Queensland Government
The Coordinator-General

ZeroGen Clean Coal Power Demonstration Project

DRAFT
TERMS OF REFERENCE
FOR AN
ENVIRONMENTAL IMPACT STATEMENT

UNDER PART (4) OF THE QUEENSLAND *STATE DEVELOPMENT AND PUBLIC WORKS ORGANISATION ACT 1971*

The Coordinator-General

October 2006

PREAMBLE

Project Background

ZeroGen Pty Ltd is proposing to build and operate a world-first demonstration plant, at commercial-scale, that integrates the gasification of coal with the capture and safe storage of carbon dioxide (CO_2) emissions to generate low emission base-load electricity. The process of capturing and safely storing CO_2 is commonly referred to CCS. The demonstration project is called ZeroGen Clean Coal Power Demonstration (the Project). The objective of the Project is to demonstrate clean coal technologies that can address the challenge of reducing greenhouse gas (GHG) emissions to the atmosphere from coal-fired base-load electricity generation.

The rationale for undertaking the Project is to find a technological solution to the twin challenges of providing base-load electricity to meet growing industry and community demand while simultaneously reducing GHG emissions to the atmosphere. Australia has an abundance of coal resources (approximately 80,000 million tonnes) conservatively valued at $100 billion. Coal is currently the lowest-cost energy source for base-load power in Australia and was responsible 78% of the electricity generated in Australia in 2000-01. The demand for stationary energy services such as base-load power is projected to grow by 50% by 2020.

An issue with generating base-load electricity from traditional coal-fired power stations however, is the emission of CO_2. It is estimated that energy production and use contributed 68% of Australia's GHGs in 2002. Greenhouse gases are of concern because they tend to trap heat in the atmosphere potentially leading to an increase in the Earth's overall temperature, which many observers believe is contributing to climate change. The Commonwealth Scientific & Industrial Research Organisation (CSIRO) has predicted that impacts of temperature increase to Australia could result in:

- Reduced rainfall in current agricultural producing areas;
- Reductions in native pasture growth;
- Reduction in snow-covered areas in the Australian Alps; and
- Bleaching and damage to the Great Barrier Reef.

Many gases exhibit 'greenhouse' properties. Some of them occur in nature (e.g. water vapour, CO_2, methane and nitrous oxide), while others are exclusively human-made (e.g. gases used for aerosols). Greenhouse gas from electricity generation is predominantly in the form of CO_2.

Carbon dioxide is a naturally occurring gas. It is produced as a result of burning organic matter (e.g. coal, natural gas, wood fuels) in the presence of oxygen. It can also be produced by the decomposition and fermentation of certain organisms and through respiration from living organisms. Carbon dioxide is used commercially in producing carbonated drinks, as a refrigerant (e.g. dry ice) and as a fire extinguisher. While CO_2 is not explosive, flammable or poisonous, in large volumes and in confined spaces it blocks oxygen and may prevent respiration.

Carbon dioxide naturally occurs underground within geological formations throughout Australia, including within the northern Denison Trough in Queensland. Injection of CO_2 into underground storage areas has been safely undertaken for many years by the petroleum industry as part of enhanced oil and gas recovery projects.

Project Proponent

The Project will be undertaken by ZeroGen Pty Ltd, which is currently a subsidiary of Stanwell Corporation Limited (Stanwell). It is proposed that ZeroGen will be transferred to a Project Board established by the Queensland Government and that Stanwell will be engaged to provide ZeroGen Pty Ltd with services related to the Project. Stanwell is a Queensland Government-Owned-Corporation that owns and operates electricity generation facilities which represent about 20% of the State's installed capacity. In addition to its major coal-fired asset in Central Queensland, Stanwell has a significant renewable energy portfolio of hydro and wind powered stations located in Queensland, Victoria and Western Australia.

ZeroGen will also involve other major participants including major generating research organisations and equipment and service providers. Royal Dutch Shell plc, a global CO_2 sequestration leader, and Shell Global Solutions International BV have an agreement through Shell Development (Australia) Limited to provide technical advice, technological components and an option to acquire up to 10% equity in the Project.

Project Summary

The Project is comprised of three elements: a coal gasification and power generation component, a pipeline and geosequestration activities.

The coal gasification and power generation components use the thermal content of coal to generate a syngas to fuel a conventional gas turbine plant. Coal, oxygen and steam are reacted under high pressure and temperature to create the syngas which is primarily hydrogen and carbon monoxide (CO). The syngas is cooled and cleaned of any unwanted materials (e.g. ash) and then reacted to convert the CO into CO_2 producing additional hydrogen. This process is capable of converting and recovering a total of 80% of the carbon from the coal as CO_2. The CO_2 is captured from the syngas stream of the gasifier unit and then compressed to a supercritical fluid. Waste generated in the process includes vitrified coarse slag, fly ash, sulphur, sludge from water and waste water treatment and water.

Power can be generated by combustion of the high hydrogen syngas in either an open cycle or combined cycle gas turbine. A combined cycle power plant has additional equipment that raises steam by recovering heat from an open cycle plant's hot exhaust gases to generate additional power using a steam turbine. A combined cycle plant is more energy efficient than an open cycle plant and produces more power per unit of CO_2 emissions but is more expensive than an open cycle plant.

The coal gasification and power generation component is also known as an Integrated Gasification Open Cycle (IGOC) plant or Integrated Gasification Combined Cycle (IGCC) plant, depending on the power generation technology used. The basis of the Project is for an IGCC power station.

The compressed CO_2 will be transported by a conventional gas transmission pipeline (approximately 220 km) to Queensland's northern Denison Trough region for safe storage. This has been identified by the Australian Government as having suitable structures for the storage of CO_2. The area contains significant natural gas deposits that already contain relatively high levels of naturally occurring CO_2 and the region is also seismically stable. Using a series of wells and distribution pipelines, the CO_2 will be injected up to 2km below the surface into saline aquifers for permanent storage.

As part of its feasibility study, ZeroGen has commenced a test drilling program at a site outside of Springsure. The goal of this program is to carry out necessary scientific procedures to understand the local geology and to confirm its ability to safely and securely store CO_2. The test drilling program uses the same technologies as natural gas drilling in the region. This test drilling program is in advance of other power-related CCS projects proposed in Australia.

The key components of the Project will be:

- Gasification Unit – for converting the coal to a cleaned, high hydrogen syngas. This unit will include coal milling, air separation and syngas cleanup units as well as the gasifier;
- Power Block – consisting of a gas turbine adapted for high hydrogen fuel as well as for natural gas;
- Supporting Infrastructure – this will include coal handling, gas metering, water systems, fire detection, waste management and relevant buildings (e.g. control room, laboratory, workshop and warehouse);
- Compression and transportation – including compressors, pumps, pipelines (300mm main line and 150mm distribution line), control systems and metering; and
- Injection wells – standard petroleum industry wells using stainless steel materials to reduce the potential for corrosion.

The Project will require up to 700 construction and 125 operational personnel. Construction personnel are expected to be housed in construction camps near the Stanwell Energy Park and along the pipeline route. Operational personnel would live in accommodation in the wider Stanwell and Rockhampton area.

The Environmental Impact Assessment for the Project is expected to be carried out during 2006 – 2007 with construction to commence in 2008.

The decision to proceed with the demonstration project is dependent upon a range of factors. These include funding availability, the results of the test drilling program, the completion of a satisfactory environmental impact assessment study, successful cultural heritage and native title negotiations and approval from the Board of ZeroGen Pty Ltd.

Further details of the Project are available in the Initial Advice Statement (IAS), a copy of which can be downloaded from The Coordinator-General website at:

http://www.coordinatorgeneral.qld.gov.au/eis

Administrative Procedures for these Terms of Reference

On 24 July 2006 the ZeroGen Clean Coal Power Demonstration Project was declared to be a 'significant project' by the Queensland Coordinator-General (CG) pursuant to Section 26(1)(a) of the *State Development and Public Works Organisation Act 1971* (SDPWO Act), which requires ZeroGen to prepare an Environmental Impact Statement (EIS) under the provisions of this Act.

On 19 September 2006 the Australian Government Department of Environment and Heritage (DEH) determined that the Project is a 'controlled action' under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) due to potential impacts to protected matters of national environmental significance. The controlling provisions under the EPBC Act are Sections 18 and 18A, listed threatened species and communities. The Australian Government has accredited the EIS process to be conducted under the SDPWO Act under the Bilateral Agreement between the Australian and Queensland Governments. The Project will require approval from the Australian Government under Part 9 of the EPBC Act before it can proceed.

The term EIS refers to the assessment processes of the Australian and Queensland Governments and these ToR should be interpreted as satisfying the requirements of all relevant Australian and Queensland statutes for the Project.

The CG will manage the impact assessment process for this Project.

Representatives of Australian, State and Local governments and other relevant authorities have been invited to act as advisory agencies for the EIS process and they have been requested to examine the Initial Advice Statement (IAS) and comment on the draft ToR. The IAS and draft ToR have also been placed on public exhibition, inviting comments on the draft ToR.

The Proponent will prepare a draft EIS to address the ToR. Once the EIS has been prepared to the satisfaction of the CG, a public notice is advertised in relevant newspapers circulating in the district, the State and nationally. The notice will state: where copies of the EIS are available for inspection and how it can be purchased; that submissions may be made to the CG about the EIS; and the submission period. The Proponent may be required to prepare a Supplementary Report to the EIS to address specific matters raised in submissions on the EIS.

At the completion of the EIS phase, the CG will prepare a report evaluating the EIS and other related material, pursuant to Section 35 of the SDPWO Act. The CG Report will include an evaluation of the environmental effects of the proposed Project and any related matters. The Report will reach a conclusion about the environmental effects and any associated mitigation measures, taking into account all of the relevant material including: the EIS; all properly made submissions and other submissions accepted by the CG; and any other material the CG considers is relevant to the Project, such as a Supplementary Report to the EIS, comments and advice from Advisory Agencies, technical reports on specific components of the Project and legal advice.

The CG Report will be provided to the Proponent, the Queensland Minister for Mines and Energy, the Queensland Minister for the Environment, relevant Assessment Managers under the *Integrated Planning Act 1997* (IPA) and the Australian Government Minister for the Environment and Heritage (under the EPBC Act).

The development of the coal gasification and power generation components would require an application for approval for material change of use and/or impact assessment under the IPA. Development of the pipeline and geosequestration sites will require licensing under the *Petroleum and Gas (Safety and Management) Act 2004* (P&G Act). Before any licence can be issued under the P&G Act, the relevant environmental authority, under the *Environmental Protection Act 1994* (EP Act) must be obtained from the Environmental Protection Agency (EPA).

The CG Report for the EIS may state conditions for any proposed petroleum lease or licence under the P&G Act and/or environmental authority under the EP Act. The Report may also state for the assessment manager for development approval under IPA one or more of the following:

- The conditions that must attach to the development approval.
- That the development approval must be for part only of the development.
- That the approval must be preliminary approval only.

Alternatively the Report must state for the assessment manager that:

- There are no conditions or requirements for the Project; or
- The application for development approval be refused.

Results of Consultation on these Terms of Reference

The results of the consultation on this draft ToR will be incorporated into the final ToR for the Project.

