridge works and impacts upon existing road networks should be described in line with the study scope area determined following discussions with DIP and other nominated parties. The description should include:

- the type, scale and method of construction of the bridge and road works;
- the management of the traffic during the construction phase;
- the location of temporary access to the site from the existing road network during the onshore and offshore construction phase;

- justification of the preferred road infrastructure route on tidal islands and the specific construction techniques used to protect marine park habitats for any proposal to construct a bridge and associated works in the Great Barrier Reef Coast Marine Park.

2.2.1.3 Offshore construction

The extent and nature of the Project's offshore construction phase should be described. For each component that includes off-shore activities (e.g. LNG facility jetty/wharf and transmission pipeline marine crossing) the description should include:

- the type and methods of construction for the offshore works, including module unloading methodology and proposed landing sites;
- details of any temporary marine infrastructure (including dredging requirements);
- the equipment to be used for the construction of the above and the method of construction;
- the launching area for offshore equipment;
- the volume of materials to be transported to the site;
- the items to be transported to the site for construction; and
- the expected length of the offshore construction phase, and staging of the project.

Tidal works will require a resource allocation and a development approval under the *Coastal Protection and Management Act 1995.* Drawings indicating the type, location and extent of the tidal works proposed (e.g. areas to be dredged, the jetty and wharf structures, and any works proposed to be attached to the jetty and wharf) are required. Design and construction standards are summarised in the EPA's Operational Policy 'Building and engineering standards for tidal works.

2.2.1.4 Dredging and dredged material disposal

The methods proposed for the dredging of the new berth pocket, swing basin, apron and channel should be described in line with the study scope area determined following discussions with DIP and other nominated parties and should include:

- the type and method of dredging proposed;
- the dredge equipment, including any marine flora and fauna protection measures proposed;
- the expected length and timing of the dredging campaign;
- the amount of dredged material to be relocated and planned relocation sites; and
- a plan of the land to be reclaimed, drawn to an appropriate scale, showing the following information:
  - the boundary of the land to be reclaimed defined by metes and bounds, tied to real property boundaries;
  - the location of the line of mean high water spring tide and highest astronomical tide in relation to the area of reclamation;
  - existing levels of the land and proposed final levels of reclamation in relation to the lowest astronomical tide (LAT) or Australian Height Datum (AHD);
  - location of marine plants and existing and proposed bunds; and
  - typical cross section across the land to be reclaimed showing the proposed finished levels and method of protecting the seaward boundary of the reclamation from erosion.

The method, location and issues associated with the disposal of dredged material should be described including:

- the characteristics of the dredged material disposal area(s) proposed;
- the physical and chemical qualities of the dredged material;
- modelling of sediment plumes;
- future use of the dredged material disposal area(s), including the proposed rehabilitation measures or strategy;
- management of the dredged material disposal area(s) during disposal operations;
- for land-based dredge spoil disposal, a detailed assessment, with appropriate staging plans, to demonstrate that the quality of the water discharged from dredge spoil disposal areas will meet standards necessary to achieve water quality objectives and therefore maintain receiving water environmental values throughout the period of dredge spoil disposal on land. Consideration should be given to:
  - quantities of tail water likely to be generated from dredging activities;
  - the settling rate of fine sediments from all dredge material types;
  - the residence time within settling ponds prior to discharge (related to dredge pumping rate, ratio of solids to water in spoil, settling rates, available capacity of the disposal and settling areas, potential bulking factor, intensity and duration of rainfall events with consideration given to the worst case scenario for these factors);
  - source of material for bunds and bund wall stability;
  - measures to limit channelling and sediment re-suspension in settling ponds;
  - measures to limit erosion and sediment re-suspension in discharge channels; and
  - contingency measures in the event that discharge limits are exceeded.

Note: Dredging with disposal of spoil on land above mean high water springs (MHWS) in the GSDA may require an further material change of use from the CG under the SDPWO Act, as well as an allocation of quarry material or dredge management plan, under the provisions of the *Coastal Protection and Management Act 1995*, prior to application for tidal works approval under the *Integrated Planning Act 1997*. Detailed information on dredge management could be supplied subsequent to the EIS but only if all material is to be disposed of on land.

As dredging will be carried out within the Great Barrier Reef World Heritage Area (but outside the Marine Park), should disposal of dredged material at sea be the recommended option, the disposal is likely to occur within the Great Barrier Reef World Heritage Area and potentially in the Great Barrier Reef Marine Park. As such, the potential impacts on World Heritage values and how these should be managed should be described.

2.2.2 Gas transmission pipeline construction

The extent and nature of the construction of the gas transmission pipeline should be described. The description should include the type and methods of construction, the construction equipment to be used and the items to be transported onto the construction site. Any staging of the Project should be described and illustrated showing site boundaries, development sequencing and timeframes. The estimated numbers of people to be employed in the construction phase should also be provided with a brief description of where those people may be accommodated and/or how they will be transported to the site.

Reference should be made to AS2885 and the Australian Pipeline Industry Association Code of Environmental Practice, which documents the approach that should be taken when determining the optimal route selection as well as engineering standards that must be applied to the construction.

2.2.2.1 Route selection process and description of proposed route

This section should describe the route selection process used to identify the proposed route and any feasible alternatives. It should describe the decision-making process that led to the nomination of the proposed route, and describe the proposed route in a travelogue format, listing key features encountered by the proposed route from start to end and key issues to be addressed in the impact assessment.

Justification should be provided for selecting a route that traverses the conservation estate (e.g. National Park, State Forest, conservation park or nature refuge).

2.2.2.2 Co-location opportunities

Opportunities may exist for efficiency gains and the mitigation of environmental and property impacts through the location of other proposed linear infrastructure in, near or parallel to the gas corridor.

The EIS should describe the implications of locating other forms of linear infrastructure within or near the gas corridor, including the separation of existing pipelines in terms of reliability of supply and potential impacts on biodiversity. Conversely, the benefits of the proposed pipeline being located within existing cuts should be detailed.

Where co-location may be likely, the EIS should consider opportunities to coordinate or enhance any of the impact mitigation strategies proposed for the gas corridor through cooperation with other proponents in the locality. In particular, the potential implications of any infrastructure co-location on gas corridor width and alignment should be described.

Santos should identify any known existing or planned proposed projects, where details of such proposed projects are provided by the DIP to Santos or otherwise published) within the vicinity of the gas investigation corridor. However, it is the responsibility of the individual proponents of other linear infrastructure projects to provide the required information to the Proponent. The Department of Infrastructure and Planning can, at the Proponent's request, assist with the facilitation of meetings with known proponents of other linear infrastructure in the Project area.

Attention should be given to any Council Planning Schemes that address co-location (e.g. draft Central Highlands Regional Council's Consolidated Planning Scheme) to identify possible co-location opportunities.

2.2.2.3 Gas transmission pipeline specifications

This section should provide a detailed description of the proposed gas transmission pipeline(s) including ancillary infrastructure. The pipeline should be described with reference to the following:

- maps of the preferred route location;
- potential location and/or frequency of cathodic protection points, compressor stations, block valves (isolation points), and any other project facilities and linkages to existing gas pipelines;
- expected design parameters (e.g. pipe grade, design life, wall thickness, depth of cover, and other information as deemed relevant);
- criteria for design and location of any temporary or permanent access crossings;
- corridor widths and access requirements along the route, including the long-term cleared corridor width as well as the width required for construction and location of new corridor access tracks;
- engineering design concepts and pipeline management principles, including an explanation of the differing impacts between piled and trenched pipe trenched methods on tidal tides;
- requirements for the construction right of way (RoW);
- location of temporary and permanent above-ground infrastructure;
- location of existing infrastructure that might be affected by construction and operation of the pipeline; and
- construction program for the project.

2.2.2.4 Pipeline Compression facilities

This section should provide a description and layout of a typical compression facilities site.

2.2.2.5 Pre-Construction activities

A description of the pre-construction activities should be set out in this section, including any upgrading of existing infrastructure or construction of new infrastructure such as camps or dams. In addition, details should be provided from a whole-of-project perspective of the quantity of material required for ancillary construction activities and bedding materials for the pipeline from quarries, pits and extraction areas for sand and gravel. This section should also describe the proposed management of cleared trees (following removing of millable timber) in relation waste management (i.e. vegetation – chipped or ground to assist in rehabilitation or soil stabilisation).

2.2.2.6 Road infrastructure works

The extent and nature of proposed road and bridge works and impacts upon existing road networks should be described in line with the study scope area determined following discussions with DIP and other nominated parties. The description should include:

- the type, scale and method of construction of the construction and access road works;
- the management of the traffic during the construction phase and during maintenance/ access operations along the pipeline corridor;
- the location of temporary and permanent access to the site from the existing road network.

2.2.2.7 Construction activities

The full extent and nature of the Project's construction phase should be described. The description should include the quantities, specifications and potential sources of construction materials (including their proposed haulage routes), pipeline spread activities (i.e. details on the workforce and equipment required) and construction techniques.

2.2.3 Coal seam gas field expansion construction activities

The extent and nature of the construction of the coal seam gas field development should be described. The description should include the type and methods of construction, the construction equipment to be used and the items to be transported onto the construction site. Any staging of the Project should be described and illustrated showing well sites, power supply, water and gas collecting systems, service access tracks and roadways, site boundaries, development sequencing and timeframes. Proposed engineering structures for the storage, transport, treatment and use of associated water should be described, including design standard objectives.

The estimated numbers of people to be employed in the construction phase should also be provided with a brief description of where those people may be accommodated and/or how they will be transported to the site.

This section should include a description of the Proponent's overall approach to impact assessment of CSG field activities, including Phase 1 assessment work being undertaken as part of the GLNG EIS and Phase 2 assessment work, which will be undertaken post GLNG EIS, once development well locations are more firmly known.

2.2.3.1 Compression facilities

This section should provide a description and layout of a typical compression facility.

2.3 Operation

This section should describe the gas field, transmission pipeline and LNG facility operation and maintenance activities.

The location and nature of the operational processes to be used at the CSG field, transmission pipeline and the LNG facility should be described in the text and illustrated with maps, diagrams and artistic impressions as required. Operational issues to be described should include, but may not be limited to:

- a description of plant and equipment to be employed, including surface markers for underground infrastructure;
- chemicals to be used;
- the progressive increase and final project capacity;
- transport requirements (road, rail and shipping);
- maintenance dredging and dredge material disposal including frequency, estimated volumes and locations of dredged material disposal area(s);
- hours of operation;
- the estimated number of people to be employed; and
- security requirements.

Concept and layout plans should be provided highlighting proposed buildings, structures, plant and equipment. The nature, sources, location and quantities of materials to be handled, including the storage of raw materials, should be described.

The proposed methods and facilities to be used for CSG and LNG storage and transfer of product should be described and shown on plans at an appropriate scale. This section should include a discussion of any environmental design features of these facilities, including bunding of storage facilities and collection and recycling of product spillage.

2.4 Rehabilitation and decommissioning

This section should describe the strategies and methods for decommissioning the project components, including progressive and final rehabilitation of land disturbed by the project.

2.4.1 Coal seam gas field

The means of decommissioning the coal seam gas field, both from the construction and operational phases, in terms of the removal or making safe of equipment, structures and buildings should be described, and the methods proposed for the rehabilitation of the affected areas should be given.

Final rehabilitation of the gas field development sites should be discussed in terms of ongoing land use suitability, timing and sequencing of rehabilitation including progressive rehabilitation management of any residual contaminated land (including sites that may be affected by storage or spillage from associated water) and any other land management issues.

2.4.2 Gas transmission pipeline

Details should be provided on how the pipeline and ancillary equipment, including buildings and structures, would be removed or made safe if left in-situ.

2.4.3 LNG facility

The means of decommissioning the LNG facility, both from the construction and operational phases, in terms of the removal or making safe of plant, equipment, structures and buildings should be described, and the methods proposed for the rehabilitation of the affected areas should be given. Final rehabilitation of the site should be discussed in terms of ongoing land use suitability, management of any residual contaminated land and any other land management issues.

2.5 Infrastructure requirements

Arrangements for the transport and storage of plant, equipment, products, raw materials, wastes and personnel during both the construction and operational phases of the Project should be described. The description should address the use of existing infrastructure facilities and requirements for the construction, upgrading or relocation of any transport, energy or services related infrastructure.

This section should also identify opportunities to share infrastructure with other proposed LNG projects in the locality including gas and water feed pipelines, compressor stations, water treatment plants, product storage tanks, cryogenic product and boil-off gas return pipeline and ship loader facilities. The potential benefits and disadvantages should be discussed.

2.5.1 Energy

The EIS should describe energy requirements/demands for the Project, including electricity, natural gas, and/or solid and liquid fuel requirements for the construction and operational phases of the Project. The locations of any registered easements should be shown on the infrastructure plan. Energy conservation should be briefly described in the context of any Australian, State and Local Government policies.

Timeframes should also be provided for the anticipated dates for the commencement of construction of supply facilities, testing and final commissioning. This section of the EIS should include details on energy demand and annual consumption.

2.5.2 Water supply and management

The EIS should provide information on water usage by the Project. In particular, information should be provided on the demand for raw and treated water for the various processes and the proposed and optional sources of water (e.g. bores, any surface storage such as dams and weirs, municipal water supply pipelines) for construction and operation aspects of the Project.

Details on the estimated rates of supply from each source (average and maximum rates) should be included. Details on daily, seasonal and/or peak operational requirements should include:

- quality of water required, including strategies to prevent contamination;
- quantity of water required including:
  - maximum hourly and daily demand,
  - mean daily demand, and
  - total annual consumption;
- any additional water supply infrastructure; and
- requirements for fire-fighting or other emergency services.

A determination of potable water demand and supply requirements for each phase of the Project should be made, including existing town water supply to meet such requirements. Any on-site water storage and treatment proposals for use by the workforce should be described. To assist in this assessment a water balance is required to account for the estimated usage of water.

An assessment of the capability of the water network to provide the necessary demand should include:

- current and projected raw and treated water consumption and storage;
- contingency plans for planned and non-planned supply failures; and
- projected dates for increased raw and treated water supplies.

2.5.2.1 Associated Water

The EIS should review the management of associated water in Santos' CSG field development area in terms of the EPA Operational Policy 'Management of water produced in association with petroleum activity (associated water)'. In particular, the EIS should clearly investigate each method of management as well as investigating the potential beneficial reuses of associated water. The preferred management method should be identified after taking into consideration environmental, social, technical, economic and regulatory constraints. The EIS should clearly document and provide sufficient information to justify the preferred approach.

In relation to the management of associated water using containment facilities, specific reference should be made to the:

- infrastructure for storage and/or treatment of associated water and requirements for delivery to beneficial users of treated water;
- Management requirements regulating safe use of treated water by beneficial users;
- design of suitable containment facilities (e.g. dams);
- disposal of residual saline waste materials; and
- rehabilitation of decommissioned dams containing associated water.

