Connell Hatch
ABN 21 646 421 651
433 Boundary Street
Spring Hill
Queensland 4004 Australia

Telephone: +61 7 3135 8444
Facsimile: +61 7 3135 8445
Email: chbne@connellhatch.com
www.connellhatch.com

Initial Advice Statement
Moura Link - Aldoga Rail Project
Queensland Rail

13 September 2007
Reference HR8603
Revision 5

Connell HATCH
Infrastructure for Industry

Document Control

Document ID: V:\PROJECTS\QLD_RAIL\HR86 NORTHERN GSDA\ENVIRONMENTAL\IAS\REV 5\MOURA LINK-ALDOGA RAIL PROJECT IAS REV 5.DOC

Rev No	Date	Revision Details	Typist	Author	Verifier	Approver
0	14 August 2007	Draft	AW	AW	TM	
1	23 August 2007	Draft for Client Comment	MDP	MDP	TM	
2	31 August 2007	Revised Draft	TAS	TC	SAC	
3	7 September 2007	Final to QR	TAS	TC	SAC	BDP
4	7 September 2007	Draft to CoG	TAS	TC	SAC	BDP
5	13 September 2007	Final to CoG	TAS/MG	TC	SAC	BDP

A person using Connell Hatch documents or data accepts the risk of:

a) Using the documents or data in electronic form without requesting and checking them for accuracy against the original hard copy version; and
b) Using the documents or data for any purpose not agreed to in writing by Connell Hatch.

Contents

1. Introduction

This Initial Advice Statement (IAS) has been prepared on behalf of Queensland Rail Limited (QR) identifying the potential environmental impacts associated with the construction and operation of the Moura Link - Aldoga Rail Project.

1.1 Background

To cater for new tonnages from existing and new coal mines, QR is proposing a major expansion of its rail network in the less populated areas to the immediate north of greater Gladstone. This will include the construction of a new rollingstock maintenance facility, provisioning facility, new rail corridor and expansion of existing rail corridor. These works will be developed in parallel to and service a number of facilities, including the new Wiggins Island Coal Terminal (WICT) located in the Port of Gladstone.

The Environmental Impact Statement (EIS) prepared for the WICT included rollingstock maintenance and provisioning facilities, and new rail works, but at a location closer to the proposed coal terminal. In response to feedback received during the EIS consultation phase, QR has decided to proceed with a revised concept for the proposed rail works. The revised rail concept has the proposed rollingstock maintenance facility, provisioning facility and associated infrastructure located away from the WICT in the north of the Gladstone State Development Area (GSDA).

The WICT Supplementary EIS therefore proposed a corresponding reduction in the scope of the WICT rail works. The WICT rail works now include only a rail loop to service the terminal, and the quadruplication of the North Coast Line (NCL) between the new rail loop and the north-western edge of the Mount Stowe State Forest (just east of Yarwun township).

The proposed rollingstock maintenance facility and provisioning facilities are now to be constructed alongside the NCL, within the northern GSDA at Aldoga. The new rail corridor will extend north from the Moura Short Line (MSL), with a link to the East End Mine Branch Line (EEMBL) and into the existing NCL. Additional tracks are proposed to be added to the NCL between Mount Larcom and Yarwun. The proposed project area is shown in Figure 1.

1.2 Queensland coal transport

QR is the provider of major linkages in the coal supply chain. QR's Coal Fact Sheet (2007) states that QR has grown its coal tonnages in Queensland:

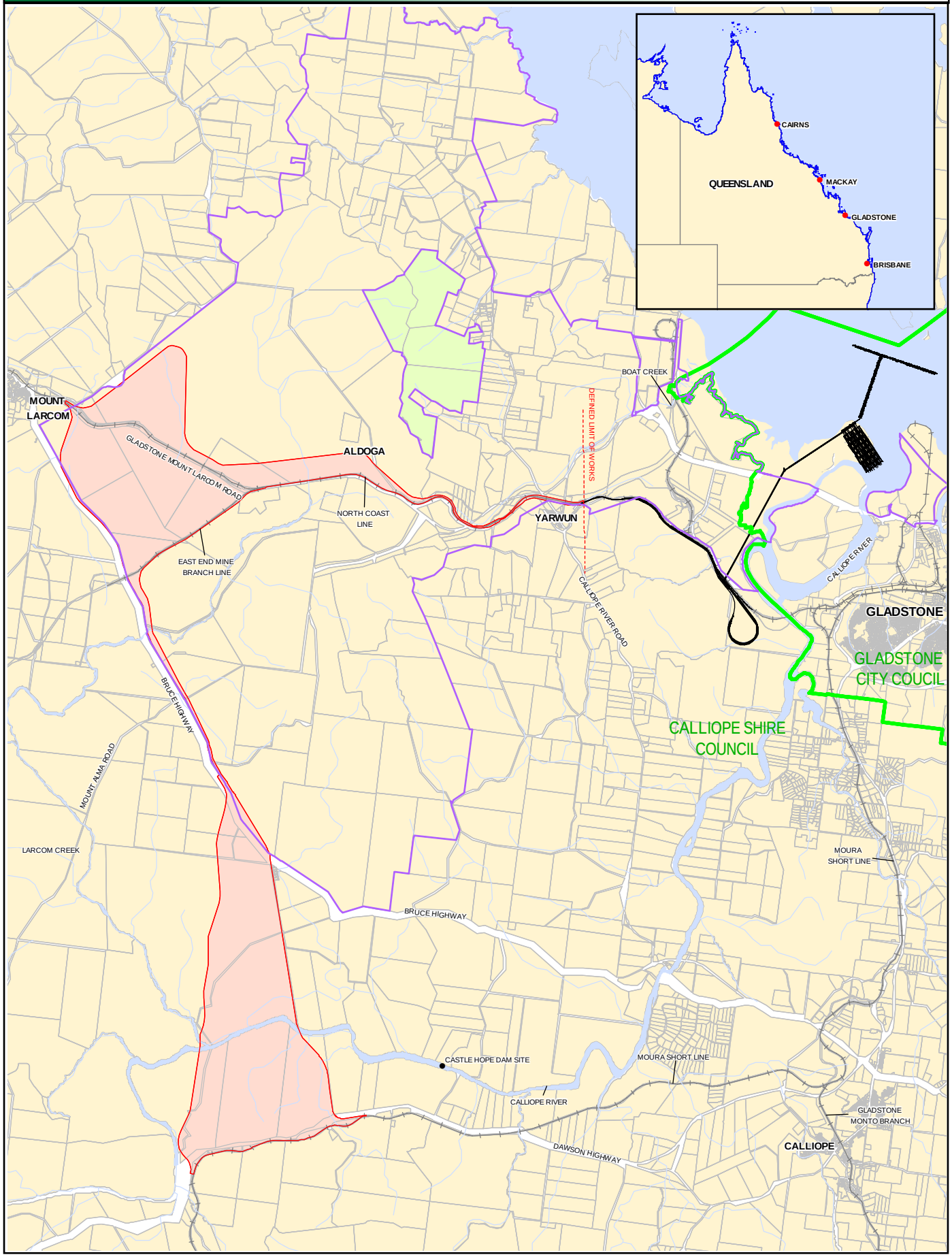
- From 96 million tonnes (Mt) in 1997/98 to 164.7 Mt in 2006/07
- 7% more than the 2005/06 figure of 153.7 Mt
- This figure could increase to 240 Mt by 2010

Major Queensland coal rail systems are shown in Figure 2. Gladstone is the hub for the Blackwater and Moura rail systems and accommodates both electric and non-electric locomotive haul trains. QR aims to upgrade the Moura and Blackwater systems from the current 55 Mtpa to approximately 90 Mtpa in the future. The ultimate capacity will be further refined during the Preliminary Engineering and EIS phase.

1.2.1 Moura system

The Moura rail system is a non-electrified line that connects the Moura, Callide and Boundary Hill mines to the RG Tanna and Barney Point coal export terminals at Gladstone. It also links the three mines with domestic coal users such as Queensland Alumina Limited (QAL) and the Gladstone Power Station.

Moura Link - Aldoga Rail Project



V:\Projects\Qld_Rail\HR86 Northern GSDA\GIS\Workspaces\HR86_04.wor By: SLG Date: 05/10/07 Version 3

N

0 5 (km)

Scale 1:100 000 (m) (@ A3 size)

LEGEND

- Rail
- Watercourse
- Wiggins Island Coal Terminal Proposed Infrastructure
- Gladstone State Development Area Boundary
- Cadastre
- Project Area
- Local Government Area Boundary
- Mt Larcom Ranges

LOCALITY PLAN

FIGURE 1

Figure 2 Queensland Rail Coal Rail Network

1.2.2 Blackwater system

The Blackwater rail system is an electrified line that connects coal mines in the southern Bowen Basin, from Gregory in the north to South Blackwater in the south, to the RG Tanna and Barney Point coal export terminals at Gladstone, and domestic coal users. The Blackwater System along with the Port of Gladstone is critical to the export logistics of the Bowen Basin.

1.2.3 Surat Basin

The Surat Basin Rail Joint Venture, of which QR is a member, is currently investigating a possible rail link from the southern end of the Moura System, south to the Surat Basin. This link would serve existing and proposed mines in this region, and provide a direct link to Gladstone's coal port facilities (including the WICT) for major new coal tonnages from the Surat Basin. Currently, mines in the Surat Basin are served only by the main western line from Brisbane.

1.3 Purpose of the Initial Advice Statement

The preparation of an IAS is the first step in the process of an environmental impact assessment and assists in the initial consultation, scoping and definition of the proposal as well as enabling the Queensland Coordinator-General (CG) to declare the Project a "Significant Project" under the provisions of the *State Development and Public Works Organisation Act 1971* (refer Section 8.2). The purpose of an IAS is to provide information on the nature and extent of potential environmental impacts arising from the construction and operation of the Moura Link - Aldoga Rail Project, the upgrade of the NCL between Mount Larcom and Yarwun, and related activities that take place concurrently to contribute to the decision making process. The IAS provides:

- Background information and historical details regarding the proposal
- The need and justification for the Project
- A brief description of the proposed works
- An outline of the potential environmental effects associated with the construction, operation and decommissioning phases of the development.

1.4 The Proponent

1.4.1 Queensland Rail

Within Queensland, QR is the largest provider of rail transportation solutions for Australia's coal mining industry. In 2006/07 QR transported 164 Mt of coal, of which approximately 10% was for domestic use and the remainder exported (QR 2007a).

In Queensland, QR operates over 400 services per week from over 30 coal mines. It rails coal to six existing export coal terminals and domestically to electricity generation and minerals processing industries. These services are operated on QR's interconnected coal network of over 2,000 km of track (75% electrified).

The contact details for the proponent of this Project are:

Mr Bob Stuart
Queensland Rail Limited
ACN 124 649 967
Network Access Group
Level 8, 127 Creek Street
GPO Box 1429
BRISBANE QLD 4001
Telephone: (07) 3235 3707
Facsimile: (07) 3235 2560
Email: robert.stuart@qr.com.au

1.5 Outline of the proposal

The focus of this proposal and IAS, and subsequent EIS, is on the construction and operation of track and facilities to support electrified and non-electrified haul trains. It is intended that haul trains will access the new terminal at Wiggins Island both from the north and from the west, on a rail network shared also by trains accessing the GSDA and other facilities in the vicinity of the Port of Gladstone. This new rail infrastructure will have a nominal ultimate capacity to handle approximately 90 Mtpa of coal in the future. The ultimate capacity will be further refined during the Preliminary Engineering and EIS phase.

The proposal is to construct:

- A rollingstock maintenance yard and provisioning facilities at Aldoga in the north of the GSDA.
- A new rail line to carry Moura/Surat traffic arriving via the Moura Short Line (MSL) in the south to the NCL southeast of Mount Larcom, and quadruplication of the NCL from the new yard to just east of Yarwun township.

The new corridor passes through rural areas to the west of the Bruce Highway, outside the GSDA. East of the Bruce Highway most of the rail works are contained within the GSDA. From the northern end of this new link, Moura/Surat traffic for carrying coal to the WICT will follow the same path as Blackwater traffic along an enlarged NCL corridor to the WICT loop, thus avoiding the greater Gladstone urban area. This effective bypass of the Gladstone urban area is a key strategic benefit of the proposal. It is a direct response to the community's clearly-stated preference (as expressed in submissions to the WICT EIS) that the city not be exposed to further increases in rail haulage of coal through Gladstone.

1.6 Site location

The location of the proposed Moura Link - Aldoga Rail Project, as shown on Figure 1, is described as follows:

- The site extends east along the NCL as far as Yarwun, north of the Aldoga Industrial Area.
- The site follows the alignment of the NCL west from Yarwun almost to Mount Larcom, with the rail corridor widened to accommodate the proposed Aldoga Rail Yard, to the north of the Aldoga Industrial Area, and a proposed turning loop east of Mount Larcom within the GSDA boundary.
- The site includes the triangle of land east of Mount Larcom between the Bruce Highway, the EEMBL and the NCL.
- The site extends south from the EEMBL, following the Bruce Highway and crossing the highway near the southern limit of the GSDA.
- The site straddles the Calliope River in the vicinity of the proposed Castle Hope Dam inundation area.
- The site extends as far south as the MSL and the Dawson Highway.

It is proposed that the Moura Link will connect the MSL to the NCL, via the EEMBL. It will traverse primarily low density grazing pastures for the entire distance of the corridor. Grade separation of crossings will be required for the Dawson Highway, the Bruce Highway and Gladstone - Mount Larcom Road.

1.7 Land tenure

The proposed rail corridor and additional infrastructure is to be located on land currently owned or leased by State Government (Department of State Development and Innovation), Queensland Transport, QR, Calliope Shire Council and private individuals. The project area is located within the CSC jurisdiction.

The acquisition of additional land parcels outside of the GSDA will be required. A number of freehold properties may be directly affected by acquisition as a result of the proposal. In addition, the project area encompasses properties which reside within the GSDA that have current grazing lease agreements.

2. Need for the Project

2.1 Overview

This section describes the need for the proposed Project, the current needs that the proposed Project will fulfil and the expected economic benefits of the Project.

Demand for coal has increased considerably in the last decade due to its low cost and stable supply compared to other fossil fuels. This growth is expected to remain strong and has seen recent surges in global demand due to accelerated world economic growth. While the recent rate of global economic growth is not expected to be sustained over the long term, there is sufficient sustainable demand to trigger the development of a new coal terminal and supporting coal rail transport infrastructure in the Gladstone region.

Recent growth in demand for metallurgical and thermal coal has resulted in a significant supply deficit. This has been reflected in the price of metallurgical coal, which increased from approximately US$43 per metric tonne (mt) in 2003 to a peak of US$145/mt in 2005.

2006 prices for metallurgical coal have decreased marginally; to around US$115/mt. Thermal coal prices have been steady since 2005, between US$50 and US$53/mt. However, this represents an increase of approximately 20% over the 2004 prices.

In order to meet such demand, capital expenditure of approximately $A2.5 billion has already been committed to projects within the Australian coal industry that will expand production by more than 60 Mtpa over the next two years.

Queensland's Bowen Basin produces high quality coking coal, pulverised coal injection coal and thermal coal that is exported to Japan, Korea, Taiwan, China, India, Europe and Brazil. The region represents a significant economic driver for the State and national economy. Continuing improvements in mining techniques at existing coal mines, as well as the development of new mines in the area, is resulting in growing supply to meet increasing demand for coal to be exported through the Port of Gladstone.

2.2 Existing capacity constraints

The RG Tanna Coal Terminal and Barney Point Coal Terminal have limited development capacity in their rail receival and port facilities. Customer contracts have been established for existing tonnage. Any additional export tonnage will require the establishment of a new terminal. Central Queensland Ports Authority (CQPA) has determined that they have sufficient committed tonnages to initiate the WICT Project.

In addition, the Callemondah Rail Yard is close to capacity, and any new significant increase in tonnage will require a new facility to be constructed.

The proposed Project will allow coal trains to access the WICT and rail transport access to future industries within the GSDA.