These ToR provide information in two broad categories:

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

The Coordinator-General's Manager for further inquiries is:

Fergus FitzGerald
Manager – ZeroGen Project
Major Projects
The Coordinator-General
PO Box 15009
City East Brisbane Qld 4002

Tel: (07) 3224 2911 Fax: (07) 3225 8282
Email: fergus.fitzgerald@coordinatorgeneral.qld.gov.au

Contents

ABBREVIATIONS

The following abbreviations have been used in this document:

ACH Act	*Aboriginal Cultural Heritage Act 2003 (Qld)*
AHD	Australian height datum
ANZECC	Australian and New Zealand Environment and Conservation Council
CHMP	Cultural Heritage Management Plan
CCS	Carbon Capture and Storage, synonymous with CO_2 geosequestration
CO	Carbon monoxide
CO_2	Carbon dioxide
CG	The Coordinator-General of the State of Queensland
DEH	Australian Department of Environment and Heritage
DMR	Queensland Department of Main Roads
DMR	Queensland Department of Mines and Energy
DNRW	Queensland Department of Natural Resources and Water
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
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*)
IGCC	Integrated Gasification Combined Cycle
IGOC	Integrated Gasification Open Cycle
Mtpa	Million tonnes per annum
NCA	*Nature Conservation Act 1992 (Qld)*
NO_x	Nitrogen oxides
NTRB	Native Title Representative Body

P&G Act	*Petroleum and Gas (Production and Safety Management) Act 2004 (Qld)*
RoW	Right of Way for pipeline
SDPWO Act	*State Development & Public Works Organisation Act 1971 (Qld)*
SO_x	Sulphur oxides
SPP 1/03	State Planning Policy 1/03 Mitigating the Adverse Impacts of Flood, Bushfire and Landslide
ToR	Terms of Reference as defined by Part 4 of the *State Development & Public Works Organisation Act 1971*

Part A: INFORMATION AND ADVICE ON THE PREPARATION OF THE EIS

1. Introduction

These Terms of Reference (ToR) are for an Environmental Impact Statement (EIS) for the ZeroGen Clean Coal Power Demonstration Project. These ToR have been prepared in accordance with the requirements of Sections 29 and 30 of the *State Development & Public Works Organisation Act 1971* (SDPWO Act) and incorporate the requirements under the *Environment Protection & Biodiversity Conservation Act 1999* (the EPBC Act).

The objective of these ToR is to identify those matters that should be addressed in the EIS. These ToR are based on the initial outline of the proposed Project given in the Initial Advice Statement (IAS).

The Australian and Queensland Governments, from which the Proponent requires approvals, may request these ToR to be expanded or revised as required to address issues that emerge in the conduct of the EIS process. The Coordinator-General (CG) has ultimate responsibility for decisions on matters of interpretation of the requirements of the ToR and all subsequent changes.

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 arrangement 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 included as a separate attachment to the main report.

An executive summary should be prepared and included in the EIS. It should be a separate document that can be made available to the public.

2. EIS Objectives

The objective of the EIS is to ensure that all potential environmental, social and economic impacts of the Project are identified and assessed and, where possible, how any adverse impacts would be avoided. Direct, indirect and cumulative impacts must be fully examined and addressed. The Project, including selection of the pipeline route and geosequestration sites, 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:

- For interested bodies and persons: a basis for understanding the Project, prudent and feasible alternatives, affected environmental values, impacts that may occur and the measures to be taken to mitigate all adverse impacts.
- For groups or persons with rights or interests in land: an outline of the effects of the proposed Project on that land including access arrangements.
- For government agencies and referral bodies: a framework for decision-makers to assess the environmental aspects of the proposed Project with respect to legislative and policy provisions and based on that information to make an informed decision on whether the Project should proceed or not and if so, on what conditions, if any.
- For the Australian Government: information to determine the extent of potential impacts of the Project on matters of national environmental significance, in particular listed threatened species and ecological communities under Sections 18 and 18A of the EPBC Act.

- For the Proponent: a mechanism by which the potential environmental impacts of the Project are identified and understood, including information to support the development of management measures such as an Environmental Management Plan, to mitigate the effects of adverse environmental impacts of the development.

Completion of the EIS to the final ToR does not mean the Project will necessarily 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 all adverse impacts on the natural, built and social environment. It should be recognised that 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 cumulative impacts should be identified and assessed with respect to the environmental values of the Project area. Cumulative impacts include impacts accumulating over time, impacts exacerbated by intensity or scale of frequency of duration both at the site and remote to the site, and interactions with other projects (e.g. Queensland Coke and Power Plant Project).

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 adverse risks of environmental impacts arising from the Project and relevant alternatives on environmental, social and economic values, relative to the 'no project' scenario. The extent of baseline and predictive studies should be commensurate to risks. Assessments should address direct and indirect, combined, short and long term, beneficial and adverse impacts, as well as cumulative impacts in combination with other known activities. An estimation of the reliability of predictions should also be provided.
- A description of stakeholder consultation undertaken.
- Responses to issues raised during public and stakeholder consultation.

The main report needs to be supported by appendices containing relevant data, technical reports and other sources of the EIS analysis. The EIS will therefore consist of the main report together with appendices.

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 the specialist studies are outlined, together with the 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.
- Residual impacts that are not quantifiable are described qualitatively, in as much detail as reasonably practicable.

The assessment of all 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. Ultimately, it is the Proponent's responsibility to ensure that adequate studies are undertaken and reported.

4. Stakeholder Consultation

The Proponent should undertake a comprehensive and inclusive program of consultation with government agencies, key stakeholders and interested parties. The consultation program should 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 all 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 and discussion papers should be used to disseminate information about the Project to a wider audience and to inform stakeholders of the Proponent's progress in the EIS process and in particular on specific issues.

The Proponent is encouraged to provide opportunities for the general public to obtain information about, and comment on, the Project through such forums as road shows or 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.

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.
- 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 for placement on the internet. All compression must be down-sampled to 72 dpi (or ppi). PDF documents should be no larger than 500 kB in file size. The executive summary should be supplied in HTML 3.2 format with *.jpg graphics files. Text size and graphics files included in the PDF document should be of sufficient resolution to facilitate reading and enable legible printing, but should be such as to keep within the 500kB file size.

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 inferred 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 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 the Proponent to mitigate all adverse impacts.

The Executive Summary should include:

- The title of the Project.
- Name and contact details of the Proponent, and a discussion of previous projects undertaken by the Proponent and their 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.
- Clear maps of the proposed Project location and/or route.

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 the Project Proponent, including nature and extent of business activities, experience and qualifications, and environmental record including the Proponent's environmental policy.

1.2 Project Description

This section should provide a brief description of the key elements of the Project including associated infrastructure requirements with specific locations illustrated on maps. This section should clearly indicate the individual sites for the coal gasification and power generation components, carbon dioxide storage and the connecting pipeline.

1.3 Project Rationale

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. The current status of the Project should be described and an outline of the relationship of the Project to other developments or actions to which it may relate.

1.3.1 Need for the Project

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

- The rationale and justification for the Project in relation to greenhouse gas and climate change in the power generation industry.
- Any relevant policy or regulatory framework.
- Expected local, regional, State or national benefits.
- The Project's technical feasibility and commercial viability.
- The Project's compatibility with the Queensland and National Greenhouse Strategies, Australian Government Ecological Sustainable Development policy, Queensland Energy Policy, National Strategy on Conservation of Australia's Biological Diversity and any other relevant policy.

1.3.2 Costs and Benefits of the Project

This section should summarise:

- The economic costs and benefits to other industries and the wider community.
- Regional social impacts including employment, skills development and any workforce accommodation issues.

1.4 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. The consequences of not proceeding with the Project must be discussed. Alternatives should be discussed in sufficient detail to justify the ultimate selection of the preferred option. Compliance with government policy and with the principles and objectives of ecologically sustainable development should be included in this discussion.

Reasons for selecting preferred options should be delineated in terms of technical, commercial, social and natural environment aspects.

1.5 The Environmental Impact Assessment Process

1.5.1 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 make clear the objectives of the EIS process under the SDPWO Act and EPBC Act, development approval under the *Integrated Planning Act 1997* (IPA), *Petroleum and Gas (Production and Safety Management) Act 2004 (*P&G Act) and the *Environmental Protection Act 1994* (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 and the public release of an EIS that will specify all responses to stakeholder submissions. It should be noted that it is necessary for the Proponent to undertake wide consultation as part of the impact assessment process.

1.5.2 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 the EIS as 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 effects of the Project;
- Set out acceptable standards and levels of impacts (both beneficial and adverse) on environmental values; and
- Demonstrate how environmental impacts can be managed through the protection and enhancement of the environmental values.

The relationship of other Project environmental management planning documentation, conditions, approvals and environmental authorities should be discussed in relation to the EIS.

1.5.3 Submissions

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

- How to make submissions.
- What form the submissions should take.
- When submissions must be made to gain standing for any appeal process.

1.6 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 and education through an inclusive program.

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.
- Seek local information and input into the Project.
- Provide the community with a sense of ownership in 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 and 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.

The Indigenous component of the public consultation program should be underpinned by the following guiding principles:

- Engagement that is inclusive rather than exclusive.
- Engagement that is geographically specific.
- Engagement that uses appropriate language and media.
- Engagement that takes into account the education and entry level of Indigenous participants.

In particular, the EIS should describe:

- The Proponent's 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.
- 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 the Proponent in the context of either the EIS studies or the refined proposal.

1.7 Project Approvals

1.7.1 Relevant Legislation and Policy Requirements

The EIS should identify all relevant legislation, policies and strategies, as well as assess their specific implications and requirements for the Project and impact assessment. Reference should be made to the SDPWO Act, P&G Act, EP Act, IPA and other relevant Queensland laws. A description of the Environmentally Relevant Activities necessary for each aspect of the Project should be given. The EIS should clearly identify all activities either directly or indirectly associated with the Project that will require development approval under IPA.

Any requirements of the Australian Government EPBC Act, including the results of a Referral, should also be included. Requirements of the *Native Title Act 1993* should be covered.

The Proponent will need to identify and address other strategies, subordinate legislation and related management or planning processes that may be relevant to the assessment of the Project. In addition, local government planning controls, local laws, and policies applying to the Project should be described, and a list of the approvals required for the Project should be provided.

The EIS should also discuss the applicability of existing legislation to regulate the long-term storage, monitoring, liability and responsibility for the sequestered CO_2.

1.7.2 Planning Processes and Standards

This section should identify all relevant State, regional and local planning polices and plans and discuss how the Project complies with these policies and plans. This section should outline the Project's consistency with existing land uses or long-term policy framework with legislation, standards, codes or guidelines available to monitor and control operations on site.

In preparing the EIS the Proponent should consider the Regional Natural Resource Management Plans (NRM) accredited by the Queensland and Australian Governments under the National Action Plan for Salinity and Water Quality and the Natural Heritage Trust. In doing so, it is recommended that the Proponent consult with relevant regional NRM bodies that would have a broad range of NRM interests along the pipeline route and in the other project areas.