The EIS should determine the most appropriate methodology to be used for constructing containment facilities that is based on best practice environmental management and engineering principles and include performance measures and rehabilitation criteria.

The EIS should develop an Associated Water Management Plan that will form part of the required Environmental Management Plan for the expansion of the CSG fields. The Plan should set specific performance measures or goals to be achieved to maximise the beneficial reuse of associated water and minimise the generation or emissions of potential contaminants to the receiving environment. The Plan should:

- state the objectives to be achieved and maintained under the Plan;
- state how the objectives to be achieved and a timetable to achieve the objectives taking into account:
  - best practice environmental management;
  - risks of environmental harm being caused (including soil contamination and loss of residue free status of properties);
- state appropriate performance indicators at time intervals of not more then 12 months; and
- make provisions for monitoring and reporting compliance with this Plan.

Potential end-users that may be off-site of the petroleum lease should be provided with the water quality analysis of any supplied water.

Associated water discharged to streams must consider:

- a review of risks;
- hydrological modelling, with the proposed approach to be discussed and accepted by the Department of Natural Resources and Water (DNRW) and EPA before model development commences;
- development of a risk management framework, with agreement obtained from the EPA and other local stakeholders;
- development of an adaptive water management plan; and
- monitoring and review.

2.5.3 Transport

This section of the EIS should provide a brief overview of transport requirements including details of transport volumes and routes.

2.5.3.1 Shipping

In relation to shipping of LNG, details of the number of ships utilising Gladstone Ports Corporation (GPC) port facilities and their size and frequency should be documented. In particular, changes to any of the following are to be described:

- berthing/departure requirements including weather constraints;
- security zones around the vessels both in berth and in transit, together with impacts on other maritime operations;
- interaction with other vessels;
- scheduling of vessel movement;
- channel configuration, including swing basins;
- towage requirements, including provision of escort tugs (if necessary);
- pilot requirements;
- parameters of vessels to be used;
- arrival and departure conditions of the vessels;
- anchorage arrangements;
- access to and from the port;
- any other navigational arrangements; and
- any additional servicing of vessels.

2.5.3.2 Roads

Details should be provided on road transportation requirements on public roads for both construction and operational phases of the Project including:

- impacts on other transportation routes, specifically marine vessels;
- the volume, composition (types and quantities), origin and destination of goods to be moved including construction materials, plant, raw materials, wastes, hazardous materials and finished products;
- the volume of traffic generated by workforce personnel, visitors and service vehicles;
- details of vehicle traffic and transport of heavy and oversize indivisible loads (including types and composition);
- the proposed transport routes; and
- the ability of existing transport infrastructure to support the additional demand.

The EIS should detail the location and lines where the gas transmission pipeline will cross the rail network. A description of the methods to be used when crossing the railway should be provided (e.g. pipe jacking under). This description will identify how continued operation, safety and operational integrity of the rail are maintained.

2.5.4 Workforce and accommodation

The EIS should provide information on the number of personnel to be employed, the skills base of the required workforce and the likely sources (i.e. local, regional or other) for the workforce during the construction and operational phases for each aspect of the Project. The estimated number of people to be employed during construction and arrangements for their transport to and from the Project areas should be provided. In addition, projections of the locations of camps required during construction and on-going maintenance for each aspect of the project.

Estimates should be provided according to occupational groupings and variations in the workforce numbers over the duration of the Project (e.g. histogram). The information should show anticipated peaks in worker numbers during the construction period. An outline of policies for recruitment of workers (addressing recruitment of local/non-local workers, business opportunities/ training for indigenous groups) should be included.

An accommodation strategy for the construction workforce should be included, which addresses the estimated housing needs of both single and accompanied construction workers. This should include details of the size, location and management of any temporary worker accommodation that will be required either on-site or off-site.

Information should include data relating to facilities for:

- food preparation and storage;
- ablution facilities;
- disease vector and vermin control;
- fire safety;
- dust and noise control in relation to proximity of camp site to the construction area; and
- the service personnel required to maintain the camp and the supply of services to each construction camp.

This section should also discuss any usefulness of existing tourist, residential accommodation to make temporary workforce requirements. Approvals required for establishment and operation of such camps should be outlined.

2.5.5 Telecommunications

The EIS should provide details of telecommunication requirements, sources and methods, describe any impacts on existing telecommunications infrastructure (such as optical cables, microwave towers, etc.) and identify the owners of any existing infrastructure.

Santos as part of establishing its telecommunication systems for the project, could give consideration as to whether these services (e.g. mobile/ internet coverage) could be retained to improve the long-term telecommunication services for landholders and other users in the gas fields and along the pipeline corridor.

2.5.6 Stormwater and Sewerage

The EIS should describe the amount and nature of sewage and stormwater generated for onsite or offsite treatment and disposal and the facilities proposed to accommodate these streams. Site layout plans should be provided, which incorporate requirements and conceptual plans for sewage and stormwater management facilities, including descriptions of any discharge requirements for both the construction and operational stages.

This should include proposals for drainage structures and dams and an overall site water balance. The topography of the site and adjacent areas should be discussed if any run-off is expected to leave the site.

If stormwater drainage systems will discharge or allow discharge across state coastal land within the Curtis Coast Coastal Management District, or propose to discharge to tidal waters, a development permit to undertake operational work within the coastal management district and/or tidal work will be required. If a development permit is required (subsequent to the EIS) the application will need to contain information in accordance with EPA's guidelines 'Operational work on State coastal land' and 'Constructing tidal works'. It will be necessary to demonstrate that any changes to the natural wetland hydrology will not result in significant adverse impacts on the adjacent coastal wetlands.

2.5.7 Air & Noise Emissions

The EIS should provide information on air emissions and in particular, sources of emission of dust particulates and toxic air emissions and greenhouse gases. A description of noise emissions should be provided and include principal noise sources (e.g. flares, wells, compression stations), sensitive noise receptors and any noise abatement measures proposed.

2.6 Waste Management

The EIS should provide an inventory of solid, liquid and gaseous wastes to be generated during the construction, operational and decommissioning phases of the Project. This should include waste stream descriptions (including physical and chemical characteristics), expected generation rates and proposed handling, storage, treatment and disposal methods. Waste streams include associated water from CSG fields, and reference should be made to how any residual salts and other potential contaminants of this associated water will be managed.

For each distinct stage of the Project (e.g. construction/site preparation, commissioning, operation and decommissioning), waste management processes and their associated waste streams (i.e. waste outputs: solid, liquid and gaseous), including waste avoidance, reuse, recycling, treatment and disposal efforts should be identified.

The processes should cross-reference the relevant sections of the EIS, where the potential impacts and mitigation measures associated with each waste stream are described. Having regard for best practice waste management strategies and the Environmental Protection (Waste) Policy, the proposals for waste avoidance, reuse, recycling, treatment and disposal should be described in the appropriate sub-section. Information should also be provided on the variability, composition and generation rates of waste produced at the project sites. Waste management planning should be detailed especially as to how these concepts have been applied to preventing or minimising environmental impacts at each stage of the proposal. Details on natural resource use efficiency (e.g. energy and water), integrated processing design, co-generation of power and by-product reuse as shown in a material/energy flow analysis should be presented.

2.6.1 Solid waste disposal

The proposed location, site suitability, dimensions and volume of any solid waste disposal facility, including its method of construction, should be discussed and illustrated.

2.6.2 Liquid waste

A description of the origin, quality and quantity of wastewater (including CSG water) and any immiscible liquid waste originating from the Project should be presented, including an assessment of volumes and quality of waste from treated associated water, and methods and monitoring of safe disposal.

The section should include a description, in general terms, of the sewerage infrastructure required by the Project. If it is intended that industrial effluent or relatively large amounts of domestic effluent are to be discharged into existing sewerage systems, an assessment of the capacity of the existing systems to accept the effluent should be provided in Section 3.7 (Waste). For industrial effluent, this should include detail on the physical and chemical characteristics of the effluent(s). Refer to the EPA website for guidelines on the detailed information requirements for the licensing of sewage treatment plants.

Details of discharge wastewater into Gladstone harbour must identify any potential contaminants likely to impact on approvals for disposal of material from maintenance dredging operations

3 Environmental Values and Management of Impacts

The functions of this section are to:

- describe the existing environmental values of the area which may be affected by the Project. Environmental values should be described by reference to background information and studies, which should be included as appendices to the EIS;
  - Environmental values are defined in section 9 of the *Environmental Protection Act 1994*, environmental protection policies and other documents such as the ANZECC 2000 guidelines and South East Queensland Regional Water Quality Management Strategy. Environmental values may also be derived following recognised procedures, such as described in the ANZECC 2000 guidelines.
- describe the potential adverse and beneficial impacts of the Project on the identified environmental values. Any likely environmental harm on the environmental values should be described and why the harm cannot be avoided;
- describe, to the greatest extent practicable, any cumulative impacts on environmental values caused by the Project, either in isolation or by combination with other known existing or planned projects (where details of such proposed projects have been provided to Santos by the DIP or are otherwise published), including from expansion of the existing Santos gas production fields and known production fields operated by other companies.
- present environmental protection objectives and the standards and measurable indicators to be achieved; and
- examine viable alternative strategies for managing impacts. These alternatives should be presented and compared in view of the stated objectives and standards to be achieved. Available techniques, including best practice, to control and manage impacts to the nominated objectives should be discussed; and
- describe any computational models used to make predictions of impacts and/or outcomes of mitigation measures. The description should address the inputs, assumptions, limitations, sensitivities, accuracy and precision of the models.

This section should detail the environmental protection measures incorporated in the planning, construction, commissioning, operations, decommissioning, rehabilitation and associated works for the Project. Measures should prevent, or where prevention is not possible, minimise environmental harm and maximise socio-economic and environmental benefits of the Project. Preferred measures should be identified and described in more detail than other alternatives.

This section should also address all elements of the environment, such as land, water, coast, air, noise, nature conservation, cultural heritage, social and community, economy, waste, health and safety, hazards and risk, in a way that is comprehensive and clear.

In particular, any requirements and recommendations of the Great Barrier Reef Marine Park Authority (GBRMPA) (should be illustrated in a map to an appropriate scale and the value for which the area is listed (for both world heritage and national heritage) be included), relevant state planning policies, environmental protection policies, national environmental protection measures and integrated catchment management plans should also be addressed.

Santos should also outline the responsibilities and obligations accepted by Australia in nominating and agreeing to world heritage listing be outlined within or as an appendix.

The EIS should assess the impacts of (including survey work), construction, commissioning and operation, potential decommissioning, and rehabilitation of disturbed lands. The impacts associated with potential ongoing maintenance, access and servicing resulting from the development and any other facilities required for the Project should also be assessed.
It is recommended that the EIS should generally follow the heading structure shown below. The mitigation measures, monitoring programs, etc., identified in this section of the EIS should be used to develop the EMP for the Project (see Section 4).

It is recognised that development of the CSG fields will consist of many small, discrete disturbances that are spread over a large area (>20 000sq km) and occurring over a 20+ year timeframe. Where appropriate, studies in this area will be staged with Phase 1 studies being reported in the EIS and consisting of:

- preliminary desktop assessments;
- reconnaissance field survey; and
- development of protocols for ongoing detailed assessment as disturbance areas are defined.

The Phase 2 work (post EIS) will be the implementation of the protocols developed in Phase 1.

In addition to issues raised in the following sections (mainly Section 3.3), the following issues relating to the controlling provisions under the EPBC Act should be addressed when assessing potential impacts on MNES.

Impact on a listed threatened species or ecological community:

Potential impacts vary depending on whether the species or ecological community is extinct in the wild, critically endangered, endangered or vulnerable but generally the EIS should address whether the Project is likely to:

- lead to long-term decrease in the size of a population or a long term adverse affect on an ecological community;
- reduce the species range or extent of occurrence of the ecological community;
- fragment an existing population or ecological community;
- adversely affect habitat critical to the survival of the species or ecological community;
- disrupt the breeding cycle of a population;
- modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline;
- modify or destroy abiotic (non-living) factors (such as water, nutrients, or soil) necessary for the ecological community's survival;
- result in invasive species that are harmful to the species or ecological community becoming established; and
- interfere with the recovery of the species or ecological community.

Impact on a listed migratory species:

With respect to listed migratory species, the EIS should address whether the Project is likely to:

- lead to loss or modification of habitat important for migratory species (including fragmentation, altered land use, fire regimes, altered nutrient cycle, altered hydrological cycles etc);
- introduce or establish invasive species; and
- disrupt species lifecycle (breeding, feeding, migration, roosting etc).

3.1 Climate

This section should describe the rainfall patterns (including magnitude and seasonal variability of rainfall), air temperatures, humidity, wind (direction and speed) and any other special factors (e.g. temperature inversions) that may affect management of the proposal including air quality within the region of the proposal. Extremes of climate (droughts, floods, cyclones including storm tide inundation, etc.) should also be discussed with particular reference to water management at the proposal site.

The vulnerability of the project to natural or induced hazards, such as sea level rising due the climate change, floods and bushfires, should also be addressed. The relative frequency and magnitude of these events should be considered together with the risk they pose to management of the project.

The potential impacts due to climatic factors should also be addressed in the relevant sections of the EIS. For example:

- the impacts of rainfall on soil erosion should be addressed in section 3.2.2.1.
- the impacts of storm events on the capacity of waste containment systems (e.g. site bunding/stormwater management and tailings dams) should be addressed in section 3.4 with regard to contamination of waterways
- in section 3.7 with regard to the design of the waste containment systems.
- the impacts of winds, rain, humidity and temperature inversions on air quality should be addressed in section 3.5.

3.2 Land

This section describes the existing environment values of the land area that may be affected by the proposed project including areas disturbed by infrastructure associated with the project. It should also define and describe the objectives and practical measures for protecting or enhancing land-based environmental values, describe how nominated quantitative standards and indicators may be achieved, and how the achievement of the objectives will be measured, monitored and managed.

3.2.1 Topography and geomorphology

Description of environmental values

Maps should be provided locating the project in both regional and local contexts. The topography of the Project sites should be detailed with contours at suitable increments shown with respect to AHD. Significant features of the landscape and any environmentally sensitive areas, or areas of a high conservation value, should be included on the maps and discussed.

Potential impacts and mitigation methods

Any measures taken to avoid or minimise impacts on major topographic features should be described. The objectives to be used for the Project in re-contouring and landscaping should be described. The extent to which use is made of appropriate native plant species during any landscaping and re-vegetation should be described.

