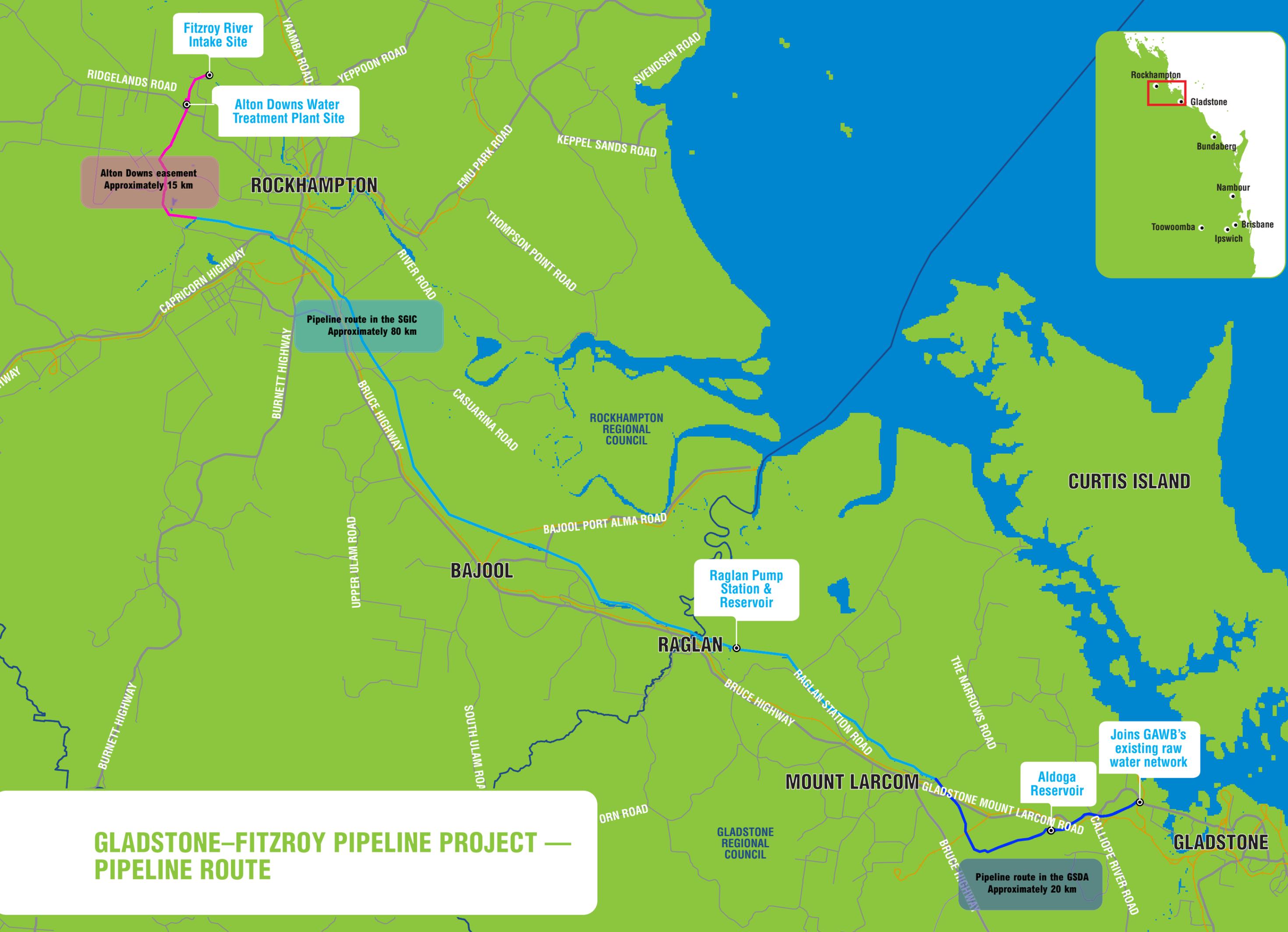


GLADSTONE – FITZROY
PIPELINE PROJECT
Environmental Impact Statement

Summary of
Major Findings



Gladstone Area
Water Board



Fitzroy River Intake Site

Alton Downs Water Treatment Plant Site

Alton Downs easement
Approximately 15 km

Pipeline route in the SGIC
Approximately 80 km

Raglan Pump Station & Reservoir

Joins GAWB's existing raw water network

Aldoga Reservoir

Pipeline route in the GSDA
Approximately 20 km



GLADSTONE-FITZROY PIPELINE PROJECT — PIPELINE ROUTE

ROCKHAMPTON

ROCKHAMPTON REGIONAL COUNCIL

BAJOOL

RAGLAN

MOUNT LARCOM

GLADSTONE REGIONAL COUNCIL

GLADSTONE

CURTIS ISLAND

RIDGELANDS ROAD

YAMBA ROAD

YEPPOON ROAD

SVENDSEN ROAD

KEPPEL SANDS ROAD

EMU PARK ROAD

THOMPSON POINT ROAD

CAPRICORN HIGHWAY

RIVER ROAD

BURNETT HIGHWAY

BRUCE HIGHWAY

CASUARINA ROAD

BAJOOL PORT ALMA ROAD

UPPER ULAM ROAD

SOUTH ULAM ROAD

BRUCE HIGHWAY

RAGLAN STATION ROAD

THE NARROWS ROAD

BURNETT HIGHWAY

ORN ROAD

BRUCE HIGHWAY

GLADSTONE MOUNT LARCOM ROAD

CALLIOPE RIVER ROAD

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This information has been prepared by, or on behalf of, the Gladstone Area Water Board (GAWB) regarding the Gladstone-Fitzroy Pipeline Project. Care has been taken to ensure that the information is accurate and up to date at the time of publishing.





Terms and Abbreviations Used in this Document

Term	Definition
ABS	Australian Bureau of Statistics
AHD	Australian Height Datum
Air NEPM	National Environment Protection (Ambient Air Quality) Measure
ANZECC	Australian and New Zealand Environment and Conservation Council
ASS	Acid Sulphate Soils
Board	Board of Directors
CEMP	Construction Environmental Management Plan
CHMP	Cultural Heritage Management Plan
CLR	Contaminated Land Register
QCRWSS	Central Queensland Regional Water Supply Strategy
CSS	Contingent Supply Strategy
DEWHA	Department of Environment, Water, Heritage and the Arts
DIP	Queensland Department of Infrastructure and Planning
DNRW	Queensland Department of Natural Resources and Water
Ecoaccess PNGG	The Ecoaccess: Planning for Noise Control Guideline 2004
EIS	Environmental Impact Statement
EMP	Environmental Management Plan
EMR	Environmental Management Register
EPA	Queensland Environmental Protection Agency
EAP	Emergency Action Plan
EPBC Act	Commonwealth <i>Environment Protection Biodiversity Conservation Act 1999</i>
EPP (Air)	<i>Environmental Protection (Air) Policy 1997</i>
GAWB	Gladstone Area Water Board
GQAL	Good Quality Agricultural Land
GRP	Glass reinforced plastic
GSDA	Gladstone State Development Area
HNFY	Historic No Failure Yield
HRA	Hazard and Risk Assessment
IP Act	<i>Integrated Planning Act 1997</i>
KRA	Key Resource Area
LGA	Local Government Area

ML	Megalitres
MSCL	Mild steel cement lined
NC Act	<i>Nature Conservation Act 1992</i>
NCL	North Coast Railway Line
NES	National Environmental Significance
NTA	<i>Native Title Act 1993</i>
NWI	National Water Initiative
OEMP	Operation Environmental Management Plan
PCCC	Port Curtis Coral Coast
Program of Works	Program of Works – Statewide Water Grid – Regional Water Infrastructure projects
QAL	Queensland Alumina Ltd
QCA	Queensland Competition Authority
QEPR	Environmental Protection Regulation
QPWS	Queensland Parks and Wildlife Service
QWQG	Queensland Water Quality Guidelines
Ramsar	The Ramsar Convention on Wetlands - an intergovernmental treaty which provides the framework for national action and international cooperation for the conservation and wise use of wetlands and their resources
RE	Regional Ecosystem
REDD	Regional Ecosystem Description Database
Residue	Term used to describe sludge in the EIS
ROP	Resource Operations Plan
ROW	Right-of-way
SCADA	Supervisory Control and Data Acquisition
SDA	State Development Area
SDPWO Act	<i>State Development and Public Works Organisation Act 1971</i>
SGIC	Stanwell Gladstone Infrastructure Corridor
SPeAR®	Sustainable Project Appraisal Routine
SPP	State Planning Policy
SWP	Strategic Water Plan
The Project	Gladstone-Fitzroy Pipeline Project
ToR	Terms of Reference
VM Act	<i>Vegetation Management Act 1999</i>
WRP	Water Resource Plan (e.g. Fitzroy Basin WRP)
WTP	Water Treatment Plant
ZVI	Zone of Visual Influence

Introduction

The Gladstone Area Water (GAWB) is planning for the future water needs of the Gladstone region by preparing plans to secure water within a suitable time frame if and when additional water supply is required.

As part of this forward planning, GAWB has prepared an Environmental Impact Statement (EIS) for the Gladstone-Fitzroy Pipeline project. GAWB is carrying out preparations for the project to ensure that the pipeline and its associated infrastructure can be constructed within two years as soon as increased demand or low dam levels triggers the need.

As an additional source of water for GAWB, the project will be capable of extracting up to 30,000 megalitres (ML) of water each year (to a maximum of 100 ML per day) from the Fitzroy River at Laurel Bank. Project works include:

- An underground pipeline approximately 115 km long from Laurel Bank near Rockhampton to a connection with GAWB's existing infrastructure near Yarwun just north of Gladstone.
- An intake and pump station on the Fitzroy River at Laurel Bank.
- A water treatment plant (WTP), reservoir and pump station at Alton Downs.
- A booster pump station and reservoir at Raglan.
- A reservoir at Aldoga.

The EIS has been prepared in parallel with the design phase of the project, enabling environmental considerations to be included in the design (e.g. creek crossing methods) and design aspects to be considered in the assessment of impacts. Information available up to and including 31 May 2008 has been used in the EIS. Some additional information made available after this date has also been included in the EIS.

About this Summary of Major Findings

This summary has been prepared as an overview of the key environmental, social and economic findings contained in the EIS. For a full description of the findings, it is important to view the complete EIS.

Each section in this summary reflects the structure of chapters in the EIS. Most sections in this document summarise existing conditions, potential impacts and mitigation measures, before summarising the residual impacts. The significance criteria listed in the table below have been used to describe the residual impact related to the project in this summary document and in the EIS.

Throughout the EIS, the project area assessed has been divided into two sections for ease of description, namely Fitzroy to Bajool and Bajool to Gladstone.

Significance criteria used to assess project impacts

Significance	Criteria
Major Adverse	Only adverse effects are assigned this level of importance as they represent key factors in the decision-making process. These effects are generally, but not exclusively, associated with sites and features of national importance. A change in a national or state scale site or feature may also enter this category. Typically mitigation measures are unlikely to remove such effects.
High Adverse	These effects are likely to be important considerations at a state scale but, if adverse, are potential concerns to the project, depending upon the relative importance attached to the issue during the decision-making process. Mitigation measures and detailed design for construction are unlikely to remove all of the effects on the affected communities or interests. Effects can be beneficial as well as adverse.
Moderate Adverse	These effects, if adverse, while important at a regional scale, are not likely to be key decision-making issues. Nevertheless, the cumulative effects of such issues may lead to an increase in the overall effects on a particular area or particular resource. They represent issues where effects will be experienced but mitigation measures and detailed design for construction may ameliorate/enhance some of the consequences upon affected communities or interests. Some residual effects will still arise. Effects can be beneficial as well as adverse.
Minor Adverse	These effects may be raised as local issues, but are unlikely to be of importance in the decision-making process. Nevertheless, they are of relevance in enhancing the subsequent design of the project and consideration of mitigation or compensation measures. Effects can be beneficial as well as adverse.
Negligible	No effects or those which are beneath levels of perception, within normal bounds of variation within the margin of forecasting error.
Beneficial	The effects of a project can also be beneficial – using the same scale minor, moderate and major.

The Environmental Impact Statement

In 2007 the project was declared a significant project requiring an EIS under the *Queensland State Development and Public Works Organisation Act 1971* (SDPWO Act). See the diagram below for a flowchart showing the EIS process.

The project was also declared a 'controlled action' under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) for potential impacts on matters of National Environmental Significance (NES). The controlling provision under the EPBC Act is Listed Threatened Species and Communities, and for the purposes of this project include:

Fauna

- Yellow Chat (*Epthianura crocea macgregorii*).
- Fitzroy Tortoise (*Rheodytes leukops*).
- Brigalow Scaly Foot (*Paradelma orientalis*).
- Squatter Pigeon (*Geophaps scripta scripta*).
- Yakka Skink (*Egernia rugosa*).

Flora

- Semi evergreen vine thickets of the Brigalow belt.
- Brigalow (*Acacia harpophylla* dominant and co-dominant).
- White wood (*Atalaya collina*).
- *Cycas megacarpa*.
- *Cycas ophiolitica*.
- *Quassia bidwillii*.

The Australian Government has accredited the EIS process to be conducted under the SDPWO Act under the bilateral agreement between the Australian and Queensland Governments. The project will require approval from the Australian Government's Minister for the Environment, Water, Heritage and the Arts (DEWHA) under Part 9 of the EPBC Act before it can proceed.

The EIS has been prepared in accordance with the requirements of the Terms of Reference (ToR) for the project. The ToR was prepared by the Department of Infrastructure and Planning (DIP) under Part 4 of the Queensland SDPWO Act. The ToR was finalised in October 2007 following the required 30 day public comment period and with input from the Australian Government in relation to matters of NES.

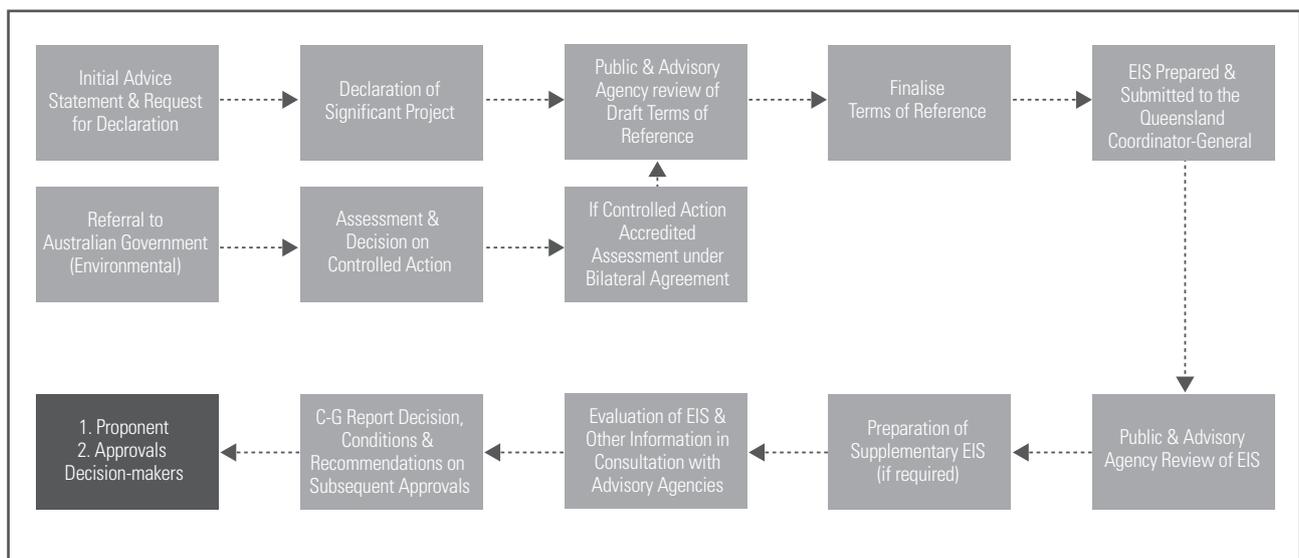
Methodology

The chapters of the EIS detail the existing (or baseline) conditions in the project area with reference to a wide range of information including:

- Historical and contemporary records.
- Data from recent field surveys and sampling in the project area.
- Maps and aerial photography.
- Data obtained from statutory bodies such as local councils and government departments.

The approach to assessing impacts in the EIS has involved a description of the impacts using significance criteria (listed on the previous page) followed by a description of existing or proposed mitigation measures and then criteria specific to each chapter have been used to assess the significance of the residual impact.

The EIS process (Source: www.dip.qld.gov.au)



In order of preference, identified impacts have been:

- 1) Avoided if possible through appropriate location of the pipeline and associated infrastructure.
- 2) 'Designed-out' where practicable, thereby minimising significant impacts to environmental values.
- 3) Mitigated through the implementation of environmental management plans that will measure and minimise impacts.

Who Prepared the Environmental Impact Statement?

GAWB, as the project proponent, engaged the services of suitably qualified experts to carry out the extensive investigations required for the EIS. A list of these experts is included on the back cover of this document.

GAWB can be contacted via:

The Project Director

- Phone: (07) 4976 3000
- Post: PO Box 466, Gladstone QLD 4680
- Fax: (07) 4972 5632
- Web: www.gawb.qld.gov.au

Public Comment Period

The EIS will be on public display for a period of 30 business days, during which time the Coordinator-General invites written comment from any interested person or party. Submissions need to include the name, address and signature of the party(ies) making the submission and their reasons for making the submission.

The Gladstone-Fitzroy Pipeline project's EIS can be viewed:

- Online at www.gladstone-fitzroypipeline.com.au
- On CD Rom – available free of charge by request (phone 1800 771 185 email info@gladstone-fitzroypipeline.com.au)
- In hard copy at the following locations:
 - **State Library of Queensland**
Cultural Centre, Stanley Place, South Bank, Brisbane.
 - **GAWB Head Office**
147 Goondoon Street, Gladstone.
 - **Flynn Electorate Office (Gladstone)**
Suite 3, 120 Goondoon Street, Gladstone.
 - **Capricornia Electorate Office**
145 - 149 East Street, Rockhampton.
 - **Gladstone Electorate Office**
2/191 Philip Street, Gladstone.
 - **Fitzroy Electorate Office**
Suite 3, Gracemere Plaza, Russell Street, Gracemere.

- **Raglan Tavern**
Bruce Highway, Raglan.
- **Rockhampton Electoral Office**
Shop 3, 7 Denham Street, Rockhampton.
- **Gladstone Regional Council (Gladstone Office)**
101 Goondoon Street, Gladstone.
- **Gladstone Regional Council (Calliope Office)**
5 Don Cameron Drive, Calliope.
- **Rockhampton Regional Council (Rockhampton Office)**
232 Bolsover Street, Rockhampton.
- **Rockhampton Regional Council (Gracemere Office)**
1 Ranger Street, Gracemere.
- **Gladstone City Library**
39 Goondoon Street, Gladstone.
- **Mt Larcom Library**
Raglan Street, Mount Larcom.
- **Rockhampton Southside Library**
Cnr William and Alma Streets, Rockhampton.
- **Rockhampton Northside Library**
154 Berserker Street, Rockhampton.
- **Marmor Community Postal Agency**
Bruce Highway, Marmor.
- **Bajool Community Postal Agency**
60 High Street, Bajool.
- **Yarwun Post Office**
40 Butler Street, Yarwun.
- **Wandal Post Office**
Shop 4, 10 Wandal Road, Rockhampton.

Printed copies of the EIS can also be purchased for \$180 (including GST, postage and handling) by calling the project information line 1800 771 185 or emailing info@gladstone-fitzroypipeline.com.au.

Written Comments

Submissions should be addressed to the Queensland Coordinator-General and sent via:

Post

The Project Manager
Gladstone-Fitzroy Pipeline Project
Department of Infrastructure and Planning
PO Box 15009
City East, QLD 4002

Email

GFP@infrastructure.qld.gov.au

Written submissions must arrive by close of business on 15 December 2008.

Submissions received during the public comment period will be collated by DIP and where additional information is required to address the submissions, a supplementary report to the EIS will be prepared by the Proponent.

Who Approves the Environmental Impact Statement?

The Queensland Coordinator-General will provide a copy of his Evaluation Report to the Australian Minister for DEWHA. The Minister will assess the EIS and the project in respect of national environmental significance matters and will make a decision under the EPBC Act. If the action is approved by the Minister, the approval will be valid for a period of four years.

Other State and local Government approvals are also required before the project can proceed.

The Gladstone Area Water Board

Pursuant to section 1084 of the *Water Act 2000*, GAWB has been recognised as a Category 1 Water Authority since 1 July 2000. GAWB is also a registered Service Provider under the Water Act and operates as a commercialised statutory authority with the function of carrying out water activities. GAWB is responsible to the Minister for Natural Resources and Water (DNRW) through a Board of Directors. As a government owned monopoly business, the Queensland Competition Authority (QCA) has a regulatory role in relation to GAWB's pricing and investment in new infrastructure.

The internal structure and organisation of GAWB supports a focus on service provision and the delivery of balanced water and commercial outcomes as shown in the organisational chart below.