2. Description of the Project

This section should describe the Project and its components including how it would be constructed, operated and decommissioned (including rehabilitation). Details should include:

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

2.1 Site and Route Selection Process

This section should include a detailed description of the proposed sites associated with the Project including plans of the areas in relation to the surrounding features and land uses. Mapping should include details of:

- The location of the facilities (i.e. coal gasification and power generation components, pipeline, and geosequestration area) in a regional and local context.
- Land tenures.
- Present land uses and Planning Scheme zonings.
- Surrounding industries and other land uses.
- Features of State and National environmental significance.
- Proposed buffer zones.
- Locations and layout of new structures.

This section should describe the route selection process used to identify the proposed pipeline 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.

The EIS should provide details on adjacent areas that could be affected by the Project and existing infrastructure facilities available on, and adjacent to, the various sites/locations.

2.2 Coal Gasification and Power Generation Components

This section should provide a description and layout of the power generation components including the air separation unit, coal gasifier, syngas cleanup facility and gasification-based power plant facilities including:

- Concept and layout plans indicating the proposed buildings, structures, plant and equipment associated with the process.
- Description of key plant and equipment, processes, capacities and raw materials to be used.
- Description of key buildings and infrastructure, site access, services access, buffer areas, car parks, landscaping and site boundaries.
- Indicative process flow-sheets showing material balances and the anticipated rates of inputs, along with similar data on products, wastes and recycle streams. Additional detail on waste and recycle streams should be included in Section 3.7.1.
- The process and criteria for selecting the facilities and the rationale for the preferred option.

- Description of the amount of electricity generated and how it is to be transmitted from the site.

2.3 Pipeline

This section should provide a detailed description of the proposed CO_2 pipeline including ancillary infrastructure. The proposed pipeline route should be illustrated on maps at suitable scales. The Project should be described with reference to the following:

- Map of the preferred route location using cadastral and topographical maps.
- For the preferred pipeline route describe, with the aid of maps and diagrams, the location and/or frequency of cathodic protection points, compressor stations, control valves (isolation points), and any other Project facilities.
- Design parameters covering, pipe grade, diameter, wall thickness, length, capacity, test and operating pressures, depth of cover over the pipe, minimum depths of cover under transport infrastructure, coating and design life.
- Properties of the gas and/or liquid stream being transported and stored including, composition, impurities, trace elements and density state of the gas/liquid.
- Above ground facilities - physical dimensions and construction materials for surface facilities along the pipeline route including information on pipeline markers.
- Criteria for design and location of any temporary or permanent access crossing for machinery, transport etc. across any waterway (e.g. construction of causeways, bridges, culvert crossings etc.) and any permanent access points or roads for maintenance purposes, in particular where they are adjacent to waterways. The nature of any permanent access points should be described.
- Easement widths and access requirements along the route, including the use of existing areas of disturbance for pipeline access and future maintenance, and separation distances from major transport infrastructure.
- Engineering design concepts and pipeline management principles.
- Location of temporary above ground infrastructure.
- Location of existing infrastructure including roads, railways, bridges, access tracks, dams and weirs, pipelines (water, gas, oil and slurry) and overhead and underground electricity and telecommunication cables and structures that might be affected by construction and operation of the pipeline.

2.4 Geosequestration Area

This section should provide a detailed description of the proposed geosequestration facilities and geosequestration area. The Project should be described with reference to:

- Map(s) of the preferred sequestration area using cadastral and topographical maps.
- Likely location and frequency of injection well heads and any other geosequestration related facilities.
- Details of the storage concept for the CO_2, (e.g. sequestration in abandoned oil or gas field, saline aquifer sequestration etc.).
- Geometry of the CO_2 storage reservoir including the spatial distribution, depth and the topography of the surface area.
- Description of any hydrocarbons present in or adjacent to the sequestration reservoir.
- Description of the degree to which geological resources (such as oil and gas) have been exploited prior to the injection of CO_2.
- Features of the sequestration area which are believed to prevent migration of injected CO_2 into outside areas including cap rock, other stratigraphic layers etc.
- For any above ground facilities – physical dimensions and construction materials for surface facilities.

- Sequestered material details including physical state of the material, temperature at injection, injection rate, physical properties of CO_2 including density, viscosity, interfacial tension, solubility and thermal conductivity and their dependence on pressure and temperature, impurities present and quantities to be injected over the life of the Project.
- Drilling techniques to be employed, casing materials and description of the wellhead facilities with particular reference to protection devices.
- Criteria for the design and location of any temporary or permanent access routes including watercourse crossings and intersection with existing road infrastructure.
- Injection point footprints and access requirements to these locations during construction, operation and post injection.
- Proximity to potential natural hazards and human populations.
- Engineering design concepts and management principles (ie industry standards, codes of practice).
- Location of any temporary above ground facilities.
- Location of existing infrastructure including roads, railways, dams, weirs, pipelines, power transmission lines and telecommunications cables and structures that may be affected by the construction and operation of the geosequestration facilities.
- A description of the level of deliberate over pressurising of the sub-strata that may occur during injections.

2.5 Pre-construction Activities

A description of the pre-construction activities should be set out in this section including:

- Upgrading of any roads, railways and other infrastructure.
- Development of lay-down areas and access tracks.
- Location and site establishment requirements for construction camps.
- Any preliminary drilling activities.
- Details on the likely quantities and source of materials required for ancillary construction activities (e.g. access roads/tracks, concrete structures etc.).

2.6 Construction Activities

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

- Indicative construction timetable, including expected commissioning and start-up dates and hours of operation.
- Management of soil during construction with detailed information provided in Section 3.2.3.
- Process inputs, handling and storage including an outline of procedures for loading and unloading materials and contingency plans for spillages.
- Management of weed and plant-matter cleared from sites with detailed information provided in Section 3.3.2.
- Management of domestic and wild animals trapped or injured during construction – protocols or rescue plans compatible with any relevant animal welfare legislation should be included in Section 3.3.3.
- Cleanup and restoration of areas used during construction, including camp sites and storage areas.

2.6.1 Coal Gasification and Power Generation Components

The full extent and nature of the power generation components, including the air separation unit, coal gasifier, syngas cleanup facility and gasification-based power plant facilities construction phase should be described. The description should include:

- Type and methods of construction to be used.
- Management of watercourses in the construction area.
- Construction equipment to be used.
- Materials or plant to be transported onto the construction site.
- The extent of surface disturbance, particularly extent of vegetation clearing.
- Description of testing requirements for commissioning of the various components including water sourcing and disposal.

2.6.2 Pipeline

The full extent and nature of the pipeline's construction phase should be described. The description should include:

- Pipeline spread activities i.e. groups of construction personnel, pipe-string fabrication and pipe-laying equipment.
- Pipeline construction techniques including:

    - Plant and machinery likely to be involved.
    - Supply and storage of materials – volume, composition, handling and storage during construction.
    - Anticipated timing, duration and progress of pipe-laying.
    - Possible interruption of pipeline laying to other land activities, e.g. interruption to road and/or rail traffic.
    - Extent that service corridors would be used during construction and maintenance.
    - Width of vegetation clearing required. This information should indicate where vegetation to be cleared has significant conservation value (such as sensitive environmental areas and creek crossings), and should also cross reference where in the EIS the impacts on such vegetation have been addressed.
    - Management of soil during construction, with detailed information contained in Section 3.2.3.
    - Depth of trenching and burial of the pipeline; bedding materials (if any) including compaction techniques on the pipeline trench and in particular adjacent to and within waterways, to achieve bank stability.
    - Procedures for trench construction and pipe-laying if rock is encountered (see Section 3.7.2).
    - Typical crossing techniques including restoration works that would be used at creek crossings, and road, rail and other service corridor crossings. Detail whether the flow of water would need to be altered within and/or diverted out of any waterway during pipeline construction with detailed information contained in Section 3.4. Where in-stream infrastructure is in place, identify practicality of attaching the pipeline to these structures.

- Identification of sections of the pipeline route where blasting may be required including discussion of procedures for trench construction and pipe-laying if rock is encountered and the impacts of blasting.
- Management of spread of weed seed, including quarantine areas and wash-down facilities and the dispersal/destruction of weed seeds and contaminated vegetative matter.
- Management of air emissions, particularly dust, during construction.
- Disposal of plant-matter left after clearing vegetation.
- Details of the anticipated hydrostatic testing procedures.
- Program for testing the pipeline's integrity, including cathodic protection requirements, launcher and receiver scraper stations.
- Cleanup and restoration (rehabilitation) of areas used during construction including camp sites and storage areas (see Section 3.3.2).

- Type and methods of construction including methods for crossing watercourses and other infrastructure. The process and criteria used to determine the crossing method for watercourses should be described. Details of criteria to assess the minimum depth the pipeline is to be buried under creeks, rivers and ephemeral waterways taking into account one in one hundred years (Q100) flood events.
- Construction traffic, access and haul routes.
- An outline of any protocols or rescue plans that will be implemented should domestic or wild animals be injured or unable to escape from the trenches. These plans and protocols need to be compatible with any relevant animal welfare legislation (see Section 3.3.3).
- The sources of quarry material, how it is located and environmental management including resource allocations for material in water courses needs to be explained with reference to Section 3.2.3.

2.6.3 Geosequestration Area

The full extent and nature of the geosequestration area's construction phase should be described. The description should include:

- Type and methods of construction to be employed.
- Construction equipment to be used.
- Materials or plant to be transported onto the geosequestration site (transport requirements are to be addressed in detail in Section 3.8).
- Design parameters and construction materials used in well-heads.
- The extent of surface disturbance, particularly extent of vegetation clearing.
- Description of all testing requirements for commissioning of the CO_2 injection wells, including source and disposal of water.
- Borehole lining materials.

2.7 Commissioning Activities

This section should describe the activities involved in commissioning all aspects of the Project.

2.8 Operation Activities

This section should describe the operation and maintenance requirements for all elements of the Project including:

- Inspection and surveillance activities and frequency.
- Impact on waterways as a result of operation and maintenance activities.
- Safety procedures, including provision for shut-down and/or venting in event of an emergency.
- Provision for public safety in such circumstances.
- Monitoring regimes for the sequestration area and related boreholes.
- Expected maintenance operations for boreholes.

2.9 Decommissioning

This section should present the strategies and methods for final closure, decommissioning, and rehabilitation of all Project elements. Decommissioning of the Project, in terms of the removal of plant, equipment, structures and buildings should be described and the methods proposed for the stabilisation of the affected areas should be given. Information should be provided on how buildings and structures would be removed or made safe, if left in-situ.

Final rehabilitation of the Project sites should be discussed in terms of ongoing land use suitability, management of any residual contaminated land and other land management issues.

The strategic approach to progressive and final rehabilitation, with a view to minimising the amount of land disturbed at any one time, should be described.

Any future proposed disturbance to waterways and associated fisheries resources as a result of decommissioning activities should be described.

The EIS should outline the development and implementation of rehabilitation success criteria for the decommissioning of the pipeline RoW at the end of operational life.

A description of the casing and plugging methods used on decommissioned injection wells should be provided. Methods to prevent deliberate interference with or accidental intrusion into the geosequestration reservoir should be provided. An outline of how information relating to the sequestration area will be archived and made available for individuals or groups which may have a future interest in the affected land should be provided. Ongoing monitoring regimes of the sequestration area post closure should be outlined, along with arrangements for any remediation actions post-closure. Administrative control arrangement of the sequestration site after closure of the Project should be detailed. Any long-term risks that require management post-closure should be outlined.