3.2.2 Geology and Soils

Description of environmental values

The EIS should provide a description and map and series of cross-sections of the geology of the Project area, with particular reference to the physical and chemical properties of surface and sub-surface materials and geological structures within the proposed areas of disturbance/ subsidence. Geological properties that may influence: ground stability (including seismic activity, geological faults and associated geological hazards); occupational health and safety; rehabilitation programs; or the quality of wastewater leaving any area disturbed by the proposal should be described.

A soil survey of the sites affected by the Project should be conducted at a suitable scale, with particular reference to the physical and chemical properties of the materials that will influence erosion potential, storm water run-off quality, rehabilitation and agricultural productivity of the land. Information should also be provided on soil stability and suitability for construction of proposed project facilities. GPS referenced sites should be established in the CSG fields, in areas to be used for storage/treatment of associated water, and in spillage risk sites.

An investigation of acid sulfate soils (ASS) should be carried out and a map of ASS occurrence/absence produced, following the *Guidelines for sampling and analysis of Lowland Acid Sulfate Soils (ASS) in Queensland 1998 (Revision 4.0)* and the *State Planning Policy 2/02 Guideline Planning and Management development Involving Acid Sulfate Soils.*

An assessment of sulfate content by depth for proposed disturbances should be carried out, providing a risk assessment according to the treatment categories of the *Queensland Acid Sulfate Soil Technical Manual, Soil Management Guidelines.* A site specific Acid Sulfate Management Plan should be produced, with management strategies related to the ASS map. Consultation should occur with officers of DNRW and EPA.

Landform descriptions and soil profiles should be mapped at a suitable scale and described according to the Australian Soil and Land Survey Field Handbook (McDonald et al, 1990) and Australian Soil Classification (Isbell, 2002). An appraisal of the depth and quality of useable soil should be undertaken.

Information should be presented according to the standards required in the Planning Guidelines: the Identification of Good Quality Agricultural Land (DPI, DHLGP, 1993), and the State Planning Policy 1/92: Development and the Conservation of Agricultural Land.

Potential impacts and mitigation methods

This section of the EIS should provide information on potential impacts to the land resources and proposed mitigation and management methods to be used for the proposal and should provide information on:

- the need for rock, sand and gravel for construction materials, including any new or expanded quarry and screening operations required to service the project;
- the environmental consequences of the excavation and removal of soils from any borrow pits;
- measures to ensure that soil erosion does not accelerate in the Project area due to construction or maintenance activities;
- influence of the time of year of construction on the impact on soils;
- management of any contaminated land and potential for contamination from construction and/or operation;
- details of erosion control measures and criteria used to assess methods that would minimise or alleviate sedimentation over various terrain types, including waterway beds, banks and adjacent areas.
- erosion and sediment control measures to ensure:
  - prevention of soil loss in order to maintain land capability/suitability;
  - reduction of wind-generated dust concentrations; and
  - prevention of significant degradation of local waterways by suspended solids.
- An assessment of the load bearing capacity of soils in the marine plain area and a discussion of proposed access road construction methods;
- methods of stockpiling and disposal of trench material from excavated streambed, bank, and adjacent areas;
- adjustments of the Project area and/or rehabilitation measures to minimise impacts on Good Quality Agricultural Land (GQAL);
- a description of topsoil management, including transport, storage and replacement of topsoil to disturbed areas, and minimisation of topsoil storage times recognising the risk and potential to spread pest (e.g. African lovegrass) and disease to adjoining land uses;
- an assessment of the potential for any heavy metals to be released from sorbed geological materials, including potential effects and mitigation methods to reduce any impact;

3.2.2.1 Soil erosion and stability

For permanent and temporary landforms, possible qualitative erosion rates and management techniques should be described. 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 monitoring, should also be outlined. Mitigation strategies should be developed in line with Australian Engineering Guidelines on Erosion and sediment Control to achieve acceptable soil loss rates, levels of sediment in rainfall runoff and wind-generated dust concentration.

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

- areas cleared of vegetation;
- stockpiles;
- dams, banks and creek crossings;
- the plant site, including buildings; and

- access roads or other transport corridors.

Methods proposed to prevent or control erosion should be specified and developed with regard to (a) preventing soil loss in order to maintain land capability/suitability, and (b) preventing significant degradation of local waterways by suspended solids.

Identify and assess the impact of exposure of sodic soils and the subsequent potential for gully erosion. Mitigation measures to limit the impact of gully erosion on surrounding landscapes should also be specified.

3.2.3 Land use and infrastructure

Description of environmental values

The EIS should identify the following, with the aid of maps:

- land tenure (including reserves, tenure of special interest such as protected areas and forest reserves, roads, railways, and stock routes);
- land use (urban, residential, industrial, agricultural, GQAL, forestry, recreational, mining exploration tenures, mining leases, mining claims, mineral development licences, extractive industry permits, petroleum authorities);
- areas covered by applications for native title determination, with a description of Native Title Representative Bodies' (NTRB) boundaries;
- Information on any known occurrences of economic mineralisation and extractive Resources, petroleum and gas deposits within the project area and the potential impact of the project on these operations and associated tenements (e.g. Stuart Shale Oil);
- location of gas and major water pipelines, power lines, telecommunication cables, roads, railways, bridges, airports, airstrips, helipads and any other infrastructure;
- the distance of the Project from residential and recreational facilities, or other potentially non-compatible land uses;
- port uses need to be placed into context of Gladstone Port Authority Land Use Plan (GPA 1995), or any subsequent revision of this version; and
- recreational and commercial fishing activities and values undertaken in proximity to the site and offshore area should be described.

The EIS should identify whether areas that are environmentally sensitive could be affected, directly and indirectly, by the project. Areas sensitive to environmental harm caused by the project can be determined through site-specific environmental impact assessment.

In particular, the EIS should indicate if the land affected by the proposal is, or is likely, to become part of the protected area estate, or is subject to any treaty. Consideration should be given to national parks, marine park (State and Commonwealth), conservation parks, declared fish habitat areas, wilderness areas, areas of state significance (scenic coastal landscapes), areas of state significance (natural resources), coastal wetlands, aquatic reserves, heritage/historic areas or items, national estates, world heritage listings and sites covered by international treaties or agreements (e.g. Ramsar, JAMBA, CAMBA), areas of cultural significance and scientific reserves.

In addition, the Commonwealth's EPBC Act should be addressed and a determination should be made whether there are MNES that should be described.

Potential impacts and mitigation methods

This section should:

- assess the compatibility of the proposal with surrounding land uses (e.g. mining);
- describe possible impacts on surrounding land uses and human activities, including impacts to agricultural land/GQAL and forestry and tidal lands (addressing loss of access to land and waterways and tidal lands;
- fragmentation of sites, increase of fire risk, impacts on on-farm infrastructure (e.g. for irrigation) and loss of productive land for those purposes) as well as residential and industrial uses;
- indicate measures to be taken to minimise the project's footprint and impact on GQAL
- describe strategy and progress in relation to making of Native Title agreements, including NTRBs, consultant selection, traditional owner involvement and related statutory processes;
- comment on the suitability for co-location of other publicly published infrastructure services, and/or the separation requirements.
- outline the potential issues involved in proximity of the project to electric power transmission lines and electrified rail lines, both at crossing points, where lines run parallel, and where construction and maintenance machinery is used in the vicinity of other infrastructure corridors;
- specify possible impacts on, or sterilization of, identified mineral or energy resources and extractive industry deposits, the amount of sterilization (if any) of the deposits resulting from the construction and/or operation of the Project and associated infrastructure;
- identify if millable timber or quarry resources exist on the CSG fields, pipeline route and LNG plant sites and conduct an assessment of the commercial value of these resources in consultation with and to the satisfying of the NRW; and
- the proposed location of any proposed construction workers' accommodation should be identified in maps.

3.2.4 Visual amenity

Description of environmental values

This section should describe existing landscape features, panoramas and views that have, or could be expected to have, value to the community whether of local, regional, state-wide, national or international significance. In particular, reference should be made to areas of state significance (scenic coastal landscapes) in the Curtis Coast Regional Coastal Management Plan. Information in the form of maps, sections, elevations and photographs are to be used, particularly where addressing the following issues:

- major views, view sheds, existing viewing outlooks, ridgelines and other features contributing to the amenity of the area, including assessment from private residences, Curtis Island National Park, the GBRMP and future transport corridors that service Curtis Island;
- identification of elements within the proposal and surrounding area that contribute to their image of the town/city as discussed in the any local government strategic plan - city image and townscape objectives and associated maps;

- focal points, landmarks (built form or topography), gateways associated with project site and immediate surrounding areas, waterways, and other features contributing to the visual quality of the area and the project site;
- character of the local and surrounding areas including character of built form (scale, form, materials and colours) and vegetation (natural and cultural vegetation) directional signage and land use;
- identification of the areas of the project that have the capacity to absorb land use changes without detriment to the existing visual quality and landscape character; and
- the value of existing vegetation as a visual screen.

Potential impacts and mitigation methods

This section should also discuss the visual impact of the construction and operation of the Project as it relates to the surrounding landscape on particular panoramas and outlooks.

The assessment should address the local and broader visual impacts of the Project structures. Appropriate simulations to portray the near views and far views of the completed structures and their surroundings from visually sensitive locations should be utilised. The significance of any clearing of vegetation, from a local amenity, landscape and visual perspective should be discussed.

Information should be supplied on the techniques proposed to minimise visual impacts. Special consideration should be given to public roads/ thoroughfares or places of residence, recreation, worship or work which are within the line-of-sight of the Project sites.

Details of the design and colour of any major structures, buildings or fixed plant and proposed screenings either vegetative or material should be described and discussed where relevant to the minimisation of the visual impacts of the Project.

The obstruction of sunlight due to the construction of buildings or alteration of landforms should be considered, as well as major illumination or reflection impacts on adjacent properties or roads.

3.2.4.1 Existing Light Sources

Determine the existing light sources within the Project site and its immediate surroundings. Of particular interest would be:

- visual aspect at night in relation to the location of the project in a predominantly rural setting and impacts of the LNG facility on marine usage in Gladstone harbour;
- vehicular and rail movements at night within the surrounding area;
- impacts on port users in the northern section of the Gladstone harbour, in particular navigation of vessels on the North China bay precinct; and
- proximity of existing light sources to significant receptor areas such as fauna habitats, residential and business establishments.

Potential impacts and mitigation methods

An assessment of potential impacts of lighting of the Project and means for mitigation of these projects should be undertaken both during the construction and operational phases, with particular reference to:

- alterations to visual impact at night;
- potential impact of increase in vehicular and rail traffic in the area;
- effects of lighting from night operations and maintenance on residents; and
- changed habitat conditions for nocturnal fauna and associated impacts.

3.2.5 Land contamination

Description of environmental values

The EIS should describe the possible contamination of land from aspects of the Project including spillage, waste, acid generation from exposed sulphuric material, spills at chemical and fuel storage areas, and storage/spillage of associated water or waste from treated water at the CSG fields.

A preliminary site investigation (PSI) of the project sites consistent with the EPA's "Draft Guidelines for the Assessment and Management of Contaminated Land in Queensland" should be undertaken to determine background contamination levels. The results of the PSI should be summarised in the EIS and provided in detail in an appendix. Due to the nature and scale of the pipeline and CSG project components the EPA should be consulted to determine the most practicable approach to completing a PSI.

If the results of the PSI indicate potential or actual contamination, a detailed site investigation progressively managed in accordance with the stages outlined in Appendix 5 of the Draft Guidelines for the Assessment and Management of Contaminated Land in Queensland should be undertaken.

In short, the following information may be required in the EIS:

- mapping of any areas listed on the Environmental Management Register or Contaminated Land Register under the EP Act;
- identification of any potentially contaminated sites not on the registers which may need remediation; and
- a description of the nature and extent of contamination at each site and a remediation plan and validation sampling.

The EIS should address management of any existing or potentially contaminated land in addition to preventing and managing land contamination resulting from project activities. Proponents should consult with the Contaminated Land Section in the Queensland EPA regarding study proposals.

Potential impacts and mitigation methods

The means of preventing land contamination (within the meaning of the EP Act) should be addressed and methods proposed for preventing, recording, containing and removing any contaminated land outlined. Intentions should be stated concerning the classification (in terms of the Queensland Contaminated Land Register) of any contamination on the land and storage areas after proposal completion.

3.3 Nature conservation

This section should detail the existing nature conservation values of the Project area and how these have changed over time. The environmental values of nature conservation for the affected area should be described in terms of:

- integrity of ecological processes, including habitats of rare and threatened species;
- conservation of resources;
- biological diversity, including habitats of rare and threatened species;
- Integrity of landscapes and places including wilderness and similar natural places;
- Marine plants under the *Fisheries Act 1994*; and
- Aquatic and terrestrial ecosystems.

A discussion should be presented on the nature conservation values of the areas likely to be affected by the Project. The flora and fauna communities that are rare or threatened, environmentally sensitive localities including the Ramsar sites, National Parks, lakes, waterways and adjacent marine environment should be described. The description should include a plant species list, a vegetation map at appropriate scale and an assessment of the significance of native vegetation, from a local and regional and state perspective.

The description should indicate any areas of state or regional significance identified in an approved biodiversity planning assessment produced by the EPA (e.g. see the draft "Regional Nature Conservation Strategy for SEQ 2001-2006"). The description should also take into consideration relevant Council Biodiversity Strategies.

Reference should be made to legislation and policies of both Australian and Queensland Governments that deal with the identification, protection and recovery of threatened species and ecological communities.

All surveys undertaken should be in accordance with recognised best practice, including consideration of advice from the EPA, and should include consideration of seasonality, potential for occurrence of significant species, rarity of species and the sensitivity of the species to disturbance. This section should also discuss likely direct and indirect environmental impacts on flora and fauna in both terrestrial and aquatic environments in sensitive areas.

The EIS should demonstrate how the Project elements, including all access routes and campsites, would comply with the following:

- avoiding or minimising impacts on areas of remnant vegetation and other areas of conservation value; and
- apply measures to mitigate the impacts of loss of land of conservation values. where this cannot be achieved consideration should be given to offset.

The boundaries of the areas impacted by the Project within or adjacent to an endangered ecological community, including details of potential footprint width should be discussed. Where the Project area would impact upon a threatened community, the discussion should include reasons for the preferred alignment and the viability of alternatives.

3.3.1 Sensitive environmental/ areas

Description of environmental values

The EIS should identify areas that are environmentally sensitive in proximity to the Project. Environmentally sensitive areas should also include areas classified as having national, state, regional or local biodiversity significance, or flagged as important for their integrated biodiversity values.

Consideration should be given to nature refuges, national parks, conservation parks, marine parks (State and Commonwealth), world heritage areas and migratory and shorebird habitat, declared fish habitat areas, wilderness areas, aquatic reserves, heritage/historic areas or items, national estates, world heritage listings and sites covered by international treaties or agreements (e.g. Ramsar, Japan-Australia Migratory Bird Agreement, China-Australia Migratory Bird Agreement), areas of cultural significance (see section 3.10) and scientific reserves.

