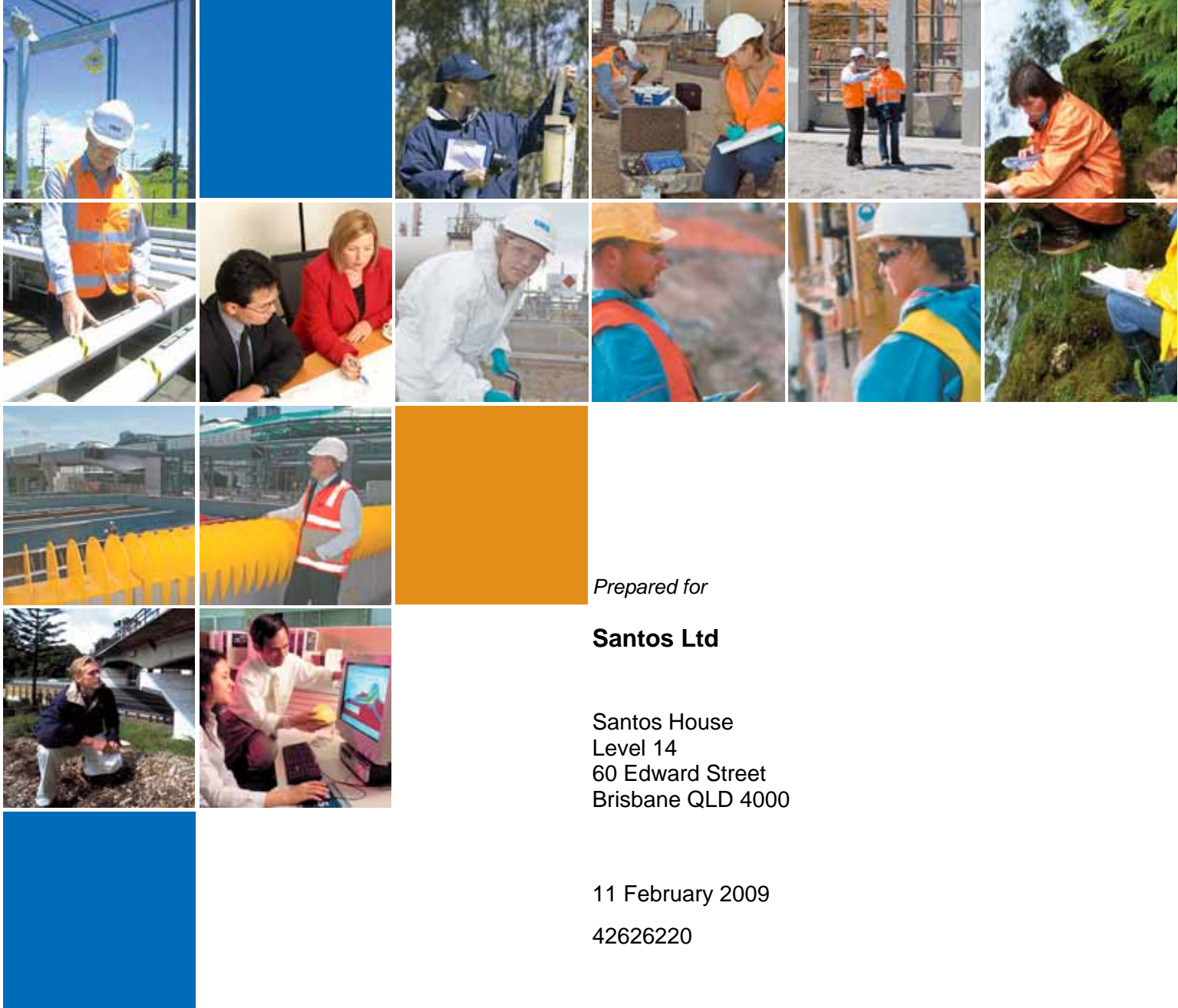


# FINAL REPORT

## Santos GLNG Ecological Assessment Report – Pipeline Flora



*Prepared for*

**Santos Ltd**

Santos House  
Level 14  
60 Edward Street  
Brisbane QLD 4000

11 February 2009  
42626220



Project Manager:



Dan Simmons  
Associate Environmental  
Scientist

URS Australia Pty Ltd

Level 16, 240 Queen Street  
Brisbane, QLD 4000  
GPO Box 302, QLD 4001  
Australia  
T: 61 7 3243 2111  
F: 61 7 3243 2199

Project Director:



Chris Pigott  
Senior Principal

Author:



Chris Todd  
Senior Ecologist

Date: 11 February 2009  
Reference: 42626230  
Status: Final

# Table of Contents

<b>ES</b>	<b>Executive Summary .....</b>	<b>1</b>
<b>1</b>	<b>Glossary and Abbreviations.....</b>	<b>1</b>
	Abbreviations.....	1
	Glossary .....	2
<b>2</b>	<b>Introduction .....</b>	<b>4</b>
2.1	<b>Study Aim and Objectives.....</b>	<b>4</b>
2.2	<b>Review of Existing Information .....</b>	<b>4</b>
2.3	<b>Target Species.....</b>	<b>4</b>
2.4	<b>Legislative Context .....</b>	<b>5</b>
2.4.1	<i>Environment Protection and Biodiversity Conservation Act, 1999 (EPBC Act).....</i>	<i>5</i>
2.4.2	<i>Nature Conservation Act, 1992 (NC Act).....</i>	<i>5</i>
2.4.3	<i>Lands Protection Act, 2002 (LP Act) .....</i>	<i>5</i>
2.4.4	<i>Vegetation Management Act, 1999 (VM Act) .....</i>	<i>6</i>
2.5	<b>Field Survey Approach.....</b>	<b>8</b>
2.5.1	Survey Limitations .....	9
2.5.2	Nomenclature .....	10
<b>3</b>	<b>GLNG Environmental Values.....</b>	<b>11</b>
3.1	<b>Regional Context.....</b>	<b>11</b>
3.1.1	Bioregion.....	11
3.1.2	Sub-regions .....	11
3.1.3	Regional Ecosystems (REs).....	11
3.1.4	Study Site .....	12
3.1.5	Weather Conditions .....	12
3.2	<b>Survey Results .....</b>	<b>13</b>
3.2.1	Species Diversity .....	13
3.2.2	Regional Ecosystems .....	14
3.2.3	Weeds of Concern .....	16
3.2.4	Vegetation of Significance .....	16
3.2.5	Regional Connectivity.....	16
<b>4</b>	<b>Potential Impacts and Mitigation Measures .....</b>	<b>16</b>
4.1	<b>Potential Impacts .....</b>	<b>16</b>

## Table of Contents

4.1.1	Proposed Development .....	16
4.1.2	Vegetation Disturbance .....	16
4.1.3	Impacts to Conservation Significant Species .....	16
4.1.4	Dust Impacts .....	16
4.1.5	Fragmentation.....	16
4.1.6	Impact to Marine Plants .....	16
4.1.7	Weed Impacts .....	16
4.1.8	Edge Effects.....	16
4.1.9	Impacts associated with changes to fire regimes .....	16
4.1.10	Impacts associated with Erosion and Sedimentation .....	16
<b>4.2</b>	<b>Impact Mitigation.....</b>	<b>16</b>
4.2.1	Pipeline Route Selection.....	16
4.2.2	Further Surveys .....	16
4.2.3	Clearing Scheme .....	16
4.2.4	Weed Control.....	16
4.2.5	Rehabilitation of Disturbed Areas .....	16
4.2.6	Biodiversity Offsetting .....	16
4.2.7	Cumulative Impacts .....	16
<b>5</b>	<b>References .....</b>	<b>16</b>



## Tables, Figures, Appendices

### Tables

Table 3-1	Regional Ecosystems recorded within 100 m buffer of gas transmission pipeline .....	14
Table 3-2	Declared exotic weeds present along gas transmission pipeline .....	16
Table 3-3	Conservation Significant species recorded from gas transmission pipeline.....	16
Table 3-4	Significant Vegetation Communities recorded within 100 m buffer along gas transmission pipeline .....	16
Table 4-1	Proposed area of vegetation communities to be removed from the gas transmission pipeline .....	16

### Figures

Figures 1 - 3	Significant Flora Species Records (HERBRECS)
Figures 4 - 28	Regional Ecosystem Mapping

### Appendices

Appendix A	Pipeline Flora Survey (A1 – Potentially occurring significant species, A2 – Flora Survey Methodology, A3 – Regional Ecosystem Survey Data)
Appendix B	Master Flora Species List

## Executive Summary

The flora assessment of the gas transmission pipeline comprised a desktop assessment and a detailed flora field survey. The aims of the investigation were to map the Regional Ecosystems of the gas transmission pipeline corridor and identify vegetation or species of conservation significance. In addition, the survey sought to identify pest plants in the study area and discuss potential impacts and outline mitigation strategies.

A desktop study identified flora species potentially present, including significant species listed under the Queensland *Nature Conservation Act, 1992* (NC Act) and the Commonwealth *Environment Protection and Biodiversity Conservation Act, 1999* (EPBC Act). The flora field survey utilised standard sampling techniques for the mapping of Regional Ecosystems. The field survey was conducted over a 32 day period and included 126 survey sites.

The desktop assessment identified sixty-eight significant flora species as potentially present within the pipeline study area. Of these identified taxa, two species (*Cycas megacarpa* and *Acacia pedleyi*) were located during the field surveys.

The field survey identified the presence of 47 Regional Ecosystems within the gas transmission pipeline corridor including 18 listed as 'Endangered' or 'Of Concern' under the *Vegetation Management Act 1999* (VM Act) and/or EPBC Act.

The field survey identified 302 taxa of plants, representing 210 genera from 74 families. Forty exotic plant species were recorded during the flora survey. Of these, 10 species are listed as declared weed species under the Queensland *Land Protection (Pest and Stock Route Management) Act, 2002*.

The clearing of remnant vegetation within the gas transmission pipeline right-of-way (ROW) will provide the greatest impacts to flora. The pipeline ROW width will be 30 m on both the mainland and Curtis Island. The Curtis Island easement will however also accommodate a road and power line and be a total width of 100 m. Impacts to remnant vegetation will be minimised by the alignment of the gas transmission pipeline abutting the existing Queensland Gas Pipeline (QGP) for approximately 100 km of the 425 km corridor. Approximately 188.6 ha of remnant vegetation on the mainland and 69.9 ha of remnant vegetation on Curtis Island will be cleared during this phase of the project. This will result in the partial clearing of Regional Ecosystems listed as 'Endangered' and 'Of Concern' under the VM Act and EPBC Act. This vegetation clearing may also impact upon the two significant flora species recorded.

A number of potential impacts and mitigation strategies are discussed including pipeline route selection, weed control, rehabilitation and biodiversity offsetting.

## Abbreviations

**ANZECC** – Australian New Zealand Environment and Conservation Council

**CSG** – Coal Seam Gas

**DIWA** - Directory of Important Wetlands in Australia

**EIS** – Environmental Impact Statement

**EPA** – Queensland Environmental Protection Agency

**EPBC Act** - *Environment Protection and Biodiversity Conservation Act 1999*

**ESA** - Environmentally Sensitive Areas

**FPC** – Foliage Projection Cover

**HERBRECS** - is a database maintained by the Queensland Herbarium that provides a list of specimens and collections for a specified search area.

**LNG** – Liquefied Natural Gas

**LP Act** - Queensland *Lands Protection (Pest and Stock Route Management) Act 2002*

**MNES database** – Commonwealth Department of the Environment, Water, Heritage and the Arts (DEWHA) Matters of National Environmental Significance database

**NC Act** – Queensland *Nature Conservation Act 1992*

**RE** – Regional Ecosystems

**REDD** - Regional Ecosystems Description Database

**SF** - State Forest

**VM Act** – Queensland *Vegetation Management Act 1999*

**WONS** - Weeds of National Significance

## Glossary and Abbreviations

### Glossary

**Alluvium** is material deposited by a river or other running water typically made up of a variety of materials, including fine particles of silt, clay, articles of sand and gravel.

**Alluvial** relating to, composed of, or found in alluvium or alluvial soil.

**Biodiversity** The number and variety of organisms found within a specified geographic region or within a given ecosystem.

**Bioregion** a landscape pattern that reflect changes in geology and climate, as well as major changes in floral and faunal assemblages at a broad scale.

**Brigalow Belt** is a Bioregion that spans inland and eastern Queensland from Townsville in the north to northern New South Wales, covering an area of about six million hectares.

**Ecosystem** is an interdependent system of interacting plants, animals and other organisms together with the non-living (physical and chemical) components of their surroundings.

**Ecology** scientific study of abundance, distribution and interactions between organisms and their natural environment.

**Habitat** The area or natural environment in which an organism or population normally lives. A habitat is made up of physical factors such as soil, moisture, range of temperature, and availability of light as well as biotic factors such as the availability of food resources and the presence of predators.

**Herbarium** Institution where a collection of dried plants are mounted, labelled, and systematically arranged for use in scientific study as reference material for describing plant taxa.

**Nomenclature** The procedure of assigning names to groups of organisms listed in a taxonomic classification.

**Quaternary sample plots** - is a standardised flora study to collect data to verify regional ecosystem and vegetation mapping. Data from these sites are generally collected throughout the field survey and entered on spreadsheets or databases. Quaternary sites may be collected at regular intervals along a traverse, and/or made where REs/vegetation communities change.

**Ramsar wetlands of international significance** the Ramsar Convention is an inter-governmental treaty adopted on 2 February 1971 in the Iranian city of Ramsar and is focussed on the conservation and sustainable use of wetlands as important ecosystems. The addition of a site to the 'List of Wetlands of International Importance' (the "Ramsar List") expresses the relevant government's commitment to take all steps necessary to ensure the maintenance of the ecological character of the site.

**Regional Ecosystem (RE)** Describes the relationships between major floral species and the environment at the regional scale. They are mostly derived from linking vegetation mapping units based on dominant canopy species, recognised at a scale of 1:100,000 to land zones that represent major environmental variables, in particular geology, rainfall and landform. Under the VM Act REs are assigned a conservation status based on an assessment of the pre-clearing and remnant extent of a RE.

**Remnant Vegetation** - Vegetation is identified as 'remnant' under the VM Act where the predominant canopy of the vegetation: covers more than 50 % of the equivalent undisturbed canopy; averages more than 70

## Glossary and Abbreviations

## Section 1

% of the vegetations undisturbed height and is composed of species characteristic of the vegetations undisturbed predominant canopy.

**Scarp** A steep slope, ridge or escarpment of rock.

**Secondary sample plots** Secondary sample plots are standardised transects used for classification and detailed descriptions of REs and vegetation communities. Data collected include all location, environmental and overall floristic and structural information as well as a list of all species present and basal area, percentage cover and stem density measures of abundance.

**Threatened species/Conservation significant species** - a generic term for a plant or animal species listed as critically endangered, endangered, vulnerable or rare under either state or commonwealth threatened species legislation. The terms 'threatened' and 'conservation significant' are interchangeable in this context.

**Weeds** are plant species that invade native ecosystems and can adversely affect the survival of indigenous flora and fauna, often competing with indigenous plants for resources such as nutrients, moisture and light. They can prevent natural regeneration, reduce wildlife habitat, alter water flows, increase soil erosion, introduce poisons into the soil or poison animals, change fire behaviour and may introduce foreign genes into local plant populations. Weed species are not necessarily exotic non-indigenous species, but can also be non-endemic natives that are naturalised to areas outside of their natural distribution.

## Introduction

### 2.1 Study Aim and Objectives

The aims of the flora investigation were to map the vegetation communities of the gas transmission pipeline study area and identify areas of vegetation or species of conservation significance. In meeting these aims, the objectives of the flora survey were to:

- Review existing terrestrial vegetation data for the local area and region;
- Provide baseline data on Regional Ecosystems occurring in the study area;
- Assess the diversity of terrestrial vascular flora within the study area and identify ecologically sensitive areas;
- Identify the occurrence or expected occurrence of conservation significant flora species;
- Describe weed species and their distribution in the study area; and
- Determine the impacts of the gas transmission pipeline on the surrounding vegetation and develop appropriate management strategies.

### 2.2 Review of Existing Information

In order to identify the range of species, habitats, and communities that may be present within the proposed gas transmission pipeline study area a review of existing data was compiled through the acquisition of the following key references:

- Queensland EPA Herbarium flora database (HERBRECS and CORVEG);
- Queensland EPA Wildlife Online Database;
- Queensland EPA 1:100, 000 Regional Ecosystems mapping;
- Queensland EPA Ecomap environmentally sensitive areas database;
- Commonwealth Department of Environment, Water, Heritage and the Arts (DEWHA) 'Matters of National Environmental Significance' EPBC Act database;
- Central Queensland University (2007) Flora and Fauna Assessment of the Calliope Ranges Roadway Realignment;
- Well Site Inspection Report – Emu Nest 1C (Boobook, 2008);
- Environmental Management Plan for Fairview Project Area (Santos, 2008);
- Curtis Coast Study 2004; and
- Curtis Coast Regional Coastal Management Plan.

### 2.3 Target Species

Sixty eight conservation significant flora species listed under both state and commonwealth legislation were identified from the above sources as being potentially present within the study area. Fifteen of these species were considered either 'possible' or 'likely' to be present within the gas transmission pipeline corridor based upon their known distributions and habitat requirements and were targeted as part of the field survey effort. A

list of target species and ecological notes for each are provided in Appendix A (Section A.1). Conservation significant species identified include any Critically Endangered, Endangered, Vulnerable or Rare taxa listed as per:

- The Queensland *Nature Conservation Act, 1992* (NC Act); and
- The Commonwealth *Environment Protection and Biodiversity Conservation Act, 1999* (EPBC Act).

## 2.4 Legislative Context

### 2.4.1 *Environment Protection and Biodiversity Conservation Act, 1999 (EPBC Act)*

The Commonwealth *Environment Protection and Biodiversity Conservation Act, 1999* (EPBC Act) provides for the protection of the environment, especially relating to matters of National Environmental Significance (Protected matters) and is administered by the Commonwealth Department of the Environment, Water, Heritage and the Arts (DEWHA). It is designed to provide for the conservation of biodiversity through the protection of threatened species and ecological communities, migratory, marine and other protected species listed under the Act. In general, the EPBC Act streamlines the national environmental assessment and approvals process, protects Australian biodiversity and integrates management of important natural and cultural places.

### 2.4.2 *Nature Conservation Act, 1992 (NC Act)*

The Queensland *Nature Conservation Act, 1992* (NC Act) is administered by the Queensland Environmental Protection Agency (EPA) and is the principal legislation for the conservation and management of the State's native flora and fauna. The primary objective of the NC Act is to ensure the preservation of endangered, vulnerable and rare (EVR) species of flora and fauna as listed under the *Nature Conservation (Wildlife) Regulation 2006*.

### 2.4.3 *Lands Protection Act, 2002 (LP Act)*

The Queensland *Lands Protection (Pest and Stock Route Management) Act 2002* (LP Act) legislation provides pest management for agricultural lands. There are currently 84 declared plants (or plant groups) identified for Queensland. In order to prioritise the control of weeds in Queensland, declared plants are categorised into three separate classes, each with their own set of legal requirements as detailed below (DPI 2008).

#### ***Class 1 Declared Weeds***

A Class 1 declared weed is a species that has the potential to become a very serious pest in Queensland in the future. All landholders are legally required to keep their land free of Class 1 pests.

#### ***Class 2 Declared Weeds***

Class 2 declared weeds are generally pest species that have already spread across substantial areas of Queensland, but the impact is so serious that control is needed to avoid further spreading of the weed. Landholders are legally required to take reasonable steps to keep their property free from Class 2 declared weeds.



## Introduction

### ***Class 3 Declared Weeds***

A Class 3 pest is one that is very common in Queensland but is having a serious impact on native bushland. The control of a Class 3 declared weed is not required unless it is impacting, or has potential to impact, on a nearby environmentally significant area (e.g. a national park or reserve).

### **2.4.4 *Vegetation Management Act, 1999 (VM Act)***

The purpose of the Queensland *Vegetation Management Act 1999* (VM Act) is to:

- regulate the clearing of native vegetation (i.e. remnant vegetation mapped as 'Endangered', 'Of Concern' and 'Not of Concern' Regional Ecosystems (REs)) to prevent the loss of biodiversity or any increase in land degradation from vegetation clearing;
- maintain ecological processes; and
- reduce greenhouse gas emissions.

Additionally, areas of remnant vegetation specific to conservation significant species (listed under the NC Act) are further classified as Essential Habitat.

The Department of Natural Resources and Water (DNRW) uses certified mapping of remnant vegetation and Essential Habitat to administer the VM Act. Clearing of native vegetation mapped as REs and/or Essential Habitat is subject to assessment by the DNRW against the applicable Regional Vegetation Management Code for the Brigalow Belt and South-east Queensland Bioregions (DNRW, 2008).

### ***Remnant Vegetation Conservation Status***

The Regional Ecosystem Description Database (REDD) lists the status of regional ecosystems as gazetted under the *Vegetation Management Act 1999* (Vegetation Management Status) and their Biodiversity Status as recognised by the Environmental Protection Agency.

Given that Level 1 Petroleum activities (such as the GLNG project) under the Petroleum and Gas Act (2004) are subject to the Environmental Protection Act (EP Act) 1994, the management of vegetation is subject to the VM Act. Therefore, the VM Act status applies.

Biodiversity status of affected communities is to be listed in the EIS as requested within the Terms of Reference; however the VM Act status is the primary classification.

### **Vegetation Management Status**

#### Not of Concern

Regional Ecosystems are listed as 'Not of Concern' under the Queensland *Vegetation Management Act, 1999* if the remnant vegetation for the community is over 30 per cent of its pre-clearing extent across the bioregion, and the remnant area is greater than 10,000 hectares.

#### Of Concern

Regional Ecosystems are listed as 'Of Concern' under the Queensland *Vegetation Management Act, 1999* if the remnant vegetation for the community is 10 to 30 per cent of its pre-clearing extent across the bioregion; or more than 30 per cent of its pre-clearing extent remains and the remnant extent is less than 10,000 hectares.

### Endangered

Regional Ecosystems are listed as 'Endangered' under the Queensland *Vegetation Management Act 1999* if the remnant vegetation for the community is less than 10 per cent of its pre-clearing extent across the bioregion; or 10 to 30 per cent of its pre-clearing extent remains and the remnant vegetation is less than 10,000 hectares.

### **Biodiversity Status**

Biodiversity status is defined by the EPA and is based upon "an assessment of the condition of remnant vegetation in addition to the pre-clearing and remnant extent of a regional ecosystem" (EPA, 2006).

### No Concern at Present

A regional ecosystem is listed as 'Not of concern' when remnant vegetation is over 30 per cent of its pre-clearing extent across the bioregion; the remnant area is greater than 10,000 hectares and the degradation criteria<sup>1</sup> for 'Endangered' or 'Of concern' regional ecosystems are not met.

### Of Concern

A regional ecosystem is listed as having an 'Of concern' biodiversity status when remnant vegetation is 10-30 per cent of its pre-clearing extent across the bioregion; or more than 30 per cent of its pre-clearing extent remains and the remnant extent is less than 10,000 hectares, and if 10-30 per cent of its pre-clearing extent remains unaffected by moderate degradation and/or biodiversity loss.

### Endangered

A regional ecosystem is listed as having an 'Endangered' biodiversity status when less than 10 per cent of the pre-clearing extent of remnant remains unaffected by severe degradation and/or biodiversity loss; or 10-30 per cent of its pre-clearing extent remains unaffected by severe degradation and/or biodiversity loss and the remnant vegetation is less than 10,000 hectares; or it is a rare regional ecosystem subject to a threatening process.

### **EPBC Act Status**

The EPBC Act defines an 'Endangered' community as an ecological community that is not critically endangered and it is facing a very high risk of extinction in the wild in the near future.

### ***Vegetation Clearing***

The following information describes the circumstances in which the GLNG project must comply with the VM Act in regards to vegetation clearing.

Santos is authorised to undertake vegetation clearing when it is regarded as an 'incidental activity' for the following:

---

<sup>1</sup> Severe degradation and/or biodiversity loss is defined as:

- floristic and/or faunal diversity is greatly reduced but unlikely to recover within the next 50 years even with the removal of threatening processes; or
- soil surface is severely degraded, for example, by loss of A horizon, surface expression of salinity, surface compaction, loss of organic matter or sheet erosion. (EPA, 2006)

## Introduction

- Exploration or testing for petroleum reserves;
- Pipeline construction or operation;
- Construction or operation of the petroleum facility; and
- Other Incidental activities as authorised by the *Petroleum & Gas (Production and Safety) Act 2004* (P & G Act).

The clearing of native vegetation for the purpose of an 'incidental activity' is limited to that which is reasonably necessary for, or incidental to, another authorised activity for the petroleum activity. For example, clearing to enable the construction and operation of a petroleum well, natural underground reservoir for petroleum storage, pipeline or a petroleum facility.

Petroleum activities<sup>2</sup> do not require a permit to clear native vegetation when the VM Act regards it as a 'specified activity' (under Schedule 8 of the Integrated Planning Act (IPA) 1997). This exemption for clearing native vegetation does not extend to purposes outside the definition of an 'authorised activity'<sup>3</sup> (Section 22 of the *Petroleum and Gas (Production and Safety) Act, 2004* [P&G Act]). Petroleum activities are also exempt from assessment against a planning scheme (under Schedule 9 of IPA).

Note that any conditions contained in the Environmental Authority (under the *Environmental Protection Act 1994*) regarding vegetation management must be complied with. In situations where the GLNG project is operating without a petroleum authority (under petroleum legislation P&G Act and *Petroleum Act 1923*) or an Environmental Authority for petroleum activities (under the EP Act), the VM Act applies.

The clearing of vegetation should be viewed in context of the authorised activity and should be relative to the scale and /or nature of the activity. Where the clearing of native vegetation is for purposes outside of an authorised or incidental activity (as previously defined), the VM Act applies.

### 2.5 Field Survey Approach

The flora survey employed an assessment of floral taxa and Regional Ecosystems in keeping with the methodology employed by the Queensland Herbarium for the survey of Regional Ecosystems and vegetation communities (Neldner *et al.*, 2005). The survey design was established in consultation with the EPA.

Vegetation mapping was restricted to a 100 metre buffer either side of the gas transmission pipeline (200 metre wide survey corridor). Preliminary identification of the vegetation communities was conducted prior to the commencement of fieldwork using 1:100 000 Regional Ecosystems coverage Version 5.0 for the region (EPA, 2008a).

Preliminary community definition was used to identify locations for representative field survey plots to ground truth communities and obtain floristic and structural data. Fieldwork for the flora survey was conducted over three periods during May to October 2008 (dry season). A total of 32 days of field survey was undertaken by two qualified ecologists. A total of 126 sites were assessed as part of the fieldwork. Field surveys involved conducting botanical assessments in environmentally sensitive areas including Regional Ecosystems of

---

<sup>2</sup> As defined by the *Petroleum and Gas Act 2004* and the *Environmental Protection Act (EP Act) 1994*

<sup>3</sup> Such as exploration, production and storage activities; pipeline construction and operation; and petroleum processing (Part 2 of the *Petroleum and Gas Act 2004*)

conservation significance, riparian areas and EPA Essential Habitat<sup>4</sup>. A number of standard botanical assessment methods were employed including secondary transects, quaternary sample plots, and random meander searches. Vehicle traverses of the gas transmission pipeline study area were also undertaken throughout the survey period to identify changes in landform and community boundaries. Community structural formation classes were assessed according to (Neldner *et al.*, 2005). Regional ecosystem classification of communities was determined as per Sattler and Williams (1999) and in accordance with the Regional Ecosystems Description Database (REDD) Version 5.2 (EPA, 2007). Final vegetation mapping was undertaken utilising field survey data and aerial photograph interpretation of stereo pair images at a scale of approximately 1:22,000 (Aerometrex, 2008). Full details on the methodology employed can be found in Appendix A (Section A.2).

### **Survey Extent**

The flora field surveys focussed on areas considered environmentally sensitive along the gas transmission pipeline. These areas were classified as meeting one or more of the following criteria:

- Support 'Endangered' or 'Of Concern' Regional Ecosystems (as identified in EPA mapping);
- Support large tracts of remnant vegetation (e.g. range crossings);
- Major river crossings;
- Known habitat of significant species; and
- EPA Essential Habitat areas.

### **Regrowth Vegetation**

Regrowth is native vegetation that is regenerating following clearing or other disturbance but does not meet the definition of remnant<sup>5</sup> vegetation.

Regrowth was not mapped as part of this survey however it is recognised that regrowth vegetation is present within the gas transmission pipeline corridor and it will be identified within the Phase 2 pre-construction surveys. Mapping of regrowth vegetation may also be relevant to vegetation offset planning.

## **2.5.1 Survey Limitations**

### **Methodology**

Data acquisition during flora surveys has inherent limitations associated with variability of vegetation communities across a site, and changes to the detectability and presence of species with time. All survey sites were strategically located to capture representative samples of all communities and the seasonal conditions

---

<sup>4</sup> Essential habitat is vegetation in which a species that is endangered, vulnerable, rare or near threatened has been known to occur.

<sup>5</sup> Vegetation is identified as 'remnant' under the VM Act where the predominant canopy of the vegetation: covers more than 50% of the equivalent undisturbed canopy; averages more than 70% of the vegetations undisturbed height and is composed of species characteristic of the vegetations undisturbed predominant canopy.

## Introduction

during which this survey was undertaken were conducive to a relatively high degree of detectable floral diversity (Section 1.5.2). However field studies cannot account for 100 % of potential floral diversity present within a site.

Surveys were undertaken during the dry season between May and October 2008. This timing is considered suitable for assessment of woodland communities however grassland communities are more susceptible to seasonal changes and are difficult to assess during dry periods. As such further surveys are proposed to be undertaken (as part of the Phase 2 pre-construction surveys) within grassland communities (e.g. RE 11.8.11) to capture seasonal variations (Section 4.2.2).

### **Site Access**

Site access was restricted in some areas due to landholder permission and remote localities, particularly within some of the major range crossings. All reasonable efforts were made to survey all areas of ecological significance, however where sites could not be accessed vegetation mapping has been based on a combination of air photo interpretation and EPA Regional Ecosystem Mapping. Survey locations presented within Figure 3 to Figure 24 indicate the extent of field assessment along the gas transmission pipeline. The most significant area of restricted access was within the mainland section of the Gladstone State Development Area (GSDA) east of the Bruce Highway (Figure 5) in which land access was not granted for an extent of 17 kms along the proposed pipeline alignment.

### **2.5.2 Nomenclature**

Taxonomic nomenclature used for the description of floral species is according to Bostock and Holland (2007). Exotic flora species are signified in all text by an asterix (\*).

## 3.1 Regional Context

### 3.1.1 Bioregion

The gas transmission pipeline is predominantly situated within the Brigalow Belt bioregion, with a small northern section situated within the South-East Queensland bioregion. The bioregions of Queensland are based on landscape patterns that reflect changes in geology and climate, as well as major changes in floral and faunal assemblages at a broad scale and are used as the fundamental framework for the planning and conservation of biodiversity.

The Brigalow Belt bioregion is approximately 36,400,000 ha in size. Nature conservation of the bioregion has received increasing attention due to the rapid and extensive loss of habitat that has occurred. Major impacts upon vegetation of the Brigalow Belt include tree clearing, high grazing pressure and the proliferation of exotic species such as the prickly pear (Young *et al*, 1999).

The South East Queensland bioregion is one of the most species rich and diverse parts of Australia for flora and fauna. The bioregion is approximately 6,600,000 ha in size and contains localised areas of endemism and a wide range of habitat types (Young and Dilewaard, 1999).

### 3.1.2 Sub-regions

The Brigalow Belt bioregion contains 36 sub-regions or provinces that delineate significant differences in geology and geomorphology (Young *et al*, 1999). The proposed gas transmission pipeline falls within several sub-regions within the Brigalow Belt including the Mount Morgan Ranges, Callide Creek Downs, Banana-Auburn Ranges, Dawson River Downs, Arcadia, and Carnarvon Ranges.

The South East Queensland bioregion contains 10 sub-regions or provinces that delineate significant differences in geology and geomorphology (Young and Dilewaard, 1999). The section of the proposed gas transmission pipeline within the South East Queensland bioregion is located only within the Burnett-Curtis Hills and Ranges sub-region. It should be noted that the site is situated near the northern-most boundary of the Burnett-Curtis Hills and Ranges sub-region, bordering on the Marlborough Plains sub-region of the adjacent Brigalow Belt bioregion.

### 3.1.3 Regional Ecosystems (REs)

Regional Ecosystems (REs) describe the relationships between major floral species and the environment at the regional scale. They are mostly derived from linking vegetation mapping units recognised at a scale of 1:100,000 to land zones that represent major environmental variables, in particular geology and landform. Under the Queensland *Vegetation Management Act, 1999* (VM Act) REs are assigned a conservation status (Vegetation Management Status) based on an assessment of the pre-clearing and remnant extent of a RE.

The Queensland Herbarium has developed a program for mapping remnant REs across Queensland, however it should be noted that there are inaccuracies inherent in RE mapping at a scale of 1:100,000. As a result these maps provide an indication of what is potentially present and cannot be relied upon as an inherently correct source of vegetation mapping. On-site ground truthing is required to confirm the presence of RE types and extents, verify floristics and structure and confirm conservation status. Within the 7 sub-regions occurring along the gas transmission pipeline the number of REs mapped within each sub-region ranges from 50 to 104. The average number of REs per sub-region is 71. Forty-seven REs were identified by field studies as being present along the gas transmission pipeline alignment. REs of relevance are further discussed in Section 3.2.2.

## GLNG Environmental Values

### 3.1.4 Study Site

The gas transmission pipeline will link the Coal Seam Gas (CSG) fields to the LNG facility on Curtis Island, off the coast of Gladstone. The gas transmission pipeline is to be approximately 425 km in length within a 30 metre wide easement on the mainland and 100 metre easement on Curtis Island. Existing land use along the proposed route is predominantly rural. Curtis Island and the Calliope, Callide, Dawson, Expedition and Carnarvon Range crossings are generally well-vegetated. Grazing and cropping dominates the remaining areas with few large expanses of remnant vegetation enduring. Isolated patches of woodland and riparian vegetation remain as relics of the extent of former widespread vegetation communities over the majority of the area.

#### ***Curtis Island***

Curtis Island is located off the coast of central Queensland near Gladstone and forms part of the eastern rim of Port Curtis. It is approximately 40 km long and 20 km across at its widest point. It is located within the Gladstone Regional Council area.

Typical landforms on the island include moderate to steep wooded slopes, wooded alluvial plains, ephemeral watercourses, estuarine systems and fresh and saltwater wetlands. The gas transmission pipeline is to be constructed primarily in the basin of a narrow fluvial valley. The valley is dominated by *Eucalyptus* and *Corymbia* woodlands on moderate to low slopes. Mangrove and saltmarsh communities are present within intertidal areas. The pipeline area, as with the LNG facility site, displays disturbance consistent with a long history of land use that includes grazing, clearing, cropping, and selected timber felling. The presence of weeds and a history of fire have also impacted upon the ecological values of the site. Whilst the majority of the woodland is regrowth, mature trees are present, especially along the ephemeral creeks in the low-lying portions of the extended valley within which the gas transmission pipeline is proposed. In the north of the valley, streams discharge into Graham Creek. Southern streams drain to The Narrows north of China Bay.

#### ***Mainland Section***

The gas transmission pipeline on the mainland traverses a range of landforms and land uses. The majority of the route (approximately 83 %) is situated within cleared land supporting grazing or cropping activities. The Calliope, Callide, Dawson, Expedition and Carnarvon ranges generally feature large expanses of bushland with various degrees of integrity (Figure 4 and Figure 5). Isolated patches of bushland exist as open woodland, often along and adjacent to the waterways. Much of the bushland is held in forestry leases with typical uses being commercial timber harvesting and grazing. The field survey indicated bushland on privately owned land is generally grazed and is often subject to light timber harvesting.

### 3.1.5 Weather Conditions

#### ***Curtis Section***

The Curtis Island section of the gas transmission pipeline flora survey was undertaken over 8 days between 14 and 21 May, 2008. Weather conditions were typical for the season in the region; warm days and mild nights with occasional gusty winds. Bureau of Meteorology daily weather observations at the Gladstone Radar shows that the minimum and maximum temperatures were 11.9° C and 28.4° C respectively. Relative humidity for the survey period averaged 59.5 %, however no rainfall was recorded over the eight days of survey (BoM, 2008).

Prior to the survey period, Curtis Island experienced un-seasonally high rainfall during the month of February 2008 with a total rainfall of 451 mm recorded (BoM, 2008b). This rainfall was a dramatic change in typical meteorological conditions, as the Curtis coast area had experienced significant long term drought conditions.



Rainfall statistics for the region indicated that rainfall had been below average for approximately the past 10 years (BoM, 2008d).

### **Mainland Section**

Flora assessments for the mainland section of the gas transmission pipeline were undertaken during two survey periods; over the course of 20 days between 30 June and 25 July 2008 and over a 5 day period between 6 and 10 October 2008. Weather observations are taken from the Bureau of Meteorology (BoM) Gladstone Radar for the period 30 June to 11 July, as an indication of the weather conditions on the eastern mainland gas transmission pipeline section during the survey period. Weather observations for the period 12 to 25 July are taken from the BoM Rolleston weather station as more indicative of conditions in the western portion of the gas transmission pipeline during this period.

During the period 30 June to 11 July (at Gladstone Radar), temperatures were cool and ranged between 13.2° C and 22.9° C with wind speeds averaging 13 km/h. Relative humidity for this period averaged 66% and a total of 58.4 mm rainfall was recorded.