GAWB's four primary business goals are:

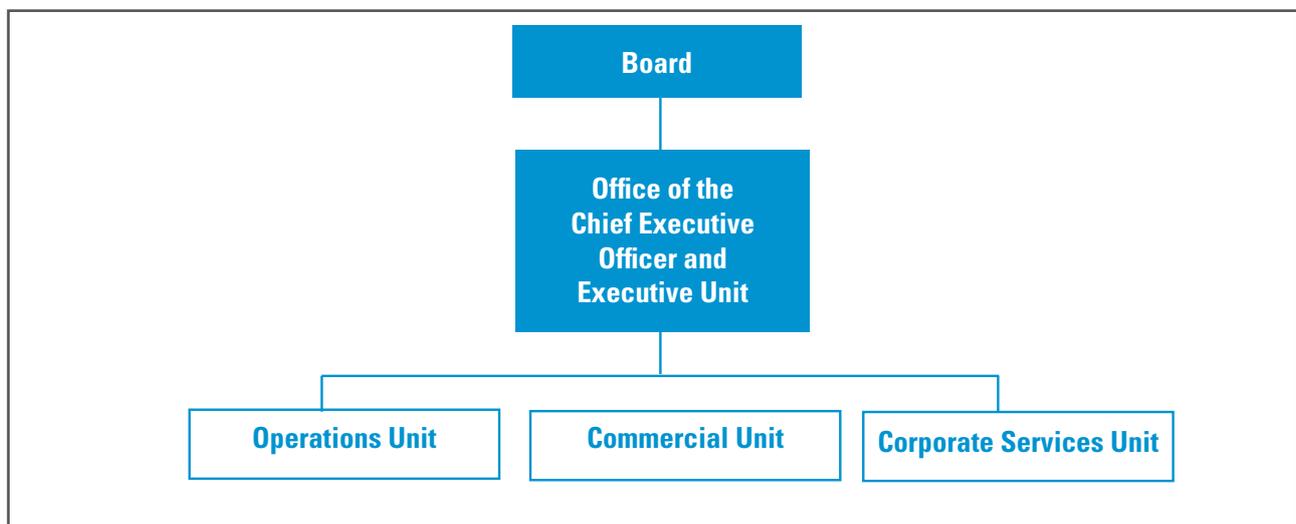
- **Meeting water needs:** to understand, facilitate and satisfy the water requirements of current and future customers.
- **Commercial results:** to ensure GAWB's profitability and build the value of the business.
- **Corporate citizenship:** to be regarded as a responsible corporate citizen.
- **Capability:** to ensure the organisation has the ability to carry out its mission.

GAWB achieves these aims through:

- Water supply and demand management planning.
- Responding to customer needs.
- Development of the treated and untreated water delivery system.
- Water quality management.
- Management of the treatment and water distribution system.
- Land management.
- Recreation and hatchery management.
- Regulatory management and compliance.
- Commercial management.
- Risk management.

GAWB provides both treated and untreated water to municipal and industrial customers, including large industrial operations in the Gladstone area and in the Callide Valley. Supplies to industrial customers accounted for approximately 80 percent of GAWB's total demand from Awoonga dam in 2007-08, with supplies to municipal customers accounting for approximately 20 percent.

GAWB's organisational chart (Source: GAWB, 2008)



GAWB owns and operates:

- Awoonga Dam on the Boyne River.
- Delivery pipelines for delivery of untreated water to treatment plants and industrial customers and for delivery of treated water to the Gladstone Regional Council water reticulation systems and to other industrial consumers.
- Water treatment plants in the Gladstone Regional Council area.
- Untreated water pumping station at Awoonga, and treated water pumping stations at Benaraby, Calliope, Glen Eden, Boat Creek, Gladstone Water Treatment Plant (High Lift and Low Lift) and Yarwun Water Treatment Plant.
- Untreated water reservoirs at Gladstone (Fitzsimmons Street) and Toolooa, and treated water reservoirs at Boyne Island, East End, Golegumma, Mt Miller and South Gladstone.
- The Lake Awoonga Recreation Area adjacent to Awoonga Dam and Boynedale Bush Camp on the western shores of the Boyne River.
- A fish hatchery in Gladstone City.

Awoonga Dam

Awoonga Dam was commissioned in 1985 immediately downstream of the old weir which is now submerged in Lake Awoonga. GAWB completed the raising of Awoonga Dam to 40 m Australian Height Datum (AHD) in June 2002, resulting in a storage capacity of 770,000 ML. Until the raised dam first overtops, GAWB's water entitlement is 70,000 ML per annum. GAWB's water allocation will increase by approximately 2,500 ML per annum for every metre increase in the maximum water level recorded up to the current 40 m AHD spillway height.

Although there is a large storage at Awoonga Dam, inflows into the dam are irregular with GAWB's allocation relying upon major inflows that sustain supplies for a number of years – this is partly attributable to the relatively small size of the Boyne catchment. Inflows for the three years 2004-2007 were 66 percent lower than the average of the worst 10-year historical sequence and set a new, worst three-year sequence of inflows in the historical record. The worst 10-year sequence on record was itself generated in the drought ending in 2003.

GAWB's Awoonga Dam (Source: GAWB, 2008)



GAWB is currently contracted to supply some 55,000 ML per annum to its customers. The composition of GAWB's customer base has meant that the growth in demand over time has occurred in large increments based on major new industrial water users commencing operations in the region. Current information available for GAWB's planning indicated that this pattern of demand will increase into the future, with large industrial projects (with major requirements) continuing to be attracted to the Gladstone region.

Water Pricing

GAWB's water prices are determined in accordance with pricing principles that are based on recommendations of the Queensland Competition Authority (QCA) and accepted by the QCA Ministers (the Premier and Treasurer). The principles comply with the National Water Initiative (NWI) that was agreed by the Australian government and all State governments. The NWI emphasises the importance of cost reflective pricing.

GAWB's investments and other expenditures are subject to monopoly prices oversight by the QCA (upon referral by the QCA Ministers). The Authority has recently completed a review of GAWB's proposal to conduct preparatory expenditure for the pipeline, where it supported the need for preparatory expenditure as part of a prudent contingent supply strategy. Once preparatory works – including environmental approvals, design and land acquisition – are completed, the QCA will assess them for efficiency. Only efficient costs will be recovered from customers.

Once developed, the cost of the pipeline will be integrated into GAWB's charges to customers. Again, the efficiency of this investment – including its scope, standard and cost – would also be assessed by the QCA (subject to Ministerial referral) either before the investment, or after it occurs. The efficient cost of the pipeline will be included in charges to customers. The QCA is currently considering GAWB's proposals for the triggers for augmentation (both for demand and drought), and will later assess GAWB's pricing proposals for recovering the investment.

Need for the Project

A prudent water supplier should have plans in place to supply reasonably expected demand growth. In the context of GAWB's uncertain and incremental demand environment this involves either holding more spare capacity than would otherwise be required or having contingent supply plans in place to cope with large demand increments.

There are three key drivers supporting the need for GAWB to undertake detailed augmentation planning and investigations for the project:

- As a drought response and contingency measure.
- In order to meet the likely sudden incremental increase in demand associated with new industrial developments in the Gladstone region.
- To respond to lower expectations of the performance of Awoonga Dam in supplying required water allocations, which has impacts both in terms of drought and demand responses.

The Strategic Water Plan

In 2003, in response to a trend of declining rainfall and increasing demand for water, GAWB initiated a Strategic Water Planning Project. The report produced in November 2004 ('Securing the Gladstone Region's Future: Water, Final Report of GAWB's Strategic Planning Project'), was a collaborative effort between GAWB, government, industry (including GAWB's customers) and the community. The report became known as the Strategic Water Plan (SWP).

The SWP considered various options, including seawater desalination, further raising of Awoonga Dam, other new weirs and dams and demand management measures, before concluding that the preferred supplementary source of water was the lower Fitzroy River.

GAWB must be able to meet demand not only as it is expected to emerge, but where lead times are considerably shortened. To achieve this, GAWB has initiated a Contingent Supply Strategy (CSS). The CSS responds to these challenges by providing a 'least cost' effective risk mitigation strategy for customers, the State, the community and GAWB. The project is the major vehicle for the present delivery of the CSS.

The Central Queensland Regional Water Supply Strategy

The Central Queensland Regional Water Supply Strategy (CQRWSS) was developed in a process that was initiated in 2003 by the then Department of Natural Resources and Mines (now DNRW) in response to the prolonged drought in Central Queensland. It was evident that a regional, whole-of-government approach was the most efficient way of meeting the region's water supply challenges. GAWB's SWP was considered by DNRW in the course of the development of this strategy.

The CQRWSS was publicly released in December 2006. The strategy provides for the reservation of unallocated water to provide high priority supplies to meet urban, industrial and mining demands in the region. It recommends that the Fitzroy Basin Resources Operations Plan may be amended to include a reservation of up to 30,000 ML per annum of reliable water from the Lower Fitzroy River for urban and industrial purposes



for GAWB. This allocation is contingent upon the construction of additional in-stream storage. The CQRWSS also specifically identifies the need for a pipeline to transport this water to Gladstone from the Fitzroy River.

Fitzroy River Water Allocation

The Queensland Government's Statewide Water Policy aims to lay the foundation for economic growth in regional Queensland by, among other things, guaranteeing water to industry in Gladstone. Policy and program implementation are expressed through the Program of Works – Statewide Water Grid – Regional Water Infrastructure projects (Program of Works) which became effective in December 2007 and includes this project.

In the Program of Works, the Queensland Government has committed funds towards preliminary investigations for the construction of Rookwood weir and the raising the Eden Bann weir, on the lower Fitzroy River. The weirs were identified in the CQRWSS as being required to meet future demands for water in the region and to Gladstone, and the allocation of water to GAWB, if made, would likely be sourced from the development of the weirs.

The Government has directed the Rockhampton Regional Council, GAWB and SunWater to form the Lower Fitzroy Water Joint Venture as the proponent to undertake these investigations.

Whilst the project is linked to the proposed weirs, the assessment of environmental impacts for the weirs is outside the scope of the ToR for this project.

As a further contingency measure, GAWB has had preliminary discussions with the Rockhampton Regional Council concerning a possible commercial agreement to access some water from its annual 50,000 ML allocation from the Barrage on the Fitzroy River. Rockhampton Regional Council currently uses between 20,000 ML - 25,000 ML of its allocation each year, leaving the balance potentially available for sale.

Project Benefits

The project's construction cost is estimated at around \$300 million. This figure is an estimate (July 2007) and could differ from the actual cost of construction in future years. The key benefits of the project include:

- Provision of efficient infrastructure to enable water supply from the Fitzroy River to Gladstone industries contributing to the economic growth of the region.
- Direct economic contribution of the project to the local, State and national economies during construction and operation.

The flow on benefits from the project include:

- Provision of employment opportunities in the Rockhampton and Gladstone regions.
- Potential future provision for bulk water supply to communities along the pipeline route.

Project Options and Alternatives

The project alternatives considered are based on the options identified by GAWB as part of the SWP and subsequent work. Since the release of the SWP, GAWB has undertaken further evaluation of these options. This work has sought to expand upon the conclusions contained in the SWP.

The options considered by GAWB as alternatives to the project include:

- **No action**
- **Demand management:** including consideration of seawater cooling of coastal industrial facilities and air cooling of inland power stations.
- **Water use efficiency options:** including a review of water trading, pricing and contract conditions to increase water efficiency.
- **Reducing water losses:** including assessing water losses throughout GAWB's raw and treated systems and identifying strategies to reduce these.
- **Supply alternatives:** including dam and weir construction, water recycling, ground water and desalination. GAWB has undertaken additional feasibility work on desalination to improve the reliability of cost estimates.

GAWB has also developed a framework for customers to present alternatives to augmentation, such as reducing demand and/or investing in water saving measures, as a means to potentially defer or avoid source augmentation.

Timing

Construction for the project will only commence once all approvals have been obtained and when one or both pre-defined triggers for demand or drought are met. The QCA is charged with considering a submission from GAWB on appropriate construction triggers for the project.

Approximate timing of the main project phases are shown in the table below:

Project Phase	Timing
Strategic planning (including Central Queensland Regional Water Supply Strategy)	2004-06
Project definition and scoping	2006
Preparatory works	2007-09
Construction (includes commissioning)	When triggered

On the completion of project construction GAWB will be responsible for the operation and maintenance of the pipeline and its decommissioning if required.

Project Description

Preparatory works for the project included several stages of design and environmental assessment. Before completion of the environmental impact assessment, a preliminary functional design and a detailed optioneering design were completed. The detailed optioneering design confirmed all of the essential elements and locations relevant to the project, and forms the basis of the EIS.

The layout of the Fitzroy River Intake



At the time of writing the EIS, for costing purposes, the detailed design was going through a design review process. This review will be complete by the time the EIS is displayed. If there are any refinements to the design already articulated in the EIS, these will be incorporated into a Supplementary EIS. The stage is detailed design for construction, which will be completed only when construction is triggered.

Location

The project will transfer approximately 30,000 ML of water per annum from the Fitzroy River to GAWB's existing water infrastructure at Yarwun.

Project elements include:

- An underground pipeline approximately 115 km long from Laurel Bank near Rockhampton to a connection with GAWB's existing infrastructure near Yarwun just north of Gladstone.
- An intake and pump station on the Fitzroy River at Laurel Bank.
- A water treatment plant, reservoir and pump station at Alton Downs.
- A booster pump station and reservoir at Raglan.
- A reservoir at Aldoga.

The site for the Fitzroy River intake is approximately 15.5 km upstream of Rockhampton Barrage adjacent to an existing intake point owned and operated by SunWater to provide water to the Stanwell Energy Park. A pump station associated with the project will be located at the same site.

The Alton Downs WTP site is approximately 3 km from the intake and is located at Alton Downs on freehold land. Both the intake site and WTP site are within the Rockhampton Regional Council area. The Raglan pump station site is located on freehold land in the vicinity of Raglan in the Gladstone Regional Council area. The main storage reservoir is to be located at Aldoga on land currently owned by the State (administered by DIP) within the Gladstone State Development Area (GSDA) which falls within the Gladstone Regional Council area.

The selection of the Fitzroy River intake location, the WTP site and the northern pipeline route from the Alton Downs WTP to the Stanwell-Gladstone Infrastructure Corridor (SGIC) are interlinked. It is preferable for the WTP site to be located in close proximity to the intake point to reduce the length of pipe that carries untreated water. The northern pipeline route ultimately needs to connect to the SGIC alignment and the most direct route is preferable as pipeline cost is generally proportional to length.

The location of the SGIC and the alignment of the pipeline within the GSDA were determined by DIP through corridor investigation studies. Consultation with landowners has also occurred as part of the process of assessing the pipeline route and sites for infrastructure.

The following section describes each element of the project. For more detailed information, refer to the EIS (Chapter 2, Project Description).

Fitzroy River Intake

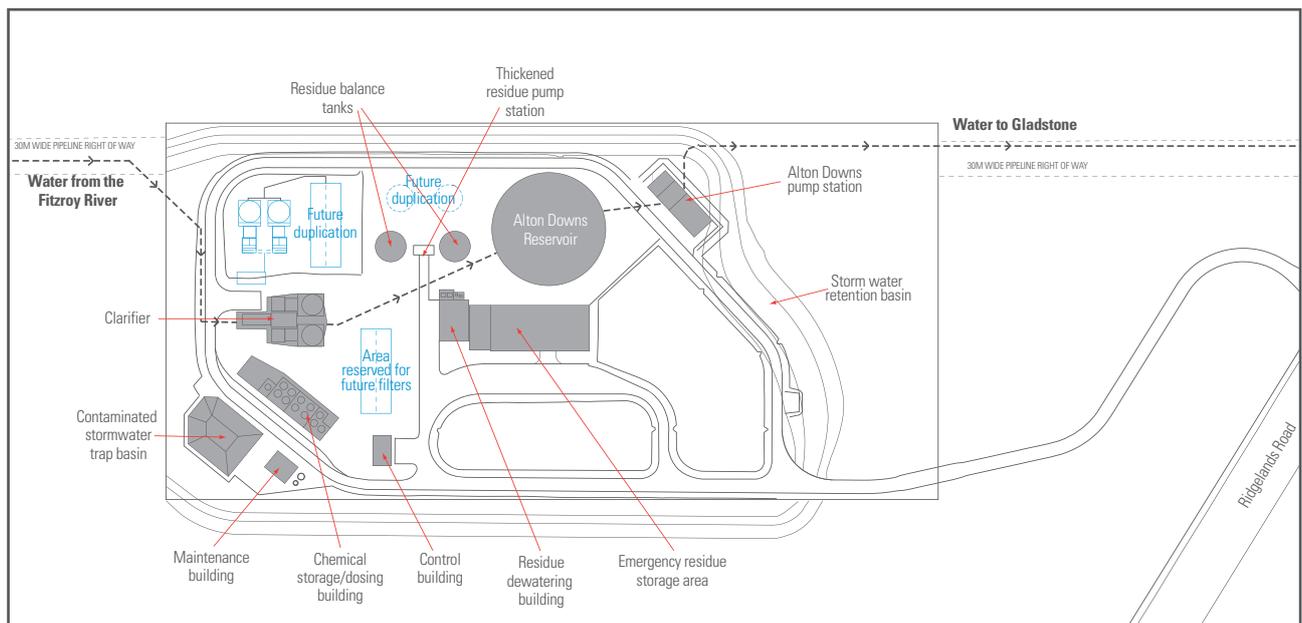
The intake and pump station will consist of a structure located in the river bank, with a separate plant room adjacent to the existing SunWater pump station. See the diagram on the previous page for the layout of the Fitzroy River intake. The delivery pipe will be located within the approach embankment. Construction of the combined intake and pump station structure will require the temporary installation of a sheet piled coffer dam, extending into the river, to allow the foundation of the structure to be dewatered and excavated to the required design level. The construction of the combined structure will take place within the coffer dam.

The site will be accessed via Laurel Bank Road and Ski Gardens Road, using the existing point of access to the site from Ski Gardens Road.

The Alton Downs Water Treatment Plant

The project requires a WTP at the northern end of the pipeline to improve the operating efficiency of the pipeline and to provide water of a similar quality to that already provided to existing GAWB customers from Awoonga Dam. The WTP will occupy

The layout of the Alton Downs WTP



Simulation of the view to the Alton Downs WTP from a viewpoint on Ridgелands Road



Simulation of the view to the Alton Downs WTP from a viewpoint near the corner of McNamara Road and Klaproth Road



an area of approximately 11.5 hectares. The preferred site is partially cleared and is currently used for grazing purposes. The WTP will comprise several buildings and structures including the control building, clarifier, residue dewatering (centrifuge) building, chemical dosing facility, a reservoir and pump stations. Buildings will be fully enclosed, ventilated and equipment acoustically attenuated. See the diagram on the previous page for the layout and components of the WTP. Photographs showing visualisations of the view to the WTP are included above. The site will be landscaped post construction to improve the visual amenity of the new WTP. Access to the Alton Downs WTP will be via Ridgелands Road, and the point of access has been located away from residences.

Water will be pumped from the Fitzroy River through fine screens and passed into the coagulation/flocculation chamber where chemicals (including aluminium chlorohydrate, polyDADMac, polyelectrolyte and/or sodium hydroxide) may be added to the water. The sedimentation (clarification) phase follows, where solid matter is removed from water as residue. Treated water from the sedimentation process is discharged to the treated

water reservoir and then disinfected with sodium hypochlorite (and potentially ammonium sulphate).

Residue from the sedimentation process is transferred to a thickener, and then transferred to a centrifuge for dewatering to 30 percent solids. It is then taken to hoppers (silos) for storage, ready for transportation off site. The entire residue handling area, including the emergency residue stockpile area, is bunded with runoff directed to a sediment basin to prevent residue from entering the external environment. Water recovered from clarification and centrifuge processes is returned to the head of the WTP for re-treatment. Treated water from the plant is then pumped along the pipeline.

At the end of the process, residue will remain that consists of water (approximately 70 percent of the total quantity) and the coagulant and other solids removed from the raw water (approximately 30 percent of the total quantity).

The quantity of residue produced by the WTP is based on the water quality of the Fitzroy River which varies depending on seasonal and catchment conditions. On average, the WTP will

produce 120 tonnes of residue each day. The appropriate residue disposal strategy will be determined in consultation with the relevant council authority and approving bodies.

Raglan Pump Station and Reservoir

The Raglan pump station and reservoir site will be located midway along the pipeline to pump water to the Aldoga reservoir. The proposed location is a site of approximately 6 ha adjacent to the SGIC. The building will be fully enclosed, ventilated and acoustically rated. The reservoir will have a capacity of 15 ML.

Aldoga Reservoir

The Aldoga reservoir is to be located near Mt Larcom, with a storage capacity of 100 ML. The land area of the site is approximately 10.5 ha. Due to the shape and size of the hilltop location, it is expected that the final design of the reservoir will be two separate structures.

The site consists of rock (tuff) and will require a combination of drilling, blasting and/or mechanical removal. Blasting will be completed by a certified operator under controlled conditions.

The Pipeline

The pipeline will be buried for its full length with varying cover depending upon pipe material, ground conditions and loading, and will be laid with a minimum grade of 1 in 500. The pipeline material is proposed to be mild steel cement lined (MSCL) pipe,

which will require cathodic protection. Cathodic protection is the method of protecting metal pipes from corrosion in the presence of water and oxygen, acid sulfate soils or stray currents. In some locations the pipeline may be constructed using glass reinforced plastic (GRP). The pipeline will have an external diameter of approximately 1 m.