2.10 Workforce, Accommodation & Support Infrastructure

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 overseas) 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, including the proposed use of regional or charter air services should be provided.

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 recruitment schedules and policies for recruitment of workers (addressing recruitment of local and non-local workers) 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. Maps should be included as necessary to illustrate the site and should include the location of any proposed construction workers' accommodation on-site or in the vicinity of the Project.

If camp sites are to be used to accommodate the workforce, details on the number, location (shown on a map), proximity to the construction site and typical facilities for these sites should be provided. Information should include data relating to facilities for:

- Food preparation and storage.
- Ablution facilities.
- Vector and vermin control.
- Fire safety.
- Dust and noise control in relation to proximity of camp site to the construction area.
- The service personnel required to maintain the camp and the supply of services to each construction camp.

Local government approvals required for establishment and operation of such camps should be outlined.

2.11 Energy and Telecommunications Requirements

Electricity supply requirements for the construction and operation of the Project should be provided and locations of any associated easements should be shown on an infrastructure plan. Timeframes should 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. Energy conservation should be described in the context of any Australian, State and local government policies.

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.

2.12 Water Supply & 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 for all aspects of the Project.

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

- Quality of water required, including strategies to prevent contamination.
- Quantity of water required including:
    - Maximum hourly demand.
    - Maximum daily demand.
    - Mean daily demand.
    - Total annual consumption.
- Any additional water supply infrastructure.
- 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 (including sewage) proposals for use by the workforce should be described.

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

- Current and projected raw and treated water consumption.
- Current and projected on-site raw and treated water storage.
- Contingency plans for planned and non-planned supply failures.
- Projected dates for increased raw and treated water supplies.

The EIS should describe the site layout plans for the coal gasification and power generation components which incorporate requirements and conceptual plans for stormwater management structures, 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.

2.13 Transport – Road, Rail, Pipelines and Shipping

This section of the EIS should provide a brief overview of transport requirements. Full details of transport volumes and routes should be provided under Section 3.8.

2.14 Waste

This section should provide a brief overview of the waste management requirements of the Project. Full details of the waste volumes, characteristics and management strategies should be provided in Section 3.7.

2.15 Air & Noise Emissions

The EIS should provide information on the location, type, volume and concentrations of air emissions (i.e. process, safety relief and fugitive) and in particular sources of emission of particulates, carbon monoxide (CO), carbon dioxide (CO_2), sulphur dioxide (SO_2), nitrous oxides (NO_x) and other toxic air emissions. This should include a description of air emissions during atypical circumstances. More detailed information requirements for air emissions, to be presented in the EIS, are set down in Section 3.5.

A description of noise emissions should be provided and include principal noise sources, any noise abatement measures and expected noise emission levels, including those for routine operations and any atypical circumstances (e.g. descriptions of sound pressure levels at reference distances or sound power levels). The EIS should identify the location of noise emission sources and in particular those which are steady, transient and of low frequency. More detailed information requirements for noise emissions, to be presented in the EIS, are set down in Section 3.6.

3. Environmental Values & Management of Impacts

This section should address all elements of the environment, (such as land, water, nature conservation, cultural heritage, social and economic, air, noise, waste, transport and traffic and hazards and risk) in a way that is comprehensive and clear.

The EIS should assess the impacts of the construction, operation and decommissioning stages (including rehabilitation) of the Project elements, together with impacts associated with potential ongoing maintenance, access and servicing resulting from the development and any other facilities required for the Project.

This section of the EIS should:

- Describe the existing environmental values of the areas affected by the proposal through reference to background information and studies.
- Describe the potential adverse and beneficial impacts of the proposal on the identified environmental values, including analysis of any cumulative impacts on the environment.
- Present environmental protection objectives, standards and measurable indicators.
- Examine viable alternative strategies for managing impacts based on objectives and standards to be achieved through discussion of available techniques and best practice.

The EIS should detail environmental protection measures which are to be incorporated in the planning, construction, operations, decommissioning and associated works for the Project. Measures proposed in the EIS should aim to minimise environmental harm and maximise socio-economic and environmental benefits of the proposal.

Environmental protection objectives may be derived from legislative and planning requirements which apply to the proposal, including Australian Government strategies, State planning policies, local authority strategic plans, environmental protection policies under the *Environmental Protection Act 1994*, and any catchment management plans prepared by local water boards or land care groups. Special attention should be given to those mitigation strategies designed to protect the values of any sensitive areas and any identified ecosystems of high conservation value within the area of possible proposal impact.

It is recommended that the EIS follow the heading structure shown below. The mitigation measures, monitoring programs, etc., identified in this section of the EIS should be used to develop the Environmental Management Plans for the Project.

3.1 Climate

This section should describe climatic conditions in the Project area and seasonal conditions (e.g. cyclones, floods) that may influence timing and/or construction methods and how this would be managed.

This section should include a discussion on how weather would be monitored to minimise the risk of adverse impacts to the Project area during the construction period.

3.2 Land

This section should detail the existing land environment for all areas associated with the Project including the coal gasification and power generation components site, pipeline, sequestration area and any new permanent (e.g. compressors) or temporary (e.g. accommodation camps) facilities constructed for the Project.

This section should also describe the potential for the construction and operation of the Project to change existing and potential land uses of the Project sites and adjacent areas.

3.2.1 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 and road reserves, railways and rail reserves, and stock routes).
- Land use (urban, residential, industrial, agricultural, forestry, recreational, mining including mining and petroleum exploration tenures, mining leases, mining claims, mineral development licences, extractive industry permits, petroleum leases and pipeline licences).
- Areas covered by applications for native title determination, including traditional and contemporary uses of land and water by Aboriginal people. A description of Native Title Representative Bodies' (NTRB) boundaries should be provided.
- Information on any known occurrences of economic mineralisation, gas and oil fields and extractive resources within the Project area.
- Location of gas and water pipelines, power lines, telecommunication cables, roads, railways, bridges, airports, airstrips, helipads and any other infrastructure.
- Location of mines and mineral processing plants, gas and oil wells, processing plants and storage facilities.
- Distance of facilities and pipelines from residential and recreational facilities.

Potential Impacts and Mitigation Measures

This section should include the following:

- Assessment of the compatibility of the proposal with surrounding land uses.
- Description of possible impacts on surrounding land uses and human activities, including impacts to Good Quality Agricultural Land (GQAL) and forestry land (addressing loss of access to land, fragmentation of sites, increase of fire risk and loss of productive land for those purposes) as well as residential and industrial uses.
- Proposed measures to minimise impact on GQAL.
- The 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 of the pipeline route for co-location of other infrastructure services, and/or the separation requirements.
- Discussion of potential issues involved in proximity of the CO_2 pipeline 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.
- 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 components.
- Possible impacts of drilling activities within the vicinity of the geosequestration area by other groups/individuals (e.g. exploration for natural resources, drilling for water resources, drilling for further CO_2 disposal, drilling for hydrothermal resources etc.).
- Potential for and mitigation methods to prevent interference with the CO_2 reservoir from mining and other underground activities.
- Potential for other non-Project activities to impact on the geosequestration area (eg quarrying, trenching, excavation for construction, residential, industrial, and transport and road construction).
- Identification of any millable timber or quarry resources on the pipeline route and in the geosequestration area and an assessment of the commercial value of these resources to satisfy the requirements of the Department of Primary Industries and Fisheries.

- Management of fences and gates to be crossed by the pipeline RoW or constructed for pipeline and geosequestration site access.

3.2.2 Topography & Geomorphology

Description of Environmental Values

Maps should be provided locating the Project elements and its environs in both regional and local contexts. The topography of the proposal sites should be detailed with contours at suitable increments, shown with respect to Australian Height Datum (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.

In areas of major watercourse crossings by the pipeline, surrounding topography should be mapped in appropriate detail with levels shown with respect to AHD. Any features related to the relief and shape of the surface environment and its evolution that may have an impact on geosequestration activities should be described.

Potential Impacts and Mitigation Measures

The Project should be discussed in the context of major topographic features and any measures taken to avoid or minimise impact to such.

The objectives to be used for the Project in re-contouring and landscaping should be described. Consideration should be given to the use of appropriate native plant species during any landscaping and re-vegetation.

3.2.3 Geology & Soils

Description of Environmental Values

The EIS should provide a description and map of the geology of the Project areas, with particular reference to the physical and chemical properties of surface and sub-surface materials and geological structures within the proposed areas of disturbance. 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.

The EIS should provide detailed information on the geology of the sequestration area (including neotectonic features, any volcanic or magmatic activity, seismicity profile, and the presence of any hydrothermal activity) with particular reference to its capability to safely store the proposed volumes of CO_2. A description of the stress condition and mechanical properties of the sequestration area prior to injection should also be provided.

The location of identified natural resources within the sequestration area, including solid mineralogical resources, such as coal or minerals, fluid and gaseous resources, such as hydrocarbons or water, and other resources such as geothermal or microbial resources should be provided. The location of any existing wells within the geosequestration area (including decommissioned wells) and details of any existing wells (age, casing material, etc.) should be given.

Details of the lithologies in the sequestration area should be provided and a description of the suitability of the geosequestration area's ability to contain CO_2 should be detailed based on these lithologies. Other geological features of the geosequestration area should be outlined including the presence of any unconformities, heterogeneities of storage rock, fractures and faults and the effects these features may have on the long-term storage success of the injected CO_2.

A temperature profile of the geosequestration reservoir prior to injection should be provided giving an estimation of the geothermal gradient of the area. Petrophysical properties of the geosphere prior to the injection of CO_2, including features such as permeability, porosity, residual saturation, capillary pressure and wettability should be described. Details of fluids in the geosphere, which comprises of the reservoir, overburden and surrounding rock prior to the injection of CO_2 should be provided. The presence and distribution of hydrocarbons, such as oil and/or gas, within the storage system should be outlined.

Soils of the Project sites (i.e. coal gasification and power generation components, pipeline and sequestration area) should be mapped at a suitable scale, with particular reference to the physical and chemical properties of the soils which would influence erosion potential, stormwater run-off quality, rehabilitation and agricultural productivity of the land. Information should also be provided on soil stability and suitability for construction of all Project facilities.

Soils should be mapped and described in accordance with *Australian Soil and Land Survey Field Handbook (Gunn et al 1988 and McDonald et al, 1990)*. An appraisal of the depth and quality of useable soil should be undertaken. Information, including borehole locations, should be presented in accordance with the standards required in the *Planning Guidelines: The Identification of Good Quality Agricultural Land (DPI, DHLGP, 1993)*, which supports *State Planning Policy 1/92: Development and the Conservation of Agricultural Land.*

This section should discuss the potential for:

- The existence of GQAL within and adjacent to the disturbance zone of the Project.
- Land contamination from existing and past uses based on land use history and the nature and quantity of any contaminants. A preliminary site investigation should be prepared including a risk based search of the Contaminated Land Register and Environmental Management Register.
- Other significant geological features such as possible palaeontology sites.