During the period 12 July to 25 July (at Rolleston), temperatures were cool and ranged between 10.1° C and 22.4° C. No wind data is available from this station during this period. Relative humidity for this period averaged 90.6% and a total of 63.1 mm rainfall was recorded.

The October 2008 survey was conducted over a large area between the Expedition Range and Calliope Range. Weather statistics were taken from the Baralaba station as they were the most central records available for this section. Weather conditions for the October 2008 period were typical for this season in the region, with temperatures being warmer, ranging from 15.1 ° C to 29.5 ° C. Relative humidity for this period was 51.0 %. No wind data was available from this station during this period. A total of 3.2 mm of rainfall was recorded for the region for the month (BoM, 2008).

## **3.2 Survey Results**

This section documents the floristics and vegetation communities of the proposed gas transmission pipeline. Community descriptions and quantitative data, including floristics and structure for each survey site are detailed in Appendix A (Section A.3). A complete flora species list for all taxa identified is provided in Appendix B.

### **3.2.1 Species Diversity**

The field survey identified the presence of 302 taxa representing 74 families and 210 genera. Families represented by 3 or more genera included Amaranthaceae (4), Apocynaceae (3), Asclepiadaceae (4), Asteraceae (16), Caesalpiniaceae (3), Chenopodiaceae (5), Euphorbiaceae (8), Fabaceae (15), Lamiaceae (3), Malvaceae (3), Mimosaceae (3), Myrtaceae (7), Pittosporaceae (3), Poaceae (39), Rubiaceae (5), Rutaceae (3), Sapindaceae (4), and Verbenaceae (3).

Genera represented by 3 or more species included *Acacia* (18 species), *Alectryon* (3), *Aristida* (6), *Bothriochloa* (3), *Brachychiton* (3), *Calotis* (3), *Capparis* (3), *Corymbia* (7), *Cyperus* (3), *Eucalyptus* (12), *Hibiscus* (3), *Lomandra* (5), *Melaleuca* (5), *Sida* (3), and *Sporobolus* (3).

The survey identified 40 exotic taxa representing 16 families within the gas transmission pipeline corridor. Families with 3 or more exotic weed taxa include Asclepiadaceae (3), Asteraceae (7), Cactaceae (3), Poaceae (10), Verbenaceae (5). Weed species are discussed further in Section 3.2.3.

A full flora species list and a list of exotic species are provided in Appendix B.

## GLNG Environmental Values

### 3.2.2 Regional Ecosystems

Forty-seven REs were described and mapped along a 100 metre buffer either side of the gas transmission pipeline, based upon the field survey results and interpretation of aerial photo stereo images (Figure 4 to Figure 28). Table 3-1 details the total area of each community found within the 100 metre buffer of the gas transmission pipeline. It also shows the area for each vegetation community within each bioregion (as defined by RE types within the Brigalow Belt bioregion and the South-East Queensland bioregion). Community descriptions including floristics, structure, location, ecological integrity and disturbance notes are given in Appendix A (Section A.3).

**Table 3-1 Regional Ecosystems recorded within 100 m buffer of gas transmission pipeline**

RE	Community Description	Area within 100 m buffer (ha)	Area within Bioregion (ha) <sup>1</sup>	% of regional extent
11.1.2a	Estuarine wetlands. Bare mud flats on Quaternary estuarine deposits, with very isolated individual stunted mangroves	29.5	108,380	0.027
11.1.4a	Estuarine wetlands. <i>Rhizophora</i> spp. open-forest on Quaternary estuarine deposits	11.0	84,218	0.013
11.1.4c	Estuarine wetlands. <i>Ceriops tagal</i> , +/- <i>Avicennia marina</i> open forest on Quaternary estuarine deposits	5.3	84,218	0.006
11.3.2	<i>Eucalyptus populnea</i> woodland on alluvial plains	43.4	546,475	0.008
11.3.3	<i>Eucalyptus coolabah</i> woodland on alluvial plains	25.9	292,212	0.009
11.3.4	<i>Eucalyptus tereticornis</i> and/or <i>Eucalyptus</i> spp.	10.1	193,996	0.005
11.3.17	<i>Eucalyptus populnea</i> woodland with <i>Acacia harpophylla</i> and/or <i>Casuarina cristata</i> on alluvial plains	29.5	37,097	0.080
11.3.25	<i>Eucalyptus tereticornis</i> or <i>E. camaldulensis</i> woodland fringing drainage lines	111.6	488,417	0.023
11.3.26	<i>Eucalyptus moluccana</i> or <i>E. microcarpa</i> woodland to open forest on margins of alluvial plains	26.2	45,413	0.058
11.3.29	<i>Eucalyptus crebra</i> , <i>E. exserta</i> , <i>Melaleuca</i> spp. woodland on alluvial plains	22.0	31,662	0.070
11.4.8	<i>Eucalyptus cambageana</i> woodland to open forest with <i>Acacia harpophylla</i> or <i>A. argyrodendron</i> on Cainozoic clay plains	0.2	74,015	0.0003
11.4.9a	<i>Acacia harpophylla</i> , <i>Lysiphyllum carronii</i> ± <i>Casuarina cristata</i> open-forest to woodland.	0.1	100,830	0.00009
11.4.9	<i>Acacia harpophylla</i> shrubby open forest to woodland with <i>Terminalia oblongata</i> on Cainozoic clay plains	7.9	100,830	0.008
11.5.2	<i>Eucalyptus crebra</i> , <i>Corymbia</i> spp., with <i>E. moluccana</i> on lower slopes of Cainozoic sand plains/remnant surfaces	52.3	199,176	0.026

## GLNG Environmental Values

## Section 3

RE	Community Description	Area within 100 m buffer (ha)	Area within Bioregion (ha) <sup>1</sup>	% of regional extent
11.8.4	<i>Eucalyptus melanophloia</i> woodland on Cainozoic igneous rocks. Occurs on hillsides.	7.8	152,171	0.005
11.8.5	<i>Eucalyptus orgadophila</i> open woodland on Cainozoic igneous rocks	27	356,328	0.008
11.8.11 <sup>2</sup>	<i>Dichanthium sericeum</i> grassland on Cainozoic igneous rocks	2.4	179,308	0.001
11.9.2	<i>Eucalyptus melanophloia</i> ± <i>E. orgadophila</i> woodland on fine-grained sedimentary rocks	4	149,809	0.003
11.9.4b	<i>Acacia harpophylla</i> predominates and forms a fairly continuous canopy. Occurs on undulating plains and rises formed mainly on shale's.	14.2	58,895	0.024
11.9.5	<i>Acacia harpophylla</i> and/or <i>Casuarina cristata</i> open forest on fine-grained sedimentary rocks	24.9	147,136	0.017
11.9.9	<i>Eucalyptus crebra</i> woodland on fine-grained sedimentary rocks	0.9	122,371	0.0007
11.10.1	<i>Corymbia citriodora</i> open forest on coarse-grained sedimentary rocks	164.6	885,283	0.019
11.10.3	<i>Acacia catenulata</i> or <i>A. shirleyi</i> open forest on coarse-grained sedimentary rocks.	14.4	338,052	0.004
11.10.4	<i>Eucalyptus decorticans</i> , <i>Lysicarpus angustifolius</i> ± <i>Eucalyptus</i> spp., <i>Corymbia</i> spp., <i>Acacia</i> spp. woodland on coarse-grained sedimentary rocks, crests and scarps.	29.7	476,248	0.006
11.10.7	<i>Eucalyptus crebra</i> woodland on coarse-grained sedimentary rocks	140	285,459	0.049
11.10.8	Semi-evergreen vine thicket in sheltered habitats on medium to coarse-grained sedimentary rocks	0.8	9,322	0.009
11.10.12	<i>Eucalyptus populnea</i> woodland on medium to coarse-grained sedimentary rocks	8.7	55,554	0.016
11.10.13	<i>Eucalyptus</i> spp. and/or <i>Corymbia</i> spp. open forest on scarps and sandstone tablelands	130.1	391,919	0.033
11.10.13a	<i>Eucalyptus cloeziana</i> ± <i>E. melanoleuca</i> ± <i>Corymbia bunites</i> ± <i>E. sphaerocarpa</i> woodland to open-forest.	72.4	391,919	0.018
11.11.3	<i>Corymbia citriodora</i> , <i>Eucalyptus crebra</i> , <i>E. acmenoides</i> open forest on old sedimentary rocks with varying degrees of metamorphism and folding.	17	97,671	0.017
11.11.4	<i>Eucalyptus crebra</i> woodland on old sedimentary rocks with varying degrees of metamorphism and folding. Coastal ranges	5.6	69,519	0.008
11.11.4c	<i>Eucalyptus moluccana</i> dominated woodland	1.7	69,519	0.002

## GLNG Environmental Values

RE	Community Description	Area within 100 m buffer (ha)	Area within Bioregion (ha) <sup>1</sup>	% of regional extent
11.11.5	Microphyll vine forest ± <i>Araucaria cunninghamii</i> on old sedimentary rocks with varying degrees of metamorphism and folding	0.8	34,415	0.002
11.11.15	<i>Eucalyptus crebra</i> woodland on deformed and metamorphosed sediments and interbedded volcanics. Undulating plains.	173.5	532,990	0.033
11.11.18	Semi-evergreen vine thicket on old sedimentary rocks with varying degrees of metamorphism and folding. Lowlands	0.2	4,708	0.004
11.12.1	<i>Eucalyptus crebra</i> woodland on igneous rocks	74.9	854,512	0.009
11.12.3	<i>Eucalyptus crebra</i> , <i>E. tereticornis</i> , <i>Angophora leiocarpa</i> woodland on igneous rocks especially granite	3.9	54,685	0.007
11.12.6	<i>Corymbia citriodora</i> open forest on igneous rocks (granite)	12.5	157,059	0.008
11.12.17	<i>Eucalyptus populnea</i> woodland on igneous rocks. Colluvial lower slopes	2	2,397	0.083
12.1.2	Saltpan vegetation including grassland, hermland and sedgeland on marine clay plains	23.4	27,945	0.084
12.1.3	Mangrove shrubland to low closed forest. Occurs on Quaternary estuarine deposits.	21.6	51,220	0.042
12.3.1	Gallery rainforest (notophyll vine forest) on alluvial plains	0.2	9,055	0.002
12.3.3	<i>Eucalyptus tereticornis</i> woodland to open forest on alluvial plains	2.5	45,659	0.006
12.3.7	<i>Eucalyptus tereticornis</i> , <i>Melaleuca viminalis</i> , <i>Casuarina cunninghamiana</i> fringing forest	2.9	35,309	0.008
12.11.6	<i>Corymbia citriodora</i> , <i>Eucalyptus crebra</i> open forest on metamorphics ± interbedded volcanics	108.5	239,899	0.045
12.11.7	<i>Eucalyptus crebra</i> woodland on metamorphics ± interbedded volcanics	13.5	31,180	0.043
12.11.14	<i>Eucalyptus crebra</i> , <i>E. tereticornis</i> woodland on metamorphics ± interbedded volcanics	11.9	29,622	0.040
n/a	Cleared areas (e.g. improved pastures, cropping land or non-remnant regrowth vegetation)	7,081.5	n/a	n/a
<b>TOTAL</b>		<b>8,575</b>	n/a	n/a

1 Derived from RE data for each bioregion as per Accad *et al.* (2006)

2 - Grassland communities with > 50% cover of exotic species are not regulated under the EPBC Act (EPBC Act Administrative Guidelines on Significance, 2001). RE 11.8.11 was in poor condition during the sampling period and therefore in most cases would not have met the

## GLNG Environmental Values

## Section 3

criteria to be regulated under the EPBC Act. However the precautionary principle will be applied in this case as it is considered likely the grassland would meet EPBC Act requirements in better growing seasons.

The gas transmission pipeline corridor traverses predominantly cleared areas and approximately 83 % of the 425 km pipeline has been cleared of remnant vegetation. Cleared areas support a number of land uses including cropping and improved pasture for grazing.

The remnant vegetation that is present is largely restricted to the range crossings of the Calliope Range, Callide Range, Dawson Range, Expedition Range and Carnarvon Range (Figure 4 and Figure 5). Major watercourses such as the Dawson River have also retained a significant amount of remnant riparian vegetation. The mainland section of the gas transmission pipeline supports 47 REs. The Curtis Island section of the gas transmission pipeline supports six REs. All of the vegetation associations surveyed have been disturbed or modified to some degree by grazing, thinning, clearing for agriculture or weed invasion.

The most common RE along the mainland section of the gas transmission pipeline corridor was *Eucalyptus crebra* woodland on metamorphics (RE 11.11.15) which was recorded along several of the range crossings. This RE supported a canopy dominated by *Eucalyptus crebra* (narrow-leaved ironbark) with sub-dominant species including *Corymbia erythrophloia* (gum-topped bloodwood). The shrub layer was sparse and included *Alphitonia excelsa* (red ash), *Acacia disparrima* (hickory wattle) and *Acacia decora* (pretty wattle). The ground cover supports a diversity of grass and herb species including *Cymbopogon refractus* (barbwire grass), *Heteropogon contortus* (black speargrass) and *Cyanthillium cinereum* (vernonia).

The second most common RE was *Corymbia citriodora* open forest on coarse-grained sedimentary rocks (RE 11.10.1). This RE was recorded within several of the range crossings and was characterised by a tall canopy of *Corymbia citriodora* subsp. *citriodora* (lemon-scented gum). Sub-dominant canopy species included *Eucalyptus crebra* (narrow-leaved ironbark) and *Corymbia trachyphloia* (brown bloodwood). The shrub layer supports a number of species including *Alphitonia excelsa* (red ash), *Acacia leiocalyx* (black wattle), and *Cassinia laevis* (cough bush). Ground cover species included *Cymbopogon refractus* (barbwire grass), *Heteropogon contortus* (black speargrass) and *Lantana montevidensis* \* (creeping lantana).

Other common REs occurring on the range crossings included RE 11.10.7 (*Eucalyptus crebra* woodland on coarse-grained sedimentary rocks) and RE 11.10.13 (*Eucalyptus* spp. and/or *Corymbia* spp. open forest on scarps and sandstone tablelands).

The majority of the of the major creek crossings along the gas transmission pipeline corridor supported *Eucalyptus tereticornis* woodland fringing drainage lines (RE 11.3.25). This community is characterised by a tall canopy of *Eucalyptus tereticornis* (forest red gum). The mid-storey and shrub layers often supported *Casuarina cunninghamiana* (river sheoak), *Melaleuca bracteata* (black tea-tree), *Melaleuca linariifolia* (snow-in-summer) and *Callistemon viminalis* (weeping bottlebrush).

Within the Curtis Island section of the gas transmission pipeline corridor the hill top and mid-slope areas support open forest dominated by *Corymbia citriodora* subsp. *citriodora* (lemon-scented gum) (RE 12.11.6); and the lower slopes and coastal areas of low relief generally support grassy woodlands dominated by *Eucalyptus tereticornis* (forest red gum) and *Eucalyptus crebra* (narrow-leaved ironbark) (RE 12.11.14). The ground layer of RE 12.11.6 was found to be relatively sparse due to the rocky substrate and shallow soils exhibited on the slopes and hilly areas on the site.

Saltpan (RE 12.1.2 and 11.1.2a) and mangrove (RE 12.1.3 and 11.1.4) communities were present along the sheltered intertidal zones at the western side of Curtis Island (Hamilton Point) and along the mainland route along the western side of The Narrows. Saltpan species included *Enchylaena tomentosa* (ruby saltbush) and *Sarcocornia quinqueflora* (beadweed). Mangrove species included *Avicennia marina* (grey mangrove),

## GLNG Environmental Values

*Rhizophora stylosa* (spotted mangrove) *Exoecaria agallocha* (milky mangrove), and *Lumnitzera racemosa* (black mangrove). Environmental values of the intertidal zone are detailed further in the Marine Flora and Fauna section of the EIS report.

### 3.2.3 Weeds of Concern

Of the 40 exotic weed species recorded in this survey of the gas transmission pipeline, 10 are declared species under the Queensland *Land Protection (Pest and Stock Route Management) Act, 2002* (Table 3-2). Three of these species (rubber vine, lantana and parthenium) are also listed as Weeds of National Significance (WONS). WONS are exotic weed species identified as causing significant environmental damage on a national scale (Thorp and Lynch, 2000). All exotic weed species identified in this study are listed within the full flora species list in Appendix B. The locations of declared weeds recorded during the field survey are shown in Figures 4 – 28.

**Table 3-2 Declared exotic weeds present along gas transmission pipeline**

Species	Common Name	State/Federal Declared Status <sup>1</sup>	Regional Ecosystems affected
<i>Bryophyllum delagoense</i> *	Mother of millions	Class 2	11.3.25
<i>Celtis sinensis</i> *	Chinese celtis	Class 3	11.3.25
<i>Cryptostegia grandiflora</i> *	rubber vine	Class 2/WONS	11.3.25; 12.11.7
<i>Eriocereus martinii</i> *	harrisia cactus	Class 2	12.11.6
<i>Lantana camara</i> *	Lantana	Class 3/WONS	11.12.1; 11.11.3; 11.10.1; 11.3.25; 12.11.6
<i>Lantana montevidensis</i> *	creeping lantana	Class 3	11.9.9; 11.10.1; 11.11.15; 11.11.3; 11.12.17; 11.3.25
<i>Macfadyena unguis-cati</i> *	cat's claw creeper	Class 3	11.3.25
<i>Opuntia stricta</i> var. <i>stricta</i> *	prickly pear	Class 2	11.3.25; 12.11.7; 12.11.14
<i>Opuntia tomentosa</i> *	velvety tree pear	Class 2	11.3.3; 11.3.4; 11.3.25; 11.9.2; 11.10.11; 11.11.3; 12.11.6
<i>Parthenium hysterophorus</i> *	parthenium	Class 2/WONS	11.3.25; 11.3.3; 11.8.5.

<sup>1</sup> Status under the Queensland *Land Protection (Pest and Stock Route Management) Act, 2002* and Weeds of National Significance.

#### **Mother of Millions**

*Bryophyllum delagoense* \* (mother-of-millions) was found within the riparian RE 11.3.25 in low numbers. The species was recorded at only two locations near the Callide River. The species is an escaped ornamental plant originating from Madagascar. The species is highly toxic to stock and is well adapted to dry areas because of its succulent features (DPI, 2008).



**Chinese Elm**

*Celtis sinensis* \* (Chinese celtis) was only found at one site east of the Callide River where it occurred in the riparian RE 11.3.25. The species is an Asian tree that is naturalised throughout most of south-east Queensland. The fast growing species forms dense infestations along creek banks and prevents regeneration of native riparian vegetation. It also has the potential to affect populations of native animals through habitat destruction (DPI, 2008).

**Rubber Vine**

*Cryptostegia grandiflora*\* (rubber vine) was found within or close to riparian RE 11.3.25. The species was recorded at five locations all at the eastern end of the mainland gas transmission pipeline section or on Curtis Island. Rubber vine is a Weed of National Significance and is regarded as one of the worst weeds in Australia because of its invasiveness, potential for spread, and economic and environmental impacts. Rubber vine is a native of south-west Madagascar, although the exact date of its introduction into Australia is not known.

Rubber vine is a woody perennial vine that colonises areas aggressively, forming impenetrable thickets which smother vegetation. It prefers areas where annual rainfall is between 400 mm and 1400 mm, and is well adapted to a monsoonal climate. Rubber vine was declared a noxious weed in Queensland in 1955. It is now present across 20 per cent of the state and densely infests over 700,000 hectares (DNRME, 2004).

**Harrisia Cactus**

*Eriocereus martinii* \* (harrisia cactus) was recorded from one location in RE 12.11.6. The species is a native of South America and was introduced to Queensland as a pot plant in the 1890s. Dense infestations choke out pasture and the sharp spines, even in light infestations, make pasture unfavourable to stock (DPI, 2008).

**Creeping Lantana**

*Lantana montevidensis* \* (creeping lantana) was common over the gas transmission pipeline corridor and was particularly abundant within the range crossings, where it is well adapted to the dry rocky conditions. The species is a popular ornamental plant but is considered a weed when in natural ecosystems. Creeping lantana occurs in coastal and sub-coastal Queensland and as far south as Sydney. It is similar to lantana but does not have thorns, has mainly pink or purple flowers and trails along the ground, only growing to a height of half a metre. It is known to be toxic to sheep and cattle if ingested (Parsons and Cuthbertson, 2001) and readily displaces native vegetation (Anderson, 1993).

**Lantana**

*Lantana camara* \* (lantana) was widespread along the gas transmission pipeline corridor, particularly within riparian areas. Lantana is a Weed of National Significance and is regarded as one of the worst weeds in Australia. Lantana forms dense, impenetrable thickets that take over native bushland and pastures throughout the east coast of Australia. It competes for resources with, and reduces the productivity of, pastures and forestry plantations. It adds fuel to fires, and is toxic to stock (Weed Management CRC, 2003).

**Cat's Claw Creeper**

*Macfadyena unguis-cati* \* (cat's claw creeper) was recorded at one site within RE 11.3.25 on the Calliope River. This species is a native of tropical America, and is an aggressive climber that has been used as an ornamental in older-style Queensland gardens. This vine has the ability to completely smother native vegetation and many bushland areas already have serious infestations of this weed (DPI, 2008).



## GLNG Environmental Values

### **Prickly Pear and Velvety Tree Pear**

*Opuntia stricta* var. *stricta*\* (prickly pear) and *Opuntia tomentosa*\* (velvety tree pear) were found in a number of vegetation communities along the gas transmission pipeline, although densities were consistently low. These species were introduced into pastoral districts in the 1840's and by 1925 the pest had invaded over 24 million hectares. The introduction of the moth, *Cactoblastis cactorum*, in the 1920's controlled the pest, and by the mid-1930's, prickly pear was no longer a major problem (DNRW, 2006).

### **Parthenium**

*Parthenium hysterophorus*\* (parthenium) was found at several sites within and adjacent to cropping areas. The species was most common near the Dawson River. Native to South and North America, parthenium is an annual herb with a deep tap root and an erect stem that becomes woody with age. The species invades pastures, disturbed bare areas along roadsides, and heavily stocked areas around yards and watering points (DPI 2008).

## 3.2.4 Vegetation of Significance

### **Conservation Significant Species**

The desktop literature review (refer Appendix A (section A.1)) identified 68 flora species of conservation significance as being potentially present along the gas transmission pipeline. Locations of conservation significant species identified within the HERBRECS database search are presented in Figures 1-3.

Fifteen of the 68 potentially occurring species were considered either 'possible' or 'likely' to be present within the gas transmission pipeline corridor based upon their known distribution or habitat requirements and were targeted as part of the field survey effort.

Two flora species of conservation significance were identified from the field survey: *Cycas megacarpa* and *Acacia pedleyi* (Table 3-3). Voucher specimens of these two species were sent to the Queensland Herbarium to confirm identification (Herbarium reference numbers MBT:AS 869/08 and DM:mh 1321/08). The locations where these two species were recorded are shown in Figures 19, 20 and 21.

**Table 3-3 Conservation Significant species recorded from gas transmission pipeline**

Species Name	NC Act Status	EPBC Act Status
<i>Cycas megacarpa</i>	Endangered	Endangered
<i>Acacia pedleyi</i>	Rare	-

### ***Acacia pedleyi***

*Acacia pedleyi* is a wattle that is listed as Rare under the Queensland NC Act and is not listed under the Commonwealth EPBC Act. The species is a slender, erect tree to 10 m high with predominantly smooth bark and dark green, feathery leaves (Maslin, 2001). This species tends to grow in red loamy soil on slopes and ridge tops, in open eucalypt forest or woodland and is endemic to the Callide and Calliope Ranges in the Port Curtis District, Queensland (Maslin, 2001). The extent of *Acacia pedleyi* populations known from the area based upon HERBRECS data is provided in Figures 1-3.

*Acacia pedleyi* was identified from only one location along the gas transmission pipeline corridor within the Callide Range (Figure 16) where it was observed as an uncommon shrub layer species.

### ***Cycas megacarpa***

The cycad *Cycas megacarpa* is listed as Endangered under both the Queensland NC Act and the Commonwealth EPBC Act. *Cycas megacarpa* is endemic to central Queensland although its distribution is restricted, occurring from Bouldercombe in the north, to near Woolooga in the south, in woodland or open woodland dominated by eucalypts (Queensland Herbarium, 2007). A Central Queensland University investigation (CQU, 2007) recorded four separate communities of *Cycas megacarpa* within the Calliope Ranges, although the study was not extensive throughout the area. The extent of *Cycas megacarpa* populations known from the area based upon HERBRECS data is provided in Figures 1-3.

*Cycas megacarpa* has a slender trunk to about 5 metres tall and ranges from 8 cm to 14 cm in diameter. The leaves are 70 cm to 110 cm long, with 120 to 170 leaflets. The seeds are ovoid in shape, green becoming yellowish, pinkish or purplish as they mature (Queensland Herbarium, 2007). A national multi-species recovery plan has been developed for six cycad species known to Queensland, including *Cycas megacarpa* (Queensland Herbarium, 2007). The objectives of this recovery plan are to “prevent further loss of individuals, populations, pollinator species and habitat critical to the species survival; and to recover existing populations to normal reproductive capacity to ensure viability in the long-term, prevent extinction, maintain genetic viability, and improve conservation status”.

*Cycas megacarpa* was recorded from three locations within the Callide and Calliope Ranges (Figures 16, 17 and 18). Based upon incidental observations of the species as part of this survey and mapping presented within the Central Queensland University investigation (CQU, 2007) the gas transmission pipeline corridor avoids the core populations of this species within the ranges, and intersects the margins of the populations where plant densities are lower.

#### Other Potentially Occurring Conservation Significant Species

*Cadellia pentastylis* (Ooline tree) was anecdotally recorded at one property within the Arcadia Valley (Figure 7) (“Huntly” property landholder, pers. comm., 2008). The species was identified within the desktop review as being likely within the region but was not observed during the field survey. This species is listed as Vulnerable under the NC Act and EPBC Act. *Cadellia pentastylis* is known to occur on ridges and undulating terrain in pure stands or with brigalow or semi-evergreen vine thicket. Distribution is north from near Gunnedah to Carnarvon Range and Callide Valley (south-west of Rockhampton).

The exact location of the species within the property is not known, however the gas transmission pipeline is restricted to cleared areas of this property and as such any individuals of this species present will not be affected by the pipeline.

In addition to the three conservation significant species discussed above the literature review (Appendix A.1) identifies 12 species that are considered ‘likely’ or ‘possible’ occurrences within the gas transmission pipeline corridor. ‘Likely’ occurrences are identified as *Acacia pubicosta*, *Gossypium sturtianum* and *Macrozamia fearnsidei*. ‘Possible’ occurrences are identified as *Alyxia sharpei*, *Apatophyllum teretifolium*, *Aponogeton queenslandicus*, *Desmodium macrocarpum*, *Dichanthium queenslandicum*, *Grevillea cyranostigma*, *Grevillea hockingsii*, *Homoranthus decasetus*, and *Wahlenbergia islensis*. None of these additional species were recorded during field surveys however their presence cannot be categorically ruled out.

#### Culturally Significant Species

Within the gas transmission pipeline corridor many flora species of cultural significance were identified including species traditionally utilised for food or medicinal purposes, painting or decoration. Common bush tucker foods identified include *Avicennia marina* (grey mangrove), *Carissa ovata* (currant bush), *Dianella* species, *Eustrephus latifolius* (wombat berry), *Ficus* species, *Lomandra multiflora* (many-flowered mat rush), *Marsilea*

## GLNG Environmental Values

*hirsuta* (short-fruit nardoo), *Melaleuca* species, *Portulaca olearacea* (pigweed) and *Sarcocornia quinqueflora* (bead weed). Species of cultural value to the indigenous traditional owners of the area are discussed within gas transmission pipeline Cultural Heritage Report.

### Commercially Significant Species

Many of the woodland species identified over the gas transmission pipeline corridor are considered a potential commercial resource and suitable timber for flooring, telephone poles and other wood products. Commercial timber sources found within the study area include *Corymbia citriodora* subsp. *citriodora* (lemon-scented gum), used for saw logs, fencing material, firewood, turnery, power poles and house poles; *Eucalyptus crebra* (narrow-leaved ironbark), used for power poles, house poles, fencing, and firewood; and *Eucalyptus tereticornis* (forest red gum), used for saw logs, power poles, posts, fencing material and firewood (Taylor and Williamson, 2000).

### Marine Plants

All areas supporting "marine plants" are protected under the Queensland *Fisheries Act 1994*. Under the *Fisheries Act 1994*, the term "marine plant" includes plants that usually grow on, or adjacent to tidal lands. For the gas transmission pipeline this will include all areas of mangrove and saltmarsh communities occurring along The Narrows, including RE 12.1.2, RE 12.1.3, RE 11.1.2 and RE 11.1.4. This may also include plants such as *Melaleuca* species (paper barks) and *Casuarina* species (she-oaks) that occur in adjoining alluvial REs.

### Significant Regional Ecosystems

Eighteen REs recorded within the 100 metre buffer each side of the gas transmission pipeline are identified as having either 'Of Concern' or 'Endangered' Vegetation Management Status (VM Status) and 'Of Concern' or 'Endangered' biodiversity status. Nine of these vegetation communities are also listed under the EPBC Act as 'Endangered'. The conservation status of these communities is detailed in Table 3-4.

**Table 3-4 Significant Vegetation Communities recorded within 100 m buffer along gas transmission pipeline**

RE	Community Description	VM Status	Biodiversity Status	EPBC Act Status
11.3.2	<i>Eucalyptus populnea</i> woodland on alluvial plains	Of Concern	Of Concern	-
11.3.3	<i>Eucalyptus coolabah</i> woodland on alluvial plains	Of Concern	Of Concern	-
11.3.4	<i>Eucalyptus tereticornis</i> and/or <i>Eucalyptus</i> spp.	Of Concern	Of Concern	-
11.3.17	<i>Eucalyptus populnea</i> woodland with <i>Acacia harpophylla</i> and/or <i>Casuarina cristata</i> on alluvial plains	Of Concern	Endangered	-
11.3.25	<i>Eucalyptus tereticornis</i> or <i>E. camaldulensis</i> woodland fringing drainage lines	Not of Concern	Of Concern	-
11.4.8	<i>Eucalyptus cambageana</i> woodland to open forest with <i>Acacia harpophylla</i> or <i>A. argyrodendron</i> on Cainozoic clay plains	Endangered	Endangered	Endangered
11.4.9a	<i>Acacia harpophylla</i> , <i>Lysiphyllum carronii</i> ± <i>Casuarina cristata</i> open-forest to woodland.	Endangered	Endangered	Endangered

## GLNG Environmental Values

## Section 3

RE	Community Description	VM Status	Biodiversity Status	EPBC Act Status
11.4.9	<i>Acacia harpophylla</i> shrubby open forest to woodland with <i>Terminalia oblongata</i> on Cainozoic clay plains	Endangered	Endangered	Endangered
11.8.11	<i>Dichanthium sericeum</i> grassland on Cainozoic igneous rocks	Of Concern	Of Concern	Endangered <sup>1</sup>
11.9.4	Semi-evergreen vine thicket on fine grained sedimentary rocks	Endangered	Endangered	Endangered
11.9.5	<i>Acacia harpophylla</i> and/or <i>Casuarina cristata</i> open forest on fine-grained sedimentary rocks	Endangered	Endangered	Endangered
11.10.8	Semi-evergreen vine thicket in sheltered habitats on medium to coarse-grained sedimentary rocks	Of Concern	Of Concern	-
11.11.18	Semi-evergreen vine thicket on old sedimentary rocks with varying degrees of metamorphism and folding. Lowlands	Endangered	Endangered	Endangered
11.12.3	<i>Eucalyptus crebra</i> , <i>E. tereticornis</i> , <i>Angophora leiocarpa</i> woodland on igneous rocks especially granite	Not of Concern	Of Concern	-
11.12.17	<i>Eucalyptus populnea</i> woodland on igneous rocks. Colluvial lower slopes	Endangered	Endangered	-
12.3.1	Gallery rainforest (notophyll vine forest) on alluvial plains	Endangered	Endangered	-
12.3.3	<i>Eucalyptus tereticornis</i> woodland to open forest on alluvial plains	Endangered	Endangered	-
12.11.14	<i>Eucalyptus crebra</i> , <i>E. tereticornis</i> woodland on metamorphics ± interbedded volcanics	Of Concern	Of Concern	-

### 3.2.5 Regional Connectivity

Regional connectivity provided by vegetation along the gas transmission pipeline is detailed within the gas transmission pipeline fauna report.

## Potential Impacts and Mitigation Measures

### 4.1 Potential Impacts

#### 4.1.1 Proposed Development

To minimise impacts to remnant vegetation the gas transmission pipeline corridor was closely aligned with the existing Queensland Gas Pipeline (QGP) for much of its length (approximately 100 km), with the exception of the section north of Injune where the preferred corridor will traverse the Arcadia Valley. The gas transmission pipeline will approach Gladstone from the north and will pass through the Gladstone State Development Area (GSDA), before crossing Port Curtis at The Narrows to Curtis Island. To cross Port Curtis the gas transmission pipeline will be trenched into the seabed and overlain with a protective rock cover. The length of this route is 425 km.

The gas transmission pipeline will be buried for its entire length. It will be designed so that current land use activities will be able to continue after the pipe has been installed. Typical cover depth will be 750 mm – 2,000 mm depending on location.

Typical construction procedures and activities include:

- Survey of the pipeline route;
- Provision of access tracks and temporary facilities;
- Clear and grade of the right-of-way (ROW) including vegetation removal;
- Trenching;
- Pipe stringing and bending;
- Pipe welding;
- Pipe placement in the trench (lowering in and laying);
- Hydro-testing; and
- Rehabilitation.

The clearing of remnant vegetation within the pipeline right of way (ROW) will provide the greatest impacts to flora. The pipeline ROW width will be 30 m on both the mainland and Curtis Island. The Curtis Island easement will however also accommodate a road and power line and be a total width of 100 m.

#### 4.1.2 Vegetation Disturbance

The clearance of the gas transmission pipeline ROW will result in the disturbance of 1,342.7 ha of land which will include approximately 258 ha of remnant vegetation. A breakdown of the disturbance to REs as a result of this clearing is presented below in Table 4-1. The table also shows the disturbance to each community as a percentage of the RE within the bioregion.