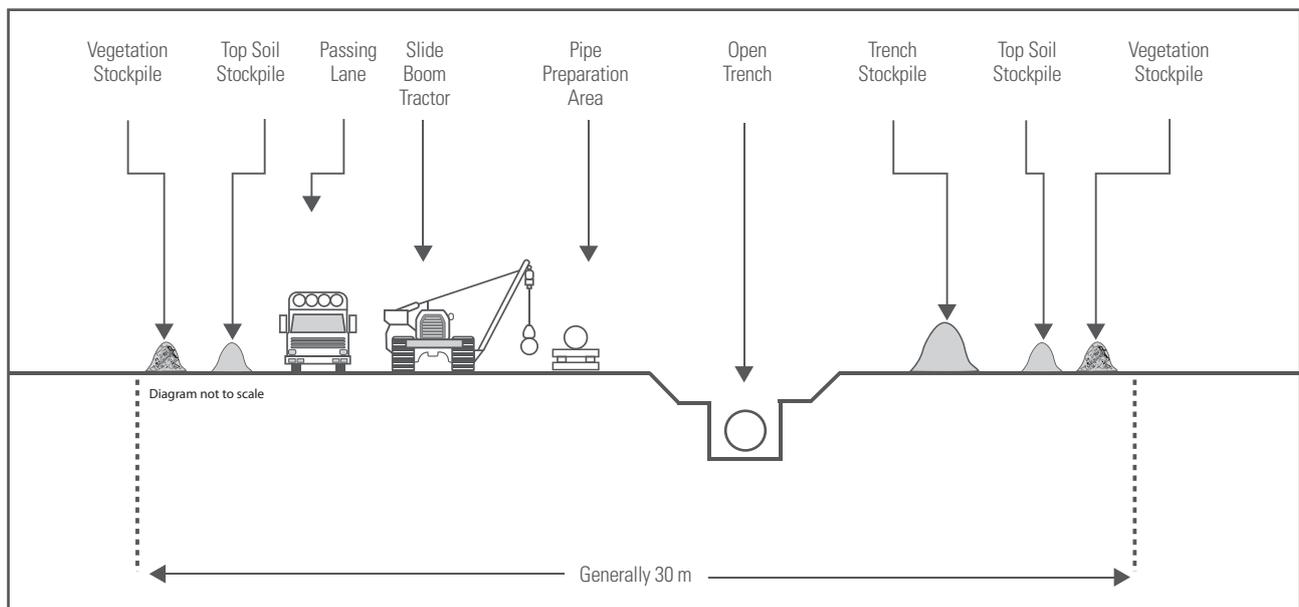
The pipeline will be constructed within a right-of-way (ROW) which will generally be 30 m wide. The ROW will allow room during construction for the pipeline trench, vegetation and soil stockpiles, a roadway with appropriate width for passing and the pipeline preparation area.

A typical ROW layout is shown in the diagram below. In some places, trenchless methods will be utilised to cross waterways, roads, rail and other infrastructure. For full details of these methods, refer to the EIS (Chapter 2, Project Description).

The main stages in constructing the pipeline are as follows:

- **Survey** – prior to the commencement of construction, the ROW will be fully surveyed and the pipeline centre line will be pegged.
- **Clearing** – clearing of the pipeline construction area involves removal of vegetation, rocks and obstructions from the pipeline ROW. Vegetation will be stockpiled as shown in the diagram below.
- **Grading** – bulldozers and graders will level the ground in certain areas within the ROW to prepare a safe construction platform.

A typical ROW layout (Adapted from: Australian Pipeline Industry Association Code of Environmental Practice - Onshore Pipelines 2005)



- **Pipeline stringing** – pipes will be delivered to site by truck from stockpile locations adjacent to the ROW and then laid next to the trench on skids (timber blocks like railway sleepers used to keep the pipe off the ground) or sand bags to protect the pipe from damage.
- **Trenching** – the pipeline trench will generally be 2 m deep, but could be up to 5 m deep depending on pipeline design. The top of the excavation trench will generally be 12 m wide, but could be up to 16 m wide in some locations depending on trench wall soil stability and pipeline design. Specialist heavy earth moving machinery will be used to excavate the pipeline trench. Top soil and trench spoil will be stockpiled separately as shown in the diagram below.
- **Pipe laying and backfilling** – appropriate bedding material is required to prepare the trench for pipe laying. Following placement of the bedding the remainder of the trench will be backfilled using trench spoil and finally top soil.
- **Clean up and rehabilitation** – all areas affected by construction including ROW, work areas, access tracks, and temporary site office areas will be cleaned up and rehabilitated to pre-construction conditions as far as practicable. The vegetation stockpile will be utilised in the rehabilitation process.
- **Pipeline cleaning and testing** – this process occurs at the end of construction to remove debris from the inside of the pipe and test for leaks.
- **Access** – temporary gravel access tracks will be constructed along the pipe route where required to temporarily access facilities and work areas. Where possible existing roads and tracks will be used for access.
- **Isolation valves** allow isolation of sections of the pipeline in the case of failure in the adjacent pipeline, pump station, storage reservoir or WTP. Isolation valves are typically to be installed every 5 km and are to be installed at the inlet and outlets of all pump stations and storage reservoirs.
- **Scour valves** are used to drain the pipeline and to allow scouring (cleaning) of the main pipe. Scouring of the mainline will be part of the maintenance program, to remove any solid particles that may have settled on the bottom of the pipe during normal operations. Scour valves are to be included at all low points in the pipeline and will function under gravity where possible. There are approximately 200 scour valves in the pipeline design.
- **Branch tees** will be provided to allow connection to any future augmentation of the pipeline system.

Workforce, Accommodation and Project Facilities

Labour requirements during the project are likely to vary as construction progresses. The average construction workforce for the project at any one time has been estimated at 194 people. Existing housing in the area will be used for labour accommodation needs where possible. Depending on the timing of the project, construction camps may also need to be investigated to accommodate staff. An assessment of the accommodation market in the region and the possible impacts of the project is provided in the EIS (see Chapter 15, Social and Economic Environment). Transportable buildings with a power and water supply will be utilised to establish temporary site offices where required to house day-to-day workforce activities such as catering, toilets and offices. The main site facility during construction will be located at the WTP site.

Temporary storage areas, typically 1 ha in size, will be required at intervals along the pipeline route to unload and store large quantities of pipe and construction materials and equipment.

Construction Timeframe

It is proposed that the project will be complete within 24 months from the commencement of construction, which will be triggered either by increased demand for water or drought.

Wet weather has the potential to slow pipeline construction and will also potentially increase the environmental impact (as described in the EIS, see Chapter 8, Aquatic Flora and Fauna).

Valves

Different types of valves are included in the pipeline design including air release, isolation, check (reflux) and scour valves. Where possible, valves will be located in the vicinity of existing boundary fences to minimise the disruption to properties. These will form part of the maintenance, control and surge protection measures for the pipeline and include:

- **Air valves** will be located at high points along the pipeline route. Currently, some 240 air valves are included in the design at a spacing averaging approximately 450 to 500 m and are provided to vent air into and out of the pipe.
- **Check valves** will be included where required to prevent backflow for pipes and pumps, protect pumps under emergency conditions and protect components against surge. There will be one check valve installed before the high point of the pipeline between Raglan and Aldoga (approximately 15 km from Aldoga). Other check valves are located near reservoirs and at the pump stations. A flow control valve is to be included at the Yarwun connection point.

Operation, Control and Maintenance

GAWB currently employs operations staff for their network and it is anticipated that GAWB will maintain this skill base and, where necessary, employ new staff or contractors to operate the pipeline and its related infrastructure upon commissioning. Permanent facilities will be provided at certain infrastructure locations including the WTP, pump stations and storage reservoirs as appropriate to the level of staffing required.

System control and monitoring of pipeline operations will be provided by a Supervisory Control and Data Acquisition (SCADA) system that will generally be controlled from the centralised control room at GAWB's existing WTP in Gladstone with a facility to also control the system at the new Alton Downs WTP.

The Alton Downs WTP will generally be designed for a single daily shift attendance, with mostly automatic operation and manual override of critical functions. A control philosophy will be fully developed during detailed design for construction, which will address the level of automation required, methods of reporting plant operational condition and actions in the event of plant failures.

A program for inspection and surveillance activities and their frequency will be developed before the pipeline is operational. Maintenance inspections will include safety procedures (including provision of shutdown and/or draining of project infrastructure in event of an emergency) and provision for public safety in such circumstances. Common activities likely to be undertaken by operations staff include pipeline corridor patrols, and maintenance of the pipeline and associated facilities.

Climate

This chapter of the EIS discusses local climate characteristics, seasonal conditions, extreme climatic events and climate change in relation to the project. The following presents a summary of the key findings, for more detail see the EIS (Chapter 3, Climate).

Existing Conditions

The project area is classified as a subtropical climate zone, characterised by a hot, humid summer and low winter rainfall. The median annual rainfall is in the range 650 mm to 1200 mm. Rockhampton City lies on the Tropic of Capricorn and the south-east trade wind belt. As a result the area does not tend to experience regular north-west monsoonal activity nor does it experience higher latitude cold fronts.

Severe climatic events that are relevant to the project (excluding flood, bushfire and landslide, see the EIS (Chapter 16, Hazard and Risk)) include storms and cyclones. Severe storms relevant to

the project are more likely to occur in the summer months. The effects of a storm are usually localised and may include damage from torrential rain, high winds, hail and lightning. The project is located partly within a 'cyclone risk zone' that can be affected by cyclones at least once a year, usually between the months of November to April.

In relation to climate change, a significant body of evidence suggests the increase of greenhouse gases (heat-absorbing) in the atmosphere has resulted in a warming of the global climate during the previous century. During the 20th century, global average sea levels have risen by 10-20 cm, primarily due to global warming. This sea level rise will continue, and possibly accelerate over the next century and beyond, potentially impacting Australia's coastal areas.

Impact Assessment

The likely impacts of local climate and seasonal changes relating to the project include:

- Dry conditions are likely to increase the amount of dust generated from construction activities.
- High temperatures and humidity can potentially affect construction workers, resulting in sunburn and/or sunstroke.
- Wet weather can hamper construction activities and vehicle access to construction sites.
- Erosion is likely to increase following a severe storm or flood event.
- A cyclonic event or severe storm has the potential to cause flooding of construction areas and halt works for periods of time.
- Increased wind speeds during a storm are likely to increase the impact of dust generating activities.
- The impact of sea level rise as a result of climate change on the operation of the pipeline and its related infrastructure is expected to be limited as the predicted change in sea level during the next 100 years remains well below the height of the existing Fitzroy River Barrage.

Mitigation Measures

A number of measures are proposed to mitigate impacts related to climate. These include:

- Scheduling works taking into account seasonal conditions.
- Controlling dust at all times.
- Using erosion and sediment control measures during construction.
- Implementing health and safety procedures for personnel to reduce the risk of dehydration, heat stroke or sunburn (see the EIS, Chapter 16, Hazard and Risk).

In the case of severe climate events, mitigation measures may include:

- Monitoring long and short range weather forecasts.
- Modifying work hours for personnel as necessary.
- Postponing construction work during periods of cyclones, severe storms and other extreme climatic events.
- Ensuring appropriate health and safety, disaster management and emergency management plans are in place for both construction and operation.

Although sea level rise as a result of climate change has been assessed as posing low risk to the project, flood risk has been taken into consideration in the project siting and design. The Fitzroy River intake has been designed to operate effectively even in the event of a flood and the Alton Downs WTP and Raglan pump station will be constructed above mapped flood levels.

Summary

Local climate, extreme climatic events and climate change have the potential to have an influence on the environment in the project area during construction or operation of the pipeline. Mitigation measures that have been proposed are considered adequate to reduce the impact of these conditions or events to **negligible** or **minor adverse**.

Land Use and Infrastructure

This chapter of the EIS discusses the land use and underlying tenure for the project. Various information resources have been used to identify potential influences on the project. These sources include aerial photography, topographic and cadastral maps, relevant databases and studies. A range of existing tenements including Native Title claims, extractive and mineral development licences and infrastructure networks were taken into consideration for this assessment.

The project area for this chapter is defined as the land within the 30 m ROW that is to be cleared for construction and includes the sites for project infrastructure. Where relevant, the areas directly adjacent to the ROW have been included.

The following presents a summary of the key findings, for more detail see the EIS (Chapter 4, Land Use and Infrastructure).

Existing Conditions

The predominant land uses in the project area are grazing and other agricultural purposes.

The project area is located along and adjacent to:

- Predominantly freehold lots, with several leasehold areas, reserves, and State land located adjacent to the corridor.
- Infrastructure including roads, rail lines, powerlines, gas pipelines and a fibre optic line.
- Dams, pondage banks, fences and gates.
- The Yarwun Key Resource Area (KRA), a regionally important quarry as it is one of the largest of only two sizeable quarries supplying crushed rock products to the development and construction industries in the region.
- Several areas of land where exploration permits for minerals are held.
- The racecourse reserve at Raglan which is classified as Open Space – Recreational.

The project area is in the vicinity of:

- Several rural residential areas including Alton Downs, Gracemere, Bajool, Marmor, Raglan, Mt Larcom and Gladstone.
- Recreational areas used for water skiing (Fitzroy River) and boating and fishing activities (Raglan Creek).
- The Fitzroy River intake is located in close proximity to, but outside of, the boundary of the separation area for the Pink Lily Key Resource Area (KRA).
- An existing explosives manufacturing facility located to the west of Bajool and the Port Alma Salt Works located to the east of Bajool.

Within the project area there are two existing Native Title claims, one by the Darumbal People for the area between the Fitzroy River and Raglan and one for the Port Curtis Coral Coast (PCCC) for the area between approximately Raglan and Gladstone. The Native Title process for the land affected by the project is being undertaken in accordance with all legislative requirements of the *Native Title Act 1993* (NTA), in full consultation with relevant Native Title claimants (see Chapter 14, Cultural Heritage).

Impact Assessment

The possible impacts on land use and infrastructure related to the project include:

Land tenure

- The Fitzroy River intake location will be subject to a sub-lease agreement with SunWater.
- GAWB will acquire and manage an easement for the pipeline corridor in the Alton Downs area, with land remaining available for use by the landowners under the terms of the easement agreement.
- GAWB will acquire and own the land required for the Alton Downs WTP, Raglan pump station and Aldoga reservoir.
- The State Government will acquire and manage easements for the SGIC. GAWB's use of the easement is subject to a licence agreement between GAWB and the State.
- Within the GSDA the pipeline is located on freehold land owned by the State (administered by DIP) and the Central Queensland Port Authority (now known as Gladstone Ports Corporation). GAWB will be granted a licence to construct and operate a pipeline within the GSDA.

Native Title

- In the case of the Alton Downs WTP, Raglan pump station and Aldoga reservoir, Native Title has been extinguished through past land tenure grants.
- Native Title is still likely to exist at the intake and at some areas along the pipeline. These areas are subject to processes under Section 24HA and 24KA of the NTA. The pipeline meets the necessary criteria required under these sections of the NTA and in both cases, the non-extinguishment principle applies and any right that Native Title holders may have to compensation for the effect of the project on their Native Title rights is preserved under Section 24KA and 24HA.

Economic Mineralisation and Extractive Resources

- The construction and operation of the pipeline and associated infrastructure will have negligible impact upon existing mining tenements.
- There is expected to be limited impact on KRAs at Pink Lily and Yarwun.

Residential and Recreational Areas

- There is the potential for residential properties within close proximity to the pipeline and its related infrastructure to be affected by noise and dust during construction and operation.
- Residents may be impacted by short-term traffic delays to local access during construction of the pipeline at road crossings.
- Recreational use of the Fitzroy River for water skiing and the Alton Downs Ski Club may be temporarily disrupted whilst the Fitzroy River intake is constructed. There are not expected to be long-term operational impacts as there is an existing intake point adjacent to the site operated by SunWater and this does not currently impact water skiing activities.
- As there are no residences in close proximity to the Raglan pump station and reservoir, impacts to visual amenity are not expected during construction or operation.
- Recreational use of Raglan Creek is likely to be temporarily impacted during construction of the pipeline in this area, through the removal of vegetation and the presence of construction machinery.

Infrastructure

- Trenched crossing methods may cause some delays to local traffic, however the delays are expected to be brief and temporary with access maintained.
- Risk to personnel associated with construction in operational areas around railways, powerlines and gas pipelines.
- Loss of stored water from farm dams and pondage banks.

Land Use

- Temporary disruption to existing land uses will occur during construction.
- During operation, agricultural activities, such as grazing and cropping, will generally be able to continue on the ROW. There may be restrictions to new areas of irrigation, ploughing and cropping if they are likely to damage the pipeline.
- The potential impacts of the WTP to surrounding land uses during operation are detailed in the EIS (see Chapter 10, Air environment, Chapter 12, Noise and Vibration, Chapter 13, Transport and Access Arrangements and Chapter 17, Landscape and Visual).

Mitigation Measures

A number of measures are proposed to mitigate impacts related to land use and infrastructure.

- GAWB will continue regular consultation and communication with landowners and relevant stakeholders, where required.
- Special area plans will be developed to ensure timely notification of planned construction and operational activities.
- The Native Title process will be undertaken in accordance with the provisions of the NTA and in consultation with the Native Title claimants – the Darumbal People and the Port Curtis Coral Coast groups.
- GAWB will obtain appropriate approvals and permits and implement management plans for all works that impact third party infrastructure (such as roads, rail, powerlines, gas pipelines, fibre optic cables) in the project area during construction and operations.
- Implementation of the measures set out in the EIS that relate to the management of vegetation or habitat during construction and operation, this includes rehabilitation of the pipeline ROW.
- Trenchless crossing methods will be used where practicable to cross vital infrastructure such as major roads and railways (see the EIS, Chapter 13, Transport and Access Arrangements) in consultation with relevant parties to ensure there is no disruption to services during construction.
- The impacts to minor roads as a result of trenching will be managed through a construction traffic management plan which will specify traffic control measures to reduce the delay times and provide detours as necessary.
- Temporary gates will be installed in fences on the ROW during construction in consultation with landowners.
- On completion of the pipeline's construction, fences will be restored and permanent lockable gates may be installed where required to provide permanent access along the pipeline ROW in accordance with the relevant easement agreement and licences.
- Impacts to farm dams will be mitigated where possible through small realignments of the final ROW to minimise the impact to the dam walls. Where avoidance of dam walls or levee banks is not possible, they will be reconstructed in consultation with the appropriate governing authority and landowner in a location, where possible, that is not within either the ROW or the SGIC.

Summary

As the predominant land uses in the project area are grazing and other agricultural purposes, combined with the fact that the majority of the project's infrastructure is underground, most impacts are related to the construction phase of the project rather than the operational phase. The majority of these will be temporary in nature. With the mitigation measures proposed, the impacts to land use and infrastructure are manageable and have been assessed as **negligible to minor adverse**.

Soils and Contaminated Land

This chapter of the EIS discusses soils, geology and contaminated land for the project. The project area for this chapter has been defined as the land within the 30 m ROW that is to be cleared for pipeline construction and includes the sites for related project infrastructure. Where relevant, the areas directly adjacent to the ROW have also been included.

Soils and geology in the project area have been described based on desktop analysis and field work completed as part of preliminary geotechnical investigations. These investigations included identification of soil types, assessment of terrain and potential for erosion and dispersion.

The extent and quality of Good Quality Agricultural Land (GOAL) surrounding the project was ascertained from GOAL overlay maps developed by the former Calliope and Fitzroy Councils. From these overlay maps, the area and type of GOAL affected by the project was mapped and determined.

Contaminated land in the project area was identified via a desktop review and a search of the Contaminated Land Register (CLR) and Environmental Management Register (EMR) for Queensland. A preliminary risk assessment was also carried out to quantify the risk that potential contaminated land poses to the project.

The preliminary Acid Sulfate Soil (ASS) assessment was completed through a desktop review of relevant documents and field investigations and forms the precursor to the detailed ASS investigation and ASS Management Plan that will be completed prior to the commencement of construction.

The following presents a summary of the key findings, for more detail see the EIS (Chapter 5, Soils and Contaminated Land).

Existing Conditions

The project area traverses a number of different geological units and land forms.

Soils

The following soil characteristics were found to exist in the project area:

- **Gradient** – 14 percent of the project area is above 15 percent gradient. Areas above 15 percent gradient are expected to increase the erosion potential category by one level (e.g. medium is increased to high erosion potential).
- **Dispersion** – soil testing identified dispersive soils throughout the project area. Dispersive soils tend to be highly erodible when in contact with water and require controls for successfully managing earth works.
- **Salinity** – the levels of salinity indicated are not expected to influence soil dispersion (i.e. where soils are sufficiently saline, dispersion is not likely).
- **Topsoils** – are mostly shallow and comprise low plasticity silty/sandy loams, clay loams and light sandy clays, all of which have a moderate to high potential for erosion if left uncovered on significant gradients (i.e. steeper than 15 percent).
- **Subsoil** – erosion potential of the subsoil, based on soil texture and proximity to the surface of rock substrate ranges from 'low' to 'moderate - high' ratings.

Good Quality Agricultural Land

Land classified as GOAL is located within the project area. This includes land classified as suitable for rain fed cropping, sown pastures, native pastures and light grazing of native pastures.

Contaminated Land

The land use of the region has generally been that of grazing and some cropping. Some activities likely to be associated with these land uses include the use of pesticides, presence of cattle dips, rail corridors and unidentified dumpsites. These have the potential to give rise to contaminated land.

For the section of pipeline running between Fitzroy River and Bajool, there are no properties listed on the CLR or EMR that are traversed by the alignment.

Between Bajool and Gladstone there are five properties recorded on the EMR that are traversed by the pipeline.

Acid Sulfate Soils

Pyritic soils or ASS, were deposited in coastal zones throughout the world during the last 6,500 to 10,000 years. When disturbed, the iron pyrite in these sediments oxidises producing sulfuric acid which lowers the pH in runoff and groundwater, leading to the release of toxic aluminium and iron from the sediments into the groundwater.

ASS are only found in soils of alluvial origin, although they are most common on low lying coastal floodplains. These soils may also be found at moderate elevations, along the banks of inland creeks and streams.

ASS were identified in a low lying area of mangroves near Raglan Creek. There are other areas within the project area that have potential for ASS based on their proximity to the coast and waterways. Further assessment of ASS in the project area will be completed prior to construction.

