Santos GLNG Gas Field Development Project –Initial Advice Statement

November 2012

Santos Limited

Santos
GLNG Project

GLNG is a Santos PETRONAS Total KOGAS project.

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Santos GLNG Project

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Executive summary

This Initial Advice Statement (IAS) has been prepared for the Santos Gladstone Liquefied Natural Gas (GLNG) Gas Field Development Project, hereinafter referred to as the Project, which complements the existing and previously approved GLNG Project. The proponent, Santos Limited, herein referred to as Santos GLNG, is undertaking the development of the Project on behalf of the same Joint Venture (JV) arrangement between the international petroleum and gas corporations of the GLNG Project, namely Santos, Petroliam Nasional Berhad (PETRONAS), Total and Korean Gas Corporation (KOGAS).

This IAS has been drafted to provide the Queensland Coordinator-General with enough information to make a determination under the *State Development and Public Works Organisation Act 1971* (Qld) (SDPWO Act), about whether to declare the Project to be a 'significant project'. The proponent believes that the Project is suitable to be declared due to the significant employment opportunities and the strategic value of the Project to contribute further towards Queensland growing coal seam gas (CSG) industry – an industry of increasing importance in Queensland for employment, economic growth and future government revenue. Other attributes of the Project, such as the complexity of the assessment to be undertaken and approvals required from local, State and Commonwealth authorities, also indicate the suitability for project declaration under the SDPWO Act. The Project represents a significant multi-billion dollar level of investment over the life of the Project.

The Project will provide for additional CSG production within the GLNG Project area as well as additional fields to provide supplementary gas supply for the LNG processing and export facility on Curtis Island, or to third parties including domestic and/or export customers (herein referred to as 'Third Parties'). The development of these gas fields will complement existing Santos GLNG gas field developments across the Surat and Bowen Basins, and is likely to take advantage of synergies and opportunities to share infrastructure with the GLNG Project. The Project is strategically important as the next stage in the GLNG Project. The Project may also involve sourcing of gas from third-party suppliers, and the sharing or co-location of gas field and associated infrastructure and/or facilities with those of third-parties.

Future gas field development across the GLNG tenures was envisaged in the original GLNG Environmental Impact Statement (EIS). This Santos GLNG Gas Field Development Project will involve further development of CSG reserves within the Approved Development Area of the GLNG Project comprising the Arcadia, Fairview and Roma gas fields, as well as the development of additional tenements within a portion of an area that was identified as the 'Future Development Area' within the original GLNG EIS (Santos, 2009a).

The Project has been referred to the Commonwealth Minister for SEWPaC in anticipation that the proposal will be deemed a 'controlled action', under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). If determined to be a controlled action, Santos GLNG will seek assessment of the Project in accordance with the Bilateral Agreement between the Australian Government and the State of Queensland as a Class 2 Action, to be assessed under Part 4 of the SDPWO Act and the *State Development and Public Works Organisation Regulation 1999* (SDPWO Regulation). The added complexity of requiring Commonwealth, as well as State approvals, would best be administered through the Coordinator-General's EIS assessment process.

Santos GLNG proposes to progressively develop CSG production wells and associated facilities across a total of 35 petroleum tenures covering approximately 11,190 square kilometres (km^2), and additional supporting infrastructure such as pipelines and powerlines between these tenements. The tenements are located across four local government areas including Maranoa, Western Downs, Banana and Central Highlands, in the vicinity of the townships of Roma, Surat, Wallumbilla, Miles, Taroom, Wandoan, Injune and Rolleston.

Typical development activities across the Project area will include drilling and completion of production, monitoring and underground gas storage injection wells; construction of facilities that include gas compression and treatment, water management, power supply and generation infrastructure; installation of associated gas and water gathering and transmission pipelines, and distribution powerlines (underground and/or aboveground); together with the construction of requisite support infrastructure such as access roads, accommodation facilities, communications and maintenance facilities.

The number, size and location of these components of the Project have yet to be determined. This will be influenced by the location, size and quality of the currently defined and future CSG resources that will be identified within the Project area through ongoing exploration and appraisal activities. The timing of the field developments will also be determined by the timing and nature of the appraisal results as well as the proximity to, and synergies with, existing and planned facilities previously approved for the GLNG Project, and the availability of third-party gas and/or infrastructure, where such arrangements are required.

There are a range of environmental and social values potentially impacted by the Project. This IAS describes the significant environmental and social values of the Project area (Section5), along with potential impacts to these values that may result from project implementation (Section 6) and the high-level environmental management and mitigation measures likely to be implemented (Section 7).

1 Introduction

Santos GLNG proposes to develop the GLNG Gas Field Development Project (herein referred to as 'the Project') and is seeking to have the Project declared a 'significant project' under the Queensland *State Development and Public Works Organisation Act 1971* (SDPWO Act).

1.1 Background

The Project involves the further development of the coal seam gas (CSG) fields in the Surat and Bowen basins in support of the authorised Santos Gladstone Liquefied Natural Gas Project (herein referred to as 'the GLNG Project'). The Project may also supply gas to third parties including domestic and export customers (herein referred to 'Third Parties').

1.1.1 Relationship to the Authorised GLNG Project

The Santos GLNG Project is one of Australia's major CSG to LNG projects involving the development of an LNG Facility in Gladstone, a 420 km high pressure gas transmission pipeline to transport gas from the CSG fields to the LNG Facility, a total of 2,650 production wells across 6,900 square kilometres of gas fields, and all associated and supporting infrastructure.

The GLNG Project was the subject of an earlier EIS (the GLNG EIS; Santos, 2009). On 28 May 2010, the GLNG Project became the first major CSG to LNG project to receive environmental approval from the Queensland Coordinator-General. Australian government approval of the Project followed in October 2010. The project components that formed the basis of the original GLNG EIS and which are already authorised and under implementation are illustrated on Figure 1.1 to provide context to the GLNG Gas Field Development Project.

Future gas field development across the GLNG tenures was envisaged in the original GLNG EIS (Santos, 2009). This Santos GLNG Gas Field Development Project will involve further development of CSG reserves within the Approved Development Area of the GLNG Project comprising the Arcadia, Fairview and Roma gas fields, as well as the development of additional tenements within a portion of an area that was identified as the 'Future Development Area' within the original GLNG EIS (Santos, 2009). The Approved Development Area and the Future Development Area are illustrated on Figure 1.1.

The Coordinator-General's evaluation report for an EIS (May 2010) states that 'such future gas fields will require their own approvals process including an EIS.' The development of the Project tenements will complement existing Santos GLNG gas field developments across the Surat and Bowen Basins. The Gas Field Development Project does not involve any additions or changes to the LNG storage or processing capacity at Curtis Island and will continue to use the same high-pressure transmission pipeline to transport gas to Gladstone, as well as to other transmission pipelines where required.

Gas Field Development Project activities, which are expected to be largely the same as those currently under implementation in the GLNG Approved Development Area, will be progressively undertaken over 20+ year gas field life. The 35 petroleum tenements comprising the Project area are illustrated on Figure 1.2, along with the area where potential supporting infrastructure such as gas pipelines, communications and powerlines or other supporting infrastructure may be installed. A more detailed description of the Project is provided in Section 3.

148°
149°
150°
151°
-24°
-25°
-26°
-27°
Emerald
Blackwater
Capricorn Highway
Gregory Highway
Rolleston
Dawson Highway
Carnarvon Highway
Injune
Taroom
Leichhardt Highway
Wandoan
Mitchell
Warrego Highway
Roma
Wallumbilla
Miles
Gladstone
Approved LNG Facilty
Town
Major Road
Approved Gas Transmission Pipeline
Approved LNG Facility
GLNG Gas Fields
GLNG Future Development Area
GLNG Approved Devlopment Area
Key Map
Brisbane
INDICATIVE
GDA
N
W
E
S
20 0 20 40 km
Date: October 2012 File No. GLNG 385d
Notes/Disclaimers:

Santos GLNG
Gas Field Development Project

Figure 1.1
GLNG Project Overview

Santos
GLNG Project

149°
150°
-24°
-25°
-26°
-27°

Gregory Highway
Rolleston
Carnarvon Highway
Dawson Highway
Leichhardt Highway
Warrego Highway
Roma
Wallumbilla
Miles
Taroom
Injune
Wandoan
Gladstone
Brisbane

ATP 804P
ATP 745P
ATP 745P
ATP 526P
ATP 526P
PL 235
PL 236
ATP 526P
ATP 526P
ATP 653P
PL 233
PL 234
ATP 526P
PL 90
PL 91
PL 232
PL 92
PL 99
PL 100
ATP 803P
ATP 655P
ATP 655P
PL 176
ATP 868P
ATP 708P
PL 309
PL 13
PL 314
PL 310
PL 3
PL 93
ATP 631P
PL 315
ATP 631P
PL 6
PL 7
PL 8
ATP 665P
PL 9
PL 10
PL 11
ATP 665P
ATP 336P R
ATP 336P R

Key Map

Town
Major Road
Santos GLNG Gas Field Development Project Tenements
Possible Supporting Infrastructure Area

INDICATIVE

GDA

N
W
E
S

20 0 20 40 km

Date: October 2012 File No. GLNG 385a - Rev.1

Notes/Disclaimers:

Santos GLNG
Gas Field Development Project

Figure 1.2 - Project Tenements and Possible Supporting Infrastructure Area

Santos
GLNG Project

1.2 Purpose and scope of the initial advice statement

This IAS has been prepared for the Project which complements the existing and previously approved GLNG Project. The purpose of this IAS is to provide the Coordinator-General with sufficient information regarding the Project and its potential environmental, social and economic impacts to determine whether to declare the proposal to be a Significant Project, under the SDPWO Act.

The scope of the Project IAS encompasses a range of aspects associated with the Project and provides information on:

- the proponent
- the purpose and proposed operations
- the costs and benefits
- existing environmental factors
- potential environmental impacts
- any identified measures for environmental management and mitigation.

2 Project proponent

Santos GLNG is undertaking the development of the Project on behalf of the same Joint Venture (JV) arrangement between the international petroleum and gas corporations of the GLNG Project, namely Santos, PETRONAS, Total and KOGAS.

Santos has been in the Australian energy sector since 1954 as an oil and gas exploration and production company and is today one of the country's leading gas producers, supplying Australian and Asian customers.

The company is listed on the Australian Securities Exchange and has approximately 2,800 employees working across its operations in Australia and Asia, as well as three offices in Queensland, namely Brisbane, Gladstone and Roma. As of September 2011, Santos has the largest Australian exploration portfolio by area of any company – 152,360 km², CSG assets in every producing CSG basin, and vast CSG interests in Queensland.

PETRONAS (Petroliam Nasional Berhad) is a Malaysian based oil and gas corporation ranked among FORTUNE Global 500's largest corporations in the world. PETRONAS has extensive experience in LNG and is currently operating the world's largest integrated LNG facility in Bintulu, Sarawak, which has a total capacity of around 24 million tonnes per annum (Mtpa) from eight LNG trains.

Total is the fifth largest publicly-traded integrated international oil and gas company and a world-class chemicals manufacturer. Total operates in more than 130 countries, has over 96,000 employees and is a leading player in the international LNG sector. Total is active in almost all LNG producing regions and main LNG markets.

KOGAS (Korean Gas Corporation) is currently the world's largest LNG importer and operates three LNG import terminals in Korea and a nationwide pipeline network spanning over 3,022 km.

3 The nature of the proposal

3.1 Scope of the Project

As described in Section 1.1.1 the Project comprises the further development of the GLNG gas fields that will supply the existing approved LNG facility in the future, or Third Parties. Project activities, which are expected to be largely the same as those currently implemented for the GLNG Project, will be progressively undertaken over the 20+ year life of the gas fields. The Project area comprises a total of 35 petroleum tenements, over an approximate area of 11,190 km^2 in south eastern Queensland (refer to Figure 1.2).

The key project activities to be assessed in the Project EIS include the development and construction, production and operation, and the decommissioning and rehabilitation of gas field and supporting infrastructure, both on and off petroleum tenements, including:

- production and monitoring wells and associated well lease equipment
- underground gas storage, injection wells and associated well lease equipment
- fixed aboveground gas field facilities, such as gas treatment and compression, and water management facilities (treatment, amendment and/or end-use), including power generation where the site is not connected to the electricity network
- water management infrastructure, such as management ponds, brine and solid salt management and disposal, and end-use infrastructure
- above and below ground linear infrastructure, such as gas and water gathering flowlines and transmission pipelines, access roads, and electricity and communication distribution lines
- supporting infrastructure, such as borrow pits, quarries, stockpile, lay-down and storage areas, and maintenance, warehousing and administration facilities
- accommodation facilities and associated infrastructure, including sewerage treatment.

There may be potential for the Project to utilise infrastructure within either the GLNG Project or alternatively infrastructure supplied by, or shared or co-located with that of, a third party or another LNG proponent. The potential for infrastructure sharing will be investigated within the EIS.

The gas field infrastructure will reflect best practice gas field management and be designed to minimise the environmental footprint and social impact. The ultimate configuration and location of infrastructure will be determined by the location and quality of discovered gas resources and subsequent agreements reached with landholders.

3.2 Land use

The predominant land use of the Project area includes agriculture, cattle grazing, conservation and the ongoing CSG, oil and gas and mining development. There are areas of urban land use located within townships of the region.

3.3 Project need, justification and alternatives considered

3.3.1 Project Need, Justification and Objectives

Global demand for energy continues to rise. Over the next two decades (2008-2035), energy consumption is anticipated to grow by 53 per cent (Energy Information Administration, 2011). Simultaneously, there is, and will be increased pressure to advance more environmentally sustainable energy sources, including less carbon-intensive solutions, such as CSG. National and State energy policies are driven by the need to:

- Grow a diverse economy at different scales (local, regional, State and national levels)
- Move towards cleaner energy solutions and reduce greenhouse gas emissions
- Support domestic industries (including the energy industry) and ensure security of domestic and international supplies.

These objectives support a greater shift towards domestic gas production and consumption, as well as export.

The primary objective of the Project is to continue the commercialisation of Santos GLNG's Queensland CSG resource in a sustainable manner, in support of the existing authorised GLNG Project by through the implementation of up to 6,100 additional production wells. This includes continuing to protect environmental values; managing environmental, health and safety requirements; implementing best environmental practice, and providing employment opportunities in Queensland throughout all phases of the Project.

The main aims of the Project are to:

- enable Santos GLNG to expand its current CSG production fields to maintain gas supply for the GLNG Project and Third Parties
- facilitate the viable commercial development of available Santos GLNG CSG resources within the region
- plan and design to protect the diverse existing environmental values within the Project area
- adequately manage environment, health and safety requirements
- implement best environmental practice
- provide employment opportunities in Queensland throughout all phases of the Project.

3.3.2 Project Alternatives

The extent of the Santos GLNG tenements limits the boundaries of the key components of the Project (Refer to Figure 1.2). The project may also involve off-tenure infrastructure such as pipelines and powerlines to connect gas field activities. The extent of the coal seams within the Project tenements will primarily influence the location of gas field infrastructure. The selection of appropriate sites and routes for Project infrastructure are influenced by a number of factors including:

- location, size and characteristics of the currently defined and future CSG resources that will be identified within the Project area through ongoing exploration and appraisal activities

- avoidance of significant environmental, social and cultural values
- safety and hazard management, planning, engineering, design and construction constraints
- planning or land use constraints, including land access arrangements
- distance considerations
- avoidance of infrastructure conflicts and minimisation of impacts to third party infrastructure
- development costs.

Within the Project tenements technologies and strategies will be investigated to minimise the disturbance footprint and impacts of the Project where possible or practicable such as:

- co-location of infrastructure to reduce the disturbance footprint
- utilising shared infrastructure with the GLNG Project or with third parties, including other LNG proponents
- use of multi-well pads to reduce the development footprint and disturbances
- review of alternative design specifications and construction materials to maximise infrastructure integrity and reliability while enhancing environmental and safety outcomes and ensuring efficiency and cost-effectiveness
- investigation of the potential for remote monitoring to reduce traffic generation.

The Project is an integral part of the GLNG Project, to maintain gas supply to the LNG Facility and/or Third Parties. Not proceeding with an economically, socially and environmentally feasible version of the Project may jeopardise the viability of the GLNG Project in addition to generating uncertainty about the State and Nation's stated commitment to the CSG and LNG industries and the development of less carbon intensive energy resources.

Federal and state legislation and policy requires Australia's resources to be developed expeditiously. As holders of the petroleum tenements, Santos GLNG is obliged to bring the hydrocarbon resources into commercial production as soon as reasonably practicable. The Project represents a significant multi-billion dollar level of investment. The economic benefits resulting from the Project will have national, state and regional dimensions. Refer to Sections 3.9, 6.4 and 9.1 for further information regarding the anticipated economic benefits of the Project. If the Project does not proceed, the economic, social and strategic benefits described in this document will not be realised.