<u>Potential Impacts and Mitigation Measures</u>

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. A strategy should be developed with a view to minimising the amount of land disturbed at any one time. This section should provide information on:

- The availability and suitability of rock, sand and gravel for trench padding and road construction materials.
- The environmental consequences of the excavation and removal of soils from borrow pits and from excavation and backfill of the pipeline trench.
- Measures to ensure that soil erosion does not accelerate in the various Project areas 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. Methods of stockpiling and disposal of trench material from excavated streambed, bank, and adjacent areas should be included.
- Pipeline route adjustments and/or rehabilitation measures to minimise impacts on GQAL.
- A description of topsoil management should consider transport, storage and replacement of topsoil to disturbed areas. The minimisation of topsoil storage times (to reduce fertility degradation) should also be addressed. Erosion and sediment control should be described with a Soils Erosion and Sediment Control Plan included in the EMP.

- Potential for leakage or accidental release of CO_2 and other gases that may be present (risk assessment should be addressed in Section 3.11.2).
- Potential impact of leakage of CO_2, trace gases or impurities on soils and methods to mitigate these impacts.
- A description of gases naturally present in the geosphere that could affect the behaviour of CO_2 injected into a storage reservoir and could accompany CO_2 along potential migration paths
- Potential for any neotectonic, seismic, volcanic, geothermal and/or magmatic events in the geosequestration area and methods to mitigate the impacts of such events.
- Potential impacts of over pressurising the sedimentary basin (either intentionally or unintentionally), including enhanced fracture permeability, CO_2 migration and fault activation leading to seismic instability or seismic events.
- The degree to which the sequestered CO_2 could be deliberately removed, if required.
- Methods to monitor the integrity of wells (both active and decommissioned), seismicity, injection rates, pressure, and subsurface distribution and migration of CO_2.
- Potential for an increased level of seismic events in the sequestration area due to CO_2 injection altering physical processes (e.g. reactivation of ancient fault planes, changes in the orientation, fluid-pocket occurrences etc.).
- Potential effects on geological features due to the temperature of the injected fluid causing geological modification of the region around the point of injection due to thermal gradients.
- Details of hydrocarbons present in the reservoir that could be mobilised by the injected CO_2.
- The potential for, and methods to mitigate, soil creep around injection boreholes.
- The rate of sorption and desorption of CO_2 on geological materials present in the storage reservoir and an assessment of the effects these rates will have on the performance of the storage system e.g. porosity and permeability of the reservoir; fluid flow (direction or velocity); mechanical properties (e.g. strength); and CO_2 storage capacity.
- 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.
- For each area of disturbance identified erosion potential (wind and water) through the removal of vegetation.
- Topsoil management measures such as transport, storage, and re-use on disturbed areas.
- Erosion-monitoring program
- Erosion and sediment control measures to ensure:

    - Prevention of soil loss in order to maintain land capability/suitability.
    - Reduction of wind-generated dust concentrations.
    - Prevention of significant degradation of local waterways by suspended solids.

The EIS should describe the possible contamination of land from aspects of the proposal including CO_2 injection, waste, and spills at chemical and fuel storage areas. The means of preventing land contamination (within the meaning of the EP Act) should be addressed and methods proposed for preventing, recording, containing and remediating 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, processing plant site and product storage areas after proposal completion.

3.3 Nature Conservation

This section should detail the existing nature conservation values of the Project area.

The flora and fauna communities should be described, in particular those that are rare or threatened, in environmentally sensitive localities, including watercourses, riparian zones and habitat corridors. The description should include species lists.

Reference should be made to both Queensland and Australian Government legislation and policies on threatened species and ecological communities.

All surveys undertaken should be in accordance with best practice 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 all likely direct and indirect environmental harm 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 hierarchy:

1. Avoiding impacts on areas of remnant vegetation and other areas of conservation value.
2. Mitigation of impacts through rehabilitation and restoration.
3. Measures to be taken to replace or offset the loss of conservation values where avoidance and mitigation or impacts cannot be achieved.
4. Explanation of why measures 1 to 3 above would not apply in areas where loss would occur.

Where the power plant site, pipeline alignment or geosequestration 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 environmentally sensitive areas (Category A and B – see schedule 1A of the *Environmental Protection Regulation 1998*) which could be affected, directly and indirectly, by the Project. In particular, the EIS should indicate if the land affected by the Project is, or is likely to become part of, the protected area estate, or is subject to any treaty.

Details of the proximity of the Project and related ancillary infrastructure and the potential impact on environmentally sensitive areas (Category A and B – see schedule 1A *Environmental Protection Regulation 1998*) should be described. 'Endangered' and 'of concern' remnants should be considered in terms of their connection to larger remnants and corridors (including 'not of concern' regional ecosystems) to minimise disturbance and isolation of these communities.

The EPBC Act should be addressed with regard to matters of national environmental significance identified by the Australian Government when the Project was determined to be a controlled action. In addition to the EPBC Act identified species, any other threatened species found during survey work is also afforded the same protection status as those listed below and must be addressed:

Threatened Species		EPBC Act Status
Birds		
Erythrotriorchis radiatus	Red Goshawk	Vulnerable
Geophaps scripta scripta	Squatter Pigeon (southern)	Vulnerable
Neochmia ruficauda ruficauda	Star Finch (eastern)	Endangered
Rostratula australis	Australian Painted Snipe	Vulnerable
Turnix melanogaster	Black-breasted Button-quail	Vulnerable
Mammals		
Chalinolobus dwyeri	Large-eared Pied Bat, Large Pied Bat	Vulnerable
Dasyurus hallucatus	Northern Quoll	Endangered
Nyctophilus timoriensis	(South-eastern form) Eastern Long-eared Bat	Vulnerable
Onychogalea fraenata	Bridled Nail-tail Wallaby	Endangered
Reptiles		
Denisonia maculata	Ornamental Snake	Vulnerable
Egernia rugosa	Yakka Skink	Vulnerable
Furina dunmalli	Dunmall's Snake	Vulnerable
Paradelma orientalis	Brigalow Scaly-foot	Vulnerable
Rheodytes leukops	Fitzroy Tortoise	Vulnerable
Plants		
Aristida annua		Vulnerable
Cadellia pentastylis	Ooline	Vulnerable
Commersonia sp. Cadarga		Vulnerable
Cossinia australiana	Cossinia	Endangered
Dichanthium queenslandicum	King Blue-grass	Vulnerable
Digitaria porrecta	Finger Panic Grass	Endangered
Eucalyptus raveretiana	Black Ironbox	Vulnerable
Leucopogon cuspidatus		Vulnerable
Macrozamia platyrhachis		Endangered
Threatened Ecological Communities		
Dichanthium spp	Bluegrass	Endangered

Acacia harpophylla	Brigalow	Endangered
	Semi-evergreen vine thicket	Endangered

The proximity of the Project elements to any of these areas should be identified and mapped. Areas which would be regarded as sensitive with regard to flora and fauna have one or more of the following features:

- Important habitats of species listed under the *Nature Conservation Act 1992* and/or EPBC Act as presumed extinct, endangered, vulnerable or rare.
- Regional ecosystems recognised by the EPA as 'endangered' or 'of concern' or 'not of concern' but where permits are no longer granted due to being at threshold levels, and/or ecosystems listed as presumed extinct, endangered or vulnerable under the EPBC Act.
- Ecosystems which provide important ecological functions such as riparian vegetation, important buffer to a protected area, refugia or important habitat corridor between areas.
- Protected areas which have been proclaimed under the *Nature Conservation Act 1992* or are under consideration for proclamation.
- Areas identified as significant by Brigalow Belt and Mulga Lands Biodiversity Planning Assessments.

Potential Impacts & Mitigation Measures

This section should discuss:

- The impact of the Project on species, communities and habitats of local, regional or national significance as identified above including EPBC Act listed threatened species and communities. Particular reference should be made to potential leaks of CO_2 on flora and fauna.
- Proposals to minimise such impacts (e.g. timing of works, minimising area of disturbance).
- Planned rehabilitation techniques to be applied to all vegetation types of significance including Brigalow communities.

3.3.2 Terrestrial Flora

Description of Environmental Values

Terrestrial vegetation maps at a suitable scale should be provided for the entire Project area. Mapping should be produced from aerial photos and ground truthing and should show and discuss:

- 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/sciemce/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 should be identified.
- Areas of re-growth or restoration and remnant vegetation.
- Any threatened species or communities under the EPBC Act.
- Vegetation map unit descriptions should also discuss 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 each significant natural vegetation community likely to be impacted by the Project, vegetation surveys should be undertaken at a sufficient number of sites, allowing for seasonal factors. Surveys are to be conducted at the appropriate time of year when the species are known to be present in the Project area, so that identification and location of these species is optimal. Where this is not possible, the Proponent is required to assess the potential impact on the species as if it were to exist. Surveys should be conducted as follows:

- All data requirements of the Queensland Herbarium CORVEG database should be collected.
- The minimum site size should be 500 square metres.
- A complete list of species present at each site should be recorded.
- The relative abundance of plant species present should be recorded.
- Any plant species of conservation, cultural, commercial or recreational significance should be identified.
- Vegetation mapping and data should be submitted to the Queensland Herbarium to assist the updating of the CORVEG database.
- 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 existence of rare or threatened species should be specifically addressed under sensitive areas, and the location of any horticultural crops in the vicinity of the Project area should be shown.

Details of any riparian vegetation and native grasslands, and their value for faunal habitat and conservation of specific rare floral and faunal assemblage or community types, from both a local and regional perspective, should be provided. Any special landscape values of any natural vegetation communities should be described.

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 & Mitigation Measures

This section should include:

- A discussion of the ability of identified stands of vegetation to withstand any increased pressure resulting from the proposal and identify measures proposed to mitigate 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 and what benchmarks should be used for review of monitoring should be included.

- An outline of the development and implementation of rehabilitation success criteria for the reinstatement of the pipeline right-of-way after construction as been completed.
- Potential for and monitoring programs of terrestrial flora which may provide an indication of CO_2 leakage.
- Potential impact of leakage of CO_2, trace gases or impurities, on terrestrial flora and methods to mitigate these impacts.
- 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.
    - The need for vehicle and machinery wash-down and any other hygiene protocols.
    - Staff/operator education program.

- A weed management plan, to be developed in consultation with local government environmental officers, is to be included in the EMP and shall cover construction, rehabilitation and operation of the Project. The plan is to include a comprehensive description of weeds requiring management, the means and potential effectiveness of proposed control measures and monitoring and corrective actions that will be taken should there be any outbreaks or spread of weeds.

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.
- Any species that are poorly known but suspected of being rare or threatened.
- Habitat requirements and sensitivity to changes; including movement corridors and barriers to movement.
- The existence of feral or exotic animals.
- Existence of any listed rare, threatened or otherwise noteworthy species/communities in the study areas, including a discussion of range, habitat, breeding, recruitment, feeding and movement requirements, and current level of protection (e.g. any requirements of Protected Area Management Plans).
- Use of the areas by migratory birds, and nomadic birds, fish and terrestrial fauna.

The EIS should contain results from surveys for species listed as threatened or migratory under the EPBC Act. Surveys are to be conducted at the appropriate time of year when the species are known to be present in the Project area, so that identification and location of these species is optimal. Where this is not possible, the Proponent is required to assess the potential impact on the species as if it were to exist.