Impact Assessment

Construction

Soils

Soils in the project area will be temporarily disturbed during construction. As the soils are generally considered highly dispersive in the project area, rain events or other contact with water is likely to result in the break-down of soils into clays, sand and silt, creating sediment and nutrient laden runoff (see the EIS, Chapter 9, Water Resources and Water Quality). Loss of soils through erosion and dispersion also causes stripping of the soils potentially resulting in local productivity yield losses.

Construction around creek beds and other areas close to creeks with gradients of greater than 15 percent will have higher potential to create sediment and nutrient laden runoff that could enter creeks.

Good Quality Agricultural Land

There will be temporary disturbances to GOAL in the project area during construction. The Fitzroy River intake, Alton Downs WTP, Raglan pump station and reservoir and Aldoga reservoir will remove areas of GOAL for an indefinite period.

Contaminated Land

Between Fitzroy and Bajool there are no likely impacts due to contaminated land disturbance as no properties listed on the CLR or EMR are traversed by the pipeline route. However there is the potential for unknown contaminated sites to exist in this section of the project area.

Between Bajool and Gladstone five properties listed on the EMR are traversed by the pipeline route. The EMR provides information on current and historical land use, including whether the land has been or is currently used for a notifiable activity, or has been contaminated by a hazardous contaminate. A notifiable activity is an activity that is considered likely to cause land contamination.

In most circumstances, sites on the EMR pose 'low risk' to human health or the environment under their current land use, however their presence on the EMR does not necessarily mean they are contaminated. There is also the potential for unknown contaminated sites to exist in this section of the project area as a result of past land uses.

Acid Sulfate Soils

It is considered that the development as a whole poses the risk of adverse impact to the receiving environment (i.e. various water bodies) associated with disturbance of ASS.

Due to the nature of ASS in the project area, there are potentially low-level impacts upon the environment. If ASS is disturbed, leachate containing sulfuric acid and metal contaminants can be released into the environment.

Environmental impacts of ASS may include:

- Reduction in water quality.
- Damage to estuarine environments.
- Habitat degradation.
- Reduction in plant productivity.
- Acidification.
- Deoxygenation.
- Heavy metal precipitation.

Further description of the potential impacts to water resources as a result of the disturbance of ASS, is provided in the EIS (see Chapter 6, Terrestrial Flora, Chapter 7, Terrestrial Fauna, Chapter 8, Aquatic Flora and Fauna, and Chapter 9, Water quality and water resources).

Operation

Following construction, the ROW will be re-vegetated and rehabilitated and infrastructure sites will be landscaped. This will reduce the potential for soil erosion and dispersion. It is acknowledged that the greater area of impermeable surfaces created by permanent structures has the potential to increase run off.

Agricultural activities, such as grazing and cropping, will generally be able to continue on the ROW as the majority of the infrastructure will be located below ground. New areas of irrigation, ploughing and cropping may not be allowed if they are likely to damage the pipeline. These activities will be subject to the terms of the relevant easement agreement.

Maintenance works on the pipeline route and at associated infrastructure sites that involve excavation of soils will be required periodically and will have the potential to cause erosion.

Mitigation Measures

A number of measures are proposed to mitigate impacts related to soil and contaminated land including:

- Topsoil to be stockpiled separately to allow replacement post-construction (especially in areas of GOAL) where possible.
- Reduction of stockpiling spoil where possible.
- Restoration of land use post construction as much as possible through a program of rehabilitation.
- Compaction of backfill where possible to reduce the risk of surface erosion.
- Further investigation of ASS.
- Assessment and management of properties with identified contaminated land prior to the commencement of works.
- Surveillance of the pipeline route and at associated infrastructure sites during operations checking for indications of erosion, subsidence and loss of vegetation cover, and repair if required.
- Design infrastructure to reduce and manage run-off to minimise potential for erosion.

Summary

Construction of the pipeline presents the greatest number of potential impacts in relation to soils and contaminated land. This is due to the fact that construction will involve a significant amount of earthworks, including soil stockpiling and vegetation removal. In comparison, the pipeline operation is anticipated to have minimal impact.

Consideration of residual impacts resulting from the project are expected to be **negligible** overall, with the exception of the **minor adverse** residual impact associated with GOAL and the potential **minor adverse** impacts associated with soil disturbance (which will vary depending on weather conditions).



Terrestrial Flora

This chapter of the EIS discusses vegetation communities classified as Regional Ecosystems and Threatened species as relevant to the project. Desktop research and field studies form the basis of analysis in this chapter.

The conservation status of a species may be described as *Endangered*, *Vulnerable*, *Rare*, *Culturally Significant* or *Common*. These terms are used in accordance with the provisions of the *Nature Conservation Act 1992* (Qld) (NC Act) and its amendments, and/or the *Environment Protection and Biodiversity Conservation Act 1999* (Cth) (EPBC Act). *Threatened* is used in this chapter to collectively describe *Endangered* and *Vulnerable* species.

This chapter describes the potential impacts of the project on remnant vegetation as defined under the *Vegetation Management Act 1999* (Qld) (VM Act). The descriptions of conservation status used in this chapter reflect those defined under the VM Act and Regional Ecosystem Description Database (REDD) maintained by the Queensland Herbarium. Botanical names conform to those recognised by the Queensland Herbarium.

The impacts on terrestrial flora were considered in conjunction with the related indirect effects on other factors including aquatic ecology, fauna, soils, and cultural values. Remnant terrestrial vegetation provides habitat for fauna, so the assessment of terrestrial vegetation is able to provide an indication of fauna habitat value (see the EIS, Chapter 6, Terrestrial Fauna). Remnant riparian vegetation provides habitat protection for aquatic flora and fauna, through processes such as shading, erosion control and stream flow regulation (see the EIS, Chapter 8, Aquatic Flora and Fauna).

The project area for this chapter refers to lands and waterways within the project corridor. The average width of the corridor investigated is approximately 100 m. The 30 m ROW that is likely to be substantially cleared for the construction and operation of the pipeline sits within this corridor.

Initial field studies were undertaken in April 2007, with subsequent detailed site surveys completed from late August through to early September 2007. Due to extended drought conditions in the region and the fact that some areas of the project area were not accessible at the time of field surveys, it is likely that not all species were observed.

The chapter also considers weed issues in the project area to avoid exacerbating weed seed spread, particularly Parthenium around the northern end of the corridor and Giant Rats-tail Grass around the southern end of the corridor.

The following presents a summary of the key findings, for more detail see the EIS (Chapter 6, Terrestrial Flora).

Existing Conditions

The project area is located within the Brigalow Belt South and South-East Queensland bioregions. A bioregion is an area of land that is dominated by similar broad landscape patterns that reflect major structural geologies and climate, as well as major changes in flora and fauna collections.

The north-western section of the project area is within the Brigalow Belt South bioregion, and is characterised by flatter, undulating country, with less eucalypt forest (but notably with Poplar Box), and more clay plains, sometimes with Brigalow. The south-eastern end of the project area (east of Yarwun) is within the South-East Queensland bioregion, and this area is characterised by part of the Great Dividing Range, and hilly country with eucalypt forest (but with Poplar Box notably absent).

Upper strata (trees and shrubs) did not appear to be adversely affected by drought. It is likely that recent rain and flooding in the region will have had a positive impact on ground layer flora. However it is not expected that any additional *Rare* or *Threatened* species would establish following the rain, and would not significantly alter the baseline terrestrial flora values as outlined in this chapter.

Softwood scrub is a collective term for non-eucalypt species which are often diverse, and sometimes regarded as “dry rainforest”. Some types of softwood scrub in this area are classified as “semi-evergreen vine thicket”, but scrub (or softwood scrub) will be used from this point as a collective term.

The project area from the Fitzroy River through to Bajool consists of alluvial country in the Gracemere and Gavial areas, with dark, high clay content soils, commonly referred to as “black soil”. There were a high number of permanent and ephemeral wetlands in these areas. Tree cover was generally sparse as a result of clearing for pasture, and was predominantly scattered Coolabah, Blue Gum, and further south around Bajool, Poplar Box. There were small patches (i.e. less than 1 ha) of remnant scrub within this length of the corridor, with one notable patch in the Gracemere area.

Further south around Marmor, the area is slightly hilly, with areas of scrub and Brigalow, which have mostly been cleared. There are small patches (i.e. less than 1 ha) of remnant scrub within this length of the corridor, plus a number of areas of scrub regrowth. Hills increased in size further south, indicating a change in geology, and the predominant vegetation type around Raglan, Ambrose and Mt Larcom was Grey Box forest. Soils tend to be grey and silty, with a lower clay content, and geological parent material was metamorphic or sedimentary, but not generally alluvial like the northern end of the corridor.

The area from Mt Larcom to Gladstone has substantially larger hills of metamorphic origin, which increase slightly in eucalypt species diversity, with species including Narrow-Leafed Ironbark and Spotted Gum. There are alluvial areas, but these change

around Aldoga from the Brigalow Belt South bioregion in the west, to the South-East Queensland bioregion in the east. The remaining predominant trees on these alluvial plains tend to be Blue Gum, and not the others described for the northern (and western) end of the corridor.

No targeted *Rare* or *Threatened* plant species were observed during field survey in either section of the corridor. For summaries of observations from field investigations, see the EIS (Chapter 6, Terrestrial Flora).

Almost all of the species listed as *Endangered* or *Vulnerable* in the NC Act, and *Threatened* under the EPBC Act, are species typically found in scrub. These species were assumed to be most likely to occur within remnant patches of softwood scrub or vine thicket, so targeted survey for these species was restricted to these remnant patches. Partially cleared, or regrowth, areas of scrub were also surveyed as part of the vegetation survey. None of the listed scrub species were found during the surveys. If they are present, they are protected by virtue of their habitat which is protected under the NC Act and EPBC Act.

Throughout the project area there were areas of ecological concern due to their conservation status under State or Commonwealth legislation, or other values. These include:

- **Fitzroy to Bajool** - a wetland of good condition was observed in the project area. The wetland was inundated at the time of survey, with waterbirds present, and limited weed infestation. An area of mapped wetland also occurred in the project area.
- **Bajool to Gladstone** - during field studies Brigalow and Softwood scrub were observed in various locations. There were also occurrences of mangroves at Horrigan Creek and Raglan Creek and Riverine Blue Gum and rainforest at Boat Creek.

Impact Assessment

The main potential impacts on terrestrial flora during construction of the project are:

- Clearing of vegetation remnants.
- Reduction of flora species habitat.
- Removal of individual species of significance.
- Reduction of wildlife corridor functionality.
- Remnant vegetation edge effects.
- Riparian vegetation disturbance.
- Weed introduction.

Activities that may cause these impacts include:

- Felling of individual trees.
- Clear-felling of stands of trees, and increasing edge effects such as wind and weed penetration.
- Bulldozing of shrubby areas.
- Trenching across ephemeral wetlands and creeks, specifically including clearing either side of the trench.
- Digging pits on either side of wet creeks for entry and exit of underground boring.
- Possible accidental introduction of weeds to a site.

Mitigation measures

A number of measures have been identified to mitigate impacts associated with terrestrial flora, including:

- A pre-construction survey of all scrub communities.
- Minimise removal of vegetation where possible.
- Confinement of trenching activities to already-cleared or open areas where possible.
- Implementation of weed control measures, including vehicle wash down where appropriate.
- Replanting of removed vegetation where possible.
- Replacement of topsoil after trenching to promote re-establishment of vegetation.
- Use of trenchless creek crossing measures in three locations to minimise impact on riparian vegetation.
- Implementation of sediment and erosion control measures.
- Translocation of *Rare* or *Threatened* sapling species where possible.
- Reduction of ROW width where possible across creeks and creek banks.
- Surveillance of the ROW during operations checking for indications of loss of vegetation cover and occurrence of weeds.

Environmental Offsets

Environmental offsets are mechanisms that can be used in environmental management to compensate for the impacts of developments on ecologically significant features. Offsets are usually available through an environmental impact and approvals process. The arrangements for offsets will be finalised following successful completion of the EIS process and in the context of vegetation clearing applications under the VM Act.

Summary

The construction of the pipeline and clearing of the ROW is likely to have an overall **negligible to minor adverse** impact on vegetation communities in the project area once mitigation measures are implemented. Prior to construction, a qualified ecologist will identify areas within the corridor where negative impacts on flora communities (in general) and *Threatened* species are possible.

Occasional traffic and other activities that could potentially disturb vegetation are likely to occur infrequently in the ROW during the operational phase of this project. The main ongoing concerns will be monitoring of vegetation rehabilitation, and weed control.

Terrestrial Fauna

This chapter of the EIS discusses conditions within the project area with respect to terrestrial fauna. The term fauna refers to all vertebrate fauna (excluding fish, see the EIS Chapter 8, Aquatic Flora and Fauna).

The project area for this chapter refers to the land within the 30 m ROW, plus land for associated infrastructure sites. The term 'surrounding area' refers generally to the lands within 2 km of the project area.

Within this chapter, the conservation status of a species may be described as *Rare*, *Endangered* (also *Critically Endangered*), *Vulnerable*, *Near-Threatened* and/or *Migratory*. These terms are used in accordance with the provisions of the EPBC Act and/or the NC Act and its regulations and amendments.

Initial desktop research indicated that a number of species of conservation significance may use habitats within the project area and surrounding areas. Consequently, consideration was given to these species in the design and implementation of the field survey program and habitat assessments.

The field survey program was initiated in April 2007 and comprised of the following survey events:

- A preliminary biodiversity investigation.
- A series of monthly surveys between June and December 2007 to monitor known and potential habitat areas for the threatened Yellow Chat.
- A spring-season bird survey.
- A comprehensive target species and biodiversity survey.

All habitat assessments and fauna surveys were conducted during the period April to December 2007. Although there were moderate amounts of rainfall in late winter and early November 2007, rainfall coverage was patchy, and only the early November rainfall promoted reasonable vegetative growth (particularly

in relation to diversity and biomass of grasses) in areas where rainfall was heaviest. Much of the region still exhibited the effects of having experienced drought conditions for an extended period (greater than five years).

The following presents a summary of the key findings, for more detail see the EIS (Chapter 7, Terrestrial Fauna).

Existing Conditions

The region between Rockhampton and Gladstone has a long history of pastoralism and agriculture (since the 1850s) and is currently dominated by extensive cattle grazing activities. Clearance of native vegetation, pasture improvement and cattle grazing is a land use sequence that has significantly influenced fauna habitat values and the characteristics of the fauna collection in the area. The ability of native fauna to adapt to changes in habitat extent and condition varies considerably, and for a variety of species, there has been a notable decline in their local and regional distribution and abundance.

The review of existing information sources (including an EPBC Act Protected Matters database search and Queensland Environment Protection Agency (EPA) Wildlife Online database extract) for the wider area within 30 km of the project area provided records for a variety of *Threatened* and/or migratory species as listed under the EPBC Act and *Rare* and *Threatened* species as listed under the NC Act.

Essential habitat is an area of vegetation in which a *Rare* or *Threatened* species is known to occur. Essential habitat areas are identified by the EPA as being crucial for the survival of a species of wildlife which has been listed as *Endangered*, *Vulnerable*, *Near-Threatened* or *Rare* under the NC Act. There are no areas of essential habitat mapped within or adjacent to the project area.

The review of existing information identified that a number of weed and pest species occur in the project area. These species, to varying extents, whether individually or collectively, add pressure to the maintenance of local biodiversity and species of conservation concern.

In the Fitzroy to Bajool section of the project area, the highest value habitats for fauna diversity are located in and around:

- Riparian vegetation along the Fitzroy River and smaller waterways.
- Small and scattered patches of native remnant and regrowth vegetation.
- Wetlands including a small number of depressions.

The Bajool to Gladstone section of the project area supports a greater extent of remnant vegetation in comparison to that recorded for the Fitzroy to Bajool section. The comparatively higher species richness recorded for Bajool to Gladstone relates

to both a wider range of habitat types and the greater extent of remnant vegetation in comparison to that recorded for the Fitzroy to Bajool section. The highest value habitats for fauna diversity in this section are located in and around:

- Riparian vegetation (e.g. Raglan Creek).
- Areas of native remnant and regrowth vegetation.
- Wetlands including a variety of freshwater, brackish, saline habitats.

Field Survey Results

The field survey recorded a number of terrestrial fauna species, including mammals, reptiles, frogs and birds (see the EIS, Chapter 7, Terrestrial Fauna, for details). A large proportion of the recorded fauna collection was comprised of species regarded as relatively common and widespread within the South-East Queensland and Brigalow Belt bioregions. Due to the limited diversity of habitat, this was an expected result.

The results of the survey program provided records for introduced fauna species (nine mammal, one reptile, one amphibian and two bird species). Evidence of these species was widespread throughout the project area.

Eight species recorded in the surveys are listed as *Rare*, *Threatened*, or otherwise significant under the provisions of the Commonwealth and/or State legislation. These are:

Critically Endangered: Yellow Chat (*Epthianura crocea macgregori*).

Vulnerable: Squatter Pigeon (sth. subsp.) (*Geophaps scripta scripta*) and Ornamental Snake (*Denisonia maculata*).

Regionally Vulnerable: Koala (South-East Qld) (*Phascolarctos cinereus*).

Rare: Cotton Pygmy-goose (*Nettapus coromandelianus*), Jabiru (*Ephippiorhynchus asiaticus*), Radjah Shelduck (*Tadorna radjah*) and Black-chinned Honeyeater (*Melithreptus gularis*).

Impact Assessment

The project's ROW traverses cleared and highly disturbed environments and avoids as many areas of regrowth native vegetation as possible. However, given the length of the pipeline and topographic constraints, it is not possible to avoid all areas that may support fauna habitat. Potential impacts include:

- Vegetation clearing and habitat disturbance.
- Habitat fragmentation and disturbance to wildlife movement corridors.
- Disturbance to wetlands and waterways.
- Trench fall (entrapment of fauna within open trenches during construction).

- Creation of environments favourable to the colonisation and expansion of environmental weeds and pest animals.

As determined through field surveys, habitat suitability assessments, and knowledge of habitat requirements, the project area does not support examples of quality preferred habitat for many of these species. Though highly unlikely, it is possible that these species could occur in the project area, therefore a conservative, precautionary approach has been adopted during impact assessment by including these species.

An assessment of the potential impacts to Threatened and migratory species listed under the EPBC Act, with reference to the significant impact criteria in EPBC Act Policy Statement 1.1 Significant Impact Guidelines – Matters of National Environmental Significance (May 2006), identified that the project is not likely to have a significant impact on these species.

Mitigation Measures

A number of measures are proposed to mitigate the identified potential impacts to terrestrial fauna. These include:

- Gaining relevant approvals prior to removal of any vegetation.
- Delineation of clearing boundaries on all drawings and in the field to define the extent of authorised clearing.
- Retention and protection of all mature hollow-bearing trees wherever practicable.
- Scheduling of construction activities to minimise the time between clearing and rehabilitating of the ROW.
- Constraining corridor clearing widths to the minimum necessary to allow construction of infrastructure.
- Replacing logs and fallen vegetation on the ROW post construction to provide habitat for native fauna.
- Minimising disturbance to habitat values where possible through use of trenchless construction methods.
- Rehabilitation of areas disturbed by construction to closely reflect pre-construction vegetation floristics and structure.
- Planning construction activities so that the excavated trench will be open for the minimum practicable amount of time to install pipe sections.
- Developing and implementing protocols for displaced fauna to be relocated to more suitable similar habitat within the project area.

Summary

The majority of the project area is highly disturbed and has been previously cleared. For these largely cleared and grazed lands, the implementation of the mitigation strategies outlined above will result in the project creating a **negligible** residual impact on terrestrial fauna.



At the key habitat locations identified within the project area, the residual impact ranges from **negligible** to **minor adverse** for the vast majority of the habitat areas described. The only area which may sustain a higher residual impact is Raglan Creek, where the impact of the creek crossing has been assessed as **moderate adverse**.

Aquatic Flora and Fauna

This chapter discusses the following key ecological groups:

- Aquatic macrophytes (aquatic plants that are typically large enough to be visible to the naked eye) and habitats.
- Macroinvertebrates (animals without backbones that are visible to the naked eye).
- Fish (estuarine and freshwater).
- Freshwater turtles.
- Marine megafauna (marine mammals and marine reptiles).

On the basis of a review of existing data, six main drainages were identified within the project area, namely Fitzroy River, Gaviol Creek, Inkerman Creek, Twelve Mile Creek, Raglan Creek and Larcom Creek. Two semi-permanent floodplain lagoons and approximately 24 ephemeral drainages of varying size were identified within the project area. Of these streams and drainages, a total of 16 sites were selected for field assessments.

Marine and aquatic habitat and flora surveys were undertaken at 16 representative sites during August 2007. A survey of the habitat characteristics of each site was undertaken, documenting riparian vegetation characteristics, stream substrate composition and profile, adjacent land uses, and several other indicators of habitat condition.

The following presents a summary of the key findings, for more detail see the EIS (Chapter 8, Aquatic Flora and Fauna).

Existing Conditions

Aquatic Habitats

The project area traverses the low-lying Fitzroy River delta and the more elevated northern reaches of the Calliope River catchment. The lower section of the Fitzroy River catchment has an approximate area of 6,052 km², which represents approximately 4 percent of the total catchment area (142,537 km²) of the Fitzroy River Basin. It is estimated that the total length of waterways within the lower Fitzroy River Basin is 13,585 km, with most waterways consisting of low (first and second) order drainages.

The Calliope River catchment had a mapped area of approximately 2,236 km², with the 4,077 km of waterways mostly comprised of first and second order streams.