## Potential Impacts and Mitigation Measures

## Section 4

**Table 4-1 Proposed area of vegetation communities to be removed from the gas transmission pipeline**

RE	Community Description	VM Status	Biodiversity Status	EPBC Act Status	Ha Cleared <sup>1</sup>	Area within Bioregion (ha) <sup>2</sup>	% of Bioregion Extent
11.1.2a	Estuarine wetlands. Bare mud flats on Quaternary estuarine deposits, with very isolated individual stunted mangroves	Not of Concern	No concern at present	-	4.7	108,380	0.004
11.1.4a	Estuarine wetlands. <i>Rhizophora</i> spp. open-forest on Quaternary estuarine deposits	Not of Concern	No concern at present	-	2.0	84,218	0.002
11.1.4c	Estuarine wetlands. <i>Ceriops tagal</i> , +/- <i>Avicennia marina</i> open forest on Quaternary estuarine deposits	Not of Concern	No concern at present	-	0.6	84,218	0.001
11.3.2	<i>Eucalyptus populnea</i> woodland on alluvial plains	Of Concern	Of Concern	-	6.2	546,475	0.001
11.3.3	<i>Eucalyptus coolabah</i> woodland on alluvial plains	Of Concern	Of Concern	-	1.4	292,212	0.0005
11.3.4	<i>Eucalyptus tereticornis</i> and/or <i>Eucalyptus</i> spp.	Of Concern	Of Concern	-	0.9	193,996	0.0005
11.3.17	<i>Eucalyptus populnea</i> woodland with <i>Acacia harpophylla</i> and/or <i>Casuarina cristata</i> on alluvial plains	Of Concern	Endangered	-	4.2	37,097	0.01
11.3.25	<i>Eucalyptus tereticornis</i> or <i>E. camaldulensis</i> woodland fringing drainage lines	Not of Concern	Of Concern	-	13.6	488,417	0.003
11.3.26	<i>Eucalyptus moluccana</i> or <i>E. microcarpa</i> woodland to open forest on margins of alluvial plains	Not of Concern	No concern at present	-	4.6	45,413	0.01

## Potential Impacts and Mitigation Measures

RE	Community Description	VM Status	Biodiversity Status	EPBC Act Status	Ha Cleared <sup>1</sup>	Area within Bioregion (ha) <sup>2</sup>	% of Bioregion Extent
11.3.29	<i>Eucalyptus crebra</i> , <i>E. exserta</i> , <i>Melaleuca</i> spp. woodland on alluvial plains	Not of Concern	No concern at present	-	3.4	31,662	0.011
11.4.9	<i>Acacia harpophylla</i> shrubby open forest to woodland with <i>Terminalia oblongata</i> on Cainozoic clay plains	Endangered	Endangered	Endangered	1.2	100,830	0.001
11.5.2	<i>Eucalyptus crebra</i> , <i>Corymbia</i> spp., with <i>E. moluccana</i> on lower slopes of Cainozoic sand plains/remnant surfaces	Not of Concern	No concern at present	-	6.3	199,176	0.003
11.8.4	<i>Eucalyptus melanophloia</i> woodland on Cainozoic igneous rocks. Occurs on hillsides.	Not of Concern	No concern at present	-	0.3	152,171	0.0002
11.8.5	<i>Eucalyptus orgadophila</i> open woodland on Cainozoic igneous rocks	Not of Concern	No concern at present	-	4	356,328	0.001
11.9.2	<i>Eucalyptus melanophloia</i> ± <i>E. orgadophila</i> woodland on fine-grained sedimentary rocks	Not of Concern	No concern at present	-	0.5	149,809	0.0003
11.9.4	Semi-evergreen vine thicket on fine grained sedimentary rocks	Endangered	Endangered	Endangered	2.1	58,895	0.004
11.9.5	<i>Acacia harpophylla</i> and/or <i>Casuarina cristata</i> open forest on fine-grained sedimentary rocks	Endangered	Endangered	Endangered	3.5	147,136	0.002
11.9.9	<i>Eucalyptus crebra</i> woodland on fine-grained sedimentary rocks	Not of Concern	No concern at present	-	0.1	122,371	0.00008



## Potential Impacts and Mitigation Measures

## Section 4

RE	Community Description	VM Status	Biodiversity Status	EPBC Act Status	Ha Cleared <sup>1</sup>	Area within Bioregion (ha) <sup>2</sup>	% of Bioregion Extent
11.10.1	<i>Corymbia citriodora</i> open forest on coarse-grained sedimentary rocks	Not of Concern	No concern at present	-	25.5	885,283	0.003
11.10.3	<i>Acacia catenulata</i> or <i>A. shirleyi</i> open forest on coarse-grained sedimentary rocks	Not of Concern	No concern at present	-	1.3	338,052	0.0004
11.10.4	<i>Eucalyptus decorticans</i> , <i>Lysicarpus angustifolius</i> ± <i>Eucalyptus</i> spp., <i>Corymbia</i> spp., <i>Acacia</i> spp. woodland on coarse-grained sedimentary rocks, crests and scarps	Not of Concern	No concern at present	-	5	476,248	0.001
11.10.7	<i>Eucalyptus crebra</i> woodland on coarse-grained sedimentary rocks	Not of Concern	No concern at present	-	19.9	285,459	0.007
11.10.12	<i>Eucalyptus populnea</i> woodland on medium to coarse-grained sedimentary rocks	Not of Concern	No concern at present	-	1.3	55,554	0.002
11.10.13	<i>Eucalyptus</i> spp. and/or <i>Corymbia</i> spp. open forest on scarps and sandstone tablelands	Not of Concern	No concern at present	-	20.3	391,919	0.005
11.10.13 a	<i>Eucalyptus cloeziana</i> ± <i>E. melanoleuca</i> ± <i>Corymbia bunites</i> ± <i>E. sphaerocarpa</i> woodland to open-forest.	Not of Concern	No concern at present	-	11	391,919	0.003
11.11.3	<i>Corymbia citriodora</i> , <i>Eucalyptus crebra</i> , <i>E. acmenoides</i> open forest on old sedimentary rocks with varying degrees of metamorphism and folding.	Not of Concern	No concern at present	-	2.5	97,671	0.003

## Potential Impacts and Mitigation Measures

RE	Community Description	VM Status	Biodiversity Status	EPBC Act Status	Ha Cleared <sup>1</sup>	Area within Bioregion (ha) <sup>2</sup>	% of Bioregion Extent
11.11.15	<i>Eucalyptus crebra</i> woodland on deformed and metamorphosed sediments and interbedded volcanics. Undulating plains.	Not of Concern	No concern at present	-	25.1	532,990	0.005
11.12.1	<i>Eucalyptus crebra</i> woodland on igneous rocks	Not of Concern	No concern at present	-	9.7	854,512	0.001
11.12.6	<i>Corymbia citriodora</i> open forest on igneous rocks (granite)	Not of Concern	No concern at present	-	1.7	157,059	0.001
12.1.2	Saltpan vegetation including grassland, hermland and sedgeland on marine clay plains	Not of Concern	No concern at present	-	6.9	27,945	0.025
12.1.3	Mangrove shrubland to low closed forest. Occurs on Quaternary estuarine deposits.	Not of Concern	No concern at present	-	4.3	51,220	0.008
12.3.3	<i>Eucalyptus tereticornis</i> woodland to open forest on alluvial plains	Endangered	Endangered	-	0.7	45,659	0.002
12.11.6	<i>Corymbia citriodora</i> , <i>Eucalyptus crebra</i> open forest on metamorphics ± interbedded volcanics	Not of Concern	No concern at present	-	50.9	239,899	0.021
12.11.7	<i>Eucalyptus crebra</i> woodland on metamorphics ± interbedded volcanics	Not of Concern	No concern at present	-	7.8	31,180	0.025
12.11.14	<i>Eucalyptus crebra</i> , <i>E. tereticornis</i> woodland on metamorphics ± interbedded volcanics	Of Concern	Of Concern	-	4.7	29,622	0.015
n/a	Cleared areas (e.g. improved pastures, cropping land or non-remnant regrowth vegetation).	n/a	n/a	n/a	1,084.5	n/a	n/a

## Potential Impacts and Mitigation Measures

## Section 4

RE	Community Description	VM Status	Biodiversity Status	EPBC Act Status	Ha Cleared <sup>1</sup>	Area within Bioregion (ha) <sup>2</sup>	% of Bioregion Extent
<b>TOTAL</b>					<b>1,342.7</b>	-	-

<sup>1</sup> Hectare cleared based upon 30 m ROW within mainland pipeline section and 30 m ROW plus 70 m road and services corridor within Curtis Island section

<sup>2</sup> Indicates disturbed % of vegetation community within the relevant Brigalow Belt bioregion or South-east Queensland bioregion as per Accad *et. al.* (2006)

Non-remnant areas including improved pastures, cropping land and regrowth vegetation are to be subjected to the majority of proposed disturbance (1,084.5 ha). This represents 81.0% of the total area of disturbance.

Of the remnant vegetation to be cleared, the vegetation community of *Corymbia citriodora*, *Eucalyptus crebra* open forest on metamorphics ± interbedded volcanics (RE 12.11.6) is to be subjected to the majority of proposed disturbance (50.9 ha). This disturbance represents 0.021 % of this community within the bioregion. This vegetation community has no current conservation significance under state or commonwealth legislation.

Vegetation communities representing the second and third greatest area of clearance are *Corymbia citriodora* open forest on coarse-grained sedimentary rocks (RE 11.10.1) and *Eucalyptus crebra* woodland on deformed and metamorphosed sediments and interbedded volcanics (RE 11.11.15). It is estimated that 25.5 ha and 25.1 ha of these REs is proposed to be cleared respectively. This disturbance represents 0.003 % and 0.005 % of these REs within the bioregion respectively. These communities have no current conservation significance under state or commonwealth legislation.

The vegetation community of *Eucalyptus crebra* woodland on metamorphics ± interbedded volcanics (RE 12.11.7) is subject to the greatest disturbance when viewed as a percentage of the bioregional extent (0.025%). Approximately 7.8 ha of this RE is proposed to be cleared. This vegetation community has no current conservation significance under state or commonwealth legislation.

### **Significant Regional Ecosystems**

Of the Endangered REs recorded along the gas transmission pipeline corridor, the community subjected to the highest amount of clearing is *Acacia harpophylla* and/or *Casuarina cristata* open forest on fine-grained sedimentary rocks (RE 11.9.5). This community is listed as 'Endangered' under both the VM Act and EPBC Act. Approximately 3.5 ha of this community will potentially be cleared. This disturbance represents 0.002% of this community found within the bioregion.

The second greatest area of clearance of a significant RE will be Semi-evergreen vine thicket on fine grained sedimentary rocks (RE 11.9.4). This community is listed as 'Endangered' under both the VM Act and EPBC Act. Approximately 2.1 ha of this community will potentially be cleared. This disturbance represents 0.004% of this community found within the bioregion.

### **Ecological Integrity of Impacted Communities**

Vegetation of the gas transmission pipeline corridor has a long history of disturbance including grazing, thinning and exotic weed invasion. The area supports remnant vegetation, modified woodlands and non-remnant shrubby regrowth and cleared land. All areas of remnant vegetation investigated have been disturbed by human activity to some degree. Despite the relatively high degree of past disturbance, the ecological integrity of

## Potential Impacts and Mitigation Measures

remnant communities along the gas transmission pipeline corridor was found to be moderate, with integral ecological processes intact.

The highest levels of ecological integrity occur within the range crossings where the steep terrain has offered some protection to remnant vegetation from repeated clearing. However even within these areas weed species are common and species such as *Lantana montevidensis* \* (creeping lantana) have reduced native species diversity significantly. Creek crossings also generally support higher levels of ecological integrity than surrounding areas, however these crossings are still often degraded by grazing and weed invasion.

### **Cumulative Impacts**

Although the proposed overall clearing of vegetation communities along the gas transmission pipeline is generally minor, the cumulative impacts of external proposed development within the region must also be taken into account. This issue is addressed in further detail in the Cumulative Impacts Section.

### **4.1.3 Impacts to Conservation Significant Species**

Further surveys of the areas known to support conservation significant species are proposed to be undertaken as part of the Phase 2 pre-construction surveys (Section 4.2.2). The aims of these surveys will be to gain more accurate data on population size and extent of these species within the area of proposed disturbance. However, based upon the EIS field surveys the potential impacts are discussed below.

The gas transmission pipeline avoids the main populations of *Cycas megacarpa* within the Callide and Calliope Ranges, however it is likely that a number of individuals will be present within the proposed 30 metre wide ROW and as such would require removal. Given the number of species within the local area combined within the potential for successful relocation of individuals affected (Section 4.2.3) this is not expected to have a significant impact upon the species.

*Acacia pedleyi* was only recorded in low numbers from one location along the pipeline. The desktop searches conducted for the pipeline (Appendix A) indicated the presence of 16 populations of the species within a 5 km buffer of the pipeline, indicating the species is relatively widespread within the area. Therefore, it is considered the potential impact to the species from the clearing of this one area is minor.

A clearing permit will be required under the NC Act where clearance of these species cannot be avoided. DEWHA approval will also be required for the removal of *Cycas megacarpa*.

### **4.1.4 Dust Impacts**

Deposition of dust, sand and soil may have potential impacts on vegetation if excessive levels are sustained over extended periods. When dust settles on plant foliage, it can reduce the amount of light penetration on the leaf surface, block and damage stomata, and slow rates of gas exchange and water loss. Reduction in the ability to photosynthesise due to physical effects may result in reduced growth rates of vegetation and decreases in floral vigour and overall community health. The potential effects of dust deposition on vegetation are determined by a number of factors including:

- The characteristics of leaf surfaces, such as surface roughness, influencing the rate of dust deposition on vegetation;
- Concentration and size of dust particles in the ambient air and its associated deposition rates; and
- Local meteorological conditions and the degree of penetration of dust into vegetation;

## Potential Impacts and Mitigation Measures

## Section 4

The dominant woodland species of the vegetation communities along the gas transmission pipeline corridor typically exhibit physiological qualities that are not sensitive to dust deposition. The sclerophyllous foliage of *Eucalyptus* and *Corymbia* species is generally pendulous (i.e. points down), with a thick smooth cuticle that does not encourage particulate matter to remain on the surface. The dominant woodland species are also generally hardy and well adapted to adverse conditions (e.g. extended dry conditions and low nutrient soils).

There is evidence however, that carbon dioxide exchange in mangroves may be inhibited by increased dust deposition. The mangrove *Avicennia marina* (grey mangrove), as found in the proposed gas transmission pipeline intertidal zone on and adjacent to Curtis Island, has been shown to demonstrate reduced carbon dioxide exchange of the upper and lower leaf surfaces and thus reduced photosynthetic performance of leaves coated in coal dust (Naidoo & Chirkoot, 2004). This result is exacerbated by the presence of sticky brine secreted by salt glands. Although no significant long term dust deposition is anticipated from the gas transmission pipeline construction program, the vulnerability of mangroves to dust deposition should be highlighted.

Control measures will be implemented to minimise dust generation during the construction and operational phases of the gas transmission pipeline development, and it is not expected that potential effects of dust deposition on vegetation within close proximity to transmission pipeline operations will be significant.

### 4.1.5 Fragmentation

Details on fragmentation of native vegetation and its impacts from the proposed pipeline construction are discussed in the gas transmission pipeline fauna report.

### 4.1.6 Impact to Marine Plants

The potential clearing of marine plants may affect the following REs: RE 12.1.2, RE 12.1.3, RE 11.1.2 and RE 11.1.4. An application to clear these marine plants will be required under the *Fisheries Act 1994*. Impacts to marine plants are detailed within Section 8.4.4.4 of the EIS (Marine Flora and Fauna: Potential Impacts and Mitigation Measures).

### 4.1.7 Weed Impacts

Desktop and field studies have confirmed the presence of the declared weeds *Parthenium hysterophorus*\* (parthenium), *Opuntia tomentosa*\* (velvety tree pear), *O. stricta*\* (prickly pear), *Bryophyllum delagoense*\* (mother of millions), *Celtis sinensis*\* (Chinese celtis), *Cryptostegia grandiflora*\* (rubber vine), *Eriocereus martinii*\* (harissia cactus), *Lantana camara*\* (lantana), *Lantana montevidensis*\* (creeping lantana) and *Macfadyena unguis-cati*\* (cat's claw creeper) within the gas transmission pipeline corridor. Of these species, parthenium has the greatest potential to impact upon grazing and ecological values in the area. The majority of the corridor remains free of parthenium. However, the weed could easily be introduced to new areas through poor weed hygiene practices. Introduction to areas previously free of infestations could cause major impacts including loss of grazing potential, reduction in habitat value and increase in risk to human health.

### 4.1.8 Edge Effects

The fragmentation and modification of ecosystems following land clearing can lead to changes in physical edge effects (Lindenmayer & Burgman, 2005). These edge effects occur when disturbances to the edge of a habitat or ecosystem result in a change or disturbance to the interior of that area. Examples of edge effects that may be associated with vegetation communities of the gas transmission pipeline include weed invasion and altered micro-climatic conditions. There is potential for weed invasion to occur as a result of RE clearing for the gas

## Potential Impacts and Mitigation Measures

transmission pipeline however this result may be mitigated by the instigation of weed control measures as detailed in Section 4.2.4.

### 4.1.9 Impacts associated with changes to fire regimes

The majority of Australian terrestrial ecosystems and many endemic flora species are threatened by inappropriate fire regimes (Lindenmayer & Burgman, 2005). Changes to the landscape from vegetation clearing could potentially impact the fire regime of the vegetation communities within close proximity to the gas transmission pipeline. These impacts are dependent upon several factors including type of vegetation community, fire history, and weather and rainfall history.

Potential sources for accidental ignition of fires will be managed during the construction and operation of the gas transmission pipeline. This will include restricted access to the gas transmission pipeline to reduce the probability of starting a fire.

### 4.1.10 Impacts associated with Erosion and Sedimentation

There is potential for erosion on areas disturbed by works associated with the creation of the gas transmission pipeline. Where these activities occur on erosive soils and/ or on slopes, mobilisation of sediment into watercourses can occur. Impacts to aquatic ecosystems can include build-up of sediment in waterholes with a subsequent reduction in available habitat, smothering of aquatic plants and substrate and cumulative downstream impacts on estuarine and offshore marine habitats.

## 4.2 Impact Mitigation

### 4.2.1 Pipeline Route Selection

A detailed route selection process was undertaken prior to selection of the current gas transmission pipeline alignment in accordance with the Australian Pipeline Industry Association (APIA) - Code of Environmental Practice (APIA, 2005). An initial alignment was selected based on avoidance of National Parks, mining leases, and environmentally sensitive areas. This initial route followed the Queensland Gas Pipeline (QGP) as much as possible. A subsequent workshop and aerial reconnaissance survey (by helicopter) refined the route to further reduce impacts to environmental values including remnant vegetation and waterways and to avoid any other environmentally sensitive areas where practicable.

### 4.2.2 Further Surveys

The following additional flora surveys are proposed to be undertaken as part of the Phase 2 pre-construction surveys:

- Ground truthing of Regional Ecosystems and potentially occurring conservation significant species within the GSDA;
- Targeted surveys of conservation significant species to identify population size and extent to be impacted, particularly near known populations of *Cycas megacarpa* and *Acacia pedleyi* (Section 4.1.3); and
- Summer surveys of grassland communities (RE 11.8.11) to identify community extent and condition during optimal growing conditions.

## Potential Impacts and Mitigation Measures

## Section 4

### 4.2.3 Clearing Scheme

Areas of vegetation to be cleared should be restricted to the minimum width required, that is 30 metres within the mainland section and 100 metres within the Curtis Island section. Where practicable this ROW should be further reduced within environmentally sensitive areas (e.g. river crossings or 'Endangered' and 'Of Concern' REs). The use of tape, pegs or other markers should be employed to clearly delineate areas to be cleared, prior to commencement. Particular attention will be paid when delineating clearing areas in proximity to 'Endangered' and 'Of Concern' REs. Clearing of these areas should be supervised by a qualified ecologist.

Clearing of all remnant REs and particularly 'Of concern' and 'Endangered' should be avoided for ancillary areas including construction camps and vehicle tracks where possible.

Any clearing involving the removal of expansive stands of woodland vegetation should be undertaken in stages to reduce disruption for fauna dispersal, thereby retaining habitat connectivity.

Large scale burning of clearing will be avoided and timber should be stick raked into piles to provide fauna habitat and assist revegetation.

All vegetation clearance will be undertaken in accordance with Santos EHS Management System Standard – EHS01 Land Disturbance.

#### **Management of Conservation Significant Species**

The two species of conservation significance recorded along the gas transmission pipeline will require appropriate management actions. The management priority will be avoidance of impact to these areas where practicable following the actions described below.

Further surveys for conservation significant species are proposed to be undertaken as part of the Phase 2 pre-construction surveys. This will target areas of known habitat for the above two species in addition to areas considered potential habitat for conservation significant species identified as 'likely' or 'possibly' present. These detailed surveys will allow for avoidance of conservation significant species where practicable.

Prior to vegetation clearing, all individuals of these species should be flagged by a qualified botanist to provide an accurate number of individuals to be removed. Individuals of *Cycas megacarpa* have been successfully translocated in similar projects (Queensland Herbarium, 2007) and the option for translocation of individuals should be investigated for this project. For *Acacia pedleyi*, the planting of seed from the species as part of the project's rehabilitation program should be considered to offset any net loss of the species (Section 4.2.5).

Additional management strategies will include:

- Reduce ROW width where possible near areas of conservation significant species;
- Awareness presentation of conservation significant species to pipeline construction crews; and
- Increased monitoring of dust, water movement, and weeds around areas supporting conservation significant species.

#### **River Crossings**

Where clearing of vegetation is within or in close proximity to riparian communities, adequate erosion and sedimentation mitigation measures will be utilised to ensure waterways are not impacted and riparian vegetation is not unduly affected. Horizontal Directional Drilling (HDD) is proposed to be undertaken at two of the major



## Potential Impacts and Mitigation Measures

river crossings (Calliope River and Dawson River crossing near Moura) to minimise disturbance to riparian sections of these rivers.

For minor watercourse crossings, open trenches will be used. Where possible existing gaps in the canopy will be utilised and mature trees will be avoided to minimise impacts to vegetation communities. Watercourse bed and bank material and trench spoil will be stockpiled separately, away from banks to reduce the likelihood of sedimentation from surface runoff. To minimise the period of construction and subsequent environmental disturbance, it is proposed to complete watercourse crossings within the shortest period practicable. Further erosion control measures are detailed in the following EIS sections: Section 7.3.3 (Soil Erosion and Stability), Section 7.5.4 (Surface Water: Potential Impacts and Mitigation Measures) and Section 7.11.4 (Land Use and Infrastructure: Potential Impacts and Mitigation Measures).

### **Marine Plants**

Clearing should be minimised as much as practicable within areas of marine plants (RE 12.1.2, RE 12.1.3, RE 11.1.2 and RE 11.1.4). Possible mitigation measures will include the reduction of ROW width, revegetation of marine plant communities and additional erosion control measures.

### **4.2.4 Weed Control**

The introduction of vehicles and heavy machinery may potentially increase the risk of introducing new and declared weeds, and spread existing weeds across the site and its surrounds. Appropriate weed management strategies will need to be implemented for controlling the spread of weeds, including continued weed monitoring. An effective Weed Management Plan should be implemented for the gas transmission pipeline and should include:

- Effective management strategies to control the spread of declared weed species in keeping with Santos Standards (including Santos EHS09 Weeds and Pest Animal Control), regional management practice or DNR&W pest control fact sheets;
- Incorporation of the Santos Parthenium Weed Management Plan (URS, 2008);
- Ongoing monitoring of the project site to identify any new incidence of weed infestation;
- Provision of information for project staff on the identification of declared weeds and their dispersal methods; and
- Wash down protocols for any vehicles or machinery entering and leaving site.

### **4.2.5 Rehabilitation of Disturbed Areas**

A rehabilitation strategy developed for the areas to be disturbed is outlined in Gas Transmission Pipeline Rehabilitation Plan. Rehabilitation will involve the re-establishment of ground cover along the gas transmission pipeline ROW following construction. Rehabilitation methods will be in keeping with current best practice and will employ techniques involving natural regeneration, direct seeding and / or tube stock to ensure a viable success rate of re-established vegetation. Tree species will be excluded from the ROW to minimise risk of pipeline damage from root interference. Monitoring of the rehabilitated areas will be undertaken to ensure long term viability and allow adaptive management of rehabilitation strategies where necessary.

### **4.2.6 Biodiversity Offsetting**

A program to implement offsetting of cleared vegetation communities will be undertaken in accordance with current Commonwealth and State legislation for the offsetting of significant vegetation communities. A

## Potential Impacts and Mitigation Measures

## Section 4

biodiversity offset strategy and management plan will be developed for the GLNG project. Criteria for offset suitability will be in accordance with EPA and DEWHA guidelines and best practice. General suitability criteria will, where practicable, include:

- The offset strategy will be in compliance with the requirements of the Policy for Vegetation Management Offsets (DNRW, 2007), the Queensland Government Environmental Offset Policy, and the regional vegetation management codes both for the coastal bioregions and Brigalow Belt Bioregions, under the provisions of the Queensland VM Act (DNRW, 2006a and DNRW 2006b);
- For EPBC Act listed communities the offset strategy will address the 'Use of environmental offsets under the EPBC Act 1999' (August, 2007);
- The offset strategy will include reference to existing Santos biodiversity offsets including the Environmental Management Plan for Fairview Project Area offset strategy (Santos 2008);
- The acquisition of a remnant/regrowth community that is greater in area than that which will be impacted by the project;
- Support the same suite of plant species contained in RE types impacted by the project;
- Consider maximising biodiversity gains through site selection, (e.g. habitat requirements for migratory species that will be impacted by loss of foraging trees and water sources);
- Offset locations will be preferentially closer (at least within the locality) to communities impacted by the project;
- Offset sites will be preferentially larger contiguous stands of vegetation with connectivity to other habitat types to increase viability of ecological processes;
- Place potential offset(s) parcels under a secure protection such as a conservation covenant to ensure that protection runs with title;
- Management measures to ensure offset areas remain viable in perpetuity. Such measures may include the management of supplementary planting, weed, fire, feral animal, livestock management and restriction on access; and
- Monitoring and maintenance activities to measure success and viability of the offset.

### 4.2.7 Cumulative Impacts

The regions of central Queensland in which the pipeline traverses have been historically altered by clearing for pastoral and agricultural activities. In addition, forestry, road development, mining and existing pipeline easements have further reduced the amount of remnant vegetation. In this context therefore, the construction of the gas transmission pipeline will not particularly reduce the overall conservation values of central Queensland. Route selection and planning from the commencement of the project has aimed to minimise impacts on remnant vegetation and fauna habitat through the avoidance of these areas wherever practicable. This is borne out in that approximately 81% of the gas transmission pipeline ROW traverses cleared or non-remnant vegetation. Field studies have determined that areas of remnant vegetation impacted by the ROW have often experienced historical disturbance from forestry and grazing activities. It is not anticipated that the proposed works will significantly further reduce current values.

Given the intensification of the CSG industry in central Queensland, it is conceivable that other gas transmission pipelines might be developed. Over time, the duplication of pipelines may result in further loss of remnant vegetation and habitat. The adherence to sound environmental policy and planning frameworks will assist in ensuring that additional pipelines will not significantly impact on natural ecosystems.

## References

- Accad, A; Neldner, V.J; Wilson, B. A; and Niehus, R.E. (2006). *Remnant Vegetation in Queensland. Analysis of remnant vegetation 1997-1999-2000-2001-2003, including regional ecosystem information*. Brisbane: Queensland Herbarium, Environmental Protection Agency.
- ACMER (2005). Environmental Management for the Minerals and Quarrying Industries (Short Course Notes). Australian Centre for Minerals Extension and Research.
- Aerometrex (2008). Roma to Gladstone Pipeline Aerial Photos. Scale 1:22,150.
- Anderson, E. (1993) *Plants of Central Queensland, their identification and uses*. Department of Primary Industries Queensland.
- Australian Pipeline Industry Association (APIA) (2005). Code of Environmental Practice – Onshore Pipelines.
- BoM (2008a). Bureau of Meteorology Report. Gladstone Queensland, May 2008 Daily weather observations. Available from: <http://www.bom.gov.au/climate/dwo/200805/html/IDCJDW4049.200805.shtml> Accessed 17 October 2008.
- BoM (2008b). Bureau of Meteorology Report. Gladstone Queensland, July 2008 Daily weather observations. Available from: <http://www.bom.gov.au/climate/dwo/200807/html/IDCJDW4049.200807.shtml> Accessed 17 October 2008.
- BoM (2008c). Bureau of Meteorology Report. Gladstone Queensland, October 2008 Daily weather observations. Available from: <http://www.bom.gov.au/climate/dwo/200810/html/IDCJDW4049.200810.shtml>. Accessed 17 October 2008.
- BoM (2008d). Bureau of Meteorology. Annual Queensland climate summary for 2007. Available from: <http://www.bom.gov.au/climate/current/annual/qld/summary.shtml> Accessed 12 November 2008
- Boobook Consulting (2008). Well Site Inspection Report – Emu Nest 1C.
- Brooker, M.I.H. and Kleinig, D.A. (1994) *Field Guide to Eucalypts, Volume III Northern Australia*, Bloomings Books.
- Central Queensland University (2007). Flora and Fauna Assessment of the Calliope Ranges Roadway Realignment. July 2007.
- Cropper, S.C. (1993). *Management of Endangered Plants*. CSIRO, East Melbourne.
- DEWHA (2008a). *A directory of important wetlands in Australia, The Narrows QLD021*. Viewed 07 August 2008. [http://www.environment.gov.au/cgi-bin/wetlands/report.pl?smode=DOIW&doiw\\_refcodelist=QLD021](http://www.environment.gov.au/cgi-bin/wetlands/report.pl?smode=DOIW&doiw_refcodelist=QLD021)
- DEWHA (2008b). *Species Profile and Threats Database*, Australian Government, Department of Environment, Water, Heritage and the Arts. <http://www.environment.gov.au/cgi-bin/sprat/public/sprat.pl>
- DNRME (2004). *Rubber Vine Management Manual*. Department of Natural Resources, Mines and Energy Queensland.
- DNRW (2006a) Regional Vegetarian Management Code for Brigalow Belt and New England Tablelands Bioregions, November 2006.
- DNRW (2006b) Regional Vegetarian Management Code for Coastal Bioregions, November 2006
- DNRW (2007) Policy for Regional Vegetation Management Offsets, September 2007

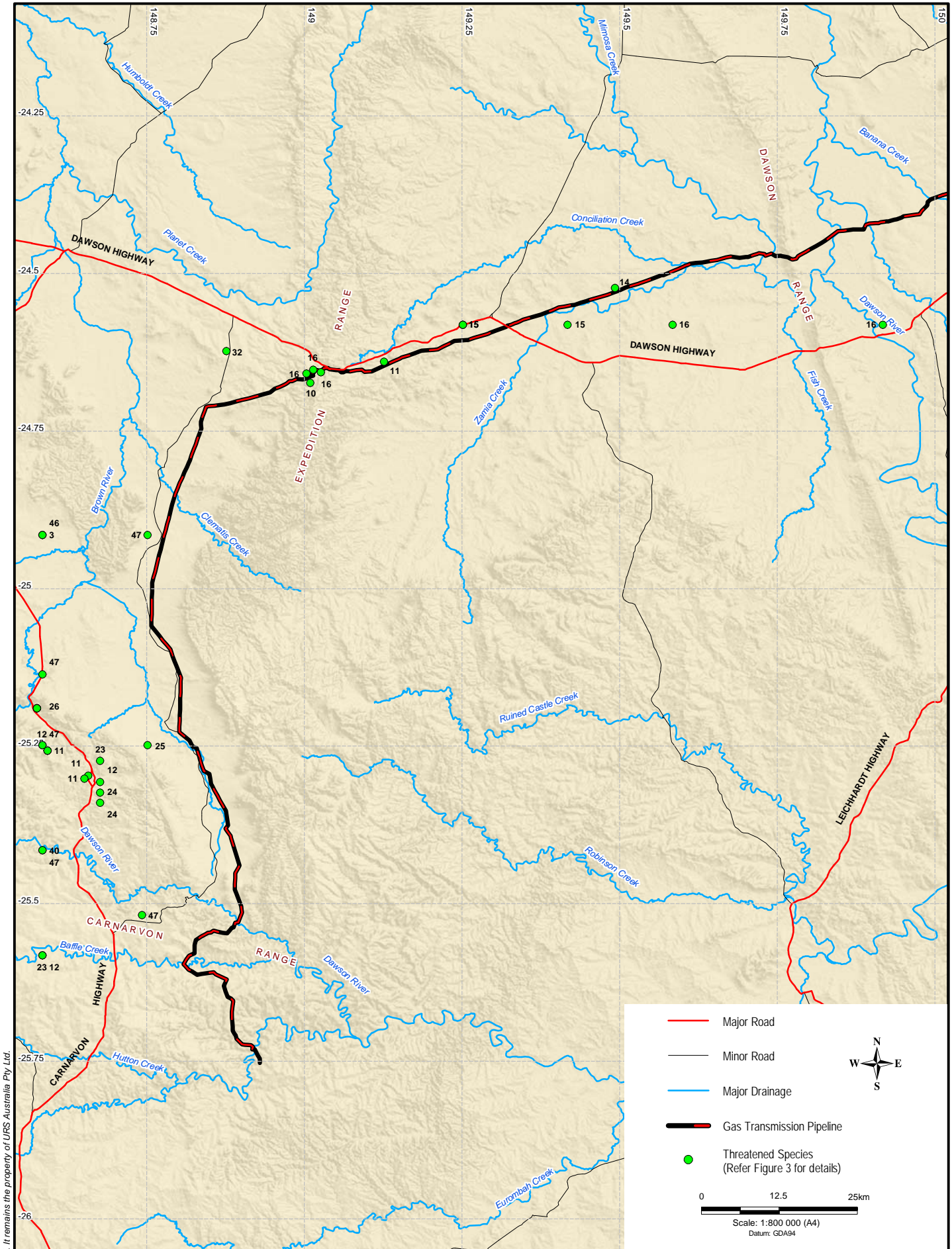
- DNRW (2007) *Prickly Pear Identification and Their Control, Factsheet PP29*. Queensland Department of Natural Resources and Water. Available from: <http://www.dpi.qld.gov.au/cps/rde/xbcr/dpi/IPA-Prickly-Pear-Control-PP29.pdf> Accessed 19.06.08.
- Environment Protection and Biodiversity Conservation Act* (1999) Commonwealth Government.
- EPA (2003). *Curtis Coast Regional Management Plan*. Queensland Government, Environmental Protection Agency, September 2003.
- EPA (2006). *The State of Queensland (Environmental Protection Agency), Queensland*, viewed 29 May 2008, [http://www.epa.qld.gov.au/nature\\_conservation/biodiversity/regional\\_ecosystems/introduction\\_and\\_status](http://www.epa.qld.gov.au/nature_conservation/biodiversity/regional_ecosystems/introduction_and_status)
- EPA (2007) *Regional Ecosystem Description Database (REDD)*, Version 5.2, updated 2007, Environmental Protection Agency, Brisbane.  
[[http://www.epa.qld.gov.au/media/nature\\_conservation/biodiversity/regional\\_ecosystem.csv](http://www.epa.qld.gov.au/media/nature_conservation/biodiversity/regional_ecosystem.csv)].
- EPA (2007a). South East Queensland Biodiversity Planning Assessment Version 3.5. Queensland Government. Release date 3 December 2007; DVD production date 19 September 2008.
- EPA (2007b). *Curtis Island Basin – Wetland Summary Information*, viewed 07 August 2008. <http://www.epa.qld.gov.au/wetlandinfo/site/MappingFandD/WetlandMapsAndData/SummaryInfo/B-131.jsp>
- EPA (2008a). *Copy of the certified regional ecosystem map for the purpose of the Vegetation Management Act 1999. Online RE Maps*, Environmental Protection Agency, Brisbane. [<http://www.epa.qld.gov.au/REMAP>].
- EPA (2008b). *The State of Queensland (Environment Protection Agency), Queensland Parks and Wildlife Service*, viewed 27 June 2008. <https://www.epa.qld.gov.au/parks/iaparks/gds/IAGDS020.do?parkId=40>
- Johns, L. (2006). *Field guide to Common Saltmarsh Plants of Queensland*, DPI&F publication. 76pp.
- Land Protection (Pest and Stock Route Management) Act* (2002).
- Lindenmayer, D. & Burgman, M. (2005). *Practical Conservation Biology*. CSIRO Publishing, Australia. 609pp.
- Maslin, B.R. (2001). *Wattle – Acacias of Australia*. CSIRO Publishing, Collingwood, Victoria.
- Milson, J. (2000) *Trees and Shrubs of North-west Queensland*, Department of Primary Industries.
- Naidoo, G. & Chirkoot, D. (2004). *The effects of coal dust on photosynthetic performance of the mangrove Avicennia marina in Richards Bay, South Africa*. Environmental Pollution 127 (3): 359-66 Elsevier Applied Science Publishers UK
- Nature Conservation Act*, (1992), Queensland State Government.
- Neldner, V.J., Wilson, B. A., Thompson, E.J. and Dillewaard, H.A. (2005) *Methodology for Survey and Mapping of Regional Ecosystems and Vegetation Communities in Queensland*. Version 3.1. September 2005. Queensland Herbarium, Environmental Protection Agency, Brisbane. 128 pp.
- Parsons, W.T. & Cuthbertson, E.G. (2001). *Noxious weeds of Australia*, 2<sup>nd</sup> Edition. CSIRO Publishing, Victoria, Australia.
- PlantNET (2008). *New South Wales Flora Online* (<http://plantnet.rbg Syd.nsw.gov.au/floraonline.htm>)

## References

- Queensland Herbarium (2007). National Multi-species Recovery Plan for the cycads, *Cycas megacarpa*, *Cycas ophiolitica*, *Macrozamia cranei*, *Macrozamia lomandroides*, *Macrozamia pauli-guilielmi* and *Macrozamia platyrhachis*. Environmental Protection Agency, Brisbane.
- Santos (2008). Environmental Management Plan for Fairview Project Area. May 2008.
- Sattler, P. S. and Williams, R.D. (Eds) (1999) *The Conservation Status of Queensland's Bioregional Ecosystems*, Environmental Protection Agency.
- Specht, R.L., (1970) *Vegetation*. In *The Australian Environment*, Leeper, G.W. (Ed). CSIRO Publishing.
- Stanley, T.D. and E.M. Ross (1986, 1989, 1995). *Flora of south-eastern Queensland*. Department of Primary Industries. Brisbane: Queensland.
- Taylor, P. and Williamson, K. (2000). *Brigalow Belt: Main plant species and their uses*. Forest Planning and Sustainable Use Forest Resources QDNR.
- Thorp, J R, & Lynch, R (2000) *The Determination of Weeds of National Significance*. National Weeds Strategy Executive Committee, Launceston.
- (URS, 2008). Santos Parthenium Weed Management Plan.
- Vegetation Management Act 1999*, Queensland Government.
- Weed Management CRC (2003). *Weed Management Guide – Lantana (Lantana camara)*, Australian Weed Management.
- Young, B.A.R. and Dilewaard, H.A. (1999) Chapter 12 Southeast Queensland In Sattler, P. S. and Williams, R.D. (eds) (1999). *The Conservation Status of Queensland's Bioregional Ecosystems*, Environmental Protection Agency.
- Young, P.A.R., Wilson, B.A., McCosker, J.C., Fensham, R.J., Morgan, G. and Taylor, P.M. (1999) *Chapter 11 Brigalow Belt* In Sattler, P. S. and Williams, R.D. (Eds) (1999) *The Conservation Status of Queensland's Bioregional Ecosystems*, Environmental Protection Agency.