3.3.3 Synergies with the GLNG Project

The development of the Project will benefit from the Santos GLNG organisation, processes, learnings and significant capability and from project infrastructure developed and currently under development in the upstream sector of the broader Santos GLNG Project. The Project developments are expected to gain substantial leverage in the following key areas:

- minimisation of environmental and social impacts via utilisation of existing and ongoing developments in the Fairview, Roma, and Arcadia CSG fields, thereby reducing the need for additional infrastructure, which potentially minimises disturbance and impacts from the proposed development

- minimisation of landholder and broader community impacts through the use of well-established protocols, processes, networks, relationships and experience
- energy efficiency gains, greenhouse gas reductions and waste minimisation through utilisation of existing facilities
- extension and expansion of local industry development potential
- broadening of the scientific and practical knowledge base in the areas of coal seam water management, aquifer monitoring, and cumulative impacts
- implementation of management plans, systems and procedures developed to comply with the GLNG Project approval which have been developed with significant investment over several years since the EIS was prepared (2008/2009) and approved (2010)

To this end, the Santos GLNG Project has established a strong cross-functional and accountable organisational structure, supported by the requisite systems, processes and safeguards to ensure that the GLNG Project activities are well planned and successfully implemented.

3.4 Project to be declared as significant

When considering whether the Project should be declared to be a Significant Project, the Coordinator-General must have regard to one or more of the following points in accordance with sections 27 and 27AB of the SDPWO Act:

- relevant planning schemes or policy frameworks, including those of a relevant Local Government or of the State or the Commonwealth
- the Project's potential effect on relevant infrastructure
- the employment opportunities that will be provided by the Project
- the potential environmental effects of the Project
- the complexity of Local, State and Commonwealth approval requirements for the Project
- the level of investment necessary for the proponent to carry out the Project
- the strategic significance of the Project to the locality, region or the State.

Santos GLNG believes that the Project is suitable to be declared due to the significant employment opportunities and the strategic value of the Project to contribute further towards Queensland growing CSG industry – an industry of increasing importance in Queensland for employment, economic growth and future government revenue. Other attributes of the Project such as the complexity of the assessment to be undertaken and approvals required from local, State and Commonwealth authorities also indicate suitability for declaration.

If determined to be a controlled action, Santos GLNG will seek assessment of the Project in accordance with the Bilateral Agreement between the Australian Government and the State of Queensland as a Class 2 Action, to be assessed under Part 4 of the SDPWO Act and the SDPWO Regulation. This added complexity of requiring Commonwealth, as well as State approvals, would best be administered through the Coordinator-General's EIS assessment process.

There are a range of environmental and social values potentially impacted by the Project. This IAS describes the significant environmental and social values of the Project area (Section 5), along with potential impacts to these values that may result from project implementation (Section 6) and the high-level environmental management and mitigation measures under consideration (Section 7). The Project EIS will investigate these aspects in detail.

3.4.1 Activities excludes from the Project under this application

The Project area is subject to a range of CSG and other activities carried out by the proponent which do not form part of this Project (and are therefore excluded from the Project the subject of this IAS and do not form part of the application to the Coordinator-General for 'significant project' declaration). These activities include, but are not limited to:

- all exploration, appraisal and surveying activities, including associated ancillary and incidental activities, which will be carried out under existing and anticipated tenements and approvals;
- ongoing, authorised GLNG Project activities (which, among a range of other existing and anticipated tenements and approvals, are authorised by an existing EPBC Act approval);
- separate construction, production, operational and decommissioning activities and projects, including associated ancillary and incidental activities, which do not form part of the Project (including, by way of example, authorised production operations on PL10, PL11 and PL176 and authorised projects undertaken by other third parties); and
- any currently anticipated or future necessary changes to each of the activities summarised above, including their approvals and tenements, as required and approved from time to time, which do not form part of Project activities.

The continuation of these activities is essential in order to maintain to supply gas to the GLNG Project and Third Parties.

As discussed above, the Project seeks to achieve synergies and improved environmental outcomes by the use of existing or planned infrastructure which forms part of the existing approved GLNG Project or other separately approved projects.

However, this IAS does not capture or include, to any extent, the use or future development of such infrastructure for the existing approved GLNG Project or other separately approved projects (given continued development, use and/or alteration of such infrastructure is necessary for those projects).

Any future development of, alterations to or extensions to such infrastructure which will be required for the sole purpose of the Project (for example, to provide additional capacity or capabilities) are included as part of this IAS, and will be the subject of environmental impact assessment.

3.5 External infrastructure requirements

The utilisation of external infrastructure such as transportation networks, electricity and communications infrastructure, and water supply, where necessary, will be required for the construction, operation and decommissioning of the Project.

Transportation of materials and components during the Project's construction and operational phases will predominantly be undertaken by road. Rail transportation may be possible, and will be considered in the planning stages. The use of ports will be required for the importation of equipment and construction materials. Generally, access to various sites will be gained from main highways, using existing state roads. Transport of the construction workforce is likely to be mainly fly in/fly out via Roma, Brisbane, Emerald and other regional airports, with accommodation in purpose built accommodation facilities close to work sites and in regional townships for both construction and operational workforce.

The remote nature of the gas fields and absence of significant existing electricity infrastructure has implications for design of infrastructure such as compressor stations. Power for the CSG fields may be generated using CSG production from the Project area, however various alternative energy sources – including potential gas fired power generation, will be investigated during detailed field design. Gas turbines will be typically installed at gas compression and water management facilities if required. Alternatively, if power transmission networks are introduced into the Project area, Santos GLNG would examine options to connect to the grid.

Water supply and storage is needed for multiple components of the Project including for drinking water, construction activities, dust suppression, and operation of the camps and gas compression facilities. CSG projects are net producers of water rather than net consumers, but various water sources are used to meet the Project's demands including coal seam water, trucked water supplies and installation of water bores.

3.6 Project timeframes

Due to commence as early as 2015, the Project will involve progressive development of the CSG resources across the Project area. Typical development activities across the Project area will include drilling and completion of production, monitoring and underground gas storage injection wells; installation construction of facilities that include gas compression and treatment, water management, power supply and generation infrastructure; installation of associated gas and water gathering and transmission pipelines, and distribution powerlines (underground and/or aboveground) distribution systems; together with the construction of requisite support infrastructure such as access roads, accommodation facilities, communications and maintenance facilities.

The number, size and location of these components of the Project have yet to be determined, but will be influenced by the location, size and quality of the currently defined and future gas resources that will be identified within the Project area through ongoing exploration and appraisal activities.

The timing of the field developments will also be determined by the timing and nature of the appraisal results as well as the proximity to, and synergies with, existing and planned facilities previously authorised within the Approved Development Area (as identified in Figure 1.1) and the availability of other third-party gas and/or infrastructure, where such arrangements are required.

3.7 Construction and operational processes

As stated, the Project's development will be progressive across the Project area. A list of typical activities and infrastructure relevant over the life of the Project potentially located both on and off petroleum tenements includes:

- drilling, installation, operation and maintenance of production, monitoring, and potentially underground gas storage injection wells
- installation, operation and maintenance of gas and water pipeline gathering and transmission networks
- construction, operation and maintenance of water management and treatment infrastructure, and associated waste (e.g. brine and solid salt) management and end-use infrastructure
- construction of gas treatment and compression facilities
- various support and ancillary activities, and the installation, operation and maintenance of associated supporting infrastructure including, but not limited, to:
    - installation and operation of workforce accommodation and associated facilities, including sewerage treatment
    - Installation of power supply, including generation facilities and powerlines (overhead and underground)various support and ancillary activities for the installation, operation and maintenance of associated infrastructure including, but not limited, to:
    - access roads
    - borrow pits and quarries
    - lay down, stockpile and storage areas
    - maintenance, workshop, construction-support, warehousing and/or administration facilities, ordinarily co-located with other facilities
- demolition, decommissioning and rehabilitation of infrastructure and disturbed areas.

3.7.1 Production wells

Production wells are drilled to extract water and gas from coal seams. The distance between wells is dependent on factors such as: coal depth, thickness, permeability and technology utilised. They are connected to the gas collection field network by underground gas and water pipelines, which are generally constructed along fence lines and existing tracks. Directional drilling may allow multiple wells to be developed from the one location, where technically viable. The gas is compressed and treated for transport at a central compressor station and delivered to users via a gas transmission pipeline.

The Santos GLNG Project area reserve has been proven, and it has been identified that additional wells are required in this area to realise the full production potential. However, reserve quantities of the additional tenements outside of the GLNG Project area are not all proven, so well spacing is not known at this time. Therefore, in the absence of field development plans, the impact assessment approach consider the

maximum potential number of wells and maximum number of gas treatment and compressor stations and water management facilities across the Project area.

Santos GLNG proposes to drill and complete production wells as field development plans are finalised. The proposed location of each gas well will be dependent on the location, size and characteristics of the currently defined and future CSG resources that will be identified within each of the Project fields through ongoing exploration and production activities. There is some flexibility in the final placement of wells, which can often be located to avoid environmentally sensitive areas.

3.7.2 Associated supporting infrastructure

Infrastructure will be required to support the development of the gas fields, and will be predominantly constructed within the Project tenements, but also potentially within the area identified on Figure 1.2 as the PSI Area including, but not limited to:

- a network of low-pressure gas gathering and high-pressure gas transmission pipelines transporting the gas from the wells to the compressor stations and then onto the LNG facility or to Third Parties
- water gathering and transmission pipeline networks and associated water management ponds and pumping stations, if required
- field compressor stations for gas treatment and compression
- water management facilities and infrastructure, including ponds, treatment or other management equipment and plant, and brine and solid waste (e.g. salt) management and disposal infrastructure, as well as water use/supply infrastructure
- accommodation facilities for construction and operational staff, including sewerage treatment.
- access roads
- communication facilities and electricity supply (including power generation and/or grid connection, and overhead and underground power lines) to the gas fields
- borrow pits and quarries
- water supply infrastructure
- stockpile, laydown and/or storage areas
- workshops, construction yards, warehousing and/or administration facilities, and the like.

An overview of some of these key infrastructure components required for the Project is described below.

3.7.2.1 Gas and water pipeline gathering and transmission networks

Gas gathering pipelines are used to collect the gas from the wells and direct it to compression and treatment facilities. Higher-pressure gas transmission pipelines are used to deliver compressed gas to larger hub compression facilities and/or other gas transmission pipelines for transmission from the gas fields to an LNG facility or to Third Parties.

Gas gathering lines and gas pipelines are buried and typically constructed of high density polyethylene (HDPE) or steel, depending on pressure requirements for the line, although other suitable pipe materials may be investigated during detailed engineering and design.

Water gathering and transmission pipelines collect water from wells around the Project area and transport it to the relevant treatment facility and/or water management option. The water pipelines are typically constructed of HDPE or other suitable material, and are generally buried in the same trench as the gas pipeline, where practicable.

3.7.2.2 Gas treatment, compression and water management facilities

The gas treatment and compressor stations and water management facilities will be located throughout the gas fields as centrally as possible, to minimise the length of the gathering and transmission pipelines and associated pumping requirements. The size and number of gas and water facilities will depend on the nature of the reservoirs, the number of wells and the volume and nature of the gas and coal seam water.

A number of gas compressor stations and facilities that treat and compress the gas for transport, will be located throughout the Project area. These facilities may also include gas treatment to remove impurities from the gas prior to compression and export into pipeline(s).

Compressor stations require a cleared fenced area and comprise a number of components, such as instrument and control systems, fuel tanks, compressor units, dehydrators, gas treatment plant, gas-fired engine alternators for power supply (where the site is not connected to the electricity grid), safety flare systems, and operations-related buildings.

Water management facilities may be co-located with compressor stations, where possible. Water management facilities may potentially comprise plant and equipment for water treatment and potentially power generation, interconnecting pipework, treatment chemical storage tanks (where applicable), waste management (e.g. solid salt storage) and water management ponds, (such as holding or transfer ponds, treated water /. permeate ponds, and brine / reverse osmosis concentrate. ponds).

3.7.2.3 Accommodation facilities

Consistent with the GLNG Project, the construction workforce will be accommodated in purpose built accommodation facilities (also referred to as camps) close to work sites. The operations workforce will be housed in field-based accommodation facilities and/or within local housing in nearby regional townships. Accommodation facilities typically include a kitchen, and workers mess, recreational, laundry and sleeping facilities as well as water tanks, on-site sewage treatment, onsite power generation (if not connected to the grid supply), back-up power generators, fuel and materials storage areas, administration facilities, and carparking.

An accommodation assessment will be undertaken as part of the Project EIS to determine the estimated construction and operational workforce generated by the Project and the availability of existing accommodation to support this workforce. Where accommodation, services and amenities cannot be provided at a nearby town, or it is deemed to be undesirable, accommodation facilities may be developed as part of the Project. The type, size and location of these would be investigated as part of the accommodation assessment.

3.7.2.4 Access roads

Access to wells and associated facilities will require construction of access roads, including grading and sealing of some roads, while others will be 4WD access only. Some access routes will utilise existing tracks (such as the existing GLNG access tracks), roads or cleared / disturbed areas, with upgrading as required.

Other access will require construction of new roads. Access routes will require on-ground investigation and their location will depend on the location of CSG resources and environmental constraints as identified in the development of the Project EIS.

3.7.2.5 Communication and electricity supply

At this early stage, power supply for the Project is anticipated to be a combination of power generated by CSG-fuelled power generation and/or grid-supplied electricity. In lieu of grid-supplied power, gas-fired engine alternators or other generating plant may be used at various facilities including for example, at gas compressor and treatment, water management, and accommodation facilities. Plant may also be installed to provide for emergency back-up power generation. A number of power supply alternatives will be considered as part of the Project EIS. Power will need to be distributed and reticulated throughout the gas fields and supporting infrastructure area via a network of power transmission lines and related infrastructure.

A combination of communication options will likely be used throughout the Project area, including:

- telemetry services for field production through a series of radio towers
- extending the Santos GLNG existing fibre network
- using existing carrier services, where available
- satellite communication in remote locations.

3.7.2.6 Borrow pits, quarries and storage areas

Borrow pits and quarries are typically required as a source of gravel, sands and clays, and other related construction materials that are needed for construction activities associated with infrastructure such as well sites, facilities, access roads and storage areas. Storage areas, stockpile and lay down areas for equipment and materials may also be required which are generally placed in centralised locations to minimise the disturbance area.

3.8 Workforce requirements

The Project will require a broad range of semi-skilled, skilled and professional personnel. However, these requirements will be generally consistent with those identified in the GLNG EIS and engaged in current CSG field development. The peak construction workforce is anticipated to be in the order of 1,700 people and will include both locally-based and non-local workers. It is anticipated that approximately 20% of these workers will be resident in the communities proximate to the development sites, with the remaining 80% being sourced from outside the regional area. Locally-based workers are generally expected to work a normal work week while non-local workers will be hired on a fly in/fly out roster basis.

It is anticipated that rostered personnel will utilise the Roma airport as their primary entry point to the southern portion of the Project area, with potentially Emerald or other regional airports or airfields used in the northern or eastern portions of the Project area, and be accommodated in purpose-built accommodation facilities within a reasonable distance of their worksites in order to reduce the impact on the local road network and ensure worker and community safety. This approach is also consistent with current GLNG practices and management plans.

The longer-term operational workforce is expected to be approximately 200 people at peak. This workforce will also require a combination of locally-based and rostered non-local personnel as determined primarily by the availability of the former, both from a quantity and skill set perspective, given the overall dynamic of the workforce requirements in the regional area. It is intended that the operational workforce for the currently approved GLNG Project will be utilised for the Project wherever practicable, however additional local employment is expected to be a positive flow-on effect of the Project.

3.9 Economic indicators

The Project represents a significant multi-billion dollar investment. Several billion dollars in capital expenditure is expected to develop the gas fields, and undertake all construction work for the associated infrastructure and facilities to support the development of 6,100 production wells, beyond the currently authorised field development activities. There may emerge cost reduction opportunities associated with sourcing of materials and construction costs for large infrastructure projects in the future.

A full economic analysis will be completed as part of the EIS, and more detailed financial analysis, including cost optimisation, and budgeting, will be undertaken during the front-end engineering and design (FEED) process. This will occur at a later date ahead of financial investment decision and project sanction.

3.10 Financing requirements and implications

The Joint Venture parties (JV Parties) of Santos GLNG will provide funding for the Project. All JV Parties are publicly listed companies, hold investment grade credit ratings and have access to equity and global debt markets. All JV Parties have committed finance to fund the GLNG Project that is currently under implementation.