2.3 Export coal markets

Australia is estimated to hold 75 billion short tons (Bst) of coal reserves, the majority of which are concentrated along the country's eastern seaboard. The Bowen Basin in Queensland contains the largest reserves. Queensland accounts for over 50% of Australia's annual coal production (refer Table 2.1) (ACA 2007a, b).

Most black coal in Queensland comes from the Bowen Basin, extending south from Collinsville to Blackwater and Moura, and at Newlands, Blair Athol and near Brisbane. Other large deposits of younger coal in the Millmerran area west of Brisbane have the potential to be developed to generate electricity.

Table 2.1 Annual black coal production figures

	Black Coal – Raw (Mt)		Black Coal – Saleable (Mt)	
	2004-05	2005-06	2004-05	2005-06
Queensland	225	226	173	172
Australia	392	397	305	305

(Source: ABARE 2006a)

Black coal remains Australia's largest commodity export, and Australia remains the world's largest coal exporter with exports of 233 Mt in 2005-06, or 30% of the total world market (down from 31% in 2002). Australia supplies markets in more than 35 countries around the world including Japan and other Asian economies (which account for over 80% of Australian exports), Europe (12%), South America (5%) and South Africa (ACA 2007c).

Total world trade in coal in 2004-05 was 766 million tonnes - comprising 566 Mt of thermal coal (74%) and 200 Mt of metallurgical coal (26%). In terms of thermal and metallurgical coal markets, Australia's share in 2004 represented 20% and 60%, respectively of the total world trade (ACA 2007c).

Australia’s coal exports were therefore worth around $A24.5 billion in 2005-06 - an increase of 43% over 2004-05. In 2005-06 black coal represented around 19% of Australia's total commodity exports. The Australian Bureau of Agricultural and Resource Economics (ABARE) estimate a similar contribution in 2006-07 (ACA 2007c).

Coal reserves are abundant and widely distributed around the world, providing an accessible and affordable energy source. All authoritative studies, such as the International Energy Agency's "World Energy Outlook" show that coal use is set to increase over the next 20 years as the world meets its growing energy needs. For many developing countries, affordable energy from coal is vital for building internationally competitive industries, and providing basic household services such as lighting, cooking and refrigeration. Unlike oil and gas, coal is easily obtained from a large range of suppliers operating in a competitive market.

Over the past few years, China has reversed its position from a net exporter of hard coking coal to a net importer, while at the same time China’s exports of coke to the steel industry have been subject to fluctuation.

The global steel industry has responded by planning significant additions to future domestic coke production capacity to replace Chinese coke imports. This should increase global seaborne demand for hard coking coal from producers such as Australia.

During the year, the trend strengthened towards steel producers signing long-term contracts and/or purchasing equity interests in coal producers in order to secure additional supplies to meet their future needs. The higher coal prices are serving to attract new supply to the market, with major producers announcing plans for capacity increases.

Australia is ideally positioned in terms of readily accessible reserves and quality to meet the current under supply and future demand increases. The Moura Link project provides the strategic link in the coal supply chain and is critical to ensuring reliability and continuity of supply of coal to the export market. This means servicing the existing (RG Tanna Coal Terminal) and proposed (WICT) coal facilities within the Gladstone region.

2.4 Mine/customer requirements

Motivated by the significant growth in steel production in China and India, and long-standing demand for energy (thermal) coal, the ongoing demand for good quality coal is forecast to remain robust.

The Bowen Basin (Blackwater region) and Surat Basin (Wandoan region) are expected to produce good quality coal into the foreseeable future with substantial reserves of good quality coal product. The region is currently among the lowest cost producers of high metallurgical and thermal coal in the world.

Figure 3 illustrates the Queensland coal industry summary (DNRW 2007b).

Queensland is the world's largest exporter of seaborne coal. During the year 2004-05 Queensland produced a record 172.7 million tonnes (Mt) of saleable coal - an increase of 7.7% over the previous financial year.

Opportunities remain for further resource development in the central and south west Bowen Basin within the Reids Dome Beds, which are known to contain vast, and as yet, undeveloped resources of high quality thermal and metallurgical coals. Recent exploration in the southern Bowen Basin has focused on thermal and semi-soft coals. This has led to several new mines being developed, and has located other significant coal resource areas for possible future development.

QR and CQPA are receiving increasing interest from mine operators in relation to increased coal output from existing and new mine expansions in the Surat Basin and Wandoan areas. In addition to new mines, existing mines are seeking to expand to cater for the increased global demand for coal. A significant and expanding world market exists for Bowen Basin coal which, due to its low sulphur and nitrogen content, emits lower $C0_2$ concentrations upon combustion.

All of Queensland's export coal is transported to port via the coal rail network operated by QR. The ports in the Gladstone area are critical to this logistics supply chain servicing QR's Blackwater and Moura Systems. The Queensland economy places a heavy reliance on revenue derived from coal industry royalties ensuring the support of the Queensland State Government.

2.5 National competition principles affecting this development

QR is the primary rail transport operator in the Queensland coal supply chain currently transporting all of Queensland's coal exports to port. QR is also a Company Government Owned Corporation (GOC) and hence operates under the provisions of the *Government Owned Corporations Act 1993* and consequently National Competition Principles.

QR operates a "Regulated Asset" (the rail network) and is bound to provide an "Undertaking" to the Queensland Competition Authority (QCA) as to how it will provide the network to meet demand from "Operators" – both internal from its own Business Groups and from external Third Party Operators – to transport product for identified "Users".

Under the terms of its Undertaking QR is bound to provide access to existing infrastructure and define the provision of additional infrastructure to meet the demands of bona fide access seekers (Operators and Users) (refer QR Access Undertaking 2005).

The undertaking is quite specific insofar as the triggers to such development and the mechanism and response times necessary to ensure compliance.

For this reason and to support the above mentioned rail operations QR has commenced planning for the development of the Moura Link - Aldoga Rail Project, and the corresponding infrastructure necessary to meet the demands of users. These works will be developed in parallel to the new WICT and supporting port facilities located north of greater Gladstone.

Source: Department of Natural Resources and Mines website.

3. Project alternatives

3.1 Introduction

This section describes the alternatives to the proposed activity, including the no action alternative, that may be considered to fulfil the need for the proposed development.

There are a limited number of options available to accommodate the rail links required to service the new WICT and cater for the increase in rail traffic due to new and expanding coal mine developments in the Southern Bowen Basin and the Surat Basin. The WICT is pivotal to a number of new mine developments and mine expansions and major expansion of rail infrastructure in the Gladstone Region is critical to the operation of the WICT.

3.2 Alternative routes and railyard locations

QR has examined a number of alternatives prior to adopting the scheme proposed. In particular a number of rail options have been investigated for connection of the Moura Line and North Coast Line to the proposed WICT on Golding Point (north of the greater Gladstone region).

These initial studies identified that rail provisioning and rollingstock maintenance facilities should be located in the vicinity of the WICT to provide the lowest cost option. This option was assessed in detail during the WICT EIS.

However, during the WICT EIS there was significant community opposition to transporting coal to the WICT through existing and growing rural residential areas along the pre-existing Moura Short Line. Also a land, port, rail and road infrastructure study (being undertaken at the same time as the WICT EIS) was identifying infrastructure corridors through the GSDA.

The study raised the possibility of providing a single Rail Provisioning and Rollingstock Maintenance Facility south of Mount Larcom to service the GSDA precinct, and existing and future port developments north of the Calliope River, including the proposed WICT. This option was developed further by QR and is now the rail scheme proposed and presented in this Initial Advice Statement (IAS).

A summary of the alternatives identified, including the No Action option, are given in Table 3.1.

3.3 No Action option

The inability to transport coal by rail to the new WICT would have significant financial implications for Australia and Queensland.

Further, inaction to meet the demands of industry would curtail further proposed investment in the coal industry. The transport of additional coal to the new WICT will provide additional export revenue for Australia, increased State revenue, and additional employment opportunities.

3.4 Summary of alternatives

Table 3.1 summarises the Project alternatives.

Table 3.1 Project alternatives summary

Option	Issue
Moura and Surat rail traffic to be directed along existing Moura Short Line and Blackwater rail traffic to be directed along existing North Coast Line with new Rollingstock Maintenance and Provisioning facilities near WICT (the rail option examined within the WICT EIS).	• WICT EIS process led to this option not being considered further. • Strong community opposition to transporting coal to the WICT along the Moura Short Line between Gladstone and Calliope (which is considered to be part of the greater Gladstone region). • Rollingstock maintenance and provisioning facilities located in area that was suited to the WICT, but not for future port facilities.
Expand existing facilities at the existing Callemondah Rail Yard and develop additional rail infrastructure to service WICT.	• Existing Callemondah Rail Yard is not ideally located to service WICT. Existing development constrains the yard from significant expansion. The length of the Callemondah Rail Yard is not sufficient to accommodate the proposed coal train consists to service Blackwater, Surat and the WICT. • Existing Callemondah Rail Yard is already operating at capacity.
Do nothing	• Damage Australia's reputation as reliable exporter of coal. • Loss of export revenue and employment opportunities.

4. Project description

4.1 Introduction

The proposal is to develop a new rail corridor, rollingstock maintenance yard and provisioning facilities to support the development of the WICT.

This Project will allow increasing coal tonnages to be transported to ports in the Gladstone region from mines in the Central Queensland coal fields. The capacity of existing rail facility at Callemondah is approaching its limit and to increase its current capacity would be both expensive and disruptive to current operations.

A concept layout of the proposal is illustrated in Figure 4 and the key components of the development include:

- Construction of new rail link (Moura Link) between the existing Moura Short Line (MSL) and the East End Mine Branch Line (EEMBL).
- Construction of a rail link between the EEMBL and the North Coast Line (NCL) near the township of Mt Larcom to the north.
- Construction of new rollingstock maintenance yard including:
  - Locomotive provisioning facility and associated trackwork
  - New wagon and locomotive maintenance facility and associated trackwork
  - Train examination roads
  - Wagon storage roads
- Construction of new tracks parallel to the existing NCL between the new yard and the WICT unload loop.
- Construction of a rail loop off the NCL between the new rail yard and Mt Larcom.
- Diversion of the NCL around a new yard at Aldoga.
- Associated roadworks and bridges.
- Infrastructure to service the rail works and facilities.

Approval for the WICT unload loop is being sought under the WICT EIS.

The sections below describe the individual elements of the Project in more detail.

4.2 Rail infrastructure

The scope of railway works included in this Project comprises all of the works required to provide rail access to and from the new terminal at Wiggins Island from both the Blackwater and Moura/Surat Systems, together with the support infrastructure. Supporting infrastructure is expected to include rail holding roads and rollingstock maintenance facilities, as necessary for operational support of the rail traffic generated by the terminal development. The rail works will include a combination of both electrified and non-electrified tracks.

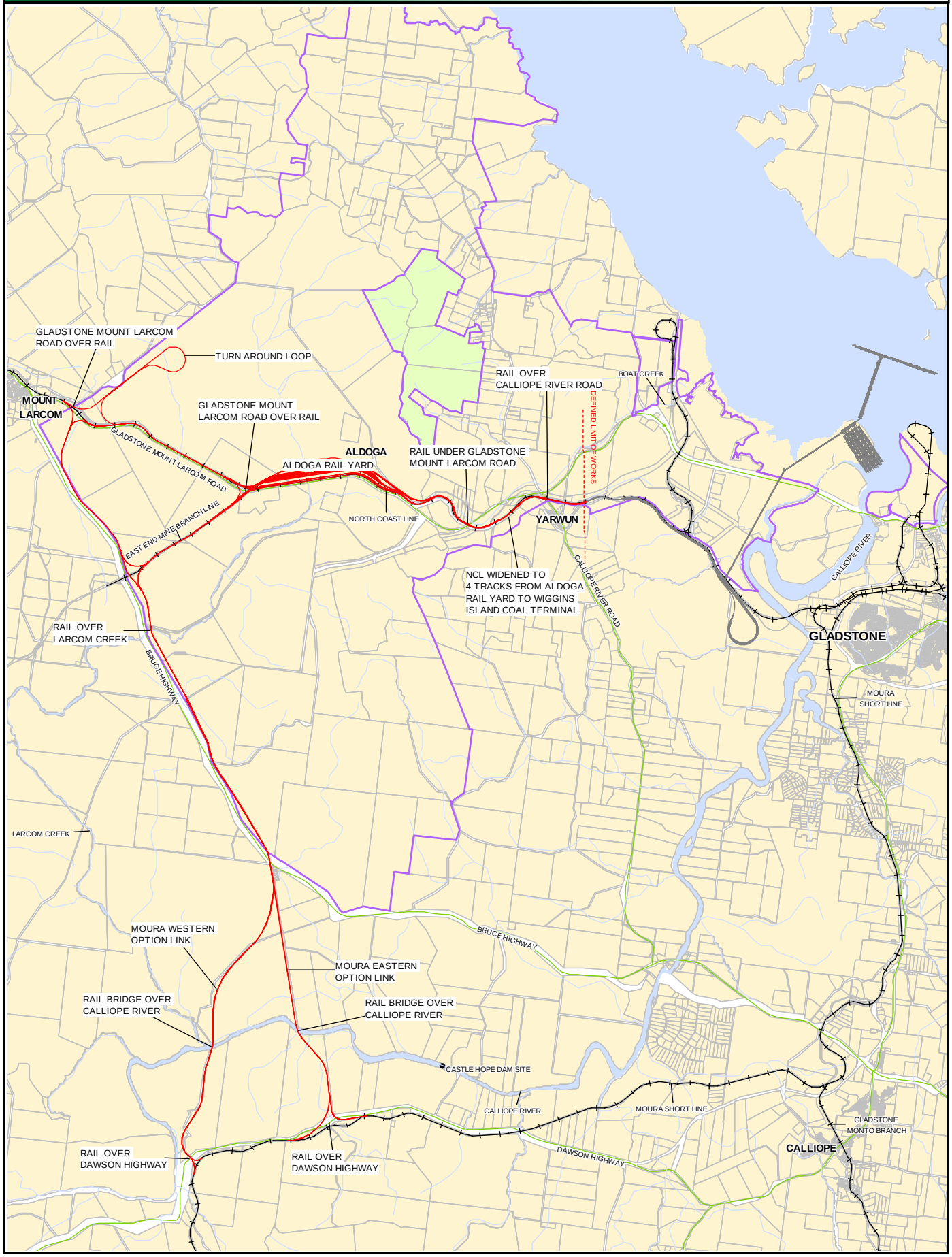
The railway works that will be provided to service the new WICT are discussed below.

4.2.1 Moura Link

The Moura Link involves the construction of a new rail link between the existing MSL and the EEMBL to allow trains travelling to/from the Moura/Surat system to enter the WICT unload loop from the same direction as those travelling from the Blackwater system.

Two route options, eastern and western, were initially investigated for the portion of the Moura Link to the south of the Bruce Highway crossing. However, recent discussions with the Department of Natural Resources and Water (DNRW) have highlighted the existence of the potential future Castle Hope Dam site within the DNRW register.

Moura Link - Aldoga Rail Project



V:\Projects\Qld_Rail\HR86 Northern GSDA\GIS\Workspaces\HR86_21.wor By: SLG Date: 18/10/07 Version 3

N

0 5 (km)

Scale 1:100 000 (m) (@ A3 size)

LEGEND

- Existing Rail
- Proposed Rail
- Wiggins Island Coal Terminal Proposed Infrastructure
- Mt Larcom Ranges
- Gladstone State Development Area Boundary
- Cadastre
- Major Road
- Waterway

GENERAL ARRANGEMENT

FIGURE 4

Even though it has been ranked very low on the list of water supply options for the Gladstone area by the Gladstone Area Water Board (GAWB), Castle Hope Dam can not be disregarded as a longer term water supply option in the DNRW water resource planning. Consequently initial planning has taken into account the possibility that this dam may be constructed in the future.

Several alignment options are under consideration giving rise to the study area shown in Appendix B.

To the north of the Bruce Highway the Moura Link travels parallel to the Highway and is fully contained within the GSDA. An extension of the Moura Link is proposed, linking the EEMBL with the NCL near the township of Mt Larcom. Provision for future addition of standard gauge track will be considered in this corridor, and has been included in the project scope accordingly.