## Figures







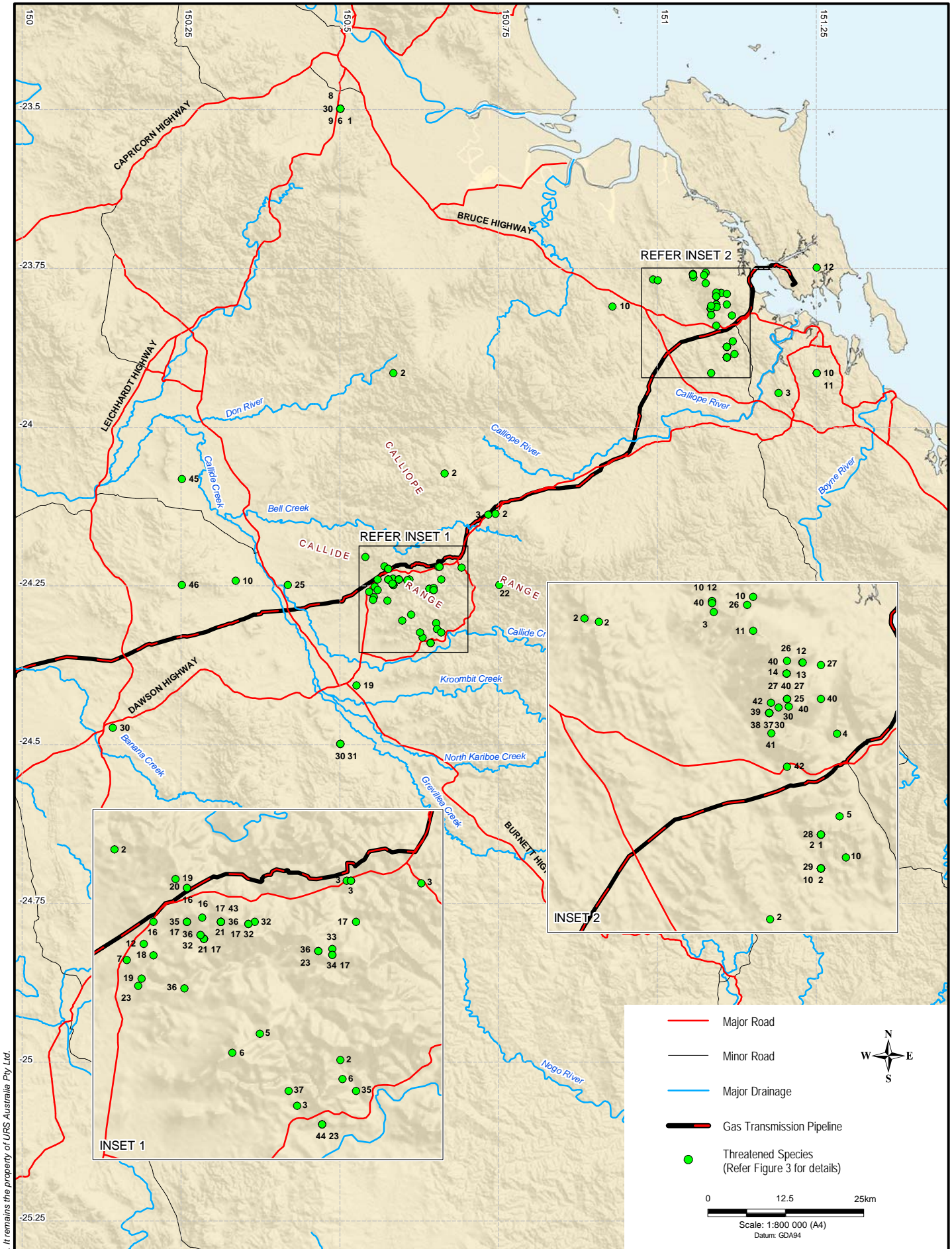
This drawing is subject to COPYRIGHT. It remains the property of URS Australia Pty Ltd.

Source: This map may contain data which is sourced and Copyright. Refer to Section 18.2 of the EIS for Ownership and Copyright.

**Note: Figures 1 & 2 must be viewed with Figure 3**

Client  	Project GLADSTONE LNG PROJECT TERRESTRIAL FLORA ASSESSMENT GAS TRANSMISSION PIPELINE		Title <b>THREATENED SPECIES          GAS TRANSMISSION PIPELINE          (WESTERN SECTION)</b>	
	Drawn: RG Job No: <b>4262 6220</b>	Approved: JB File No: 42626220-g-790.wor	Date: 05-02-2009	Figure: 1







This drawing is subject to COPYRIGHT. It remains the property of URS Australia Pty Ltd.

Source: This map may contain data which is sourced and Copyright. Refer to Section 18.2 of the EIS for Ownership and Copyright.



**Note: Figures 1 & 2 must be viewed with Figure 3**

Client  	Project <b>GLADSTONE LNG PROJECT          TERRESTRIAL FLORA ASSESSMENT          GAS TRANSMISSION PIPELINE</b>		Title <b>THREATENED SPECIES          GAS TRANSMISSION PIPELINE          (EASTERN SECTION)</b>	
	Drawn: RG Job No: <b>4262 6220</b>	Approved: JB File No: 42626220-g-791.wor	Date: 05-02-2009	Figure: 2

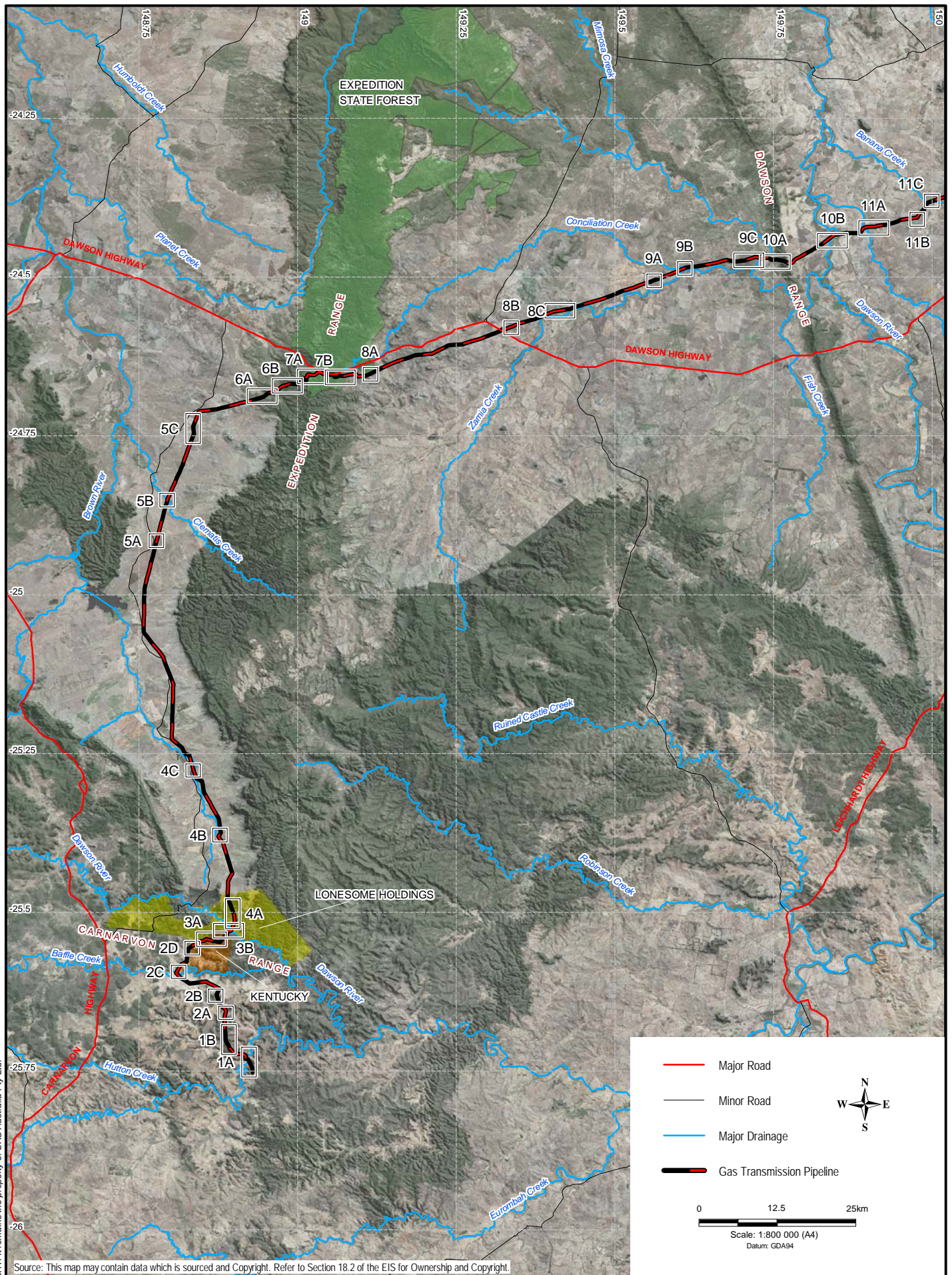
● Threatened Species	
Map Reference	Species
1	Acacia gittinsii
2	Acacia pedleyi
3	Acacia pubicosta
4	Actephila sessilifolia
5	Alyxia magnifolia
6	Alyxia sharpei
7	Apatophyllum teretifolium
8	Aponogeton queenslandicus
9	Atalaya calcicola
10	Atalaya collina
11	Atalaya rigida
12	Cadellia pentastylis
13	Capparis humistrata
14	Cerbera dumicola
15	Cossinia australiana
16	Cupaniopsis shirleyana
17	Cycas megacarpa
18	Cyperus clarus
19	Dansiea elliptica
20	Desmodium macrocarpum
21	Dichanthium queenslandicum
22	Eucalyptus raveretiana
23	Gossypium sturtianum
24	Graptophyllum excelsum
25	Grevillea cyranostigma
26	Grevillea hockingsii
27	Hernandia bivalvis
28	Homoranthus decasetus
29	Indigofera baileyi
30	Leucopogon grandiflorus
31	Macropteranthes fitzalanii
32	Macropteranthes leiocaulis
33	Macrozamia fearnsidei
34	Macrozamia platyrhachis
35	Marsdenia hemiptera
36	Melaleuca groveana
37	Parsonsia larcomensis
38	Paspalidium scabrifolium
39	Phyllanthus brassii
40	Polianthion minutiflorum
41	Prasophyllum incompositum
42	Quassia bidwillii
43	Rhaponticum australe
44	Senna acclinis
45	Thesium australe
46	Wahlenbergia islensis
47	Zieria actites

Source: This map may contain data which is sourced and Copyright. Refer to Section 18.2 of the EIS for Ownership and Copyright.

Note: Figure 3 must be read with Figures 1 & 2

Client  	Project GLADSTONE LNG PROJECT TERRESTRIAL FLORA ASSESSMENT GAS TRANSMISSION PIPELINE	Title <b>THREATENED SPECIES          GAS TRANSMISSION PIPELINE          LEGEND TO THREATENED SPECIES</b>
	Drawn: RG    Approved: JB    Date: 05-02-2009 Job No: <b>4262 6220</b> File No: 42626220-g-792.wor	Figure: <b>3</b>





— Major Road  
— Minor Road  
— Major Drainage  
 Gas Transmission Pipeline

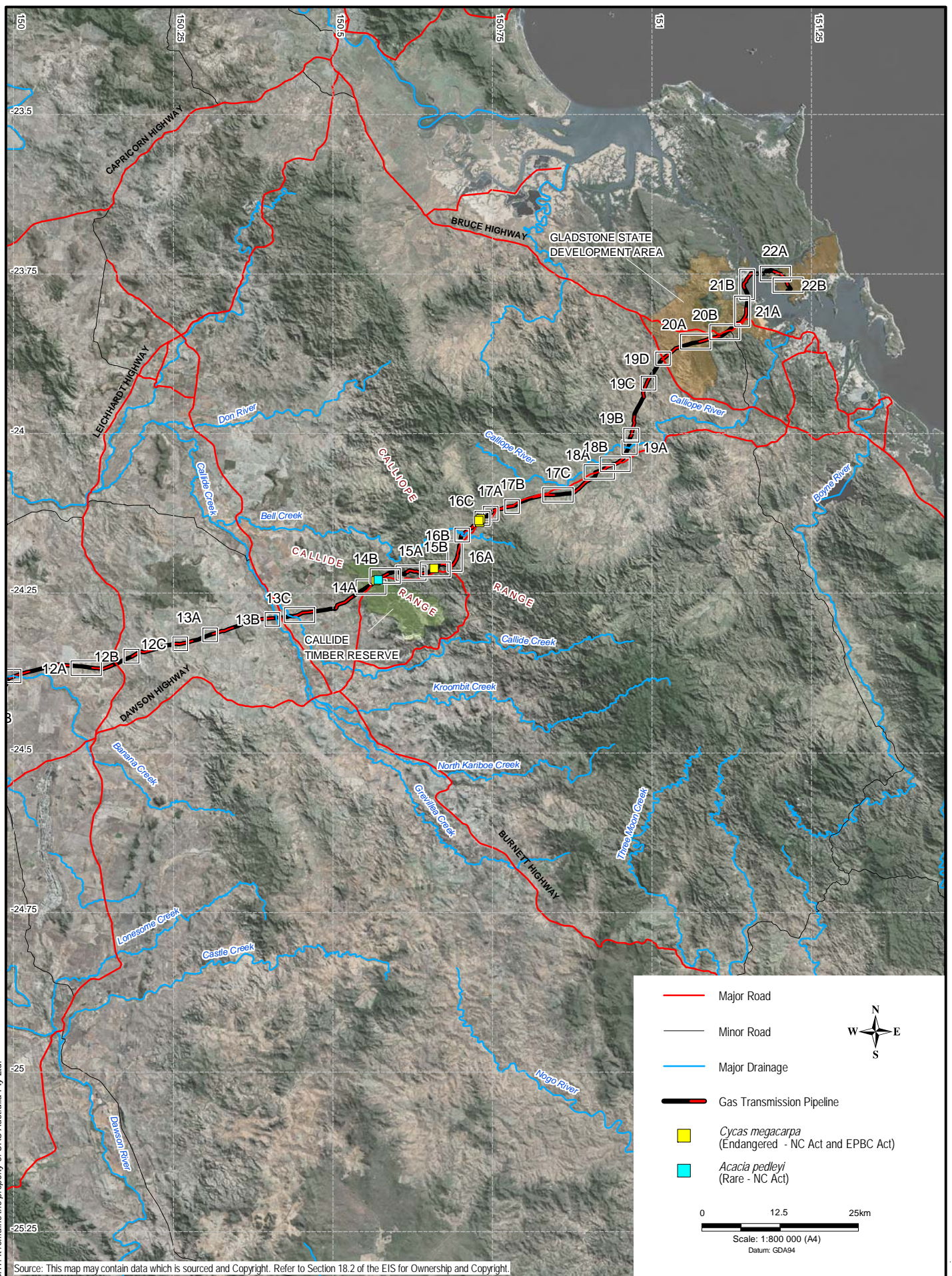
0      12.5      25km  
 Scale: 1:800 000 (A4)  
 Datum: GDA94



Source: This map may contain data which is sourced and Copyright. Refer to Section 18.2 of the EIS for Ownership and Copyright.

This drawing is subject to COPYRIGHT. It remains the property of URS Australia Pty Ltd.

<p>Client</p>	<p>Project</p> <p style="text-align: center;"><b>GLADSTONE LNG PROJECT TERRESTRIAL FLORA ASSESSMENT GAS TRANSMISSION PIPELINE</b></p>	<p>Title</p> <p style="text-align: center;"><b>REGIONAL ECOSYSTEMS GAS TRANSMISSION PIPELINE KEY MAP 1 OF 2</b></p>
<p>Drawn: RG      Approved: JB      Date: 05-02-2009</p>		<p>Figure: 4</p>
<p>Job No: 4262 6220      File No: 42626220-g-726b.wor</p>		





Client  	Project <b>GLADSTONE LNG PROJECT          TERRESTRIAL FLORA ASSESSMENT          GAS TRANSMISSION PIPELINE</b>		Title <b>REGIONAL ECOSYSTEMS          GAS TRANSMISSION PIPELINE          KEY MAP 2 OF 2</b>	
	Drawn: RG Job No: <b>4262 6220</b>	Approved: JB File No: 42626220-g-727b.wor	Date: 05-02-2009	Figure: <b>5</b>

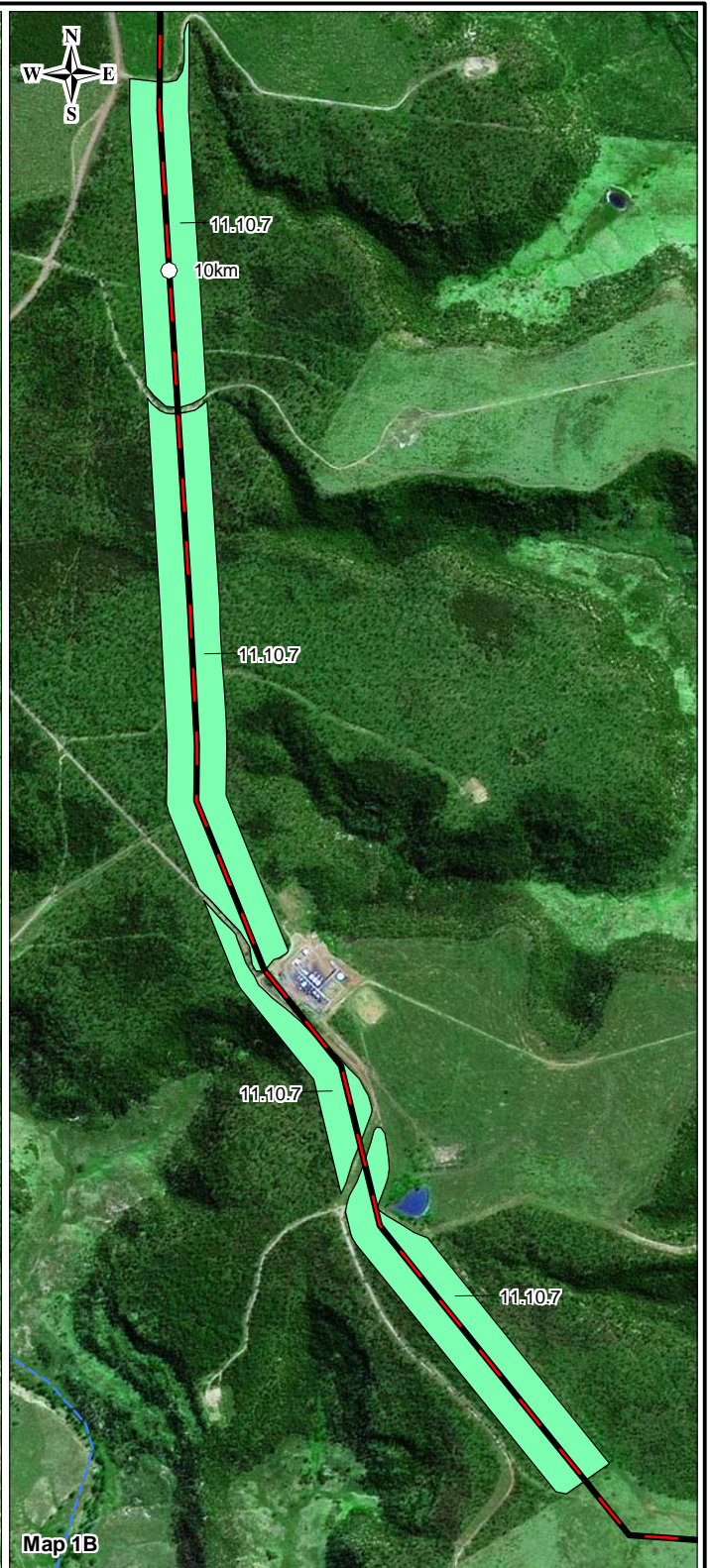
This drawing is subject to COPYRIGHT. It remains the property of URS Australia Pty Ltd.

Source: This map may contain data which is sourced and Copyright. Refer to Section 18.2 of the EIS for Ownership and Copyright.





Map 1A



Map 1B

- |            |                           |                                                             |                        |
|------------|---------------------------|-------------------------------------------------------------|------------------------|
| Major Road | Gas Transmission Pipeline | Pipeline Distance Marker                                    | Not of concern RE      |
| Minor Road | Major Drainage            | Secondary Sites                                             | Of concern dominant RE |
| Other Road | Minor Drainage            | Quaternary Sites                                            | Endangered dominant RE |
|            |                           | Presence of Exotic Species<br>(Refer Figure 28 for details) |                        |

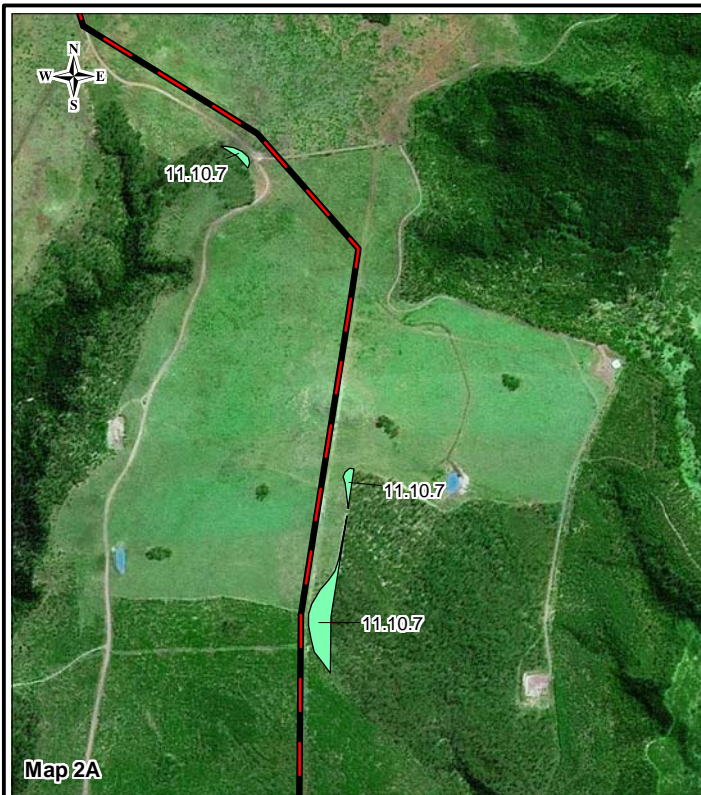
0 500 1000m  
 Scale: 1:25,000 (A4)  
 Projection: Geographic (GDA94)

Source: This map may contain data which is sourced and Copyright. Refer to Section 18.2 of the EIS for Ownership and Copyright.

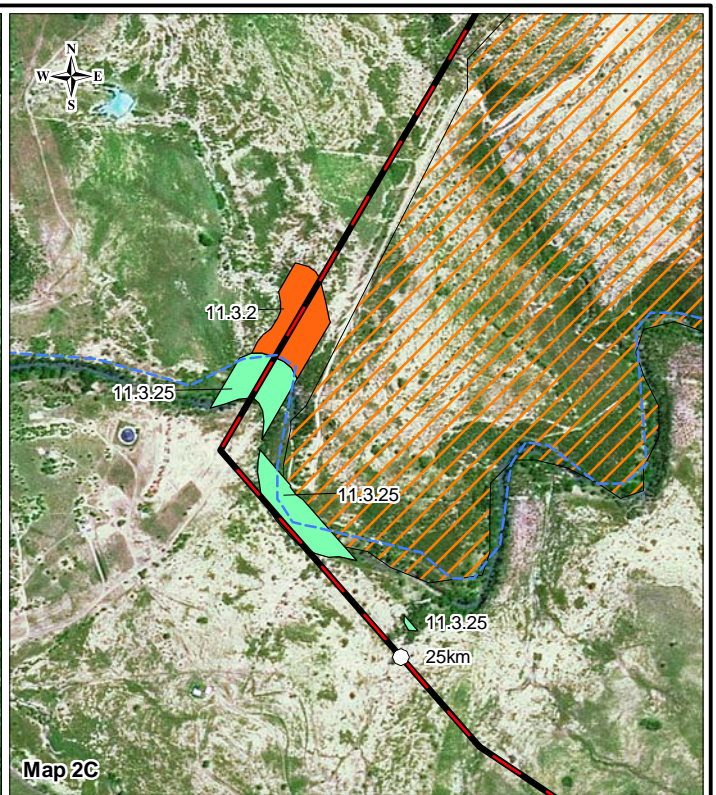
Note: Figures 6 to 27 must be viewed with Figure 28.

Client  	Project GLADSTONE LNG PROJECT TERRESTRIAL FLORA ASSESSMENT GAS TRANSMISSION PIPELINE		Title REGIONAL ECOSYSTEMS GAS TRANSMISSION PIPELINE MAP 1 OF 22	
	Drawn: RG Job No: 4262 6220	Approved: JB File No: 42626220-g-728b.wor	Date: 05-02-2009	Figure: 6

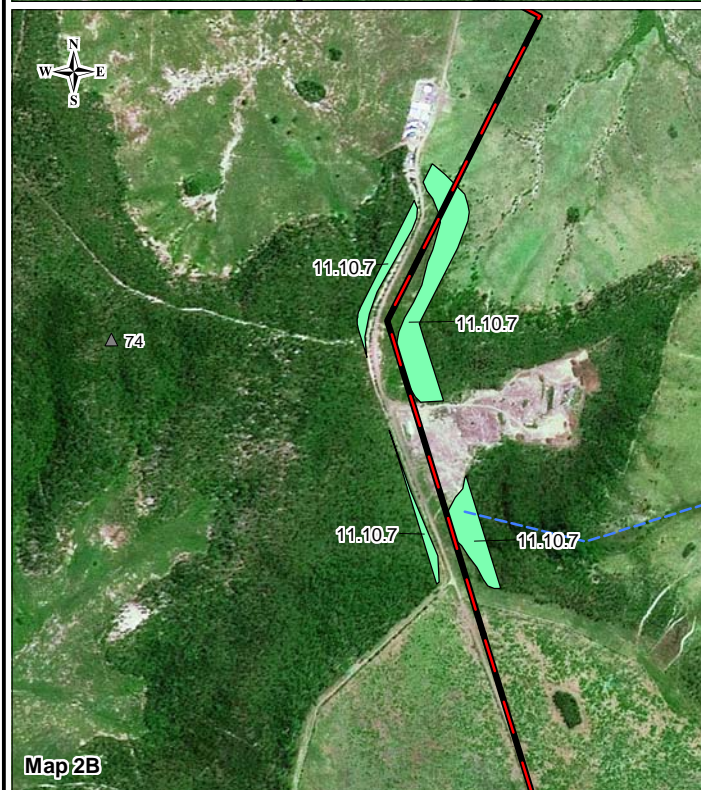




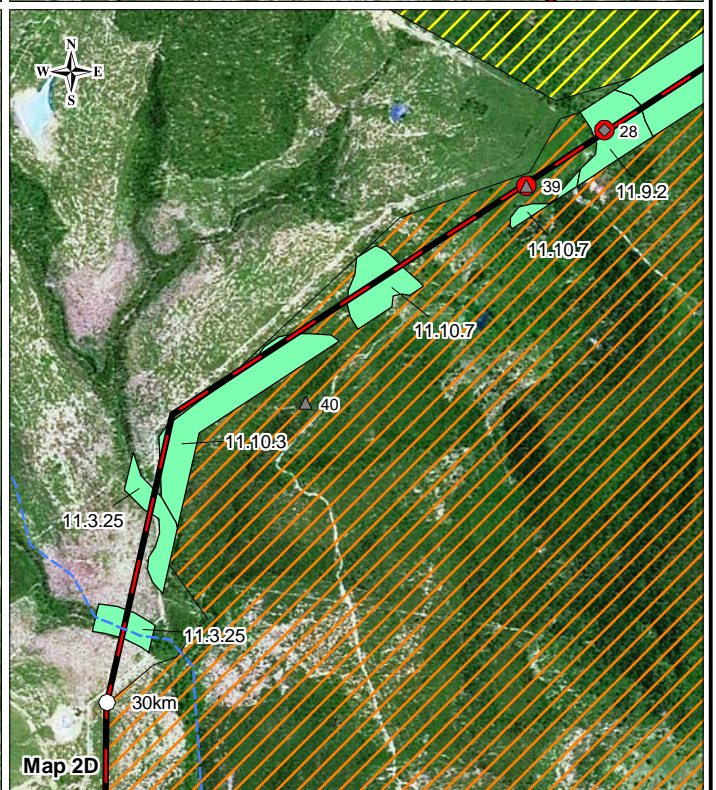
Map 2A



Map 2C



Map 2B



Map 2D

- |               |                           |                                                          |                            |
|---------------|---------------------------|----------------------------------------------------------|----------------------------|
| Major Highway | Gas Transmission Pipeline | Pipeline Distance Marker                                 | Not of concern RE          |
| Major Road    | Major Drainage            | Secondary Sites                                          | Of concern dominant RE     |
| Minor Road    | Minor Drainage            | Quaternary Sites                                         | Endangered dominant RE     |
|               |                           | Presence of Exotic Species (Refer Figure 28 for details) | Kentucky Property          |
|               |                           |                                                          | Lonesome Holdings Property |

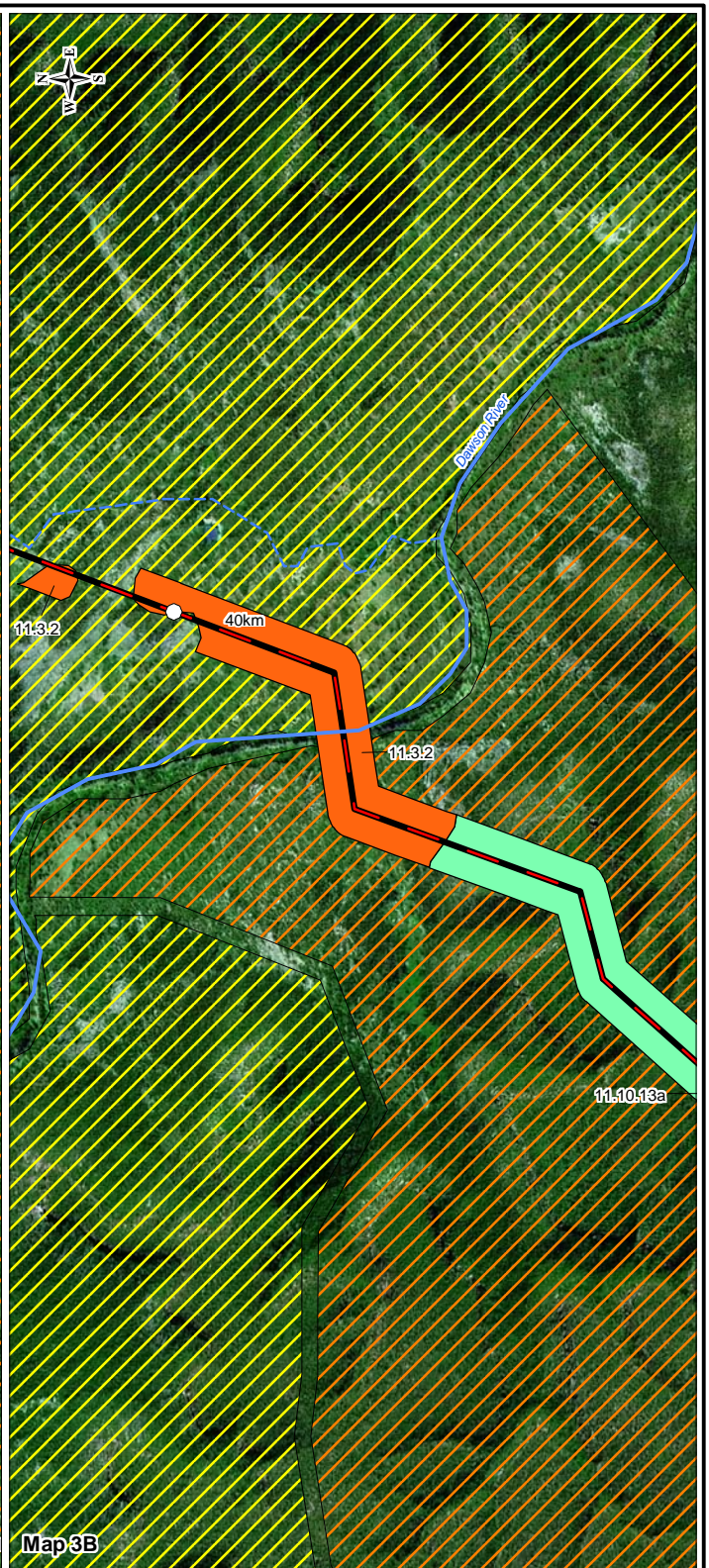
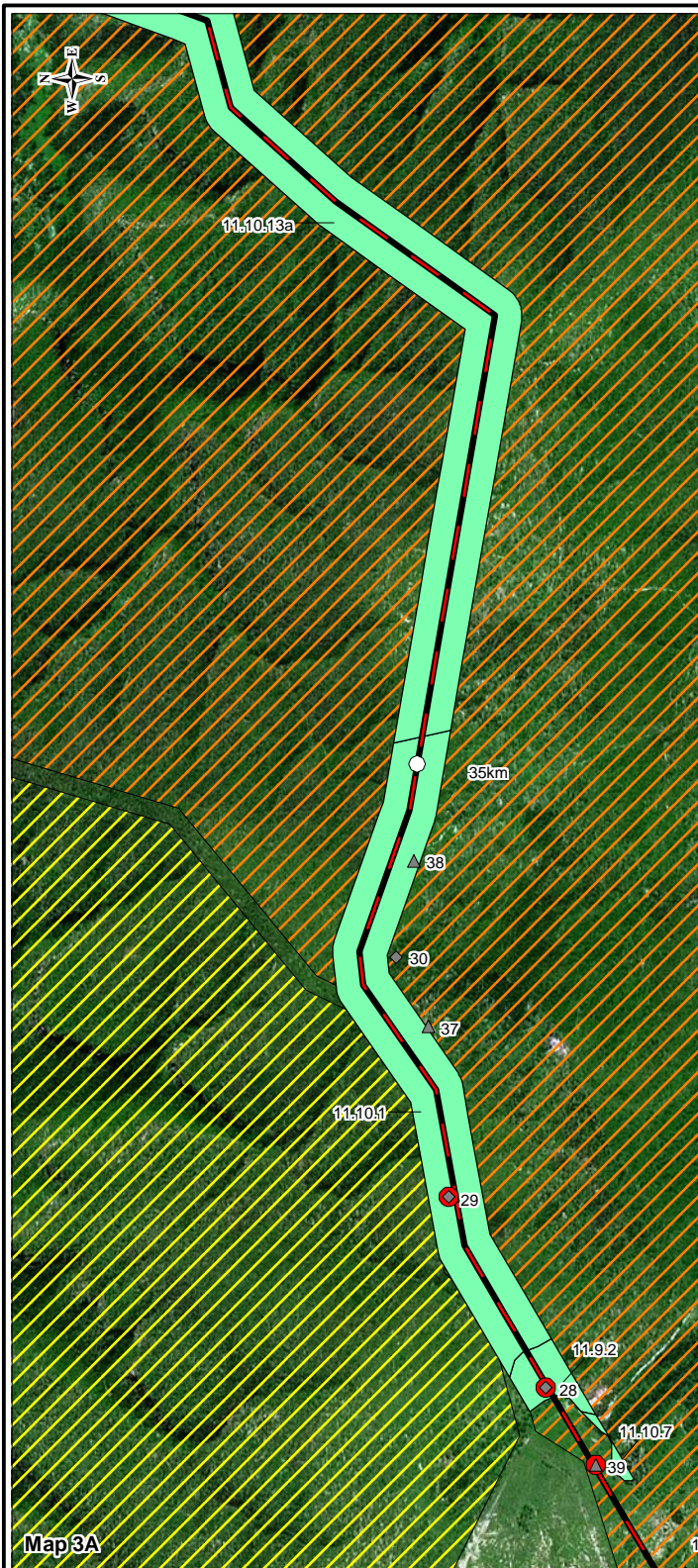
0 500 1000m  
 Scale: 1:25,000 (A4)  
 Datum: GDA94

Source: This map may contain data which is sourced and Copyright. Refer to Section 18.2 of the EIS for Ownership and Copyright.