Key operating metrics for the Santos GLNG JV Parties are as follows:

- Santos (30%) – A$2.5 billion in revenue and annual operating cash flow of around A$1.2 billion in 2011
- PETRONAS (27.5%) – MYR 241 billion (A$76 billion) in revenue and annual operating cash flow of around MYR 71 billion (A$22 billion) for FY 2010/11
- Total (27.5%) – 186€ billion (A$235 billion) in revenue and annual operating cash flow of around 19.5€ billion (A$25 billion) in 2011
- KOGAS (15%) – KRW 28,494 billion (A$24.5 billion) in revenue and annual operating cash flow of around KRW 201 billion (A$0.18 billion) in 2011.

4 Location of key project elements

4.1 Location

The Project comprises 35 petroleum tenements, in whole or part, covering approximately 11,190 km^2 in the Bowen and Surat basins, within south eastern Queensland (refer to Figure 1.2). The tenements are located across four local government areas; including Maranoa, Western Downs and Central Highlands Regional Councils and Banana Shire Council, in the vicinity of Roma, Wallumbilla, Miles, Surat, Wandoan, Taroom, Injune and Rolleston.

4.2 Tenure and tenements

The Project area includes a total of 35 petroleum tenements including 11 Authorities to Prospect (ATPs) and 24 Petroleum Leases (PLs), which are listed in Table 4.1 below.

Table 4.1: Tenements forming the Project area

Gas Field (no. of tenements)	Tenements		Area (km^2)
	Petroleum Lease (PL)*	Authority to Prospect (ATP)	
Roma Field (17 tenements):	PL 3 (313) PL 6 (316) PL 7 (317) PL 8 (318) PL 9 (319) PL 10 (320) PL 11 (321) PL 13 (322) PL 93 (323) PL 309 PL 310 PL 314 PL 315 (PL 281) (PL 282)	ATP 336P (2 parts) ATP 631P (2 parts) ATP 665P (2 parts) ATP 708P (1 part)	4,850
Scotia Field (3 tenements):	PL 176	ATP 803P (1 part) ATP 868P (1 part)	1,604
Fairview Field (7 tenements):	PL 90 PL 91 PL 92 PL 99 PL 100 PL 232	ATP 655P (2 parts)	1,624
Arcadia Field (8 tenements):	PL 233 PL 234 PL 235 PL 236	ATP 526P (5 parts) ATP 653P (1 part) ATP 745P (2 parts) ATP 804P (1 part)	3,114

Gas Field (no. of tenements)	Tenements		Area (km²)
	Petroleum Lease (PL)*	Authority to Prospect (ATP)	
	(PL 420) (PL 421) (PL 440)		
Total (35 tenements)	**24 Petroleum Leases**	**11 Authorities to Prospect**	**11,192**

* Note: tenements listed in parentheses indicate current applications e.g. (313) or (PL 281)

Exploration, appraisal activities, production and operational activities, and all associated incidental activities will continue within Project tenements (as listed in Table 4.1) in accordance with existing approvals, as amended from time to time.

5 Description of the existing environment

5.1 Natural environment

5.1.1 Land

The topography across the Project area varies from flat open valleys, undulating hills and low plateaux to mountainous range country.

Geoscience Australia provides mapping of the regional geology at 1:250,000 scale. A summary of the regional geology present within the Project tenements is provided below in Table 5.1. The Walloon Coal Measures, the Bandanna Formation, as well as the coal seams associated with the Cattle Creek Formation are the target coal measures for the Project.

Table 5.1: Regional geology of the Project area

Geological formation	Description
Gubberamunda Sandstone	Sandstone, minor conglomerate, siltstone
Hutton Sandstone	Pale brown to pale grey, poorly sorted, medium-grained, feldspathic sublabile sandstone (at base) and fine-grained, well-sorted quartzose sandstone (at top); minor dark grey carbonaceous siltstone, mudstone and rare pebble conglomerate
Injune Creek Group	Calcareous lithic sandstone, siltstone, mudstone, coal, conglomerate
Birkhead Formation	Siltstone, mudstone, labile to quartzose sandstone, minor coal
Westbourne Formation	Micaceous siltstone, mudstone, minor labile to quartzose sandstone
Mooga Sandstone	Sandstone, siltstone, mudstone
Orallo Formation	Sandstone, siltstone, mudstone, conglomerate, coal
Coreena Member	Siltstone, mudstone, sandstone; commonly glauconitic and calcareous
Doncaster Member	Carbonaceous mudstone, siltstone, minor siltstone; some glauconitic and calcareous; shelly fossils
Bungil Formation	Glauconitic, labile to quartzose, siltstone, mudstone
Q-NSB	Alluvium of older flood plains, sand, gravel, soil
Qa-NSB	Clay, silt, sand, gravel; flood plain alluvium
Clematis Group	Medium to coarse-grained quartzose to sublabile, micaceous sandstone, siltstone, mudstone and granule to pebble conglomerate
Rewan Formation	Lithic sandstone, pebbly lithic sandstone, green to reddish brown mudstone and minor volcanilithic pebble conglomerate (at base)
T-NSB	Quartzose sandstone, conglomerate, siltstone
Tob-NSB	Basalt flows, minor trachyte and volcaniclastics

Source: GEODATA Topographic 250K Series 3, Geoscience Australia 2006

The Australian Soil Resource Information System provides broad-scale landscape unit mapping across Australia. A summary of the landscape units and associated soil materials present within the Project tenements is provided below in Table 5.2.

Table 5.2: Landscape units and soils materials of the Project area

Landscape Unit	Landscape Unit Description	Soil materials
Mackenzie-Dawson Lowlands	Floodplains, clay plains and sandy bedrock lowlands.	Highly weathered bedrock (>50%), residual sand (<20%), alluvial sediments (<20%)
Springsure-Clermont Plateaus	Moderately dissected low plateaus, mainly basalt with minor sandstone.	Very highly weathered bedrock (> 50%), highly weathered bedrock (<20%), alluvial sediments (<20%)
Expedition Scarplands	Rugged plateaus and ridges on sandstone.	Saprolith (>50%)
Taroom Hills	Sandstone ridges and shale lowlands.	Saprolith (>50%), alluvial sediments (<20%)
Condamine Lowlands	Undulating clay lowlands on siltstone and low sandstone hills; floodplains.	Highly weathered bedrock (>50%), alluvial sediments (<20%)
Charleville Tableland	Low sandy tableland of weathered sandstone and shale.	Very highly weathered bedrock (>50%), residual sand (20-50%)

Source: Australian Soil Resource Information System 2010

5.1.2 Water

5.1.2.1 Surface water

The Project area spans both the eastern and western watersheds. The Condamine-Balonne Catchment is located with part of the Murray Darling Basin which eventually discharges to the Great Australian Bight in South Australia. The Dawson River and Comet River catchments are located in the Fitzroy Basin which discharges into the southern end of the Great Barrier Reef near Rockhampton. All catchments demonstrate typical dendritic drainage patterns.

Flows within lower order streams of the catchment are ephemeral in nature, whilst higher order stream flow patterns are characterised by long periods of low flows, where rivers are quite often reduced to chains of ponds. These periods are interspersed by relatively short periods of high volume flows. The summer dominant rainfall pattern (October to April) represents the period where streams experience highest flows.

Surface water hydrology is characterised by relatively flat terrain where rainfall runoff finds its way to the major rivers and streams via a maze of defined, poorly defined and indistinct channels. The flat terrain and labyrinth of waterways combine to produce extensive overland flows during seasonal and unseasonal flooding. Overland flow characteristics will vary across the Project area, with vast areas of very low gradient floodplains or terrace surfaces, many of which are modified for agriculture that may generate little runoff except when saturated under intense rainfall. The hydrology of the surface waters flowing through the Project development area has been extensively modified by land clearance, dams, weirs and pumping infrastructure constructed primarily for irrigation and potable water use. The extent of these modifications varies between catchments. Flood impact assessment and analysis will be undertaken during the EIS hydrological studies.

The Dawson River downstream of Dawson's Bend, from the outflow of Hutton Creek to Yebna Crossing is the only River in the area to consist of relatively constant flows as it obtains inflow from groundwater springs throughout the year.

A number of water storages and weirs are located on the major water courses within the catchments, which are used for irrigation and recreation purposes supporting regional industry and communities.

As similar land uses exist within each catchment, it is anticipated that similar environmental values will apply across the catchments.

5.1.2.2 Groundwater

The Project area is located within the Surat Basin (a sub-basin of the Great Artesian Basin) and the underlying Bowen Basin. The Surat Basin has a maximum sediment thickness of approximately 2,500 m and covers the southern half of the Bowen Basin, which has a maximum sediment thickness of approximately 10,000 m.

The Surat Basin is a major sedimentary basin that forms an eastern limb of the Great Artesian Basin in Eastern Queensland. The major aquifer units through the Surat Basin consist of sandstone aquifers, being the: Nullumwurt (Bungil Formation), Mooga, Gubberamunda, Springbok, Hutton and Precipice aquifers. Recharge to the aquifers occurs by way of rainfall infiltration into the outcropping sandstone aquifers situated along the eastern margins of the Basin on the western slopes of the Great Dividing Range. Natural discharge, as mound springs, occurs in the south-western area of the Basin.

The Bowen Basin is an Early Permian to Middle Triassic aged basin, which contains shallow marine and continental clastic and volcanic rocks. The major aquifer units in the Bowen Basin consist of: Clematis Sandstone, Showgrounds Sandstone and Aldebaran Sandstone.

Shallow groundwater is likely to be present in close proximity to watercourses and other water bodies (i.e. billabongs) and have been recorded at depths of 10 m in selected areas. Groundwater bores in the local area generally range between 100 m (sub-artesian) and 2,500 m deep (artesian).

5.1.3 Air

Given the rural nature of the region and the absence of extensive or heavily built-up areas, regional air quality is considered to be generally good. Air quality in the vicinity of the Project area is potentially impacted at a localised level by dust of natural origin (particularly during dry periods), burn-offs (controlled fires), bushfires, dust associated with rural land use and vehicular movements on unsealed roads, and from various mining operations. Several townships are located within the surrounding region. These townships are expected to generate air emissions from motor vehicles as well as domestic industry and business activities.

5.1.4 Ecosystems

A series of database and mapping searches were undertaken for the region surrounding the Project area to provide a preliminary description of the biological environment and identify the likely values. Preliminary identification of the plant, animal, vegetation communities and habitat values were obtained from the following sources:

- EPBC Act Protected Matters Search Tool (SEWPaC 2012)
- regional ecosystem (RE) and remnant map (Version 6.1), essential habitat map (Version 3.1) and regrowth vegetation map (Version 2) (DERM 2011a)
- environmentally sensitive areas (ESAs) mapping (DERM 2011b).

Due to the large spatial area of the Project these results are indicative only and could be an over- or under-estimation of the actual values and these would be determined more accurately as part of the EIS.

5.1.4.1 Commonwealth matters of national environmental significance

The EPBC Act provides for the protection of a number of maters of national environmental significance (MNES). MNES that may be relevant to the Project are discussed in the following sections.

Threatened ecological communities

Seven endangered or critically endangered threatened ecological communities have been identified from the EPBC Act Protected Matters Search Tool as potentially occurring in the Project area (SEWPaC, 2012) as listed in Table 5.3. An indicative distribution of these threatened ecological communities, based on remnant regional ecosystem (RE) mapping, is illustrated on Figure 5.1. Representative sampling of mapped threatened ecological communities will be undertaken to validate detailed desktop studies as part of the EIS ecological assessment.

Table 5.3: Threatened ecological communities potentially occurring in the Project

Threatened Ecological Community	EPBC Act Status	Type of Presence
Brigalow (*Acacia harpophylla* dominant and co-dominant)	Endangered	Community known to occur within area
Coolibah - Black Box Woodlands of the Darling Riverine Plains and the Brigalow Belt South Bioregions	Endangered	Community likely to occur within area
Natural Grasslands of the Queensland Central Highlands and the northern Fitzroy Basin	Endangered	Community likely occur within area
Semi-evergreen vine thickets of the Brigalow Belt (North and South) and Nandewar Bioregions	Endangered	Community likely to occur within area
The community of native species dependent on natural discharge of groundwater from the Great Artesian Basin	Endangered	Community likely to occur within area
Weeping Myall Woodlands	Endangered	Community likely to occur within area
White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland	Critically Endangered	Community may occur within area

Source: SEWPaC, 2012

Groundwater dependent ecosystems are known to occur within the Project area, as indicated by the potential presence of 'native species dependent on natural discharge of groundwater from the Great Artesian Basin' and as identified during ecological assessments undertaken for the GLNG Project. It should be noted that the threatened ecological community of 'White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland' has not been identified as occurring within the Project tenements or the PSI Area from mapping. However the mapping shows an area of this threatened ecological community to the west of Injune. Detailed ecological assessments will investigate the likely occurrence of this community within the Project area.

Plants and animals

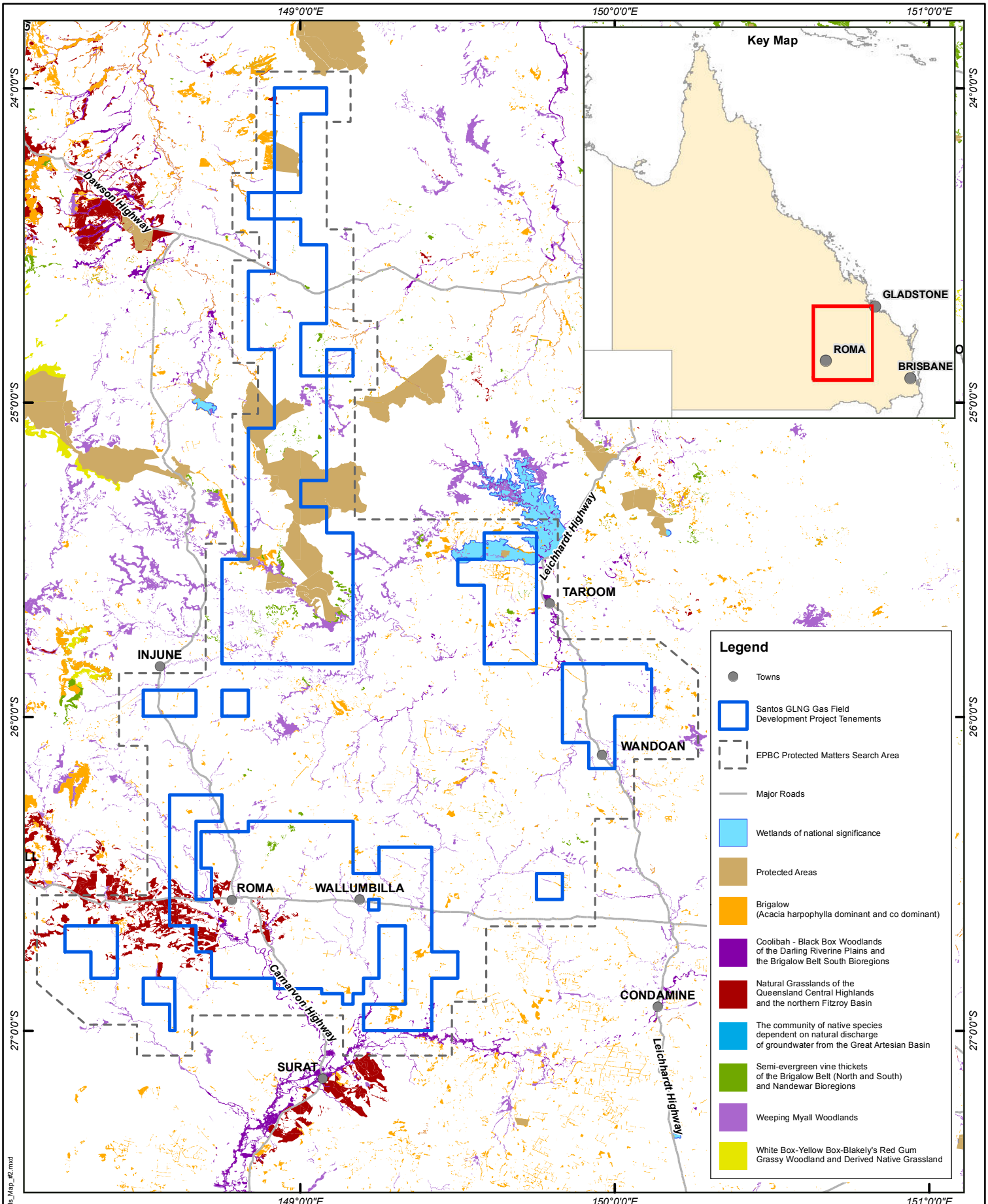
Search results indicate 21 threatened animal species and 19 threatened plant species protected under the EPBC Act are known, likely or have potential to occur, or have habitat that is known, likely to, or may occur, in the region surrounding the Project. This includes nine birds, six reptiles, five mammals and one fish. An additional 13 listed migratory (marine, terrestrial and/or wetland) and/or marine bird species were also returned from the search as potentially occurring in the region surrounding the Project (SEWPaC, 2012).