The proximity of the Project to any environmentally sensitive areas should be shown on a map of suitable scale. Areas regarded as sensitive with respect to flora and fauna have one or more of the following features (and which should be identified, mapped, avoided or effects minimised):

- important habitats of species listed under the *Nature Conservation Act 1992* and/or Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* as presumed extinct, endangered, vulnerable or rare;
- regional ecosystems listed as 'endangered' or 'of concern' under State legislation, and/or ecosystems listed as presumed extinct, endangered or vulnerable under the *Commonwealth Environment Protection and Biodiversity Conservation Act 1999*;
- good representative examples of remnant regional ecosystems or regional ecosystems which are poorly represented in protected areas;
- sites listed under international treaties such as Ramsar wetlands and World Heritage areas;
- sites containing near threatened or bio-regionally significant species or essential, viable habitat for near threatened or bio-regionally significant species;
- sites in, or adjacent to, areas containing important resting, feeding or breeding sites for migratory species of conservation concern listed under the Convention of Migratory Species of Wild Animals, and/or bilateral agreements between Australia and Japan (JAMBA) and between Australia and China (CAMBA);
- sites adjacent to nesting beaches, feeding, resting or calving areas of species of special interest; for example, marine turtles, dugongs and cetaceans;
- sites containing common species which represent a distributional limit and are of scientific value or which contains feeding, breeding, resting areas for populations of echidna, koala, platypus and other species of special cultural significance;
- sites containing high biodiversity that are of a suitable size or with connectivity to corridors/protected areas to ensure survival in the longer term; such land may contain:
  - natural vegetation in good condition or other habitat in good condition (e.g. wetlands); and/or
  - degraded vegetation or other habitats that still supports high levels of biodiversity or acts as an important corridor for maintaining high levels of biodiversity in the area;

- a site containing other special ecological values, for example, high habitat diversity and areas of high endemism;
- ecosystems which provide important ecological functions such as: wetlands of national, state and regional significance; coral reefs; riparian vegetation; important buffer to a protected area or important habitat corridor between areas;
- protected areas which have been proclaimed under the *Nature Conservation Act 1992* and *Marine Parks Act 1982* or are under consideration for proclamation; and/ or
- areas of major interest, or critical habitat declared under the *Nature Conservation Act 1992* or high nature conservation value areas or areas vulnerable to land degradation under the *Vegetation Management Act 1999*.
- details of the passive impacts (i.e. roads, infrastructure, access, and people) this project will have on the northern area of Curtis Island, in particular Graham Creek.

As a minimum, Referrable Wetlands (wetlands that are assessable under the *Integrated Planning Act 1994*, available on the EPA's Referrable Wetlands layer) should be incorporated. It is suggested, however, that all wetlands (including ephemeral wetlands) be considered as sensitive environmental areas and viewed as such when determining environmental values, potential impacts, and mitigation measures. State forests should be included in the list of environmentally sensitive areas.

Santos should in relation national heritage places address the potential impacts (and proposed mitigation) of the project against each value for which the GBRWHA area was listed as world heritage and as a national heritage listed place.

3.3.1.1 Potential impacts and mitigation measures

This section should discuss the following:

- bio-security for pest vectors (Pest, weed and disease considerations and strategies should take into account relevant Australian Government, Queensland Government and local council management plans);
- the potential impact of the Project on species, communities and habitats and features of local, regional or national significance as identified above, including wet heathland, wetlands, eucalypt and melaleuca woodland, mangroves and riparian vegetation;
- proposals to mitigate potential impacts (e.g. timing of works, minimise width of disturbance, proposed rehabilitation of in-stream and floodplain disturbances);
- planned rehabilitation of wet heathland, eucalypt and melaleuca woodland, and riparian vegetation communities and any relevant previous experience/experiments rehabilitating these communities;
- appropriate mitigation measures for remnant ecosystems that may be affected by the Project should refer to the relevant regional vegetation management codes and, if appropriate, the "Policy for Vegetation Management Offsets (DNRW 2007)"; and
- potential impacts and associated mitigation measures should be discussed further under Section 3.3.4 Aquatic Flora and Fauna, 3.3.5 Marine Flora and Fauna and Section 3.4 Water Resources.

3.3.2 Terrestrial flora

Description of environmental values

The section should include mapping of the areas of remnant, disturbed and regrowth regional ecosystems likely to be cleared for the various project areas, and a description of the potential clearing or disturbance of remnant, disturbed and regrowth regional ecosystems where the location of infrastructure and activities can not be determined for the EIS.

Information should include details of each regional ecosystem within the project area, their status, and the predicted area (hectares) of each RE required to be cleared or potentially at risk, as well as discussion of the impact that this is likely to have on the sustainability and functionality of remaining ecosystems and viability of species populations, to the extent practicable. It is recommended that Santos checks the current certified regional ecosystem mapping to ensure that mapping reflects the actual on-ground extent and status of the vegetation. Should discrepancies be noted, Santos may wish to undertake a map amendment through the Queensland Herbarium.

A discussion of clearing activities in relation to requirements of the *Vegetation Management Act 1999* and associated policies should be included. All assessable vegetation (which may include non-remnant vegetation on State land) should also be identified.

Commitments should be given to providing more detailed and accurate information on impacts and mitigation to terrestrial flora throughout the life of the project.

Terrestrial vegetation maps at a suitable scale should be provided for the Project area. Mapping should show and discuss:

- current extent (bioregional and catchment) of protected vegetation types of conservation significance within the protected area estate (national parks, conservation parks, designated flora reserves, resource reserves, nature refuges);
- location and abundance of any exotic or weed species;
- location and extent of vegetation types using the EPA's regional ecosystem type descriptions and the EPA's website (www.epa.gov.qld.au/environment/science/wildlife/) listing the biodiversity status of regional ecosystems;
- location of species listed as Protected Plants under the Nature Conservation (Wildlife) Regulation 1994 and subsequent amendments;
- any plant communities of cultural, commercial or recreational significance;
- areas of re-growth or restoration and remnant vegetation; and
- any threatened species or communities under the EPBC Act.

Discussion of vegetation map units should include their relationship to regional ecosystems. Sensitive or important vegetation types should be highlighted and their value as habitat for fauna and conservation of specific rare floral and faunal assemblages or community types discussed.

The description should contain a review of published information regarding the assessment of the significance of the vegetation to conservation, recreation, scientific, educational and historical interest. The assessment should also include the significance of native vegetation (including re-growth and restored areas in addition to remnant vegetation), from a local, regional, state and national perspective.

For a cross-section of each natural vegetation community likely to be significantly impacted by the Project, vegetation surveys should be undertaken and should include consideration of seasonality. Surveys should be conducted as follows:

- Data compatible with the Queensland Herbarium CORVEG database should be collected across the four assessment tiers in accordance with the vegetation community encountered;
- a list of species present at representative sites covering both proposed and alternative project locations should be recorded;
- the relative abundance of plant species present should be recorded;
- any plant species of conservation, cultural, commercial or recreational significance should be identified;
- vegetation mapping and data should be submitted to the Queensland Herbarium to assist the updating of the CORVEG database; and

- specimens of species listed as protected plants under the Nature Conservation (Wildlife) Regulation 1994, other than common species, are to be submitted to the Queensland Herbarium for identification and entry into the HERBRECS database.

The location of any horticultural crops in the vicinity of the Project area should be shown. Existing information on plant species may be used instead of new survey work provided that the data are derived from surveys consistent with the above methodology. Methodology used for flora surveys should be specified in the appendices to the EIS.
Any existing information should be revised and comment provided on whether the areas are degraded, cleared or affected in ways that would affect their environmental value.

The occurrence of pest plants (weeds), particularly declared plants under the *Land Protection (Land and Stock Route Management) Act 2002*, should be shown on a map at an appropriate scale. A weed management strategy will be required to include the provision of surveys for pest plants to occur after significant rainfall events that would allow germination.

Potential impacts and mitigation methods

This section should include:

- a discussion of the ability of identified vegetation to withstand any increased pressure resulting from the Project and any measures proposed to mitigate potential impacts;
- a description of 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;
- details of any post construction monitoring programs;

- a description of methods of minimising the potential for the introduction and/or spread of weeds or plant disease, including:
  - identification of the origin of construction materials, machinery and equipment;
  - vehicle and machinery wash-down and any other hygiene protocols; and
  - staff/operator education program.

3.3.3 Terrestrial/ fauna

Description of environmental values

The terrestrial and riparian fauna occurring in the areas affected by the Project should be mapped and described, 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 areas should include:

- species diversity (i.e. a species list) and abundance of animals, including amphibians, birds, reptiles, mammals and bats;
- 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 exotic animals;
- existence of any listed rare, threatened or otherwise noteworthy species/communities in the study areas, and current level of protection; and
- use of the areas by migratory birds, and nomadic birds, fish and terrestrial fauna.

A comprehensive vertebrate fauna survey should be undertaken of the project area at a sampling intensity that supports the scale of vegetation mapping (i.e. 1:10 000 or better). The EPA's local District Office should be consulted when developing the fauna survey methodology.

Apart from the species recorded in the survey, an indicative list of all known and potential species and threatened species in the project area should be provided, by reference to the regional ecosystems within the project area and a 100km buffer, and knowledge of species present in the local bioregion.

The occurrence of fauna of conservation significance should be geo-coded to mapped vegetation units or habitats. The EIS should indicate how well any affected communities are represented and protected elsewhere in the province where the site of the proposal occurs.

Discuss the potential for seasonal changes in these fauna distribution patterns. The EIS should indicate how well any affected communities are represented and protected elsewhere in the sub-region where Project sites occur. Site data should be recorded in a format compatible with EPA Wildnet databases.

Potential impacts and mitigation methods

This section of the EIS should include:

- impacts the proposal may have on terrestrial fauna, relevant wildlife habitat and other fauna conservation values, including the impact of introduced animals and plants on Curtis Island;
- measures to minimise wildlife capture and mortality (including in the open pipeline trench);
- monitoring of terrestrial fauna health, productivity and biodiversity;
- details of the methodology that would be used to assess and handle injuries that may be inflicted on livestock or native fauna as a result of construction or operational works for the Project;
- methods of minimising the introduction of feral animals and other exotic fauna; and
- effects of construction activities and disposal of construction wastes on biting insect species or pests and health significance, including measures to prevent increase in these species.

3.3.4 Aquatic flora and fauna

Description of environmental values

The aquatic flora and fauna occurring in the areas affected by the Project should be described, noting the patterns and distribution in the waterways and any associated wetland, tidal lands and marine environments. A description of the habitat requirements and the sensitivity of aquatic flora species to changes in flow regime, water levels and water quality in the Project areas should be described.

This section should encompass non-riverine (palustrine and lacustrine) wetlands, utilising the EPA's Queensland Wetlands Programme maps for the location and classification of both riverine and non-riverine wetlands. This can be accessed at Wetland*Info* www.epa.qld.gov.au/wetlandinfo.

The discussion and identification of freshwater the fauna and flora present or likely to be present within and adjacent to the Project area at any time during the year should include:

- species diversity and abundance;
- any rare or threatened marine species, particularly the dugong and its habitat
- existence of any other listed rare, threatened or otherwise noteworthy species/communities in the study areas, and current level of protection;
- fish species, mammals, reptiles, amphibians, birds, crustaceans and aquatic invertebrates or diatoms occurring in the waterways and any associated wetlands and marine environments within the Project area;
- marine and aquatic (waterway) plants and weeds;
- the existence of feral or exotic animals;
- marine and aquatic substrate and stream type;
- use of wetland and marine habitat by migratory birds, and nomadic birds, fish and terrestrial fauna;
- habitat requirements and sensitivity to changes; including movement corridors and barriers to movement;
- habitat potentially impacted due to changes in currents in associated wetland and marine environments; and

- the potential for seasonal changes in flora and fauna distribution patterns.

Potential impacts and mitigation methods

This section should include:

- a description of the methods used to mitigate and rehabilitate impacts on tidal lands and waterways;
- potential for, and mitigation measures to prevent, the creation of new mosquito and biting midge breeding sites during construction (e.g. in quarries and borrow pits);
- proposed stream diversions, causeway construction and crossing facilities, stockpiled material and other impediments that would restrict free movement of fish;
- measures to avoid fish spawning periods, such as seasonal construction of waterway crossings;
- monitoring of aquatic biology health, productivity and biodiversity in areas subject to ongoing direct discharge; and
- identification of permits/authorities required by the Project associated with activities in waterways (e.g. permits under the *Fisheries Act 1994* to construct temporary or permanent waterway barriers).

3.3.5 Marine Flora and Fauna

If no biota surveys/studies have previously been conducted in and downstream of the project area, the aquatic flora and fauna occurring in the areas affected by the proposal should be described, noting the patterns and distribution in the waterways and/or associated lacustrine and marine environments. The description of the fauna and flora present or likely to be present in the area should include:

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

This section should also detail the existing marine flora and fauna and conservation values in the dredging area and potential area of impact within Port Curtis (including mapping) addressing at least the following:

- native and introduced marine flora and fauna;
- marine ecosystems;
- integrity of ecological processes;
- habitats of significance, rare or threatened species; and
- integrity of natural habitats.

Where possible, environmental thresholds for specific impacts on marine flora and fauna should also be defined having regard to existing environmental values. Flora and fauna species and marine habitats within the study area (particularly hatcheries) should be defined through searches of the appropriate State and Commonwealth databases, review of previous studies and review of aerial photography.

Field studies should be undertaken where inadequate information is available to sufficiently describe the marine communities for the purposes of the impact assessment. Specific issues to be highlighted include:

- presence of turtles and marine mammals within the study area (including location of hatcheries and breeding areas;
- sea floor habitat and benthic macro-invertebrate communities in the vicinity of the spoil ground; and
- seagrass beds and reef communities and their sensitivity to disturbance or adverse water quality conditions.

A desktop review of information on the turtle and dugong communities of the study area should be undertaken with specific attention paid to any anecdotal or recorded information (including from Turtle Watch) on the populations of these animals frequenting areas potentially impacted by the project and any known nesting sites.