4.2.2 Aldoga Rail Yard and new track to WICT loop

The Aldoga Rail Yard will be constructed to the north of the NCL adjacent to the EEMBL junction. The scope of the railway works within the yard includes:

- New locomotive provisioning facilities to meet the requirements of the Wiggins Island electric and non-electric rail traffic and to avoid the need for trains servicing the new terminal to be diverted to Callemondah Rail Yard for provisioning purposes.
- New rollingstock maintenance facilities for wagons and locomotives. These facilities are required due to the scope of rail operations contemplated and the significantly increased number of trains accessing the network to service the Wiggins Island development (both electric and non-electric). It is therefore proposed to develop locomotive maintenance facilities (for electric and non-electric locomotives) and wagon maintenance facilities together. The facilities will also include the necessary stabling and storage roads.
- New train examination roads which will be used to perform routine maintenance inspections on train consist.
- New tracks between the rail yard and Yarwun to link with the WICT unload loop[1].

Railway works may be delivered in stages in line with the build up in export demand and will be designed so that future port expansion and trade through the port is not precluded. In terms of its holding capacity, the Aldoga Rail Yard will be designed to cater for the ultimate capacity of the WICT, as well as to provide capacity relief to the Callemondah Rail Yard. The ultimate capacity is not known at this stage of the project, but will be more closely defined through the detailed design and EIS phases, and as the WICT Project develops.

The arrangement of the rail yard will require the diversion of the existing NCL to the north of the rail yard.

4.2.3 Turnaround loop

A turnaround loop, located in an unpopulated area to the north west of the rail yard is included in the scope of the Project. This loop will be used to hold and turn around trains.

4.3 General infrastructure

4.3.1 Road infrastructure

A number of local government and State controlled roads will be affected by the Project.

A road over rail bridge off Gladstone - Mount Larcom Road is proposed at the eastern end of the yard to provide employee and delivery access to the provisioning and maintenance facility. An alternative access will be provided at the western end of the yard to the north of the EEMBL junction.

[1] The WICT unload loop and the portion of coal mainline between the loop and Yarwun is being covered under the WICT Supplementary EIS (CH 2007)

In addition, the following major roads are expected to be impacted:

- The Bruce Highway will be crossed by the Moura Link corridor. At this stage it is likely that rail will pass under the Highway
- Extension of the existing Gladstone - Mount Larcom Road over Rail at the EEMBL junction to cater for four additional provisioning tracks
- Grade separation of Gladstone - Mount Larcom Road with rail to cover the proposed extension of the Moura Link to the township of Mt Larcom. It is likely that rail will pass under Gladstone - Mount Larcom Road
- Grade separation of Gladstone - Mount Larcom Road for the new tracks between the Aldoga Rail Yard and the WICT rail loop. It is likely the rail will pass under Gladstone - Mount Larcom Road
- New rail crossing over Calliope River Road for the new tracks between the Aldoga Rail Yard and the WICT rail loop.

Figure 4 illustrates the location of major road crossings.

4.3.2 Other onsite infrastructure

Other infrastructure associated with the Project may include the following, in isolation or in combination:

- Buildings, including offices, workshops, amenities, substations and security
- Site roads, comprising a combination of sealed and unsealed roads
- Car and heavy vehicle parking
- Fuel storage
- Fencing
- Landscaping
- Lighting
- Stormwater drainage
- Culverts/bridges over Larcom Creek within the rail yard
- Water and sewage networks and treatment plants as required
- Power distribution
- Provision of fire fighting facilities

The full scope of other associated infrastructure including any staged delivery will be determined during subsequent studies.

4.3.3 Offsite infrastructure

Offsite infrastructure may include following, in isolation or in combination:

- Power supply
- Provision of access to land potentially isolated by the new rail tracks
- Utility infrastructure connections (eg electricity, water and telecommunications)

The full scope of offsite infrastructure including any staged delivery will be determined during subsequent studies.

4.4 Cost estimate

The estimated cost of rail infrastructure for this project is approximately $500 million excluding land acquisition costs. This figure is an estimate only based on a broad scope of work which will be further refined during the Preliminary Engineering and EIS phase, as more details become available.

4.5 Construction timeline

Construction is expected to commence during the first half of 2010, with the Project expected to commence operations approximately two years later. The progress of this Project is very much dependent on the support of the mining industry and implementation of the WICT Project.

4.6 Employment generation

The Moura Link - Aldoga Rail Project will generate a significant number of jobs during construction and operational phases. It is anticipated that a peak work force of approximately 300 - 350 will be deployed during the construction phase, and approximately 550 during the operational phase. These numbers are estimates only based on a broad scope of works, and will be further refined during the Preliminary Engineering and EIS phase of the Project. Further, the operational workforce stated here applies to the ultimate stage only. It is anticipated that the operational workforce will grow in accordance with demand over the various stages of the Project's development. There will be more clarity on the scope of works for each stage at the conclusion of the Preliminary Engineering and EIS phase of the Study.

5. Existing environment

5.1 General

The proposed rail corridor will extend north from the existing MSL, approximately 13 km north east of Calliope, and join the NCL to the east of Mt Larcom and/or along the East End Mine Branch Line. The rollingstock maintenance yard and provisioning facilities will be constructed adjacent to the NCL at Aldoga.

The prevailing land uses within the broader project area are industry and agriculture with limited residential development. Several industries are located in close proximity to the proposed rail maintenance yard, including the Rio Tinto Aluminium Yarwun Refinery and Aldoga Aluminium Smelter (not constructed).

5.2 Climate

The region has a sub-tropical climate and experiences average annual rainfall of approximately 890 mm. The majority of rainfall occurs during the summer months.

The average air temperature is 27 degrees with summer and winter average maxima between 31 and 22 degrees, respectively. Climate data for the Gladstone is outlined in Table 5.1 and Table 5.2 (meteorological data for Calliope was not available).

Table 5.1 Gladstone Airport – Meteorological Records (1993-Present)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann
Mean Max Temp (°C)	30.7	30.6	29.9	28.0	25.8	23.5	22.9	23.6	25.9	27.4	28.6	30.0	27.2
Mean Min Temp (°C)	23.0	23.0	21.7	19.1	15.7	13.3	11.9	12.7	15.5	18.7	20.4	22.1	18.1
Mean Rainfall (mm)	110.8	141.3	46.2	37.9	37.5	50.6	13.7	40.1	32.1	69.1	54.8	89.4	727.4

(Bureau of Meteorology 2007)

Table 5.2 Gladstone Radar – Meteorological Records (1957-Present)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann
Mean Max Temp (°C)	31.2	31.0	30.3	28.4	25.7	23.2	22.8	24	26.4	28.4	29.9	31.0	27.7
Mean Min Temp (°C)	22.5	22.4	21.5	19.6	17.0	14.3	13.4	14.2	16.4	18.7	20.5	21.9	18.5
Mean Rainfall (mm)	144.3	135.2	83.4	46.3	60.9	40.0	32.7	33.0	26.3	63.1	73.5	126.5	868.9

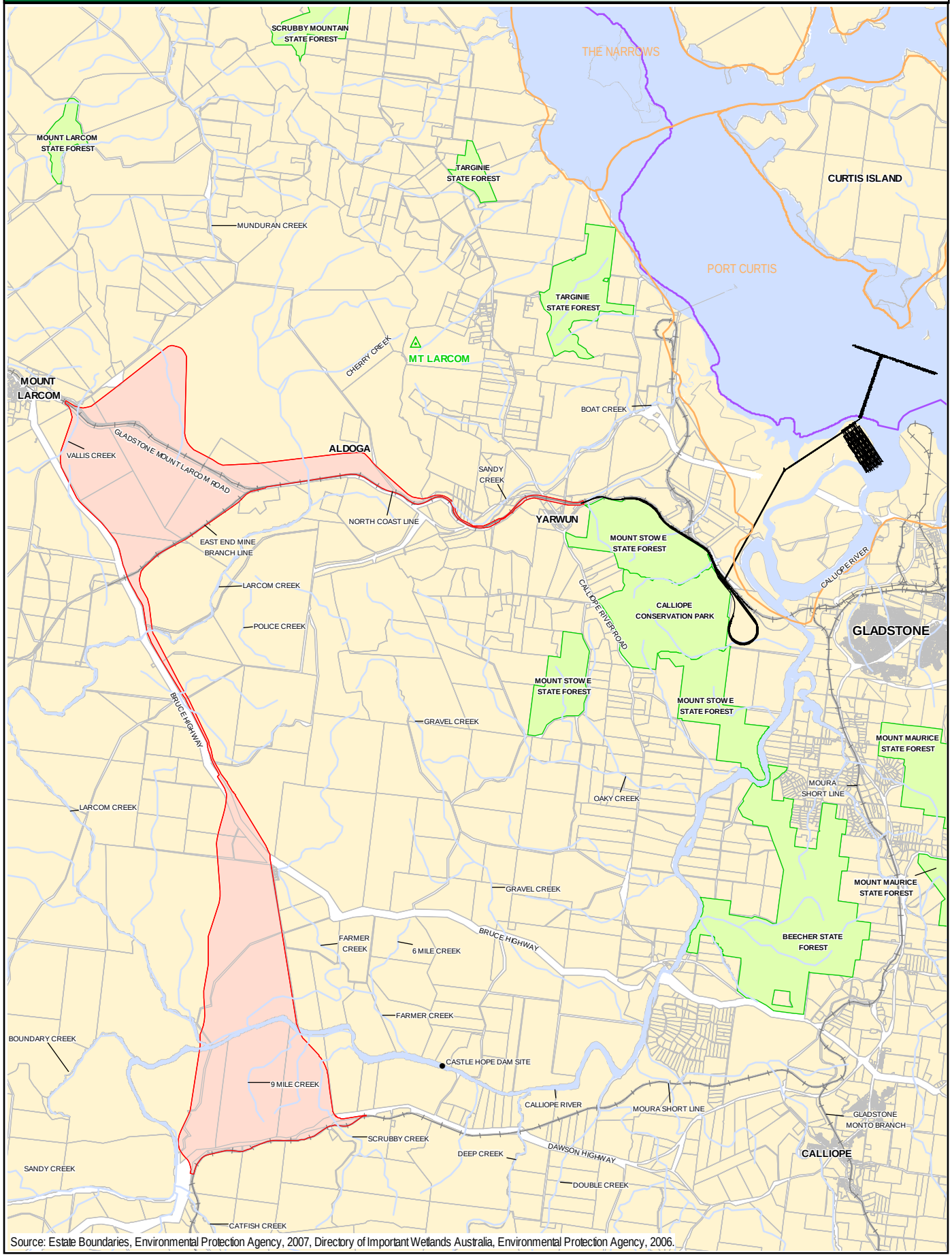
(Bureau of Meteorology 2007)

5.3 Soils and geology

The geology underlying the project area is dominated by geological formations of the Palaeozoic Era (248 – 570 million years ago), which include:

- Mount Holly Beds, which were laid down during the lower to middle Devonian period and comprises acid or intermediate ash flow tuff, ash fall tuff, acid or basic flows, volcanic arenite, siltstone, mudstone, conglomerate and crinoidal and coraline limestone.
- Doonside Formation, which was formed during the late Devonian to early Carboniferous periods. It is part of the Curtis Island Group and comprises red, green and white chert, mudstone, acid tuff, limestone and tuffaceous arenite.

Moura Link - Aldoga Rail Project



Source: Estate Boundaries, Environmental Protection Agency, 2007, Directory of Important Wetlands Australia, Environmental Protection Agency, 2006.

V:\Projects\Qld_Rail\HR86 Northern GSDA\GIS\Workspaces\HR86_12.wor By: SLG Date: 18/10/07 Version 3

N

0 5 (km)

Scale 1:100 000 (m) (@ A3 size)

LEGEND

- Wiggins Island Coal Terminal Proposed Infrastructure
- Watercourse
- Rail
- Cadastre
- Project Area
- Protected Area
- Great Barrier Reef World Heritage Area (Low Water Mark)
- Directory of Important Wetlands Australia

SIGNIFICANT ENVIRONMENTAL AREAS

FIGURE 5

- Crana Beds, which were laid down during the lower Carboniferous period and comprises feldspathic and lithic arenite, conglomerate, mudstone, siltstone, andesite flows and tuff and rare acid flows. These beds form part of the Yarrol Basin Sequence.
- Berseker Beds, which were laid down in the lower Permian period and comprises acid lapilli tuff, vitric and crystal tuff , andesitic and acid flows, agglomerate, tuffaceous, conglomerate, mudstone and lithic arenite. These beds form part of the Yarrol Basin Sequence.
- Targinie Adamellite, which was laid down in the upper Permian period and comprises minor granite.

More recent material comprises Quarternary alluvium deposited during the Holocene Epoch of the Cainozoic Era and comprises of gravel, sand silt and clay (DNRM 2001).

Prior to construction, an investigation will need to be undertaken to determine the presence of contaminated land and acid sulphate soils within the project area. All of the subject land within the project area is at elevations above 15 m AHD, and therefore acid sulphate soils are not expected to present a risk to the Project. However, investigations would be undertaken during the EIS phase to confirm this, and to determine whether other contaminants or potential contaminant sources exist within the project area.

5.4 Water quality

The project area is located within the Calliope River catchment which encompasses an area of approximately 2,236 km^2.

The Calliope River is currently an unregulated system that flows in an easterly direction from the Calliope Ranges. It discharges into Port Curtis north of Gladstone near the WICT Project at Golding Point (refer Figure 5). The Calliope River is approximately 100 km in length and includes the four major tributaries of Oakey Creek, Paddock Creek, Double Creek and Larcom Creek.

The project area is located within the freshwater reaches of the Calliope River (ie above the tidal limit of 32.8 km Adopted Middle Thread Distance (AMTD), the proposed Castle Hope Dam site) (C & R Consulting 2005).

Within this area, the Calliope River is characterised by a series of large, deep waterholes. This is supported by the EPA Wetland Mapping which characterises the reach as a riverine system (ie wetlands and deepwater habitats contained within the river channel). Similar habitats were identified on Farmer Creek and Larcom Creek. A palustrine wetland (ie wetlands with persistent emergent vegetation) was also identified within the lower reaches of Farmer Creek.

The northern section of the Project is located within the Larcom Creek subcatchment, which encompasses the area of approximately 34,000 ha.

Larcom Creek is a major tributary of the Calliope River, which is sourced to the west of Mt Larcom and flows south west prior to discharging into the Calliope River north of Castlehope. The creek is generally characterised in the lower reaches by a series of large, deep waterholes and by a series of smaller ephemeral creeks and waterholes in the upper reaches.

Water use within this area is mainly associated with dryland grazing, however some irrigated cropping and industrial pressures occur.

Current water quality conditions within the Calliope River catchment are influenced by a number of anthropogenic activities, including grazing, agriculture, industry and urban-based activities. The condition of the Calliope River has been reported as poor to moderate in the National Land and Water Audit (C & R Consulting 2005).

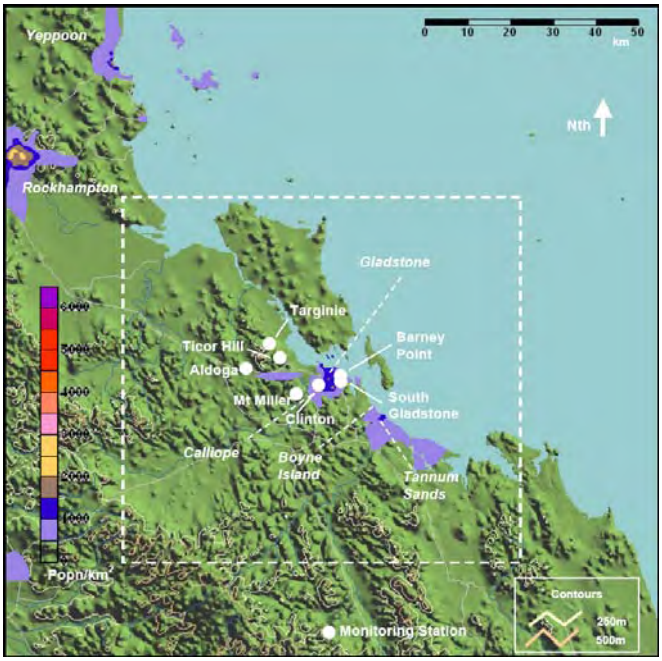
Water quality data on the freshwater reaches of Calliope River and Larcom Creek is limited. Existing data is associated with environmental studies conducted as part of large scale developments (eg Aldoga Aluminium Smelter) or as part of long-term monitoring within the estuarine reach. However, existing water quality data suggests that the system is in relatively good health (C & R Consulting 2005).