Other matters

Other MNES indicated on the EPBC Act Protected Matters Report (SEWPaC, 2012), as being located nearby or downstream of the Project area include:

- Narran Lake Nature Reserve, a Ramsar wetland located over 300 km south (downstream) of the Project area in northern New South Wales
- one parcel of Commonwealth Land used for Defence training purposes in Roma – Roma Training Depot
- Palm Tree and Robinson Creeks, which is a nationally important wetland located approximately 28 km north of the Taroom township
- sixteen places listed on the Register of the National Estate, nine of which are listed for their natural heritage values, with seven listed for historic value
- eight State reserves
- fourteen invasive introduced species, or their habitat, that are likely, or have potential, to occur within the search area, comprising six feral animal species (1 frog and 5 mammals) and eight weed species of national or state significance.

The EPBC Act Protected Matters Search Report (SEWPaC, 2012) for an area encompassing the Project area is provided in Appendix A.



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TEC communities Based on Regional Ecosytem Mapping V6.1 - DERM
Data used in this assessment may include

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Santos GLNG
Gas Field Development Project

Santos GLNG Project

Figure 5.1
Commonwealth Matters of National Environmental Significance

5.1.4.2 Matters of significance to the state

Regional ecosystems

Extensive areas of remnant REs are mapped within and surrounding the Project area. These remnant areas are generally associated with topographical features such as ranges and watercourses, as well as protected areas. A large swathe of 'Least Concern' remnant vegetation occurs within the northern tenements of the Project, and smaller patches of 'Endangered' and 'Of Concern' remnant vegetation occur throughout the landscape. In comparison, the southern and eastern Project tenements are predominantly clear of remnant vegetation, primarily due to extensive historic clearing for agricultural land uses.

While clearing of remnant and regulated regrowth vegetation for a petroleum activity is exempt from assessment under the *Vegetation Management Act 1999* (Qld), it is possible that some areas may represent significant vegetation or habitat under other legislation. Validation and mapping of remnant and regrowth vegetation within the Project area will be undertaken as part of the EIS.

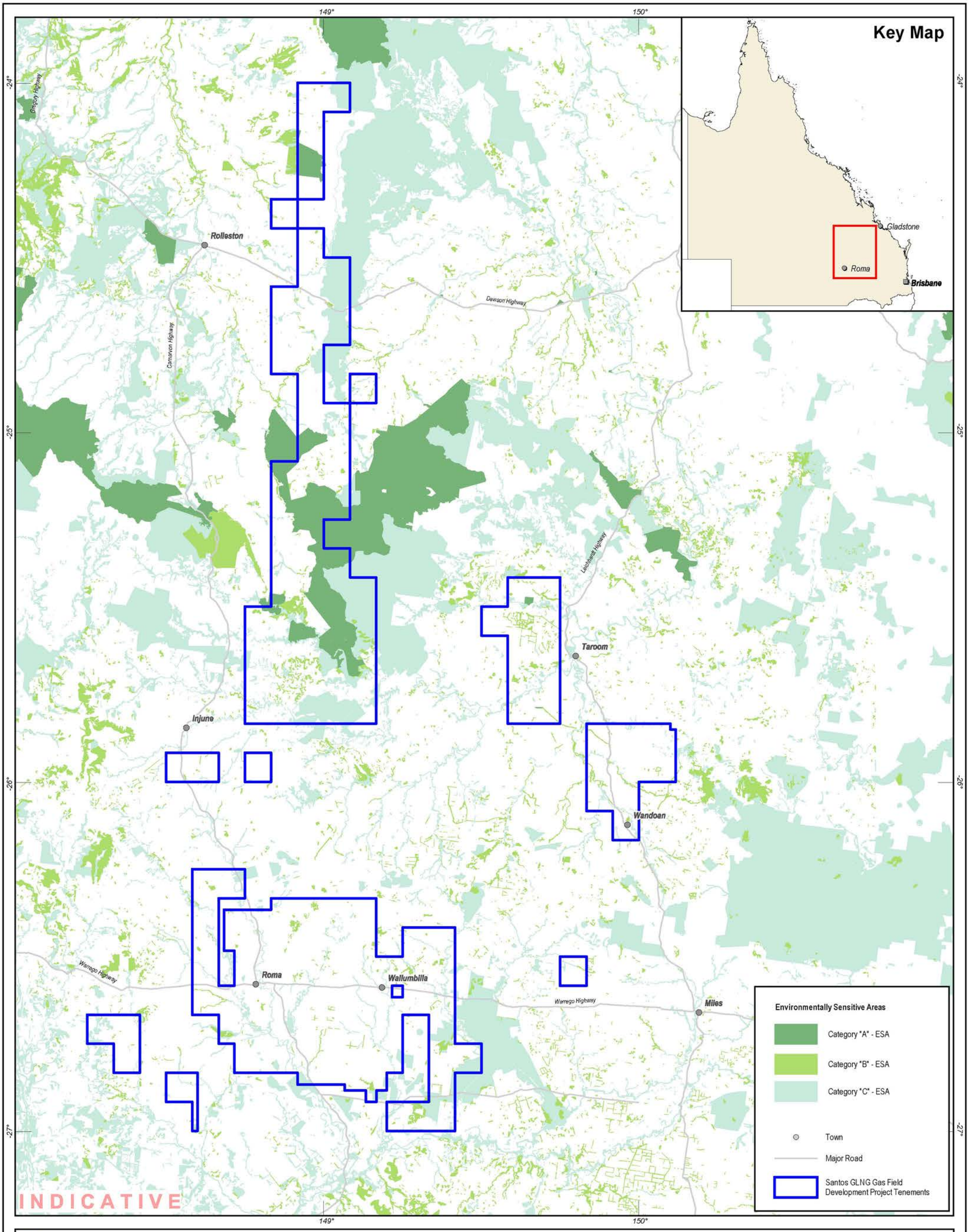
Environmentally sensitive areas

Based on Queensland environmentally sensitive areas (ESAs) mapping (DERM 2011b), a number of ESAs occur within or in close proximity to the Project area. These are shown on Figure 5.2.

ESAs relevant to the Project include Category A, B and C areas, which are defined under the *Environmental Protection Regulation 2008*. Matters protected under these categories, which are likely to be of most relevance to the Project area include:

- protected areas under the *Nature Conservation Act 1992*, such as National Parks or areas providing essential habitat for Threatened species
- endangered REs
- places of heritage significance under the *Queensland Heritage Act 1992*
- sites of indigenous cultural significance registered under the *Aboriginal Cultural Heritage Act 2003*
- a fish habitat area protected under the *Fisheries Act 1994*
- some areas protected under the *Forestry Act 1959*
- areas subject to international conventions, to which Australia is a signatory, relating to migratory species, wetlands of internal importance (Ramsar wetlands) and protection of cultural and natural heritage.

Three areas of Category A ESA occur within the Arcadia Valley gas fields (GLNG Project), ATP804 and ATP803. These are associated with the Expedition National Park, Humboldt National Park and the Lake Murphy Conservation Park. Category B ESAs occur throughout the Project area as small scattered patches, and are associated with Endangered remnant REs. Category C ESAs occur throughout the Project area associated with state forests. Some of the larger state forests within the Project area include Expedition State Forest, Mount Nicholson State Forest, Belington Hut State Forest and Hallett State Forest. Category C ESAs are also associated with numerous remnant vegetation which occurs along waterways traversing the Project area. Representative sampling of ESAs will be undertaken to validate detailed desktop studies as part of the EIS ecological assessment.



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Santos GLNG
Gas Field Development Project

Figure 5.2 - Queensland Government Ecological Considerations

Santos
GLNG Project

5.2 Social and economic environment

The Project will be located in a predominantly rural area and be encompassed within four local government areas (LGAs):

- Central Highlands Regional Council
- Maranoa Regional Council
- Banana Shire Council
- Western Downs Regional Council.

These LGAs have a combined total resident population of 90,193 people and cover a total area of 185,790 km^2 (OESR 2012). For the purpose of this IAS, the study area is defined as the four LGAs of the Maranoa Regional Council, Western Downs Regional Council, Central Highlands Regional Council and Banana Shire Council.

The region is currently experiencing rapid growth and diversification of industry into the energy resources sector, primarily as a result of its location within the Surat and Bowen Basins' extensive gas and mineral reserves.

Central Highlands Regional Council

The Estimated Resident Population of the Central Highlands Regional Council is 29,533 people (OESR 2012). The LGA is rich in natural resources and covers an area of approximately 60,000 km^2. Key industries supporting the region include agriculture (particularly cattle, cotton, grain, citrus and grapes) and recently the development of mining and gas resources.

The largest town in the region is Emerald, which is also the administrative centre. Other smaller townships include Blackwater, Duaringa and Rolleston, which is the closest township to the Project area.

Maranoa Regional Council

The Maranoa Regional Council has an estimated resident population of 14,069 people (ABS, 2012) and covers an area of approximately 58,820 km^2 (MRC, 2012). Beef, sheep, wool and grains are the key industries characterising the region's strong productive rural industry base. Recent growth industries include oil and gas, tourism and timber production (Maranoa Regional Council, n.d.).

Roma is the business, transport and community hub of the region, while the surrounding townships of Injune, Mitchell, Surat and Wallumbilla provide for the day to day needs of nearby residents.

Banana Shire Council

The Banana Shire Council has an estimated resident population of 14,861 people (OESR 2012) and covers an area of approximately 28,606 km^2. It is the largest commodity producer within the Fitzroy Statistical Area and is also known for farming, mining and grazing with beef production, cropping (cotton and lucerne), coal seam gas and power generation its major industries (Banana Shire Council, n.d.).

The main urban and administrative centre of the LGA is Biloela and the key satellite townships are Moura, Theodore and Taroom, which is the closest township to the Project area.

Western Downs Regional Council

The Western Downs Regional Council has an estimated resident population of 32,335 people (OESR 2012) and covers an area of approximately 59,000 km^2. Agriculture, fishing and forestry industries have historically supported the region, however, more recently, economic and population growth have been driven by the energy resources sector (particularly coal seam gas).

The key towns within the local government area are Miles, Chinchilla, Jandowae, Tara, Dalby and Wandoan, which is the only township in this LGA that is located within the Project area.

Woorabinda Aboriginal Shire Council

An additional Council lies to the north east of the Project area, the Woorabinda Aboriginal Shire Council. The Woorabinda Aboriginal Shire Council covers an area of 391 km^2 and is surrounded along all boundaries by the Central Highlands Regional Council. At the time of the 2011 census, there were 982 people residing in the LGA at the time of the 2011 census, most of whom identify as Aboriginal or Torres Strait Islander. The community is supported by agricultural activities. There is only one township located within this LGA. Unlike the four LGAs described above, no Project activities are proposed within this the Woorabinda Aboriginal Shire Council area.

5.2.1 Economic and demographic characterisation

It is estimated that the compound annual growth rate for the study area was 1.3% between 2001 and 2006 (compared to 2.1% for Queensland) and 1.8% between 2006 and 2011 (compared to 2% for Queensland). This represents a high growth rate compared with other regional areas, although it is lower than the average growth rate for Queensland.

Based on 2011 Australian Bureau of Statistics census data (ABS, 2012), some key socio-demographic characteristics of the study area, compared to Queensland demographics, are summarised as follows:

- In 2011, 55.1% of the population were male (53,669 persons) and 44.9% were female (43,758 persons). The proportion of males is approximately 5% higher than for Queensland as a whole. This difference is more pronounced in the 25-54 year age bracket
- Including the Woorabinda LGA, the total Indigenous population of the study area was 4,969 persons at the time of the 2011 census, constituting 5.1% of the total population (compared with 3.6% for Queensland)
- In respect of cultural diversity, the population of the study area is less diverse than that of Queensland, as indicated by the lower proportion of the population that were born overseas (18%) compared with the proportion for Queensland (27.4%) in 2011
- Family composition with the study area shows a higher proportion of couples with children and a lower proportion of one parent families compared to the State average. The 2011 census data indicates that:
    - 40.2% of families are couples without children (compared with 39.5% for Queensland)
    - 46.9% of families are couples with children (compared with 42.8% for Queensland)
    - 11.7% of families are one parent families (compared with 16.1% for Queensland).

- The educational profile for the study area shows the level of educational attainment of individuals within the study area was typically lower than Queensland at the time of the 2011 Census (for example, 36.6% of the study area population completed year 12, whereas 48.0% of the Queensland population achieved the same level of educational attainment).

Population forecasts prepared by the OESR (2012) suggest that an additional 30,538 people will reside in the study area between 2011 and 2031, representing a growth rate of between 1.1 to 1.5%, with the highest growth anticipated to occur in the Central Highlands Regional Council area.

5.2.2 Accommodation and housing

The capacity of the local housing market to absorb a large influx of construction workers is low. Therefore, it is anticipated that the EIS will identify strategies such as temporary workers accommodation facilities, to mitigate against potential adverse impacts on the local housing market.

5.2.3 Social and recreational services

A broad range of social infrastructure is located throughout the study area to service the local population, and is generally concentrated within larger townships. The range of educational, heath, aged care, emergency and recreational / cultural facilities located across the study area include:

- Educational facilities; comprising 63 child care facilities, 111 primary and secondary schools and seven tertiary educational facilities
- Health facilities; comprising 27 hospitals and health centres and 35 health practitioners
- Aged care facilities; comprising 48 aged care facilities
- Emergency services; comprising 33 Queensland police services, 29 Queensland ambulance services, 26 Queensland fire services and 33 State emergency services.

In addition to the above, the communities within the study area are supported by a range of cultural and recreational facilities such as libraries, art galleries, places of worship, sport and recreation centres.

5.2.4 Cultural heritage (Indigenous and non-indigenous)

The results of the EPBC Protected Matters search (SEWPaC, 2012) identified 16 Register of National Estate places (nine natural and seven historic). The region has a strong history of pastoral, agricultural and mining industries. The majority of listed non-indigenous heritage sites in the Project area are found in major towns, distant from any planned Project development activities. These include public buildings, memorials, houses, churches and cemeteries.

Items and places of indigenous cultural heritage significance are scattered throughout the Project area. Santos GLNG is actively engaging with relevant Aboriginal parties to identify locations of such items and places so as to avoid and minimise impacts to indigenous cultural heritage. This engagement with Aboriginal parties about indigenous cultural heritage is in accordance with the Cultural Heritage Management Plans (CHMPs) negotiated for the Project area (see Section 7.4).

5.3 Built environment

The vicinity around the Project area includes a variety of major developments currently being assessed or approved and being implemented. These include:

- coal mines, such as the Wandoan Coal Project, the North Surat–Collingwood Coal Project, North Surat–Taroom Coal Project and Belvedere Coal
- CSG and energy projects, such as the APLNG Project, Arrow Energy Project and the Linc Energy Underground Coal Gasification Project
- major infrastructure projects, such as the Nathan Dam Project, the Surat Basin Railway Project and the Spring Gully Power Station.

There may be potential capacity constraints experienced, due to the implementation of several projects at once in the same region. Such constraints as well as potential cumulative impacts will be determined during the EIS phase of the Project.

5.3.1 Infrastructure

As the Project includes tenements comprising the GLNG Project, there are likely to be significant synergies including opportunities to utilise existing or already approved infrastructure including for example infrastructure and facilities for gas and water delivery, storage, compression or treatment, or supporting infrastructure such as borrow pits and quarries, power and communications infrastructure and/or accommodation facilities.

The Project will connect to the high pressure GTP and the Santos GLNG Facility on Curtis Island, or other third-party facilities, which are already approved and currently under construction. After transport to the LNG facility via a GTP, gas will be treated, cooled and loaded onto ships for export.

The Project may connect to third-party infrastructure, such as gas transmission pipelines or facilities for the supply or receipt of gas. The project may also use, and connect to, third-party operated powerlines, substations, water management, treatment or supply infrastructure, and communications infrastructure. Santos GLNG may also identify opportunities for sharing and/or co-location arrangements to be implemented with other project proponents, for certain infrastructure or facilities.

The proponent will work with the relevant Regional Councils, State government departments, land owners, government-owned corporations and community groups to identify potential impacts on existing infrastructure external to the GLNG Project, to develop solutions to minimise potential impacts.