Both the Fitzroy River and the Calliope River catchments have been significantly modified by catchment clearing, with approximately 88 percent and 83 percent of lands cleared for grazing respectively. Grazing and dry land cropping have together resulted in broad-scale soil erosion and sediment movement within the catchment.

Floodplains

There are two nationally important wetland areas listed under the Directory of Important Wetlands within the project area and/or immediate surrounds, including:

- The Fitzroy River floodplain wetlands.
- The Fitzroy River delta wetlands.

There are no Ramsar wetlands within or directly adjacent to the project area.

The Fitzroy River floodplain and delta encompasses a large area adjacent to the project area. The wetlands in this river floodplain are considered to have exceptionally high ecological and functional values. In regard to aquatic ecology, the wetlands in the southern Fitzroy River catchment provide a number of key functions for the region, namely fish passage, fish nursery areas, and dry season refuge areas for aquatic species.

Wetlands within the project area contribute to maintaining a connection between freshwater and marine environments, which is essential in providing fish passage between freshwater and marine waters for certain migratory species. As such, the wetlands provide important nursery habitats for fish, including species of recreational and commercial significance (e.g. Barramundi). During dry periods, the permanent freshwater lagoons (e.g. Frogmore Lagoon) provide refuge areas for aquatic flora and fauna when ephemeral waterbodies are dry.

Aquatic Flora

A review of relevant databases for aquatic macrophyte species of conservation significance identified no Threatened species occurring, or likely to occur, within the project area. In the project area there are a total of 47 macrophyte species recorded in existing studies, only six species were observed in field surveys conducted during August 2007. The aquatic macrophytes observed were recorded from five of the 13 freshwater sites observed and were restricted to permanent waterbodies (i.e. Twelve Mile, Larcom and Pelican Creeks, Fitzroy River and an unnamed lagoon).

Compared to the wider region, species richness in the project area was low, ranging from one to three species per site. The results are consistent with other recent surveys undertaken

within the project area (e.g. HLA-Envirosciences 2006) in terms of species composition and species richness. It is suspected that the low abundance and richness of macrophytes in the project area was largely a result of habitat degradation due to land clearing and grazing. Ongoing drought conditions at the time of sampling were also associated with a lack of permanent to semi-permanent waterbodies within the project area, reducing the area of available habitat.

Marine Vegetation

The mainland coastal plains situated between Calliope River and Fitzroy River contain extensive tidal wetlands, which cover an area of approximately 450 km². These tidal wetlands were mainly comprised of mangrove forests and thickets (194.1 km²), saltmarsh communities (254.1 km²), and sedgeland (2.9 km²).

Isolated areas of mangroves and saltmarsh communities occur within the project area. Regional Ecosystem (RE) mapping, together with site visits, identified approximately 0.06 km² of mangrove forest on Raglan Creek and approximately 0.013 km² of mangrove forest at Inkerman Creek. No saltmarsh vegetation has been identified within the project area through RE mapping, however, sparse saltmarsh communities dominated by Pigweed surrounding the tidal regions of Inkerman Creek were noted during field surveys.

Macroinvertebrates

There are no aquatic or marine macroinvertebrate species listed under the EPBC Act, *Nature Conservation (Wildlife) Regulation 1994* or *Fisheries Act 1994* known or likely to occur within the project area, or Fitzroy River catchment.

Floodplain wetlands, ephemeral streams and the littoral edge habitat of the Fitzroy River are likely to support relatively rich and abundant macroinvertebrate communities. The more permanent waters of Gaviel Creek may provide habitat for aquatic fauna that are intolerant of pool drying.

Estuarine habitats occur at Raglan Creek, Horrigan Creek and Inkerman Creek. The habitat types present within and adjacent to these waterways are known to be important habitats for several crustacean species of commercial significance (i.e. Banana Prawns, Mud Crabs, Blue Swimmer Crabs). The area of mangroves and saltmarsh habitats within this section of the project area, particularly at Raglan Creek, is quite extensive and it is possible that this area has high fisheries habitat values at a local scale.

Fish

The Fitzroy River at the pipeline intake represents the most important aquatic habitat for fish of economic (e.g. Barramundi, Yellowbelly, Southern Saratoga) and conservation significance. This area represents permanent habitat, and contains a diverse

range of micro-habitats (i.e. snags, some rock, backwaters) of importance for fish spawning, shelter, and feeding sites. This site also forms a locally important recreational fishing area.

The floodplain lagoons in the project area represent potentially good quality fish habitats, as these wetlands connect to the Fitzroy River during large flood events. However, given the small size and shallow depths of these lagoons, it is unlikely that they would contain large numbers of bigger bodied fish species (e.g. Southern Saratoga, Yellowbelly, Barramundi) during prolonged drought conditions – although during wetter periods these lagoons may represent good quality fisheries habitats.

The ephemeral drainages (Lion Creek, Station Creek) are likely to represent temporary habitats and movement corridors for most fish species during certain flow conditions. However, no large, permanent waterbodies are known to occur on the creeks upstream of the project area, limiting the values of these waterways as fish habitats.

The pipeline route intersects tidal creeks at two main points, namely Inkerman Creek and Raglan Creek. Raglan Creek and Inkerman Creek are mangrove-lined tidal creeks that support habitat types that are of importance to fisheries productivity. Mangrove-lined creeks are known to represent potential nursery habitats and feeding areas for many fish and nekton-benthic species (i.e. prawns/crabs). The two tidal creeks provide a range of structurally complex habitats for fish and crustaceans of commercial and non-commercial significance.

These environments would contribute to the fisheries productivity of the Fitzroy and Gladstone regions, and are likely to represent important fisheries habitats at a highly localised scale. However, given their small area, it is unlikely that the project area waterways have a high value at broad spatial scales. No listed fish species of conservation significance are known or likely to occur in tidal creeks within the project area.

Two of the largest freshwater waterbodies in the project area were situated on Twelve Mile Creek and Larcom Creek. Twelve Mile Creek is heavily disturbed by cattle and presently has limited habitat diversity. Nonetheless, the permanent pools within the watercourse would provide aquatic habitat for many fish species, possibly including larger-bodied fish species such as Yellowbelly and Eels. Larcom Creek also represents a fish habitat, and contains a wide diversity of micro-habitats. This waterway is not situated in the Fitzroy catchment and is therefore not known to be within the geographic range of several large-bodied fish species, such as Southern Saratoga, Leathery Grunter and Yellowbelly. Nonetheless, it would support suitable habitat for species of conservation significance such as Purple-spotted Gudgeon, Agasizzi's Glassfish and possibly Rendahl's Tandan.

Freshwater Turtles

Five species of freshwater turtle are known to occur within the broader catchment in which the project area is located, namely the Broad-shelled River Turtle, Eastern Snake-necked Turtle, Krefft's River Turtle, Fitzroy River Turtle and Saw-shelled Turtle. Most of these species are widespread and abundant throughout the broader region, the exception being the Fitzroy River Turtle, which is restricted to the Fitzroy River catchment. The Fitzroy River Turtle is listed as *Vulnerable* under both Commonwealth (EPBC Act) and State (NC Act) legislation.

Shells of the Krefft's River Turtle were observed at four locations (Lagoon 2, Gavial Creek, Frogmore Lagoon and Larcom Creek) during the field investigations conducted for the EIS. This strongly suggests that these particular locations represent aquatic habitat utilised by this species. Within the project area, the Fitzroy River at the intake point, and possibly Gavial Creek and the two off-stream lagoons (Lagoons 1 and 2), represent potential but low quality (i.e. not typically fast flowing or clear waters) habitat for this species. The larger freshwater waterbodies (Twelve Mile Creek and Larcom Creek) represent only marginal habitat for this species as their waters are typically not clear or fast flowing.

Marine Megafauna

The marine megafauna species most likely to occur in the project area is the Estuarine Crocodile. The Estuarine Crocodile is listed as *Vulnerable* wildlife under *Queensland's Nature Conservation (Wildlife) Regulation 1994* (Qld), and as a 'listed migratory species' under the EPBC Act. The species is widely distributed within tropical Australia, with the project area situated towards the southern extent of its range. Raglan Creek, Twelve Mile Creek and Inkerman Creek represent areas likely to be inhabited by the Estuarine Crocodile.

The most likely marine turtle to inhabit nearshore areas close to the Fitzroy River is the Green Turtle, which is listed as *Vulnerable* under the EPBC Act. Dugongs are not likely to occur in the estuarine areas of the project area.

Impact Assessment

Potential impacting processes to aquatic flora, fauna and their habitat resulting from the construction and operation phases of the project are:

- Vegetation clearing and channel disturbance.
- Water quality modifications.
- Creation of in-stream barriers (i.e. culverts).
- Creation of new mosquito and biting midge breeding sites.
- Alterations to habitat, both surrounding the intake pipe and within the Fitzroy River weir pool.

- Translocation of exotic species and weeds from the Fitzroy River.
- Entrainment of flora and fauna within the pipeline.
- River bed or bank scouring at the intake.

Mitigation Measures

A number of measures were identified to mitigate impacts associated with aquatic flora and fauna, including:

- Minimise disturbance to stream/wetland banks and beds during construction.
- Utilisation of trenchless methods for three creek crossings at ecologically significant or sensitive watercourses to reduce vegetation clearing and channel disturbance, water quality modifications and the creation of in-stream barriers.
- Reduction of corridor width in sensitive areas (such as Raglan Creek).
- Utilisation of existing tracks where possible during construction.
- Implementation of sediment control measures to control disturbed sediments.
- Implementation of weed control measures.
- Replanting of vegetation after construction is complete to ensure the long-term stability of stream banks.
- Emptying any small areas of ponded water resulting from local rainfall or flooding within borrow pits within a few days to avoid the breeding of biting insects.
- Treating ASS appropriately in accordance with the ASS Management Plan where it cannot be avoided to minimise (or avoid) the generation of acid runoff.
- Placement of the intake at a depth to prevent river bed scour.
- Design intake to include adequate scour protection by using suitable rock/grout construction.
- Monitoring operation of the intake point for impacts on aquatic flora and fauna.
- Provision of an adequate distance between the pump and the intake screens to reduce the risk of fauna being impinged on the intake screens.

Summary

The project area and surrounds have a range of values from an aquatic ecology perspective. Most significant aquatic ecology features will not be directly or indirectly affected by the proposed pipeline. There are very few listed *Threatened* species and communities within the project area, reflecting in part extensive historical and ongoing disturbances, particularly those associated with land clearing. Detectable impacts to *Threatened* aquatic species associated with the project have been assessed as **negligible**.

In terms of aquatic ecology, the construction of the pipeline, ROW and operational impacts will have a **minor to moderate adverse** impact.

Water Resources and Water Quality

This chapter of the EIS discusses the surface and groundwater environment in the project area, and considers possible impacts on water quality and quantity as a result of both the construction and operation of the project. The surface water component focuses on the perennial, ephemeral and tidal streams within the pipeline corridor. The groundwater component focuses on the aquifer system below ground. The EIS (see Chapter 8, Aquatic Flora and Fauna) also addresses the aquatic environment, with a focus on flora and fauna.

The project area for this chapter includes the 30 m ROW for the project and **land for** all project infrastructure sites. Any relevant upstream or downstream water environments which may be impacted by the project are also considered.

The information in this chapter was obtained from a review of existing information and field survey, including selected water quality monitoring and geotechnical investigations.

Weekly surface water sampling was undertaken in the Fitzroy River commencing April 2007 for a period of 13 months. During aquatic flora and fauna surveys for the project, additional surface water quality sampling was undertaken at various waterways within the project area.

Geotechnical investigations (test pits and soil sampling) were undertaken in the project area between August and October 2007. Information from these investigations has been used in the groundwater assessment.

The Queensland Water Quality Guidelines (QWQG) and the Australian and New Zealand Environment and Conservation Council (ANZECC) Guidelines for Fresh and Marine Water Quality have been used as the guidelines to assess water quality in the project area.

The following presents a summary of the key findings, for more detail see the EIS (Chapter 9, Water Resources and Water Quality).

Existing Conditions

The following existing conditions were determined for surface and ground water in the project area.

Surface Water

- The majority of the project area is located within the Fitzroy River catchment (a sub-catchment of the Fitzroy Basin catchment), with the south-eastern section of the project area located within the Calliope River catchment.
- Water quality in both catchments is affected by land uses such as grazing, dry land cropping, irrigated cropping, heavy industry development, and mining which cause water quality issues through soil erosion, pesticides, nutrients, acidity, and salinity.
- The Fitzroy River is the largest waterway in the project area.
- Other waterways include Lion Creek, Gavial Creek, Station Creek, Oakey Creek, Eight Mile/Inkerman Creek, Twelve Mile Creek, Marble Creek, Pelican Creek, Raglan Creek, Horrigan Creek, Larcom Creek, Sandy Creek and a number of unnamed tributaries and lagoons.
- The assessment of the surface water quality from the Fitzroy River against the QWQG identified the following characteristics that fall outside the recommendations of the guidelines:
 - Consistently high turbidity.
 - Low levels of dissolved oxygen.
 - High levels of total nitrogen, nitrates, total phosphorus and metals.

Groundwater

Existing groundwater conditions and usage along the pipeline alignment are broadly described here based on data from existing registered bores, geological and land use data and observations during the geotechnical test pit program.

- The hydrogeology in the Fitzroy to Bajool region is characterised by the presence of medium to high-plasticity clays which extend to around 8 m to 10 m below the surface.
- Beneath this clay, there are water bearing alluvial sand aquifers in some areas.
- Depth to water in these aquifers the Bajool to Gladstone region is generally in the order 10 m to 20 m.
- These aquifers are underlain by basalt and granitic formations.
- Groundwater is very saline and would require significant treatment to reach a potable standard.
- The spatial distribution and quantity of yields from aquifers potentially affected by the pipeline indicate a limited potential for the development of centralised urban groundwater supply system.
- Water bores in the area are used for agricultural usages and secondary residential usages.



Impact Assessment

Potential impacts on water resources and water quality include:

Surface Water

Potential impacts to surface water associated with the project are mostly related to construction impacts and disturbance of the ground surface, which can be readily mitigated through good site practice and procedures.

Potential construction impacts include:

- The release of construction fuels, chemicals or other construction materials to surface water.
- The generation of litter from construction sites.
- The release of sediment-laden water to adjacent surface waters or downstream protected areas.
- The extraction of water for construction activities and associated disturbance to the hydrological regime and reliant vegetation.
- The disturbance of vegetation and subsequent destabilisation of surfaces and waterway banks.
- The spread of noxious/declared weeds into previously undisturbed areas.
- The disturbance of ASS or contaminated soils and subsequent release of contaminants to waterways.
- The discharge of water to land or waterways during commissioning and testing of the WTP and pipeline.

Potential operational impacts include:

- Scouring of bed and bank around the pipeline structure or inlet point, leading to hydraulic obstruction, exposure of in-stream infrastructure or re-suspension of suspended solids within the waterway.
- Adverse impacts on humans and aquatic fauna from the use of herbicides for weed suppression.
- Chlorination of water and harm to aquatic ecosystems from pipeline rupture due to this chlorination.
- The release of fresh water into tidal waters from pipe rupture.
- The spread of pest species to undisturbed areas through the pipeline intake point.
- The release of contaminated stormwater or wastewater from the WTP.

Groundwater

Impacts to groundwater associated with the project are strongly related to the local geology and soil profile. For example, the presence of the clay layer acting as a protective barrier to impacts from the surface. The expected depth of the pipeline trench is not likely to intersect groundwater.

Potential construction impacts to groundwater include:

- Temporary dewatering during trench construction.
- The formation of a paleochannel (a remnant of a stream channel cut in older rock and filled by the sediments of younger overlying rock) where pipeline works run below river crossings or where the pipeline trench intersects the water table.
- Potential for the exposure of ASS.
- Spills or leaching of contaminants resulting from servicing of equipment, spills, or fuel or liquid chemicals.

Key potential impacts to groundwater relating to operation of the pipeline include:

- Possible contamination of groundwater from disposal of pipe flush waters resulting in reduced groundwater quality.
- Leakage of water from the pipeline structure resulting in water quality impacts to groundwater.
- Degradation of the pipeline structure such as corrosion resulting in contaminants leaching into groundwater.
- Vegetation clearance resulting in increased groundwater recharge.
- Groundwater contamination resulting from pesticide use to maintain the pipeline easement.

Mitigation Measures

A number of measures are proposed to mitigate the potential impacts to water resources and water quality during construction and operation of the project. These include:

- Selection of trenchless methods for three creek crossings at ecologically significant or sensitive watercourses to reduce vegetation clearing and channel disturbance, water quality modifications and the creation of in-stream barriers.
- Implementation of drainage, erosion and sediment control measures.
- Choice of appropriate storage of contaminants during construction.
- Rehabilitation of disturbed areas.
- Implementation of an ASS Management Plan.
- Minimising erosion from water discharge during commissioning.
- Ensuring water discharged during commissioning and testing complies with water quality guidelines prior to release.
- Development of a Groundwater Management Plan.
- Monitoring of water levels in groundwater bodies within a defined proximity to the pipeline.

During the extraordinary condition of a pipe rupture, scour outlets will be opened and water discharged at high pressures to reduce the pressure on the ruptured part of the pipeline. The likelihood of this occurring is low, however water under a

high pressure would be released quickly, reducing the time for sodium hypochlorite levels to be diluted, which may have water quality implications. The discharge from the pipeline will be managed to reduce erosion impacts.

Mapping information does not indicate any bores within close proximity to the location of intake work. This suggests that any changes in groundwater level will not result in changes to bore water pressure affecting pressure in existing nearby bores.

Summary

Potential impacts associated with the project are mostly related to construction impacts and disturbance of the ground surface, which can be readily mitigated through good site practice and adherence to an environmental management plan.

The implementation of the mitigation measures outlined above will alleviate most of the identified adverse impacts, as a result only **minor adverse to moderate adverse** residual impacts are anticipated from construction activity and **negligible to minor adverse** for operation. Residual impacts to groundwater were assessed as **negligible**.

Air Environment

This chapter of the EIS discusses potential changes to local air quality arising from the project. The potential changes to air quality have been considered in relation to the standards set out in the National Environment Protection (Ambient Air Quality) Measure (referred to as the Air NEPM). Reference is also made to the Queensland Air Quality Goals as set out in the *Environmental Protection (Air) Policy 1997* (referred to as the EPP (Air)). Greenhouse gases are considered separately to other pollutants.

The assessment of the air environment is based on:

- A review of existing air quality data available from the Queensland EPA. Data reviewed includes annual summary and trend reports for Queensland, air quality bulletins for Central Queensland and air quality monitoring data for the Gladstone area.
- Site visit during 2007 to identify sensitive receptors (such as residences).
- Review of relevant greenhouse gas information.

The pollutants considered in the air quality assessment are:

- Nuisance dust.
- Particles.
- Odour.
- Oxides of nitrogen (NO_x).
- Carbon monoxide (CO).

The greenhouse gas assessment used methodologies consistent with those outlined within the Commonwealth Department of Climate Change's National Greenhouse Accounts Factors (January 2008). This method is consistent with assessment of greenhouse gas emissions in accordance with international requirements in the Kyoto Protocol.

This chapter considers the construction, operation and maintenance of the project and is divided into an air quality assessment and a greenhouse gas assessment. Issues considered include:

- Whether there is any impact from dust, or emissions from construction machinery.
- Whether gaseous emissions will occur from power sources at the Fitzroy River intake, WTP and pump stations, and if so what is their impact.
- Whether the water treatment process itself is likely to have any impact on air quality.
- An assessment of the greenhouse gas emissions from construction and operation of the project.

The following presents a summary of the key findings, for more detail see the EIS (Chapter 10, Air Environment).

Existing Conditions

- Given the rural nature of the majority of the project area, the likely air pollutant sources are not considered significant. As such, ambient particulate contributions in rural areas are likely to be most significant from agricultural activities, bushfires, and managed vegetation burning practices.
- Dry conditions with little rain are also likely to cause an increase in ambient particulate levels, as dust is easily mobilised in dry conditions.
- Industry in locations within the project area, including Rockhampton, Alton Downs, Midgee, Gracemere and Marmor, Bajool, Raglan, Mt Larcom, Yarwun and Gladstone have facilities reporting to the National Pollutant Inventory.
- At present no air quality monitoring is carried out in the Rockhampton area as the EPA considers that pollutant levels are reasonably expected to be below the relevant Air NEPM standards.
- The EPA carries out monitoring at three sites in the Gladstone region, including South Gladstone, Clinton and Targinie. Between June 2006 to June 2007, there were no recorded exceedences of the Air NEPM standards for the four key pollutants monitored (nitrogen dioxide, sulfur dioxide, ozone and particulates) across the three monitoring sites in the Gladstone region.

- Weather conditions, and therefore soils, tend to be drier in the winter months in Central Queensland and periods of dry weather combined with higher than average winds have the potential to generate the most dust.
- Dispersion of atmospheric pollutants, nuisance dust and nuisance odour is dependent upon wind direction and speed.
- The predominant wind directions in Rockhampton are from the south-east and east, at a frequency of around 35 to 40 percent of the time. Wind speeds are usually in the 10 to 20 km/h range.
- The predominant wind directions in Gladstone, as with Rockhampton, are also from the south-east (am) and east (pm), at a frequency of around 30 to 40 percent of the time. Wind speeds are slightly higher than those recorded in Rockhampton, usually being in the 20 to 30 km/h range.
- The baseline greenhouse gas emissions for current land use activities were estimated to be 130 t CO₂-e per annum. These emissions are mainly from enteric fermentation of methane in cattle.