**Note: Figures 6 to 27 must be viewed with Figure 28.**

Client  	Project GLADSTONE LNG PROJECT TERRESTRIAL FLORA ASSESSMENT GAS TRANSMISSION PIPELINE		Title REGIONAL ECOSYSTEMS GAS TRANSMISSION PIPELINE MAP 2 OF 22	
	Drawn: RG Job No: 4262 6220	Approved: JB File No: 42626220-g-729b.wor	Date: 05-02-2009	Figure: 7





Map 3A



Map 3B

- Major Highway
- Major Road
- Minor Road
- Gas Transmission Pipeline
- Major Drainage
- Minor Drainage
- Pipeline Distance Marker
- ◆ Secondary Sites
- ▲ Quaternary Sites
- Kentucky Property
- Lonesome Holdings Property
- Not of concern RE
- Of concern dominant RE
- Endangered dominant RE
- Presence of Exotic Species (Refer Figure 28 for details)

0 500 1000m  
 Scale: 1:25,000 (A4)  
 Datum: GDA94

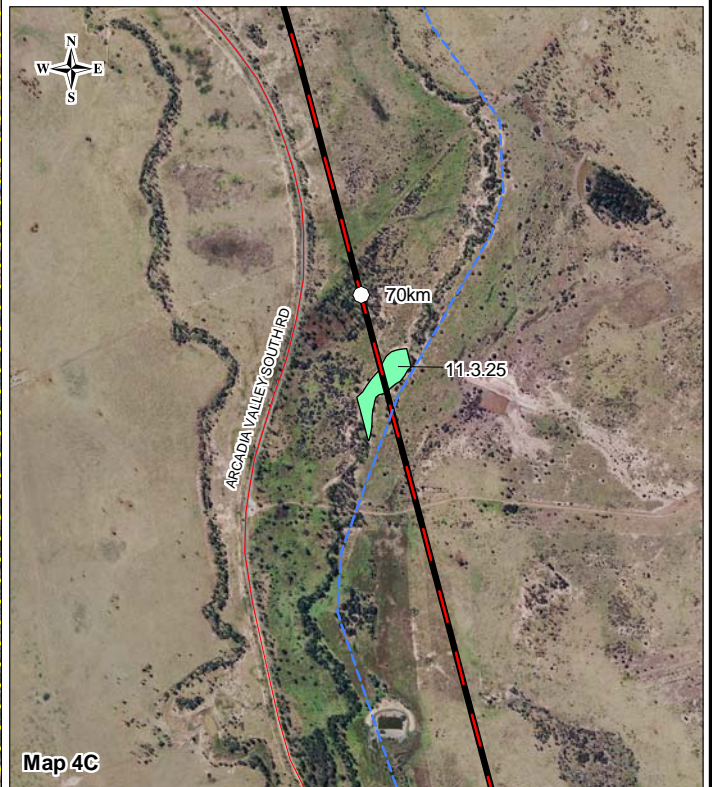
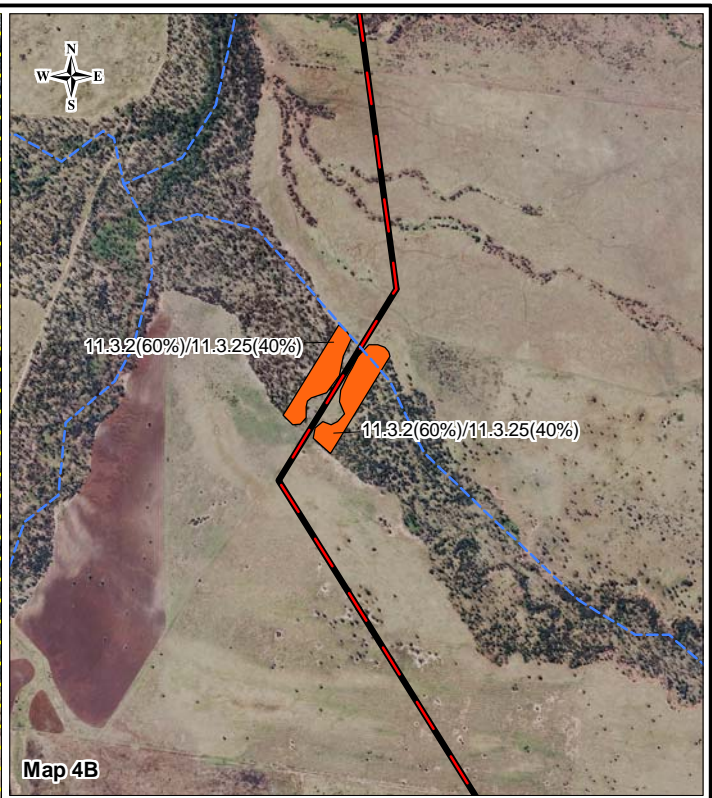
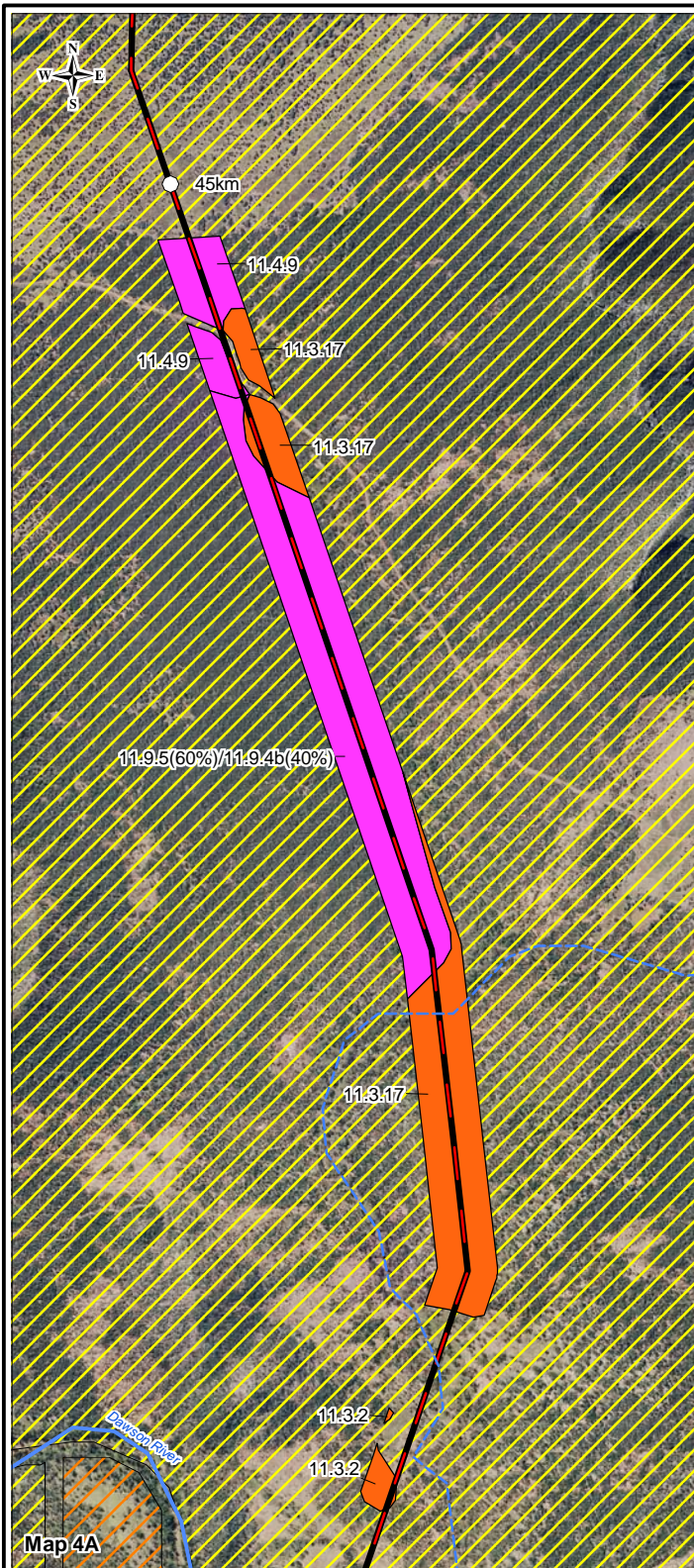
Source: This map may contain data which is sourced and Copyright. Refer to Section 18.2 of the EIS for Ownership and Copyright.

**Note: Figures 6 to 27 must be viewed with Figure 28.**

  	<b>Project</b> GLADSTONE LNG PROJECT TERRESTRIAL FLORA ASSESSMENT GAS TRANSMISSION PIPELINE	<b>Title</b> REGIONAL ECOSYSTEMS GAS TRANSMISSION PIPELINE MAP 3 OF 22
	Drawn: RG    Approved: JB    Date: 05-02-2009 Job No: <b>4262 6220</b> File No: 42626220-g-730b.wor	Figure: 8

This drawing is subject to COPYRIGHT. It remains the property of URS Australia Pty Ltd.





- |               |                           |                            |                        |
|---------------|---------------------------|----------------------------|------------------------|
| Major Highway | Gas Transmission Pipeline | Pipeline Distance Marker   | Not of concern RE      |
| Major Road    | Major Drainage            | Secondary Sites            | Of concern dominant RE |
| Minor Road    | Minor Drainage            | Quaternary Sites           | Endangered dominant RE |
|               | Kentucky Property         | Lonesome Holdings Property |                        |

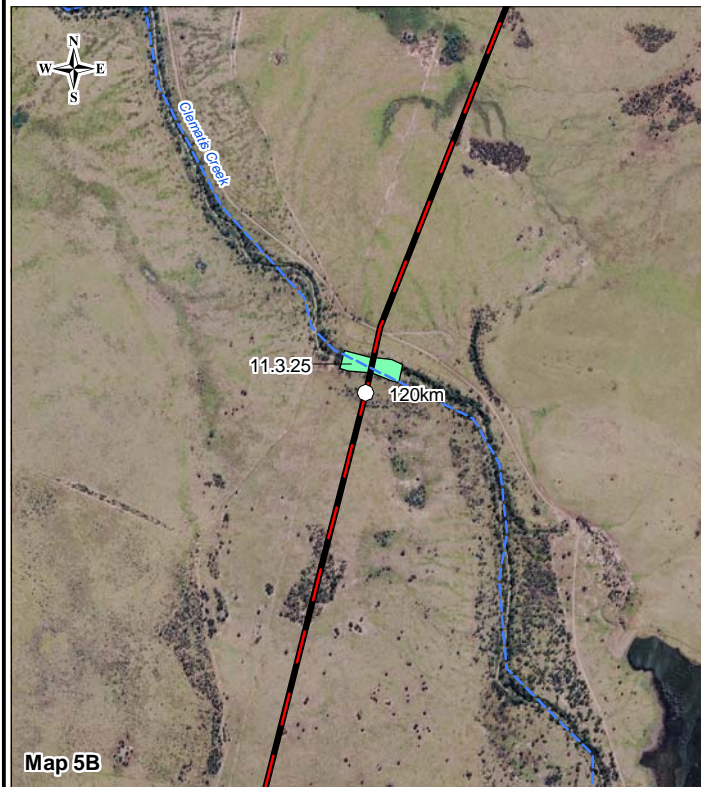
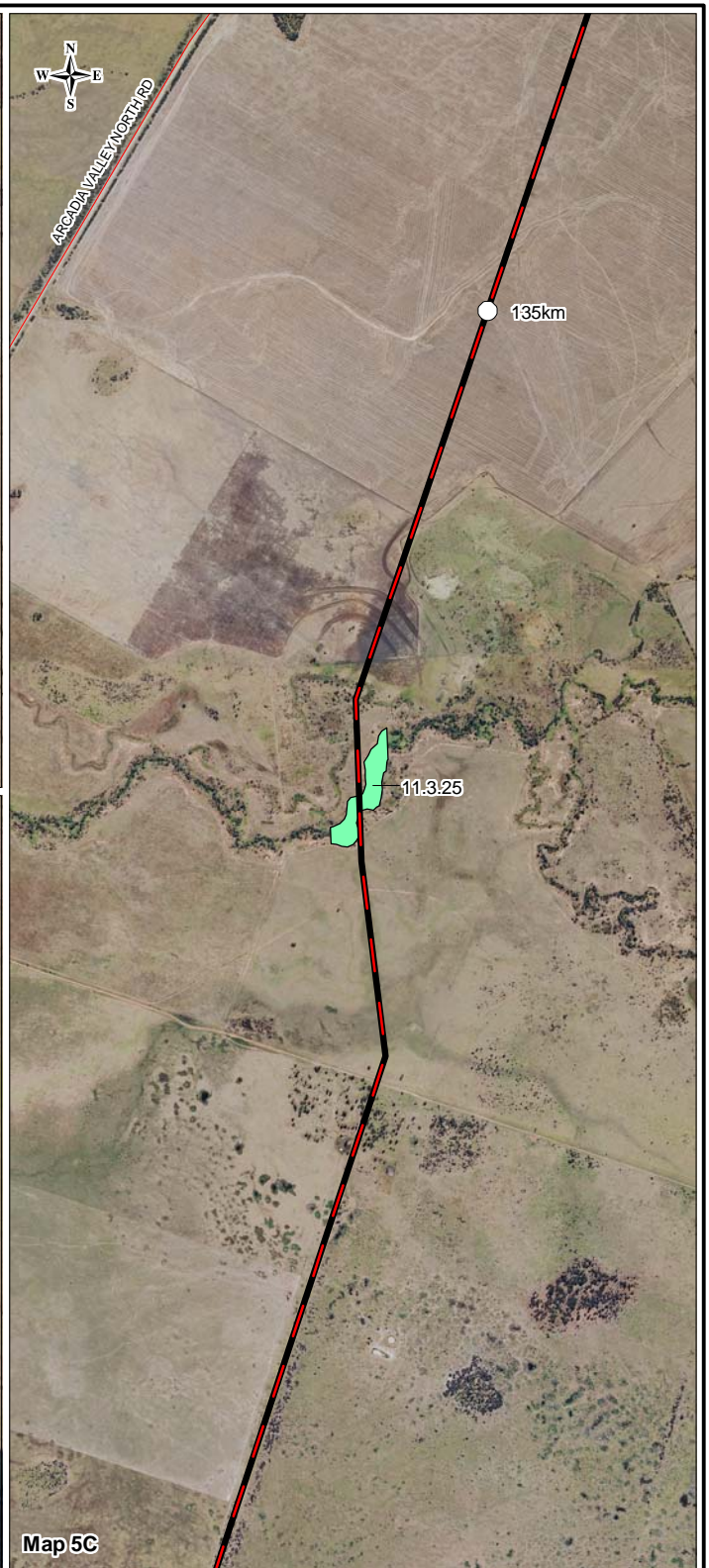
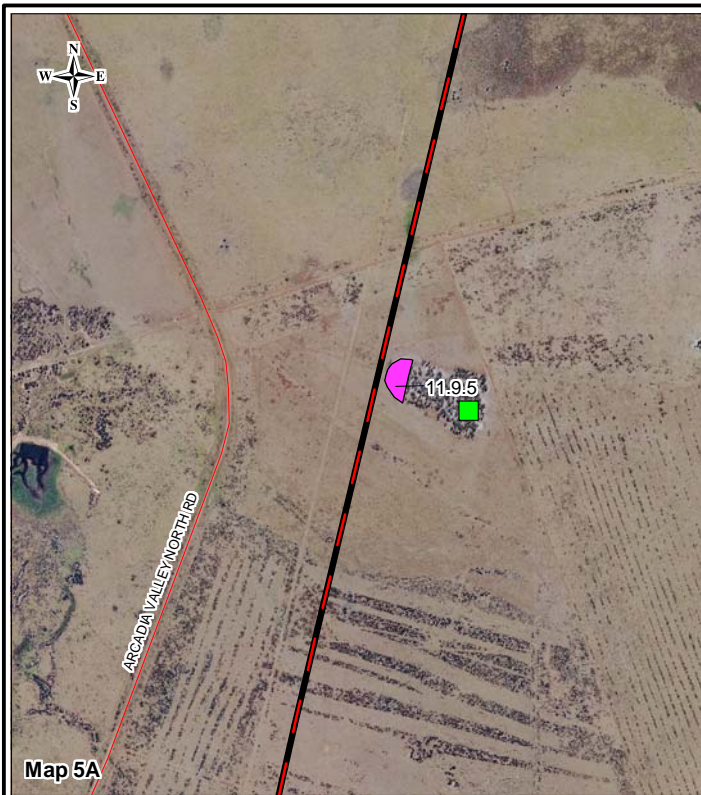
0 500 1000m  
 Scale: 1:25,000 (A4)  
 Datum: GDA94

Source: This map may contain data which is sourced and Copyright. Refer to Section 18.2 of the EIS for Ownership and Copyright.

Note: Figures 6 to 27 must be viewed with Figure 28.

Client  	Project GLADSTONE LNG PROJECT TERRESTRIAL FLORA ASSESSMENT GAS TRANSMISSION PIPELINE		Title REGIONAL ECOSYSTEMS GAS TRANSMISSION PIPELINE MAP 4 OF 22	
	Drawn: RG Job No: 4262 6220	Approved: JB File No: 42626220-g-731b.wor	Date: 05-02-2009	Figure: 9





- |               |                                                                                    |                          |                        |
|---------------|------------------------------------------------------------------------------------|--------------------------|------------------------|
| Major Highway | Gas Transmission Pipeline                                                          | Pipeline Distance Marker | Not of concern RE      |
| Major Road    | Major Drainage                                                                     | Secondary Sites          | Of concern dominant RE |
| Minor Road    | Minor Drainage                                                                     | Quaternary Sites         | Endangered dominant RE |
|               | Anecdotal record of <i>Cadellia pentastylis</i> (Endangered - NC Act and EPBC Act) |                          |                        |
- 0 500 1000m  
Scale: 1:25,000 (A4)  
Datum: GDA94

Source: This map may contain data which is sourced and Copyright. Refer to Section 18.2 of the EIS for Ownership and Copyright.

Note: Figures 6 to 27 must be viewed with Figure 28.

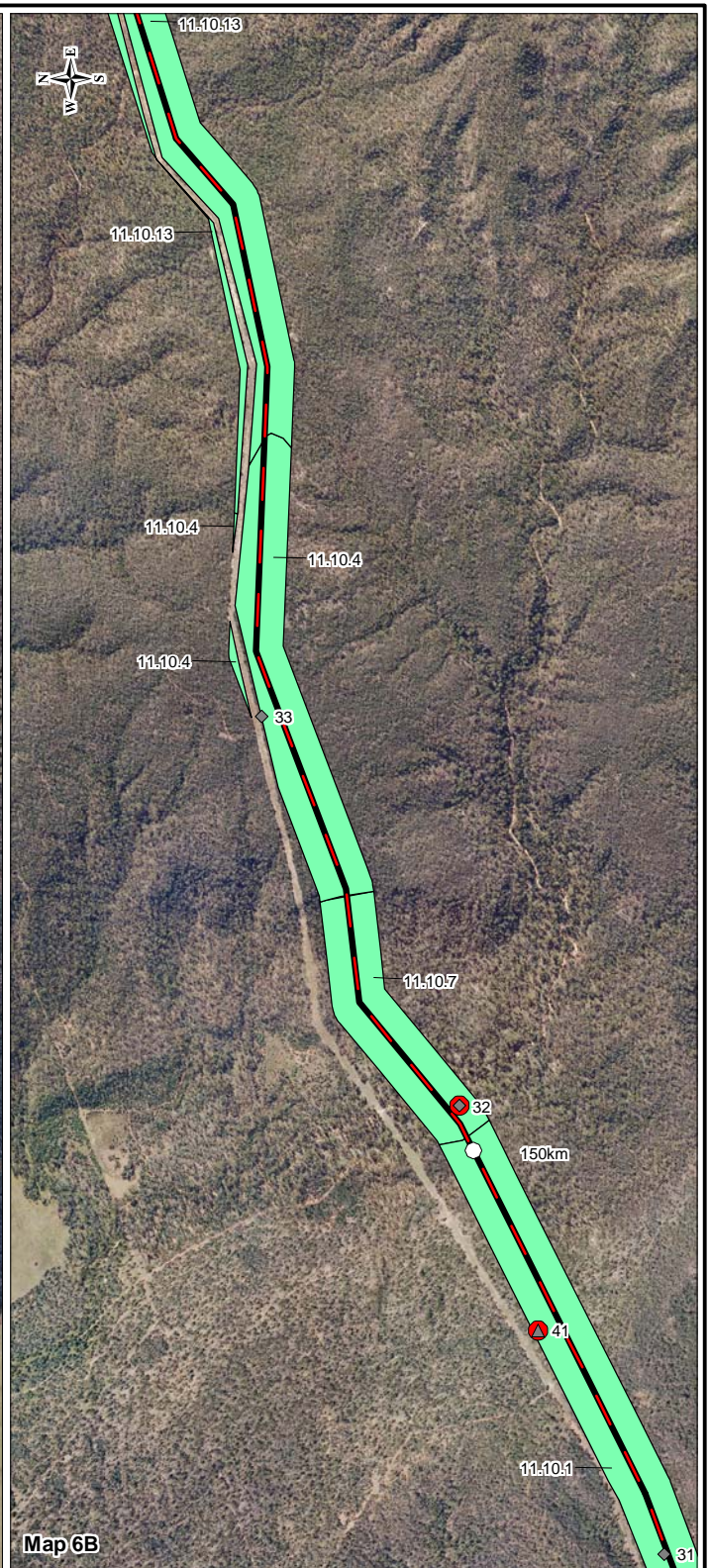
Client   	Project GLADSTONE LNG PROJECT TERRESTRIAL FLORA ASSESSMENT GAS TRANSMISSION PIPELINE			Title REGIONAL ECOSYSTEMS GAS TRANSMISSION PIPELINE MAP 5 OF 22	
	Drawn: RG Job No: 4262 6220	Approved: JB File No: 42626220-g-732b.wor	Date: 05-02-2009	Figure: 10	

This drawing is subject to COPYRIGHT. It remains the property of URS Australia Pty Ltd.



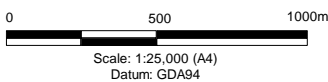


Map 6A



Map 6B

- |               |                           |                                                          |                        |
|---------------|---------------------------|----------------------------------------------------------|------------------------|
| Major Highway | Gas Transmission Pipeline | Pipeline Distance Marker                                 | Not of concern RE      |
| Major Road    | Major Drainage            | Secondary Sites                                          | Of concern dominant RE |
| Minor Road    | Minor Drainage            | Quaternary Sites                                         | Endangered dominant RE |
|               |                           | Presence of Exotic Species (Refer Figure 28 for details) |                        |

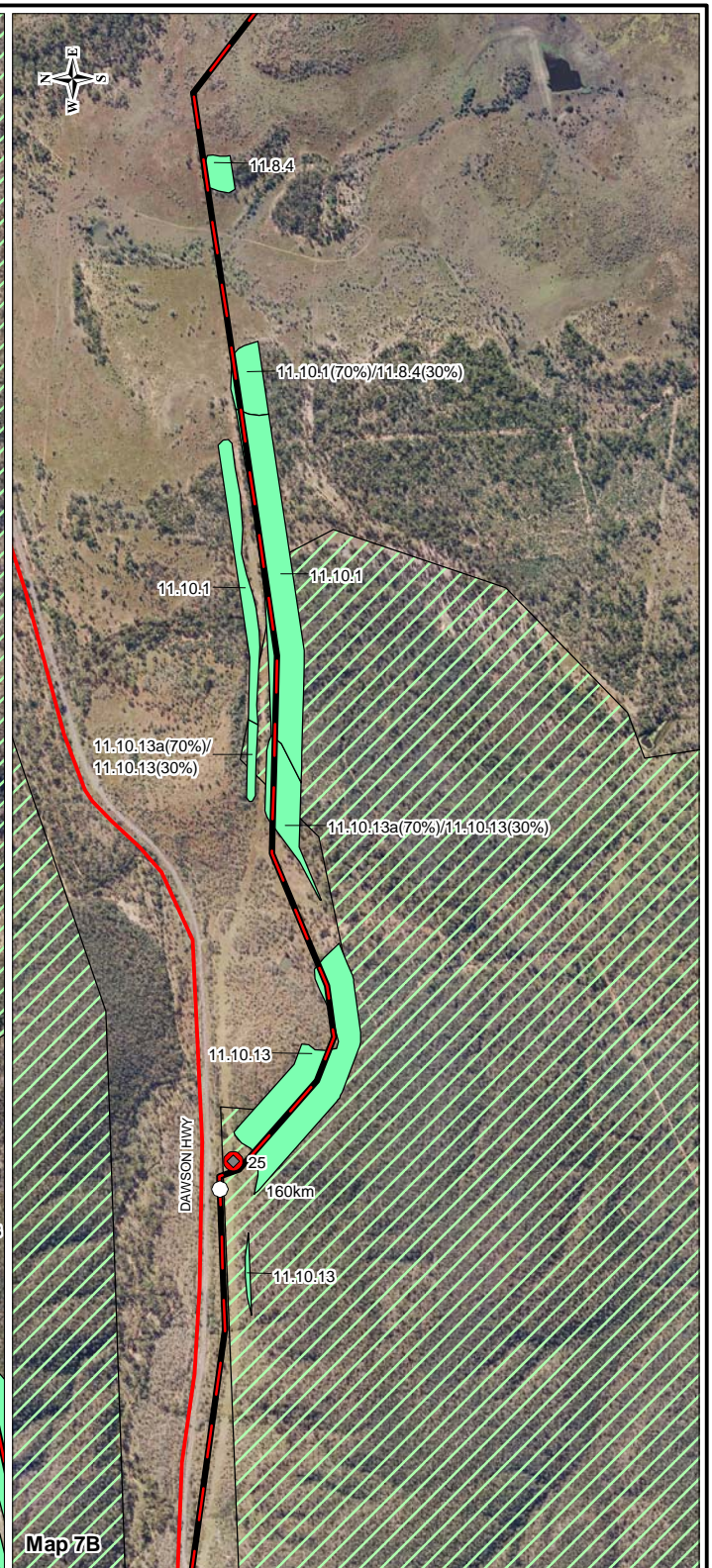
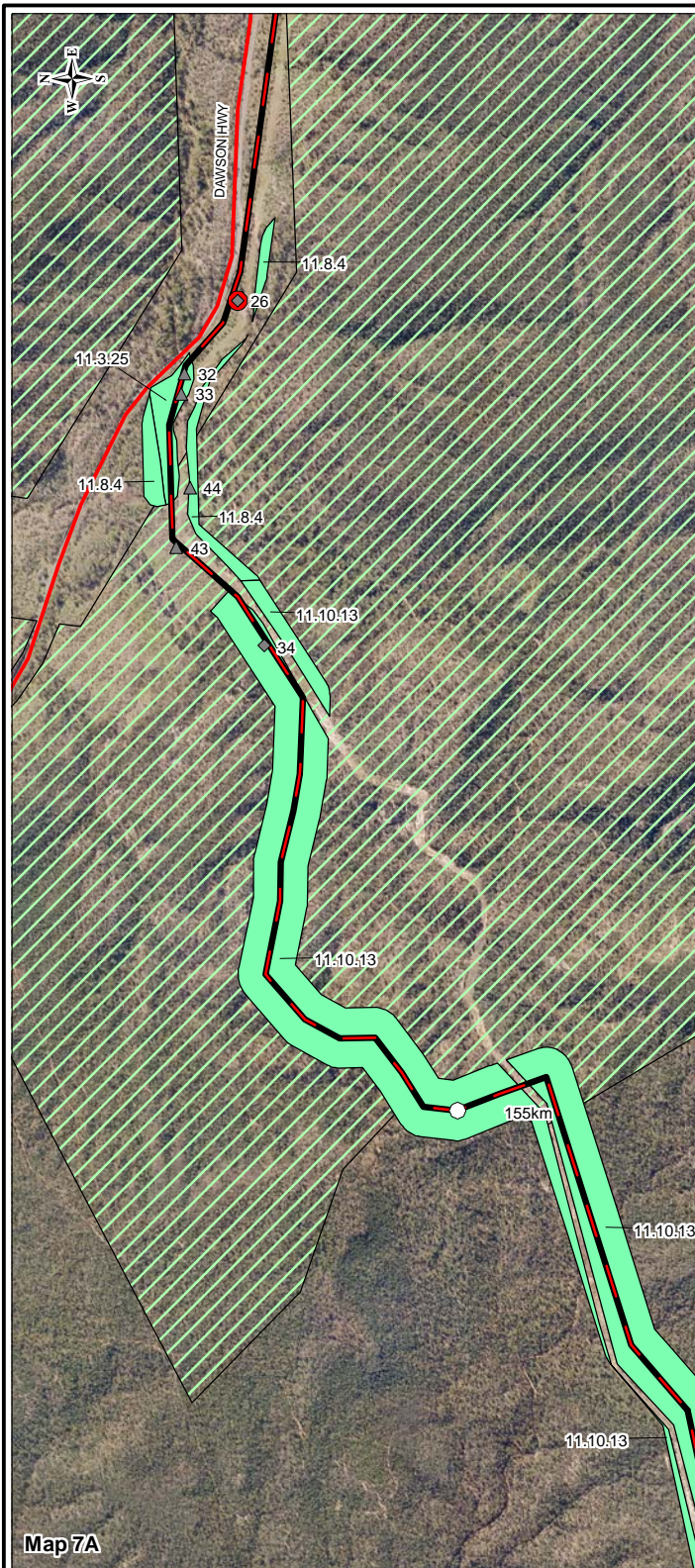


Source: This map may contain data which is sourced and Copyright. Refer to Section 18.2 of the EIS for Ownership and Copyright.

Note: Figures 6 to 27 must be viewed with Figure 28.

Client   	Project GLADSTONE LNG PROJECT TERRESTRIAL FLORA ASSESSMENT GAS TRANSMISSION PIPELINE		Title REGIONAL ECOSYSTEMS GAS TRANSMISSION PIPELINE MAP 6 OF 22	
	Drawn: RG Job No: 4262 6220	Approved: JB File No: 42626220-g-733b.wor	Date: 05-02-2009	Figure: 11





Map 7A

Map 7B

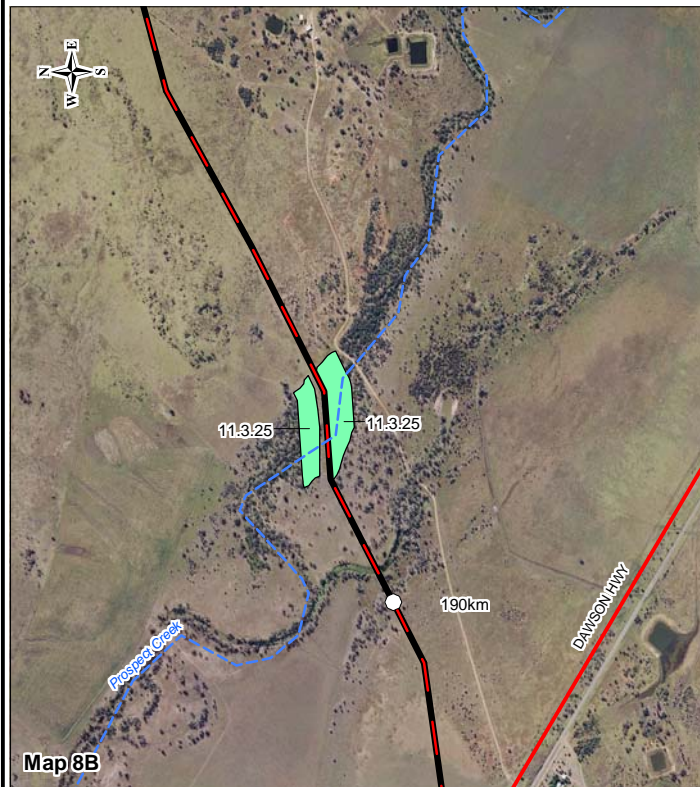
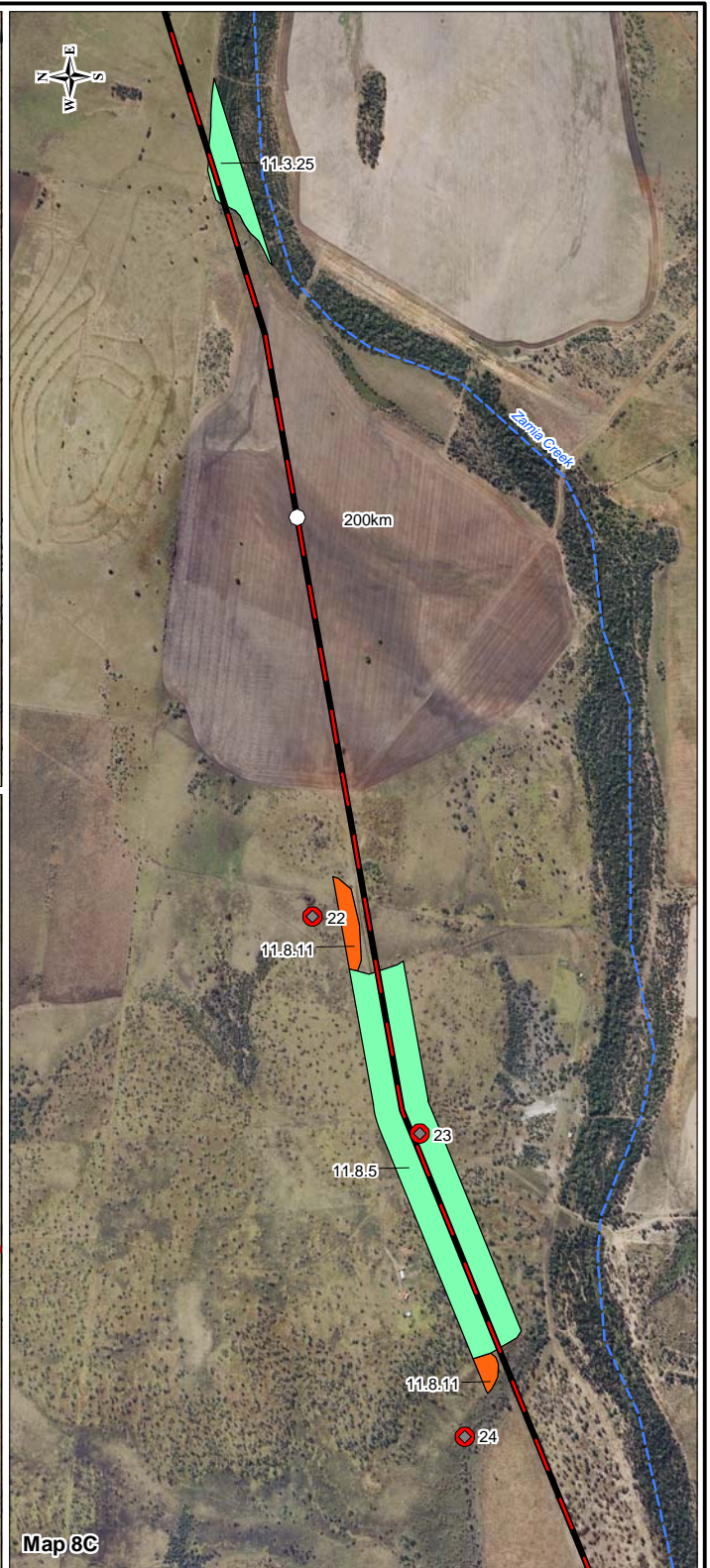
- |               |                           |                                                          |                         |
|---------------|---------------------------|----------------------------------------------------------|-------------------------|
| Major Highway | Gas Transmission Pipeline | Pipeline Distance Marker                                 | Not of concern RE       |
| Major Road    | Major Drainage            | Secondary Sites                                          | Of concern dominant RE  |
| Minor Road    | Minor Drainage            | Quaternary Sites                                         | Endangered dominant RE  |
|               |                           | Presence of Exotic Species (Refer Figure 28 for details) | Expedition State Forest |
- 0 500 1000m  
Scale: 1:25,000 (A4)  
Datum: GDA94

Source: This map may contain data which is sourced and Copyright. Refer to Section 18.2 of the EIS for Ownership and Copyright.

Note: Figures 6 to 27 must be viewed with Figure 28.

Client  	Project GLADSTONE LNG PROJECT TERRESTRIAL FLORA ASSESSMENT GAS TRANSMISSION PIPELINE		Title REGIONAL ECOSYSTEMS GAS TRANSMISSION PIPELINE MAP 7 OF 22	
	Drawn: RG Job No: 4262 6220	Approved: JB File No: 42626220-g-734b.wor	Date: 05-02-2009	Figure: 12





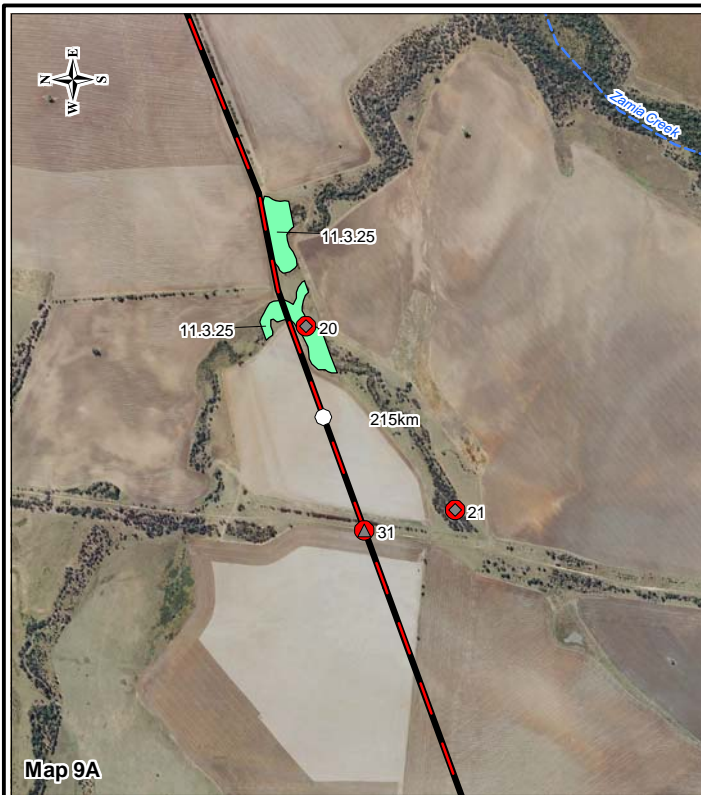
- |               |                           |                                                          |                         |
|---------------|---------------------------|----------------------------------------------------------|-------------------------|
| Major Highway | Gas Transmission Pipeline | Pipeline Distance Marker                                 | Not of concern RE       |
| Major Road    | Major Drainage            | Secondary Sites                                          | Of concern dominant RE  |
| Minor Road    | Minor Drainage            | Quaternary Sites                                         | Endangered dominant RE  |
|               |                           | Presence of Exotic Species (Refer Figure 28 for details) | Expedition State Forest |
- 0 500 1000m  
Scale: 1:25,000 (A4)  
Datum: GDA94

Source: This map may contain data which is sourced and Copyright. Refer to Section 18.2 of the EIS for Ownership and Copyright.