5.3.2 Traffic and transport

The Project area is serviced by a range of State highways, council roads and unformed single tracks providing access to private properties.

With the predominantly rural-based land use of the Project area, transport infrastructure is minimal with a number of rural secondary roads linking the major regional road network. Existing gas field developments have resulted in the construction of a number of gas field access roads (predominantly unsealed secondary roads).

As previously mentioned the key airport used for the movement of workers into and out of the gas fields is the Roma Airport, which has recently been upgraded using funds from Santos GLNG.

As gas field development progresses, it may be necessary to utilise other regional airports and/or local aerodromes. Worker transportation options will be addressed in detail within the EIS.

The port for any export gas will be at the approved Santos GLNG facility, or potentially other third-party facility, and the possible ports to be used for importing construction materials and plant or equipment are anticipated to be Port of Brisbane, Mackay and Gladstone.

5.3.3 Community amenities

Santos GLNG has developed a Social Impact Management Plan (SIMP), which was recently approved by the Queensland Government and is being successfully implemented. This Plan includes details of the existing community infrastructure, including the social amenities and community services that may be affected by the GLNG Project and can be found at: www.dsdip.qld.gov.au/resources/plan/cg/simp/santos-glng-simp.pdf

5.4 Land use and tenures

5.4.1 Key local and regional land uses and land tenures

The predominant land use zoning within and around the Project area is rural, consisting of forms of cropping and grazing. Other existing and historical land uses within and adjacent to the Project Area include:

- CSG and conventional oil and gas development;
- Mining and extractive industry;
- forestry;
- residential and urban development; and
- conservation and recreation.

The tenures of properties covered by the Project area include freehold, leasehold and Crown land, including one area of Commonwealth Land used for Defence purposes (see Section 5.1.4.1). In general, the predominant tenure within the northern project tenements is leasehold, with primarily freehold properties in the southern project tenements. There are many easements occurring across the Project area for example, in relation to high-voltage and distribution powerlines, gas and water pipelines, road and rail reserves, and stock routes. Mining and petroleum tenements are Local government areas are addressed in Section 5.2.

5.4.2 Native title

The Project is subject to a number of registered Native Title claims. A search of the National Native Title Tribunal (NNTT) indicates that the following parties have active claims within the Project area:

- Mandandanji People (QC08/10)
- Iman People 2 (QC97/55)
- Bidjara People (QC08/5)
- Karingbal People (QC06/19)

- Karingbal People #2 (QC06/5).

Santos GLNG will continue to work with these parties throughout the implementation of the Project including, where required, undertaking the native title process for any new tenements in the Project area.

5.5 Planning instruments and government policies

The relevant Local Government Planning Schemes being administered in the Project area are:

- Bauhinia Shire Planning Scheme
- Taroom Shire Planning Scheme
- Roma Town Planning Scheme
- Bungil Shire Planning Scheme
- Bendemere Shire Planning Scheme.

The following State, local and regional planning instruments, policies, plans and guidelines may apply to the Project and will be addressed in the EIS:

- Maranoa-Balonne Regional Plan
- Central Queensland Regional Plan
- Central Queensland Strategy for Sustainability
- Surat Basin Future Directions Statement
- Surat Basin Regional Planning Framework
- Queensland Murray Darling Committee Natural Resource Management Plan
- Fitzroy Basin Association Natural Resource Management Plan
- State Planning Policy (SPP) 2/12 Planning For Prosperity
- SPP 4/11 Protection of Queensland's Strategic Cropping Land
- SPP 5/10 Air, Noise and Hazardous Materials
- SPP 1/03 Mitigating the Adverse Impacts of Flood, Bushfire and Landslide
- SPP 1/92 Development and the Conservation of Agricultural Land
- Coal Seam Gas Water Management Policy 2010
- Environmental Offsets Policy 2008
- Environmental Protection (Air) Policy 2008

- Environmental Protection (Water) Policy 2009
- Environmental Protection (Waste Management) Policy 2000
- Environmental Protection (Noise) Policy 2008.

The following Federal policies and strategies may apply to the Project and will be addressed in the EIS:

- National Water Quality Management Strategy
- EBPC Act Environmental Offsets Policy (October 2012).

6 Potential impacts of the Project

6.1 Natural environment

6.1.1 Ecology

The potential impacts on threatened species and ecological communities that may result from the Project include:

- direct loss of individuals and reduction in population size
- loss or reduction in available recruitment area and/or loss or changes to habitat
- loss of forage areas
- edge effects and fragmentation of fauna habitat including weed invasion into habitat areas increasing resource competition.

Noise may also cause disturbance to some wildlife although this is likely to be mainly related with transitory and temporary activities associated with construction, and any potential impacts are therefore likely to be temporary as most species adapt to noise levels and return after initial displacement. Operational noise generated by above-ground facilities will be adequately mitigated through design to minimise impacts to the greatest extent practicable.

An ecological assessment, including a detailed desktop assessment and representative field sampling, will be undertaken as part of the EIS to assess the potential impact on the existing biological values. Measures to minimise potential disturbance to land, in particular to areas of ecological significance (i.e. remnant vegetation and threatened Ecological Communities and species habitat) will be taken into consideration during the planning, design and construction phases of the Project, in accordance with approval conditioning and legislative requirements.

6.1.2 Land and Water

Field development will be planned to minimise the environmental footprint of Santos GLNG's activities by incorporating the use of existing access tracks and cleared areas, where possible. The project has the potential to result in localised impacts due to land disturbance and vegetation clearing activities. Such potential impacts may include for example, disturbance to topographic features and associated surface overland flows, potential soil erosion and sedimentation of land and surface waters, and changes to soil characteristics that may influence land productivity. Standard soil and land management mitigation measures as well as specialised site-specific management measures will be applied to ensure adverse impacts are avoided to the greatest extent possible.

It is not anticipated that the Project will have significant impacts on surface water. The EIS will assess, analyse and model as appropriate, potential surface water impacts including in relation to potential flood impact, and provide detailed mitigation measures to minimise any potential impacts on the existing environmental values of the Project area. As appropriate, these measures will be incorporated into existing GLNG Project water management plans.

In order to extract the CSG, target coal seams will be depressurised, which allows gas (predominantly methane) desorption from the coal seam. The depressurisation results in water being produced from CSG wells, which is subject to a range of water management options. The potential impacts associated with the management of water will depend on the volume and quality of the water, the transport, treatment and storage methods and safeguards implemented, and water treatment by-products such brine and solid salt, to be managed on the surface. A detailed assessment of the potential impacts on groundwater will be undertaken as part of the EIS. This includes potential risks to surrounding users and ecosystems that may arise as a result of the Project.

The water management options available may include (but are not limited to) managed aquifer recharge, irrigation, stock-watering, release to surface water resources, dust suppression and/or construction water supply. The mitigation measures for these water management options will be assessed during the EIS process.

A significant body of research and monitoring work has been undertaken as part of the broader previously-approved GLNG Project, and this work is ongoing. The Project will be brought into this work program to ensure consistency and a regional context and management framework is applied, as appropriate, to ensure potential cumulative impacts are accounted for, monitored and appropriately managed to avoid, minimise and mitigate potential adverse impacts. It should be noted that ongoing monitoring of shallow groundwater levels as part of the existing GLNG operations indicates no impact from activities to date.

6.2 Amenity

6.2.1 Visual amenity

The Project area will be subject to petroleum development activities, which will result in some level of visual impact from surrounding vantage points. Visual impacts may occur from a variety of sources including vegetation clearing activities, earthworks associated with site preparation works, drilling activities and field infrastructure. Given the flexibility around locating large facilities, such as hub compressor stations that have a greater level of visual impact compared to individual producing gas wells, and the remote location of many of the gas fields, visual impacts are not expected to be significant from individual facilities and infrastructure. The potential visual impacts will be addressed in a detailed landscape and visual impact assessment as part of the EIS. Cumulative impacts associated with changing landscape character and visual amenity will also be addressed in the EIS.

Effective consultation with landholders will be undertaken to identify any potential impacts before they occur. This combined with the application of environmental management controls will minimise the potential impacts.

6.2.2 Noise and vibration

Noise impacts are relative to the distance to surrounding sensitive receptors, the level and duration of disturbance and the hours of disturbance. Identification of residences and other sensitive locations will occur as part of the EIS.

The generation of noise will occur from a variety of sources during construction, including vegetation clearing activities, earthworks associated with site preparation works and drilling activities. Given the rural location and hence typically large distances to most residences, and the relatively short-term nature of these activities, the impact is expected to be of low severity and short duration. Operation of the Project will generate noise from such sources as drilling activities and compressor stations.

The Project will be undertaken in accordance with the *Environment Protection (Noise) Policy 1997*. Effective consultation with landholders will be undertaken to identify any potential impacts before they occur and management controls adopted to minimise such impacts.

6.2.3 Air quality

Sources of emissions could include flares, vents, vehicles, generators and compressors. Atmospheric emissions associated with field development may include:

- carbon dioxide (CO_2)
- carbon monoxide (CO)
- nitrogen oxides (NO_x)
- sulphur dioxide (SO_2)
- volatile organic compounds (VOCs)
- particulates and dust.

Compressor stations, in particular, may be associated with emissions of nitrogen oxides and carbon monoxide, which have the potential to cause adverse impacts, if left unmitigated, to surrounding sensitive receptors.

Potential air quality impacts associated with the Project will be assessed as part of the EIS and management measures developed to mitigate potential impacts. The Project will be required to meet air quality standards for occupational health and safety, and the EP Act and the *Environmental Protection (Air) Policy 2008*.

LNG is an energy source that has significant environmental benefits including substantially lower GHG emissions and water use when compared to other fossil fuels. As reported in the Santos GLNG Greenhouse Gas Reduction Strategy (Santos, 2011), the Project can deliver global emission reductions - for every tonne of CO_2 emitted in Australia up to 4 tonnes of CO_2 will be avoided when LNG is substituted for coal-fired electricity generation (Worley Parsons, 2011).

6.3 Social environment – beneficial and adverse

The socio-economic impacts, both positive and negative, of the Project are potentially significant due to the Project size and duration, as well as cumulative impacts.

Most of the potential social impacts are anticipated to be positive for the area including economic diversification, population diversification, and increased economic and employment opportunity. It is also anticipated that improvements to economic development and revenue due to the Project will have a positive impact on the broader community in Queensland and nationally.

There is a potential for negative impact on housing affordability in the vicinity of the Project. It is anticipated that the EIS will identify strategies, such as accommodation facilities for construction workers, to mitigate against possible negative impacts on housing affordability.

The proponent has developed a Social Impact Management Plan (SIMP), which has been approved by the Queensland Government and is being successfully implemented. Through the mechanisms established within the GLNG SIMP, the proponent is committed to continuing to assess possible impacts of social infrastructure and community services and to further developing and/or improving the existing strategies to mitigate against such potential impacts.

6.4 Economic effects

As reported in Section 3.9, the Project represents a significant multi-billion dollar level of investment. The majority of economic impacts will be beneficial and will have national, state and regional dimensions. The Project will:

- extend the long-term gas processing and export industry in Queensland utilising GLNG's substantial CSG resources
- boost employment opportunities within the region and include skill development opportunities
- boost the state and national economies
- increase the tax and royalties revenue for both the state and federal governments over the life of the Project
- create opportunities to diversify rural and regional economies in a manner that will help sustain their long-term viability, including providing financial contributions towards social infrastructure improvements within the region
- generate further local economic spending through the purchase of local resources, goods and services during the implementation of the Project, and extending over the life of the Project
- raise the profile of CSG production in Queensland.

For further discussion please see Section 9.1.

6.5 Built environment

The Project is likely to impact on infrastructure, such as that used for transportation, electricity distribution and community amenities, to varying degrees. Within the tenements of the approved GLNG Project there is likely to be an incremental increase in existing infrastructure whilst impacts within the additional tenements (Future Development Area) have the potential to be more pronounced due to the limited CSG production activities currently occurring.

Development of the Project area is expected to result in transport, infrastructure and facilities being constructed, including linear infrastructure such as access roads, gas and water gathering and transmission pipeline networks, and powerlines. The EIS will include an assessment of the impact of this additional transportation and other infrastructure on both the natural and built environments. Linear infrastructure typically requires crossing of third-party linear infrastructure such as other powerlines, pipelines, roads, rail corridors, in addition to natural linear features such as ranges and watercourses.

The location of other gas field infrastructure such as wells and facilities will be selected to take into account potential impacts on private and public infrastructure, and planning will be undertaken in close liaison with all potentially affected landholders and third party infrastructure owners. Proposed control measures will be identified to minimise potential impacts on third party.

6.6 MNES under the EPBC Act

Section 5.1.4.1 identifies the MNES which may or are likely to occur within the Project area (Figure 5.1). Potential impacts to threatened ecological communities and threatened species listed under the EPBC Act are likely to be predominantly associated with vegetation and habitat clearing and associated potential impacts (see Section 6.1.1).

It is unlikely that the Project will impact on the Narran Lakes Ramsar wetland as it is greater than 300 km south of the Project area, however this will be assessed during the EIS. The Project has been referred to the SEWPaC under the EPBC Act for a 'controlled action' decision. An investigation into the potential impacts to MNES will be undertaken as part of the EIS.

7 Environmental management and mitigation measures

7.1 Natural environment

Santos GLNG is committed to undertaking activities associated with the Project in an environmentally responsible manner, and intends to implement best practice environmental management as part of a program of continuous improvement. This will be achieved by addressing issues systematically, consistent with accepted standards and the Santos Environment, Health and Safety Management System (EHSMS) (discussed in Section 7.9).

An important element of this systematic approach will be the application of the GLNG EMS to guide construction, commissioning, operation and emergency response activities.

Project environmental management will apply throughout the life of the Project from design through to planning approval, construction, and operational stages.

7.1.1 Construction stage

The construction phase of the Project involves site clearing, earth and civil works, erection of steel work, installation of machinery and equipment and the integration of management and process systems. During the construction phase, measures will be undertaken to ensure that environmental risks are minimised. Construction materials and practices will be in accordance with relevant Australian and /or international standards.

Santos GLNG will develop and implement a construction phase environmental management plan to achieve the above objectives.

7.1.2 Operational stage

During the operational phase, many aspects of the Project will be undertaken on a continuous 24 hours per day, 365 day per year basis with periodic scheduled shutdowns for routine preventative maintenance. The design approach will incorporate the need to minimise inventories of materials and the minimum use of chemicals and reagents with a high environmental impact. The Project components will employ state of the art technology allowing remote monitoring of well performance and safety aspects thereby reducing the requirement for on-site monitoring by personnel. Noise and emissions control equipment will be installed on major items plant such as compressors, as necessary to ensure noise and air quality limits are achieved at sensitive receptors.

7.1.3 Monitoring

Santos GLNG has established a comprehensive environmental monitoring program to measure and record project-specific environmental performance. The program places emphasis on performance indicators involving vegetation clearing, and the release of contaminants, discharges and incidents. The aim of the program is to confirm that clearing limits and discharges and emissions comply with all relevant environmental approval conditions. Additional activities proposed as part of this project will be incorporated into this program.

Regular environmental audits are undertaken by the proponent. These audits help Santos GLNG assess the efficiency and effectiveness of the operation from an environmental, safety and community perspective and to take appropriate corrective action as necessary.

7.1.4 Decommissioning

The planning of Project decommissioning is yet to be determined at this early stage of the Project development. However, decommissioning will be undertaken in accordance with accepted industry practices, stakeholder and regulatory requirements of the day. Best practice decommissioning, abandonment, remediation and rehabilitation will be addressed in the EIS. Santos GLNG has an approved Remediation, Rehabilitation, Recovery and Monitoring Plan (RRRMP) and it is intended that this document would be updated if/as relevant to address Project decommissioning and rehabilitation activities.

7.2 Built environment

Santos GLNG will undertake effective consultation with stakeholders (including landholders) and will apply accepted industry practices including adoption of management controls to avoid, minimise and/or manage the potential adverse impacts to community amenities, local housing and other social values, state and local roads, rail, and all potentially affected third-party infrastructure, which may result from the field development activities.

A GLNG SIMP Action Plan will be developed as part of the Project for inclusion in the EIS. The Action Plan will address the potential impacts on community amenities within the local townships. Please see Section 7.3 for further information. An Integrated Housing Strategy will also be developed for the Project, in line with the existing GLNG Integrated Housing Strategy (August 2011).

Santos GLNG will undertake transport assessments as part of the EIS and will also prepare later detailed Road Impact Assessments (RIAs) to determine specific impacts of associated project activities on state-controlled roads and local roads under the jurisdiction of the Department of Main Roads and the various local government authorities, respectively. These detailed road impact assessments are undertaken after the EIS during the pre-implementation planning when field development plans have been prepared. The findings of the detailed RIAs will frame the development of appropriately targeted mitigation measures that will be captured in Road Use Management Plan(s) (RUMPs).