Impact Assessment

Possible impacts from the construction and operation of the project include:

Construction

- Atmospheric emissions from construction activities will depend on a combination of:
 - the potential for emission (the type of activities).
 - meteorological conditions.
 - the effectiveness of control measures.
- Exhaust emissions from site plant, equipment and vehicles and fugitive dust emissions from site activities are the two sources of emissions that will need to be controlled to minimise the potential for adverse environmental effects.
- While the operation of site equipment, vehicles and machinery would result in emission to the atmosphere of unquantified levels of waste exhaust gases, such emissions are unlikely to be significant.
- Dust from construction traffic could have an impact on neighbouring or nearby occupiers if not properly controlled.
- It is not anticipated that there will be any contaminants on site with the potential to discharge toxic fumes or dangerous substances.

- The project is not likely to generate a significant level of off-road plant emissions, as a result of pump stations, generators or other plant at the site.
- Comparing the project construction greenhouse gas emissions to the total Industrial Process Sector emissions for Queensland indicates that this project will result in an increase in emissions of approximately 3.3 percent for each of the two years the project is under construction.

Operation

- Vehicles will be used during the operation of the pipeline for day-to-day operational purposes and maintenance purposes.
- Vehicle movements will comprise employees, delivery and service vehicles (including transport of waste residue). However, given the number of vehicles and that the majority of roads traversed are sealed, the effects of these traffic movements on local air quality (with regard to gaseous emissions and disturbance of nuisance dust) are not likely to be significant.
- During operation, greenhouse gas emissions will increase approximately 0.077 percent per annum for the Queensland Industrial Processes Sector.
- No odour emissions are expected from the operation of the pipeline and its associated infrastructure.

Mitigation Measures

The following mitigation measures are proposed for the construction and operation of the pipeline.

Construction

- Planning to prevent dust emissions where possible, in the first instance, rather than applying dust suppression methods.
- Identifying appropriate water sources for dust suppression purposes. Water used should not lead to soil contamination (e.g. saline groundwater or contaminated wastewater). Where water resources are scarce, dust stabilisers could be used.
- Damping down of site haul roads during prolonged dry periods.
- Regular cleaning of hard-surfaced site entrance roads.
- Ensuring that dusty materials are stored and handled appropriately (e.g. wind shielding or complete enclosure, storage away from site boundaries, restricting drop heights of materials, using watersprays where practicable to reduce dust emissions).
- Ensuring that dusty materials are transported appropriately (e.g. sheeting of vehicles carrying spoil and other dusty materials – ‘covered loads’).

- Confining vehicles to designated haulage routes within the site.
- Restricting vehicle speeds on haulage roads and other unsurfaced areas of the site.
- Hoarding and gates to prevent dust breakout.
- Including appropriate dust monitoring within the site management practices to inform site management of the success of dust control measures used.
- If all available dust suppression methods fail to adequately prevent or suppress nuisance dust resulting in unacceptable impacts, construction activities may need to cease until conditions generating dust have subsided.

Operation

- Given that only relatively small effects on local air quality are anticipated from the operational traffic associated with the project, and that the effect of the project itself on local air quality is negligible, no mitigation measures are proposed with respect to operational traffic.
- The final project design will ensure that there are no significant operational risks associated with dangerous or corrosive chemicals, by avoiding the need for them. As standard practice, design will provide for buffers, controls, screening and other measures that will mitigate any operational impact on air quality.

Greenhouse Gas Emissions

No specific measures related to mitigating greenhouse gases have been included due to the very low contribution of the project to these emissions during construction. However, it should be noted that GAWB is currently investigating options to offset its corporate greenhouse gas emissions (or carbon footprint). Options under consideration include the purchase of offsets, the use of GAWB land for carbon sequestration or the use of alternative non-carbon fuel sources (e.g. solar and wind) in its operations.

Summary

The construction effects of the project on local air quality will primarily be events where dust causes a nuisance during the limited period of the construction activities. With the implementation of suitable mitigation measures, the construction of the proposed pipeline is considered to have a **negligible to minor adverse** impact on air quality.

The air quality impacts once the project becomes operational, in relation to associated vehicle movements and direct emissions from the project itself, are likely to be **negligible**. As such, no mitigation measures in relation to the operation are proposed.

The impact associated with greenhouse gas emissions during construction and operation has also been assessed as **negligible**.

Waste

This chapter of the EIS discusses waste generation during construction, commissioning and operation of the pipeline and its associated infrastructure. Decommissioning of the pipeline and its associated infrastructure is also discussed in this chapter.

The following waste hierarchy has been applied to waste management for the project:

1. Avoid waste by optimising construction, operation and decommissioning methods.
2. Re-use waste by identifying sources that can utilise the waste.
3. Recycle waste by identifying facilities that are able to recycle waste.
4. Recover energy from waste.
5. Dispose of waste at an appropriate facility.

The waste hierarchy recommends avoidance as the preferred management process for waste, however this may be unavoidable in certain circumstances. If this is the case, the next appropriate step will be utilised to manage the waste.

The impacts of waste are assessed at a stage in the project where detailed design for construction and construction methods are under development. As such, waste streams, quantities and their associated impacts are assessed based on existing data available up to 31 May 2008. Throughout project planning, impacts and quantities will be further refined, elaborated and identified as the planning of the project progresses. Additional management requirements will also be developed and documented in Environmental Management Plans (EMP) (see the EIS, Chapter 20, Planning Environmental Management Plan) and Waste Management Plans. In the absence of detailed information, mitigation and management measures follow a precautionary approach.

Waste may include the following items:

- Debris from vegetation clearance.
- Building wastes.
- Wash-down wastewater.
- General waste from staff.
- Sewage (blackwater).
- Trench water due to groundwater infiltration and rain events.
- Hazardous and regulated wastes.
- Hydrocarbon wastes from end-use.
- Soil wastes.

The following presents a summary of the key findings, for more detail see the EIS (Chapter 11, Waste).



Impact Assessment

Potential impacts from waste generated by the construction, commissioning and operation of the project are detailed in this section.

Construction

- Aesthetic and contamination impacts due to litter.
- Contamination of creeks and soil from site run-off potentially containing oils, sediments, weed seeds and/or detergents.
- Potential distribution of weeds and the interruption of nutrient cycles from vegetation clearing.
- Environmental contamination if hazardous wastes or sewerage are accidentally released into the surrounding environment.

Commissioning

- Between 111 ML and 579 ML of waste water will be discharged to land and adjacent waterways during pipeline commissioning. The variance in the amount of water required for commissioning is due to:
 - Quantity of debris that needs to be flushed from the pipeline and its associated infrastructure.
 - Requirement to achieve operational stability for the system (i.e. water is at a quality suitable for integration into GAWB's existing network).
- An additional 328 ML of water may be required for the potential re-flushing of the entire system if necessary. This would be discharged into Boat Creek or Larcom Creek if the re-flush is required.

Operation

- The water treatment process will remove suspended solids from the water using a coagulant (e.g. polyaluminium chloride). At the end of the process, residue will remain that consists of water (approximately 70 percent of the total quantity) and the coagulant and other solids removed from the raw water (approximately 30 percent of the total quantity).
- The quantity of residue produced by the WTP is based on the water quality of the Fitzroy River which varies depending on seasonal and catchment conditions. On average, the WTP could produce 120 t of residue each day. As the WTP is not treating municipal waste water, the residue is not considered a regulated waste under the *Environmental Protection Regulation 1998* (Qld). The potential impacts associated with the transport of residue waste have been assessed in the EIS (see Chapter 13,

Transport and Access Arrangements).

- The generation of odours from the WTP is considered unlikely and would be contrary to its design. This is discussed further in the EIS (see Chapter 10, Air Environment).
- Scour maintenance waste (wastewater), which will be flushed out through the scour outlets.
- Bacteria, algae and other solid deposits may form in the pipeline and its associated infrastructure.
- General waste including food scraps and other wastes, garden clippings, toiletries, recyclable and non-recyclable office waste.

Mitigation Measures

- Preparation of a waste management plan prior to construction.
- Disposal of residue from the WTP to an approved location in accordance with local Government regulations.
- Disposal of waste (including domestic sewerage, hazardous and regulated waste) using qualified contractors and in accordance with relevant legislation.
- Mulching of vegetation where possible, to be spread with topsoil during rehabilitation of the ROW.
- Bunding of temporary wash down facilities.
- Minimising the quantity of waste water generated, especially during commissioning.
- Waste water (including trench and commissioning) will be collected, tested and treated prior to disposal to land and adjacent water ways, or disposed of in accordance with local Government regulations if it cannot be treated.
- Implementing erosion control measures during disposal of waste water.
- Use of excess soil from some site work as fill for other work sites if practical.
- Disposal of excess spoil at the nearest approved locations along the ROW, by agreement with landowners or local Council.
- If contaminated soil is present, remediation will occur depending on the level and significance of the contamination.
- Disinfection (de-scaling) and scouring maintenance may be required periodically to remove bacteria, algae and other solid deposits from the pipeline. Scour discharges will be managed in accordance with regulatory requirements, as required.

Summary

After mitigation measures are employed, general wastes during construction and operations are considered to have a **negligible** impact. Whilst commissioning wastes (discharges of water) are expected to result in **minor adverse** impacts. During operations, after mitigation measures are employed, the impact of residue disposal and scour maintenance is considered to be **minor adverse** whilst the impact of pigging wastes are considered to be **negligible**.

Noise and Vibration

This chapter of the EIS discusses noise and vibration as it relates to the project. To complete the assessment of noise and vibration for the project, a review of relevant legislation and best practice documentation was undertaken to determine the relevant acoustic criteria/regulations for industrial noise, occupational health and safety (noise), construction noise, blasting noise, and vibration.

Potential noise and vibration sources were identified and noise monitoring was conducted during August 2007 at potentially noise sensitive locations (e.g. residences) along the proposed project route. The prescribed noise limits in Queensland are outlined in the *Environment Protection (Noise) Policy 1997*, however the Ecoaccess: Planning for Noise Control Guideline 2004 (Ecoaccess PNCG) (EPA 2004) has been used for the project as it is more specific to planning for noise control related to industrial developments.

As the equipment to be used during construction is not yet finalised, a set of noise levels for generic equipment likely to be used during construction of the project were used for predicting construction noise.

It is expected that potential noise sources associated with the operation of the pipeline will be due to infrastructure such as the Fitzroy River intake, the Alton Downs WTP and pump stations.

Noise level predictions for the Fitzroy River intake and pump stations has been based on comparable existing facilities, namely the SunWater intake and Parkhurst pump station.

While these facilities have similar characteristics to those proposed for the project, the noise generated by the project's infrastructure may be different, as all facilities for the project will be newly built using modern construction materials and technology and noise attenuation measures will be designed into relevant facilities to meet noise level standards. These new facilities are therefore likely to generate lower noise levels than the existing, older comparable facilities.

To assist in accurately representing the noise impacts from the operation of the WTP, relevant suppliers also provided expected

noise levels for each component of the plant. This information was also used to predict the likely noise levels from the operation of the WTP.

The following presents a summary of the key findings, for more detail see the EIS (Chapter 12, Noise and Vibration).

Existing Conditions

A number of noise measurements were taken at relevant locations in the project area to determine the existing noise conditions. These were taken to gather information about the existing background noise in specific areas and to determine the noise generated by comparable existing facilities (SunWater intake and Parkhurst pump station). The table below describes the types of noise measured at specific locations along the pipeline route. See the EIS (Chapter 12, Noise and Vibration) for the data collected during these measurements.

Description of noise at specific locations along the pipeline route	
Location	Description of noise
Laurel Bank	Some distant farm activity related noise, personal water pump noise audible.
Laurel Bank	Night measurement, some wildlife audible.
Yarwun	Dominated by road traffic noise, approximately 30 percent heavy vehicles.
Mt Larcom	Dominated by road traffic noise, approximately 20 percent heavy vehicles.
Port Alma	Distant traffic noise from the Bruce Highway, some wildlife noise.
Archer	Dominated by road traffic noise, train noise audible, some wildlife noise.
Gracemere	Dominated by road traffic noise.
Aldoga	Distant industrial noise from aluminium quarry, some road noise.

Impact Assessment

Construction

Noise will be generated during construction by the use of equipment onsite, such as bored piling rigs, diesel generators, dump trucks, excavators and rock breakers and as a result of blasting activities.

Under the *Environment Protection (Noise) Policy 1997* (Qld) there are no specific noise limits for general construction noise, other than blasting. However, according to the Queensland



Environmental Protection Regulation (QEPR), on Sundays and Monday to Saturday before 6:30am and after 6:30pm, construction activities must be managed to avoid audible noise at the nearest noise sensitive receiver (i.e. residence).

Ecoaccess PNCG recommends that blasting activity should not occur on Sundays or public holidays and should be limited to the hours of 9:00am - 3:00pm, Monday to Friday and 9:00am - 1:00pm, Saturday.

Operation

The Fitzroy River intake, the Alton Downs WTP and the Raglan pump station are potential sources of noise during the project's operation. Noise limits for the assessment of noise impacts have been determined using the Ecoaccess PNCG.

Fitzroy River Intake

The Fitzroy River intake is located at a distance of more than 100 m from the nearest residence. The noise assessment has been completed using the measured noise levels at the existing Stanwell intake at Laurel Bank, and the noise limits recommended by the Ecoaccess PNCG for Laurel Bank. Based on this assessment, the noise levels associated with the Fitzroy River intake are not expected to exceed the noise limits set for Laurel Bank.

Alton Downs WTP

The boundary of the Alton Downs WTP is located at a distance of approximately 175 m from the nearest residence. The noise assessment has been completed using noise levels provided by suppliers of equipment to be used at the Alton Downs WTP and the noise limits recommended by the Ecoaccess PNCG for Laurel Bank. Based on this assessment, noise levels associated with the equipment proposed to be used at the Alton Downs WTP are predicted to exceed the noise limits set for Alton Downs; therefore appropriate mitigation measures need to be implemented.

Raglan Pump Station and Reservoir

The Raglan pump station and reservoir is located at a distance of well over 500 m from the nearest residence. The noise assessment has been completed using the measured noise levels at the Parkhurst pump station, and the noise limits recommended by the Ecoaccess PNCG for Raglan. Based on this assessment, the noise levels associated with Raglan pump station are not expected to exceed the noise limits set for Raglan.

Mitigation Measures

The following mitigation measures are proposed for the construction and operation of the project.

Construction

Mitigation methods for construction noise can be separated into strategies for:

- Source noise control.
- Work practice control.
- Community liaison.

Source Noise Control Strategies

In order to control noise at the source:

- The quietest plant and equipment will be selected wherever practicable.
- Equipment and plant will be regularly maintained.
- Loading/unloading will be performed as far from sensitive receivers (such as residences) as possible.
- Heavy materials will be placed into dump trucks (not dropped).
- Horns and reversing alarms will be kept to the minimum volume level possible, without compromising safety requirements.
- Stockpiled materials will be used as "noise barriers" where practicable to shield sensitive receivers (such as residences).
- Monitoring of noise will be undertaken during construction activities that are expected to generate significant noise and/or vibration (e.g. blasting and work outside regulated work hours).

Work Practice Control Strategies

In order to assist in the control of noise through work practices:

- Diesel powered equipment (including, but not limited to excavators, front end loaders, dump trucks) will be fitted with mufflers.
- Exhaust brake usage will be minimised on site.
- Ensure operators of equipment are educated in potential noise issues, and in work techniques to minimise potential impacts.
- Set target noise levels for all equipment, and regularly check noise levels.

Community Liaison Strategies

A community liaison program will be put in place to ensure community members are aware of activities related to the project and have a point of contact for the project. The program would include strategies to:

- Keep residents informed about when they will be affected by works, and the duration of the works.
- Inform residents about the mitigation strategies in place to control noise and protect their interests as far as practicable.
- Implement a free call information telephone number that community members can call when they have questions or concerns.

Operation

It is possible that noise levels attributed to the operation of the Alton Downs WTP may exceed noise limits based on existing information. This will be mitigated through the use of modern equipment and design measures such as housing the pump and equipment in an acoustically rated building.

Examples of appropriate acoustic mitigation measures may include:

- Reinforced concrete walls or blockwork.
- Internal lining of enclosure with an acoustical absorption material.
- Solid-core access doors with compression seals.
- Acoustically-rated machinery access doors.

Further development of the acoustical treatments required to reduce the impact of noise from the Alton Downs WTP will be carried out during the detailed design for construction process.

The Fitzroy River intake and the Raglan pump station do not require acoustical treatment in order to meet local noise limits. These recommendations are based on the assumption that equipment used to operate the pipeline will have noise levels equivalent to or less than the equipment used at the SunWater Intake and Parkhurst Booster Station.

Summary

Noise will be generated by the construction of the pipeline due to the type of equipment that will be used. Normal construction activities for the project are not expected to be significant sources of vibration, though there is the potential for some blasting to take place during construction. If blasting is required it will be carried out within the applicable guidelines.

During operation, the Alton Downs WTP may exceed noise limits based on noise data gathered from comparable facilities. This is a worst case scenario and is not considered likely as the WTP will be newly built using modern materials and technology and will incorporate mitigation measures to address noise generated by the WTP. The Fitzroy River intake and Raglan pump station are not expected to exceed noise limits.

Based on this assessment, the residual noise impact during construction and operation of the project has been assessed as **minor adverse**.

Transport and Access Arrangements

This chapter of the EIS discusses transport and access arrangements for the project including impacts of traffic volumes, access and safety and transport corridor crossings (such as rail lines).

The project area for this chapter includes the transport infrastructure traversed by the project and that which is likely to be affected by the project such as roads to be used for access during the construction and operation of the project.

A desktop study, site visit and traffic counts on key roads within the project area were undertaken to establish the existing conditions within the project area. Traffic counts were carried out during September and October 2007. The impact assessment was undertaken generally in accordance with the requirements described within the Department of Main Roads' Guidelines for Assessment of Road Impacts of Development (April 2006).

The traffic impact assessment assumed that the delivery of pipe from manufacturers to the storage areas would occur entirely via road. However, there is the possibility that transportation could also be via rail or sea. If transportation via rail was to occur, it is envisaged that pipe would be delivered to the Rockhampton Railway Yards. The pipe would then be transported by road to the various storage areas. If transportation via sea was to occur, it is likely that the pipe would be delivered to Gladstone Port, with the pipe then also transported by road to the various storage areas. This is not expected to substantially alter the outcomes of this traffic impact assessment.

Existing Conditions

The project area encompasses several nationally and regionally significant transport routes including major highways, State controlled roads and the North Coast Railway Line (NCL). The NCL is the major rail corridor running north-south in Queensland and is of National and State significance. This line carries passenger services between Brisbane and Cairns as well



as providing an important freight corridor, especially for the transportation of coal to shipping terminals in Gladstone. Other rail lines in the project area include the Blackwater Mine Branch Line and the Rockhampton Yeppoon Line. There are also a number of school bus routes within the project area.

Impact Assessment

The following potential impacts have been identified for the construction and operation of the project.

Construction

The project elements likely to generate traffic during construction include the Fitzroy River intake, Alton Downs WTP, Raglan pump station, Aldoga reservoir and the pipeline itself.

The generation of construction traffic will create a short-term increase in traffic volumes on the road network during the construction period. On average the WTP will require a construction crew of approximately 20 people on site, peaking at around 100 people depending on the construction phases, typically generating 20 to 100 light vehicle trips a day.

Intersections in the project area were assessed in line with the projected increases in traffic in relation to sight distances, need for turning lanes and condition of road surface. Without appropriate mitigation measures, instances where inadequate conditions exist include:

- Rockhampton Ridgелands Road/Laurel Bank Road intersection.
- Capricorn Highway and Service Road intersection
- Bruce Highway/Roope Road intersection.
- Bruce Highway/Casuarina Road intersection.

A combination of road improvements and traffic management plans are proposed to address these.

Laurel Bank Road, which provides access to the Fitzroy River intake and a short section of the pipeline corridor, is currently single lane bitumen for the first 2.3 km of its length from Rockhampton Ridgелands Road. Without appropriate mitigation measures, this section of road is considered too narrow to allow acceptable traffic operation during the construction of the intake.

It is assumed that the increased safety risk at other intersections due to the increased number of heavy vehicle turning movements would be adequately mitigated through the implementation of an appropriate traffic management plan.

The construction of the pipeline will require the crossing of road and rail corridors. For roads which carry relatively low traffic volumes, trenching would be used to lay the pipeline. This would cause some minor delays to road traffic. It is expected that most local roads would be trenching

For other regionally significant roads, specifically the Bruce Highway and the Capricorn Highway, a trenchless crossing method (such as thrust boring) will be used. This will result in limited disruption to traffic on these roads.

Trenchless methods will also be used for all railway line crossings, thus resulting in no disruption to rail services. Traffic management plans will be developed with input from Queensland Rail and will be in place to minimise the potential safety impacts of heavy vehicles on rail crossings.

New accesses to the project from the road network will be required from several local roads as well as four points on State controlled roads. The State controlled roads that will be affected by new direct accesses are:

- Rockhampton Ridgелands Road – Alton Downs WTP.
- Rockhampton Ridgелands Road – pipeline.
- Bajool Port Alma Road – pipeline.
- Gladstone Mt Larcom Road – pipeline.

These will be temporary accesses for construction traffic, and some permanent accesses for occasional operational traffic.

Operation

Transport impacts due to the operation of the project are expected to be relatively minor. The pipeline is expected to generate a negligible level of traffic during its operational phase. Occasional access would be required by four-wheel drive passenger vehicles to conduct inspections. Occasional access for maintenance by heavy machinery may also be required throughout the life of the pipeline.