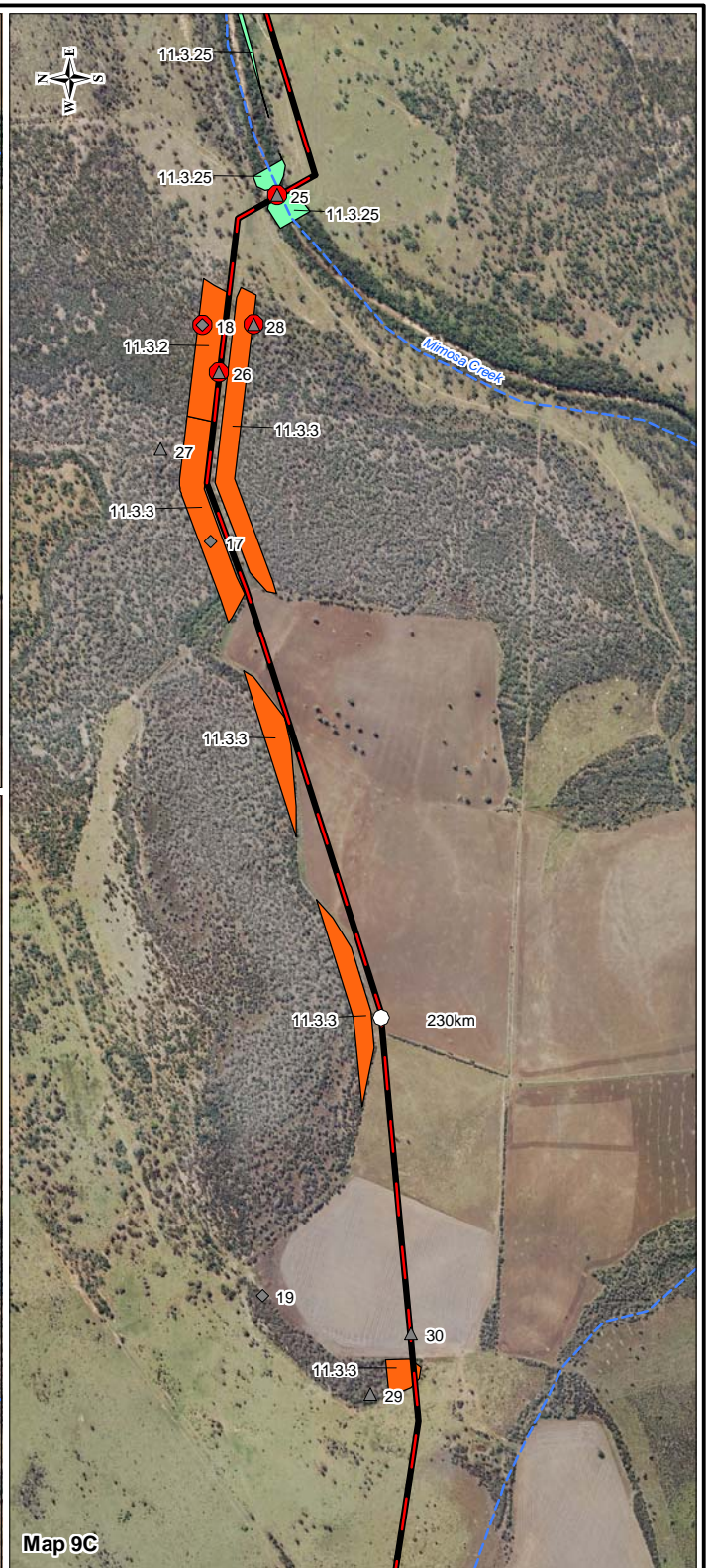
**Note: Figures 6 to 27 must be viewed with Figure 28.**

Client  	Project GLADSTONE LNG PROJECT TERRESTRIAL FLORA ASSESSMENT GAS TRANSMISSION PIPELINE		Title REGIONAL ECOSYSTEMS GAS TRANSMISSION PIPELINE MAP 8 OF 22	
	Drawn: RG Job No: 4262 6220	Approved: JB File No: 42626220-g-735b.wor	Date: 05-02-2009	Figure: 13

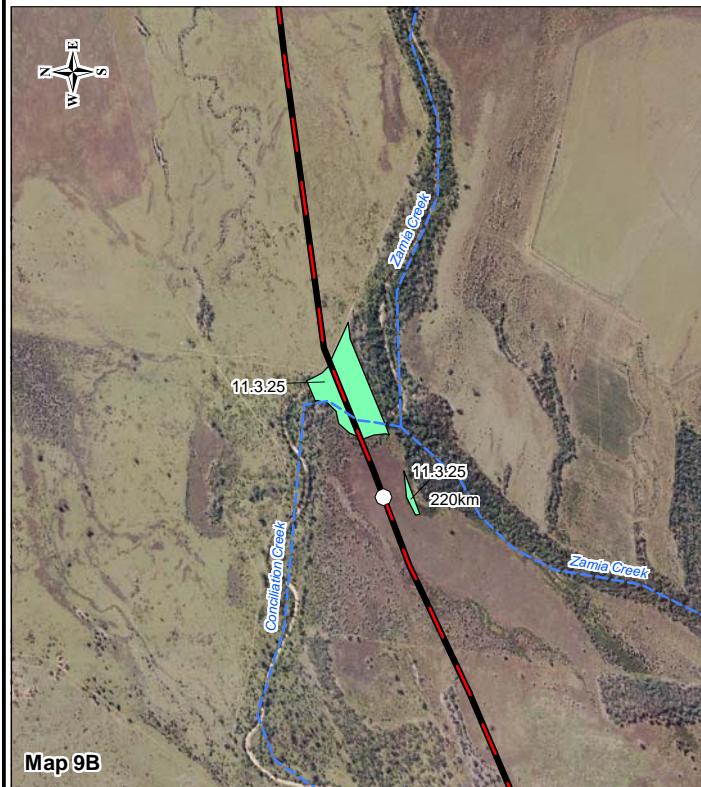




Map 9A



Map 9C



Map 9B

- |               |                           |                                                             |                        |
|---------------|---------------------------|-------------------------------------------------------------|------------------------|
| Major Highway | Gas Transmission Pipeline | Pipeline Distance Marker                                    | Not of concern RE      |
| Major Road    | Major Drainage            | Secondary Sites                                             | Of concern dominant RE |
| Minor Road    | Minor Drainage            | Quaternary Sites                                            | Endangered dominant RE |
|               |                           | Presence of Exotic Species<br>(Refer Figure 28 for details) |                        |

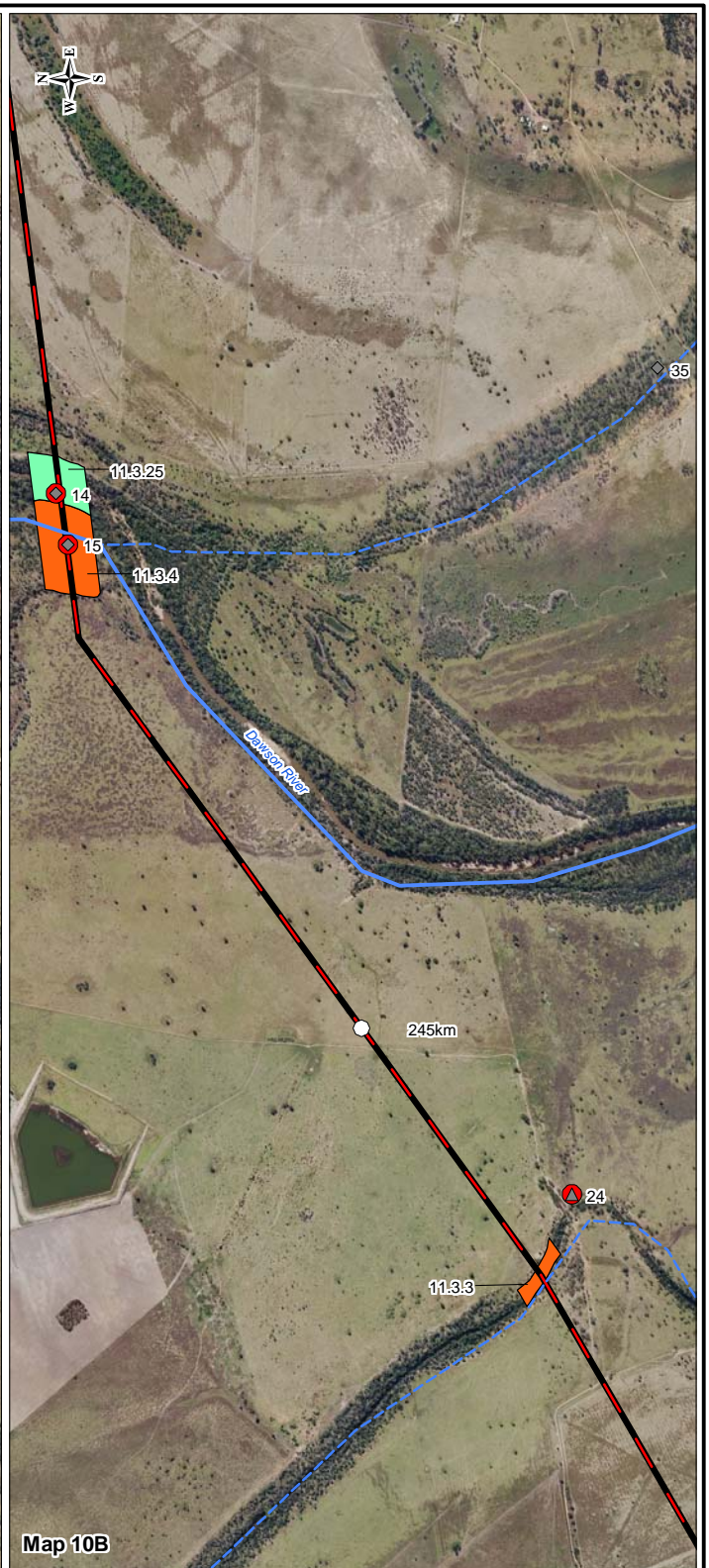
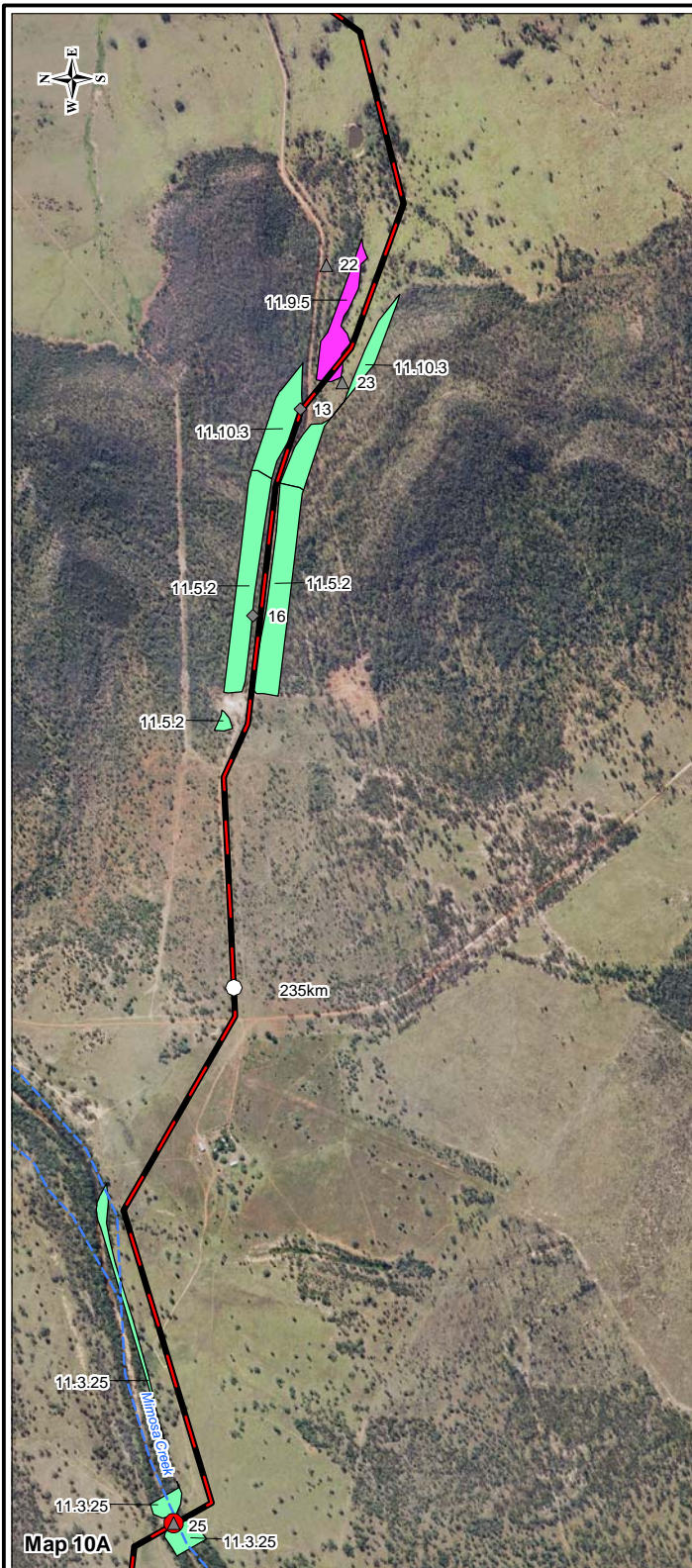
0 500 1000m  
 Scale: 1:25,000 (A4)  
 Datum: GDA94

Source: This map may contain data which is sourced and Copyright. Refer to Section 18.2 of the EIS for Ownership and Copyright.

**Note: Figures 6 to 27 must be viewed with Figure 28.**

Client  	Project GLADSTONE LNG PROJECT TERRESTRIAL FLORA ASSESSMENT GAS TRANSMISSION PIPELINE		Title REGIONAL ECOSYSTEMS GAS TRANSMISSION PIPELINE MAP 9 OF 22	
	Drawn: RG Job No: 4262 6220	Approved: JB File No: 42626220-g-736b.wor	Date: 05-02-2009	Figure: 14





- |               |                           |                                                          |                        |
|---------------|---------------------------|----------------------------------------------------------|------------------------|
| Major Highway | Gas Transmission Pipeline | Pipeline Distance Marker                                 | Not of concern RE      |
| Major Road    | Major Drainage            | Secondary Sites                                          | Of concern dominant RE |
| Minor Road    | Minor Drainage            | Quaternary Sites                                         | Endangered dominant RE |
|               |                           | Presence of Exotic Species (Refer Figure 28 for details) |                        |
- 0 500 1000m  
Scale: 1:25,000 (A4)  
Datum: GDA94

Source: This map may contain data which is sourced and Copyright. Refer to Section 18.2 of the EIS for Ownership and Copyright.

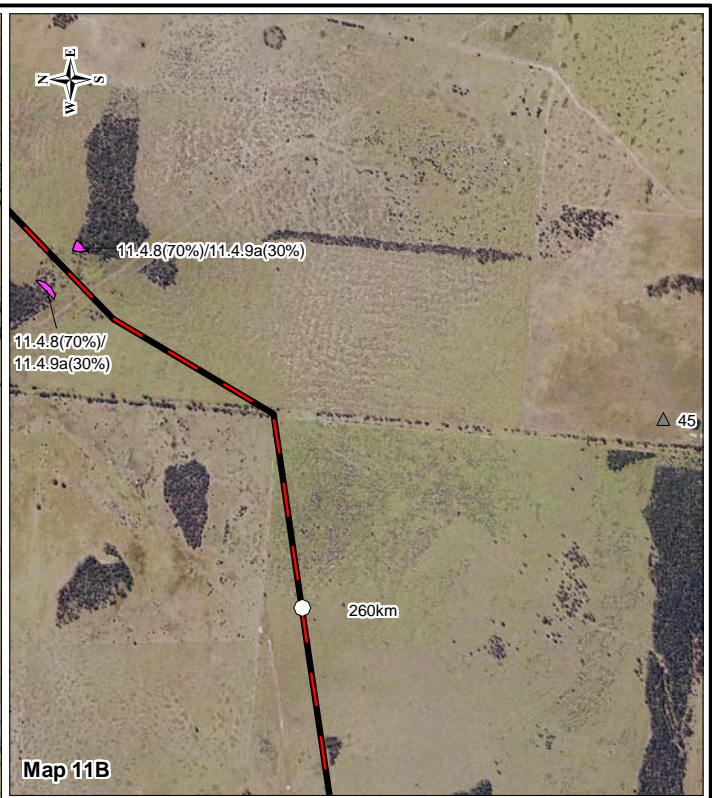
**Note: Figures 6 to 27 must be viewed with Figure 28.**

Client  	Project GLADSTONE LNG PROJECT TERRESTRIAL FLORA ASSESSMENT GAS TRANSMISSION PIPELINE		Title REGIONAL ECOSYSTEMS GAS TRANSMISSION PIPELINE MAP 10 OF 22	
	Drawn: RG Job No: <b>4262 6220</b>	Approved: JB File No: 42626220-g-737b.wor	Date: 05-02-2009	Figure: <b>15</b>

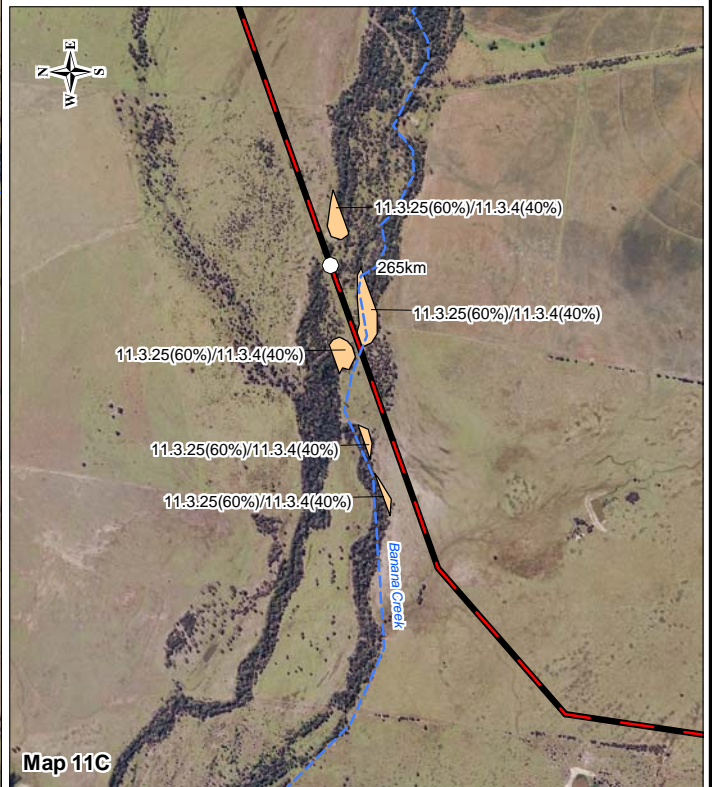




Map 11A



Map 11B



Map 11C

- Major Highway
- Major Road
- Minor Road
- Gas Transmission Pipeline
- Major Drainage
- - - Minor Drainage
- Pipeline Distance Marker
- ◆ Secondary Sites
- ▲ Quaternary Sites
- Not of concern RE
- Of concern sub-dominant RE
- Of concern dominant RE
- Endangered dominant RE

0 500 1000m  
 Scale: 1:25,000 (A4)  
 Datum: GDA94

Source: This map may contain data which is sourced and Copyright. Refer to Section 18.2 of the EIS for Ownership and Copyright.

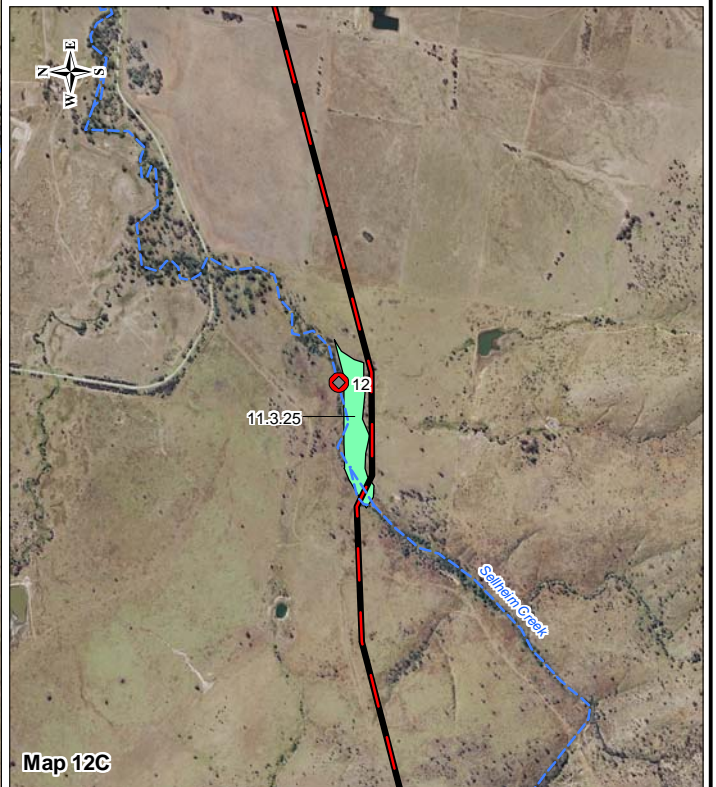
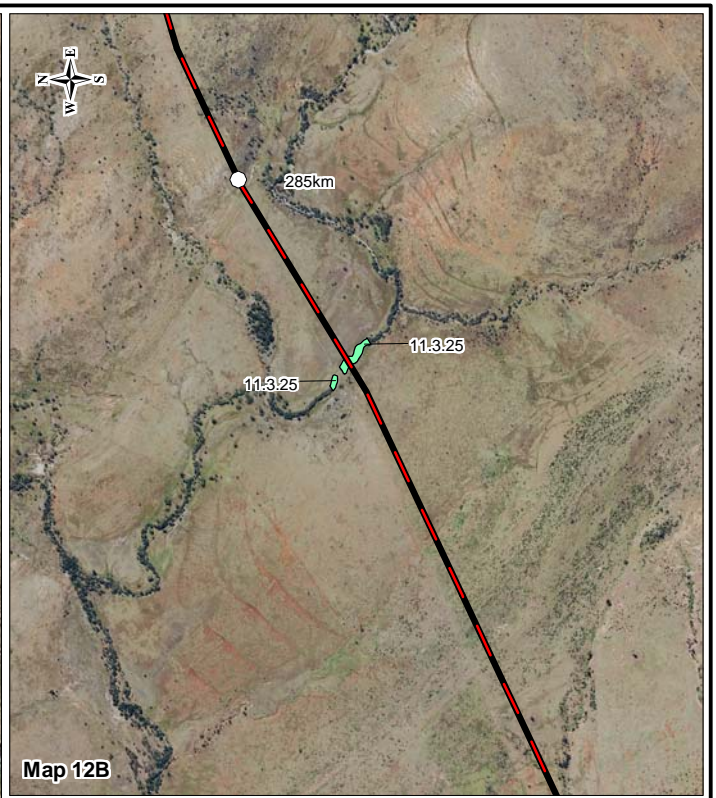
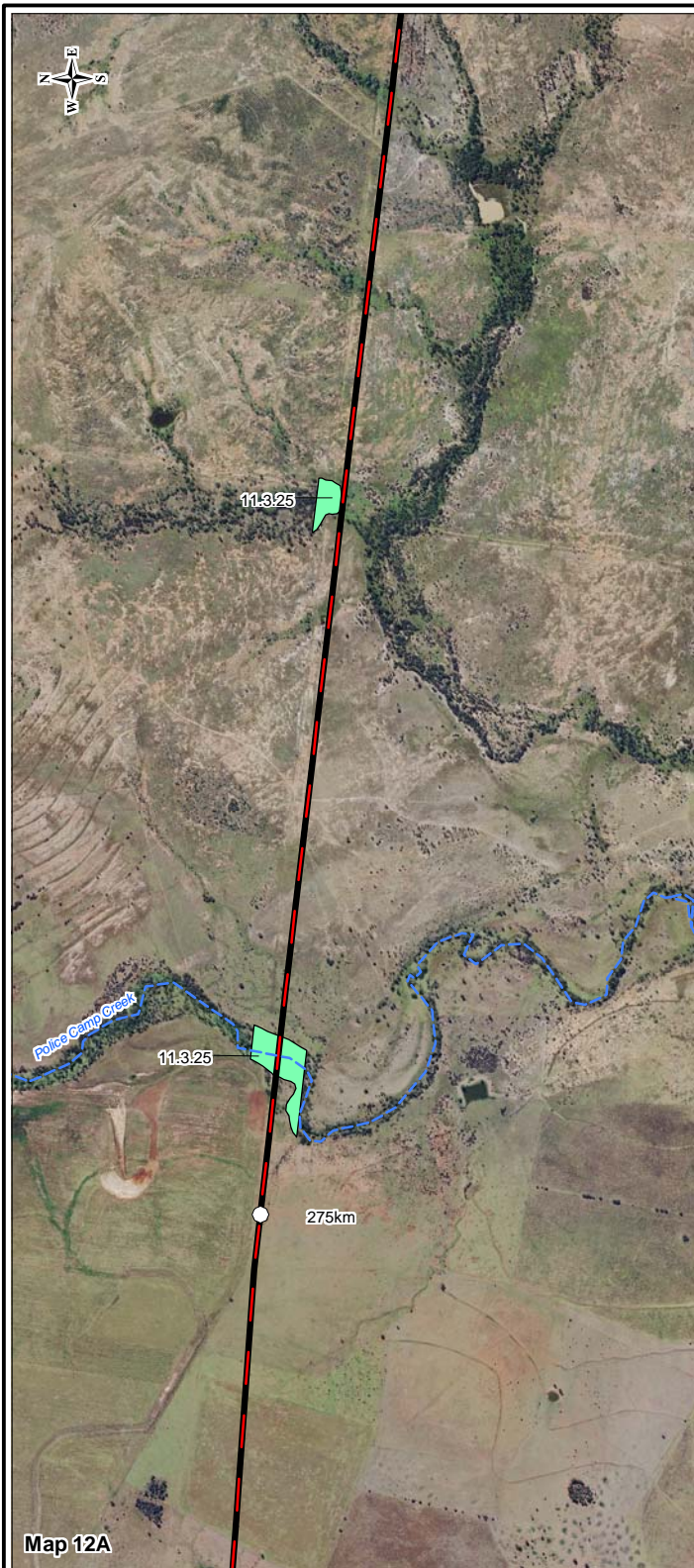
Note: Figures 6 to 27 must be viewed with Figure 28.

Client   	Project GLADSTONE LNG PROJECT TERRESTRIAL FLORA ASSESSMENT GAS TRANSMISSION PIPELINE	Title REGIONAL ECOSYSTEMS GAS TRANSMISSION PIPELINE MAP 11 OF 22
Drawn: RG    Approved: JB    Date: 05-02-2009		Figure: 16
Job No: 4262 6220    File No: 42626220-g-738b.wor		
		Rev: B A4

This drawing is subject to COPYRIGHT. It remains the property of URS Australia Pty Ltd.



This drawing is subject to COPYRIGHT. It remains the property of URS Australia Pty Ltd.



- |               |                           |                                                          |                        |
|---------------|---------------------------|----------------------------------------------------------|------------------------|
| Major Highway | Gas Transmission Pipeline | Pipeline Distance Marker                                 | Not of concern RE      |
| Major Road    | Major Drainage            | Secondary Sites                                          | Of concern dominant RE |
| Minor Road    | Minor Drainage            | Quaternary Sites                                         | Endangered dominant RE |
|               |                           | Presence of Exotic Species (Refer Figure 28 for details) |                        |

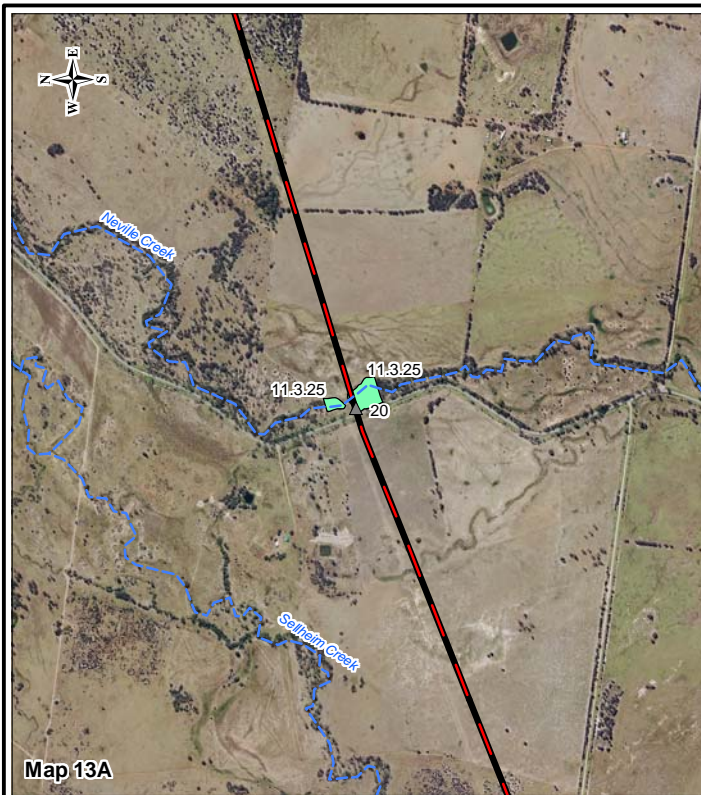
0 500 1000m  
 Scale: 1:25,000 (A4)  
 Datum: GDA94

Source: This map may contain data which is sourced and Copyright. Refer to Section 18.2 of the EIS for Ownership and Copyright.

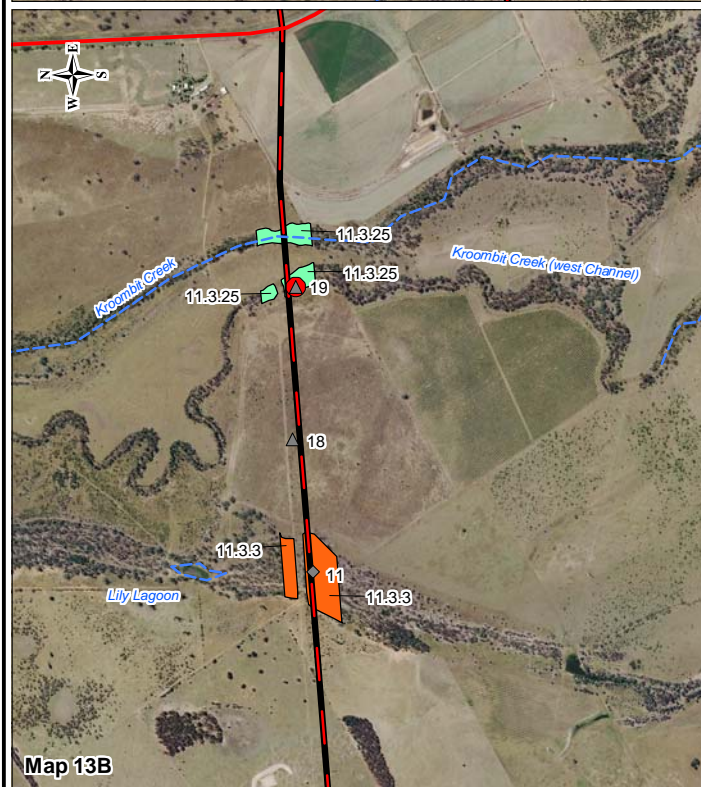
**Note: Figures 6 to 27 must be viewed with Figure 28.**

Client   	Project GLADSTONE LNG PROJECT TERRESTRIAL FLORA ASSESSMENT GAS TRANSMISSION PIPELINE	Title REGIONAL ECOSYSTEMS GAS TRANSMISSION PIPELINE MAP 12 OF 22	
	Drawn: RG    Approved: JB    Date: 05-02-2009 Job No: 4262 6220    File No: 42626220-g-739b.wor	Figure: 17	Rev: B A4

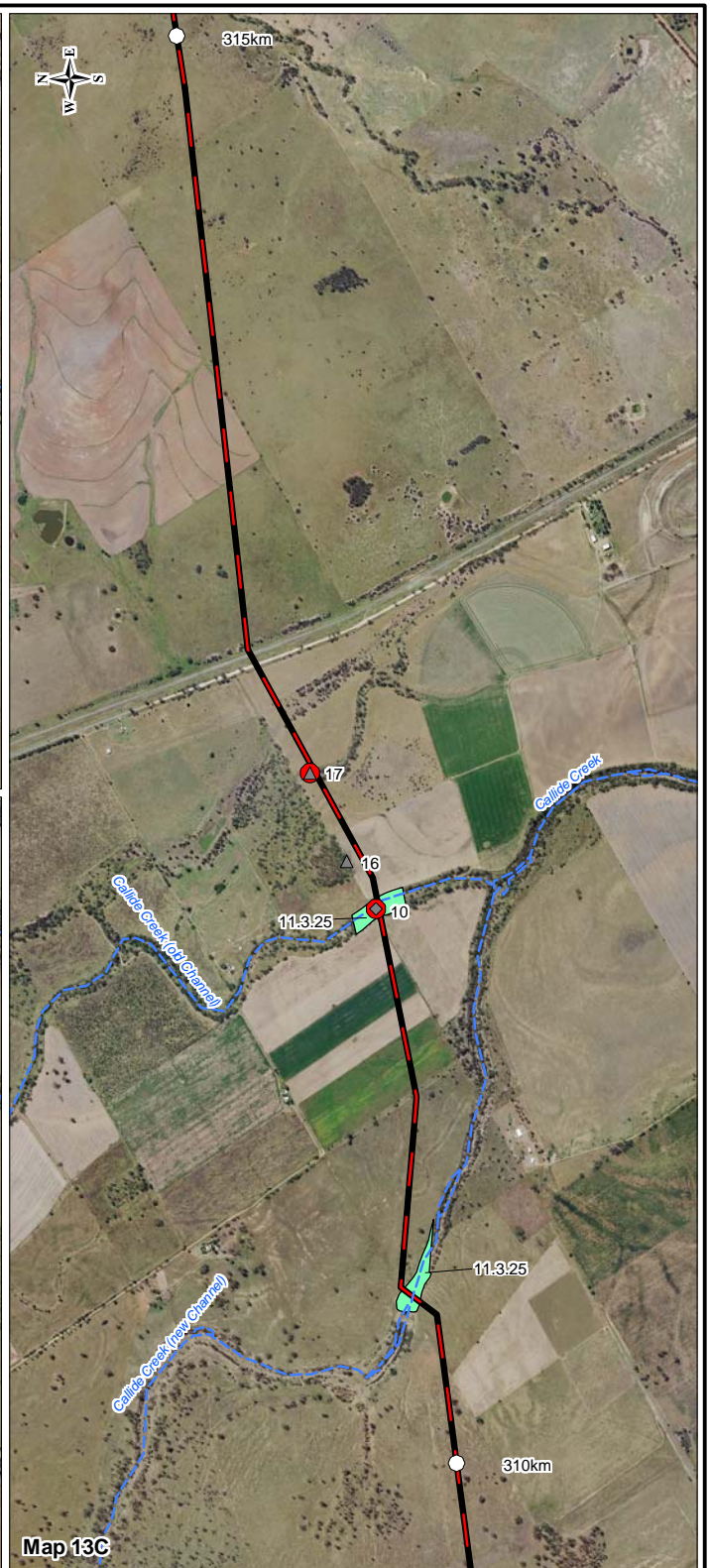




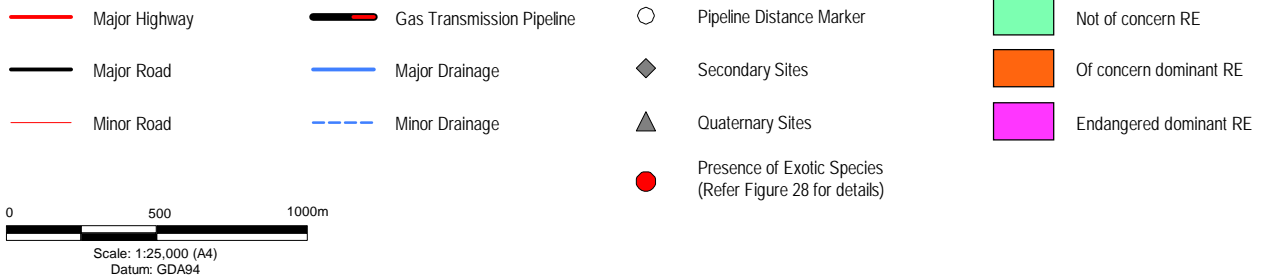
Map 13A



Map 13B



Map 13C

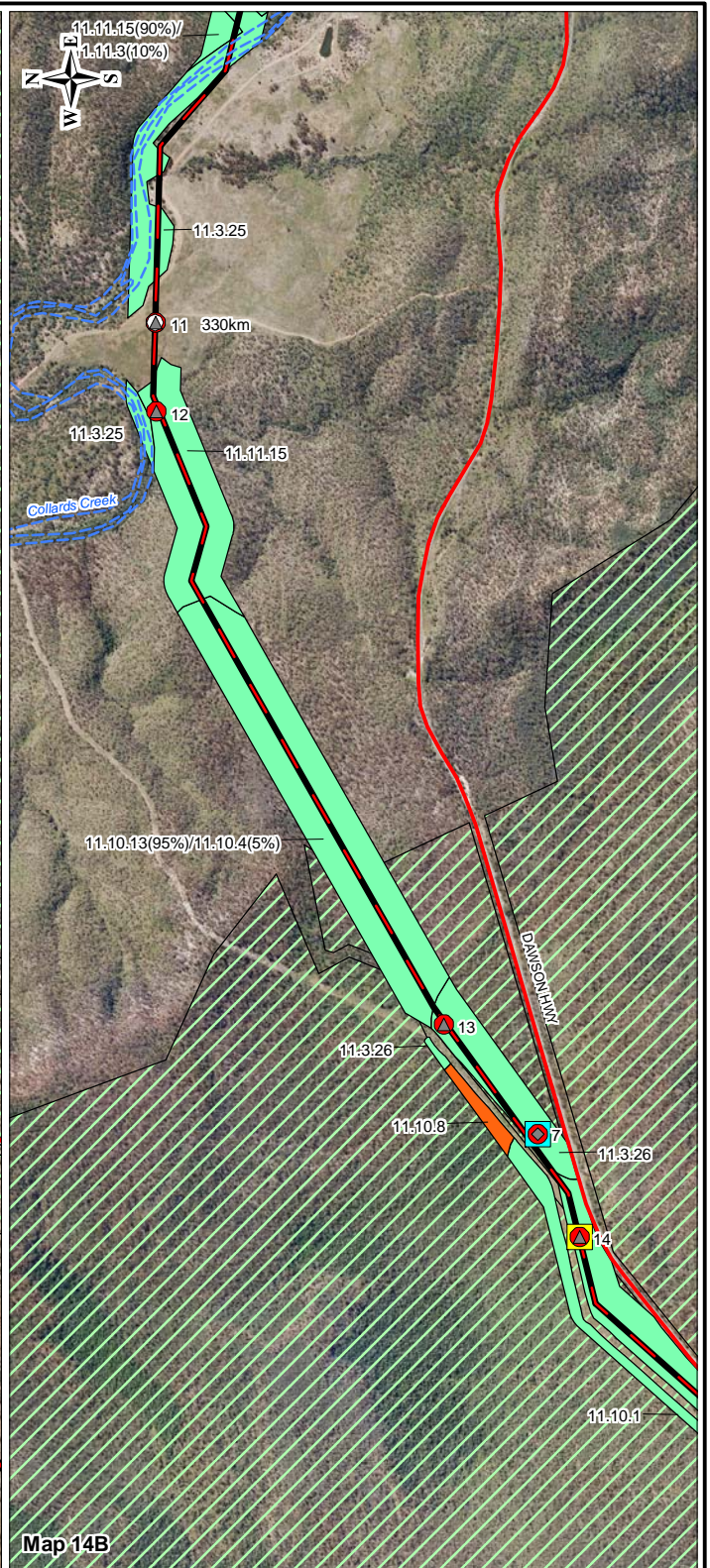
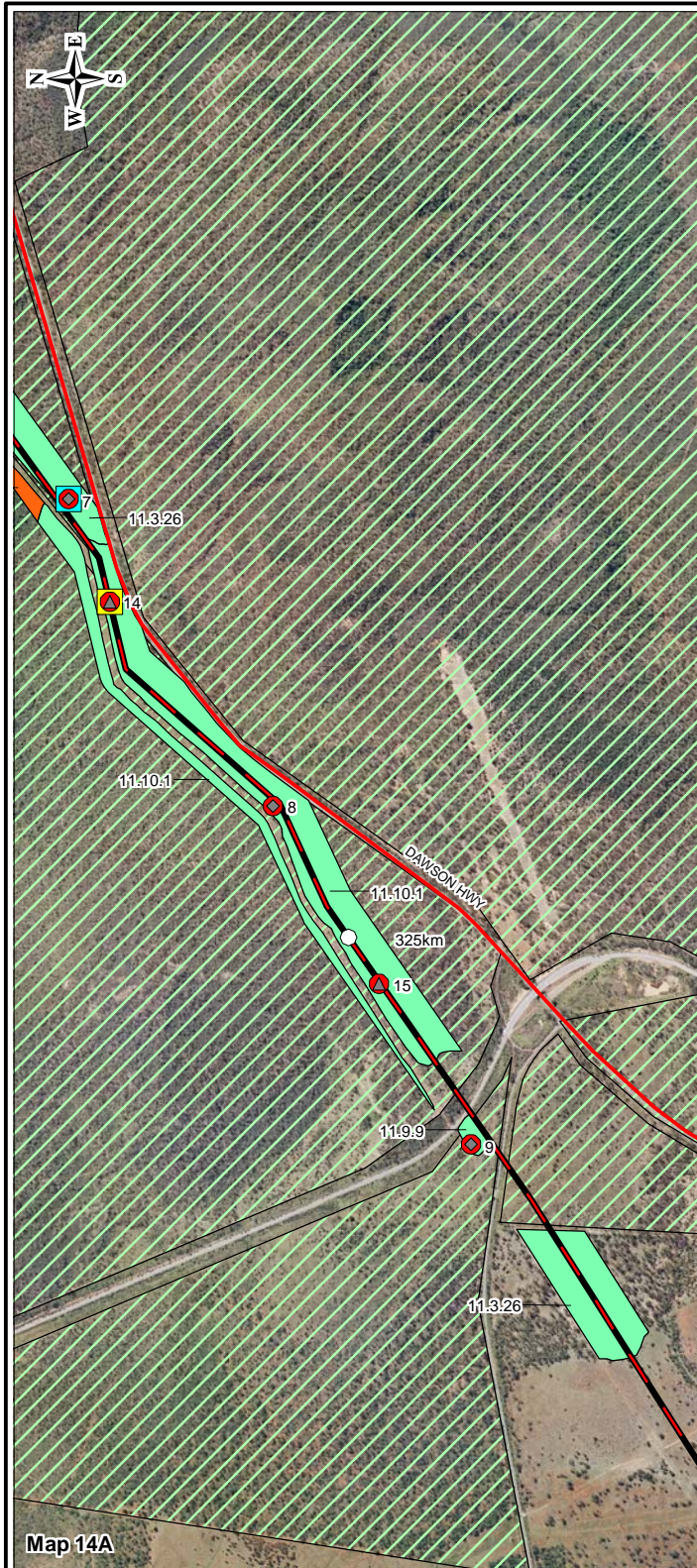


Source: This map may contain data which is sourced and Copyright. Refer to Section 18.2 of the EIS for Ownership and Copyright.