Potential impacts and mitigation measures

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

The EIS should address any actions of the project or likely impacts that require an authority under the *Nature Conservation Act 1992*, and/or would be assessable development for the purposes of the *Vegetation Management Act 1999*. Potential impacts on World Heritage values and how these should be managed should be described. Assessment criteria outlined in the *Great Barrier Reef Marine Park Regulation 1983* should also be addressed including (as derived from the regulations):

- the objective of the zone in which the proposal is located;
- the need to protect the cultural and heritage values held in relation to the Marine Park by traditional owners and other people;
- the likely effect of granting permission on future options for the Marine Park;
- the conservation of the natural resources of the Marine Park;
- the nature and scale of the proposed use in relation to the existing use and amenity, and the future or desirable use and amenity of the relevant area and of nearby areas;
- the likely effects of the proposed use on adjoining and adjacent areas, and any possible effects of the proposed use on the environment and the adequacy of safeguards for the environment;
- the means of transport for entry into, use within or departure from the zone or designated area and the adequacy of provisions for aircraft or vessel mooring, landing, taking off, parking, loading and unloading;
- the arrangements for making good any damage caused to the Marine Park by the proposed activity;

- any other requirements for ensuring the orderly and proper management of the Marine Park;

The discussion should cover likely direct and indirect environmental harm due to the project on flora and fauna particularly sensitive areas as listed below. Also include human impacts and the control of any domestic animals introduced to the area.

Strategies for protecting the Great Barrier Reef Marine Park and World Heritage Property, and any rare or threatened species should be described, and any obligations imposed by State or Commonwealth legislation or policy or international treaty obligations (i.e. JAMBA, CAMBA) should be discussed. Emphasis should be given to potential environmental harm to benthic and intertidal communities, seagrass beds and mangroves.

The potential environmental harm to the ecological values of the area arising from the construction, operation and decommissioning of the project including clearing, salvaging or removal of vegetation should be described, and the indirect effects on remaining vegetation should be discussed. Short-term and long-term effects should be considered with comment on whether the impacts are reversible or irreversible. Mitigation measures and/or offsets should be proposed for adverse impacts. Any departure from no net loss of ecological values should be described.

Strategies to mitigate identified impacts from the project on flora and fauna in relation to dredging should be described. Specific attention should be paid to the potential for turtles to be injured or captured by the dredge and the potential impacts from reduction in water quality from dredging (and offshore disposal if proposed). Potential mitigation measures should be reviewed and their likely effectiveness presented.

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

The provision of buffer zones and movement corridors, and strategies to minimise environmental harm on migratory, nomadic and aquatic animals should also be discussed.

3.4 Water resources

3.4.1 Surface waterways and Groundwater

Description of environmental values

The section of the EIS should provide a description of the existing environment for water resources that may be affected by the Project in the context of environmental values as defined in such documents as the EP Act 1994, ANZECC/ ARMCANZ (2000) National Water Quality Management Strategy Paper 4:, Australian Water Quality Guidelines for Fresh and Marine Waters and the Queensland EPA (2006) Queensland Water Quality Guidelines (March 2006).

This section should also encompass non-riverine (palustrine and lacustrine) wetlands, utilising the EPA's Queensland Wetlands Programme maps for the location and classification of both riverine and non-riverine wetlands. This can be accessed at Wetland*Info* www.epa.qld.gov.au/wetlandinfo.

An indication should be provided of the quality and quantity of water resources in the vicinity of the Project area. This section should describe:

- existing surface and groundwater in terms of physical, chemical and biological characteristics;
- existing surface drainage patterns, ephemeral water systems, permanent and episodic wetlands, overland flows, history of flooding including extent, levels and frequency and present water uses;
- environmental values of the surface waterways of the affected area in terms of:
  - values identified in the EPP (Water);
  - physical integrity, fluvial processes and morphology of watercourses, including riparian zone vegetation and form;
  - hydrology of waterways and groundwater, in particular the interconnectiveness of surface water and aquifers to adjoining features;
  - existing and other potential (where details have been provided to Santos by the DIP or are otherwise published) surface and groundwater users and holders of Quarry Material Allocation Notices in the Project area; and
  - any Water Resource Plans relevant to the affected catchments.

If the Project is likely to use or affect local sources of groundwater, this section should provide a description of groundwater resources in the area in terms of:

- geology/stratigraphy;
- aquifer type - such as confined, unconfined;
- depth to and thickness of the aquifers;
- process for assessing and monitoring impacts on alluvial aquifers to qualify water levels and salt concentrations;
- depth to water level and seasonal changes in levels, if possible;
- groundwater flow directions (defined from water level contours);
- interaction with surface water to the greatest extent possible using existing information;
- possible sources of recharge; and
- vulnerability to pollution.

The environmental values of the groundwater of the affected areas should be described in terms of:

- values identified in the EPP (Water);
- sustainability, including both quality and quantity; and
- physical integrity, fluvial processes and morphology of groundwater resources.

Potential impacts and mitigation methods

This section should assess potential impacts of the Project on water resource environmental values identified in the previous section.

It should also define and describe the objectives and practical measures for protecting or enhancing water resource environmental values, to describe how nominated quantitative standards and indicators may be achieved, and how the achievement of the objectives will be monitored, assessed and managed.

Matters to be addressed should include:

- the potential impacts of managing associated water, particularly from current and future proposed activities including – beneficial uses of treated or untreated water, discharge to grade with or without treatment, direct injection and injection of brine from RO plants;
- the potential impacts the proposed Project may have on the flow and the quality of surface and ground waters from all phases of the Project, with particular reference to their suitability for the current and potential downstream uses and discharge licences;
- potential regional impacts of groundwater extraction should be assessed, document and monitored;
- the potential impacts of surface water flow on existing infrastructure, with reference to the EPP (Water) and the *Water Act 2000*;
- chemical and physical properties of any waste water including stormwater at the point of discharge into natural surface waters, including the potential effects of effluent to flora and fauna;
- potential impacts (e.g. salt distribution) on other relevant downstream creeks, if it is proposed to discharge water to the creek system;
- risk and potential spread of pest and disease in aquatic and riparian areas associated with discharge into the creek system (e.g. aquatic weeds, feral fish species and parthenium in stream bed/banks);
- the results of a risk assessment for uncontrolled releases to water due to system or catastrophic failure, implications of such releases for human health and natural ecosystems, and list strategies to prevent, minimise and contain impacts; and
- an assessment of the potential to contaminate groundwater resources and measures to prevent, mitigate and remediate such contamination.

In relation to water supply, usage and wastewater disposal, the EIS should assess:

- anticipated flows of water to and from the Project areas;
- the effects of predictable climatic extremes (droughts, floods) upon the structural integrity of containment walls where dams, weirs or ponds are proposed;
- quality of water contained in dams;
- the need or otherwise for licensing any dams (including referable dams) or other works/activities, under the *Water Act 2000*; and
- The engineering design standards required for containment structures to ensure that they are fit for purpose and achieve best practice in design, construction, operation and decommissioning.

The ANZECC/ ARMCANZ (2000) National Water Quality Management Strategy Paper 4: Australian Water Quality Guidelines for Fresh and Marine Waters and the Queensland EPA (2006) Queensland Water Quality Guidelines (March 2006) may be used as a reference data for evaluating the effects of various levels of contamination, where no local data is available.

Management strategies should be adequately detailed to demonstrate best practice management and that environmental values of receiving waters will be maintained to nominated water quality objectives. Monitoring programs, which will assess the effectiveness of management strategies for protecting water quality during the construction, operation and decommissioning of the Project, should be described. GPS referenced site should be established in the CSG fields to measure the quality of potentially impacted surface water and groundwater resources.

3.4.2 Coastal environment

Description of environmental values

This section describes the existing coastal environment, which may be affected by the proposal in the context of coastal values identified in State of the Coastal Zone Reports, State Coastal management Plan and the Curtis Coast Regional Coastal Management Plan and environmental values as defined by the *Environmental Protection Act 1994* and environmental protection policies. The Environmental Protection (Water) Policy has a set of default environmental values for waterways that include aquatic ecosystem protection.

This section should also identify actions associated with the project that are assessable development within the coastal zone and will require assessment and subsequent approval under the provisions of the *Coastal Protection and Management Act 1995*.

3.4.2.1 Marine water and sediments

Provide baseline information on water quality in the sea and in estuaries below the limit of tidal influence, including heavy metals, acidity, turbidity and oil in water. Discuss the interaction of freshwater flows with marine waters its significance in relation to marine flora and fauna adjacent to the proposal area.

Describe the environmental values of the coastal seas of the affected area in terms of:

- pH, suspended solids, nitrogen and phosphorous;
- values identified in the *Environmental Protection (Water) Policy 1997*; and
- the State Coastal Management Plan and the Curtis Coast Regional Coastal Management Plan.

An assessment of physical and chemical characteristics of sediments should be provided in:

- the areas to be dredged within the full extent of development; and
- if offshore disposal is proposed, the disposal location for dredged material. Information provided should be consistent with EPA requirements (as outlined on the EPA website) for the disposal of dredge spoil.

Any contaminants and implications for management of the dredged material should be described. The description of sediment characteristics should be based on the results of sediment sampling and analysis conducted as per a Sampling and Analysis Plan (SAP) approved under the *Environment Protection (Sea Dumping) Act 1981*. The chemical and physical characteristics of the material to be dredged, the spoil ground and control sites should be summarised. If the material is to be disposed in an offshore area, a statement as to the suitability of the sediment for unconfined ocean disposal should be made using the framework within the National Ocean Disposal Guidelines for Dredged Material (DEH 2002).

Provide testing of marine sediments near the offshore facilities for coal or other operational contaminants from past operation and examine any environmental impacts that have occurred.

Potential impacts and mitigation measures

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

Describe the water quality objectives used (including how they were developed), and how predicted activities will meet these objectives (refer to the EPA's Queensland Water Quality guidelines and the Australian and New Zealand Guidelines for Fresh and Marine Water Quality, ANZECC 2000).

The potential environmental harm caused by the proposal on coastal resources and processes should be described in the context of controlling such effects. The State Planning Policy – Planning and Managing Development involving Acid Sulfate Soils 2002 should be addressed as should the State Coastal Management Plan 2001 and DPI Guidelines for Marine Areas.

The role of buffer zones in sustaining fisheries resources, water quality and the values of coastal wetland systems through maintaining connectivity between coastal and riparian vegetation and estuarine and freshwater reaches of catchments should be discussed. Impacts on water quality due to increased water turbidity and nutrients being brought into the water column from the sediment due to dredging and sea disposal of material, if required, should be addressed and strategies developed to address potential impacts. In addition to the above considerations, the following guidelines and standards should be considered:

- the *Environmental Protection (Water) Policy 1997*, and any recent or proposed amendments that incorporate recommendations of the National Environment Protection Measures;
- ANZECC Australian Water Quality Guidelines for Fresh and Marine Waters (2000);
- amelioration or mitigation measures to address each activity identified to impact on local and regional water quality; and
- any monitoring of water quality recommended during past dredging activities at the port to ensure environmental values are protected.

The potential impacts of sediment quality on the marine environment should be discussed. This assessment will be guided by the suitability of the dredged sediment for ocean disposal (if proposed) as determined by the framework outlined in the National Ocean Disposal Guidelines for Dredged Material (DEH 2002).

3.4.2.2 Coastal processes

Describe the physical processes of the adjacent marine environment, including but not limited to currents, tides, wave action and storm surges. Describe the environmental values of the coastal resources of the affected area in terms of the physical integrity and morphology of landforms created or modified by coastal processes. Assessment should be based on hydrodynamic investigations and include a description of:

- the physical properties of the sediments likely to be dredged;
- sediment dynamics and tidal flows and pathway;
- existing silt ration patterns;
- sediment dynamics at the offshore disposal ground based (if proposed) on the influence of tides, waves, currents and turbidity ; and
- assessment of processes that have occurred at the original spoil ground.

The relationship of these processes to marine flora and fauna, biological processes, recreational and commercial fisheries productivity within the study area should also be discussed. The relationship between currents, wave actions and extreme events (such as cyclones) and how they influence coastal processes should also be discussed.

Potential impacts and mitigation measures

The impacts of development of the new berth area (to the full extent of development including the swing basin apron and any new channels required to facilitate the full extent of the development) on hydrodynamic processes within the study area should be described and quantified. In particular, impacts on silt and sediment transport and any implications for maintenance dredge requirements, marine flora and fauna and/or biological processes should be discussed, including generation and migration of turbid plumes.

Describe the potential impacts associated with and the frequency of maintenance dredging requirements of the berth and apron area, and the long-term options for disposal of dredge spoil.

Consideration needs to be given to the intended size of vessels proposed to access the facility and associated dredging of access channels. Provide details of the capacity and lifespan of existing (including existing approved) reclamation areas to deal with capital and future maintenance dredging to the full extent of development proposed.

Information on currents in the region should be used to predict impacts from dredging and disposal and the subsequent impacts on marine environmental values and coastal processes should be assessed.

3.5 Air

Description of environmental values

This section should describe the existing air environment, which may be affected by the Project, having particular regard for dust particulates and gaseous and odorous compounds. The background levels and sources of suspended particulates, SOx, NOx and any other major constituent of the existing air environment that may be affected by the proposal should be discussed. Sufficient data on local meteorology and ambient levels of pollutants should be collected to provide a baseline for later studies or for the modelling of air quality environmental impact assessment within the air shed. The meteorological parameters should include air temperature, wind speed and direction, atmospheric stability, mixing depth and other parameters necessary for input to the models.

Any existing data on local meteorology and ambient levels of pollutants should be gathered. The environmental values of the air shed for the affected areas should be described in terms of the Environmental Protection (Air) Policy 1998 (EPP(Air)).

Potential impacts and mitigation methods

The EIS should examine the effects on air quality of air emissions during construction, and also during operations on human health.

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

The objectives for air emissions should be stated in respect of relevant standards (stack and ground level concentrations), relevant emission guidelines, and any relevant legislation, and the emissions modelled using a recognised atmospheric dispersion model. The potential for interaction between the emissions from the processing plant, and emissions in the air shed, and the likely environmental harm from any such interaction, should also be detailed.

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

The assessment of the proposal's impact on air quality should include at least the following matters:

- the accurate description of the activities carried out on the site and the surrounding environment;
- process flow diagram clearly showing all unit operations to be carried out on the premises, detailed discussion of all unit operations, and detailed lists of all process inputs and outputs;
- description of all pollution control equipment and pollution control techniques employed on the premises and the features of the proposal designed to suppress or minimise emissions, including dusts and odours; and compare the proposed technologies against the best available control technologies (e.g. low NOx burners and catalyst for controlling CO, VOC and formaldehyde);
- describe the back up measures to be incorporated that will act in the event of failure of primary measures to minimise the likelihood of plant upsets and adverse air impacts; and
- conduct air emission inventory of the proposed site for all potential point, line, area and volume sources including fugitive emissions of dusts and odours. Provide a complete list of emissions to the atmosphere including but not limited to those substances listed in table 1. Present the concentrations at standard temperature and pressure, and provide the mass emission rate, exit velocity, volume flow rate and temperature at exit. Also, specify oxygen content of the flue gases.