The intake is expected to generate only a low level of operational traffic, consisting of approximately one to two vehicles per week and one maintenance truck per month. Occasional access by up to a 19 m articulated truck may be required for maintenance purposes.

Regarding the long-term operations of the WTP, an average of two personnel are expected on the premises during normal operating conditions and weekday business hours. Regular monthly deliveries of chemicals will be required during the operation of the plant. This will generate approximately 13 truck deliveries per month.

At this time, it is assumed that residue from the WTP will be transported off-site by truck to an approved disposal facility. The amount of residue to be transported depends on the method and level of treatment of the raw water. At this time, based on the likely water treatment characteristics, it is assumed that there will most likely be approximately 120 t of residue produced per day. Assuming that a 20 t capacity truck will be used, this would generate an average of 12 truck trips per day.

The Raglan pump station and Aldoga reservoir are expected to generate a negligible level of operational traffic. Occasional access by up to a 19 m articulated truck may be required for maintenance purposes.

Mitigation Measures

The following mitigation measures are proposed for the construction and operation of the project:

- GAWB will continue regular consultation and communication with landowners and relevant stakeholders such as Department of Main Roads and Queensland Rail.
- Development of traffic management plans prior to construction to address site specific details for each element of the project to manage traffic flow and road safety. These plans will detail the design of site accesses, including the provision of signage and traffic control during construction at site accesses and pipeline crossings. Temporary speed reductions may be required in the vicinity of site accesses. The traffic management plans will be approved by the relevant local or State authority before the commencement of construction.
- Trenchless crossing methods are proposed where the pipeline crosses the National Highway network (i.e. the Bruce Highway and the Capricorn Highway), other regionally significant roads and rail corridors.
- Further investigation of requirements for road/intersection improvements to manage predicted traffic volumes.
- Maintain unsealed roads as required during construction.
- Upgrade commitments for Laurel Bank Road, Laurel Bank Road/Rockhampton- Ridgeland Road intersection and the new Alton Downs WTP access on Rockhampton-Ridgeland Road.

Summary

A number of roads in the project area will be used during construction and operation of the project for the transport of equipment, materials and personnel. Roads and rail corridors will also be crossed during pipeline construction. Given the implementation of the proposed mitigation measures it is expected that the transport impact would be **minor adverse** during construction and would be **negligible** during operation of the project.

Cultural Heritage

This chapter of the EIS discusses both Aboriginal cultural heritage and historical (non-Indigenous) cultural heritage and their management as it relates to the project.

Under the *Aboriginal Cultural Heritage Act 2003*, a Cultural Heritage Management Plan (CHMP) will be developed for the project to manage Aboriginal cultural heritage during construction. The CHMP will be agreed by the relevant Aboriginal parties and will contain directions and processes required to ensure Aboriginal cultural heritage is protected and preserved during the pipeline's construction. There are two registered Native Title claimants that cover almost all of the project area, namely the Darumbal people and the Port Curtis Coral Coast people. There is also a small section of the project area that does not fall within the boundaries of a Native Title claim.

The purpose of the historical (non-Indigenous) cultural heritage study is to determine the level of cultural heritage significance of the project area, determine what impact the project will have on the cultural heritage of the area, and then to recommend appropriate management of these heritage values. The study was undertaken with reference to existing information and through a historical heritage survey of the project area.

The following presents a summary of the key findings, for more detail see the EIS (Chapter 14, Cultural Heritage).

Existing Conditions

Aboriginal Cultural Heritage

There is evidence that Aboriginal people inhabited the Gladstone area for thousands of years before European settlement. One of the earliest historical observations of traditional life in the Gladstone area occurred in August 1802 during Matthew Flinders' exploration of Port Curtis which recorded a meeting with a number of Aborigines on the western side of Curtis Island.

Raglan Creek roughly marked the boundary between the Darumbal and the Port Curtis Coral Coast people. Mount Larcom and White Rock are both significant dreaming sites for Aboriginal people in the Gladstone region, the former visible from most parts of the project area. The Calliope River is also an important feature in the landscape, and its major food resources formed an important element in the cultural landscape.

Historical (non-Indigenous) Cultural Heritage

From a heritage perspective, it is concluded that the project area contains, at best, moderate levels of local cultural heritage significance. Historical Archaeological Sites and sites of Historical Interest are located within the project area. This includes the Woolwash - Frogmore Pipeline, a number of houses, a lagoon, a stone culvert on Twelve Mile Road, a number of historical trees, a bird and fish nature reserve, dump sites, a windmill, and an explosives shed/polytunnel.

The Woolwash - Frogmore Pipeline



The stone culvert on Twelve Mile Road



Impact Assessment

The following potential impacts to Aboriginal and historical cultural heritage have been identified:

Aboriginal cultural heritage

The assessment of impacts on Aboriginal cultural heritage will be carried out within the proposed CHMP, which at the time of writing is in progress.

Historical (non-Indigenous) cultural heritage

Two Historical Archaeological Sites considered to be of low to moderate cultural heritage significance are likely to be directly impacted by the project. The likely impact of the project on

these sites includes sub-surface and surface disturbance, such as vegetation clearance and open trenching, associated with the pipeline's construction and the development of associated infrastructure.

Historical cultural heritage sites potentially affected by the project

Item	Location	Description
Woolwash – Frogmore Pipeline	Running between Woolwash and Frogmore Lagoons, both connected to Gavial Creek, located on the Fitzroy River flood plain 6 km south of Rockhampton within the Fitzroy to Bajool section of the pipeline.	Rusting and partially collapsed pipeline and wooden bridges crossing two lagoons.
Stone Culvert & Twelve Mile Road	Twelve Mile Road is a well maintained graded dirt road located on the northern side of the Bruce Highway and was originally the road that linked Rockhampton and Gladstone. The road passes through the project corridor twice at approximately 2.5 km south of the town of Marmor and 1 km north of the Bruce Highway.	19th century stone culvert on old Rockhampton Gladstone road with some modern repair.

Mitigation Measures

Aboriginal Cultural Heritage

The mitigation measures will also be included as part of the CHMP process following fieldwork. The CHMP will be in place prior to construction.

Historical (non-Indigenous) Cultural Heritage

A number of recommendations have been made as potential mitigation measures for historical cultural heritage sites:

- Avoid sites where possible.
- Take photographic records of sites that will be disturbed for archival purposes.
- Conduct further surveys of relevant sites.
- Include cultural heritage management in the EMP.
- Reassess cultural heritage in line with any changes to the project.

Summary

From the perspective of Aboriginal cultural heritage, the development of a CHMP will provide protection and/or management of cultural heritage values for any objects or areas found during the cultural heritage survey and consultation with Elders nominated by Aboriginal parties.

Based on the results of the survey, what is known of the historic cultural heritage within the project area and the mitigation measures proposed, there would be a **minor adverse** impact by the project on historic cultural heritage.

Social and Economic Environment

This chapter of the EIS discusses the socio-demographic, economic and accommodation environment in the project area and the potential impacts that could arise as a result of construction and operation of the Gladstone-Fitzroy Pipeline.

As social and economic values and potential impacts are not confined to the immediate project area, for the purposes of this chapter the project area is defined as the local government areas (LGAs) through which the project passes. Prior to local Council amalgamations in March 2008, this included Rockhampton City, Fitzroy Shire, Calliope Shire and Gladstone City, however the new LGAs are the Rockhampton Regional Council area and the Gladstone Regional Council area.

The statistical and demographic information for the new LGAs was not available at the time of writing therefore the information used in this chapter has been based on the four original LGAs, for which information is available. The economies and social characteristics of these LGAs may potentially be either directly or indirectly affected by the construction and operation of the project.

The data for the existing socio-demographic and economic conditions in the project area was sourced largely from the Australian Bureau of Statistics (ABS) 2006 and 2001 Censuses, local government websites, the Planning Information and Forecasting Unit and in some cases via discussions with Council officers and industry representatives. To meet the requirements stated in the EIS ToR, the project area was compared to Queensland and Australia.

The following presents a summary of the key findings, for more detail see the EIS (Chapter 15, Social and Economic Environment).

Existing conditions

Resident Population

- At the time of the 2006 Census, the project area had a population of 116,778 (2.9 percent of the Queensland population).
- The project area had a lower average annual population growth rate than Queensland but slightly higher than Australia (1.2 percent compared with 2.1 percent and 1.1 percent respectively) over the 2001-2006 Census periods.
- Indigenous residents accounted for 4.7 percent of the resident population in the project area. This was moderately higher than the 3.2 percent and 2.3 percent observable in Queensland and Australia respectively.
- The EIS process has added to the knowledge base of the region in a number of areas (i.e. the location of Threatened species), bringing it into one publicly available document.

Economy

- The economy of the region (industry output in the project area) is approximately \$12 billion and is clearly dominated by the manufacturing sector, contributing approximately \$3.5 billion to the regional economy. The next most prominent is the construction sector, which contributed \$1.2 billion.

Employment

- Both the project area and Queensland had unemployment levels of 4 percent as of June 2007, both lower than the figure for Australia for the same period (4.6 percent). All three areas showed a decline in unemployment rate over the 2004-2007 period.
- Fitzroy had the lowest unemployment rate of the local government areas in the project area, with a rate of 2.0 percent as of June 2007. Conversely, Rockhampton had the highest, with a figure of 4.7 percent.
- The project area has an employment self sufficiency ratio (the ratio of jobs located in the region to workers living in the region) of 98 percent with approximately 52,800 jobs located in the region. This indicates that the number of labour force residents and jobs in the region is roughly equivalent, with a slightly higher number of residents in the labour force than positions.

Accommodation

- It is noted that approximately 8.5 percent of dwellings (approximately 4,000) within the region were unoccupied at the 2006 Census, but that this is declining in more recent times.
- The majority of tourist or short-term accommodation in the project area is of hotel, motel or serviced apartment type. More than four fifths (84.9 percent) of the tourist and short-term accommodation fell into this category, translating to 11,797 beds within the project area (as at the time of the 2006 Census).
- Most tourist accommodation providers in the project area are currently providing long-term housing for labourers and workers. In particular, accommodation providers in Gladstone noted that a significant majority of their clients were workers rather than tourists.

Impact Assessment

The following potential impacts have been identified for the social and economic environment.

Resident Population

- Specific landowners will be impacted by the pipeline corridor (Alton Downs area, SGIC and GSDA) and location of associated infrastructure during construction and in some circumstances during the operation of the pipeline.
- There are likely to be potential amenity issues (air quality, noise and visual impacts) in proximity to the construction area or during operation of the Alton Downs WTP.
- Given the wide range of facilities and services available in the region, the additional personnel moving to the region as a result of the project are not expected to place a significant strain on the capacity of the facilities and services.

Economy

For the economic assessment, an economic model was developed and used to determine the impact of the project on the project area's economy. The total impact or contribution is comprised of 'direct effects' and 'indirect effects'. The direct effect measures the level of output, employment or value added directly generated through the operations of the business, industry or project. In the case of the project the direct effect of the construction phase would be the total construction cost. The indirect effect relates to the flow of money spent in the local economy and is the measure of the additional value generated in the economy due to the project. Calculation of the total indirect contribution is based on all expenditures associated with the project.

The following presents a summary of the major economic findings for the project:

- The total construction cost is estimated to be \$300 million. This figure is an estimate (accurate at July 2007) and could differ from the actual cost of construction in future years. It is assumed that approximately \$57.4 million (or 20 percent) of this would be spent in the local area.
- As a result of the total direct expenditure into the construction sector, which includes an estimated \$57.4 million in the local construction sector, other industries in the local economy are estimated to produce an additional \$56.3 million worth of output (the indirect effect on the economy).
- The total economic contribution to regional, state and national economies (the sum of the direct and indirect effects) is estimated at:
 - Regional - \$113.7 million.
 - State - \$731.8 million.
 - National - \$900.1 million.
- It is anticipated that Rockhampton will be one of the positively impacted areas in the short and medium-term. Economic benefit in Rockhampton will be generated as a result of increased demand in the accommodation, earth moving and construction sectors.
- The project's most significant indirect contribution to the project area of \$12.7 million would be to the property and business services sectors in the project area. The property and business services sectors would increase their output by \$12.7 million in response to a \$57.4 million local expenditure from the construction of the pipeline.
- The second most significant impact is calculated to be on the retail trade sector with a contribution of \$5.0 million.

Employment

- The average workforce for the project during construction is expected to be 194 people and less than 10 for the operational phase.
- The indirect jobs generated as a result of the operations of the project was calculated to be 313 jobs. Adding this to the average employment level at any given time during the construction phase (approximately 200 jobs), the total contribution to jobs in Queensland was estimated at 507 jobs per annum.
- Given the current and likely future construction activity in the region (when all major projects are considered) it is likely that there will be tight competition for construction workers both for the project and for housing projects to accommodate future workers.

- Given the low unemployment rate in the project area (4.0 percent) and the labour participation rate, which is unlikely to change significantly in the future given the family profile of the region, additions to the workforce are likely to be required from outside the region.
- Based on the statistics and also verified through consultation, regions such as Gladstone are seen as 'tradie towns' and have a great deal of experience with development projects. This potentially indicates that the employment requirements have a better chance of being met locally through industry adjustments. This could, in turn, indicate a potentially lower impact on accommodation than what might be expected, if current residents are 're-deployed' to address employment requirements.

Accommodation

- Given the very low levels of vacancies of dwellings in the 'owned' or 'being purchased' categories, the very low levels of occupancies in the rental markets and the high number of workers already being accommodated in local motels and caravan parks, new persons entering the region for employment are likely to experience difficulties in securing rental housing, at least in the short-term.
- A number of other major projects are underway or planned for the project area which will have an effect on accommodation availability in the region.
- The project will have a marginal, yet cumulative, impact on the rising price of housing in the project area.

Mitigation Measures

Mitigation measures identified for social, employment, economic and accommodation impacts include:

Social

- Siting and alignment of the project elements has been undertaken with consideration to land use and amenity impacts, and have avoided residential areas where possible.
- The intake structure and pump station have been located within the boundary of the existing SunWater intake property to reduce the impact to adjacent residential properties.
- Use of the SGIC for the pipeline will lessen the disruption on individual landowners, surrounding communities and the environment that would otherwise occur if access to multiple pipeline routes was sought on a project by project basis.
- Landowners and project stakeholders have been consulted throughout the project to ensure they are aware of activities and have the chance to ask questions and comment on the process.
- A CHMP will be undertaken with relevant Aboriginal parties

to identify, protect and preserve Aboriginal cultural heritage.

- Health and safety issues during construction and operation will be addressed through GAWB and the contractor's Health and Safety Management System and the preparation of emergency planning procedures for construction.

Employment

- Local labour and sub-contractors will be used where possible during construction and the Local Industry policy will be complied with for the project.
- Local training and industry policies will be addressed by the contractor.

Economic

- No economic mitigation measures are proposed for the identified economic impacts as the project is expected to have a beneficial impact to the economy.

Accommodation

- The project will utilise local labour and sub-contractors wherever possible.
- Works will be scheduled to avoid concurrent operations where possible.
- Rental properties will be secured if required to accommodate workers for the duration of the construction phase of the project, particularly in Rockhampton.
- Short-term contractors may also be accommodated in motels or caravan parks within the project area where, pre-arrangements with these accommodation types would be undertaken to secure accommodation for the duration of the project as far in advance of construction as practicable.
- Construction camps may be utilised to accommodate staff if required.

Summary

The project will have a **moderate beneficial** impact on the regional economy with approximately 20 percent of the total cost of the project spent in the region (in the order of \$57.4 million). This will also have a beneficial impact on the State and national economies. The project will also create jobs at the regional, State and national levels. Where possible, local labour and subcontractors will be utilised during construction of the pipeline.

Impacts from the project related to social aspects have been assessed as **minor adverse**. In terms of accommodation, impacts have been assessed as **moderate adverse** due to a shortage of accommodation in the project area and the cumulative effect of multiple projects in the region.



Hazard and Risk

This chapter of the EIS discusses hazard and risk (including natural hazards), health and safety and emergency management measures as they relate to the project. This risk assessment undertaken for the purposes of the EIS is broad and qualitative and forms part of the larger risk management process which is continual throughout the project life and linked to GAWB's own company-wide risk management process. Further hazard and risk assessments will be undertaken to inform the development of the construction safety plan and work method statements.

The assessment of hazards and risks associated with the project has been undertaken prior to the commencement of detailed design for construction and construction. As such the risks and hazards identified are based on the existing information about the project and proposed construction and operational techniques. Further risks and hazards may be identified in future stages or identified risks could be downgraded or upgraded in terms of the level of risk they pose to the project, personnel or surrounding area. Additional mitigation measures will be developed as required and will be documented in relevant management plans for the project which are to remain live documents throughout the relevant project phases.

Health and safety considerations identified in this chapter will be further developed in the construction and operation documentation to be used on site.

The consideration of natural hazards is based on existing information about the project area including overlay mapping from the relevant area's planning schemes and the local disaster management plans for the former Rockhampton City, Fitzroy Shire, Calliope Shire and Gladstone Shire Councils.

Emergency Management measures described in this chapter are also based on existing knowledge about the possible emergency situations that could arise during construction or operation of the project and will be further detailed in relevant management plans.

The following presents a summary of the key findings, for more detail see the EIS (Chapter 16, Hazard and Risk).

Natural Hazards

Natural hazard management areas have been identified in the relevant planning schemes of the LGAs that the project passes through. Some areas of flood, bushfire and landslide risk occur adjacent to or within the project area and therefore require consideration under State Planning Policy 1/03 Mitigating the Adverse Effects of Bushfire, Flood and Landslide. It is considered that the project meets the requirements of this policy and these risk are addressed in the Hazard and Risk Assessment (HRA).

Hazard and Risk Assessment (HRA)

The project is believed to be both a safe and efficient means for supplying water to GAWB's industrial customers. All developments present some level of risk however, which can be identified through a HRA so that appropriate management measures can be implemented to reduce or remove the risk.

The HRA for the project has been carried out in accordance with the principles set out in AS/NZS Risk Management Standard 4360:2004 (which supersedes 4360:1999). The HRA seeks to identify risks during the construction, operation and decommissioning phases of the project and to document proposed mitigation and management measures. The HRA provides examples of the likely hazards and risks associated with the project however full assessment of hazards and risks is an ongoing process that will be fully developed as part of GAWB's risk management processes as the project progresses.

The HRA did not consider commercial risks relevant to GAWB as a corporation nor are environmental risks comprehensively assessed in this chapter as these risks are documented in other chapters of the EIS.

In adopting the recommended methodology for implementing risk assessments in line with the standard, the following steps have been followed:

- **Establish context** – define the basic parameters within which the risk must be managed and set the scope for the process. This includes reviewing the organisation's external and internal environment and the purpose of the risk management activity.
- **Identify risks** – identify the risks to be managed using an identification and analysis process.
- **Analyse risks** – develop an understanding of risks which provides an overview of whether the risks should be treated and how they should be treated.
- **Evaluate risks** – focuses decisions based on the outcomes of risk analysis and identifies which risks need treatment and treatment priorities.
- **Treat risks** – identifies options for treating risks, assesses options and proposes appropriate treatment plans.
- **Review risks** – ensures that any changes to project scope are re-examined and the risk assessment amended accordingly if required.

The risks identified in the HRA are considered to be at most a medium risk level, which in the context of the HRA means that existing measures in place for the construction or operation of the project are considered sufficient to manage the identified risks.

Health and Safety

All construction and operational works carry with them a level of potential health and safety risk both to the project personnel and to other stakeholders such as landowners and road users. GAWB has a legislated duty of care to manage the health and safety interests of these parties.

GAWB has a corporate occupational health and safety policy and a certified health and safety management system. GAWB is committed to continually improving occupational health and safety performance with the intention that no staff, contractors or visitors suffer injury or illness as a result of GAWB's activities. The health and safety policy acknowledges that each site under GAWB's control and its respective operations have varied hazards and risks which GAWB is committed to managing in compliance with all relevant workplace health and safety legislation, as well as the codes of practice and standards with which GAWB must comply to maintain industry best practice.

Health and safety risks specific to this project have been identified through the risk assessment above and with reference to the *Queensland Workplace Health and Safety Act 1995*. A key element in the management of risks during construction and operation is the monitoring and review of the risks and control measures and updating of the relevant plans and procedures accordingly. It is also critical that the requirements of the workplace health and safety documentation are communicated to all project personnel so that they are aware of their roles and responsibilities.

The management of workplace/occupational health and safety risks for the project is undertaken through the range of systems, plans and policies. This provides a framework for GAWB and the contractor to meet their obligations under the *Queensland Workplace Health and Safety Act 1995*.

Although not all of the plans and statements have been developed for the project, they will be in place prior to the commencement of works and will be developed in line with existing occupational and health and safety management systems in place within GAWB and the construction contracting company.

Emergency Management Planning

Potential emergency situations that could arise during the construction and operation of the project have been determined through the HRA and include the following:

- Natural hazards such flood, landslide, fire or cyclone.
- Spills of hazardous materials.
- Accidents at road or rail crossings.
- Accidents involving explosives.
- Pipeline failure and water discharge.
- Third party damage.

The HRA did not identify any of the above risks to be of a high level however risk identification is an ongoing process throughout the life of the project as new emergency risk situations could arise at any time. Emergency situations require effective planning and management to reduce the impact arising from the situation. This information is usually documented in an Emergency Management Plan specific to the project.

GAWB currently has a Disaster Management Plan in place under which there are sub plans including a Wildfire Action Plan, Cyclone Management Plan and site specific Emergency Action Plans (e.g. the Awoonga Emergency Action Plan). A site specific Emergency Action Plan will be developed for the operation of the project, which would include working with the relevant local disaster management committees in disaster situations.