Note: Figures 6 to 27 must be viewed with Figure 28.

Client   	Project GLADSTONE LNG PROJECT TERRESTRIAL FLORA ASSESSMENT GAS TRANSMISSION PIPELINE		Title REGIONAL ECOSYSTEMS GAS TRANSMISSION PIPELINE MAP 13 OF 22	
	Drawn: RG Job No: 4262 6220	Approved: JB File No: 42626220-g-740b.wor	Date: 05-02-2009	Figure: 18

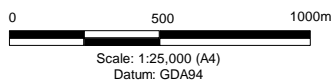




Map 14A

Map 14B

- |               |                           |                                                          |                                                           |
|---------------|---------------------------|----------------------------------------------------------|-----------------------------------------------------------|
| Major Highway | Gas Transmission Pipeline | Pipeline Distance Marker                                 | Not of concern RE                                         |
| Major Road    | Major Drainage            | Secondary Sites                                          | Of concern dominant RE                                    |
| Minor Road    | Minor Drainage            | Quaternary Sites                                         | Endangered dominant RE                                    |
|               | Callide Timber Reserve    | Presence of Exotic Species (Refer Figure 28 for details) | <i>Cycas megacarpa</i> (Endangered - NC Act and EPBC Act) |
|               |                           |                                                          | <i>Acacia pedleyi</i> (Rare - NC Act)                     |



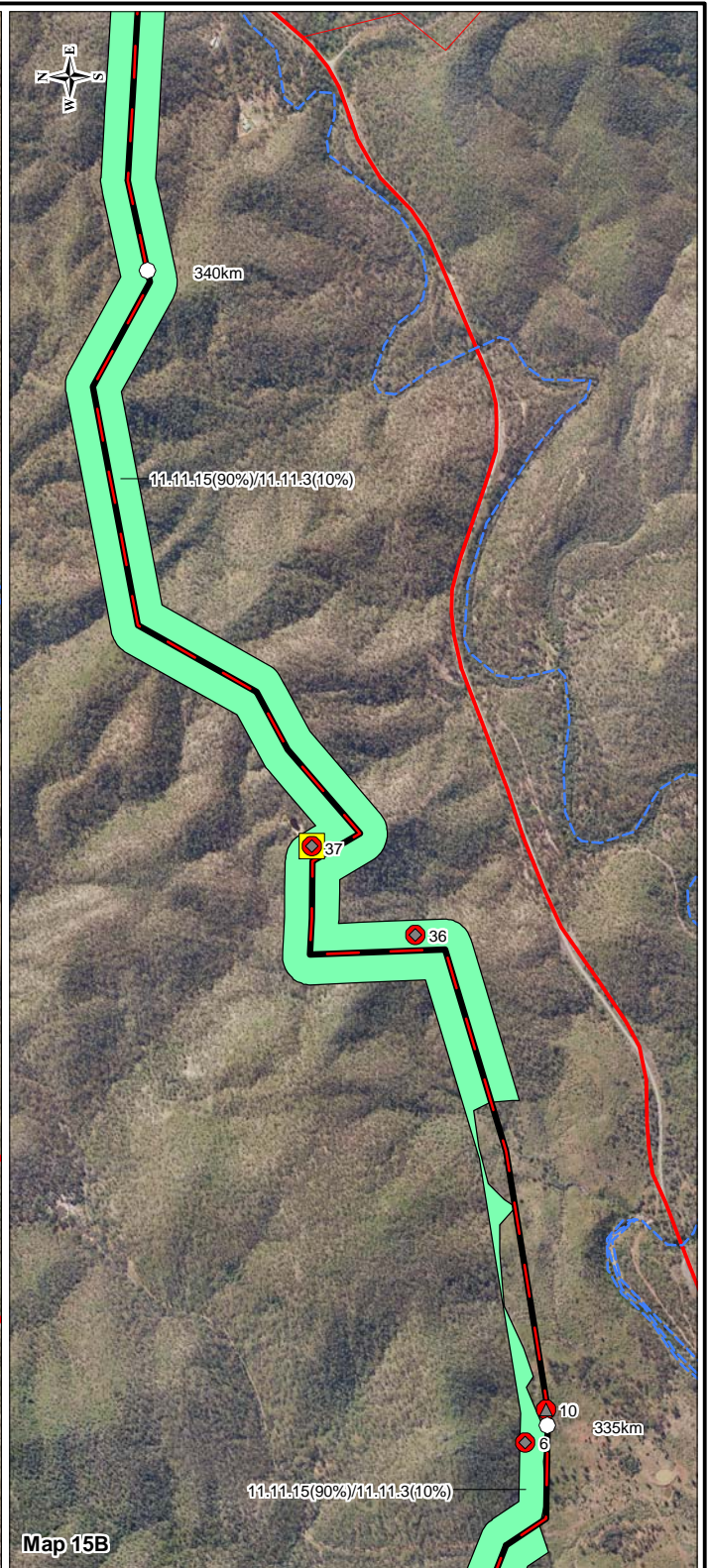
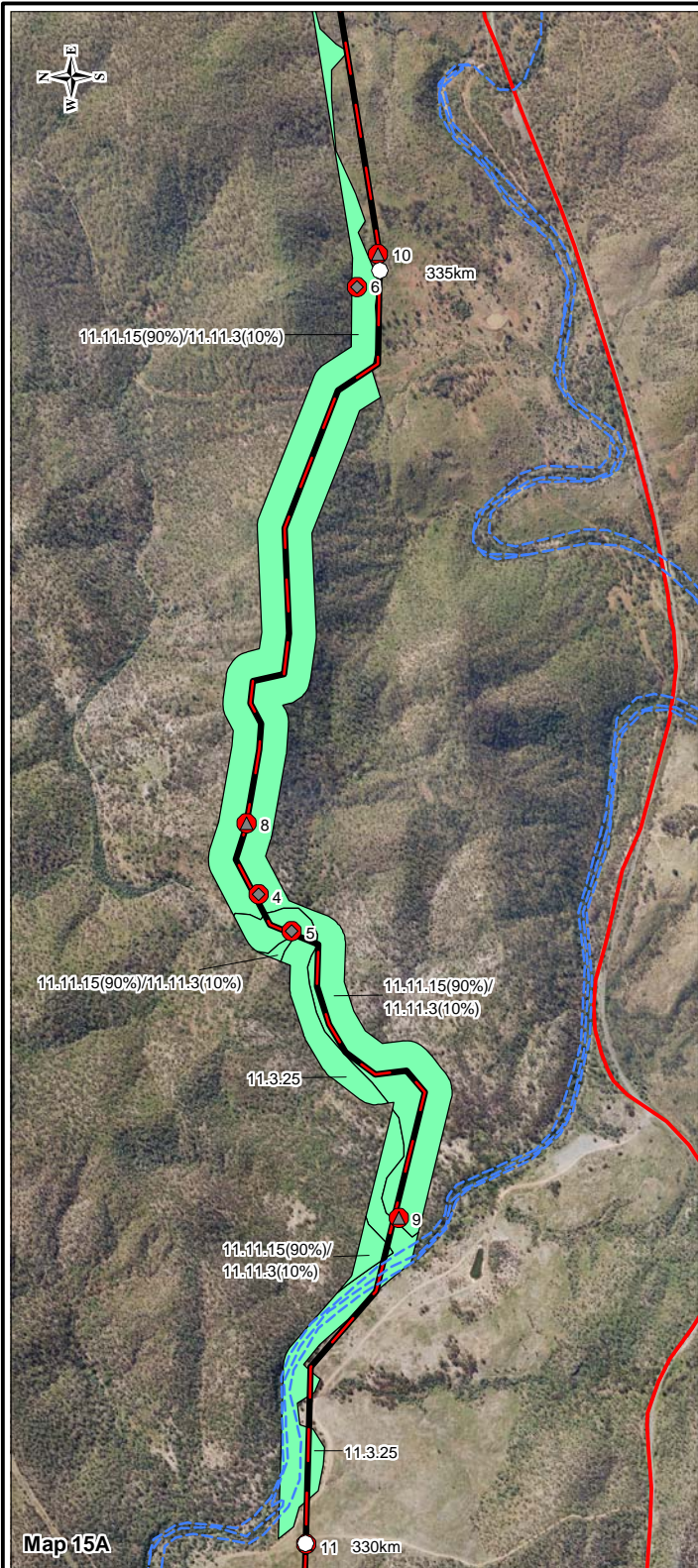
Source: This map may contain data which is sourced and Copyright. Refer to Section 18.2 of the EIS for Ownership and Copyright.

**Note: Figures 6 to 27 must be viewed with Figure 28.**

Client  	Project GLADSTONE LNG PROJECT TERRESTRIAL FLORA ASSESSMENT GAS TRANSMISSION PIPELINE		Title REGIONAL ECOSYSTEMS GAS TRANSMISSION PIPELINE MAP 14 OF 22	
	Drawn: RG Job No: <b>4262 6220</b>	Approved: JB File No: 42626220-g-741c.wor	Date: 05-02-2009	Figure: <b>19</b>



This drawing is subject to COPYRIGHT. It remains the property of URS Australia Pty Ltd.



- |               |                           |                                                          |                                                           |
|---------------|---------------------------|----------------------------------------------------------|-----------------------------------------------------------|
| Major Highway | Gas Transmission Pipeline | Pipeline Distance Marker                                 | Not of concern RE                                         |
| Major Road    | Major Drainage            | Secondary Sites                                          | Of concern dominant RE                                    |
| Minor Road    | Minor Drainage            | Quaternary Sites                                         | Endangered dominant RE                                    |
|               |                           | Presence of Exotic Species (Refer Figure 28 for details) | <i>Cycas megacarpa</i> (Endangered - NC Act and EPBC Act) |

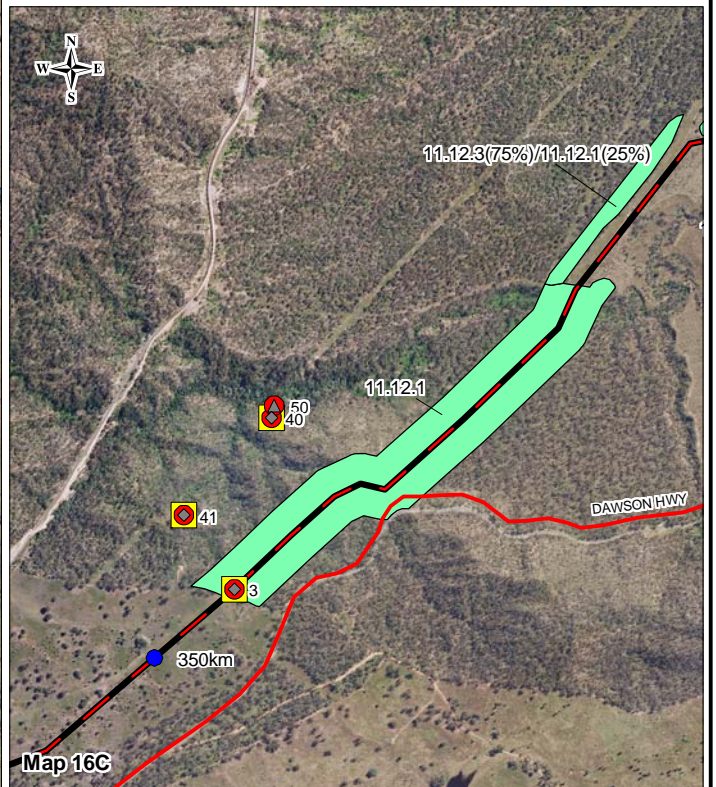
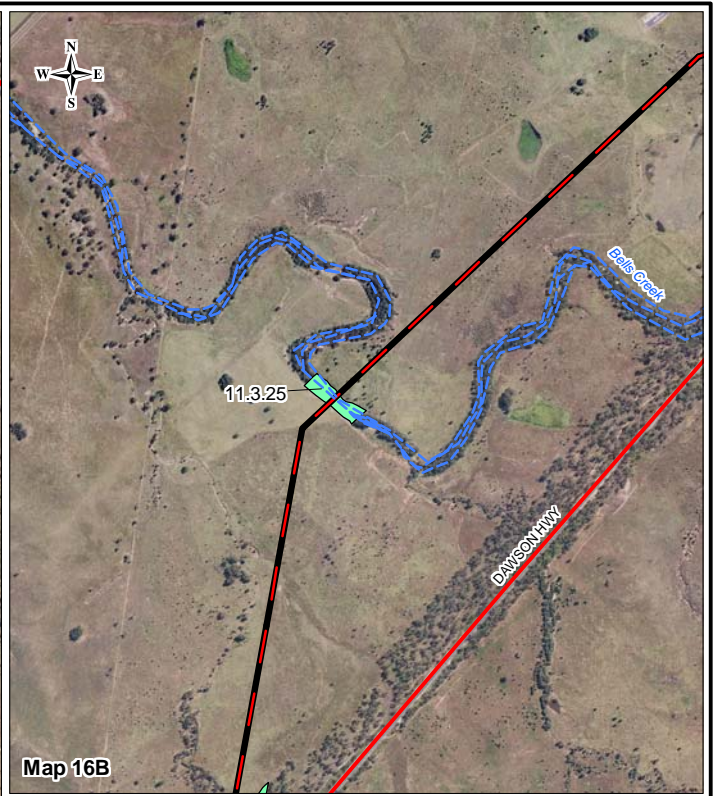
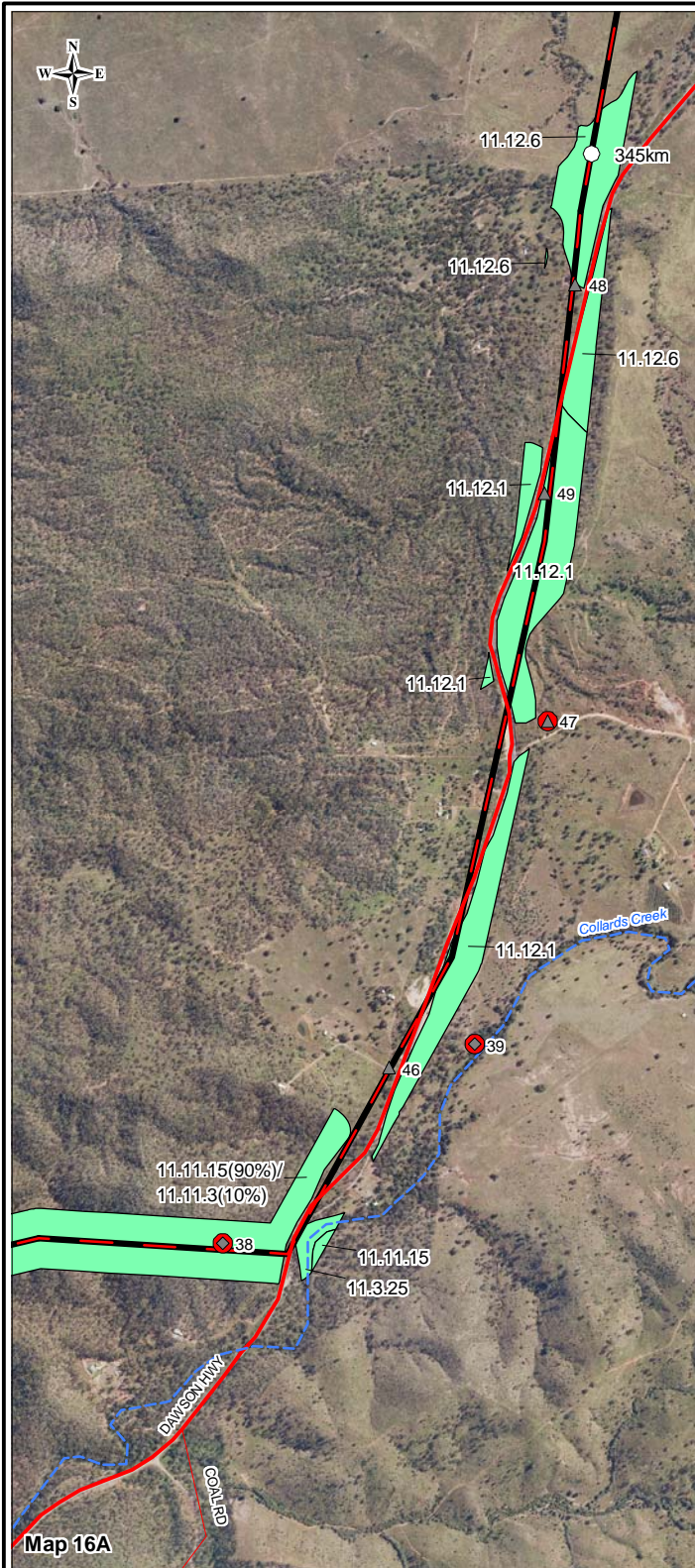
0 500 1000m  
Scale: 1:25,000 (A4)  
Datum: GDA94

Source: This map may contain data which is sourced and Copyright. Refer to Section 18.2 of the EIS for Ownership and Copyright.

**Note: Figures 6 to 27 must be viewed with Figure 28.**

Client  	Project GLADSTONE LNG PROJECT TERRESTRIAL FLORA ASSESSMENT GAS TRANSMISSION PIPELINE		Title REGIONAL ECOSYSTEMS GAS TRANSMISSION PIPELINE MAP 15 OF 22	
	Drawn: RG Job No: 4262 6220	Approved: JB File No: 42626220-g-742b.wor	Date: 05-02-2009	Figure: 20





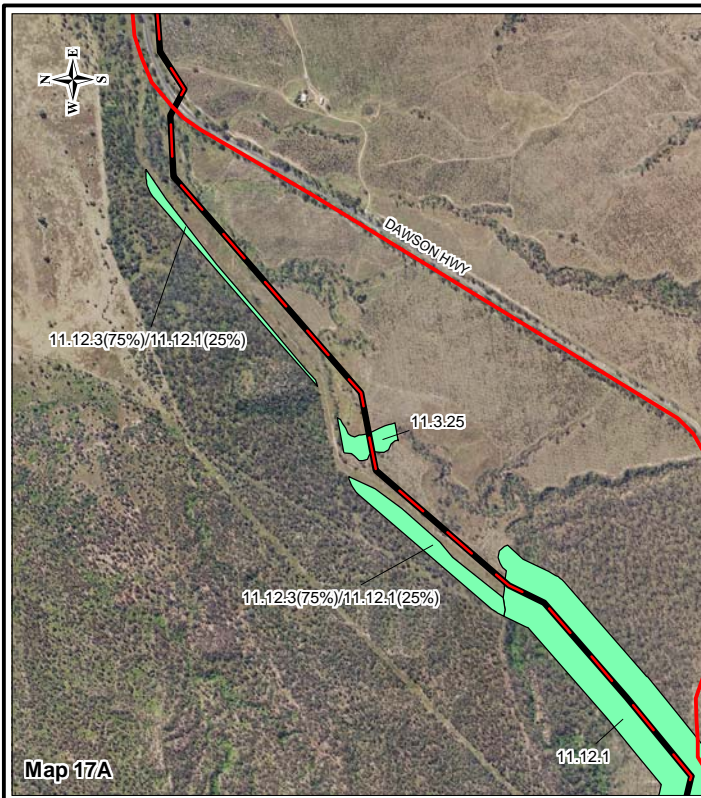
- |               |                           |                                                          |                                                           |
|---------------|---------------------------|----------------------------------------------------------|-----------------------------------------------------------|
| Major Highway | Gas Transmission Pipeline | Pipeline Distance Marker                                 | Not of concern RE                                         |
| Major Road    | Major Drainage            | Secondary Sites                                          | Of concern dominant RE                                    |
| Minor Road    | Minor Drainage            | Quaternary Sites                                         | Endangered dominant RE                                    |
|               |                           | Presence of Exotic Species (Refer Figure 28 for details) | <i>Cycas megacarpa</i> (Endangered - NC Act and EPBC Act) |
- 0 500 1000m  
Scale: 1:25,000 (A4)  
Datum: GDA94

Source: This map may contain data which is sourced and Copyright. Refer to Section 18.2 of the EIS for Ownership and Copyright.

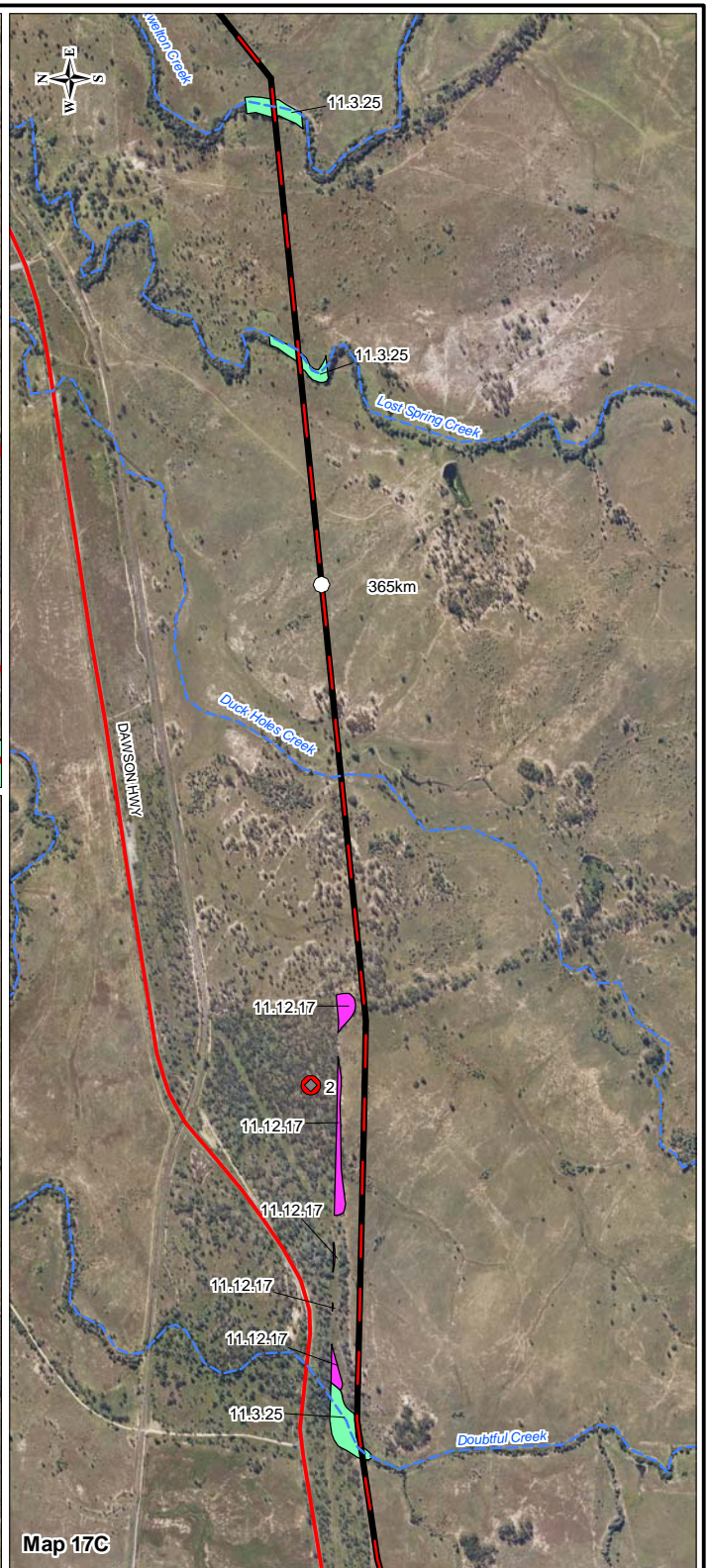
**Note: Figures 6 to 27 must be viewed with Figure 28.**

Client  	Project GLADSTONE LNG PROJECT TERRESTRIAL FLORA ASSESSMENT GAS TRANSMISSION PIPELINE		Title REGIONAL ECOSYSTEMS GAS TRANSMISSION PIPELINE MAP 16 OF 22	
	Drawn: RG Job No: 4262 6220	Approved: JB File No: 42626220-g-743b.wor	Date: 05-02-2009	Figure: 21

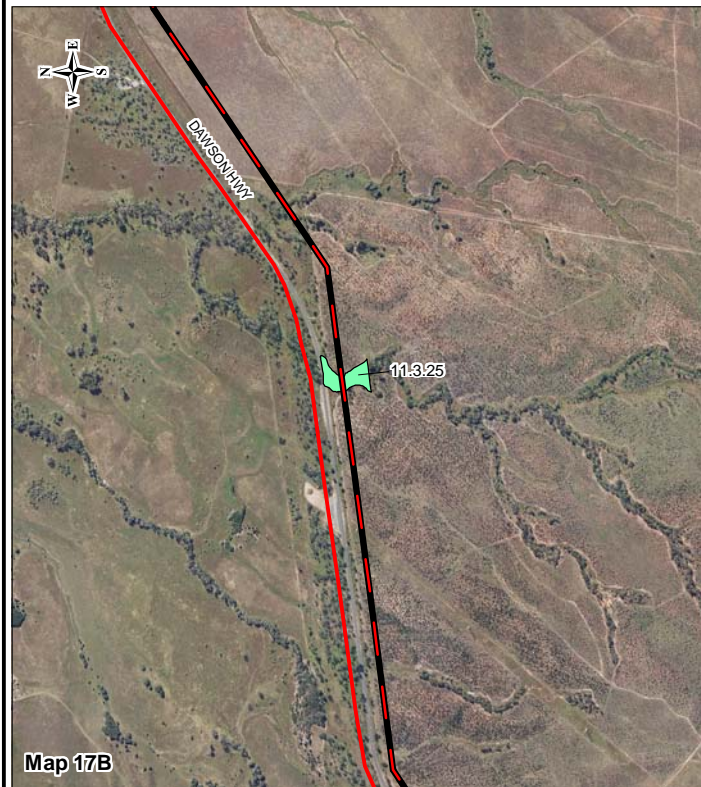




Map 17A

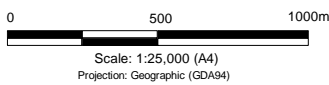


Map 17C





Map 17B

- Major Highway
- Major Road
- Minor Road
- Gas Transmission Pipeline
- Major Drainage
- - - Minor Drainage
- Pipeline Distance Marker
- ◆ Secondary Sites
- ▲ Quaternary Sites
- Presence of Exotic Species (Refer Figure 28 for details)
- Not of concern RE
- Of concern dominant RE
- Endangered dominant RE



Source: This map may contain data which is sourced and Copyright. Refer to Section 18.2 of the EIS for Ownership and Copyright.

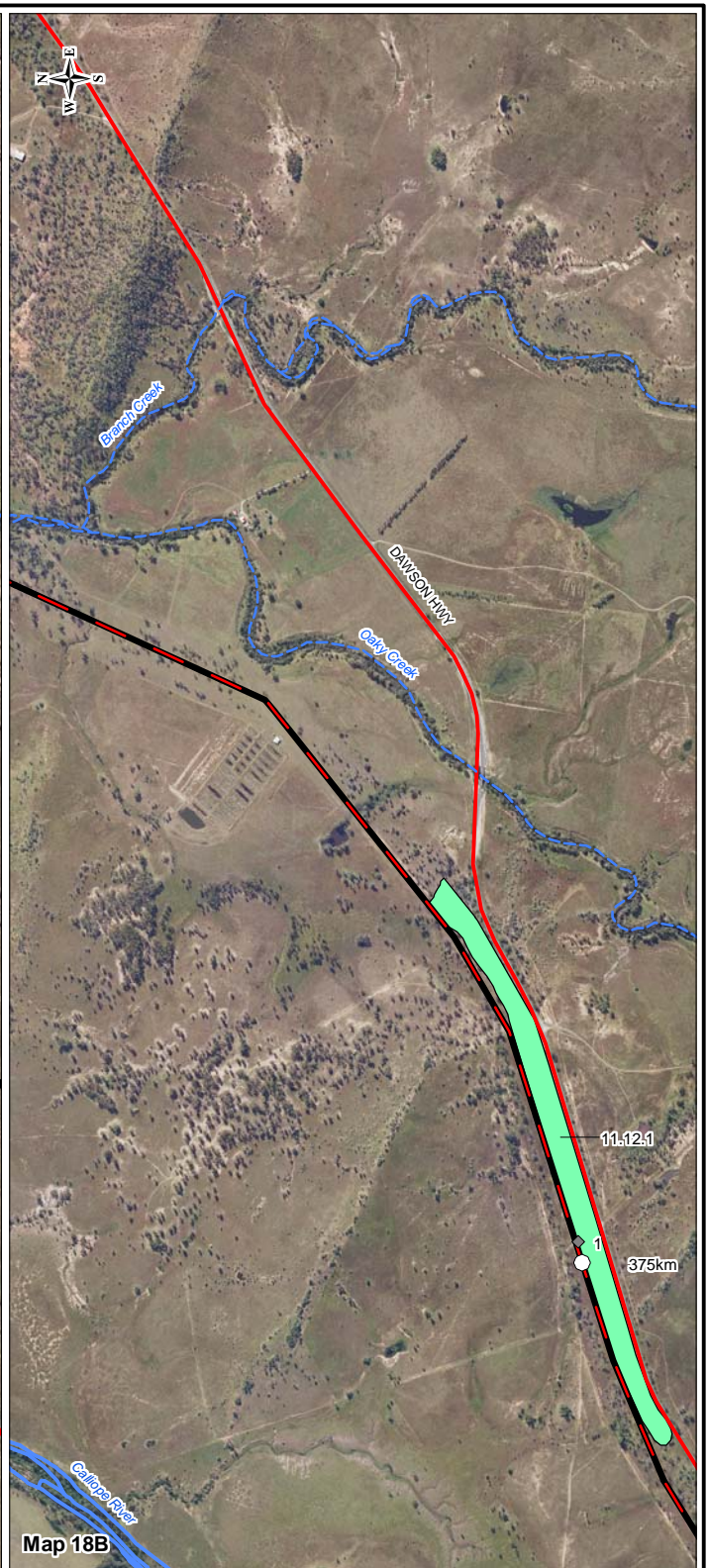
Note: Figures 6 to 27 must be viewed with Figure 28.