Table 1: list of key pollutants

Acidic/Caustic Aerosols	**Particulate Matter**
Ammonia	Total Particulate Matter
Acidic vapours	PM10
Hydrogen sulfide	PM2.5
Sodium hydroxide	PM1
Carbonyl Compounds	**Polychlorinated biphenyls**
Acetaldehyde	Carbonyl sulfide
Acrolein	Cyanides
Formaldehyde	**Polycyclic Aromatic Hydrocarbons (PAHs)**
Coal & Coal Dust	Anthracene
Criteria Gaseous Pollutants	Benzo(a)pyrene
Carbon monoxide	Benzo(g,h,i)perylene
Oxides of nitrogen	Dibenzo(a,h)anthracene
Ozone	Naphthalene
Sulphur dioxide	Phenanthrene
Fluorides	**Radionuclides**
Hydrogen fluoride and fluoride compounds	Internally deposited radionuclides (Uranium/Thorium)
Metals	**Volatile Organic Compounds (VOCs)**
Arsenic and compounds	Volatile Organic Compounds (total)
Beryllium and compounds	Benzene
Cadmium and compounds	Carbon tetrachloride
Chromium (III) compounds	Ethylbenzene
Chromium (VI) compounds	Methyl ethyl ketone
Lead compounds, inorganic	Methyl isobutyl ketone

Lead compounds, organic	Toluene
Manganese and compounds	1,1,1-Trichloroethane
Mercury and compounds	Trichloroethylene
Nickel and compounds	Xylenes
Zinc and compounds	

- all expected emissions of the hazardous air pollutants must be identified and their emissions from known and fugitive sources must be provided. Fugitive emissions from the site may include sources such as equipment leaks, storage tanks and wastewater treatment systems.
- estimation of emission rates should be based on actual measurements on samples taken from similar facilities, either full-scale facilities operating elsewhere, or experimental or demonstration-scale facilities. Where this is not possible, use published emission factors and/or data supplied by manufacturers of process and control equipment.
- the proposed level of emissions must be compared with the best practice national and international source emission standards. For example, the NSW EPA's POEO Clean Air Regulations 2005 may be considered for this evaluation.
- undertake an impact assessment with relevant inputs of emissions and local meteorology to an air dispersion model to provide estimates of the likely impacts on the surrounding environment. The model inputs should be as detailed as possible, reflecting any variation of emissions with time and including at least a full year of representative hourly meteorological data. Estimate ground level concentration (GLC) at the nearest sensitive receptor(s) based on 1-hour average for maximum (99.9 percentile) and 99.5 percentile values. Results of the dispersion modelling must be presented as concentration contour plots and frequency contour plots. The predicted average ground level concentration should be made for both normal and expected maximum emission conditions and the worst case meteorological conditions should be identified and modelled where necessary. Ground level predictions should be made at any residential, industrial and agricultural developments believed to be sensitive to the effects of predicted emissions. The techniques used to obtain the predictions should be referenced, and key assumptions and data sets explained.
- describe the background ambient air concentration from the existing sources in the airshed and evaluate the cumulative impact on the receiving environment. Address both acute and cumulative impacts by considering the project in conjunction with existing and known future emission sources within the region.
- the model input parameters must be based on the actual stack conditions for the licence conditions. Provide stack parameters such as stack height, diameter, temperature, exit velocity and volume flow rate.
- the assessment of proposed levels of emissions of dust, fumes and odours should include emissions during both normal and upset conditions. Consideration should be given to the range of potential upset condition scenarios and the air emissions that may be generated as a result.
- identify 'worst case' emissions that may occur at start-up, shut-down or during other 'upset' operating conditions. If these emissions are significantly higher than those for normal operations, it will be necessary to evaluate the worst-case odour impact, as a separate exercise to determine whether the planned buffer

distance(s) between the facility and neighbouring sensitive receptors will be adequate.

- if odour is an issue, conduct odour impact assessment using the criteria described in the Queensland EPA Guideline of “Odour Impact Assessment from Developments”. The guideline sets out various approaches to assess potential impacts from developments proposals. Guidance provides the use of air dispersion modelling as a tool to predict ground level odour concentrations and comparison must be made with guideline values to determine the likelihood of adverse odour impacts.
- the averaging period for ground level concentrations of pollutants that are modelled should be consistent with the relevant averaging periods for air quality indicators and goals in the Environmental Protection Policy (Air) 1997 and the National Environmental Protection Measure (NEPM) Air. For example, the modelling of sulphur dioxide must be conducted for 10-minutes, 1-hour, 24-hours and annual averaging periods.
- modelled air quality concentrations at the “most exposed existing or likely future off-site sensitive receptors” must be compared with the appropriate national and international ambient air quality standards including the Environmental Protection (Air) Policy 1998 and the National Environmental Protection Council (Ambient Air Quality) Measure.
- for the assessment of chemical species not listed in EPP (Air), the design criteria prescribed by the Victorian Government State Environment Protection Policy (Air Quality Management, 2001), based on odour or toxicity classification could be utilised.
- the human health risk associated with emissions from the facility of all hazardous or toxic pollutants should be assessed whether they are or are not covered by the National Environmental Protection Council (Ambient Air Quality) Measure or the Environmental Protection (Air) Policy 1998.
- where there is no single atmospheric dispersion model that is able to handle the different atmospheric dispersion characteristics exhibited in the proposal area (e.g. sea breezes, strong convection, terrain features, temperature inversions and pollutant re-circulation), a combination of acceptable models will need to be applied.
- the limitations and accuracy of the applied atmospheric dispersion models should be discussed. The air quality modelling results should be discussed in light of the limitations and accuracy of the applied models.
- describe air shed management and the contribution of the proposal to air shed capacity in view of existing and future users of the air shed for assimilation and dispersion of emissions.
- evaluate the extent to which nitrogen oxides and volatile organic compounds emissions from the proposal and existing emission sources within the region will contribute to the generation of photochemical smog.
- evaluate the extent to which sulphur dioxide emissions from the proposal and existing emission sources within the region will contribute to the generation of acid rain or acidification of other atmospheric condensation, such as rain and dew.

3.5.1 Greenhouse gas emissions

Description of environmental values

This section of the EIS should:

- estimate the projected annual Scope 1 emissions, where '*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; and
- estimate the projected annual Scope 2 emissions, where '*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; and
- briefly describe the method used to estimate the greenhouse gas emissions.

The emissions may be estimated using the methodology contained in the National Greenhouse Accounts (NGA) Factors, Department of Climate Change (January 2008), or the most recent version.

Potential impacts and mitigation measures

This section must describe the comprehensive inventory of annual greenhouse gas (GHG) emissions that will be anticipated from the project and identify the contribution of a range of GHG mitigation measures that will be incorporated the plant design. These include but not limited to the addition of waste heat recovery and additional vapour recovery for ship loading, the use of high efficiency gas turbines and/or compressors and the use of low BTU fuel. Review the greenhouse offsets (if any) and presents these with options to be considered.

The assessment of the proposal's greenhouse inventory should include at least the following matters:

- provide an inventory of projected annual emissions for each relevant greenhouse gas, both on-site and off-site attributable to the project, and with total emissions expressed in 'CO2 equivalent' terms;
- estimate emissions from upstream activities associated with the proposed project, including fossil fuel based electricity consumed;
- briefly describe method(s) by which estimates were made;
- present CO2 equivalents emissions as a percentage of Queensland's and Australia's annual greenhouse gas emissions;
- the intended measures to avoid, minimise or offset greenhouse emissions, including any sink-enhancement activities;
- an analysis of comparable technologies, processes and equipment to demonstrate the degree to which the selected option minimises emissions;
- an identification of accountabilities; and
- intended audit and critical review procedures.

The section must include a comprehensive greenhouse gas reduction strategy for the plant that include (but not limited to) items such as: the company's policy on greenhouse gas emissions, an energy efficiency program, a continuous improvement program and better control systems, and action plans for cost effective mitigation measures employed in the design of the project. Consideration should also be given to referencing of current EPA and Queensland Health studies being undertaken on the Gladstone air shed and community reference group.

3.5.2 Greenhouse gas abatement

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

- a description of the proposed measures (alternatives and preferred) to minimise greenhouse gas emissions directly resulting from activities of the project;
- an assessment of how the preferred measures minimise emissions and improve energy efficiency;
- an indication of how the Project's energy consumption and emissions compare with the relevant sector of industry;
- identify opportunities to reduce energy purchased and review opportunities to use renewable energy sources; and
- sufficient flexibility to take account of any future changes to legislation and policy in this regard and any future relevant emissions trading scheme.

Whilst recognising that the EIS process will identify environmental aspects and appropriate mitigation options, the environmental management plan in the EIS should include a specific module to address greenhouse abatement. That module should include:

- commitments to the abatement of greenhouse gas emissions from the Project with details of the intended objectives, measures and performance standards to avoid, minimise and control emissions;
- commitment to energy efficiency opportunity assessment and technology review, including undertaking periodic energy assessments with a view to progressively improving energy efficiency;
- voluntary initiatives such as the national Greenhouse Challenge Plus program; and
- commitments to monitor, assess and report on greenhouse emissions from relevant activities and the success of mitigation measures in accordance with the *National Greenhouse and Reporting Act*.

3.6 Noise and vibration

Description of environmental values

The EIS should describe the existing environmental values that may be affected by noise and vibration from Project activities. If Project activities could adversely impact on the noise environment, baseline monitoring should be undertaken at a selection of noise sensitive sites affected by the proposal. Noise sensitive places in relation to the Project should be identified on a map at a suitable scale. The results of any baseline monitoring of noise and vibration in the proposed vicinity of the proposal should be described.

The daily variation of existing noise levels at nearby sensitive sites should be monitored and reported in the EIS, with particular regard given to detailing variations at different periods of the day and night including seasonal variations.

Monitoring methods should adhere to relevant EPA Guidelines and Australian Standards, and any relevant requirements of the Environmental Protection (Noise) Policy 1997 (EPP (Noise)). Comments should be provided on any current activities near the Project areas that may cause a background level of noise and ground vibration (e.g. other industry, railway, major roads, etc.)

Assessment should be made of the potential emission of low-frequency noise (noise with significant components below 200Hz) from major items of equipment and plant. If necessary, measures should be described for reducing the intensity of these components. Reference should be made to the Environmental Protection Agency's draft guideline, *Assessment of Low Frequency Noise.*

Potential impacts and mitigation methods

The levels of noise generated during construction (including any blasting) and operation of all components of the Project should be assessed against current typical background levels. Anticipated noise levels, their timing and duration, should be considered in conjunction with the sensitivity of receptors.

An estimate should be made of the cumulative noise level at the fenced boundaries of the Project, particularly in the proximity of compressor stations and LNG facility, and at the boundaries of existing land uses likely to be affected by noise from the Project.

This estimate should include noise from construction, operation and from transport movements.

The potential environmental harm of noise and vibration at potentially sensitive places, in particular, any places of work, residence, recreation, or worship, should be quantified and compared with objectives, standards to be achieved and measurable indicators. Proposals to minimise or eliminate these effects should be outlined, 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.

Off-site transport noise and vibration factors due to road should be described and include a discussion on existing speed zones, scheduled transport movements and industry.

3.7 Waste

3.7.1 Waste generation

Description of environmental values

This section should provide technical details of waste generation, treatment, minimisation and management. Sources of waste associated with the construction, operation and decommissioning of the Project should be identified and described including:

- the type and amount of wastes produced, including an inventory of solid and liquid (including wastewater and sewage) wastes generated by each stage of the Project;
- volumes and chemical analysis of wastewater generated by the treatment of associated water for other beneficial uses;
- collection, handling, transport and fate of wastes including storage;
- market demand for recyclable waste (where appropriate); and
- opportunities for waste avoidance, reuse within the project and minimisation techniques; and
- location, site suitability, dimensions, source and volume of any landfill, including method of construction.

3.7.2 Waste management

Description of environmental values

The EIS should provide details of waste management methods, which demonstrate that waste minimisation and cleaner production techniques and designs have been implemented through the selection of processes, equipment and facilities to prevent or minimise environmental impacts. This information should include:

- descriptions of processes, equipment and facilities to be incorporated into the overall Project specifically for the purpose of avoiding waste generation, separation of wastewater from solid waste, reusing or recycling wastes, or on-site treatment methods for wastes to lessen their effect on the natural environment;
- proposed means for management of wastes produced under circumstances other than as a result of normal Project development, including wastes generated during modification (e.g. run-off, chemical cleaning before commissioning), unusual conditions when the facilities are operating (e.g. start-up, maintenance, shut-down) and domestic sewage and refuse;
- methods to prevent seepage and contamination of groundwater from waste stockpiles; and
- methods to avoid stormwater contamination by raw materials, wastes or products and present the means of containing, recycling, reusing, treating and disposing of stormwater, having regard for the requirements of the EPP (Water); and
- risk assessment and monitoring procedures for individual sites in relation to the above points.

Stormwater management should also address:

- nominated stormwater discharge points and discharge criteria;
- design criteria, diversions, volume and capacity of any retention ponds, process tanks or bunded areas, as well as those reasonable and practicable measures proposed to prevent the likely release of contaminated stormwater to any drain or waters;
- potential impacts during extreme rainfall events;
- information on the collection, treatment and disposal of contaminated stormwater runoff from the plant and associated materials handling facilities;
- details of expected contaminants (e.g. chemical composition, particulates, metals, effluent temperature and pH) in controlled discharges of proposed wastewater and stormwater management systems;
- impacts of discharges on potential receiving waters, particularly effects on the downstream environment of stormwater releases (i.e. water –salt balance); and
- where solid or liquid wastes are to be disposed of off-site outline the expected disposal strategies.

Details of discharge wastewater into Gladstone harbour must identify any potential contaminants likely to impact on approvals for disposal of material from maintenance dredging operations.

3.8 Transport

3.8.1 Transport methods and routes

Description of existing transport environmental

The EIS should provide sufficient assessment of the impacts of Project traffic during construction and operations to allow the Department of Main Roads (DMR) and Queensland Transport (QT) to ascertain its effect on transport safety and efficiency requirements. Santos should fully assess transport-related impacts of the Project including sea, rail, road and air, such as:

- road and rail safety issues, for example, ensuring safe access and transition across the construction sites and safety for other transport users;
- road use resulting in reduced life of roads/pavements requiring additional or accelerated rehabilitation and maintenance;
- seasonal considerations such as potential for transport impacts during wet weather;
- reduced efficiency of traffic flows along road sections and at intersections along key routes, especially during construction including details on maximum traffic delays;
- any impacts to railways and rail open level crossings arising from any project related construction and operational traffic; and
- environmental issues relating to transport (e.g. weed management, vegetation clearing in road/rail reserves, dust control and erosion protection).