The RIAs and RUMPs will be the subject of approval by the DTMR and LGAs before project implementation. GLNG RIAs and RUMP have already been developed for the GLNG Project area and the intent will be extend coverage, where suitable, to address the specific aspects, potential impacts and proposed mitigation in relation to the Project.

7.3 Social impact management plan

A social impact assessment will be undertaken as part of the Project EIS. The already approved and successfully implemented GLNG SIMP will be utilised and an Action Plan developed specific to the Project to outline how the existing SIMP may need to be updated to accommodate the activities proposed as part of the Project. The SIMP has a variety of mitigation measures, and can be viewed at: wwww.dsdip.qld.gov.au/resources/plan/cg/simp/santos-glng-simp.pdf .

Santos GLNG will monitor social impacts associated with the Project and work to resolve any potential issues in consultation with the local community and Project stakeholders. The SIMP allows Santos GLNG to mitigate potentially undesirable social impacts, enhance positive impacts and update the management strategy as the Project progresses.

7.4 Indigenous Cultural heritage management plans

Santos GLNG has approved CHMPs with 11 registered Aboriginal Parties (Bidjara, Gangulu, Karingbal, PCCC (Port Curtis Coral Coast Native Title Claim Group), Iman, Mandandanji, Kairi, Bigambul, Kangoulu, Ghungulu, Barunggam) and two 'no claim' areas (GAP B Murribinbi Native Title Group, GAP E Endorsed Parties) covering the entire area of the gas fields and along the GLNG gas transmission pipeline to Gladstone.

The Project tenements and PSI Area are covered within the approved CHMPs and as such provide an agreed process for the management of indigenous cultural heritage values within the Project area.

7.5 Non-indigenous cultural heritage management

The management of non-indigenous cultural heritage will be in accordance with Santos' EHSMS, which requires cultural heritage clearance to be obtained prior to ground disturbance. Avoidance of places or items of non-indigenous cultural heritage significance will be the main management measure employed. Where such impacts are unavoidable, all statutory approvals will be obtained and measures implemented to minimise the potential impact.

7.6 Greenhouse gas reduction strategy

Santos has a Climate Change Policy and will begin reporting its greenhouse gas emissions through the new Commonwealth greenhouse gas report regime. The Santos Climate Change Policy can be view online at: www.santos.com/library/Santos_climate_change_policy.pdf.

The Joint Venture partners, together GLNG, are committed to reducing greenhouse gas emissions. Santos GLNG has developed the GLNG Greenhouse Gas Reduction Strategy to drive these improvements, which has been approved by the Queensland Government. The Strategy includes the Santos policy on greenhouse gas emissions, an energy efficiency program, a continuous improvement program, better control systems and a CO_2 recovery plan.

7.7 Waste management

Santos GLNG has developed the Eastern Queensland Gas Waste Management Plan for its operations and any gas field development program would be managed in accordance with this plan. The objective of this plan is to ensure operations and waste management practices are carried out in accordance with legislative requirements, Santos GLNG policies, and accepted industry standards and practices to protect identified environmental values relevant to the area. This plan will be adopted for the Project and amended as necessary to include Project-specific management measures, as required.

The waste management hierarchy of avoidance, reduction, reuse, recycling, recovery, treatment and disposal will be adopted.

7.8 Health, safety, hazard and risk

Public and workforce health and safety during both construction and operations are paramount to Santos GLNG. Drawing from expert personnel and the Santos EHSMS, the potential health and safety hazards and risks will be identified and assessed, then will be the subject of substantial planning, organisation and procedural/facility development. The Project will be designed to include spill containment systems, fire protection systems, multiple gas, flame, smoke and low- and high- temperature detectors and alarms, and automatic and manual shutdown systems.

The efficiency and stability of operations will be maximised by the use of a high level of automation, regular preventative maintenance, and safeguards such as backup systems and the capability for safe emergency shutdowns.

Prior to Project commissioning, all personnel will be required to pass an extensive training program to ensure safe operating practices. The training program and subsequent regular refresher programs will involve issues covering operations, hazards, safety and emergency procedures and environmental management.

Santos GLNG operates under an emergency response planning and preparedness framework that includes an Eastern Queensland Emergency Response Plan and upstream contingency plan for emergency environmental incidents.

7.9 Environmental management

In order to comply with the conditions of approval applied to the GLNG Project, Santos GLNG has developed a suite of environmental management plans and procedures associated with existing and proposed activities. These management plans facilitate the proper execution of the preferred management hierarchy (avoid, minimise, manage, remediate, rehabilitate and/or offset) across all of the GLNG Project and form part of the GLNG Environmental Management System (EMS). The GLNG EMS is a project-wide system that describes the requirements for effective environmental and social practices across all GLNG activities and operations. The EMS is developed based on risk, taking into account the legal and other obligations, commitments made by the GLNG Project and the Santos GLNG social licence to operate. The GLNG EMS is an extension of the Santos EHSMS as described in the diagram below (from the Santos EHSMS Guide).

The Santos EHSMS applies to all Santos operations worldwide. The GLNG EMS is specifically designed to address unique features relating to the GLNG Project. Santos GLNG's internal environmental management framework is undertaken in response to, and in parallel with, regulatory requirements. An overview of the environmental management framework is presented below as Figure 7.1. Management of the Project will align with the EHSMS and the GLNG EMS.

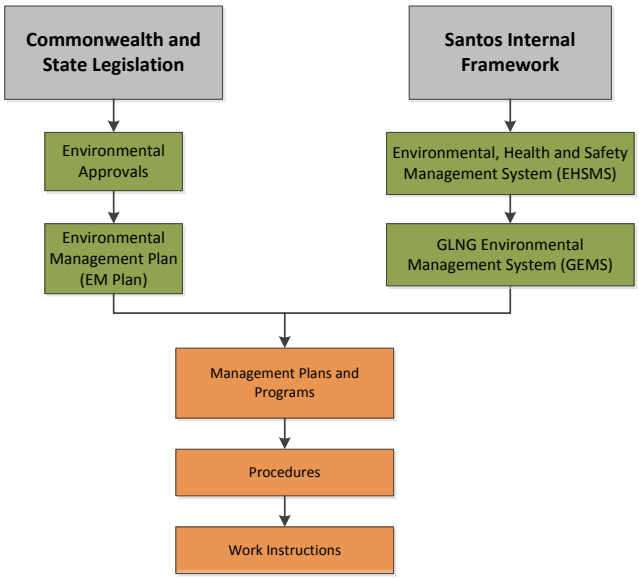

Figure 7.1: Environmental Management Framework

8 Approvals required for the Project

An approvals matrix identifying potential key Commonwealth and State approvals required by the Project is provided in Table 8.1. The approvals list should not be considered exhaustive. A full assessment of likely approvals will be undertaken and the findings presented in the EIS.

The Project has been referred to the Commonwealth Minister of SEWPaC for determination as to whether or not the Project will be a controlled action under the EPBC Act. It is anticipated that the Project will be determined a controlled action requiring assessment and approval under the EPBC Act. Information on the assessment process under the EPBC Act can be accessed at:

http://www.environment.gov.au/epbc/index.html

State legislation and policies that may also apply to the Project, in addition to those identified in Table 8.1, include however are not limited to:

- *Building Act 1975*
- *Coal Mining Safety and Health Act 1999*
- *Electricity Act 1994*
- *Explosives Act 1999*
- *Greenhouse Gas Storage Act 2009*
- *Land Act 1994*
- *Land Protection (Pest and Stock Route Management) Act 2002*
- *Local Government Act 2009*
- *Mineral Resources Act 1989*
- *Soil Conservation Act 1986*
- *Transport Infrastructure Act 1994*
- *Transport Operations (Road Use Management) Act 1995*
- *Water Supply (Safety and Reliability) Act 2008*
- *Work Health and Safety Act 2011.*

Additional approvals may be required under these pieces of legislation depending on the activity being undertaken and the location of that activity. Local government planning schemes and state planning instruments relevant to the Project are identified in Section 5.5.

Santos GLNG Project

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Table 8.1: Potential Approvals for the Project

Potential Approval	Trigger for Approval	Administering authority	Applicability to the Project
Commonwealth legislation			
Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)			
Commonwealth approval for an action which may significantly impact on a matter of national environmental significance (MNES).	The Project has been referred to SEWPaC for determination as to whether or not it will be a controlled action due to potential impacts on MNES.	SEWPaC	The Project has the potential to impact on the following MNES: • Wetlands of international importance (section 16 and 17B) • Listed threatened species and ecological communities (Section 18 and 18A) • Listed migratory species (section 20 and 20A).
National Greenhouse and Energy Reporting Act 2007			
Requirement to report greenhouse gas emissions.	Corporations are required to register and report if they emit greenhouse gas, produce energy or consume energy at or above the annual thresholds specified in the Act.	Greenhouse and Energy Data Officer	No specific approval required. Santos GLNG currently has reporting obligations under the Act for the existing GLNG Project. This will continue and the new tenements included within the reporting.
Native Title Act 1993			
A relevant agreement (Indigenous Land Use Agreement (ILUA) or right to negotiate agreement) with Native Title claimants for future acts.	The Project is located within an area subject to active Native Title claims.	National Native Title Tribunal (NNTT)	The Project is subject to five active, registered Native Title claims. Santos GLNG will continue to work with native title claimants throughout the implementation of the Project including, where required, undertaking a native title process for any new tenements in the Project area.
State legislation - Principal approvals			
State Development and Public Works Organisation Act 1971 (SDPWO Act)			
Significant project declaration	• Proponents of a project with one or	Coordinator-	Santos GLNG believes the Project is suitable to be declared a

Potential Approval	Trigger for Approval	Administering authority	Applicability to the Project
	more particular characteristics may apply to have it declared a 'significant project' by the Coordinator General.	General, Department of State Development, Infrastructure and Planning (DSDIP)	Significant Project due to the significant employment opportunities and the strategic value of the Project to contribute further towards Queensland growing CSG industry – an industry of increasing importance in Queensland for employment, economic growth and future government revenue. Other attributes of the Project, such as the complexity of the assessment to be undertaken and approvals required from local, State and Commonwealth authorities, also indicate the suitability for project declaration under the SDPWO Act.
Environmental Protection Act 1994 (EP Act)			
Environmental Authority (Chapter 5A activity)	The Project involves petroleum activities which require an environmental authority to be issued prior to any activity commencing. Section 310S allows for the amendment of an existing environmental authority.	DEHP	Chapter 5A activities for the Project will require either a new or amended environmental authority (Chapter 5A activity)
Environmentally relevant activities (ERAs)	ERAs are industrial (and agricultural) activities with the potential to release contaminants into the environment.	DEHP	Potential ERAs required on the Project include: • ERA 8 (3)(a) Chemical storage • ERA 9 Gas refining • ERA 14(1) Electricity generation • ERA 15(1) Fuel burning • ERA 16(2)(a) Extractive and screening • ERA 43(1) Concrete batching • ERA 56(2) Regulated waste storage • ERA 58(1) Regulated waste treatment • ERA 60 (1)(d) Waste disposal

Potential Approval	Trigger for Approval	Administering authority	Applicability to the Project
			• ERA 63(1)(a) Sewage treatment • ERA 64(1) Water treatment. Such ERAs are typically authorised under Environmental Authorities for relevant petroleum tenements. Separate applications for approvals to carry out ERAs may be required where such ERAs are proposed to be carried out off-tenement, or are mobile activities. In some instances, contractors conducting certain activities are required to obtain the relevant approvals and hold the registration certificates to carry out such ERAs under the EP Act.
Petroleum and Gas (Production and Safety) Act 2004 (P&G Act) and *Petroleum Act 1923*			
Petroleum Lease (PL)	A PL is required to permit the conduct of specified petroleum activities for the exploration and production of CSG within the defined lease location.	DNRM	Petroleum production activities and the commercial sale of gas. The Project EIS will support the PL applications of Santos GLNG for authorities to prospects (ATPs) 336P, 526P, 631P, 653P, 655P, 665P, 708P, 745P, 803P, 804P and 868P.
Petroleum survey licence (PSL)	A PSL is required to enter lands to survey the proposed route of a transmission pipeline or the suitability of land for a PFL.	DNRM	A PSL will be required to investigate, survey and identify potential transmission pipeline routes, or a likely site for a PFL.
Petroleum Pipeline Licence (PPL)	A PPL is required to permit the construction and operation of a pipeline within a defined easement.	DNRM	PPLs are required for higher-pressure gas transmission pipelines (though some petroleum and water pipelines can be constructed under the authority of, and in the area of, a PL or PLs). Santos GLNG, and other third-parties, operate a numerous gas pipelines under PPLs within the Project area. Some of these PPLs may require amendment to allow for project activities, or alternatively new pipelines may be required to transport gas which would require new

Potential Approval	Trigger for Approval	Administering authority	Applicability to the Project
			PPLs.
Petroleum Facility Licence (PFL)	A PFL is required to permit the construction and operation of a petroleum facility within a defined lease area / easement.	DNRM	A PFL is required for a facility which distils, processes, refines, stores or transports petroleum, other than a distribution pipeline.
Sustainable Planning Act 2009 (SP Act)			
Development approvals may be required for: • Material change of use • Operational works • Building works • Plumbing and drainage works • Reconfiguring a lot	A development approval is required if a development is considered to be assessable development under the SP Act.	DSDIP Relevant local government authority Relevant referral and advice agencies (such as DEHP, DNRM, etc)	Development approvals will be required for any Project activities, located on or off petroleum tenements, which constitute assessable development under the SP Act. Any ancillary development not occurring off tenement will require assessment against the relevant planning scheme (e.g. construction of accommodation facilities, sewage treatment plant, power/communications, utilities off tenement, beneficial use infrastructure).
Native Title (Queensland) Act 1993			
A relevant agreement (Indigenous Land Use Agreement (ILUA) or right to negotiate agreement) with Native Title claimants for future acts.	The Project is located within an area subject to active Native Title claims.	National Native Title Tribunal (NNTT)	The Project is subject to five active, registered Native Title claims. Santos GLNG will continue to work with native title claimants throughout the implementation of the Project including, where required, undertaking a native title process for any new tenements in the Project area.
State legislation – Supporting approvals			
Aboriginal Cultural Heritage Act 2003			
Cultural heritage management plan (CHMP)	A CHMP is required to ensure that matters of Indigenous cultural heritage are protected	DEHP	Santos GLNG has approved Cultural Heritage Management Plans (CHMPs) with 11 registered Aboriginal Parties.

Potential Approval	Trigger for Approval	Administering authority	Applicability to the Project
	and respected.		
Building Act 1975			
No specific approvals required under this Act. It is triggered indirectly through approval requirements generated by the *Sustainable Planning Act 2009*	Under the *Sustainable Planning Act 2009* aspects of the development may require approval for building works assessable against this Act.	Department of Housing and Public Works Relevant LGAs	Ancillary development not defined as a petroleum activity will require assessment against a relevant planning scheme (e.g. construction of off tenement temporary and permanent accommodation facilities).
Fisheries Act 1994			
Development permit (operational works) for waterway barrier works	The establishment of a barrier across a waterway (including partial barrier) may affect fish passage through the waterway.	DEHP	This approval may be required for both on- and off-tenement operational works that are waterway barrier works.
Forestry Act 1959			
Approval for vegetation clearance in a State forest or forest reserve	A permit is required to interfere with any forest products on any State forest, timber reserve or forest entitlement area.	Department of Agriculture, Fisheries and Forestry (DAFF); and Department of National Parks, Recreation, Sport and Racing (DNPRSR)	Vegetation clearing for project activities if required within a State forest or forest reserve.
Use of quarry material by a leaseholder outside of the State land area	A permit is required to extract quarry material and remove the product from a State land area.	DAFF DNPRSR	Quarry material may be used by Santos GLNG (as the leaseholder) provided the quarry material is not removed from the State land area, and is used for the construction of infrastructure authorised under a PL.