A baseline water quality monitoring programme will be undertaken to support any future EIS process.

5.5 Air quality

As shown in Figure 6, the project area is within the Gladstone airshed which is centred in the city of Gladstone and enclosed by the Calliope and Boyne ranges to the west and south and the Port of Gladstone to the east (EPA 2003).

The air quality within this area is affected by urban and rural micro-climates and major local industries. These include the NRG Gladstone Power Station and the Rio Tinto Aluminium Yarwun Refinery, which both release process gases into the local airshed, under uncontrolled or controlled licence conditions.



Source: EPA 2003

Figure 6 Gladstone Air Quality Monitoring Boundary

The Queensland Environmental Protection Agency (EPA) produces a monthly bulletin summarising the air quality results from the locations shown in Figure 6 (EPA 2007).

In general, the density of sensitive (eg residential homes, schools) receptors within the nominated project area is substantially lower than for any comparable alternative additional infrastructure through the urbanised suburbs of Gladstone.

5.6 Noise

Major industry in the immediate area, including the Rio Tinto Aluminium Yarwun Refinery and other local industries, all contribute to the local noise emissions.

In general, the density of sensitive (eg residential homes, schools) receptors within the nominated project area is substantially lower than for any comparable alternative additional infrastructure through the urbanised suburbs of Gladstone.

Although limited sensitive receptors have been identified within the project area through desktop studies, the Bruce Highway, the Dawson Highway and Gladstone - Mount Larcom Road are highly utilised roads with the potential for high volumes of industrial traffic during peak times.

During the operational phase of the Project it is likely that there will be an increase in rail traffic between the MSL and NCL (ie Moura Link) and along the NCL between Mt Larcom and the proposed WICT. This is likely to impact on the existing noise background levels within the area.

5.7 Ecology

During August 2007, a preliminary ecological assessment was undertaken for the project area which included a review of existing background data and a preliminary field survey. Database searches included the following:

- *Environment Protection and Biodiversity Conservation Act* 1999 (EPBC Act) Protected Matters Report (EPBC Report)
- Wildlife Online database search
- Regional Ecosystem (RE) mapping database search
- HERBRECS database search
- Queensland Museum database search
- Birds Australia database search

Further ecological investigations will need to be conducted during the planning phase of the Project.

5.7.1 Protected areas

The project area is located within the Calliope River catchment approximately 40 km upstream of the Great Barrier Reef World Heritage Area (GBRWHA).

The GBRWHA encompasses approximately 348,000 km^2 of Queensland's coastline extending from the low water mark of the mainland to include all islands, Queensland's internal waters and areas in the Great Barrier Reef Marine Park (GBRMP) not protected under the *Sea and Submerged Lands Act 1973*.

Other State or Commonwealth protected areas located downstream of the project area include:

- The Queensland Mackay/Capricorn Marine Park
- The Great Barrier Reef Marine Park (Mackay/Capricorn Section)
- Rodd's Bay Dugong Protection Area

However, due to the distance between these protected areas and the nominated project area, it is not considered likely that there will be any direct impacts on them. Likewise, the probability of having indirect impacts on these protected areas is also considered low.

5.7.2 Vegetation communities

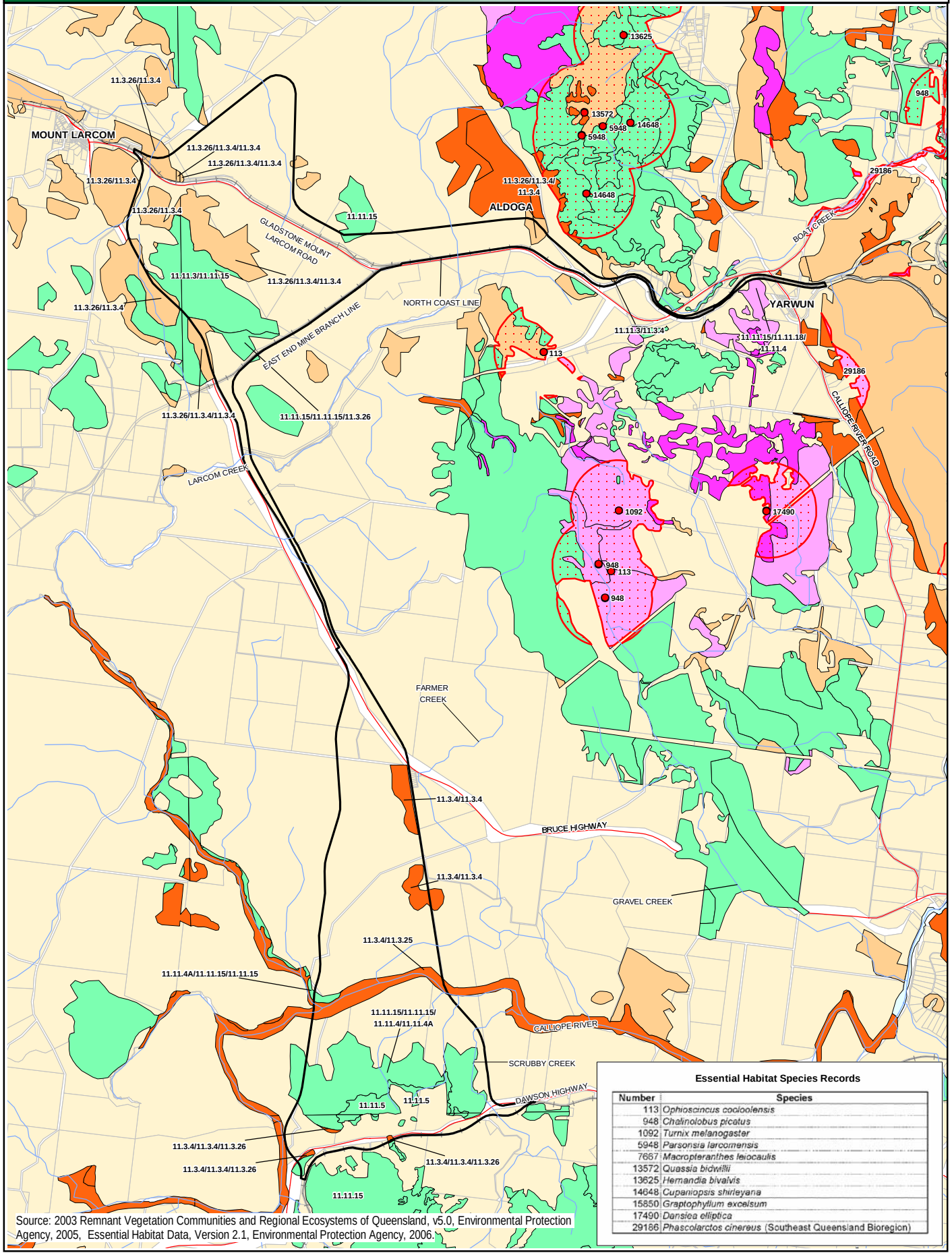
Regional Ecosystems

Based on the Queensland EPA's RE Mapping (2003) one "Endangered" RE, one "Of Concern" RE and six "Not of Concern" REs have been identified within and/or adjacent to the project area. A regional overview of the REs is provided in Appendix A.

A summary of these RE types have been listed below with Figure 7 illustrating their locations.

- RE 11.3.4 - "Of Concern" sparse *Eucalyptus tereticornis* and/or *E. camaldulensis* tall woodland on alluvial plains). This RE provides habitat for threatened flora species including *E. raveretiana*.

Moura Link - Aldoga Rail Project



Essential Habitat Species Records

Number	Species
113	*Ophioscincus cooloolensis*
948	*Chalinolobus picatus*
1092	*Turnix melanogaster*
5948	*Parsonsia larcomensis*
7667	*Macropteranthes leiocaulis*
13572	*Quassia bidwillii*
13625	*Hemiandia bivalvis*
14648	*Cupaniopsis shirleyana*
15850	*Graptophyllum excelsum*
17490	*Dansiea elliptica*
29186	*Phascolarctos cinereus* (Southeast Queensland Bioregion)

Source: 2003 Remnant Vegetation Communities and Regional Ecosystems of Queensland, v5.0, Environmental Protection Agency, 2005, Essential Habitat Data, Version 2.1, Environmental Protection Agency, 2006.

V:\Projects\Qld_Rail\HR86 Northern GSDA\GIS\Workspaces\HR86_16.wor By: SLG Date: 13/09/07 Version 3

N

0 3750 (m)

Scale 1:75 000 (m) (@ A3 size)

LEGEND

Regional Ecosystem Status

- Endangered - Dominant
- Endangered - Sub-dominant
- Of Concern - Dominant
- Of Concern - Sub-dominant
- Not of Concern
- Essential Habitat

- Essential Habitat Species Record
- Project Area
- Watercourse
- Major Road

REGIONAL ECOSYSTEMS AND ESSENTIAL HABITATS

FIGURE 7

- RE 11.3.25 – "Not of Concern" (with a biodiversity status of "Of Concern") mid-dense *E. tereticornis* or *E. camaldulensis* woodland fringing drainage lines. This RE provides habitat for threatened flora species including *E. raveretiana*.
- RE 11.3.26 - "Not of Concern" mid-dense *E. moluccana or E. macrocarpa* woodland to open forest on margins of alluvial plains.
- RE 11.11.3 - "Not of Concern" mid-dense *Corymbia citriodora, E. crebra, E.acmenoides* open forest on old sedimentary rocks with varying degrees of metamorphism and folding (coastal ranges).
- RE 11.11.4 - "Not of Concern" sparse *E. crebra* woodland on old sedimentary rocks with varying degrees of metamorphism and folding (coastal ranges).
- RE11.11.5 – "Not of Concern" dense microphyll vine forest ± *Araucria cunninghamii* on old sedimentary rocks.
- RE 11.11.15 - "Not of Concern" sparse *Eucalytpus crebra* woodland on deformed and metamorphosed sediments and interbedded volcanics (undulating plains).
- RE11.11.18 – "Endangered" semi-evergreen vine thicket on old sedimentary rocks with varying degrees of metamorphism and folding.

It should be noted that the biodiversity status of RE11.3.25 may be amended to "Of Concern" by the EPA if further clearing is carried out within this RE type. Due to the paucity of RE11.3.25 within the Calliope River catchment should be regarded as locally "Of Concern" (C & R Consulting 2005).

Existing environment

The Calliope River basin is one of the most extensively cleared catchments in south east Queensland with approximately 66 % of its native vegetation removed primarily for agricultural use (C&R Consulting 2005). Whilst the majority of clearing within the area has occurred within floodplains and alluvial areas, a narrow and semi-continuous riparian corridor of species such as *Callistemon viminalis* and *Casuarina* spp. still exists where stock has been excluded, particularly along Larcom Creek tributaries.

Linear disturbances have also increased fragmentation and reduced overall connectivity within the project area. However, the riparian vegetation along the watercourse offers a degree of connectivity between the Calliope River floodplain north and east to the Mt Larcom Ranges.

The relict native riparian vegetation that occurs along the middle and upper reaches of the Calliope River provides important ecological functionality. This includes longitudinal habitat connectivity and buffer function for aquatic habitats (C & R Consulting 2005). Within the project area the riparian zones are relatively intact; however pressure from grazing and other anthropogenic activities is likely to have impacted on ecosystem health and function.

Overall diversity and complexity of riparian vegetation was greater within the Calliope River reach which may be attributed to perennial and base flows within the watercourse. Adjoining and/or interspersed within these areas were *Eucalyptus tereticornis* woodlands on alluvial plains. This is consistent with the RE mapping which classifies the riparian vegetation along the Calliope River and the lower reaches of Larcom Creek as RE 11.3.4 and RE11.3.25 (refer Figure 7).

The middle and upper reaches of Larcom Creek (upstream of the Bruce Highway) also has a narrow riparian zone. Here *Callistemon* spp. and *Casuarina* spp. were the dominant species. However, the area is currently mapped as non-remnant vegetation (ie does not have the characteristics of a remnant vegetation community as defined in the *Vegetation Management Act 1999* (VM Act)).

The majority of the *Eucalyptus crebra* woodland has been mapped as remnant vegetation, RE11.11.15. These woodlands are mainly restricted to areas unsuitable for agricultural purposes such as the undulating country south of the Calliope River and north of the Dawson Highway and east of the Bruce Highway north of the EEMBL (refer Figure 7).

As a result of land use pressures other woodland communities, including *Eucalyptus tereticornis* and *Eucalyptus moluccana* woodlands, within the project area have been fragmented or thinned. This has effectively reduced the area of remnant vegetation within the project area.

Eucalyptus tereticornis communities were generally associated with the riparian vegetation and floodplains of the Calliope River.

E. moluccana communities were a dominant feature of the landscape within the Aldoga Precinct of the GSDA. The majority of the *E. moluccana* woodland has been mapped as remnant vegetation (ie RE11.3.26).

Corymbria tessellaris communities were prominent within the Larcom Creek catchment.

Relatively intact vegetation community extends north within the Bruce Highway corridor. This community is mapped as a mix of *Eucalyptus crebra, E. tereticornis, Corymbria tessellaris* and *E. moluccana.*

The Department of Primary Industries and Fisheries (DPIF) is developing high-value, short-rotation plantation hardwoods and timber products to lay the foundations for a future plantation hardwood industry in Queensland. A research plantation plot, encompassing an area of approximately 30 ha, has been established to the west of Larcom Creek. The plantation consists of a number of *Corymbria* hybrids.

Surveys of the freshwater reaches of the Calliope River have identified 46 aquatic and semi-aquatic species.

During the initial site inspection macrophyte diversity was generally associated with permanent pool habitats along the Calliope River and Farmer Creek. The rich instream diversity is probably associated with the perennial base flows within the catchment (C & R Consulting 2005).

A detailed ecological assessment (terrestrial ecology and aquatic biology) will be undertaken to support any future EIS process.

Weed species

A number of declared weed species were also identified within the project area, including *Sporobolus pyradmidalis, S. natalensis*, (Giant Rats Tail Grass) and *Parthenium hysterophorus* (Parthenium) and *Lantana camara* (Lantana) which are Class 2 declared species under *Land Protection (Pest and Stock Route Management) Act 2002* (LP Act). Class 2 declared species are those that have been established in Queensland and have, or could have, an adverse economic, environmental and/or social impact). Declared weed species are also subject to the Calliope Shire Council local laws relating to noxious weed control.

Salvinia sp. a free floating aquatic macrophyte was also identified within the pool habitats of the Calliope River. All species of *Salvinia* are Class 1 declared species except for *Salivinia molesta* which is a Class 2 declared species. Class 1 declared species are not common in Queensland and if widely introduced, has the potential to cause adverse economic, environmental and/or social impacts.

Giant Rats Tail is prevalent within the Larcom Creek and Farmer Creek catchments east of the Bruce Highway. Properties within these areas are signed and part of an eradication programme under the control of the Department of State Development. *Parthenium hysterophorus* was also identified along the Calliope River downstream of Larcom Creek junction.

Parthenium and *Salvinia* spp. are currently considered weeds of national significance. Being of national significance, it is regarded as one of the worst weeds in Australia due to its invasive nature as well as potential economic and environmental impacts.

5.7.3 Threatened species

Within the habitats of the Calliope Shire local government area 112 threatened species (ie endangered, vulnerable, rare, or near threatened) pursuant to the NC Act and/or the EPBC Act have been identified (Wildlife Online 2007).