During construction, emergency management will be undertaken through a construction Emergency Management Plan.

Landscape and Visual Impact Assessment

This chapter of the EIS discusses the potential landscape and visual impacts associated with the project. As the pipeline component of the project would be primarily located underground, most landscape and visual impacts relate to the visual appearance of the construction works that would be phased, temporary and restricted to the construction period, and would be either direct or indirect. This type of impact would generally be consistent across the site and are therefore assessed on a site-wide basis.

The visual impact of the project during operation, specifically in the vicinity of the above ground infrastructure and other locations along the ROW has been assessed at 11 representative viewpoints in the project area. The site survey was undertaken by two landscape planners in order to build consensus and thus limit subjectivity. The site visit was conducted in August 2007 during conditions of good visibility. A further site visit was conducted in June 2008 at the site of the Alton Downs WTP.

The assessment process aims to be objective and describe the changes factually. Potential changes as a result of the project have been defined, however the significance of these changes requires qualitative (subjective) judgements to be made. The conclusions of this assessment therefore combine objective measurement and subjective professional interpretation.



Terminology used in the assessment of impacts includes:

- **Zone of Visual Influence (ZVI)** - defined as the area from which the project may be viewed.
- **Visual Modification** - refers to the extent of change to the landscape and visual amenity that would occur as a direct result of the project from a given viewpoint.
- **Visual Sensitivity** - refers to visual receptors (e.g. residents, users of transport routes) and their sensitivity to their visual environment. Generally, this is dependent upon receptors' interest in the visual environment (i.e. high, medium or low interest in their everyday visual environment), receptors' duration and viewing opportunity (i.e. prolonged, regular viewing opportunities) and the number of viewers and their distance from the source of the effect, where relevant.

The following presents a summary of the key findings. For more detail see the EIS (Chapter 17, Landscape and Visual Impact Assessment).

Existing conditions

The project traverses approximately 115 km of landscape between Rockhampton and Gladstone. The topography is generally gently undulating landform of low hills and flat plains, rising to the north-east of the project area to coastal ranges providing a prominent and scenic green backdrop to the project area. Creeks dissect the landscape which is primarily rural in character and utilised as an agricultural resource, predominantly for beef cattle grazing.

Major urban centres occur at Rockhampton to the north of the project, and Gladstone to the south, with small settlements and individual rural residential properties scattered throughout. Grazing land is sparsely vegetated throughout the region, with individual trees, some scrub and grazing fodder. The GSDA to the south of the project area is composed of major industrial development and associated infrastructure. It is used for urban development, primary industries, mining, heavy and light manufacturing industries, port activities, residential and public facilities, tourism, and recreation.

The area from which the various elements of the project are likely to be seen, while not including large numbers of residential areas, is sensitive in parts due to the route's visibility within a predominantly sparse, flat landscape. Visual impacts resulting from the project will be derived primarily from the pipeline's associated infrastructure (i.e. the Alton Downs WTP, pump stations, intake point and reservoirs) as the pipeline itself will be mainly underground. Construction activities including the clearing of vegetation, earthworks and construction vehicles use and movement are likely to cause the most significant visual intrusion.

The majority of receptors within the ZVI will be motorists travelling along roads that cross the proposed pipeline corridor.

Other receptors may include residents, rail users, agricultural workers, industrial workers and users of recreational open space. During operation, the pipeline will generally be an underground linear feature within a largely rural environment. Landform surrounding the scheme and elevation of structures are the key determinants of visibility of the project.

Impact Assessment

The following potential impacts have been identified for the project in relation to the landscape and visual amenity.

Construction

The construction of the project would create short-term landscape and visual impacts. These impacts would primarily relate to the visual appearance of the construction works that would be temporary, restricted to the construction period. Some areas would be used on a temporary basis for storage areas to support the construction. Generally during construction the project is likely to impact the same areas as those affected by the operational phase, however construction impacts will be short-term in nature.

Areas that will be affected during construction are likely to be viewed from a distance, as prescribed by the gently undulating topography defining the route corridor. However, at Yarwun the steeper topography and dense bushland of the Mt Larcom Ranges will restrict and screen scope of views to the site.

The main visual impacts during construction are likely to include:

- Stockpiles (vegetation, soil, pipe).
- Construction vehicles and workers.
- Vegetation clearance.
- Fencing removal and construction.
- Lighting during night time construction activities (if required).
- Additional vehicular traffic generated by construction workers, materials delivery and disposal along adjacent transport routes.

The prominence of the site-wide construction works and loss of some landscape elements suggests that there would be a moderate reduction in visual amenity during this phase.

The construction site will generally be experienced by a range of viewers including:

- Small numbers of residents.
- Large numbers of motorists.
- Small numbers of outdoor workers.
- Small numbers of recreation-site or activity-focussed users.

The variety and number of people experiencing the project area suggests that it contains views of medium sensitivity.

Operation

Representative viewpoints at proposed infrastructure sites and pipeline road crossings along the project alignment were assessed in terms of visual modification and visual sensitivity. The road crossing locations assessed include:

- Ridgелands Road.
- Capricorn Highway.
- Meura Road.
- Roope Road.
- Bajool Port Alma Road.
- Darts Creek Road.
- The Narrows Road.

In these locations, there is likely to be a small reduction in visual amenity as a result of the project and the views are generally of low to medium sensitivity.

The pipeline will not be a prominent feature from these view points, as it will be underground. The project would impact upon the composition of this view through permanent loss of trees within the pipeline corridor, and through implementation of a linear maintenance route. Infrequent movement along this route by maintenance vehicles and worker access would form a visual modification. There would be an overall local reduction in the quantity of vegetation in the pipeline corridor as a result of the project. Grass would naturally regenerate to earthworks areas over time.

Fitzroy River Intake

The project will not be a prominent feature in the view from the Fitzroy River, but will cause localised change to the existing landscape. Scheme elements would be visible within the landscape, but would be seen within the context of the existing SunWater pump station. The project would cause change through minor loss of landscape elements (trees), inclusion of infrastructure and maintenance activities. However, there is scope for mitigation, in the short to medium-term.

It is anticipated that the project would result in a small reduction in visual amenity from this viewpoint. This view is of locally high scenic quality, and although a small number of people experience it, it is for prolonged periods, and is rare in the local and regional area suggesting that this is a view of minor sensitivity.

Alton Downs WTP

Two viewpoints were assessed for the WTP site, one from the north-west of the site and one from the west along Ridgелands Road. In the first case, the view is of flat grazing country with scattered trees, rural residences and other rural structures such as sheds and fences. It is anticipated that the project would result in a moderate reduction in visual amenity from

this viewpoint. Although a small number of people experience this view, the presence of residential views and the associated importance placed on the view suggests that this viewpoint is of medium sensitivity.

The view from Ridgелands Road represents one of the more likely locations on Ridgелands Road from where the plant would be able to be clearly seen. For the most part closer views on Ridgелands Road are subject to greater levels of screening from the roadside vegetation. It is anticipated that the project would result in a small reduction in visual amenity from this viewpoint. This view is primarily experienced by a moderate number of road users with a passing interest in their visual environment. The moderate number of viewers and short duration of views suggests that this is a view of low sensitivity.

Aldoga Reservoir

The storage facility and associated infrastructure will form a prominent component of this view due to its hilltop location. It will cause localised change due to: the removal of trees and vegetation; new site access; earthworks; and inclusion of new infrastructure. The project in this location would be seen within the context of the existing industrial facilities in close proximity to the site and large infrastructure (e.g. road and rail). The ultimate form, material, colour and layout (circular or rectangular) of the proposed infrastructure would play some role in determining its influence on visual amenity.

There is some scope for mitigation through orientation, form, location and various forms of screening (vegetation/earthworks), but the proposal cannot be completely mitigated due to its nature and location within the landscape. It is anticipated that this part of the project would be seen within the existing context of an industrial zone, but due to its hilltop location would result in a moderate reduction in visual amenity. The interest and filtered/ enclosed views of the storage facility from this viewpoint, and that the project would be viewed within the context of an existing industrial environment suggests that this view is of low sensitivity.

Mitigation Measures

A number of mitigation measures are proposed to reduce the visual impact of the project and examples include:

- Existing trees and vegetation to the pipeline corridor margins, or trees identified as important to retain, would be protected prior to construction.
- Vegetation clearance at sensitive sites would be minimised where practicable.
- Temporary hoardings, barriers, traffic management and signage would be removed when no longer required.
- Work onsite would be phased and restricted to agreed working hours.

- Lighting of compounds and work sites will be restricted to low impact lighting for security purposes, where and when required.
- Storage facilities would be located away from residential areas.
- Consideration of the design of above ground structures (i.e. Alton Downs WTP, Aldoga reservoir) so that they best fit with the existing contours, vegetation and earthworks features (mounding) to assist in screening and integration.
- Seek to achieve a cut and fill balance of material onsite, with reuse of excess material onsite as part of the landscape mitigation proposals where appropriate.
- Establish screening planting at the Alton Downs WTP and encourage natural regeneration around the pipeline corridor, particularly where structures are above ground and where the pipeline corridor is in close proximity to residences.
- Careful consideration of the form and finish of structures, including use of darker colours for the structures and less reflective materials.
- Consideration of the appearance of other features such as signs and fencing.
- Careful consideration of any lighting requirements and any potential increase in light pollution.

Summary

The construction effects of the project on landscape and visual amenity will primarily be related to site clearance and general construction activities that would occur during the limited duration of the construction activities. These will be controlled through mitigation measures set out within the Construction Environmental Management Plan (CEMP) to ensure that most adverse effects resulting from the construction of the project on landscape and visual amenity are minimised or avoided. The residual impact during construction has been assessed as **negligible** to **minor adverse**.

The landscape and visual impacts once the project becomes operational are generally likely to be minor, with the exception of the WTP. This is considered to have a **moderate adverse** impact. Mitigation measures in relation to operation are proposed in order to minimise these impacts, as set out above, and would be further detailed following the completion of detailed design for construction.

Summary of Impacts and Cumulative Effects

This chapter provides a high level summary of impacts related to the project. It also provides a summary of the likely cumulative effects that could occur as a consequence of the project in conjunction with other proposals that are currently under investigation in the vicinity of the project area and in the region. Interactive effects that may occur within the project are also discussed in this chapter.

Throughout the site selection and functional design processes for the project, attention has been paid to the minimisation of adverse effects on the environment and communities during construction and operation of the project. For example the alignment of the pipeline and siting of infrastructure has taken into account sensitive environmental sites such as Yellow Chat habitat and remnant vegetation, and has avoided residential areas where possible.

Iterations during the design process have allowed environmental factors to be considered, for example in the selection of creek crossing methods. Where possible, creeks with permanent water or significant vegetation will be crossed through trenchless methods – reducing instream disturbance and disturbance to riparian vegetation.

Community engagement has also been undertaken as part of the project, to inform landowners and the public about the project. This has included a 1800 number and project email to answer queries from interested stakeholders, and newsletters to landowners and GAWB's customers.

The EIS describes the baseline environment in the project area for each topic area considered. This information has been gathered through fieldwork, review of existing mapping, aerial photography, published records and data obtained from statutory and non-statutory bodies such as local Councils, Government departments and/or local interest groups.

The key potential impacts identified in the EIS relate mainly to the following aspects of the project:

- The clearing of the 30 m construction width for the pipeline (ROW) – with some direct impacts to vegetation and associated habitat areas.
- Construction activity (for example clearing and trenching) in the ROW with the potential for temporary dust and noise generation, disruption to land uses, and reduction in visual amenity.
- Construction at creek crossings, with potential impacts to riparian vegetation, stream banks and water quality.
- Traffic generation during construction and operation and the potential impacts to roads in the project area.
- The operation of the Alton Downs WTP with the potential for noise generation, impacts to visual amenity and transport of waste residue.
- The generation of testing water during the commissioning of the Alton Downs WTP and pipeline and the disposal of this water to land or waterways.
- Potential for weed and weed seed spread during construction and operation of the pipeline.

Where adverse impacts have been identified, mitigation measures have been proposed to manage the impact. The Australian Pipeline Industry Association Code of Environmental Practice - Onshore Pipelines has been used as a guide for the development of mitigation measures.

The residual impact has then been assessed taking into account the proposed mitigation measures. The residual impacts have been assigned a significance using significance criteria developed for each topic area, and can also be assigned as beneficial. The majority of impacts arising from the project have been assessed as negligible to minor adverse significance once mitigation measures are considered.

In the case of vegetation clearing, it is not possible to completely mitigate the adverse effects; however vegetation offsets will be secured through the vegetation clearing permit process under the *Vegetation Management Act 1999*.

Carbon emissions from the construction and operation of the project have been assessed as having a negligible impact (see EIS Chapter 10, Air Environment). However, there is the potential for these emissions to be offset through the carbon offsetting program that GAWB is investigating for the whole of its operations.

Two historical cultural heritage sites have been identified as likely to be impacted by the project – the Woolwash - Frogmore pipeline and Twelve Mile Road. Both sites will be photographically recorded prior to construction commencing, to contribute to the cultural heritage record.

Importantly, the potential impacts to matters of National Environmental Significance (threatened species and ecological communities) have been assessed against the EPBC Act criteria and found that the project is not likely to have a significant impact on these matters.

The mitigation measures described in each chapter have also been included in the Planning Environmental Management Plan (EMP), with other measures where necessary. This EMP included in the EIS (see Chapter 20, Planning Environmental Management Plan) forms the basis for the development of the construction and operation EMPs which will be developed prior to those phases of the project.

The economic assessment has assessed the project as having a contribution to the local and regional economy and the provision of employment opportunities during construction and operation. The project also contributes to the continued economic growth of the region through the provision of water to GAWB's Gladstone industrial customers. Provision has also been made in the design for potential future water supply to communities along the pipeline, contributing to water supply security in the region.

Cumulative Effects

The purpose of the SGIC is to reduce the potential cumulative effects of multiple projects in the region by lessening the disruption caused by investigation and construction on individual landowners, surrounding communities, and the environment that would otherwise occur if access to multiple pipeline routes was sought on a project-by-project basis.

Similarly, within the Gladstone State Development Area (GSDA) the land is currently being used for or is planned for large scale industrial development. The use and planning of the area for that purpose reduces cumulative impacts to other land uses.

However in each of these State Development Areas there is the potential for the impacts of construction or operation of more than one project to occur concurrently. With the exception of the Gladstone Pacific Nickel slurry pipeline which is proposed to align within the SGIC, the details of these future projects are not known. However any future pipeline projects in the SGIC are likely to have similar impacts to those described for this project and when occurring at the same time can have a greater effect on the surrounding environment.



The impacts that are likely to have a cumulative effect with other projects include:

- Land use disturbances during construction and maintenance of the project would occur over a greater area and time period as more projects progress.
- The potential for erosion and sedimentation, or impacts from the disturbance of ASS are increased if construction activities occur over a greater area.
- The area of vegetation cleared for each project would have a cumulative effect on the loss of habitat for flora and fauna and on the loss of visual amenity.
- The area of disturbance to creeks and waterways would increase as future projects are constructed in the same alignment. To some extent this is minimised through the selection of appropriate creek crossing methods.
- Air quality impacts from dust generation would be worsened if multiple projects are constructed in similar timeframes.
- Noise arising from construction and operation activities of several projects may have a cumulative effect on adjacent sensitive receptors (residential areas).
- Traffic volumes on local and regional roads would increase with each project constructed.
- There is greater potential for the loss or damage to items of cultural heritage significance during construction over a wider area.
- The economic benefits of many projects occurring at once would have a cumulative benefit in the economic growth and employment in the region.
- Increased construction activity in the local area has the potential to increase the pressure on the already strained accommodation market as new workers are attracted to the region.

The management of these types of effects is to be implemented through individual project EISs and Construction and Operational EMPs. As future projects are progressed, cumulative impacts are unavoidable; however the severity of these effects will depend on the environmental management practices of each future project that is to be implemented. These impacts will generally be confined to the width of the SGIC – approximately 100 m.

Interactive Effects

Interactive effects arise where effects from one environmental element bring about changes in another environmental element. The potential interactive effects identified in the EIS are summarised below:

- There is the potential for noise, air quality, visual amenity and traffic impacts during construction and operation to have an interactive effect on the amenity of the area surrounding the Alton Downs WTP. Mitigation measures implemented as part of this project would reduce the severity of these impacts.
- Disturbance to ASS or contaminated land during construction may have an interactive effect by impacting surface or groundwater quality. The implementation of an ASS Management Plan and management of potentially contaminated sites would reduce the risk of this occurring.
- Removal of vegetation during construction could increase erosion and sedimentation of surface or groundwater. Measures to reduce vegetation clearing and implement erosion and sediment controls during construction are described in the EIS (see Chapter 20, Planning Environmental Management Plan), and would reduce this impact.

Sustainability Impacts

In order to assess the sustainability performance of the project during the impact assessment stage, a sustainability assessment has been undertaken using Arup's Sustainable Project Appraisal Routine (SPeAR®) tool. The assessment focuses on planning, design, construction and operation of the whole project including the river intake structure, WTP, 115 km long pipeline, reservoirs, pump stations and connection works near Yarwun just north of Gladstone. As the assessment is undertaken at a point in time it is intended to provide a 'snapshot' of the sustainability issues relevant to the project now and does not reflect possible changes to the project over time.

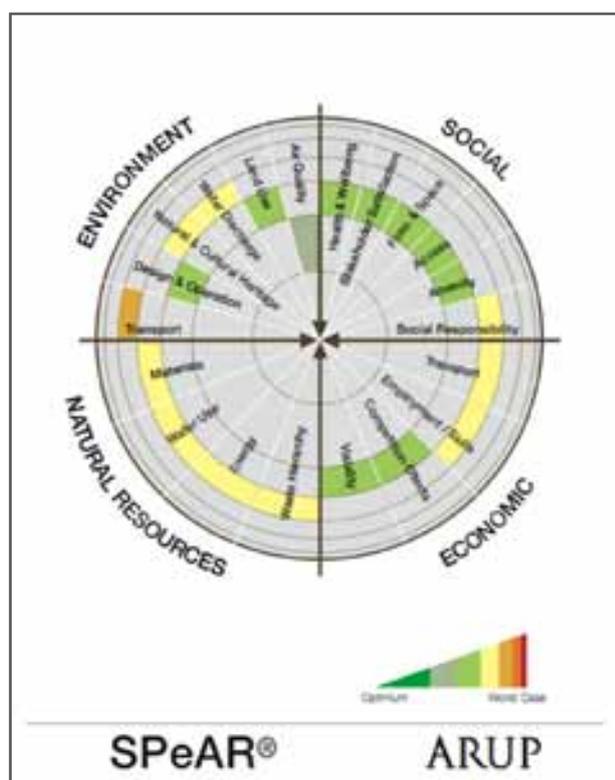
SPeAR® is a tool that is used to qualitatively assess the sustainability performance of projects, plans or developments. It provides scores against over 100 sustainability indicators defined in the four 'quadrants' of environment, social, economics, and natural resources represented on a SPeAR® diagram. Strengths of the project are represented by green tones and weaker elements from a sustainability perspective by orange to red tones.

The first step of the sustainability assessment involved a review of other pipeline projects' best practice sustainability initiatives to identify benchmarks. Using this information, the base SPeAR® indicators were reviewed and adjusted to ensure relevance to the project.

The sustainability assessment was completed using information obtained from the detailed studies developed for the preparation of the EIS. Lastly the generated SPeAR[®] diagram and results of the analysis against the SPeAR[®] indicators were documented. The full report can be found in the EIS (see Chapter 19, Sustainability Assessment)

The results of the SPeAR[®] assessment, detailed in the diagram below, have identified a range of strengths and weaknesses of the project's sustainability performance at this stage of the development.

SPeAR[®] diagram for the Gladstone-Fitzroy Pipeline Project (Source: Arup, 2008)



In summary, key strengths (the green tones on the SPeAR[®] diagram) have been identified for many of the social aspects of the assessment including health and wellbeing, stakeholder satisfaction, access and amenity. The project development has had a strong focus on stakeholder engagement, hazard and risk assessment and health and safety which has helped to contribute to this score. In addition, the project would not present any significant visual amenity issues given the rural nature of the project location and the fact that the majority of the infrastructure would be buried underground (i.e. the pipeline).

In addition, economic aspects of viability and competition effects, environmental aspects of air quality, land use and design and operation have also been identified as strengths.

The assessment has identified that all other remaining aspects meet requirements of general compliance/best practice with the exception of transport which is identified as a weakness given the more rural location of the project and the dependence on road-based transport.

Planning Environmental Management Plan

The Planning Environmental Management Plan (EMP) has been developed in the planning phase of the project. The Planning EMP draws on the findings and recommendations of the project's EIS. The Planning EMP forms the precursor to the construction EMP (CEMP) which will be developed by the construction contractor prior to commencing construction. The EMP will also be the precursor to the Operations EMP (OEMP) that will be developed by GAWB prior to the start of the operational phase of the project.

The EMP contains actions relevant to both the construction and operational phases of the project. Environmental management measures related to commissioning of the project are included under construction, where relevant. The EMP has been prepared with reference to the Australian Pipeline Industry Association Code of Environmental Practice for Onshore Pipelines (2005).

This EMP is divided into different sections corresponding to different chapters of the EIS (where applicable). Within each section there are one or more control plans to manage specific environmental aspects. The control plans contain the following information:

- The environmental aspect requiring management consideration.
- The potential impacts or key issues (summarised from the EIS).
- Performance objectives.
- Performance criteria.
- Implementation actions.
- Monitoring actions.
- Responsibility.
- Reporting requirements.
- Corrective actions.

The EMP also includes the roles and responsibilities for implementation of the EMP and reporting requirements.



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