This section should outline:

- procedures for assessing and agreeing on the scope of required mitigation works with road/rail corridor managers, 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; and
- strategies to maintain access to public road/rail reserves to allow rail maintenance activities.

Findings of studies and transport infrastructure impact assessments should be an input into preparing a draft road-use management plan. Conditions of approval for transport management impacts should also be detailed in the EMP (see Section 4.0).

Road infrastructure impacts should be assessed according to DMR's Guidelines for Assessment of Road Impacts of Development (April 2006). Reference should be made to other DMR planning documents and relevant legislation.

This section should describe existing transport infrastructure facilities within and adjacent to the Project areas. The location and owner/custodians of all tenures, reserves, roads and road reserves, railways and rail reserves, stock route easements, marine traffic and the like, covering the affected land should be shown.

The locations and descriptions of relevant existing roads, railways, gas and water pipelines, power lines, telecommunications systems, constructed waterways, and any other infrastructure within the project areas, or likely to be affected by project activities, should be provided. Transport infrastructure also includes the transport operations that utilise that infrastructure. Maps should be provided at an appropriate scale and level of detail.

Any environmental values likely to be affected by this infrastructure should be described, in particular, the presence, risk and potential spread of pest and diseases strategies should be presented, taking into account relevant Council Pest Management Plans.

Potential impacts and mitigation methods

This section of the EIS should detail impacts of the Project on existing roads, railways, port facilities. This evaluation should include any potential requirements to reschedule existing infrastructure construction, rehabilitation and maintenance programs.

Impacts resulting from the transport of plant, equipment, raw materials, wastes and personnel during the construction and operational phases of the project should be described and analysed.

The description and analysis should address the capacity of existing facilities to support the requirements and any additional requirements for the construction, upgrading or relocation of any transport related infrastructure required by the Project directly and as a result of potential cumulative impacts. The analysis should also address any requirements for new or changed services in road reserves.

Special reference should be made to any relationship between road works undertaken as part of the Project and works proposed in DMR's Roads Implementation Program where details of such works are provided by the DIP to Santos or otherwise published. Potential road impacts of the project should be described and assessed according to DMR's Guidelines for Assessment of Road Impacts of Development (April 2006). Any proposed new infrastructure provision or requirements to mitigate impacts of development on State-controlled roads should be in accordance with DMR's Road Planning and Design Manual.

The EIS should also discuss the results of consultation with the relevant district and regional officers of DMR and local government regarding the potential impacts of the Project on the road network. Where reference is made to the planning schemes of the relevant local governments, it is suggested that this also include any publicly available draft planning schemes.

This section should also address how transport elements and impacts of the Project, taking into account publicly published or DIP advised future demand growth, (including the potential impact of other major infrastructure and industrial projects in the nearby area) relate to QT's and the DMR's existing transport strategies for the Central Queensland area and the future infrastructure needs of this area as presented in State Government documents, including: *Statements of Intent for Road Link Development*; *Gladstone Integrated Regional Transport Plan 2001 – 2030*; and *Capricornia Integrated Regional Transport Plan 2004 – 2030*. It is also necessary to make reference to publicly published or DIP advised planning schemes of the relevant local governments.

The EIS should specifically document and analyse various road access and road use options to facilitate the construction and operation of the Project and to mitigate the impacts on the road system. Consultation should take place with the DMR and other government infrastructure agencies (for example, QT, GPC, QR and CG) as well as the Gladstone Regional Council and other relevant local governments with respect to developing an integrated approach with this and other existing or planned projects (whether publicly published or advised by DIP) known to Santos.

The Regional Harbour Master Gladstone should be adequately consulted regarding maritime issues relating to the movement and loading of LNG tankers and any barge operations. The EIS should discuss the results of the consultation.

3.8.1.1 Shipping

Describe current vessels utilising the port, their size, shipping movements, anchorages, access to/from the port and navigational arrangements.

Potential impacts and mitigation methods

In regard to increased shipping volumes, the following should be specifically addressed:

- potential for introduction of exotic organisms from increased shipping rates;
- ballast water management arrangements - including Australian Quarantine and Inspection Service (AQIS) mandatory arrangements and agency contingency planning;
- management of ship waste, in particular quarantine waste, domestic garbage, oil and sewage;
- potential foreshore damaged caused by LNG tanker and tug activities; and
- potential impacts on existing shipping activity.

Additional marine transport issues that should be considered include the potential of the proposal to impact on recreational craft.

3.8.1.2 Road and rail

Describe the current road and rail networks and intersections of the surrounding region and specify current traffic volumes. The current rail operations occurring during the project construction phase should also be described. This description should identify whether they comprise 24 hours a day/ seven day a week, and the number and types of services per day (e.g. coal, general freight, passenger services).

Potential impacts and mitigation methods

The EIS should provide sufficient information and analysis to make an independent assessment of how the state-controlled and local government road and rail networks will be affected throughout the duration of the Project. The potential impact on stakeholders and management of those impacts should be detailed.

A range of alternatives should be assessed with respect to road infrastructure to serve the construction and operation.

Details should be provided on the potential impacts of alterations to the existing road network and possible interruptions to traffic as a result of these alterations. Details should be provided on the impacts on environmental values of any new roads or road realignments.

Information about road impacts and proposed measures for dealing with those impacts should be prepared by the Proponent in close consultation with the relevant local Regional and District Offices of the Department of Main Roads and other relevant councils.
Santos is to consider DMR's published plans for future upgrades for the road network which may impact the study area. Santos should also provide information on product spill contingency plans and the adequacy of equipment and facilities to deal with possible spills for the transport nodes of the proposal. The EIS should outline details of any potential impacts on existing or proposed pedestrian and cycle networks as advised by DIP or otherwise publicised.

3.8.2 Road infrastructure alterations

Description of alternative transport environment

The EIS should detail proposed alterations to road infrastructure occasioned by the project. This includes road realignments, grade separated crossings, level crossings, road upgrades and resurfacing, bridges, access roads, and associated civil works.

A traffic analysis should be presented to indicate the impacts or improvements to traffic flows and capacity both during construction and after completion. Particular attention should be paid to:

- requirements for access to road/rail corridors during construction, including emergency access;
- methods to be adopted to ensure safety and avoid obstruction to other road/rail users during construction;
- proposed traffic management arrangements and plans; and
- capacity and safety improvements as a result of road infrastructure alterations.

3.9 Cultural heritage

This section should address issues raised by the Aboriginal Cultural Heritage Act 2003 (ACHA) and the Queensland Heritage Act 1992 (QHA).

3.9.1 Indigenous Cultural heritage

Description of existing cultural heritage values

This section should describe the existing Aboriginal cultural heritage values that may be affected by the project. Santos should describe the environmental values of the cultural landscapes of the affected area in terms of the physical and cultural integrity of the landforms.

In the absence of a native title agreement a Cultural Heritage Management plan (CHMP) will be required to be completed in the EIS. Compliance with an approved CHMP will ensure that Santos meets the Aboriginal cultural heritage duty of care imposed by the ACHA.

Preparation of the CHMP must comply with the requirements of the ACHA including:

- notification that a CHMP is to be negotiated, as required by the ACHA, to the Chief Executive of DNRW, owners or occupiers of the subject land and the relevant Aboriginal parties under the ACHA;
- endorsement by the company of those Aboriginal parties who respond to the notification;
- negotiation with the Aboriginal parties about the development of the CHMP;
- seeking approval of the CHMP from the Chief Executive, DNRW;

- compliance with the approved CHMP;
- as per the management regime to be recorded in the CHMPs, liaison with the Aboriginal parties concerning:
  - the identification of places of significance to that community (including archaeological sites, natural sites, story sites etc;
  - appropriate community involvement in field surveys;
- any requirements by communities and /or informants relating to confidentiality of site data should be highlighted;
- a systematic survey of the proposed development area to locate and record Aboriginal cultural heritage sites and objects in accordance with the methodology set out in the CHMPs;
- assessment of the significance of any cultural heritage sites/places located during the systematic survey;
- assessment of the impact of the proposed development on Aboriginal cultural heritage sites, objects and values and negotiation of a set of arrangements with the relevant Aboriginal parties in relation to that impact; and
- the preparation of a report of work done including background research, relevant environmental data and methodology, as well as results of field surveys, assessment of significance, recommendations put forward by Aboriginal parties and agreed outcomes in relation to managing Aboriginal cultural heritage for the Project.

3.9.2 Non-Indigenous Cultural heritage

This section should describe the existing non-indigenous cultural heritage values that may be affected by the project. The cultural heritage study must be conducted by a suitably qualified expert and will require:

- the chief executive of the EPA is to be notified if an historical archaeological artefact, that is an important source of information about an aspects of Queensland History, is found during the course of the study;
- a systematic survey of the proposed development area to locate and record non-indigenous cultural heritage places;
- significance assessment of any cultural heritage sites/places located;
- the impact of the proposed development on cultural heritage values; and
- a report of work done which includes background research, relevant environmental data and methodology, as well as results of field surveys, significance assessment and recommendations.

The study should include findings of consultation with:

- DEHWA concerning the Register of the National Estate, Commonwealth Heritage list and National Heritage list;
- EPA regarding the Queensland Heritage Register and other information regarding places of potential non-Indigenous cultural heritage significance;
- the Department of Natural Resources and Water regarding the Indigenous Site Database;
- any local government heritage register;
- any existing literature available from Queensland Government sources or provided to Santos by local community groups/organisations relating to the affected areas; and

- liaison with relevant community groups/organisations (e.g. local historical societies) concerning:
  - places of non-indigenous cultural heritage significance; and
  - opinion regarding significance of any cultural heritage places located or identified.

Investigations and consultation should be undertaken in such manner and detail as to satisfy statutory responsibilities and duties of care, including those under the *Queensland Heritage Act 1992* and the ACH Act, and the *Australian Aboriginal and Torres Strait Islander Heritage Protection Act 1984*.

Potential impacts and mitigation methods

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

To the greatest extent practicable, significant heritage areas should be avoided by the project. Santos should provide an assessment of likely effects on sites of non-Indigenous or Indigenous cultural heritage values, including but not limited to the following:

- description of the significance of artefacts, items or places of conservation or cultural heritage values likely to be affected by the Project and their values at a local, regional and national level; and
- recommended means of mitigating any negative impact on cultural heritage values and enhancing any positive impacts.

Impacts on Aboriginal cultural heritage sites, objects or values in the vicinity of the Project should be managed under approved CHMPs developed specifically for the Project. The CHMPs will provide a process for the management of Aboriginal cultural heritage places (including subsurface) at the project sites. It is usual practice for the CHMPs to be based on information contained in archaeological and/or anthropological reports on the survey area and cultural heritage survey reports and/or information from the relevant Aboriginal parties.

The CHMPs should address and include the following:

- a process for including Aboriginal people associated with the development areas in protection and management of Aboriginal cultural heritage;
- processes for mitigation, management and protection of identified cultural heritage sites and objects in the project areas, including associated infrastructure developments, both during the construction and operational phases of the project;
- provisions for the management of the accidental discovery of cultural material, including burials;
- a cultural heritage induction for project staff; and
- a conflict resolution process.

The development of the CHMPs should be negotiated between Santos and the relevant Aboriginal parties).

3.10 Social and Economic environment

Description of social values

This section describes the existing social values that may be affected by the project.
The social amenity and use of the Project areas and adjacent areas for rural, agriculture, forestry, fishing, recreation, industrial, educational or residential purposes should be described. Consideration should be given to:

- community infrastructure and services, access and mobility;
- population and demographics of the affected community;
- local community values, vitality and lifestyles;
- recreational, cultural, leisure and sporting facilities and activities in relation to the affected area;
- recreational and commercial fishers;
- health, emergency services and educational facilities;
- on farm activities near the proposed activities;
- number of properties directly affected by the Project; and
- number of landowner families directly affected by the Project, but also families of workers either living on the property or workers where the property is their primary employment.

Describe the social values for the affected area in terms of:

- the integrity of social conditions, including amenity and liveability, harmony and well being, sense of community, access to recreation, and access to social and community services and infrastructure; and
- public health and safety.

Information should also be provided on the existing housing market, and include a description of such issues as size of private rental market, vacancy rates, average rents, availability and cost of residential housing in the area and the availability of land for residential development purposes.
This section should also detail the existing social and economic environment. Issues to be addressed include:

- key characteristics of potentially affected communities in the Project area, with community profiles, including:
  - mapping of rural properties, croplands and grazing areas;
  - population and demographics of the affected community (including size, age structure, gender composition, residency;
  - workforce characteristics, including types of skills or occupations and availability both for construction and operation phases of the Project;
  - identification of existing labour force and unemployment statistics;
  - health, emergency services and educational facilities; and
  - other community services and facilities (e.g. recreational, cultural, leisure and sporting facilities);
- accommodation, with an emphasis on:
  - the size of the private rental market in the area;
  - the vacancy rate and price of rental accommodation, including assessment of seasonal fluctuations;
  - the availability and typical cost of housing for purchase in the area; and

- the level of, and demand for, social housing in the area;

- housing and other land uses:
  - constraints and opportunities for new housing construction or other land uses in the vicinity of the project area, including the potential for growth of the urban area to encroach on the project site; and
  - land areas for residential purposes including available serviced residential lots, land under development and undeveloped broad acre land that is appropriately zoned;
- the character and basis of the local and regional economies;
- a description of large scale industrial developments and their effects in the region.

Potential impacts and mitigation methods

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

The social impact assessment of the Project should consider the information gathered in the community consultation program and the analysis of the existing socio-economic environment, and describe the Project's impact, both beneficial and adverse, on the local community. The impacts of the Project on local and regional residents, community services and recreational activities are to be analysed and discussed for all stages of the development. The nature and extent of the community consultation program are to be described and a summary of the results incorporated in the EIS.

The social impact assessment should include sufficient data to enable state authorities, such as Queensland Health and Education Queensland, to plan for the continuing provision of public services in the region of the Project. Santos should consult the relevant management units of the state authorities, and summarise the results of the consultations in the EIS.

These impacts should be considered both at a regional and local level, with attention paid to the:

- impacts on demographic, social, cultural and economic profiles;
- impacts on local residents, current land uses and existing lifestyles and enterprises;
- impacts on local and state labour markets, with regard to the source of the workforce:
  - this information is to be presented according to occupational groupings of the workforce;
  - the impacts of both construction and operational workforces and associated contractors on housing demand/ availability, community services and community cohesion is to be addressed;
  - the capability of the existing housing stock, including rental accommodation, to meet any additional demands created by the project is to be discussed. This should include, to the greatest extent practicable, description of the cumulative impacts on environmental values caused by the proposed project, in isolation or in combination with other known or proposed projects (where details of such proposed projects are provided by DIP to Santos or otherwise published).