This includes 55 species of plants, four amphibian species, 25 avian species, one species of insect, 11 mammalian species and 16 species of reptiles. Of these species, there are 32 (including an additional three species not identified from Calliope Shire (EPA 2007b)), which may inhabit the flow-dependent REs within the catchment (C & R Consulting 2005).

Desktop searches identified 34 threatened species, including 11 plants, 12 birds, three mammals and six reptiles pursuant to the EPBC Act.

These are species that potentially inhabit the project area or for which suitable habitat occurs within and/or adjacent the project area. The likely occurrence of these species, based on habitat requirements and known distribution, within the project area is outlined in Table 5.3.

Table 5.3 Commonwealth protected species potentially inhabiting the Project area

Scientific name	Status	Habitat association	Likely occurrence
Plants			
Atalaya collina (NCN)	Endangered (EPBC Act and NC Act)	Endemic to the Yarwun area in dry rainforest communities (Harden *et al* 2006) This species has been recorded from GSDA (EPA 2007b)	Low-Moderate
Bulbophyllum globuliforme (Miniature mossorchid)	Vulnerable (EPBC Act) Rare (NC Act)	In Qld this species has only been located on branches/trunks of mature (>100+) *Araucaria cunninghamii* specimens in dry rainforests (DNRW 1999)	Low
Cossinia australiana (Cossinia)	Endangered (EPBC Act and NC Act)	Found in dry rainforest and vine thickets between Gympie and Rockhampton (Harden *et al* 2006).	Low-Moderate
Cupaniopsis shirleyana (Wedge-leaf tuckeroo)	Vulnerable (EPBC Act and NC Act)	Found in a variety of rainforest types between Brisbane and Rockhampton (DNRW 1999). This species has been recorded from GSDA (EPA 2007b). This species is currently mapped as "Essential Habitat" approximately 6 km east of the project area.	Low-Moderate
Cycas megacarpa (NCN)	Endangered (EPBC Act and NC Act)	Usually found in the grassy understorey of *Corymbia maculata* and *Eucalyptus crebra* woodland/open forest (DNRW 1999) This species has been recorded from GSDA (EPA 2007b) and the Mt Larcom Ranges	Moderate
Dicanthium queenslandicum (King blue-grass)	Vulnerable (EPBC Act and NC Act)	Endemic to Qld occurring on black clay soils.	Low – Moderate
Digitaria porrecta (Finger panic grass)	Endangered (EPBC Act) Rare (NC Act)	Found in tropical and sub-tropical forests/woodlands	Low - Moderate

Scientific name	Status	Habitat association	Likely occurrence
Eucalyptus raveretiana (Black ironbox)	Endangered (EPBC Act) Vulnerable (NC Act)	Found along riparian woodlands, river banks, in watercourses and on river flats on sandy/alluvial soils (Calvert *et al* 2005)	Low
Leucopogon cuspidatus (NCN)	Vulnerable (EPBC Act) Least Concern (NC Act)	Usually occurring on mountain tops, rocky slopes, cliffs and rocky outcrops on poor skeletal soils amongst granite or sepentinite outcrops (Calvert *et al* 2005)	Low
Parsonsia larcomensis (NCN)	Vulnerable (EPBC Act and NC Act)	Semi-woody climber previously recorded on Mt Larcom (DEH 1998). This species is usually found in heathland/shrubland at or near the summits of mountain peaks (DNRW 1999) This species has been recorded from GSDA (EPA 2007b)	Low
Quassia bidwillii (Quassia)	Vulnerable (EPBC Act and NC Act)	Usually found in lowland rainforest or on rainforest margins north of Gympie. It has also been found to occur in open forest, woodland and mangrove forests (DNRW 1999) This species has been recorded from GSDA (EPA 2007b)	Low
Birds			
Erythrotriorchis radiatus (Red goshawk)	Vulnerable (EPBC Act) Endangered (NC Act)	Open forest/woodlands near water and rainforest edges (Pizzey & Knight 1999). Breeding pairs nest in trees >20m near water and use the same territory every year. Need large areas of habitat because of low population densities and large home ranges (Marchant & Higgins 1993)The species home range encompasses an area between 50 and 220 km^2 This species has been recorded from Calliope Shire (EPA 2007b) and has an affiliation with the REs within the project area	Moderate
Geophaps scripta scripta (Squatter pigeon-southern subspecies)	Vulnerable (EPBC Act and NC Act)	Prefers areas of sandy soil dissected by low gravelly ridges, which have the shortest cover of grasses in woodlands/grasslands. Nearly always found near permanent water (Marchant & Higgins 1993) This species was observed within during the site inspections	High - Occurs within the project area
Neochmia ruficauda ruficauda (eastern) (Star finch)	Vulnerable (EPBC Act) Endangered (NC Act)	Lush green vegetation along temporary and permanent watercourses and rushy margins of swamps (Morcombe 2000). Only occurs within Central Queensland, with project area within the southern limits of known distribution This species has been recorded from Calliope Shire (EPA 2007b) and is affiliated with the REs within the project area.	Low-Moderate
Rostratula australis (Australian painted snipe)	Vulnerable (EPBC Act and NC Act)	Found in freshwater (occasionally brackish) wetlands of southeast Australia. Possibly part-migratory moving north into Queensland in summer (Marchant & Higgins 1993)	Low-Moderate

Scientific name	Status	Habitat association	Likely occurrence
Turnix melanogaster (Black-breasted button-quail)	Vulnerable (EPBC Act and NC Act)	Dry rainforest and forests in SEQ and North Eastern NSW with some tolerance to lantana due to its protective structure (Pizzey & Knight 1999) This species has been recorded from the GSDA and has an affiliation with the REs within the project area	Moderate
Mammals			
Chalinolobus dwyeri (Large-eared pied bat)	Vulnerable (EPBC Act) Rare (NC Act)	Variety of habitats including dry sclerophyll forests, woodland, sub-alpine woodland, edges of rainforests and wet sclerophyll forests. This species roosts in caves (Churchill 1998) This species has been recorded from Calliope Shire (EPA 2007b) and is affiliated with the REs within the project area	Low-Moderate
Dasyurus hallucatus (Northern quoll)	Endangered (EPBC Act) Least Concern (NC Act)	Preferred rocky escarpments, open forest and open woodland (DEH 2005). Has been reduced to three major geographical centres in Qld including the Drummond Range (Ctl Qld), the Wet Tropics and Northern Cape York Peninsula This species has been recorded from Calliope Shire (EPA 2007b) and is affiliated with the REs within the project area	Low-Moderate
*Nyctophilus timoriensis (*Eastern long-eared bat)	Vulnerable (EPBC Act and NC Act)	Prefers mallee, open savannah and open woodland in areas outside WA. Known to occur in Callitris/ironbark/box open forest and Buloke woodland in Qld (EPA 2007c) This species has been recorded from Calliope Shire (EPA 2007b) and is affiliated with the REs within the project area	Low-Moderate
Reptiles			
Egernia rugosa (Yakka skink)	Vulnerable (EPBC Act and NC Act)	Usually found in open woodland in dense ground vegetation, hollow logs and cavities in root systems below the ground (Wilson & Knowles 1988; Cogger 2000) This species has been recorded from Calliope Shire (EPA 2007b) and is affiliated with the REs within the project area	Low-Moderate
Delma torquata (Collared delma)	Vulnerable (EPBC Act and NC Act)	Endemic to Qld in predominately on rocky hillsides on basalt and lateritic soils supporting open eucalypt and Acacia woodland with a sparse understorey of shrubs and tussocks or semi-evergreen vine thicket (DEW 2007a) This species is affiliated with the REs within the project area but has not been recorded from Calliope Shire (EPA 2007b)	Moderate
Denisonia maculata (Ornamental snake)	Vulnerable (EPBC Act and NC Act)	Occurs in Brigalow (*Acacia harpophylla*) woodland growing on clay and sandy soils, riverside woodland, and open forest growing on natural levees (DEW 2007b). Also Associated with low lying seasonally flooded areas in the Brigalow Belt between Collinsville and Rockhampton (Wilson 2005) This species has been recorded from Calliope Shire (EPA 2007b)	Low

Scientific name	Status	Habitat association	Likely occurrence
Furina dunmalli (Dunmall's snake)	Vulnerable (EPBC Act and NC Act)	Inhabits the Brigalow Belt region in the south eastern interior of Qld, *Acacia harpophylla* forest and woodland growing on cracking black clay and clay loam soils (Covacevich *et al*. 1988; Cogger *et al*. 1993; DEW 2007c) This species has been recorded from Calliope Shire (EPA 2007b)	Low
Paradelma orientalis (Brigalow scaly-foot)	Vulnerable (EPBC Act and NC Act)	Inhabits the Brigalow Belt region, east of the Great Dividing Range in south-central Qld, in open forest habitats in remnant Brigalow (*Acacia harpophylla*) woodland with sparse tussock grasses on grey cracking clay soils (Cogger *et al*. 1993). Shelters under surface debris or in grass hummocks (Wilson & Knowles 1988) This species has been recorded from Calliope Shire (EPA 2007b)	Low
Rheodytes leukops (Fitzroy tortoise)	Vulnerable (EPBC Act and NC Act)	In rivers with large deep pools with rocky, gravelly or sandy substrates. High water clarity associated with Ribbonweed (*Vallisneria* sp.) beds (Cogger *et al*. 1993). *"Common riparian vegetation includes Blue Gums (*Eucalyptus tereticornis*), River Oaks (*Casuarina cunninghamiana*), Weeping Bottlebrushes (*Callistemon viminalis*) and paperbarks (*Melaleuca linariifolia*)"* (Tucker *et al*. 2001). Also found within well-oxygenated riffle zones, moving into deeper pools as the riffle zones cease to flow (Tucker *et al*. 2001). Within parts of the Fitzroy catchment, RE 11.3.25 is known habitat for *Rheodytes leukops* and other riparian freshwater turtles This species has not been recorded from the Calliope River catchment	Low

Table Notes:
EPBC Act = *Environment Protection and Biodiversity Conservation Act 1999*
NC Act = *Nature Conservation Act 1992*
V = Vulnerable
E = Endangered
MA = Listed Marine Species
NCN = No Common Name

Desktop studies also identified 16 threatened species, pursuant to the *Nature Conservation Act 1992* (NC Act).

This includes seven plant species, seven avian species, one mammalian species and one reptilian species. The likelihood of occurrence of these species within the project area is generally moderate to high and a detailed ecological assessment will be undertaken to support any future EIS process.

REs with similar habitat to essential habitats[2] have been identified within the project area. This includes an essential habitat for *Cupaniopsis shirleyana* approximately 400 m north of the proposed Aldoga Rail Yard (refer Figure 7). However, it is important to note that no essential habitats[2] occur within the project area (EPA 2007).

[2] Essential habitat is a habitat for species listed as 'Endangered', 'Vulnerable', 'Near Threatened' or 'Rare' under the NC Act

The Australian Government is actively involved in the conservation of migratory species and habitats through its involvement with a number of international agreements, including:

- Ramsar Convention and the Convention on Migratory Species (CMS/Bonn Convention)
- China-Australia Migratory Bird Agreement (CAMBA)
- Japan-Australia Migratory Bird Agreement (JAMBA) throughout the East Asian-Australasian Flyway

The EPBC Act provides for protection of migratory species as a matter of National Environmental Significance. A search of the EPBC Act Protected Matters database identified 16 migratory species potentially utilising the project area (refer Appendix A).

Preliminary field surveys located a single *Cycas megacarpa* amongst *Corymbia* spp. in RE11.3.26/11.3.4 in the north eastern section of the project area. This species commonly occurs in eucalypt woodlands/open forests and rainforest margins with grassy lower stratums.

Preliminary field surveys also located a population of *Geophaps scripta* (Squatter pigeon (southern)), a species listed as Vulnerable under the EPBC Act occurring in open woodland/forest communities within the eastern boundary of the project area along the Bruce Highway.

The distribution of this species is considered to extend from the Burdekin-Lynd divide west to Charleville and Longreach, east to the coastline between Proserpine and Port Curtis and south to scattered sites throughout SEQ (DEH 2007d). *Geophaps scripta scripta* is generally found within eucalypt woodlands/open forests with a grassy understorey and a waterbody close by.

A detailed ecological assessment will be undertaken to support any future EIS process.

5.7.4 Fauna assemblages

The project area encompasses a diverse array of habitats which are likely to support a diverse and abundant fauna assemblage. A detailed ecological assessment (terrestrial ecology and aquatic biology) will be undertaken to support any future EIS process.

A number of EIS and ecological surveys have been conducted within GSDA and Calliope River catchment. A summary of results for these studies is provided in Table 5.4.

Table 5.4 Summary of terrestrial fauna results within the GSDA and Calliope River catchment

Study	Region	Amphibians	Reptiles	Mammals	Birds
Moura Link - Aldoga Rail Project (EPA 2007b)	Calliope River Catchment	12	27	24 + 15 bats	128
WICT EIS Connell Hatch 2006	Yarwun - Calliope River	14	39	34 + 10 bats	142
EPA WildNet (Connell Hatch 2006)	Yarwun – Calliope River	7	29 (2 marine species)	18 + 8 bats	119
WBM (1990)	*Calliope River Mouth to Fishermans Landing*	0	3	4 + 3 bats	100
Connell Wagner (2004)	*Calliope River to Larcom Creek*	5	15	12	54
URS (2003)	*Targinnie Industrial Estate*	7	18	13 + 4 bats	93
Dames & Moore (1998)	*Yarwun Industrial Estate to Aldoga*	14	36	24 + 14 bats	140
Connell Wagner (1992)	Aldoga	9	25	12	108
Connell Wagner (1992)	Carrara	9	17	9	74
Connell Wagner (2002)	Aldoga	1	3	8 + 0 bats	35
CQU - Meltzer *et al* (1999a)	Calliope River	14	22	12 + 8 bats	109
CQU – Meltzer *et al* (1999b)	Targinnie	19	38	21 + 13 bats	141
Dames and Moore (1998)	Aldoga	12	25	17 + 13 bats	95
Houston *et al* (1999)	Targinnie	13	35	20 + 6 bats	105
QDEH (1994)	Curtis Coast	22	60	38 + 14 bats	288

It is also important to note that the freshwater habitats of the Calliope River support a diverse array of instream fauna. For example, 34 species of freshwater fish have been identified from the Calliope River catchment which compares favourably with other river systems.

No threatened aquatic species (excluding marine) are known to inhabit the Calliope River catchment (C & R Consulting 2005).

5.7.5 Clearing activities

Clearing of "Endangered" and/or "Of Concern" REs on freehold and leasehold land in rural areas is prohibited without approval. Should vegetation clearing be required, approval is needed under the VM Act, in addition to demonstrating compliance with the relevant Regional Vegetation Management Code (DNRW Regional Vegetation Management Code for Brigalow Belt and New England Tablelands Bioregions).

Where vegetation does not require a permit, any clearing will be required to meet the criteria of the DNRW Regional Vegetation Management Code for Brigalow Belt and New England Tablelands Bioregions.

Under the VM Act and *Integrated Planning Act 1997* (IPA) the clearing of native remnant vegetation on freehold land is regarded as Operational Works which, if deemed assessable, requires a Development Permit for Operational Works. To obtain a permit, an Integrated Development Assessment System (IDAS) application must be submitted to and assessed by the DNRW.

Although QR receives dispensation under Schedule 9 of IPA, these are generally in relation to clearing of vegetation within existing QR subleased land and where vegetation interferes with the operational safety and efficiency of the railway.

The NC Act and *Nature Conservation (Wildlife) Regulation 1994* protects threatened species and protected areas. Under this Act and other associated legislation, a permit to clear may be required should a protected species or area be disturbed or cleared.

A Riverine Protection Permit (RPP) may be required for the disturbance or removal of riparian vegetation within the project area under the *Water Act 2000* through DNRW. An RPP authorises the holder (QR) to carry out one or more of the following activities within a watercourse, lake or spring:

- Destroy vegetation
- Excavate
- Place fill

However, under Sections 49-51 of the *Water Regulation 2002* particular activities are permitted (ie do not require a RPP) if they are undertaken in accordance with their Guideline – Activities in a watercourse, lake or spring carried out by an entity. QR is defined as an entity under the guideline.