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 & Mitigation Measures

This section of the EIS should include:

- Impacts the proposal may have on terrestrial fauna, relevant wildlife habitat and other fauna conservation values.
- Measures to minimise wildlife capture and mortality in open trenches.
- 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.
- 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.
- Potential impact of CO_2, trace gases or impurity leakage on terrestrial fauna and methods to mitigate these impacts.

3.3.4 Aquatic Biology

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.

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. The discussion of the fauna and flora present or likely to be present in the Project area at any time during the year should include:

- Fish species, mammals, reptiles, amphibians, and aquatic invertebrates occurring in the waterways within the Project area.
- Aquatic (waterway) plants and weeds.
- Aquatic substrate and stream type.

Potential Impacts & Mitigation Measures

This section should include:

- A description of the methods used to mitigate and rehabilitate impacts on rivers, waterholes and major river crossings (for the pipeline).
- The potential for leakage of CO_2, trace gases or impurities which may impact on aquatic biology within the Project areas and measures to monitor and mitigate these impacts.
- 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 direct discharge.
- All 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).

3.4 Water Resources

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, *Environmental Protection (Water) Policy 1997* (EPP(Water)) and Australian and New Zealand Environment and Conservation Council (ANZECC) 2000. An indication should be provided of the quality and quantity of water resources required by the Project and the potential sources of those waters, including cooling water for the gasification-based power plant, hydrostatic test water for the pipeline, drilling requirements and potable water for the construction workforce.

This section should describe:

- Existing surface and groundwater in terms of physical, chemical and biological characteristics.
- Existing surface drainage patterns, flows, history of flooding including extent, levels and frequency and present water uses.
- Environmental values of the surface waterways of the affected area in terms of:

    - Values identified in the EPP (Water).
    - Sustainability, including both quality and quantity.
    - Physical integrity, fluvial processes and morphology of watercourses, including riparian zone vegetation and form.
    - Hydrology of waterways and groundwater.
    - Any Water Resource Plans relevant to the affected catchments.

- Potential sources of water for construction and estimated volumes required for the Project, including hydrostatic testing of the pipeline.
- Current events and processes related to groundwater and surface water management including water extraction, reservoirs, dams, and river management within the Project areas.
- Existing and other potential surface and groundwater users and holders of Quarry Material Allocation Notices.
- Potential sources and quantities of riverine quarry material and the impacts of the extraction of this material.

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

The EIS should provide a description of groundwater resources in the sequestration area in terms of:

- Geology/stratigraphy.
- Aquifer type - such as confined, unconfined.
- Depth to and thickness of the aquifers.
- Depth to water level and seasonal changes in levels.
- Groundwater flow directions (defined from water level contours).
- Interaction with surface water.
- Possible sources of recharge.
- 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.
- Physical integrity, fluvial processes and morphology of groundwater resources.

Potential Impacts & Mitigation Measures

This section should assess potential impacts 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, audited and managed.

Matters to be addressed should include:

- 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. The impacts of surface water flow on existing infrastructure should be considered with reference to the EPP (Water) and the *Water Act 2000*.
- Quality characteristics appropriate to the upstream and downstream uses that may be affected. Chemical and physical properties of any waste water at the point of discharge into natural surface waters should be discussed, including the toxicity of effluent to flora and fauna. If it is proposed to discharge water to the creek system an assessment of the potential impacts on Neerkol Creek and other downstream creeks should be undertaken.
- Reference should be made to the properties of the disturbed land and process wastes and the techniques to be employed to ensure that contaminated water is contained and successfully treated on site.
- The results of a risk assessment for uncontrolled releases to water due to system or catastrophic failure, implications of such emissions for human health and natural ecosystems, and list strategies to prevent, minimise and contain impacts.
- An assessment of the potential to contaminate groundwater resources and measures to prevent, mitigate and remediate such contamination.
- An assessment of the potential environmental harm caused by the proposal to local groundwater resources. Particular reference should be made to the potential for acidification of water resources due to the presence of CO_2. The impact assessment should define the extent of the areas within which groundwater resources are likely to be affected by the proposed operations and the significance of the Project to groundwater depletion or recharge, and propose management options available to monitor and mitigate any effects.
- An assessment of the possibility that injecting the CO_2 may cause acidification of formation water, leading to mineral dissolution and subsidence.
- Extraction and management of water within the Project area that may affect the movement of CO_2 or associated contaminants to and in the surface environment.
- A description of the water phase geochemistry of the injected CO_2 within the saline aquifers and any associated risks to the performance of the sequestration system.
- An assessment of the impact of the Project on the local groundwater regime caused by the altered porosity and permeability of any land disturbance.
- An assessment of the possibility that displaced saline formation fluids may contaminate near-surface aquifers with subsequent impacts, such as contamination of potable water supplies.

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.
- Flows and quality of water discharged.
- The need or otherwise for licensing any dams (including referable dams), under the *Water Act 2000*.

The ANZECC '*National Water Quality Management Strategy, Australian Water Quality Guidelines for Fresh and Marine Waters' (November 1992)* and the EPP (Water) should be used as a reference for evaluating the effects of various levels of contamination.

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.

3.5 Air Environment

Description of Environmental Values

This section should describe the existing air environment which may be affected by the proposal having particular regard for particulates and gaseous and odorous compounds. The background levels and sources of suspended particulates, sulphur oxides (SO_x), nitrogen oxides (NO_x), 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 gathered to provide a baseline for later studies or for the modelling of air quality environmental harms within the air shed, particularly in reference to the proposed coal gasification and power generation components. Parameters should include air temperature, wind speed and direction, atmospheric stability, mixing depth and other parameters necessary for input to the models.

The environmental values of the air shed for the affected areas should be described in terms of the *Environmental Protection (Air) Policy 1998* (EPP(Air)).

Potential Impacts & Mitigation Measures

The EIS should examine the effects of adverse meteorological conditions (e.g. inversions) and mixing heights on air quality. The potential for interaction between the emissions from the coal gasification and power generation components and other emissions in the air shed, and the likely environmental harm from any such interaction, should also be detailed.

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

The assessment of the Project's impact on air quality should consider the following matters:

- The extent to which NO_x and volatile hydrocarbon emissions from the Project and existing emission sources within the region will contribute to the generation of photochemical smog.

- The extent to which SO_x emissions from the Project and existing emission sources within the region will contribute to the generation of acid rain or acidification of other atmospheric condensation, such as dew.
- The human health risk associated with emissions from the Project, including the potential for CO_2, trace gases or impurity leakage for both normal operation and contingency events.
- The likely behaviour of CO_2 should it leak from the geosequestration area with reference to the prevailing atmospheric and meteorological conditions in the area.
- The potential impact of leakage of CO_2, trace gases or impurities from the Project elements on air quality and methods to mitigate these impacts.
- Potential impacts of flue or vent gases being released from the Project's operations.
- The potential for odour impacts and an assessment of the overall odour nuisance potential.
- The potential for the Project to generate a dust nuisance during and after construction.
- Records of any complaints made in the areas regarding air quality.
- Features of the Project designed to suppress or minimise emissions, including dusts and odours.
- Air quality aspects for forecast emissions derived from other similar projects.
- 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.
- Air quality monitoring program within the Project areas and at sensitive receptors.

Where there is no single atmospheric dispersion model that is able to handle the different atmospheric dispersion characteristics exhibited in the Project areas (e.g. 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 dispersion models used for calculating ground level concentrations and a sensitivity analysis of each model to variations in the input parameters should be discussed.

Air quality predictions should be compared to the relevant goals in the *National Environmental Protection Council (Ambient Air Quality) Measure*, the National Health and Medical Research Council and the EPP (Air) goals.

Greenhouse Gas Emissions

Greenhouse gas emissions should be described in the context of relevant protocols and agreements including:

- An inventory of projected future emissions, both on-site and off-site, attributable to the Project, expressed as total mass CO_2 equivalents per annum and, if possible, as a percentage of Queensland's and Australia's annual greenhouse gas emissions.
- The intended measures to avoid, minimise or offset greenhouse emissions.
- An analysis of comparable technologies, processes and equipment to demonstrate the degree to which the selected option minimises emissions.

3.6 Noise & 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. Long-term measured background noise levels should take into account seasonal and meteorological variations. The results of any baseline monitoring of noise and vibration in the proposed vicinity of the proposal should be described.

Sufficient data should be gathered to provide a baseline for later studies. The daily variation of background 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. Monitoring methods should adhere to relevant EPA Guidelines and Australian Standards, and any relevant requirements of the *Environmental Protection (Noise) Policy 1997* (EPP (Noise)).

Comment 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.).

Potential Impacts & Mitigation Measures

Information, including mapped noise contours from a suitable acoustic model for the coal gasification and power generation components, major compressor units and CO_2 injection wells, should be submitted on the proposed generation of noise. This section should include an analysis of the following noise and vibration impacts:

- 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 boundaries of the sites of the Project and at the boundaries of existing and future 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 all 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.
- This should also include environmental harm on terrestrial animals and avifauna, particularly migratory species.
- Proposals to minimise or eliminate these effects, including details of any screening, lining, enclosing or bunding of facilities, or timing schedules for construction and operations that would minimise environmental harm and environmental nuisance from noise.
- Off-site transport noise and vibration factors due to road and rail should be described and include a discussion on existing speed zones, scheduled transport movements and industry.
- Assessment should be made of the potential emission of low-frequency noise (noise with components below 200Hz) from major items or plant or equipment and, if necessary, measures should be described for reducing the intensity of these components.

3.7 Waste

3.7.1 Waste Generation

This section should provide technical details of waste generation, treatment, minimisation and management, with proposed emission, discharge and disposal criteria. All 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 (for the coal gasification and power generation components identify locations of waste generation points on the site layout plan). An inventory should be provided of all solid and liquid (including wastewater and sewage) wastes generated by each stage of the Project through construction, operation and decommissioning stages, including the characteristics and expected generation rates of each waste.
- Collection, handling and fate of all wastes including storage (for the coal gasification and power generation components show on site layout plan).
- The separation of wastewater from solid waste.
- On-site treatment methods proposed for the wastes.
- Methods of disposal (including the need to transport wastes off-site for disposal) proposed to be used for any trade wastes, liquid wastes and solid wastes.
- Proposed disposal criteria for liquid and solid wastes.
- Methods to prevent seepage and contamination of groundwater from waste stockpiles.
- Market demand for recyclable waste (where appropriate).
- Opportunities for waste avoidance and minimisation techniques.
- Where solid or liquid wastes are to be disposed of off-site the following details should be provided:

    - The name and location of the facility to which each waste will be sent for disposal.
    - Confirmation from each facility that it will accept the type, concentration and quantity of the nominated wastes.
    - An assessment that the proposed facilities are capable of accepting this waste without creating an adverse environmental impact.
    - Details that the transport of the wastes from the Project site to the disposal facility will comply with all requirements of the relevant acts governing the transport of hazardous wastes.

3.7.2 Waste Management

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, reusing or recycling wastes, or treating 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.
- Details on natural resource use efficiency (e.g. energy and water), integrated processing design and by-product reuse as shown in a material/energy flow analysis should be presented.
- Waste minimisation and treatment, and the application of cleaner production techniques, should also be applied to gaseous wastes, particularly NO_x, SOx, CO_2 and particulates. Particular attention should be paid to measures that will maximise energy efficiency and minimise internal energy consumption in the proposal.
- Cleaner production waste management planning should be detailed, especially as to how these concepts have been applied to preventing or minimising environmental impacts at each stage of the Project.