Potential Approval	Trigger for Approval	Administering authority	Applicability to the Project
Nature Conservation Act 1992			
Protected animals movement permit	Required if the Project will impact upon a protected animal species listed under the Act or subordinate regulations.	DEHP	All Project activities.
Protected plants clearing permit	Required if the Project will interfere with plant species listed under the Act or relevant subordinate regulations.	DEHP	All Project activities unless an exemption applies.
Wildlife movement permit	Required if the Project will impact upon native wildlife (other than protected wildlife) in an area that is identified under a conservation plan.	DEHP	All Project activities.
Queensland Heritage Act 1992			
Permit to enter a Protected area	A person must not, without reasonable excuse, destroy, damage, excavate or disturb a protected area except in accordance with a permit.	Queensland Heritage Council DEHP	All Project works have potential to interfere or require entry to a protection area.
Strategic Cropping Land Act 2011			
SCL compliance certificate	Any resource activities that will have a permanent or temporary impact on SCL or potential SCL must be assessed under the Act.	DNRM	SCL is mapped throughout the Project area. Where the impact is temporary in nature and relatively low risk of adversely impacting on SCL a compliance certificate can be obtained and the standard conditions applied.
SCL protection decision	Any resource activities that will have a permanent or temporary impact on SCL or potential SCL must be assessed under the	DNRM	SCL is mapped throughout the Project area. Where Santos GLNG does not believe the standard conditions code can be met, an application for a protection decision can be made.

Potential Approval	Trigger for Approval	Administering authority	Applicability to the Project
	Act.		
Validation of decision	Any resource activities that will have a permanent or temporary impact on SCL or potential SCL must be assessed under the Act.	DNRM	SCL is mapped throughout the Project area. A validation decision can be applied for if Santos GLNG contests the SCL trigger mapping.
Vegetation Management Act 1999			
Development permit to clear native vegetation	Approval for the clearing of remnant vegetation on freehold and non-freehold land.	DEHP	A development permit for vegetation clearing under this Act is not required where the clearing is carried out as part of a chapter 5A activity. However, Project activities involving vegetation clearing off petroleum tenement (e.g. accommodation facilities) may require a development permit.
Water Act 2000			
Water licence	(a) Taking and using water from a watercourse, lake, spring or aquifer, or water flowing across the relevant land. (b) Interfering with the flow of water on, under or adjoining any of the relevant land.	DNRM	Taking and interfering with water in the course of carrying out an authorised activity on a petroleum tenement ("associated water") is permitted and regulated by the P&G Act. The P&G Act also permits a petroleum tenure holder to: (a) use associated water to carry out another authorised activity for the tenure; and (b) allow the owner or occupier of land in the area of the tenure, and adjoining land (where it is owned by the same person) to use, on that land, associated water for stock or domestic purposes. In other cases, a water licence may be required for Project activities.
Development permit for operational works (taking or interfering with water)	Taking or interfering with water in specific circumstances.	DNRM	A development permit may be required for Project activities that involve operational work that is the taking or interfering with water.

Potential Approval	Trigger for Approval	Administering authority	Applicability to the Project
Riverine protection permit	Destroy vegetation, excavate, or place fill within a watercourse, lake or spring.	DNRM	A riverine protection permit may be required for Project activities that involve works within a watercourse, lake or spring which occurs off tenement.

9 Costs and benefits summary

The Project will result in consolidating and expanding the committed economic benefits to the local, regional and state economies established as part of the GLNG Project, currently under implementation (as at 2012). The implementation of the Project is likely to result in localised environmental impacts that will be minimised through the implementation of appropriate management measures to the greatest extent practicable. This section briefly outlines the expected costs and benefits.

9.1 Local, state and national economies

The proponent and its Joint Venture partners have already committed to a significant economic investment in the State. The existing GLNG Project, comprising the first stage of gas field development, the gas transmission pipeline to Gladstone and the LNG and export Facility on Curtis Island, has a projected capital investment of $18.5b.

The Project will ensure an ongoing gas supply for the existing GLNG export facilities located at Curtis Island, and potentially to Third Parties, thereby continuing the economic benefits to Australia, Queensland and the local region, through securing capacity to distribute and process state gas resources beyond 2015 and well into the future. As an integral component of the State's CSG to LNG industry, the Project will contribute to economic benefits through increased business investment and Gross State Product (GSP).

The Project represents a significant multi-billion dollar investment. The economic benefits resulting from the Project will have national, state and regional dimensions. The Project will contribute substantial economic benefits to Queensland and Australia, derived from the combination of export income the Project produces; accelerated exploration and reserve booking of the extensive CSG resources; tax and royalty revenue paid by the upstream producers; businesses and individuals employed; and increased spending in local and regional economies.

The Project will provide an avenue to commercialisation of further CSG resources in Eastern Australia, which will expand and diversify existing gas exploration and development, and increase the contribution that the CSG sector makes to the Queensland economy.

Key benefits will include:

- further stimulation of Queensland CSG development
- generation of multiple billions of dollars in revenue (over the life of the Project) from royalties and taxes
- expected increase in Gross Domestic Product (GDP) upon commencing the expansion of upstream CSG field development activities
- an annual increase in exports in excess of a billion dollars during operation
- an increase in Queensland's economic welfare from significant improvements to business investment and GSP
- regional benefits from increased demand for goods and services that will further stimulate business development and employment opportunities.

The Project is predicted to generate significant employment during construction and progressive implementation, and sustain a long-term operational workforce which will be predominantly local. A full economic analysis, including modelling of the impact of the Project on regional, state and national economies, will be completed as part of the EIS.

In summary, the Project will benefit the economy through capital investment, jobs creation, infrastructure development, revenue through royalties and taxes, and a positive trade balance from energy exports.

9.2 Natural and social environments

The Project is expected to have some impact on surrounding environmental values. These impacts are expected to be similar in nature to those identified as part of the GLNG EIS (Santos, 2009a and 2009b), which this project augments. A cursory summary of likely environmental impacts has been presented within this IAS.

It is the intention of the EIS process to investigate the possible impacts and define suitable environmental mitigation strategies to be incorporated into management protocols and plans in support of anticipated approvals. It is the intention of Santos GLNG to rigorously implement mitigation strategies as part of the construction and operation of the Project, as is already the case for the GLNG Project. Where impacts are unavoidable, the intent will be to offset such impacts to land-based and ecological values.

There is significant environmental benefit to utilising LNG as a fuel source for the future. This efficient fuel will help to reduce carbon emissions into the atmosphere and is a proven and solid step forward, as the world transitions to a low carbon economy.

Most of the potential social impacts are anticipated to be positive for the area including economic diversification, population diversification, and increased economic, employment and training opportunities.

Potential adverse impacts may be experienced in terms of housing affordability in the vicinity of the Project, evidence of which can be seen through the implementation of the GLNG Project, in association with other proximate projects. Strategies will be developed through the EIS process to avoid or mitigate against social impacts.

10 Community and stakeholder engagement

10.1 Approach to community engagement

Santos GLNG's vision is to be a valued and valuable member of the communities in which it operates and to be recognised as a company that conducts activities in a manner that sustains and enhances its social licence to operate. To achieve this, Santos GLNG embeds the following four key principles into its approach to the community (Figure 10.1).

Figure 10.1: Social licence to operate key principles

The four key principles can be summarised as follows:

- Information and Communication: a high level of transparency and information communication to community members and stakeholders
- Community Engagement and Participation: Outstanding performance in all engagement activities
- Actions Align with Values: actions taken by Santos employees and contractors align with the company's core values
- Mitigate and Manage Impacts: in order of preference, potential impacts are avoided, minimised, mitigated, remediated, or offset.

10.2 Community consultation

Communities impacted by the Project will be consulted and engaged through a variety of mechanisms. These include engagement processes established through Santos GLNG's longstanding operations in the region, and those recently established as part of the existing GLNG Project, which will continue for the life of the GLNG Project.

It is intended that wherever practical and appropriate, engagement activities for the Project will be coordinated with, and incorporated into, engagement activities planned for the GLNG Project. This approach recognises the significant synergies between the projects and aims to minimise consultation fatigue. Furthermore, a coordinated approach will promote a better understanding of the range of Santos GLNG's activities in the communities where Santos operates.

Free-call service (1800 761 113)

Santos GLNG provides a free-call service which is staffed during business hours by community engagement officers. All enquiries are registered and responded to within 48 hours.

Website

The websites listed below will provide quick access to information about the Project. There will be links to the latest facts sheets and an email address to request further information about the Project.

- www.glng.com.au
- www.santos.com

Community newsletters and fact sheets

Santos GLNG will produce a community newsletter to inform of Project progress. Newsletters are distributed through local newspapers, direct mail or email. A range of fact sheets covering key topics of interest will also be made available.

Community shopfronts

Santos GLNG has a regional community shopfront located at 80 McDowall Street, Roma that is open for community access, five days a week during business hours.

Targeted stakeholder briefings

Santos GLNG will provide tailored project briefings targeting the key issues raised by key stakeholders.

Community information sessions

Santos GLNG will hold regular public information sessions in the communities potentially affected by the Project.

Issue specific workshops

Santos GLNG is committed to working in collaboration with its industry colleagues, local and state governments, peak bodies, special interest groups and the general community.

Site tours

Santos GLNG regularly conducts site tours for special interest groups and members of the community. Site tours aim to inform the participants of Santos GLNG activities, provide participants the opportunity to ask questions about the Project, and importantly demonstrate transparency of the operations.

10.3 Community Engagement Objectives

The objectives of the Community Engagement programs are to:

a) identify key stakeholders and opinion leaders

b) communicate information about the key aspects of the proposed Project

c) provide feedback pathways for the community to raise issues or concerns, or identify opportunities for the community to benefit from the Project

d) appropriately address feedback received through these engagement activities

e) establish and build trust within the communities that may be impacted by the Project.

Underpinning these objectives is Santos GLNG's commitment to effectively mitigating potentially negative impacts while actively promoting positive change, sustainable social outcomes and economic benefits for local communities.

10.4 Key Stakeholder Groups

Stakeholder engagement is an integral part of Santos GLNG's project development process. Stakeholders will be identified in accordance with the Santos GLNG Stakeholder Engagement Strategy. The key stakeholder groups that are expected to be approached for consultation on the Project include:

- landholders
- Aboriginal groups
- general community
- local and state government agencies
- social service groups
- peak body associations
- special interest groups
- members of Parliament.

11 References and data sources

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12 Glossary, acronyms and abbreviations

Term	Definition
ATP	Authorities to Prospect (Queensland, under the P&G Act)
C	Celsius
CHMP	Cultural Heritage Management Plan
CO	Carbon Monoxide
CO_2	Carbon Dioxide
CSG	Coal Seam Gas
DAFF	Department of Agriculture, Fisheries and Forestry (Queensland)
DEHP	Department of Environment and Heritage Protection (Queensland), formerly the Department of Environment and Resource Management (DERM)
DNRM	Department of Natural Resources and Mines (Queensland)
DNPRSR	Department of National Parks, Recreation, Sport and Racing (Queensland)
DSDIP	Department of State Development, Infrastructure and Planning (Queensland)
DTMR	Department of Transport and Main Roads (Queensland)
EHSMS	Santos' Environmental Health and Safety Management System
EIS	Environmental Impact Statement
EMP	Environmental Management Plan
EMS	Environmental Management System
EP Act	*Environmental Protection Act 1994* (Queensland)
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999* (Commonwealth)
ERA	Environmentally Relevant Activity (Queensland, under EP Act)
ESAs	Environmentally Sensitive Areas (Queensland, under various State legislation)
FEED	Front-end engineering and design
GLNG	Gladstone Liquefied Natural Gas
GTP	Gas Transmission Pipeline
ha	Hectares
IAS	Initial Advice Statement
ILUA	Indigenous Land Use Agreement
km	Kilometres
KOGAS	Korean Gas Corporation
LGA	Local Government Area
LNG	Liquefied Natural Gas
m	Metres
mm	Millimetres

Mtpa	Million Tonnes Per Annum
NC Act	*Nature Conservation Act 1992* (Queensland)
NNTT	National Native Title Tribunal
MNES	Matters of National Environmental Significance (Commonwealth, under the EPBC Act)
NOx	Nitrogen Oxides
P&G Act	*Petroleum and Gas (Production and Safety) Act 2004* (Queensland)
PETRONAS	Petroliam Nasional Berhad
PJ	Petajoules
PFL	Petroleum Facility Licence (Queensland, under the P&G Act)
PL	Petroleum Lease (Queensland, under the P&G Act)
PPL	Petroleum Pipeline Licence (Queensland, under the P&G Act)
the GLNG Project	Santos Gladstone Liquefied Natural Gas Project (subject to approval in 2010)
the Project	Santos GLNG Gas Field Development Project (the subject of this IAS)
PSI Area	Possible Supporting Infrastructure Area (as illustrated on Figure 1.2)
PSL	Petroleum Survey Licence (Queensland, under the P&G Act)
RE	Regional Ecosystem (Queensland, under the VM Act)
RIA	Road Impact Assessment
RUMP	Road Use Management Plan
Santos GLNG	The proponent for the Project, Santos Limited (as the operator) is herein referred to as Santos GLNG, and is undertaking the Project on behalf of the Joint Venture arrangement between Santos, PETRONAS, Total and KOGAS.
SCL	Strategic Cropping Land (Queensland, under the *Strategic Cropping Land Act 2011*)
SDPWO Act	*State Development and Public Works Organisation Act 1971* (Queensland)
SDPWO Regulation	*State Development and Public Works Organisation Regulation 1999* (Queensland)
SEWPaC	Department of Sustainability, Environment, Water, Population and Communities (Commonwealth)
SIMP	Social Impact Management Plan
SP Act	*Sustainable Planning Act 2009* (Queensland)
SPP	State Planning Policy (Queensland)
SO_2	Sulphur dioxide
VM Act	*Vegetation Management Act 1999* (Queensland)
VOCs	Volatile Organic Compounds

Appendix A

EPBC Act Protected Matters Report for an area encompassing the Project

Australian Government

Department of Sustainability, Environment, Water, Population and Communities

EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected.

Information on the coverage of this report and qualifications on data supporting this report are contained in the caveat at the end of the report.

Information is available about Environment Assessments and the EPBC Act including significance guidelines, forms and application process details.

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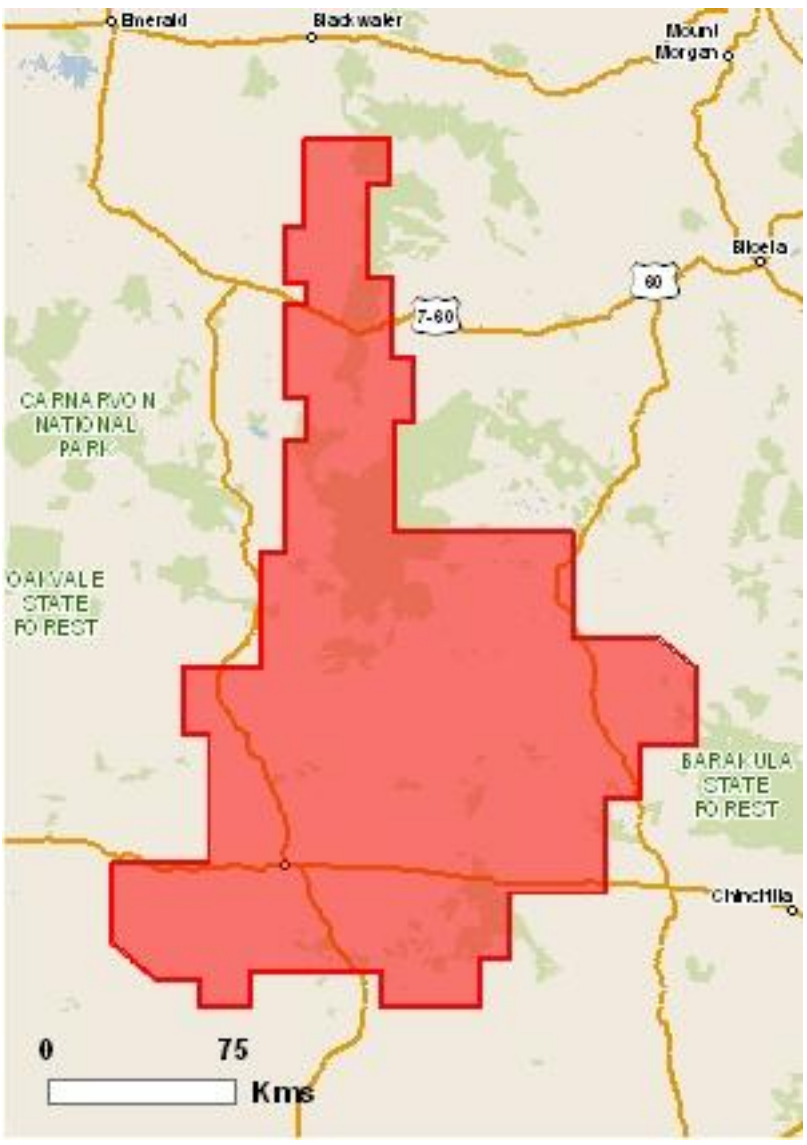

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Coordinates

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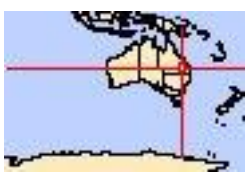

Summary

Matters of National Environmental Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the Administrative Guidelines on Significance.