5.8 Visual amenity

The Aldoga Rail Yard is sited in close proximity to the Aldoga Industrial Area, which is partially developed. However, as this area becomes further industrialised, in accordance with current land use planning, the visual effect will diminish over time.

The visual character of the project area surrounding the proposed Rail Yard is influenced by existing industry, rail and road transport infrastructure and other current rural land use.

Hilly and mountainous terrains, including Mt Larcom, frame the site. The topography (of the hills) and vegetation – open forest/dry (rainforest) scrub – affect the visual character of the site as does Mt Larcom, the surrounding undulating landform, peak and deep valleys. These visual qualities can be appreciated from the NCL.

The visual amenity of the rail corridor, extending from the NCL, below the GSDA, and joining down to the MSL intersection, is dominated by rural pastoral areas and low lying floodplains.

Major road and rail transport infrastructure affect the visual character in the southern portion of the project area around the MSL and along sections of the existing Bruce Highway. Corridors of open forest may affect the visual character along the rail corridor as the alignment will run parallel to the Bruce Highway for approximately 10 km.

North of the Dawson Highway and adjoining Calliope River, *Eucalyptus crebra* woodland may impact on visual quality of the rail corridor including *Eucalyptus tereticornis* and/or *Eucalyptus* spp. tall woodland also in the vicinity of Larcom Creek and Calliope River.

From the Gladstone Industrial Land Study (CW 1992) the visual quality of the area was found to lie in:

- The naturalness of the area
- The contrasts in the landform and vegetation
- The presence of views of landmark hills and ranges such as Mt Larcom
- The cultural landscape of open, undulating grasslands by woodlands

5.9 Traffic and transport

Currently there are no known future road networks that may affect the proposed rail corridor (and rail maintenance yard); however, it is assumed that the presence of the rail corridor may influence the construction of future road networks or infrastructure.

The rail corridor is expected to intersect with over three major roads being the Dawson Highway, the Bruce Highway and Gladstone - Mount Larcom Road leading to the rail loop and rail maintenance yard.

A traffic and transport investigation will be undertaken as part of the EIS process in conjunction with the Department of Main Roads (DMR) and local councils. Potential traffic and transport issues and mitigation measures will be investigated in addition to possible alterations or planning options appropriate in terms of safety, operations and cost.

5.10 Cultural heritage

Previous studies within the Aldoga Precinct of the GSDA indicate there to be sites/artefacts of indigenous and/or of European cultural significance within close proximity of the project area. Types of sites/artefacts include stone artefacts, former station yards and a massacre site (CW 2005).

During July 2007, a preliminary assessment was undertaken of the project area which included a review of existing background data and a preliminary field survey. Database searches included the following:

- The Australian Heritage database (DEW)
- The Queensland Heritage Register (EPA)
- Aboriginal and Torres Strait Island Cultural Heritage database (DNRW)

A search of the Australian and Queensland Heritage Databases (non-indigenous) was undertaken (July 2007). No culturally significant sites (non-indigenous) were identified within or within close proximity to the project area.

A search of the Aboriginal and Torres Strait Islander Cultural Heritage Register and Aboriginal and Torres Strait Islander Cultural Heritage Database (Indigenous) has been requested from NRW. No sites of cultural significance (Indigenous) were identified within the project area; however sites were identified along Larcom Creek to the west of the project area.

The rail component of this Project is part of the traditional country of the Port Curtis Coral Coast People (PCCCP). The PCCCP have lodged a native title claim over the wider area and this claim (Federal Court Number Q6026/01) provides the PCCCP with native title processing rights and cultural heritage consultation rights for future developments within the PCCCP claim boundary.

There is an existing agreement between the Traditional Owner Claimants and the Minister for State Development and Innovation for cultural heritage management of the GSDA. As the site will extend beyond the GSDA border, further cultural heritage studies and liaison with the Traditional Owners will be required.

Further investigations, including consultation with the relevant parties, will need to be conducted as part of the EIS process during the planning phase of the Project.

5.11 Socio-economic

In the Gladstone Region Overview, September 2006, the estimated population in the Gladstone region (ie Gladstone City, Calliope Shire, Miriam Vale Shire and the Banana Shire) was reported as 64,092.

The demographics of the region indicate that the median age in Gladstone City is 32 years and in Calliope Shire is 35 years. Over the next 20 years the demographics of the region are forecast to change such that the median age in Gladstone City will be 33 years and in Calliope Shire 37 years.

Table 5.5 outlines the employment by occupation in the Gladstone region.

Table 5.5 Employment by occupation

Occupation	Number	%
Managers and Administration	2,617	9.8%
Professionals	3,099	11.6%
Associate Professionals	2,836	10.7%
Tradespersons	4,527	17%
Clerks/sales/service workers	4,042	15.2%
Labourers and related workers	8,983	33.8%
Not stated / inadequately stated	509	1.9%
Total	26,613	100.0%

Source: Gladstone Region Overview, 2006

In terms of facilities the Gladstone region provides:

- Health – the Gladstone General Hospital offers a choice of general practitioner and specialist doctors, dentists and medical services and has 98 beds. A private hospital wing operated by the Mater hospital is also available.
- Education – there are a variety of pre-schools, primary schools, special schools, high schools and tertiary education facilities. The spectrum of tertiary education facilities in the area includes a TAFE and a Central Queensland University campus. Around 9,000 state and private school pupils are enrolled in the Gladstone education system.
- Airport – Gladstone has a modern airport that offers regular services to Brisbane, Mackay, Rockhampton, Townsville and Cairns. Services are operated by Qantas Link, offering nine daily services to Brisbane.

The population growth in the Gladstone/Rockhampton region in recent times has occurred as a result of the establishment of major industry. Australian Bureau of Statistics data shows manufacturing is the most important employer in Calliope Shire and manufacturing and wholesale/retail industries are the major employers in Gladstone.

6. Potential environmental impacts

6.1 Land use and tenure

The proposed site for the rail corridor and rail maintenance yard is within the GSDA and freehold land with few sensitive receptors.

Existing land use has predominantly been farming and cattle grazing. Construction and operation of the new rail infrastructure may have an affect on current land uses with the acquisition of land parcels below the GSDA section of the Project.

6.2 Soils, geology and topography

The proposed rail corridor extends from the MSL, crossing the Calliope River and Larcom Creek, continuing to the NCL, via the EEMBL within the GSDA.

If suitable control measures are not implemented during construction and operations, there is a risk of increasing sediment and other pollutant transportation to sensitive downstream environmental areas, such as Great Barrier Reef World Heritage Area.

Unconsolidated sediments and substrates from destabilised creek banks may require additional stabilisation works to be undertaken. It is anticipated that potential impacts will be managed through the implementation of an appropriate Construction Environmental Management Plan (CEMP).

If acid sulphate soils are present onsite (ie typically only areas below 5 m AHD have potential to have acid sulphate soils), then there is the potential for exposing acid sulphate soils to the atmosphere during earthworks and excavation. This occurs via the oxidation processes, such soils may in turn produce sulphuric acid runoff and contaminate downstream waters and the Calliope River catchment. While this is yet to be investigated fully, as stated previously the entire project area is understood to lie at elevations higher than 15 m AHD. Therefore, acid sulphate soils are unlikely to represent a constraint or environmental risk to the Project.

There is also the potential for the construction activities to disturb existing contaminated land, including cattle dips and spray races used by current and previous landowners. An investigation will be undertaken to determine the environmental risk associated with contaminated land and acid sulphate soils within the project area and any predicted impacts will be addressed in terms of mitigation measures where necessary.

6.3 Water quality

The potential for impacts on surface water quality can arise from activities such as clearing of vegetation, earthworks/excavation, increasing exposed areas during construction, operation or inappropriate storage or handling of hazardous materials.

Construction and operational activities may have the potential to generate a range of pollutants which, if not managed appropriately, will have the potential to affect water quality conditions within the Calliope River and Larcom Creek and the receiving waters of Port Curtis.

Potential pollutants include disturbance of waste material/litter, hazardous and non-hazardous chemical substances. Management measures will be implemented to mitigate potential impacts on the environmental values and overall health of Calliope River, adjoining watercourses and downstream receiving environments.

Specific measures proposed to minimise the potential impact upon the water quality of the area include, but not limited to:

- Avoid blocking of natural drainage as build up of water runoff under high rainfall conditions may create unstable near surface conditions and lead to erosion in the surrounding watercourse
- Minimise the necessity for clearing activities
- No excessive exposed soil for a prolonged period
- Rehabilitation of exposed areas (more than 70% vegetation cover)
- No construction materials or debris to be allowed to accumulate within stream channels
- Construction within watercourse/stream channels to be eliminated or minimised such that normal stream functioning is not hindered

Seasonal factors affecting erosion and sedimentation will be considered with appropriate control strategies implemented to minimise impacts. The environmental design and construction of the rail line and bridges will also consider the possibility of flood events.

Groundwater may be affected by excavation activities associated with the construction of the rail maintenance yard and rail corridor, particularly the construction of bridges. This could lead to mobilisation of contaminated groundwater and the reduction of available water for groundwater dependent ecosystems.

A study completed by Dames and Moore (1998) for the Comalco Alumina Project EIS concluded that groundwater could be potentially affected through seepage of contaminated water from material storage areas. Extraction from groundwater stores may also take place in conjunction with construction activities causing further impacts upon groundwater quality such as increased salinity levels.

Water quality impacts have the potential to impact upon the environmental values of the Calliope River catchment. Water quality monitoring will be undertaken in downstream watercourses prior to construction to determine whether the construction is affecting downstream water quality. This is of particular importance in terms of water use should the Castle Hope Dam proceed, approximately 5 km downstream of the project area.

6.4 Proposed Castle Hope Dam

The site of the Castle Hope Dam is proposed to be located south of the GSDA on the Calliope River, near Castle Hope (refer Figures 1 and 4). The western side of the GSDA is within the Calliope River catchment upstream of the proposed Castle Hope Dam.

Inundation plans provided by DNRW for three potential dam elevation level (EL) scenarios indicate that, if constructed, the dam's stage 3 inundation area may encroach into the current project area (refer Appendix B).

Furthermore, the inundated area associated with the higher dam EL options extends through the Bruce Highway corridor to the immediate south of the project area. If this triggers the realignment of the Bruce Highway to the north into the project area, this will have a significant influence on the project design.

It is recognised that development within the GSDA and overall Calliope River catchment has the potential to impact on water quality if perceived impacts are not planned and managed appropriately. Appropriate mitigation measures will be discussed with DNRW during the EIS process.

6.5 Air quality

During construction, considerable earthworks will be necessary to prepare the site for construction, along with increased traffic volume (rail and road), increasing the potential for dust generation and air quality impacts.

During the operational phase of the Project, there is also the potential for a reduction of air quality due to dust generation and emissions mainly caused by wheel action on the rails, wagon-induced turbulence acting on dust-supporting ground surfaces, wind blown dust from uncovered loads and emissions from non-electric locomotives.

Katestone Scientific (1994) undertook an extensive ambient air quality monitoring study in Gladstone. This study found that the impact of coal trains on ambient dust levels is highly localised. In other words, the concentrations of dust dispersed by coal trains diminish quickly with distance from the source.

It must be noted that QR in conjunction with the coal industry are currently in the process of investigating the impact of coal trains on ambient dust conditions and measures to mitigate or minimise potential impacts.

Because of the layout and the nature of its intended use, the Aldoga Rail Yard is likely to generate greater concentrations of dust. However, its location in the GSDA has been chosen partly for its separation from any adjoining sensitive land uses. The Rail Yard will be at least 4 km from the nearest rural residences, which are located west of Yarwun. There are very few sensitive receptors (ie houses, schools) in close proximity to the existing or proposed rail infrastructure in the project area, and although subject to detailed assessment during the EIS phase, the likely overall dust impacts are considered to be low.

Dust generation will be addressed in the Construction Environmental Management Plan (CEMP), and minimised during construction and operational phases using appropriate dust suppression and control techniques. Specific measures proposed to minimise the potential for impact upon the air quality of the surrounding environmental include but are not limited to:

- General use of water sprays for all potentially dust generating activities in windy conditions.
- Vehicles are to obey the on-site speed limit, and drivers are to adopt a driving practice where dust generation is minimised.
- Construction and road network to be wet down as necessary to minimise dust.
- Ensuring that any coal spillages during construction and operational phases are cleaned up promptly after being identified.
- Continued use of moisture analysers on rail receival points for improved control of moisture levels in incoming coal.
- Visual monitoring of all activities.

A predictive modelling study of potential dust emissions from the project, including the Aldoga Rail Yard, the rail loop and the existing and proposed rail corridor will be undertaken as part of the EIS process.

6.6 Noise and vibration

During construction there will be an increase in vehicle movements to and from the site which has the potential to generate noise.

Due to the distance from nearby properties, the impacts are therefore not likely to be significant. Other construction specific activities, such as excavation, filling and potentially blasting, also have the potential to increase ambient noise levels.

Once the rail corridor and rail yard are operational there will be an increase in noise levels due to the various operations of the rail line and associated rail infrastructure (eg Aldoga Rail Yard). Potential noise impacts from operational activities are also not likely to be considerable due to the location of the Project in respect to sensitive receptors. It is therefore not expected that planning ("target") levels nominated in the *Environmental Protection (Noise) Policy, EPP (Noise)* and QR's *Code of Practice for Railway Noise Management* (1999) will be exceeded in relation to the project.

The potential increase in noise levels, both during construction and operation, is to be mitigated through a combination of environmental management strategies, appropriate infrastructure design criteria and separation distances to sensitive receptors.

Specific measures proposed to minimise the potential for noise impact upon the surrounding environment include but are not limited to:

- Mechanical plant is to be fitted with mufflers and silencers.
- Construction activities likely to emit high noise levels would be restricted generally to between 6:30 am to 6:30 pm, Monday to Saturday.

Furthermore, due to the distance to the nearest receivers, the potential for vibration impacts during both construction and operation are expected to be minimal, with no vibration impacts occurring as part of the operational phase. Possible vibration impacts during construction from limited blasting (if required) would be managed through appropriate design of blasting patterns and selection of blasting techniques.

A detailed noise and vibration assessment will be undertaken as part any future EIS process.

6.7 Ecology

6.7.1 Protected areas

Given the project area is located approximately 40 km upstream of the State and Commonwealth protected areas, and stormwater management measures will be implemented during construction and operation, the Project is unlikely to have a significant impact on the downstream environmental values.

6.7.2 Vegetation

Potential impacts that may arise from the construction of the rail line, rail maintenance yard and provisioning facilities include:

- The removal of any existing vegetation within the project area, including locally significant and/or commonwealth protected species.
- Increased edge effects due to vegetation clearing.
- Fragmentation of “Of Concern” REs resulting in a reduction of core habitat value.
- Excessive dust deposition on foliage arising from plant and equipment use.
- Introduction and colonisation of weeds during construction and operational phases, particularly declared pest species.

Clearing of mapped RE will require approval under the VM Act and will need to demonstrate compliance with the Regional Vegetation Management Code for Brigalow Belt and New England Tablelands Bioregions.

6.7.3 Fauna

Potential impacts on the ecological biodiversity of the area will primarily result from clearing of native vegetation, particularly within existing wildlife corridors.

The increased severance of a wildlife corridor, particularly riparian vegetation along creek lines, may affect the movement of forest dependant fauna from the mountain ranges to the coastal lowlands in the region. Vegetation along these creeks and their adjacent areas provides habitat for forest dependant fauna such as Geophaps scripta in a highly modified landscape and contributes to the biodiversity of the local area.

It is important to note that the areas of the GSDA have already been severely fragmented or isolated as a result of linear disturbances, especially near the Yarwun. Other impacts include the clearing and/or thinning of vegetation and degradation of habitat as a result of agricultural land use activities.

The Project is unlikely to have a significant impact on any threatened species, pursuant to State and Commonwealth legislation, inhabiting the project area.

6.8 Visual amenity

Infrastructure to be constructed as part of the Project includes rail lines, fuel storage areas, maintenance sheds and overhead power lines.