- 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). Where no-release water systems are to be used, measures to minimise any accidental release or the likelihood of such a release should be described and the fate of salts and particulates in released water should be discussed. 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 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 all potential receiving waters, particularly effects on the downstream environment of stormwater releases.

3.8 Transport

3.8.1 Transport Methods and Routes

The EIS should detail all requirements for the transport of plant, equipment, raw materials, product, wastes and personnel during the construction, operation and decommissioning phases of the Project. The description should address the use of existing facilities and all requirements for the construction, upgrading or relocation of any transport related infrastructure. This information should cover all transportation modes (i.e. road, rail and shipping) required for all aspects of the Project and include:

- The types, quantities, origin and destination of goods to be moved including construction materials, plant, raw materials, wastes and hazardous materials.
- The volume of traffic generated by workforce personnel and service vehicles.
- Methods of movement, including transportation type and volume of transport modes likely to be used.
- The proposed transport routes.
- Anticipated times at which each type of transportation movements may occur.
- The effect of rail freight demands on rail infrastructure.
- Details of vehicle traffic and transport of heavy and oversize indivisible loads (including types and composition).
- Proposed road closures (temporary or permanent).
- The ability of existing transport infrastructure to support the additional demand.
- Any requirements for new transport facilities, upgrades (e.g. new access requirements) and increased maintenance.

The detail should include the need and extent of port facilities required for the Project. Specific shipping requirements should include expected berth duration, the wharf facilities and any issues associated with ship movements within the port.

This section should describe existing infrastructure facilities within and adjacent to the Project area. The location and owner/custodians of all tenures, reserves, roads and road reserves, railways and rail reserves, stock routes easements and the like, covering the affected land should be shown. The locations and descriptions of all existing roads and railways likely to be affected by Project activities should be provided.

Potential Impacts & Mitigation Measures

Assessment of the Project impacts on transport infrastructure and operations for all components of the Project should be discussed, with reference to the *Transport Infrastructure Act 1994,* the *Transport Planning and Coordination Act 1994,* the *Transport Operations (Road Use Management) Act 1995* and related legislation.

The EIS should outline procedures for assessing and agreeing on the scope of required mitigation works with the transport corridor manager.

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 to ascertain its effect on transport safety and efficiency requirements.

The Proponent should fully assess all transport-related impacts of the Project including sea, rail, road and air, such as:

- During the construction phase, especially in or near existing and any planned public road or rail reserves.
- Road/rail/air safety issues, for example, ensuring safe access to 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.
- Environmental issues relating to transport (e.g. weed management, vegetation clearing in road/rail reserves, dust control and erosion protection).
- The effects of increased resource usage such as gravel and water on long-term maintenance by the road corridor manager.

The EIS should provide details about:

- 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.
- 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.
- Requirements for the construction, upgrading or relocation of any transport-related infrastructure, such as the need for increased road maintenance.
- Proposed traffic management arrangements and plans, especially within rural residential areas.
- Steps to be taken to prevent access from public roads/rail corridors to the pipeline RoW.
- Access requirements to the public road/rail reserves to allow pipeline maintenance.
- Environmental issues relating to transport (e.g. weed management, vegetation clearing in road reserves, dust control and erosion protection) and ways to ameliorate any adverse impacts.

Findings of studies and transport infrastructure impact assessments should be an input into preparing a transport-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. Reference should be made to any relationship between required Project road works/ maintenance and works proposed in the current Road Implementation Program of Queensland DMR.

The EIS should 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.

This section should address how transport elements and impacts of the Project, taking into account future demand growth, relate to Queensland Transport's and the DMRs' 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 the planning schemes of the relevant local governments.

Detail on product spill management for transport infrastructure should be addressed in other relevant sections of the EIS.

3.9 Cultural Heritage

Description of Environmental Values

The EIS should describe the existing cultural heritage values that may be affected by the Project activities.

A cultural heritage study should be undertaken to describe Indigenous and non-Indigenous cultural heritage sites and places and their values. The Indigenous component of the study must be conducted by the appropriate Aboriginal Party and/or an appropriately qualified cultural heritage practitioner, in accordance with the *Aboriginal Cultural Heritage Act 2003* (ACH Act). Non-indigenous cultural heritage is administered under the *Queensland Heritage Act 1992*.

The study should include:

- Consultation with:
    - The DEH concerning the Register of the National Estate, Commonwealth Heritage list and National Heritage list.
    - The 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 relating to the affected areas.
- Findings of consultation with various agencies should be presented.
- Liaison with representatives of relevant Indigenous communities, in accordance with the requirements of the ACH Act, concerning:
    - Places of significance (including archaeological sites, natural sites, story sites etc.) and appropriate involvement in field surveys.
    - Any requirements by communities and/or informants relating to selection of consultants and confidentiality or site data. Non-indigenous communities may also have relevant information.
    - Significance assessment of any cultural heritage sites/places located.

- Liaison with relevant community groups/organisations (e.g. local historical societies) concerning:

  - Places of non-indigenous cultural heritage significance.
  - Opinion regarding significance of any cultural heritage places located or identified.

- Location of culturally significant sites, subject to any confidentiality specified by Indigenous communities, likely to be impacted by construction activities including:

  - Stone artefact scatters.
  - Culturally significant vegetation.
  - Buildings or places of archaeological significance.
  - Archaeological site, natural sites, story sites etc.

- When examining tenure, the location of historical mining areas should be shown on maps. This may be used to identify former mining zones or historical workings where slumping of the pipeline or other problems might occur in the future.
- A report of work done which includes background research, relevant environmental data and methodology, as well as results of field surveys, significance assessment and conclusions and management recommendations (having due regard for any confidentiality requirements specified by community representatives).

As a minimum, 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* and cultural heritage requirements of the EPBC Act to protect areas and objects of cultural heritage significance.

Potential Impacts & Mitigation Measures

Every attempt should be made by the Project to avoid any significant heritage areas. The Proponent should provide an assessment of any 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.
- Recommended means of mitigating any negative impact on cultural heritage values and enhancing any positive impacts.

The management of cultural heritage impacts should be detailed in a Cultural Heritage Management Plan (CHMP) that is developed specifically for the Project. The CHMP should provide a process for the management of identified cultural heritage places and values within the Project area. The CHMP should be based on information contained in the cultural heritage study reports and/or information from Indigenous community/communities. The CHMP should address and include the following:

- A process for including Indigenous communities associated with the development areas in protection and management of Indigenous cultural heritage.
- Processes for mitigation, management and protection of identified cultural heritage places and material 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 conflict resolution process.

The development of the CHMP should be negotiated with all relevant stakeholder representatives, subject to any confidentiality specified by Indigenous communities and registered native title applicants.

As a minimum, impact assessment, protection and management strategies should satisfy statutory responsibilities and duties of care, including those under the Queensland *Heritage Act 1992*, the ACH Act, and the Australian *Aboriginal and Torres Strait Islander Heritage Protection Act 1984* and cultural heritage requirements of the EPBC Act.

3.10 Social and Economic Environment

Description of Environmental Values

This section should detail the existing social and economic environment. Issues to be addressed include:

- Key characteristics of potentially affected communities in the Project area.
- Community profiles, providing information on the following characteristics:

    - Rural properties, farms, 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.
    - 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 of rental accommodation, including assessment of seasonal fluctuations.
    - Typical rents for the area.
    - The availability and typical cost of housing for purchase in the area.
    - The level of, and demand for, social housing in the area.
    - Constraints and opportunities for new housing construction in the area, including the capacity of the local land development and housing construction industries to provide new housing.
    - Land for residential purposes including available serviced residential lots, land under development and undeveloped broad acre land that is appropriately zoned.

- Existing economic environment that may be affected by the proposal. The character and basis of the local and regional economies should be described including:

    - Economic opportunities, including existing economic base and economic activity, potential economic opportunities, and current local and regional economic trends.
    - Types and numbers of businesses.
    - Availability and prices of goods and services.
    - Historical descriptions of large scale industrial developments and their effects in the region.

Potential Impacts & Mitigation Measures

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 all expected impacts should be outlined.

Attention should be paid to:

- Impacts on demographic, social, cultural and economic profiles.
- Impacts on local residents, current land uses, existing lifestyles, enterprises and values.
- Impacts on affected and adjoining landowners/occupiers resulting from the Project (e.g. land values).
- Impacts on local and state labour markets, with regard to the source of the workforce and competing projects, with the information presented according to occupational groupings of the workforce.
- Impacts of both the construction and operation workforces and associated contractors on housing demand, community infrastructure and services and community cohesion, including health care services, education facilities and the rental market.

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 access to existing human and commercial services and housing.
- The ability to participate in regional and local employment and training opportunities.
- The new Project workforce and their families.
- Strategies to foster cross-cultural awareness for the Project and its participants.

For identified impacts on social values, proposed mitigation and enhancement strategies should be described, and approaches to facilitate initial negotiations towards community acceptance of these strategies identified. Practical monitoring regimes should also be discussed.

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.

The EIS should include strategies responding to Government Policy relating to:

- The level of training provided for construction contracts on Queensland Government building and construction contracts - The State Government Building and Construction Contracts Structured Training Policy (the 10% Policy).
- Indigenous employment opportunities - Indigenous Employment Policy for Queensland Government Building and Civil Construction Projects (the 20% Policy).
- The use of locally sourced goods and services – Department of State Development, Local Industry Policy.

The Proponent should demonstrate commitment to utilising local contractors and employees in the design, mobilisation, construction and operation stages of the Project.

An economic analysis should be presented from national, state, regional and local perspectives as appropriate to the scale of the Project. The general economic benefits from the Project should be described. The analysis should include:

- The relative significance of this proposal in the local and regional economic context.

- 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 all levels of government.
- Implications for future development in the locality (including constraints on surrounding land uses and existing industry).
- The distributional effects of the Project, including proposals to mitigate any negative impact on disadvantaged groups.
- The extent to which local and other Australian goods and services will be used.

3.11 Hazard and Risk

3.11.1 Hazard Analysis

This section of the EIS should describe the potential hazards and risks that may be associated with the Project. A preliminary hazard analysis should be conducted for the Project in accordance with the *Hazardous Industry Planning Advisory Paper No. 8 – 'HAZOP Guidelines" NSW Department Urban Affairs and Planning* or a similar standard and should take into account *State Planning Policy 1/03 Mitigating the Adverse Impacts of Flood, Bushfire and Landslide* (SPP1/03). The preliminary hazard analysis should incorporate:

- Possible frequency of potential hazards, accidents, spillages and abnormal events occurring during all stages of the Project.
- Potential for release of gaseous materials (e.g. CO_2, hydrogen).
- Indication of cumulative risk levels to surrounding land uses.
- Identification of dangerous goods (as classified in the *Dangerous Goods Safety Management Act 2001* and *Dangerous Goods Safety Management Regulation 2001*) to be used, stored, processed or produced and the rate of usage.
- The location and nature of sensitive sites including, but not limited to, residences and schools, within the surrounding 10 kilometre radius.
- Impacts of natural events such as cyclones, earthquakes, bushfires or local flooding.
- Potential for limnic eruption of CO_2 and trace gases from any water bodies present in the geosequestration area.
- Potential wildlife hazards such as snakes and disease vectors, particularly in reference to the pipeline element of the Project.
- An overview of the objectives and management principles to be adopted for the preparation of a detailed emergency plan (including emergency response and recovery/cleanup procedures) in consultation with the relevant emergency services.