- comment should be made on how much service revenue and work from the project (e.g. provisioning, catering and site maintenance) would be likely to flow to existing communities in the area of the project, particularly if a fly-in, fly-out workforce is proposed;
- impacts on local residents' values and aspirations; and
- in regard to affected indigenous and non-indigenous communities respectively, particular attention should be paid to the effects on:
  - the ability of both indigenous and non-indigenous people, to live in accordance with their own values and priorities;
  - the use of and access to culturally important areas and landscapes;
  - the access to existing human and commercial services and housing;
  - the ability to participate in regional and local employment and training opportunities; and
  - the new project workforce and their families.

The social and community impacts of the Project should be addressed, incorporating any stakeholder concerns about adverse impacts to the natural, social, economic or built environment. Relevant strategies and resources that will be committed to address expected impacts should be outlined.

The potential impact on the amenity of adjacent areas used for commercial and recreational fishing, boating/yachting (as a result of jetty exclusion zones), cropping, grazing, forestry, recreation, industry, education, aesthetics, scientific or residential purposes should also be discussed. As well as the implications of the proposal on potential future developments in the local area, including constraints on surrounding land.

The cumulative social impacts on the community, brought about by this project together with other concurrent existing projects or proposed projects (where details of such proposed projects have been provided to Santos by the DIP or are otherwise published) must also be carried out in consultation with the Department of Communities and via a cumulative Social Impact Assessment (SIA). Reference to CQSS2 3.9 Social- target and indicators for viable town and communities should also be considered when undertaking the assessments.

Particular attention should be paid to:

- the increase in population in the region brought about by the construction and operational workforces and the resulting implications for the provision of government and other services;
- the availability of accommodation for the project's workforce and the possible cumulative impact on the housing and rental market;
- the proposed long-term and post use of any worker's village constructed for the project;
- the development of a demographic profile of the region and the associated sufficiency of current infrastructure and services; and
- the development of a community consultation management plan that promotes
- an active role for impacted communities.

Description of economic values

The general economic benefits/ impacts from the Project should be described, including:

- the relative significance of this proposal in the local and regional economic context;
- the extent to which local and other Australian goods and services will be used;
- the short and long-term beneficial (e.g. job creation) and adverse (e.g. competition with local small business) impacts that are likely to result from the development.
- the need for any additional infrastructure provision by government to support the Project;
- implications for future development in the locality (including constraints on surrounding land uses and existing industry); and
- the potential impact of the project on the domestic gas market and domestic gas prices, including the ability of the power generations sector to meet government emission targets and gas-power level targets.

The economic impacts of the project could be discussed in the context of the CQSS2 3.8 – Economy – Aspirational targets and on-ground actions to explain the predicted cumulative and intergenerational impacts and proposed monitoring and mitigation measures.

Any new skills and training to be introduced in relation to the Project should be identified. Adequate provision should be made for apprenticeship and worker training schemes. The EIS should indicate the occupational skill groups required and potential skill shortages anticipated.

3.11 Hazard and risk

3.11.1 Hazard and risk assessment

The EIS should identify all legislation, standards and codes of practice in relation to the transport storage and handling of hazardous materials and in particular dangerous cargos in port areas.

A risk assessment consistent with Australian / *New Zealand Standard for Risk Management AS2885, AS4360:2004* and/or Santos Standard EHSMS 09 *Hazard Identification, Risk Assessment and Control* shall be conducted. The study must assess risks during the construction, operational and decommissioning phases of the LNG facility. These risks are to be assessed in quantitative terms where possible.

A preliminary hazard identification exercise should be conducted in order to identify the nature and scale of hazards which might occur during the construction and operation of the Project. This would be expected to include hazards involving:

- Construction accidents;
- Pipeline, processing unit or storage vessel rupture or loss of containment, and explosions and fires associated with such incidents (resulting in supply reliability issues);
- Release of liquid gaseous or particulate pollutants or any other hazardous material used, produced or stored on the site;
- Marine collision;
- Spills of materials during shiploading;

- The potential for deliberate breaching of LNG vessel's hulls and the resulting breach size and spill rate;
- The extent of thermal dispersion and resulting hazard/ignition zones following accidental or deliberate spillage (e.g. 35 kWm^2 and $5kWm^2$ analysis); and Natural events such as cyclones, earthquakes, bushfires or local flooding.

In particular, detailed risk assessments associated with marine operational activities, while LNG vessels are at berth, during loading and during vessel movements within the port limits, are undertaken to identify all risks and mitigation measures required to ensure that operational activities associated with LNG vessels do not impact on other operational activities within the port.

A set of representative incident scenarios should be selected. This set should include worst case scenarios (e.g. a catastrophic failure of a storage vessel or processing unit, either accidentally or deliberately and the consequential explosion zone).

This will require an evaluation of the likelihood of each scenario occurring in order to calculate the level of risk in surrounding areas due to the presence of the facility.

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

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

The risk analysis is to address the potential impacts that may occur on the normal on-site day-to-day activities during the construction and/or operation of the facilities. Furthermore, Santos must determine the level of change that may result on the risk contours of other relevant existing or proposed industrial facilities (where details of such proposed facilities are provided by the DIP to Santos or otherwise published) in the area as a result of the proposed project. Individual risk criteria should be used to limit risks to individual workers and members of the public. Societal risk criteria should be used to limit risk to the affected population as a whole.

Any changes to operating or storage procedures that would reduce the possibility of these events occurring, or reduce the severity of the events should they occur, are to be identified and adopted where appropriate. Draft Risk Management Plans shall be presented for Construction and Operational phases of the project.

The acceptability of the risk on-site and to surrounding land uses should be assessed by referring to nationally-adopted risk criteria presented in the New South Wales Department of Urban Affairs and Planning's *Hazardous Industry Planning Advisory Paper No. 4 "Risk Criteria for Land Use Safety Planning"*. Details of the methodology and results of each step described above should be presented in the EIS.

3.11.2 Health and safety

Description of existing public health and safety values

This section of the EIS should define and describe the objectives for protecting or enhancing health and safety community values. It should detail any impacts of the project during construction and operation on the health and safety of the community, workforce, suppliers and other stakeholders, in terms of health, safety and quality of life from factors such as: air emissions, odour, dust, pests, traffic noise and vibration, waste and water. This includes health and safety matters associated with onsite and offsite workforce accommodation. It should include details of:

- compliance with relevant Health and Safety legislation;
- security arrangements;
- emergency plans and safety management strategies, as well as corroboration of the effectiveness of such systems;
- details of on-site emergency response capabilities (e.g. on-site paramedic or first-aid officer), for both the construction and operational phases of the project, which should include personnel trained for fire suppression and containment, rescue and first aid;
- the risk assessment conclusions reached and the level of off-site risk from the proposed developments; and
- the location and nature of sensitive sites including, but not limited to, residences and schools.

An onsite preliminary occupational health and safety risk assessment should be completed by Santos. Safety management strategies and control measures to be used to minimise the risks of incidents on site and to minimise the consequences of potentially significant incidents under known operating conditions should be included in the EIS.

This information should include:

- the handling of reworked or recycled material;
- the prevention and handling of fires on site;
- the segregation of incompatible products and ingredients;
- the containment of hazardous materials;
- the collection, treatment and disposal of any spillage of hazardous materials and wastes (provide details of the design, volume and capacity of any retention ponds, process tanks, waste holding tanks or bunded areas);
- the application of safety distances (e.g. exclusion zones) to the various activities on site to minimise consequences of incident;
- quality control of products and raw materials on site, including handling of non-conforming material;
- maintenance of critical items of equipment;
- the training of personnel; and
- emergency procedures, including evacuation procedures where necessary.

An assessment should be made of any areas where mosquitoes may breed (e.g. areas with poor drainage or where water ponds) and mitigation measures developed to prevent the harbourage and breeding of mosquitoes and other pests of public health significance.

The EIS should include a discussion on the site planning, management, mitigation and monitoring of potential pest impacts by considering Division 2 of Part 8 of the *Health Regulation 1996*. This section should draw on the information in Queensland Health's *Guidelines to Minimise Mosquito and Biting Midge Problems in New Development Areas (March 2002)*.

3.11.3 Emergency management plan

Preliminary information on the design and operation of proposed safety/ contingency systems to address terrorist attack, marine collusion minimisation, fire prevention/protection, leak detection/ minimisation, release of contaminants, and emergency shutdown systems and procedures should be presented for the whole project. In addition, an assessment of businesses that may be affected in the event of an emergency should be undertaken, including strategies to mitigate the impact on these businesses.

A description of the emergency planning procedure to be adopted, and a copy of the emergency plans and procedures developed to date should be included. The development of emergency planning and response procedures is to be determined in consultation with regional emergency service providers.

An outline of the proposed emergency management procedures is to be provided (including evacuation plans) for the range of situations identified in the above risk assessment as providing measurable risks, including strategies to deal with contingencies such as hydrocarbon/ oil spills and natural disasters during operations.

In regard to fires, the EIS should address:

- fire management systems to ensure the retention on site of fire water or other fire suppressants used to combat emergency incidents;
- building fire safety measures for any construction or permanent accommodation;
- details of any emergency response plans and bushfire mitigation plans under the SPP 1/03;
- on-site fire fighting equipment provided and the level of training of staff who will be tasked with emergency management activities;
- detailed maps showing the plant outline, potential hazardous material stores, incident control points, fire fighting equipment, etc.; and
- an outline of any dangerous goods stores associated with the plant operations, including fuel storage and emergency response plans.

The EIS should present outlines of emergency planning and response strategies to deal with relevant incidents above, which have been determined in consultation with State and regional emergency service providers.

The EIS should present plans for involvement of the relevant State agencies (such as the Queensland Ambulance Service, Queensland Fire and rescue Service and Emergency Management Queensland) in relation to emergency medical response and transport and first aid matters.

3.12 Cumulative impacts

The purpose of this section is to provide a clear and concise summary of the cumulative impacts (i.e. the additional impacts on population, workforce, accommodation, housing, use of community infrastructure and services) detailed in prior sections, and to provide a description of these cumulative impacts both in isolation and in combination with other known, existing or proposed project(s) (where details of such proposed projects have been provided to Santos by the DIP or are otherwise published), to the greatest extent practicable.

The methodology which has been used to determine the cumulative impacts of the Project should also be presented, detailing the range of variables considered, including where applicable, relevant baseline or other criteria upon which the incremental aspects of the Project have been assessed.

4 Environmental Management Plans

This section of the EIS should present environmental management plans (EMPs) developed for the Project. It is expected that all EMPs will, where relevant, be prepared in accordance with the EPA Guideline Preparing Environmental Management Plans. The EMPs should be developed from the preceding information in the EIS. An EMP should provide life-of-proposal control strategies in accordance with agreed performance criteria for specified acceptable levels of environmental harm. In addition, EMPs should identify:

- potential impacts on environmental values;
- mitigation strategies;
- relevant monitoring;
- appropriate indicators and performance criteria;
- reporting requirements; and
- appropriate corrective actions, should an undesirable impact or unforeseen level of impact occur.

The aims of an EMP are to provide:

- commitments by Santos to practical and achievable strategies and design standards (performance specifications) for the management of the Project to ensure that environmental requirements are specified and complied with;
- an integrated plan for comprehensive monitoring and control of impacts;
- local, State and Australian Government authorities, stakeholders and Santos with a common focus for approvals conditions and compliance with policies and conditions; and
- the community with evidence that the environmental management of the Project is acceptable. The recommended structure of each element of the EMP is:

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

Specific EMPs prepared in accordance with section 103 of the *Environmental Protection Act 1994* will be required to be prepared for each component of the project (gas fields, gas pipeline and LNG plant) that require an Environmental Authority to proceed under the *Petroleum and Gas (Production and Safety) Act 2004*. Studies undertaken as part of the EIS process should be used to derive the information necessary to prepare these EMPs.

The EPA has prepared a guideline to assist proponents interpret the requirements. For transmissions pipelines, an Operational EMP will also need to be prepared that covers the operation of the pipeline post construction, including the eventual decommissioning and abandonment activities at the end of the project.

5 Conclusion and recommendations

The EIS should make conclusions and recommendations with respect to the proposal, based on the studies presented, the Environmental Management Plans and conformity of the proposal with legislative and policy requirements.

6 References

All references used in the preparation of the EIS should be presented in a recognised format such as the Harvard standard (refer to the Style Guide, Australian Government Publishing service). This standard lists references by presenting in the following order: author (date of publication) title, publisher, and place of publication.

7 Recommended appendices

7.1 Final terms of reference for this EIS

The finalised Terms of Reference should be included as an Appendix to the EIS.

7.2 Cross- reference with terms of reference

This section provides a cross reference of the findings of the relevant sections of the EIS, where the potential impacts and mitigation measures associated with the project are described, with the corresponding sections of the terms of reference. A list of all commitments made by the Proponent in the EIS should be provided, together with a reference to the relevant section in the EIS.

7.3 Development approvals

A list should be provided of the development approvals, marine parks approvals and environmental authorities for petroleum and gas activities required for the Project to proceed.

7.4 Study team

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

7.5 Consultation report

A list of Advisory Agencies should be provided in a summary Consultation Report, which should also list the Australian, State and Local Government agencies consulted, and the individuals and groups of community stakeholders consulted. A summary of the issues raised by these groups, and the means by which the issues have been addressed, should be provided in the text of the EIS. The discussion should include the methodology used in the community consultation program, including criteria for identifying stakeholders and the communication methods used.

Information about identifying interested and/or affected persons (as defined by the EP Act 1994) should be included.

7.6 Technical data and baseline studies

Relevant supporting data and information generated from specialist studies undertaken as part of the EIS are to be included as appendices. These studies may include:

- geology;
- soil survey and land suitability, use and capability;
- Waterway hydrology and groundwater;
- flora and fauna;
- air quality, noise and vibration;
- transport and traffic;
- housing and accommodation;
- social, and socio-economic impacts; and
- hazard and risk.

7.7 List of Proponent commitments

A list of all commitments made by the Proponent in the EIS should be provided, together with a reference to the relevant section in the EIS.

7.8 EPBC Act report

This section should be provided as a stand alone chapter that fully addresses the issues relevant to the controlling provisions, with sub-section for each of the EPBC referrals. The report should be constructed along the lines of the following:

- title of EPBC referral and number;
- description of the Project;
- explanation of the infrastructure the referral relates too;
- description of proposed action (as it would impact on MNES);
- description of the affected environment relevant to the controlling provisions (i.e. describe the features of the environment that are MNES protected under the EPBC Act);
- assessment of impacts on MNES and mitigation measures;
- conclusions; and
- references.

Santos should also in relation to action which have national heritage places as a controlling provision address the potential impacts (and proposed mitigation) of the project against each value for which the GBRWHA area was listed as world heritage and as a national heritage listed place.