Land use surrounding the site is generally agricultural and/or industrial. The proposed rail line will traverse through the northern portion of the GSDA and through zoned rural property transforming the visual amenity of this area from agricultural to rail transport related infrastructure.

The proposed construction area is situated away from residents but will remain visible to commuters on the Bruce Highway, the Dawson Highway and Gladstone - Mount Larcom Road.

6.9 Traffic and transport

The development will generate an increase in traffic to and from the project area during the construction and operation phase (Aldoga Rail Yard). Access roads such as the Dawson Highway, Bruce Highway and Gladstone - Mount Larcom Road, would experience an increase in traffic volume compared to present trends.

The impact of the Project on the roads has not yet been determined as a traffic study will be undertaken as part of the EIS process.

During the operational phase a greater volume of rail traffic will utilise the Moura and Blackwater systems especially along the Moura Link and NCL between the Bruce Highway and the proposed rail loop associated with the WICT Project. A risk assessment on the potential for any non-barrier and/or level crossings will be conducted as part of the standard QR process.

6.10 Cultural heritage

The methodology to be employed to ensure that the Project proceeds in compliance with the *Aboriginal Cultural Heritage Act 2003* (ACHA) and best practice is as follows:

- Discussion with Port Curtis and Coral Coast People (PCCCP) about the nature of the Project, its location and the potential impacts on known Aboriginal cultural heritage.
- The commissioning of an Aboriginal cultural heritage survey involving nominated PCCCP traditional owners and an accredited independent archaeological consultant to conduct the survey. This systematic survey will cover the entire project area and will locate and record any items and places of Aboriginal cultural heritage value.
- The production of a report by the independent archaeologist detailing specifics and locations of cultural heritage significant to the PCCCP together with recommendations as to the preservation and mitigation of cultural heritage within the impact area.
- The survey recommendations will be discussed and agreed with PCCCP and, as required under ACHA, these procedures will be drafted into a Project specific Cultural Heritage Management Plan (CHMP).
- The procedures contained within the CHMP will be strictly adhered to during the construction and operational phases to ensure that impacts on Aboriginal cultural heritage are minimised, and where impact is unavoidable, ensure that effective management and mitigation measures are employed to preserve Aboriginal cultural heritage.

The CHMP development will follow the processes described under ACHA which will then be endorsed and registered with the DNRW as a formal CHMP.

6.11 Socio-economic

There are Local, State and National level socio-economic benefits associated with the rail corridor and rail yard development.

Direct benefits occur primarily at the local level at both the construction phase and during the ongoing operation of the rail corridor and rail yard:

- During construction and operation it is anticipated that the workforce within the Gladstone Region will increase.
- The demographics and nature of the in-migrant workforce and the influence of the existing demographic profile will not be altered significantly considering past infrastructure expansions and the available workforce within the region. Gladstone City and Calliope Shire will be the dormitory centres for both the construction workforce and the permanent workforce.

The construction of the rail corridor and rail yard reinforces the Southern Bowen Basin and the Surat Basin coal supply infrastructure positively influencing the Queensland Coal Industry and the regional community economies of these areas.

The development also builds on the socio-economic benefits of the WICT. This includes:

- Ensures the capacity for the WICT will be met
- Frees up previous bottlenecks in exporting coal from the Port of Gladstone
- Ensures that export capacity for coal is met = economic benefits
- Reduces the pressures on existing rail systems and infrastructure, in addition to existing port facilities

7. Environmental and risk management

7.1 QR Environmental Policy and Environmental Management System (EMS)

QR is committed to effective management of its environmental risks. Appendix C has a copy of QR's Environmental Policy (titled Environmental Statement).

QR is taking a proactive approach to meeting its environmental obligations and continually improving environmental performance through an EMS that is consistent with ISO1400a and AS3806 Compliance Programs.

QR's EMS sits under the Governance and Management System Framework which applies risk principles to various disciplines in QR. Under this framework, QR Board approved policies are supported by management systems, which detail how the policy goals are to be achieved in QR. This gives effect to the QR Board Governance Charter including the Director's responsibility for, as well as the organisational role in, managing the interaction between economic efficiency, social obligations and environmental responsibility.

QR's EMS is designed to provide the framework for ensuring that the associated Policy is implemented, achieved, reviewed and maintained. The EMS includes standards and specifications which are mandatory and associated documents which are guidelines to assist with implementation.

QR formally issued its EMS in August 1999 recognising that the system would need to be refined over time with the benefit of experience, input from its Business Groups and changing internal and external environments. QR's EMS is currently being substantially revised to both align and integrate within QR's recently revised Governance and Management System Framework and to reflect risks identified in QR's Environmental Risk Report.

7.2 Project environmental management

As part of the EIS process, the environmental risks associated with this Project will be managed by the development and implementation of an Environmental Management Plan for the Project. This will allow necessary planning to ensure all reasonable measures are taken to protect the environmental values which may be impacted upon by the construction and operation activities and related infrastructure.

The purpose of an EMP is to detail the actions and procedures to be carried out during the implementation phase of the Project in order to mitigate adverse, and enhance beneficial, environmental and social impacts.

The EIS will identify the potential construction and operation effects of proceeding with the coal terminal and recommend a range of impact mitigation measures to be implemented during the design, construction and operation stages of the Project.

The EMP will address proposed environmental safeguards and control measures and establish the framework to ensure they are implemented. In effect, the EMP will become the key reference document in that it converts the undertakings and recommendations in the EIS into a set of actions and commitments to be followed by designers, constructors and operators.

The EMP will serve as the framework for measuring the effectiveness of environmental protection and management. This is achieved by specifying the monitoring, reporting and auditing requirements, including responsibilities, timing and format in order to meet the necessary performance criteria. The EMP also makes provision, as appropriate, for unforseen events by outlining corrective actions which may be implemented in these situations. The EMP will be written as a stand alone document, so that it may be extracted from the main body of the EIS.

7.3 Environmental Design Report

An Environmental Design Report (EDR) will be undertaken in the detailed design phase of the Project.

The purpose of the EDR is to review the designer's awareness of the environmental issues of the Project throughout the design phase. The report will demonstrate the integration of the Project's environmental issues into the design.

The report also has an auditing purpose to ensure all the issues identified in the EMP are addressed in the design and/or contract documentation.

7.4 Construction Environmental Management Plan

An important requirement for projects of this nature is to prepare a Construction Environmental Management Plan (CEMP) to ensure the environmental safeguards proposed as a result of the planning and environmental assessments associated with the Project are enacted in an appropriate and timely fashion.

Design and construction measures/strategies will ensure that all reasonable measures are taken to protect the environmental values, which may otherwise be impacted during construction activities associated with the proposed Project.

The CEMP details the performance objectives, actions and procedures to be carried out during the construction phase of the project to minimise potential environmental impacts. The CEMP defines the environmental issues of the proposed development by addressing the following:

- The environmental policies of QR and the Construction Contractor(s)
- Environmental responsibilities
- Environmental site induction
- Environmental monitoring
- Environmental reporting
- Environmental incidents/complaints
- Environmental audits
- A management plan for each environmental element

With the effective implementation of the developed CEMP during the construction phase and the EMP (as a subset of the EMS) during operation, it is expected that environmental risks can be managed to meet all legislative requirements and stakeholder's expectations.

7.5 Current QR environmental approvals

QR has investigated its environmental approvals database and advises that no environmental approvals have been given or are required for its operations within the study area.

With increased operations it may arise as a result of legislative threshold triggers that approval is required to accommodate locomotive fuelling and maintenance.

Mt Miller container yard has been nominated as a Dangerous Goods area. This nomination can be readily applied to a new facility with the development of a Dangerous Goods Management Plan (as required under the *Dangerous Goods Safety Management Act 2001*).

All current and future environmental approval requirements will be investigated during the EIS and subsequent approvals phases of the project.

7.6 Hazard, risk and health and safety issues

There will be a number of hazards and associated risks with both the construction and operation of coal terminal and rail loop. A hazard is a source, or a situation with a potential for harm in terms of:

- Human injury or ill health
- Damage to property
- Damage to the environment
- Or a combination of these

A risk is the likelihood and consequence of an injury or harm occurring as result of a hazard. Risk management is the systematic application of management policies, procedures and practices to the tasks of establishing the context, identifying, analysing, assessing, controlling and monitoring risk.

To enable effective risk management, some form of formal risk assessment is required to identify the risks associated with the construction and operation of the plant. The formal risk assessment process follows the methodology outlined in *AS4360: Risk Assessment*. This process is based on:

- Establishing the context
- Identifying the risks
- Analysis of the risks
- Evaluating the risks
- Treating the risks

At various stages of the Project, formal risk assessments will be conducted to ensure that effective risk management of all risks (including health and safety risks) occurs during both the construction and operation phases of the Project.

8. Environmental and planning approval process

8.1 Overview

This section describes the Project approval framework and the relevant legislation to be addressed by the proposed Moura Link - Aldoga Rail Project, and considers the Project within a broader project development process.

Given the nature, scale and location of the proposed rail corridor and rail maintenance yard, there will be a need for various approvals from Commonwealth, State and Local government. A referral to the Department of Environment and Water Resources (DEW) will need to be made under the EPBC Act for a determination on the Controlled Action status of the Project.

Further details regarding the approvals required for the Project are provided below.

8.2 State Development and Public Works Organisation Act 1971

QR is seeking declaration of the proposed Moura Link - Aldoga Rail Project as a "Significant Project" under Section 26 of the *State Development and Public Works Organisation Act 1971* (SD Act). The SD Act establishes the framework for environmental assessment of major projects in Queensland, identifying the EIS process and its relationship with IPA.

In considering whether the project may be declared a significant project, the Coordinator-General must have regard to one or more of the matters listed under Section 27 of the SD Act. This IAS is considered to satisfy the requirements of Section 27 in that it provides:

- "detailed information about the project … in an initial advice statement" (Section 27(a))
- "the employment opportunities that will be provided by the project" (Section 27(d))
- "the potential environmental effects of the project" (Section 27(e))
- "the level of investment necessary for the proponent to carry out the project" (Section 27(g))
- "the strategic significance of the project to the locality, region or the State" (Section 27(f)).

On the basis of this IAS, it is considered that the Coordinator-General would have sufficient information available on which to make the declaration.

GSDA Development Scheme

As required by the SD Act, a Development Scheme has been prepared to manage the development of the GSDA. The Development Scheme applies to the land use approval being for a Material Change of Use (MCU) of premises as usually required under IPA. The application for MCU will be accompanied by the EIS.

The Development Scheme provides for a transparent and streamlined approval process with stated objectives and guidelines for land use. Under this framework there are:

- Requirements for public notification of applications and referral to government agencies
- Processes to avoid duplication in handling applications
- Procedures to ensure that referrals proceed within acceptable timeframes
- Requirements for liaison with local governments

Matters to be addressed in an EIS prepared pursuant to the SD Act are detailed in Schedule 1 of the *State Development and Public Works Organisation Regulation 1999*.

The EIS process includes provision for:

- Public notification and development of the EIS Terms of Reference (ToR)
- Public notification of the EIS which must address the matters detailed in the ToR
- Consideration and review of public submissions on the EIS
- The evaluation of the EIS and public submissions, and the preparation of an Evaluation Report by the Coordinator-General (CoG)

The EIS process under the SD Act replaces the Information and Referral Stage, and the Notification Stage under IPA (refer Section 8.4).

8.3 Commonwealth approvals

8.3.1 Environment Protection and Biodiversity Conservation Act 1999

The EPBC Act provides the primary environmental assessment and approval legislative framework for the Commonwealth Government.

The EPBC Act establishes the requirement for the approval by the Commonwealth for actions which have, will have or are likely to have a significant impact on matters of national environmental significance.

The current list of matters of national environmental significance is:

- The world heritage values of a declared World Heritage property
- The ecological character of a declared Ramsar wetland
- Listed threatened species and ecological communities
- Listed migratory species
- Nuclear actions
- Commonwealth marine areas

Although the Project is unlikely to have a significant impact on matters of environmental significance as listed above, the Project will be referred under the EPBC Act to DEW for confirmation that the Project is a Non Controlled Action. The referral to DEW will provide detailed information indicating whether or not the Project should be considered as a Controlled Action.

8.4 State approvals

In addition to preparing an EIS under the SD Act as discussed in Section 8.2, a number of other environmental approvals may be required prior to the construction and operation of the Moura Link - Aldoga Rail Project. These approvals will be fully identified and confirmed as part of the EIS process. However, it is likely that those provided in Table 8.1 may be required.

Table 8.1 Summary of likely approvals for rail infrastructure

Legislation	Administering authority	Trigger
Environment Protection and Biodiversity Conservation Act 1999	Commonwealth Environment Minister	To be confirmed if required by submitting an EPBC Referral to DEW
State Development and Public Works Organisation Act 1971	Coordinator-General	Initial Advice Statement prepared by the Proponents, identified the level of investment necessary for the Project, employment opportunities provided by the Project, potential impact on the environment, potential effects on relevant infrastructure and the significance of the Project to the region and State

Legislation	Administering authority	Trigger
Dangerous Goods Safety Management Act 2001	DES	Large dangerous goods location established
Aboriginal Cultural Heritage Act 2003	DNRW	Duty of care to take all reasonable and practicable measures not to harm Aboriginal cultural heritage. Cultural Heritage Management Plan required if EIS prepared.
Environmental Protection Act 1994 and *Integrated Planning Act 1997*	EPA	ERA 7: Storing chemicals (other than crude oil, natural gas and petroleum products)
		ERA 11: Crude oil or petroleum product storing in tanks or containers having a combined total storage capacity of: (a) 10,000L or more but less than 500,000L (b) 500,000L or more
		ERA 15 (a): Operating a sewage treatment plant having a peak design capacity to treat sewage of 21 or more equivalent persons but less than 100 equivalent persons
		ERA 20: Extracting rock or other material
		ERA 22: Screening, washing, crushing, grinding, milling, sizing or separating material extracted from the earth
		ERA 62: Concrete batching Other ERAs as required during construction
		ERA 72: Operating any railway facility for refuelling and maintaining or repairing rolling stock
		ERA 83: Transporting regulated waste commercially or in quantities of more than 250kg in a load
		Removal of contaminated soil from sites listed on CLR or EMR
Explosives Act 1999	DNRW	Possession, storage and use of explosives
Fisheries Act 1994 and *Integrated Planning Act 1997*	DPIF	The construction or raising of a waterway barrier
Nature Conservation Act 1992	EPA	Taking, using, keeping or interfering with a protected wildlife
Vegetation Management Act 1999 and *Integrated Planning Act 1997*	DNRW	Removal of Regional Ecosystems as defined by the EPA under the VM Act
Water Act 2000	DNRW	Destroying of vegetation, excavating or placing fill in a watercourse, lake or spring
		Works in a watercourse

Table Notes:
DES = Department of Emergency Services
DPIF = Department of Primary Industries and Fisheries
EPA = Environmental Protection Agency
DNRW = Department of Natural Resources and Water

Key legislation relevant to the Project includes:

- *State Development and Public Works Organisation Act 1971*
- *Transport Infrastructure Act 1994*
- *Integrated Planning Act 1997*

- *Environmental Protection Act 1994*
- *Vegetation Management Act 1999*

These legislative requirements are summarised below.

Transport Infrastructure Act 1994

Under Section 242 of the *Transport Infrastructure 1994,* the railway manager for corridor land is, for any transport infrastructure on the land or proposed to be constructed on the land, subject to the same controls and exemptions under State and local laws that an agency of the State would be if it has the manager's interest in the land.

The Chief Executive (Queensland Transport) administering the *Transport Infrastructure Act 1994* under Section 246, is required to perform and function or exercise a power equivalent to a local government, under the *Building Act 1975* and IPA, for works carried out on corridor land that relate to rail transport infrastructure. In this section corridor land means commercial corridor land, existing rail corridor land, new corridor land, future railway land or non-corridor land.

Integrated Planning Act 1997

IPA is Queensland's principal planning legislation. It establishes a framework for assessing new developments through a development approval system known as IDAS.