Details should be provided of any impacts of the Project during construction and operation on the health, safety and quality of life of the community, workforce, suppliers and other stakeholders from factors such as air emissions, odour, dust, pests, traffic noise and vibration, waste and water. This includes health and safety matters associated with on-site and off-site workforce accommodation. It should include details of:

- Compliance with relevant Health and Safety legislation.
- Security arrangements.
- Details of on-site emergency response capabilities (e.g. on-site paramedic or first-aid officer), for both the construction and operation phases of the Project, which should include personnel trained for fire suppression and containment, rescue and first aid.

3.11.2 Risk Assessment

The EIS should deal comprehensively with on-site and off-site risks. External risks to the Project should also be considered including risks from natural hazards as determined on the basis of *AS/NZ Risk Management Standard 4360:1999*. Studies should address risks to all phases of the Project (i.e. construction, operation and decommissioning).

The Proponent should carry out a risk assessment in accordance with relevant standards (e.g. *AS 2885 Gas and Liquid Petroleum Pipelines*) and guidelines of the responsible authority as appropriate.

An on-site Occupational Health and Safety Risk Assessment for the coal gasification and power generation components should be completed. Risk contours should be presented on a suitably scaled location map. The risk analysis is to address the potential impacts that may occur on the normal on-site day-to-day activities during the construction of the facilities. Furthermore, the Proponent must determine the level of change that may result on the risk contours of other industrial facilities in the areas as a result of the proposed Project. The risk contours are to be prepared in accordance with the protocol used in *Industrial/Residential Interface Buffer Arrangements, Wynnum (Peter J Turnbull Pty Ltd & UniQuest Ltd, April 1999*).

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. A set of representative incident scenarios should be selected. This set should initially include worst case scenarios (e.g. a catastrophic failure of a storage vessel or processing unit).

The acceptability of the risk 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.

Safety management strategies and control measures to be used to minimise the risks of incidents on and off-site and to minimise the consequences of any incident under known operating conditions should be included in the EIS. This information should include:

- The prevention and handling of fires on Project sites.
- 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, including details of the design, volume and capacity of any retention ponds, process tanks, waste holding tanks or bunded areas.
- The application of safety distances to the various activities on Project sites to minimise consequences of incident.
- Quality control of products and raw materials on Project sites, including handling of non-conforming material.
- Maintenance of critical items of equipment.
- The training of operatives.
- Emergency procedures, including evacuation procedures where necessary.
- Monitoring equipment/programs particularly with reference to CO_2 injection sites.
- The risk assessment conclusions reached and the level of off-site risk from the proposed developments.

An assessment should be made of any areas where mosquitos may breed (e.g. areas with poor drainage or 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

Overview of the design and operation of proposed safety systems, including fire prevention and protection, leak detection and minimisation, and emergency shutdown systems and procedures, should be presented. The contingency procedures to respond to an emergency, equipment failure, CO_2 leak or other malfunction that results in the release of contaminants should be discussed.

The emergency plans should address:

- Contingency plan to deal with gas leaks (e.g. CO_2, hydrogen).
- Contingency plans to account for natural disasters such as storms, floods, and fires during construction, operation and maintenance phases.
- Overview of the emergency planning and response procedure that have been determined in consultation with State and regional emergency service providers.

In regard to fires, the EIS should address:

- 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 (if any) who will be tasked with emergency management activities.
- Detailed maps of the coal gasification and power generation components, compressor and geosequestration sites showing the plant outline, hazardous material store, incident control points, fire fighting equipment, etc.
- Details of any dangerous goods stores associated with the coal gasification and power generation components operations, compressor station or geosequestration site, including fuel storage and emergency response plans.

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* and the draft EPA Guideline: *Preparing an Environmental Management Plan for Level 1 Petroleum Activities*. Separate EMPs should individually address the discrete Project elements such as the plant, transmission pipeline corridor and injection sites. 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.
- Appropriate corrective actions, should an undesirable impact or unforeseen level of impact occur.

The aims of an EMP are to provide:

- Commitments by the Proponent 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 the Proponent with a common focus for approvals conditions and compliance with policies and conditions.
- 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).

An EMP should commit to manage, enhance or protect identified environmental values. The commitments should contain the following components for performance criteria and implementation strategies:

- Environmental protection objectives for enhancing or protecting each relevant value.
- Indicators to be measured to demonstrate the extent to which the environmental protection objective is achieved.
- Environmental protection standards (a numerical target or value for the indicator), which define the achievement of the objective.
- An action program to ensure the environmental protection commitments are achieved and implemented. This will include strategies in relation to:

    - Continuous improvement.
    - Environmental auditing.
    - Monitoring.
    - Reporting.
    - Staff training.
    - A decommissioning program for land proposed to be disturbed under each relevant aspect of the proposal.

5. Conclusions 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

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

7.2 Development Approvals

A list of the development approvals required by the Project should be provided.

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

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

7.4 Study Team

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

7.5 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 may include:

- Geology.
- Soil survey and land suitability studies.
- Land use and land capability studies.

- Waterway hydrology and groundwater.
- Flora and fauna studies, including the subregional analysis of representativeness and adequacy of protection for the terrestrial/riparian vegetation communities and their component flora and fauna taxa within the affected areas.
- An integrated assessment of relative biodiversity/conservation values, based on the methodology outlined in Biodiversity Assessment and Mapping Methodology (EPA 2002".
- Air pollution, noise and vibration.
- Transport and traffic studies.
- Housing and accommodation studies.
- Economic studies and/or cost-benefit analyses.
- Hazard and risk studies.

7.6 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.

Attachment 1: The Objects of the *Environment Protection and Biodiversity Conservation Act 1999*

Objects of the Act

(a) To provide for the protection of the environment, especially those aspects of the environment that are matters of national environmental significance;

(b) To promote ecologically sustainable development through the conservation and ecologically sustainable use of natural resources;

(c) To promote the conservation of biodiversity;

(d) To promote a co-operative approach to the protection and management of the environment involving governments, the community, land-holders and indigenous peoples;

(e) To assist in the co-operative implementation of Australia's international environmental responsibilities;

(f) To recognise the role of indigenous people in the conservation and ecologically sustainable use of Australia's biodiversity; and

(g) To promote the use of indigenous peoples' knowledge of biodiversity with the involvement of, and in co-operation with, the owners of the knowledge.

Principles of Ecologically Sustainable Development

The following principles are principles of ecologically sustainable development:

(a) Decision-making processes should effectively integrate both long-term and short-term economic, environmental, social and equitable considerations;

(b) If there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation;

(c) The principle of inter-generational equity – that the present generation should ensure that the health , diversity and productivity of the environment is maintained or enhanced for the benefit of future generations;

(d) The conservation of biological diversity and ecological integrity should be a fundamental consideration in decision-making; and

(e) Improved valuation, pricing and incentive mechanisms should be promoted.

Attachment 2: Matters that must be addressed in an EIS (Schedule 4 of the *EPBC Act Regulations 2000*)

1. General Information

The background of the action including:

(a) The title of the action;

(b) The full name and postal address of the designated proponent;

(c) A clear outline of the objective of the action;

(d) The location of the action;

(e) The background to the development of the action;

(f) How the action relates to any other actions (of which the proponent should reasonably be aware) that have been, or are being, taken or that have been approved in the region affected by the action;

(g) The current status of the action; and

(h) The consequences of not proceeding with the action.

2. Description

A description of the action, including:

(a) All the components of the action;

(b) The precise location of any works to be undertaken, structures to be built or elements of the action that may have relevant impacts;

(c) How the works are to be undertaken and design parameters for those aspects of the structures or elements of the action that may have relevant impacts;

(d) Relevant impacts of the action;

(e) Proposed safeguards and mitigation measures to deal with relevant impacts of the action;

(f) Any other requirements for approval or conditions that apply, or that the proponent reasonably believes are likely to apply, to the proposed action;

(g) To the extent reasonably practicable, any feasible alternatives to the action, including:

(h) If relevant, the alternative of taking no action;

(i) A comparative description of the impacts of each alternative on the matters protected by the controlling provisions for the action;

(j) Sufficient detail to make clear why any alternative is preferred to another;

(k) Any consultation about the action, including:

(l) Any consultation that has already taken place;

(m) Proposed consultation about relevant impacts of the action;

(n) If there has been consultation about the proposed action — any documented response to, or result of, the consultation; and

(o) Identification of affected parties, including a statement mentioning any communities that may be affected and describing their views.

3. Relevant Impacts

Information given under paragraph 2(d) must include:

(a) A description of the relevant impacts of the action;

(b) A detailed assessment of the nature and extent of the likely short term and long term relevant impacts;

(c) A statement whether any relevant impacts are likely to be unknown, unpredictable or irreversible;

(d) Analysis of the significance of the relevant impacts; and

(e) Any technical data and other information used or needed to make a detailed assessment of the relevant impacts.

4. Proposed Safeguards and Mitigation Measures

Information given under paragraph 2(e) must include:

(a) A description, and an assessment of the expected or predicted effectiveness of, the mitigation measures;

(b) Any statutory or policy basis for the mitigation measures;

(c) The cost of the mitigation measures;

(d) An outline of an environmental management plan that sets out the framework for continuing management, mitigation and monitoring programs for the relevant impacts of the action, including any provisions for independent environmental auditing;

(e) The name of the agency responsible for endorsing or approving each mitigation measure or monitoring program; and

(f) A consolidated list of mitigation measures proposed to be undertaken to prevent, minimise or compensate for the relevant impacts of the action, including mitigation measures proposed to be taken by State governments, local governments or the proponent.

5. Other Approvals and Conditions

Information given under paragraph 2(f) must include:

(a) Details of any local or State government planning scheme, or plan or policy under any local or State government planning system that deals with the proposed action, including:

(b) What environmental assessment of the proposed action has been, or is being, carried out under the scheme, plan or policy;

(c) How the scheme provides for the prevention, minimisation and management of any relevant impacts;

(d) A description of any approval that has been obtained from a State, Territory or Australian Government agency or authority (other than an approval under the Act), including any conditions that apply to the action;

(e) A statement identifying any additional approval that is required; and

(f) A description of the monitoring, enforcement and review procedures that apply, or are proposed to apply, to the action.

6. Environmental Record of Person Proposing to Take the Action

(a) Details of any proceedings under an Australian, State or Territory law for the protection of the environment or the conservation and sustainable use of natural resources against:

(b) The person proposing to take the action; and

(c) For an action for which a person has applied for a permit, the person making the application.

(d) If the person proposing to take the action is a corporation — details of the corporation's environmental policy and planning framework.

7. Information Sources

For information given, the EIS must state:

(a) The source of the information;

(b) How recent the information is;

(c) How the reliability of the information was tested; and

(d) What uncertainties (if any) are in the information.