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance:	1
Great Barrier Reef Marine Park:	None
Commonwealth Marine Areas:	None
Listed Threatened Ecological Communities:	7
Listed Threatened Species:	40
Listed Migratory Species:	13

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place and the heritage values of a place on the Register of the National Estate.

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

A permit may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

Commonwealth Land:	1
Commonwealth Heritage Places:	None
Listed Marine Species:	13
Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves:	None

Extra Information

This part of the report provides information that may also be relevant to the area you have nominated.

Place on the RNE:	16
State and Territory Reserves:	8
Regional Forest Agreements:	None
Invasive Species:	14
Nationally Important Wetlands:	1
Key Ecological Features (Marine)	None

Details

Matters of National Environmental Significance

Wetlands of International Importance (RAMSAR) [Resource Information]

Name	Proximity
Narran lake nature reserve	Upstream from Ramsar

Listed Threatened Ecological Communities [Resource Information]

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Name	Status	Type of Presence
Brigalow (Acacia harpophylla dominant and co-dominant)	Endangered	Community known to occur within area
Coolibah - Black Box Woodlands of the Darling Riverine Plains and the Brigalow Belt South Bioregions	Endangered	Community likely to occur within area
Natural Grasslands of the Queensland Central Highlands and the northern Fitzroy Basin	Endangered	Community likely to occur within area
Semi-evergreen vine thickets of the Brigalow Belt (North and South) and Nandewar Bioregions	Endangered	Community likely to occur within area
The community of native species dependent on natural discharge of groundwater from the Great Artesian Basin	Endangered	Community likely to occur within area
Weeping Myall Woodlands	Endangered	Community likely to occur within area
White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland	Critically Endangered	Community may occur within area

Listed Threatened Species [Resource Information]

Name	Status	Type of Presence
Birds		
Botaurus poiciloptilus Australasian Bittern [1001]	Endangered	Species or species habitat may occur within area
Erythrotriorchis radiatus Red Goshawk [942]	Vulnerable	Species or species habitat likely to occur within area
Geophaps scripta scripta Squatter Pigeon (southern) [64440]	Vulnerable	Species or species habitat known to occur within area
Lathamus discolor Swift Parrot [744]	Endangered	Species or species

Name	Status	Type of Presence
		habitat may occur within area
Neochmia ruficauda ruficauda		
Star Finch (eastern), Star Finch (southern) [26027]	Endangered	Species or species habitat likely to occur within area
Poephila cincta cincta		
Black-throated Finch (southern) [64447]	Endangered	Species or species habitat may occur within area
Polytelis swainsonii		
Superb Parrot [738]	Vulnerable	Species or species habitat may occur within area
Rostratula australis		
Australian Painted Snipe [77037]	Vulnerable	Species or species habitat likely to occur within area
Turnix melanogaster		
Black-breasted Button-quail [923]	Vulnerable	Species or species habitat likely to occur within area
Fish		
Maccullochella peelii		
Murray Cod [66633]	Vulnerable	Species or species habitat may occur within area
Mammals		
Chalinolobus dwyeri		
Large-eared Pied Bat, Large Pied Bat [183]	Vulnerable	Species or species habitat may occur within area
Dasyurus hallucatus		
Northern Quoll [331]	Endangered	Species or species habitat known to occur within area
Nyctophilus corbeni		
South-eastern Long-eared Bat [83395]	Vulnerable	Species or species habitat may occur within area
Petrogale penicillata		
Brush-tailed Rock-wallaby [225]	Vulnerable	Species or species habitat may occur within area
Phascolarctos cinereus (combined populations of Qld, NSW and the ACT)		
Koala (combined populations of Queensland, New South Wales and the Australian Capital Territory) [85104]	Vulnerable	Species or species habitat known to occur within area
Other		
Macrozamia fearnsidei		
[55405]	Vulnerable	Species or species habitat likely to occur within area
Macrozamia platyrhachis		
[3412]	Endangered	Species or species habitat likely to occur within area
Plants		
Acacia curranii		
Curly-bark Wattle [3908]	Vulnerable	Species or species habitat likely to occur within area
Acacia wardellii		
[3916]	Vulnerable	Species or species habitat may occur within area
Aristida annua		
[17906]	Vulnerable	Species or species habitat likely to occur within area
Arthraxon hispidus		
Hairy-joint Grass [9338]	Vulnerable	Species or species habitat may occur within

Name	Status	Type of Presence
		area
Cadellia pentastylis Ooline [9828]	Vulnerable	Species or species habitat likely to occur within area
Calytrix gurulmundensis [24241]	Vulnerable	Species or species habitat likely to occur within area
Commersonia argentea a shrub [82761]	Vulnerable	Species or species habitat likely to occur within area
Daviesia discolor [3567]	Vulnerable	Species or species habitat likely to occur within area
Dichanthium queenslandicum King Blue-grass [5481]	Vulnerable	Species or species habitat likely to occur within area
Digitaria porrecta Finger Panic Grass [12768]	Endangered	Species or species habitat likely to occur within area
Eriocaulon carsonii Salt Pipewort, Button Grass [10584]	Endangered	Species or species habitat likely to occur within area
Homopholis belsonii [2406]	Vulnerable	Species or species habitat may occur within area
Homoranthus decumbens [55186]	Vulnerable	Species or species habitat known to occur within area
Phaius australis Lesser Swamp-orchid [5872]	Endangered	Species or species habitat likely to occur within area
Pterostylis cobarensis Cobar Greenhood Orchid [12993]	Vulnerable	Species or species habitat likely to occur within area
Swainsona murrayana Slender Darling-pea, Slender Swainson, Murray Swainson-pea [6765]	Vulnerable	Species or species habitat likely to occur within area
Tylophora linearis [55231]	Endangered	Species or species habitat may occur within area
Reptiles		
Delma torquata Collared Delma [1656]	Vulnerable	Species or species habitat known to occur within area
Denisonia maculata Ornamental Snake [1193]	Vulnerable	Species or species habitat likely to occur within area
Egernia rugosa Yakka Skink [1420]	Vulnerable	Species or species habitat known to occur within area
Furina dunmalli Dunmall's Snake [59254]	Vulnerable	Species or species habitat known to occur within area
Paradelma orientalis Brigalow Scaly-foot [59134]	Vulnerable	Species or species habitat known to occur

Name	Status	Type of Presence
		within area
Rheodytes leukops		
Fitzroy River Turtle, Fitzroy Tortoise, Fitzroy Turtle [1761]	Vulnerable	Species or species habitat may occur within area

Listed Migratory Species [Resource Information]

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
Migratory Marine Birds		
Apus pacificus		
Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardea alba		
Great Egret, White Egret [59541]		Species or species habitat may occur within area
Ardea ibis		
Cattle Egret [59542]		Species or species habitat may occur within area
Migratory Terrestrial Species		
Haliaeetus leucogaster		
White-bellied Sea-Eagle [943]		Species or species habitat likely to occur within area
Hirundapus caudacutus		
White-throated Needletail [682]		Species or species habitat likely to occur within area
Merops ornatus		
Rainbow Bee-eater [670]		Species or species habitat may occur within area
Monarcha melanopsis		
Black-faced Monarch [609]		Species or species habitat likely to occur within area
Myiagra cyanoleuca		
Satin Flycatcher [612]		Species or species habitat known to occur within area
Rhipidura rufifrons		
Rufous Fantail [592]		Species or species habitat known to occur within area
Migratory Wetlands Species		
Ardea alba		
Great Egret, White Egret [59541]		Species or species habitat may occur within area
Ardea ibis		
Cattle Egret [59542]		Species or species habitat may occur within area
Gallinago hardwickii		
Latham's Snipe, Japanese Snipe [863]		Species or species habitat may occur within area
Rostratula benghalensis (sensu lato)		
Painted Snipe [889]	Vulnerable*	Species or species habitat likely to occur within area

Other Matters Protected by the EPBC Act

Commonwealth Land [Resource Information]

The Commonwealth area listed below may indicate the presence of Commonwealth land in this vicinity. Due to the unreliability of the data source, all proposals should be checked as to whether it impacts on a Commonwealth area, before making a definitive decision. Contact the State or Territory government land department for further information.

Name
Defence - ROMA TRAINING DEPOT

Listed Marine Species [Resource Information]

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
Birds		
Anseranas semipalmata Magpie Goose [978]		Species or species habitat may occur within area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardea alba Great Egret, White Egret [59541]		Species or species habitat may occur within area
Ardea ibis Cattle Egret [59542]		Species or species habitat may occur within area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Species or species habitat may occur within area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat likely to occur within area
Hirundapus caudacutus White-throated Needletail [682]		Species or species habitat likely to occur within area
Lathamus discolor Swift Parrot [744]	Endangered	Species or species habitat may occur within area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area
Monarcha melanopsis Black-faced Monarch [609]		Species or species habitat likely to occur within area
Myiagra cyanoleuca Satin Flycatcher [612]		Species or species habitat known to occur within area
Rhipidura rufifrons Rufous Fantail [592]		Species or species habitat known to occur within area
Rostratula benghalensis (sensu lato) Painted Snipe [889]	Vulnerable*	Species or species habitat likely to occur within area

Extra Information

Places on the RNE [Resource Information]

Note that not all Indigenous sites may be listed.

Name	State	Status
Natural		
Barakula State Forest Area	QLD	Indicative Place
Carraba Environmental Park	QLD	Indicative Place
Central Highlands Region	QLD	Indicative Place
Blackdown Tableland Area	QLD	Registered
Brigalow Invertebrate Site	QLD	Registered
Expedition Range Area	QLD	Registered
Lonesome National Park	QLD	Registered
Palmgrove Fauna Reserve	QLD	Registered
Robinson Gorge National Park (former)	QLD	Registered
Historic		
Ace Drapers	QLD	Indicative Place
Hibernian Hall	QLD	Indicative Place
Hornet Bank Homestead	QLD	Indicative Place
Ladbrooks Butchery	QLD	Indicative Place
Mount Abundance Homestead	QLD	Indicative Place
Romavilla Winery	QLD	Indicative Place
Roma War Memorial and Heroes Avenue	QLD	Registered

State and Territory Reserves [Resource Information]

Name	State
Blackdown Tableland	QLD
Carraba	QLD
Expedition	QLD
Expedition (Limited Depth)	QLD
Lake Murphy	QLD
Moorabinda	QLD
Palmgrove (Scientific)	QLD
Stones Country	QLD

Invasive Species [Resource Information]

Weeds reported here are the 20 species of national significance (WoNS), along with other introduced plants that are considered by the States and Territories to pose a particularly significant threat to biodiversity. The following feral animals are reported: Goat, Red Fox, Cat, Rabbit, Pig, Water Buffalo and Cane Toad. Maps from Landscape Health Project, National Land and Water Resouces Audit, 2001.

Name	Status	Type of Presence
Frogs		
Bufo marinus Cane Toad [1772]		Species or species habitat likely to occur within area
Mammals		
Capra hircus Goat [2]		Species or species habitat likely to occur within area

Name	Status	Type of Presence
Felis catus Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
Oryctolagus cuniculus Rabbit, European Rabbit [128]		Species or species habitat likely to occur within area
Sus scrofa Pig [6]		Species or species habitat likely to occur within area
Vulpes vulpes Red Fox, Fox [18]		Species or species habitat likely to occur within area
Plants		
Acacia nilotica subsp. indica Prickly Acacia [6196]		Species or species habitat may occur within area
Cenchrus ciliaris Buffel-grass, Black Buffel-grass [20213]		Species or species habitat likely to occur within area
Cryptostegia grandiflora Rubber Vine, Rubbervine, India Rubber Vine, India Rubbervine, Palay Rubbervine, Purple Allamanda [18913]		Species or species habitat likely to occur within area
Hymenachne amplexicaulis Hymenachne, Olive Hymenachne, Water Stargrass, West Indian Grass, West Indian Marsh Grass [31754]		Species or species habitat likely to occur within area
Lantana camara Lantana, Common Lantana, Kamara Lantana, Large-leaf Lantana, Pink Flowered Lantana, Red Flowered Lantana, Red-Flowered Sage, White Sage, Wild Sage [10892]		Species or species habitat likely to occur within area
Parkinsonia aculeata Parkinsonia, Jerusalem Thorn, Jelly Bean Tree, Horse Bean [12301]		Species or species habitat likely to occur within area
Parthenium hysterophorus Parthenium Weed, Bitter Weed, Carrot Grass, False Ragweed [19566]		Species or species habitat likely to occur within area
Prosopis spp. Mesquite, Algaroba [68407]		Species or species habitat likely to occur within area

Nationally Important Wetlands	[Resource Information]
Name	State
Palm Tree and Robinson Creeks	QLD

Coordinates

-23.9474 148.86041,-23.9474 149.1595,-24.10611 149.1595,-24.10611 149.08354,-24.44927
149.08354,-24.44927 149.16899,-24.74096 149.16899,-24.74096 149.24495,-24.95973
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150.06151,-26.3238 150.06151,-26.3238 149.93807,-26.66696 149.93807,-26.66696
149.59151,-26.90717 149.59151,-26.90717 149.48232,-27.07863 149.48232,-27.07863
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148.48061,-26.98009 148.48061,-26.98009 148.32012,-26.84833 148.16253,-26.5683
148.16253,-26.5683 148.51384,-26.09216 148.51384,-26.09216 148.42364,-25.86053
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148.78445,-24.26911 148.86041,-23.9474 148.86041

Caveat

The information presented in this report has been provided by a range of data sources as acknowledged at the end of the report. This report is designed to assist in identifying the locations of places, which may be relevant in determining obligations under the Environment Protection and Biodiversity Conservation Act 1999. It holds mapped locations of World Heritage and Register of National Estate properties. Wetlands of International Importance Commonwealth and State Territory reserves listed threatened migratory and marine species and listed threatened ecological communities. Mapping of Commonwealth land is not complete at this stage. Maps have been collated from a range of sources at various resolutions.

Not all species listed under the EPBC Act have been mapped (see below) and therefore a report is a general guide only. Where available data supports mapping, the type of presence that can be determined from the data is indicated in general terms. People using this information in making a referral may need to consider the qualifications below and may need to seek and consider other information sources.

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

For species where the distributions are well known, maps are digitised from sources such as recovery plans and detailed habitat studies. Where appropriate, core breeding, foraging and roosting areas are indicated under 'type of presence'. For species whose distributions are less well known, point locations are collated from government wildlife authorities, museums, and non-government organisations; bioclimatic
distribution models are generated and these validated by experts. In some cases, the distribution maps are based solely on expert knowledge.

Only selected species covered by the following provisions of the EPBC Act have been mapped:

- migratory and
- marine

The following species and ecological communities have not been mapped and do not appear in reports produced from this database:

- threatened species listed as extinct or considered as vagrants
- some species and ecological communities that have only recently been listed
- some terrestrial species that overfly the Commonwealth marine area
- migratory species that are very widespread, vagrant, or only occur in small numbers

The following groups have been mapped, but may not cover the complete distribution of the species:

- non-threatened seabirds which have only been mapped for recorded breeding sites
- seals which have only been mapped for breeding sites near the Australian continent

Such breeding sites may be important for the protection of the Commonwealth Marine environment.

Acknowledgements

This database has been compiled from a range of data sources. The department acknowledges the following custodians who have contributed valuable data and advice:

-Department of Environment, Climate Change and Water, New South Wales
-Department of Sustainability and Environment, Victoria
-Department of Primary Industries, Parks, Water and Environment, Tasmania
-Department of Environment and Natural Resources, South Australia
-Parks and Wildlife Service NT, NT Dept of Natural Resources, Environment and the Arts
-Environmental and Resource Management, Queensland
-Department of Environment and Conservation, Western Australia
-Department of the Environment, Climate Change, Energy and Water
-Birds Australia
-Australian Bird and Bat Banding Scheme
-Australian National Wildlife Collection
-Natural history museums of Australia
-Museum Victoria
-Australian Museum
-SA Museum
-Queensland Museum
-Online Zoological Collections of Australian Museums
-Queensland Herbarium
-National Herbarium of NSW
-Royal Botanic Gardens and National Herbarium of Victoria
-Tasmanian Herbarium
-State Herbarium of South Australia
-Northern Territory Herbarium
-Western Australian Herbarium
-Australian National Herbarium, Atherton and Canberra
-University of New England
-Ocean Biogeographic Information System
-Australian Government, Department of Defence
-State Forests of NSW
-Geoscience Australia
-CSIRO
-Other groups and individuals

The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Please feel free to provide feedback via the Contact Us page.

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