As discussed above, the SD Act EIS process replaces the Information and Referral Stage, and the Notification Stage of the IDAS process under IPA. At the completion of the EIS process, the CoG Report will be taken as being a Concurrence Agency response under IPA and will be provided to the Assessment Manager to issue a Decision Notice.

Environmental Protection Act 1994

The *Environmental Protection Act 1994* (EP Act) provides a licensing and approval regime for a range of Environmentally Relevant Activities (ERAs). A range of ERAs will be carried out during the construction and operation of the Project.

Approval for these ERAs will take the form of Development Approvals granted under IPA and Registration Certificates granted under the EP Act.

Vegetation Management Act 1999

The VM Act and associated *Vegetation Management Regulation 2000* (VM Regulation) regulate the conservation and management of vegetation communities. The Act aims to conserve remnant 'Endangered' and 'Of Concern' REs, prevent land degradation and the loss of biodiversity, manage the environmental effects of land clearing and reduce greenhouse emissions. The Act is administered through IPA and DNRW.

9. References

ABARE 2006, "Energy", *Australian Commodities*, viewed 22 August 2007, <http://www.abareconomics.com/interactive/AC_june_2006/htm/coal.htm>.

ABARE (2006a) *Australian Mineral Statistics, June Quarter 2006.* Canberra, September 2006. Available at: http://www.abareconomics.com/publications_html/ams/ams_06/ams06_june.pdf

Aboriginal Cultural Heritage Act 2003 (Queensland) Reprint No. 1 [Online] Accessed: August 2007, Available at: http://www.legislation.qld.gov.au/LEGISLTN/CURRENT/A/AborCultHA03.pdf

Australian Coal Association (2007a), *Australian Coal Association*, Accessed: August 2007, Available at: http://www.australiancoal.com.au

Australian Coal Association (2007b), "Black Coal Production", viewed 22 August 2007, <http://www.australiancoal.com.au/production.htm>.

Australian Coal Association (2007c), "Australian Black Coal Exports", viewed 22 August 2007, <http://www.australiancoal.com.au/exports.htm>.

Birds Australia (2007) '*Birdata*' (database) Birds Australia.

Boyle, M 2007, "China, India Demand Cushions Prices", viewed 22 August 2007, <http://www.platts.com/Magazines/Insight/2006/december/2LU00612G0Nv7125Q8J58e_1.xml>.

Bureau of Meteorology (BoM) (2007), *Climate Statistics for Gladstone Radar and Gladstone Airport*, Accessed: August 2007, http://www-cluster.bom.gov.au/climate/averages/tables/cw_039326.shtml

C & R Consulting [Eds: Hydrobiology P/L]. (June 2005), *Calliope River Basin Draft Water Resource Plan, Ecological Assessment Report*. Department of Natural Resources and Mines, Queensland.

Calliope Shire Council (2007), Calliope Shire Planning Scheme 2007, Accessed: 13 July 2007, http://tpscheme.dz1.calliope.qld.gov.au/Documents/documentation.html

Calvert G, Lokkers C, Cumming R, (2005), *Rare and Threatened Plants of the Townsville Thuringowa Region* Coastal Dry Tropics Landcare Inc, Townsville.

Central Queensland Port Authority (CQPA), (2007), Accessed: July & August 2007, Available at: http://www.cqpa.com.au

Churchill, S (1998), *Australian Bats.* Reed New Holland: Sydney.

Cogger, H (2000), *Reptiles and Amphibians of Australia - 6th edn*, Reed New Holland, Sydney.

Cogger, HG, Cameron, E, Sadlier, R & Eggler, P, (1993), *The Action Plan for Australian Reptiles*. Australian Nature Conservation Agency, Canberra.

Connell Hatch, (2005), *Scoping Study Wiggins Island Coal Terminal, Volumes 1, 2 and 3*, Central Queensland Ports Authority, April 2005.

Connell Hatch, (2005), *Wiggins Island Rail Options, Wiggins Island Coal Terminal Transport Study*, Queensland Rail, April 2005.

Connell Hatch, (2006), *Wiggins Island Coal Terminal Environmental Impact Statement*, Central Queensland Ports Authority and Queensland Rail, November 2006.

Connell Hatch, (2007), *Wiggins Island Coal Terminal Supplementary Environmental Impact Statement*, Central Queensland Ports Authority and Queensland Rail, July 2007.

Connell Wagner (CW) 2005, 'Gladstone State Development Area (GSDA) Industrial Land Suitability', Connell Wagner and Queensland Government State Development and Innovation.

Connell Wagner, (1992), *Gladstone Industrial Land Study Consortium – Consolidated Data Analysis Report*, Office of the Coordinator General – Queensland Government.

Connell Wagner, (2002), *Aldoga Aluminium Smelter, Environmental Impact Statement*, Aldoga Aluminium Smelter Project, October 2006.

Connell Wagner, Powerlink Queensland (2004) Environmental Impact Assessment Review: Gladstone Power Station to Larcom Creek 275kV Transmission Line.

Covacevich, JA, Couper, PJ & McDonald, KR (1988), 'Reptile diversity at risk in the Brigalow Belt, Queensland' in *Memoirs of the Queensland Museum*, 42, no. 2, pp. 475-486.

Dames & Moore (1998), *Comalco Alumina Project Gladstone Impact Assessment Study Environmental Impact Statement*, Comalco Alumina Project, May 1998.

Dangerous Goods Safety Management Act 2001 (Queensland) Reprint No. 2 [Online] Accessed: August 2007, Available at: http://www.legislation.qld.gov.au/LEGISLTN/CURRENT/D/DanGoSaManA01.pdf

Department of Environment and Heritage (DEH) (2005), *Northern Quoll (Dasyurus hallucatus) listing advice,* Accessed: August 2007, Available at: http://www.deh.gov.au/biodiversity/threatened/species/dasyurus-hallucatus.htnml

Department of Environment and Water Resources (2007). EPBC Protected Matters Search. Department of Environment and Water Resources [Online] Accessed: August 2007, Available at: http://www.environment.gov.au/erin/ert/epbc/imap/map.html

Department of Natural Resources and Mines (2001) Gladstone Special Geological Map, 1:100,000, Sheet 9150 & Part 9151. First Ed.

Department of Natural Resources and Water (2007a), *Declared plants of Queensland* http://www.nrw.qld.gov.au/pests/weeds/declared_plants/index.html

Department of Natural Resources and Water (DNRW), (1999), Species Management Manual.

Department of Natural Resources and Water, (2007b), *Mining, exploration & petroleum*, Accessed: August 2007, Available at: http://www.nrm.qld.gov.au/mines

Department of the Environment and Water Resources (2007a). *Delma torquata* in Species Profile and Threats Database, Department of the Environment and Water Resources, Canberra. Available from: http://www.environment.gov.au/sprat. Accessed 2007-08-21@13:08:12.

Department of the Environment and Water Resources (2007b). *Denisonia maculata* in Species Profile and Threats Database, Department of the Environment and Water Resources, Canberra. Available from: http://www.environment.gov.au/sprat. Accessed 2007-08-21@13:00:44.

Department of the Environment and Water Resources (2007c). *Furina dunmalli* in Species Profile and Threats Database, Department of the Environment and Water Resources, Canberra. Available from: http://www.environment.gov.au/sprat. Accessed 2007-08-21@13:07:57.

Department of the Environment and Water Resources (2007d). *Geophaps scripta scripta,* Species Profile and Threats Database [Online] Accessed: September 2007, Available at: http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=64440

Environment Australia (2001) A directory of important wetlands in Australia 3rd Edition Environment Australia Canberra.

Environment Protection and Biodiversity Conservation Act 1999 (Commonwealth) 19 February 2007 taking into account amendments up to Act No. 165 of 2006 [Online] Accessed: August 2007, Available at: http://www.frli.gov.au/ComLaw/Legislation/ActCompilation1.nsf/0/863E4E04096B1D5ACA25728F001D3647/$file/EnvProtBioDivCons99Vol1WD02.pdf

Environmental Protection (Noise) Policy 1997 (Queensland) Reprint No 3 [Online] Accessed August 2007, Available at: http;//www.legislation.qld.gov.au/LEGISLTN/CURRENT/E/EnvProtNoPo97.pdf

Environmental Protection (Air) Policy 1997 (Queensland) Reprint No 3 [Online] Accessed August 2007, Available at: http;//www.legislation.qld.gov.au/LEGISLTN/CURRENT/E/EnvProtAirPo97.pdf

Environmental Protection Act 1994 (Queensland) Reprint No. 7B [Online] Accessed August 2007, Available at: http://www.legislation.qld.gov.au/LEGISLTN/CURRENT/E/EnvProtA94.pdf

Environmental Protection Agency (2007b) 'Wildlife Online Extract Calliope Shire Local Government Area' (Database) Environmental Protection Agency, Brisbane, Queensland.

Environmental Protection Agency (2007c) 'Wildlife Online Extract Project Area' (Database) Environmental Protection Agency, Brisbane, Queensland.

Environmental Protection Agency (EPA) (2005) Shoalwater and Corio Bays, Accessed: 11 July 2007, Available at: http://www.epa.qld.gov.au/nature_conservation/habitats/wetlands/wetlands_habitats/shoalwater_and_corio_bay

Environmental Protection Agency (EPA) (2006a) *Regional Ecosystem Description Database (REDD)*, (Database) Environmental Protection Agency [Online] Accessed: August 2007, Available at: http://www.epa.qld.gov.au/nature_conservation/biodiversity/regional_ecosystems/

Environmental Protection Agency (EPA) (2006b) *Regional Ecosystem Maps*, Environmental Protection Agency [Online] Accessed: August 2007, Available at: http://www.epa.qld.gov.au/nature_conservation/biodiversity/regional_ecosystems/introduction_and_status/regional_ecosystem_maps/

Environmental Protection Agency (EPA), (2003), *Environmental Protection Agency Air Quality Bulletins*, Accessed: August 2007, Available at: http://www.epa.qld.gov.au/projects/air/bulletin.cgi

Environmental Protection Agency (EPA), (2007a), *Environmental Protection Agency Air Quality Bulletins*, Accessed: August 2007, Available at: http://www.epa.qld.gov.au/projects/air/bulletin.cgi

Explosives Act 1999 (Queensland) Reprint No. 2C [Online] Accessed: August 2007, Available at: http://www.legislation.qld.gov.au/LEGISLTN/CURRENT/E/EnvProtA94.pdf

Fisheries Act 1994 (Queensland) Reprint No. 6 [Online] Accessed: August 2007, Available at: http://www.legislation.qld.gov.au/LEGISLTN/CURRENT/F/FisherA94.pdf

Gladstone Area Promotion and Development Limited (GAPDL), (2006), *Gladstone Regional Overview (September Quarter 2006)*, Accessed: August 2007, Available at: http://svc105.wic466d.server-web.com/images/gladstone/gladstone%20region%20overview%20-%20sept%202006.pdf

Harden, G, McDonald, B & Williams, J (2006), *Rainforest Trees and Shrubs: a field guide to their identification*, Gwen Harden Publishing, Nambucca Heads.

Houston W, Melzer A, Elliott B, and Lowry R. (1999) Stuart Oil Shale Project Terrestrial and Aquatic Flora and Fauna Studies Report 3A: Audit of the vertebrate fauna of the Targinie area, north of Gladstone, January 1998. Industrial Land Management Programme, Centre for Land and Water Resource Management, Central Queensland University.

Integrated Planning Act 1997 (Queensland) Reprint No. 8E [Online] Accessed August 2007, Available at: http://www.legislation.qld.gov.au/LEGISLTN/CURRENT/I/IntegPlanA97.pdf

Katestone Scientific (1994) Gladstone Coal Dust Monitoring Study.

Marchant, S & Higgins, PJ (1993), *Handbook of Australian New Zealand and Antarctic Birds Volume 2: Raptors to Lapwings.* Oxford University Press.

Melzer A, Rayner D, Hendry R, Knight R, Orr O, Purcell J, Attard T, Hamilton D and Obridge T (1999a) Flora and fauna of the proposed Castle Hope Dam on the Calliope River, Industrial Land Management Programme, Centre for Land and Water Resource Management, Central Queensland University.

Melzer A, Rayner D, Hendry R, Knight R, Orr O, Purcell J, Attard T, Hamilton D, and Obridge T (1999b) Flora and fauna of the inundation areas associated with the raising of the Awoonga Dam, Industrial Land Management Programme, Centre for Land and Water Resource Management, Central Queensland University.

Morcombe, M (2000), *Field Guide to Australian Birds*, Steve Parish Publishing, Archerfield.

Natural Resources and Mines 2005, *Queensland's World-class Coals: Mine Production and Developments*, Queensland Government, Brisbane.

Nature Conservation (Wildlife) Regulation 2006 (Queensland) Reprint No. 1 [Online] Accessed August 2007, Available at: http://www.legislation.qld.gov.au/LEGISLTN/CURRENT/N/NatureConWiR06.pdf

*Nature Conservation Act 1992 (*Queensland) Reprint No. 5 [Online] Accessed: August 2007, Available at: http://www.legislation.qld.gov.au/LEGISLTN/CURRENT/N/NatureConA92.pdf

Pizzey, G & Knight, F (1999) *Field Guide to the Birds of Australia.* Harper Collins Publishers, Sydney.

Queensland Department of Environment and Heritage and Gladstone Port Authority (1994) Curtis Coast Study Resource Report, Queensland.

Queensland Herbarium (2007) '*HERBRECS*' (database) Queensland Herbarium, Queensland Environmental Protection Agency, Qld, Australia.

Queensland Rail (QR) (1999), *Code of Practice for Railway Noise Management*, Available at: http://www.qr.com.au.

Queensland Rail (QR) (2007a), Fact Sheet QR Coal Business and Network, Accessed: August 2007, Available at: http://www.corporate.qr.com.au/

Queensland Rail (QR) (2007b), *QR Homepage*, Accessed: July & August 2007, Available at: http://www.qr.com.au

Queensland Rail (QR), (2005), *QR Access Undertaking,* Accessed: 11 July 2007, Available at: http://www.networkaccess.qr.com.au/downloads/undertaking/undertaking.asp

Royal Botanic Gardens & Domain Trust (RBG&DT) (2007), 'PlantNet', Accessed: August 2007, Available at: http://plantnet.rbgsyd.nsw.gov.au/

State Development and Public Works Organisation Act 1971 (Queensland) Reprint No. 5 [Online] Accessed: August 2007, Available at: http://www.legislation.qld.gov.au/LEGISLTN/CURRENT/S/StateDevA71.pdf

The Energy Bulletin Website (2007), *EnergyBulletin*, Accessed: August 2007, Available at: http://www.energybulletin.net

Transport Infrastructure Act 1994 (Queensland) Reprint No. 101 [Online] Accessed: August 2007, Available at: http://www.legislation.qld.gov.au/LEGISLTN/CURRENT/T/TranstInfA94.pdf

Tucker, AD, CJ Limpus, TE Priest, J Cay, C Glen & E Guarino, (2001), 'Home ranges of Fitzroy River turtles (*Rheodytes leukops*) overlap riffle zones: potential concerns related to river regulation', *Biological Conservation*, vol. 102 no. 2, pp. 171-181.

Vegetation Management Act 1999 (Queensland) Reprint No. 2D [Online] Accessed: August 2007, Available at: http://www.legislation.qld.gov.au/LEGISLTN/CURRENT/V/VegetManA99.pdf

Water Act 2000 (Queensland) Reprint No. 5 [Online] Accessed: August 2007, Available at: http://www.legislation.qld.gov.au/LEGISLTN/CURRENT/W/WaterA00.pdf

Water Regulation 2002 (Queensland) Reprint No. 4D [Online] Accessed: August 2007, Available at: http://www.legislation.qld.gov.au/LEGISLTN/CURRENT/W/WaterR02.pdf

WBM Consulting Engineers, (1990), *Impact Assessment Study of Reclamation of Land West of Calliope River*, Gladstone Port Authority.

Wilson, S, (2005), *A Field Guide to Reptiles of Queensland*, Reed New Holland, Sydney.

Wilson, SK & Knowles, DG, (1988), *Australia's Reptiles: A Photographic Reference to the Terrestrial Reptiles of Australia*, Collins, Sydney.