  	<b>Project</b> GLADSTONE LNG PROJECT TERRESTRIAL FLORA ASSESSMENT GAS TRANSMISSION PIPELINE	<b>Title</b> REGIONAL ECOSYSTEMS GAS TRANSMISSION PIPELINE MAP 17 OF 22	
	Drawn: RG    Approved: JB    Date: 05-02-2009	Figure: 22	
Job No: 4262 6220    File No: 42626220-g-744b.wor			





Map 18A



Map 18B

- |               |                           |                          |                        |
|---------------|---------------------------|--------------------------|------------------------|
| Major Highway | Gas Transmission Pipeline | Pipeline Distance Marker | Not of concern RE      |
| Major Road    | Major Drainage            | Secondary Sites          | Of concern dominant RE |
| Minor Road    | Minor Drainage            | Quaternary Sites         | Endangered dominant RE |

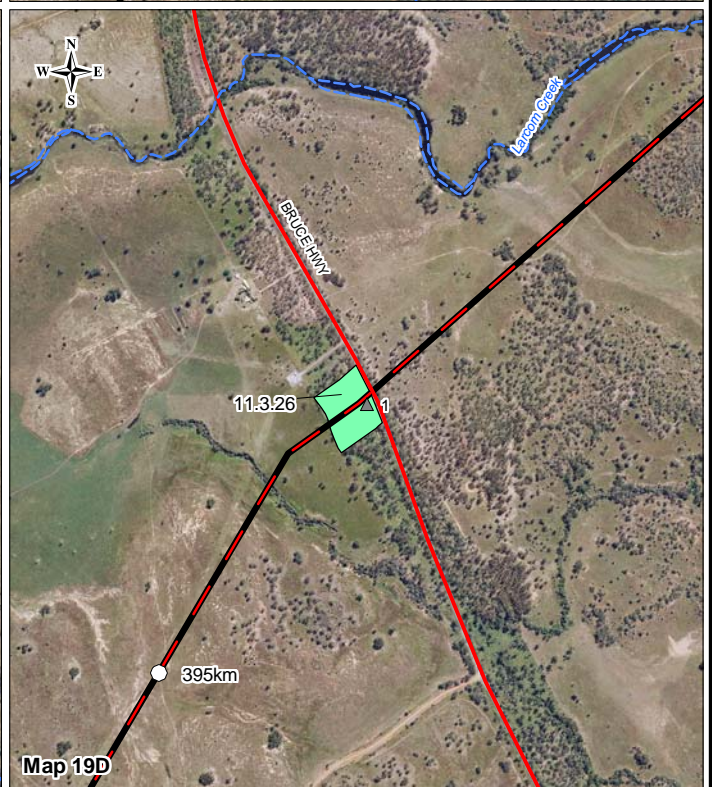
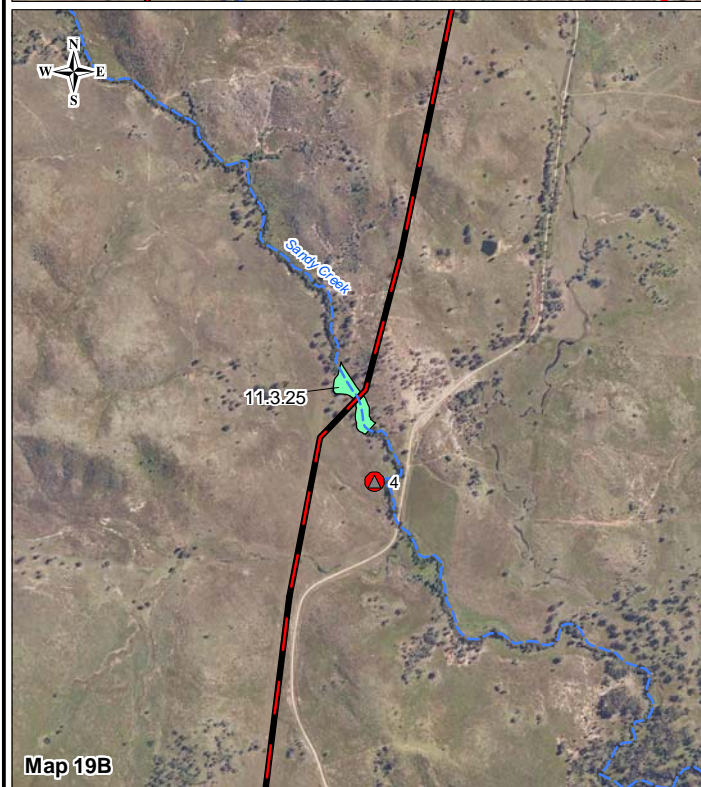
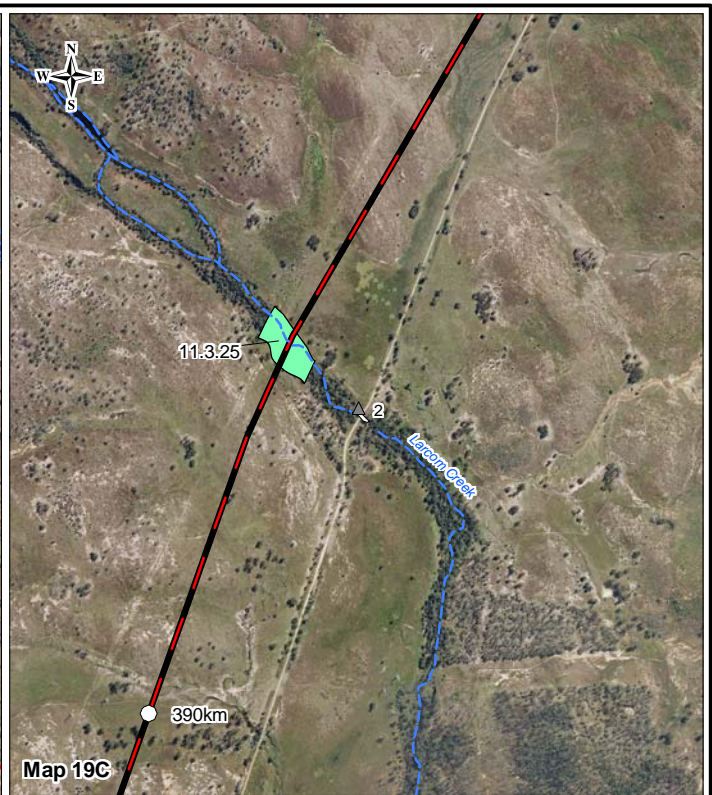
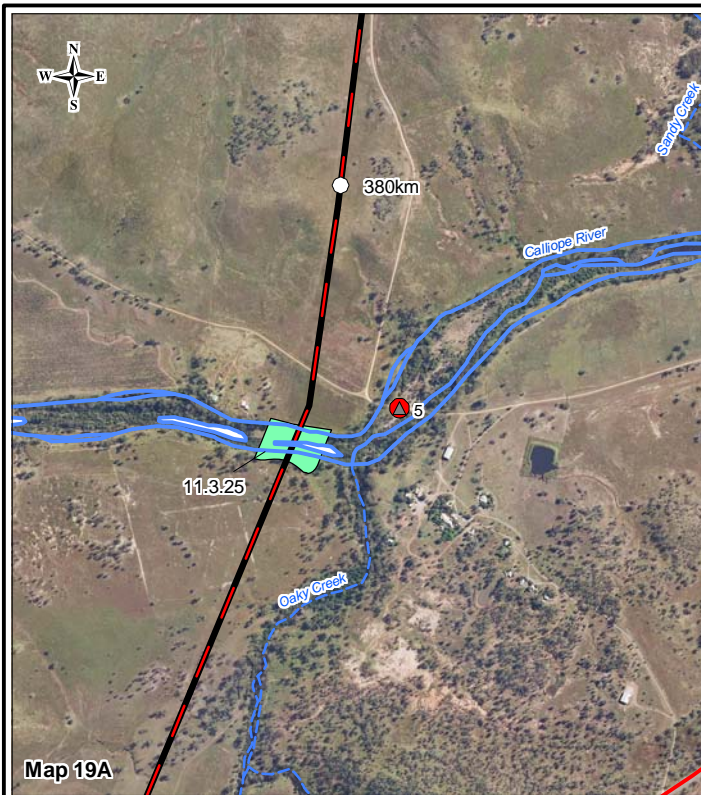
0 500 1000m  
 Scale: 1:25,000 (A4)  
 Datum: GDA94

Source: This map may contain data which is sourced and Copyright. Refer to Section 18.2 of the EIS for Ownership and Copyright.

Note: Figures 6 to 27 must be viewed with Figure 28.

Client  	Project GLADSTONE LNG PROJECT TERRESTRIAL FLORA ASSESSMENT GAS TRANSMISSION PIPELINE		Title REGIONAL ECOSYSTEMS GAS TRANSMISSION PIPELINE MAP 18 OF 22	
	Drawn: RG Job No: 4262 6220	Approved: JB File No: 42626220-g-745b.wor	Date: 05-02-2009	Figure: 23





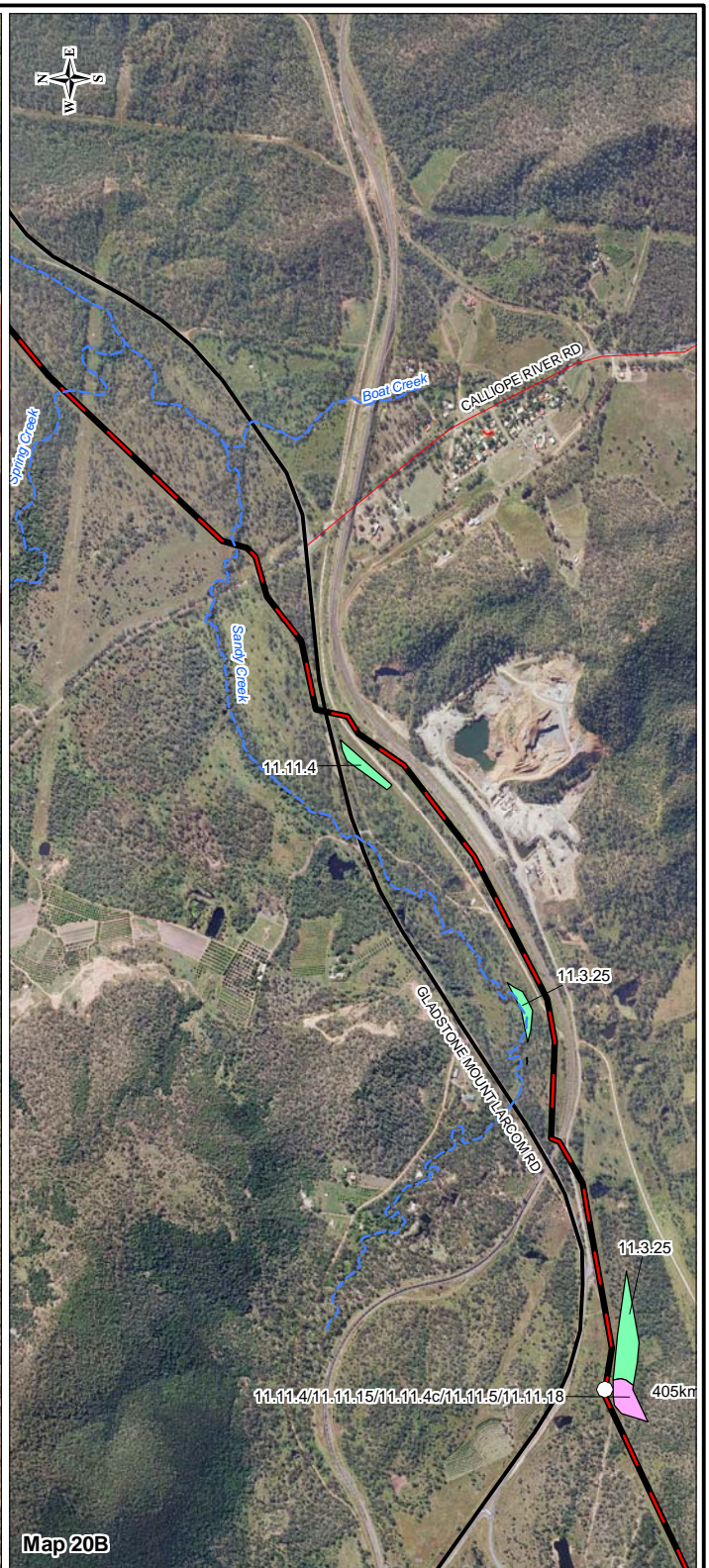
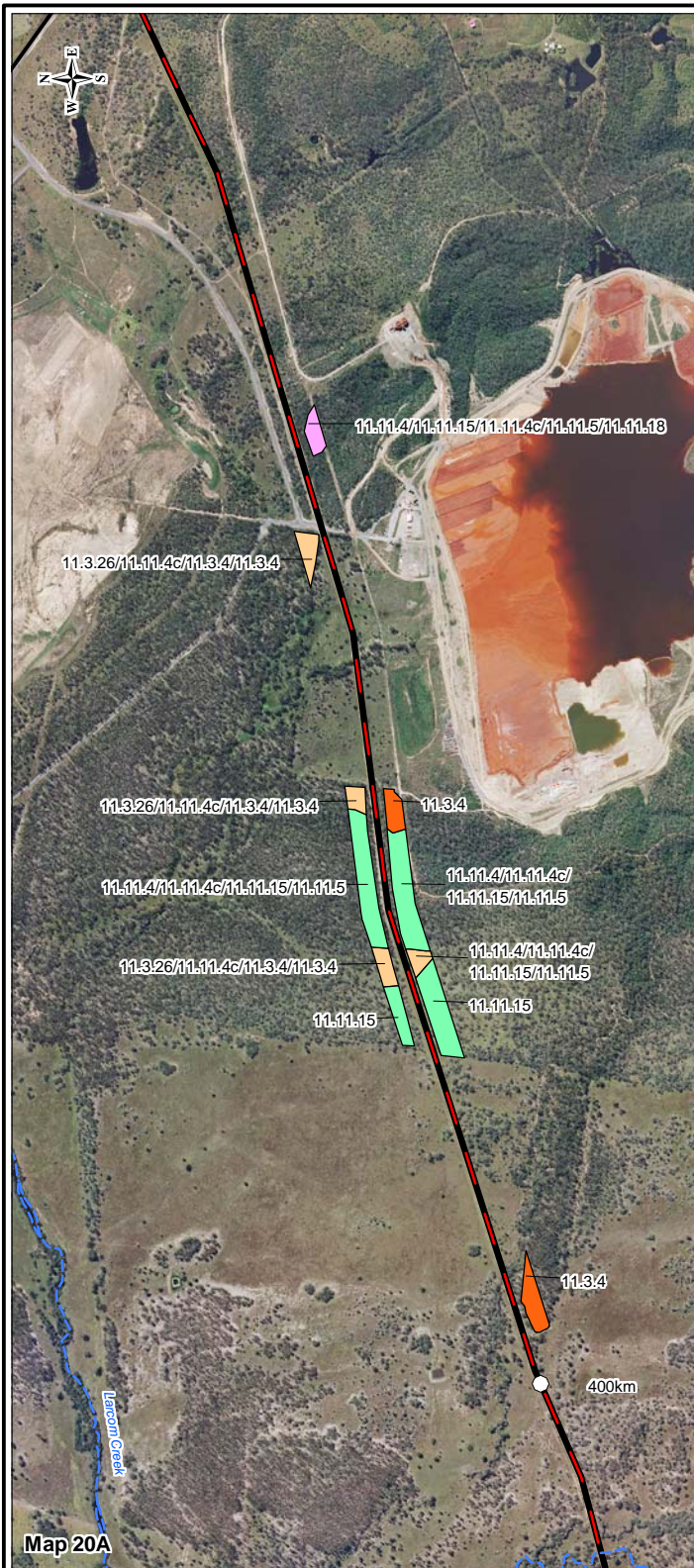
- |               |                           |                                                          |                        |
|---------------|---------------------------|----------------------------------------------------------|------------------------|
| Major Highway | Gas Transmission Pipeline | Pipeline Distance Marker                                 | Not of concern RE      |
| Major Road    | Major Drainage            | Secondary Sites                                          | Of concern dominant RE |
| Minor Road    | Minor Drainage            | Quaternary Sites                                         | Endangered dominant RE |
|               |                           | Presence of Exotic Species (Refer Figure 28 for details) |                        |
- 0 500 1000m  
Scale: 1:25,000 (A4)  
Datum: GDA94

Source: This map may contain data which is sourced and Copyright. Refer to Section 18.2 of the EIS for Ownership and Copyright.

Note: Figures 6 to 27 must be viewed with Figure 28.

Client   	Project GLADSTONE LNG PROJECT TERRESTRIAL FLORA ASSESSMENT GAS TRANSMISSION PIPELINE		Title REGIONAL ECOSYSTEMS GAS TRANSMISSION PIPELINE MAP 19 OF 22	
	Drawn: RG Job No: 4262 6220	Approved: JB File No: 42626220-g-746b.wor	Date: 05-02-2009	Figure: 24





- Major Highway
- Major Road
- Minor Road
- Gas Transmission Pipeline
- Major Drainage
- - - Minor Drainage
- Pipeline Distance Marker
- ◆ Secondary Sites
- ▲ Quaternary Sites
- Not of concern RE
- Of concern sub-dominant RE
- Of concern dominant RE
- Endangered sub-dominant RE
- Endangered dominant RE

0 500 1000m  
 Scale: 1:25,000 (A4)  
 Datum: GDA94

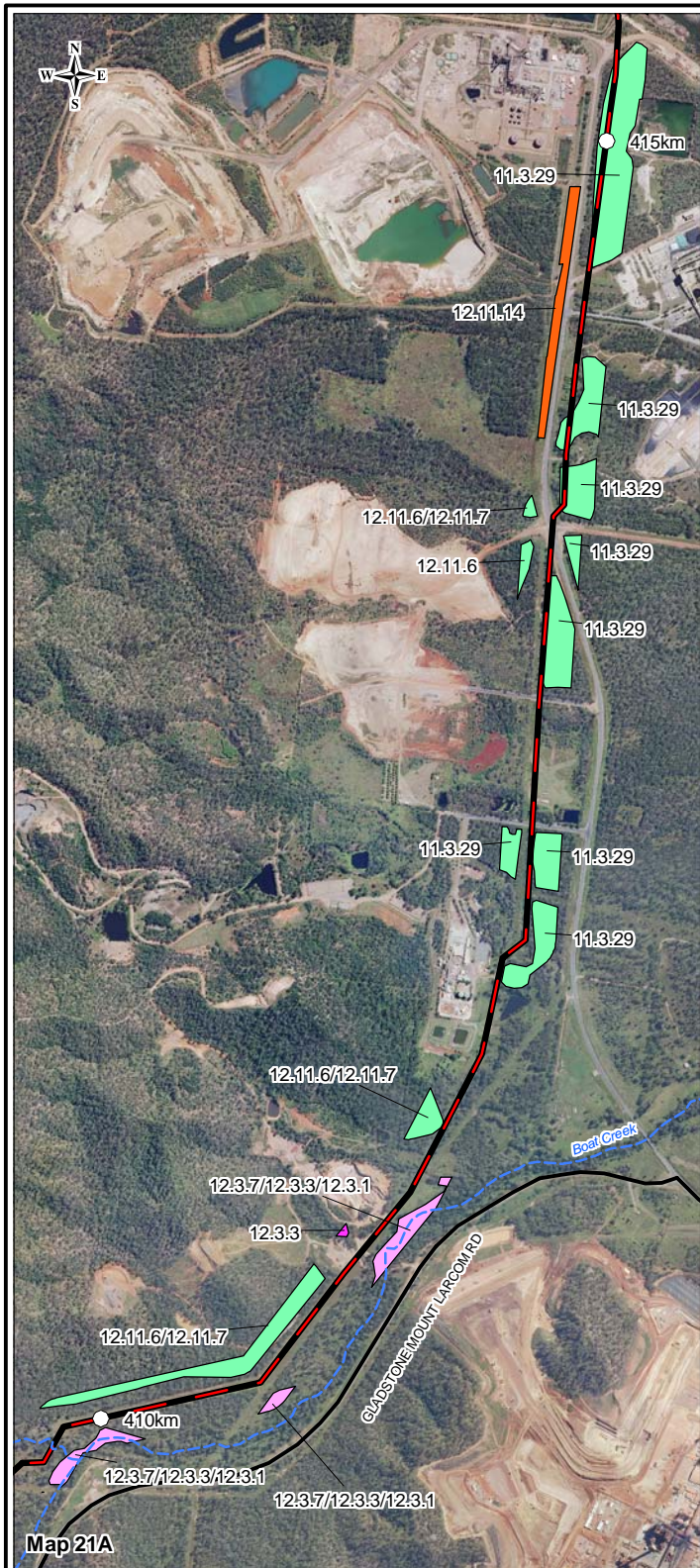
Source: This map may contain data which is sourced and Copyright. Refer to Section 18.2 of the EIS for Ownership and Copyright.

**Note: Figures 6 to 27 must be viewed with Figure 28.**

Client   	Project <b>GLADSTONE LNG PROJECT          TERRESTRIAL FLORA ASSESSMENT          GAS TRANSMISSION PIPELINE</b>	Title <b>REGIONAL ECOSYSTEMS          GAS TRANSMISSION PIPELINE          MAP 20 OF 22</b>
Drawn: RG    Approved: JB    Date: 05-02-2009		Figure: <b>25</b>
Job No: <b>4262 6220</b> File No: 42626220-g-747b.wor		
		Rev: B <b>A4</b>

This drawing is subject to COPYRIGHT. It remains the property of URS Australia Pty Ltd.







- Major Highway
- Major Road
- Minor Road
- Gas Transmission Pipeline
- Major Drainage
- - - Minor Drainage
- Pipeline Distance Marker
- ◆ Secondary Sites
- ▲ Quaternary Sites
- Not of concern RE
- Of concern dominant RE
- Endangered sub-dominant RE
- Endangered dominant RE

0 500 1000m  
 Scale: 1:25,000 (A4)  
 Datum: GDA94

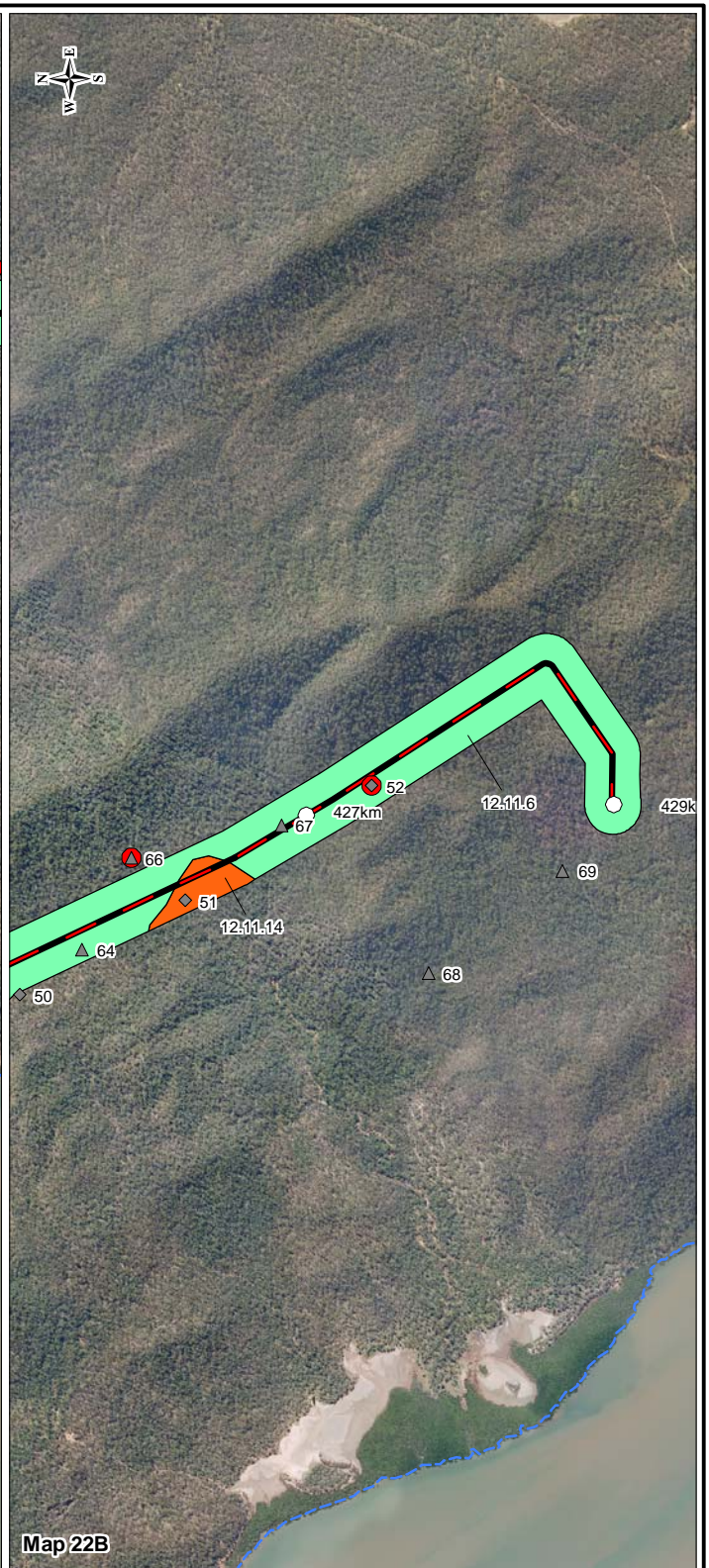
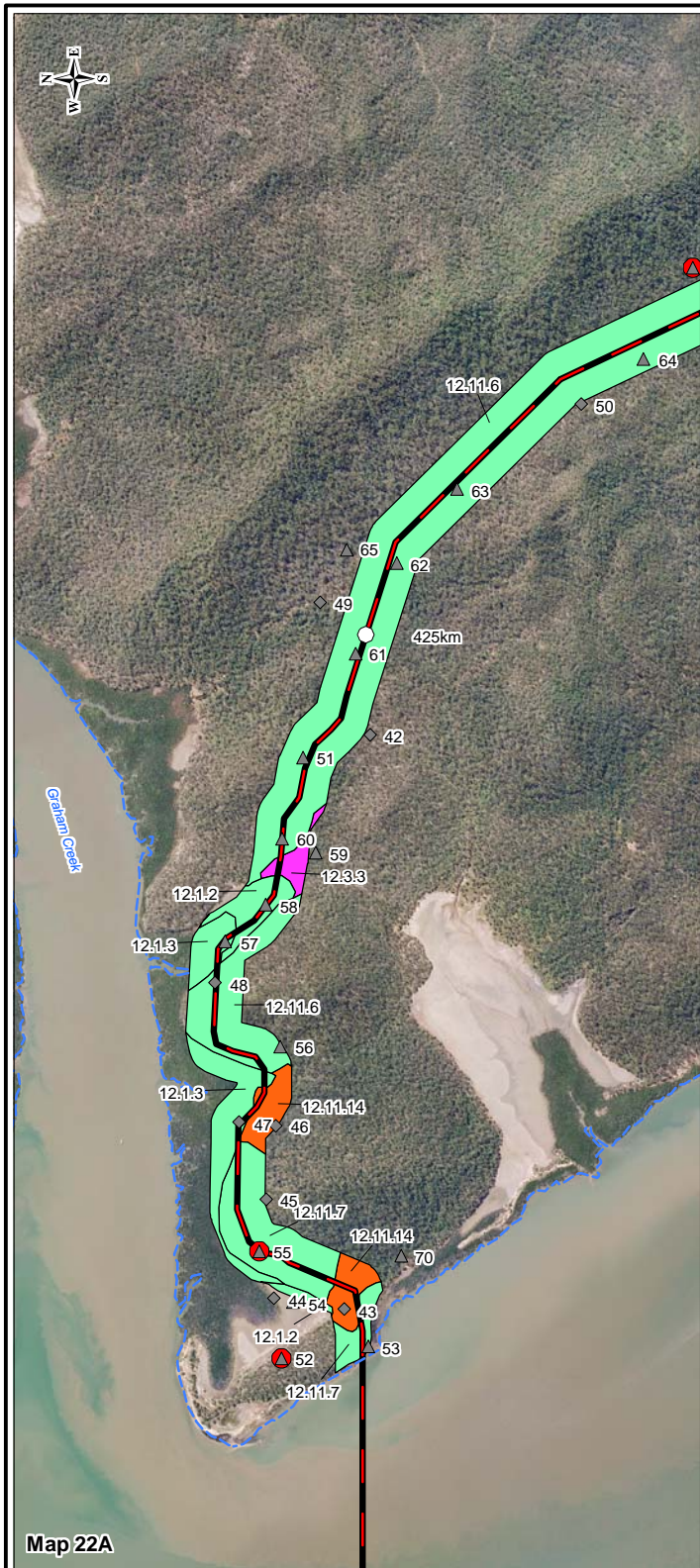
Source: This map may contain data which is sourced and Copyright. Refer to Section 18.2 of the EIS for Ownership and Copyright.

**Note: Figures 6 to 27 must be viewed with Figure 28.**

  	Project <b>GLADSTONE LNG PROJECT          TERRESTRIAL FLORA ASSESSMENT          GAS TRANSMISSION PIPELINE</b>	Title <b>REGIONAL ECOSYSTEMS          GAS TRANSMISSION PIPELINE          MAP 21 OF 22</b>	
	Drawn: RG    Approved: JB    Date: 05-02-2009 Job No: <b>4262 6220</b> File No: 42626220-g-707b.wor	Figure: <b>26</b>	Rev: B <b>A4</b>

This drawing is subject to COPYRIGHT. It remains the property of URS Australia Pty Ltd.





Map 22A

Map 22B

- |               |                           |                                                          |                        |
|---------------|---------------------------|----------------------------------------------------------|------------------------|
| Major Highway | Gas Transmission Pipeline | Pipeline Distance Marker                                 | Not of concern RE      |
| Major Road    | Major Drainage            | Secondary Sites                                          | Of concern dominant RE |
| Minor Road    | Minor Drainage            | Quaternary Sites                                         | Endangered dominant RE |
|               |                           | Presence of Exotic Species (Refer Figure 28 for details) |                        |
- 0 500 1000m  
Scale: 1:25,000 (A4)  
Datum: GDA94

Source: This map may contain data which is sourced and Copyright. Refer to Section 18.2 of the EIS for Ownership and Copyright.

Note: Figures 6 to 27 must be viewed with Figure 28.

Client  	Project GLADSTONE LNG PROJECT TERRESTRIAL FLORA ASSESSMENT GAS TRANSMISSION PIPELINE		Title REGIONAL ECOSYSTEMS GAS TRANSMISSION PIPELINE MAP 22 OF 22	
	Drawn: RG Job No: 4262 6220	Approved: JB File No: 42626220-g-708b.wor	Date: 05-02-2009	Figure: 27

This drawing is subject to COPYRIGHT. It remains the property of URS Australia Pty Ltd.





Client

Project

Title

Source: This map may contain data which is sourced and Copyright. Refer to Section 18.2 of the EIS for Ownership and Copyright.

Note: Figure 28 must be viewed with Figures 6 to 27.

Drawn: RG  
Job No.: 4262 6220  
Approved: JB  
File No.: 42626220-g-793.wor  
Date: 05-02-2009

Figure: 28

Rev: A  
A4

GLADSTONE LNG PROJECT  
TERRESTRIAL FLORA ASSESSMENT  
GAS TRANSMISSION PIPELINE

REGIONAL ECOSYSTEMS  
AND SURVEY LOCATIONS -  
LEGEND TO EXOTIC SPECIES

Secondary Sites		Map Reference	Site Reference	<i>Bryophyllum delagoense</i> (Mother of Millions)	<i>Celtis sinensis</i> (Chinese Celtis)	<i>Cryptostegia grandiflora</i> (Rubber Vine)	<i>Eriocereus martinii</i> (Harrisia cactus)	<i>Lantana camara</i> (Lantana)	<i>Lantana montevidensis</i> (Creeping Lantana)	<i>Macfadyena unguis-cati</i> (Cats Claw Creeper)	<i>Opuntia stricta</i> (Common Prickly Pear)	<i>Opuntia tomentosa</i> (Velvety Tree Pear)	<i>Parthenium hysterophorus</i> (Parthenium)
1A	27						●						
2D	28											●	
3A	29										●	●	
6B	32											●	
7A	26											●	
7B	25											●	
8C	22												●
8C	23												●
8C	24												●
9A	20											●	●
9A	21											●	●
9C	18												●
10B	14											●	●
10B	15											●	●
12C	12					●							
13C	10			●						●			
14A	7						●	●	●	●	●	●	
14A	8						●	●	●	●	●	●	
14A	9						●	●	●	●	●	●	
15A	4						●	●	●	●	●	●	
15A	5					●		●	●	●	●	●	
15A	6						●	●	●	●	●	●	
15B	36							●	●	●	●	●	
15B	37							●	●	●	●	●	
16A	38							●	●	●	●	●	
16A	39							●	●	●	●	●	
16C	3							●	●	●	●	●	
16C	40							●	●	●	●	●	
16C	41							●	●	●	●	●	
17C	2							●	●	●	●	●	
22B	52							●					

Quaternary Sites		Map Reference	Site Reference	<i>Bryophyllum delagoense</i> (Mother of Millions)	<i>Celtis sinensis</i> (Chinese Celtis)	<i>Cryptostegia grandiflora</i> (Rubber Vine)	<i>Eriocereus martinii</i> (Harrisia cactus)	<i>Lantana camara</i> (Lantana)	<i>Lantana montevidensis</i> (Creeping Lantana)	<i>Macfadyena unguis-cati</i> (Cats Claw Creeper)	<i>Opuntia stricta</i> (Common Prickly Pear)	<i>Opuntia tomentosa</i> (Velvety Tree Pear)	<i>Parthenium hysterophorus</i> (Parthenium)
1A	34						●					●	
2D	39											●	
6A	41											●	
9A	31												●
9C	26												●
9C	28												●
10A	25					●							●
10B	24												●
13B	19									●			
13C	17											●	
14A	14								●			●	
14A	15							●					
14B	11							●	●				
14B	12							●	●				
14B	13			●									
15A	8								●				
15A	9								●				
15A	10								●				
16A	47							●					
16C	50							●					
19A	5				●					●			
19B	4					●		●					
22A	52										●		
22A	55										●		
22A	66							●					
---	3							●					

# Pipeline Flora Survey

# Appendix A



## Appendix A

## Pipeline Flora Survey

## A.1 Potentially occurring conservation significant species

Scientific Name	NCA Status <sup>1</sup>	EPBC Status <sup>2</sup>	Habitat/ Distribution <sup>3</sup>	Likelihood of Presence	Source <sup>4</sup>
<i>Acacia gittinsii</i>	R		Shrub 1-2 m high; grows on sandstone in <i>Eucalypt</i> woodland and is common in wetter areas. Confined to the Blackdown Tableland, Qld.	Unlikely	EPA (i); EPA (ii)
<i>Acacia grandifolia</i>		V	Tree up to 8 m. Endemic to south-east Qld and restricted to a small area around Gayndah, Munduberra, Coulston Lakes and Proston in the Burnett district.	Unlikely	EPA (ii)
<i>Acacia pedleyi</i>	R		The species is a slender, erect tree to 10 m high with predominantly smooth bark and dark green, feathery leaves. This species tends to grow in red loamy soil on slopes and ridge tops, in open eucalypt forest or woodland. HERBRECS data identified 16 populations of this species within a 5km buffer of the pipeline, indicating that it may be widespread within the study area.	Presence confirmed during field survey	EPA (i); EPA (ii)
<i>Acacia pubicosta</i>	R		Shrub to 5 m high; confined to rocky slopes. Restricted to the Biggenden area.	Likely	EPA (i); EPA (ii)
<i>Acacia tenuinervis</i>	R		Shrub or tree to 9 m high; grows in brigalow scrub or eucalypt woodland, in ironstone gravel. Restricted to a few localities in south-east Qld including near Boondooma and Impey Pastoral Holding.	Unlikely	EPA (ii)
<i>Acacia tingoorensis</i>	V		Grows in deep red loam or shallow loamy and sandy soils in eucalypt woodland or forest, forms dense stands on roadsides. Restricted to small area near Kingaroy, Qld.	Unlikely	EPA (ii)

## Appendix A

## Pipeline Flora Survey

Scientific Name	NCA Status <sup>1</sup>	EPBC Status <sup>2</sup>	Habitat/ Distribution <sup>3</sup>	Likelihood of Presence	Source <sup>4</sup>
<i>Actephila sessilifolia</i>	R		Shrub to 4 metres occurring in vine thicket and dry rainforest along creek/drainage lines on steep rocky slopes. <i>Actephila sessilifolia</i> is recorded as associating with the canopy tree - <i>Melaleuca leucadrendra</i> and numerous vine thicket species.	Unlikely	EPA (i);EPA (ii)
<i>Alyxia magnifolia</i>	R		Shrub/small tree from the Apocynaceae family that grows to between 2 and 7m in height. This species is endemic to Queensland and has a restricted distribution that extends from Mount Greville in south-east Queensland north to Cathu State Forest, north-west of Mackay. <i>A. magnifolia</i> occurs commonly in wet sclerophyll forest, complex notophyll vine forest and araucarian microphyll vine forest between 130 – 800 m altitude.	Unlikely	EPA (i);EPA (ii)
<i>Alyxia sharpei</i>	R		Restricted to dry rainforest and littoral rainforest of the Miriam Vale district, Boyne Valley and Callide Range. This is a rare, rigid, prickly-leaved shrub with milky latex present in the leaves and twigs when cut or broken. The fruit is orange-red and either simple or in a chain of 2 or 3 segments.	Possible	EPA (i); EPA (ii)
<i>Amphibromus whitei</i>	X	X	Extinct.	Unlikely	
<i>Apatophyllum teretifolium</i>	R		Grows on coarse sandy soils among rock or along cliff edges on sandstone ridges in Eucalypt woodlands. It grows as a distinctive compact shrub to 0.4 m high and is widely scattered in the Carnarvon and Expedition Range with an additional record found from the Barakula State Forest.	Possible	EPA (i); EPA (ii)



## Appendix A

## Pipeline Flora Survey

Scientific Name	NCA Status <sup>1</sup>	EPBC Status <sup>2</sup>	Habitat/ Distribution <sup>3</sup>	Likelihood of Presence	Source <sup>4</sup>
<i>Aponogeton queenslandicus</i>	R		A perennial, tuberous rooted aquatic plant, with submerged and floating leaves. Grows in freshwater ephemeral habitats. Occurs along coastal Queensland from Cooktown southward where it is found in 30-60cm deep temporary freshwater pools that occur in full sun and have clay bottoms. It is not usually found in permanent waters.	Possible	EPA (i); EPA (ii)
<i>Asplenium pellucidum</i>	V	V	Lithophytic or epiphytic fern which grows on mossy branches and rocks near in damp areas. The species is known from the Palmerston Valley within Wooroonooran National Park in north-east Queensland, recorded from a single collection.	Unlikely	EPA (ii)
<i>Atalaya calcicola</i>	R		This species is found on boulder-strewn slopes, and on hills with granite, limestone, sandstone and basaltic rock outcrops dry in rainforest and deciduous vine thicket environments north from the Boyne Valley (south of Gladstone).	Unlikely	EPA (i);EPA (ii)
<i>Atalaya collina</i>	E	E	Grows on hillsides in remnant dry scrubs, and is associated with <i>A. salicifolia</i> . Known only from Yarwun (near Gladstone, Queensland).	Unlikely	EPA (i); EPA (ii); DEWHA
<i>Atalaya rigida</i>	R		This grows in red clay soil or black clay loam within vine thicket and araucarian microphyll notophyll vine forest. It is restricted to eastern Qld from Mt Aberdeen near Bowen, south to Mt Glastonbury south west of Gympie.	Unlikely	EPA (i);EPA (ii)
<i>Bertya opponens</i>	C	V	Slender shrub or small tree to 4 m high. Found in shallow soils on ridges with mallee. This species is found from only four locations in New South Wales including the Cobar-Coolabah area, Jacks Creek State Forest, Gibraltar Range National Park and Kangaroo River State Forest.	Unlikely	EPA (ii)

## Appendix A

## Pipeline Flora Survey

Scientific Name	NCA Status <sup>1</sup>	EPBC Status <sup>2</sup>	Habitat/ Distribution <sup>3</sup>	Likelihood of Presence	Source <sup>4</sup>
<i>Bosista selwynii</i>		V	Grows in rainforests up to 300 m in altitude. From Maryborough in Queensland south to the Tweed River district in north-east NSW.	Unlikely	DEWHA
<i>Bosistoa transversa</i>	C	V	Grows in lowland subtropical rainforest up to 300 m in altitude. From Maryborough in Queensland south to the Nightcap Range north of Lismore in north-east NSW.	Unlikely	EPA (ii); DEWHA
<i>Bulbophyllum globuliforme</i>	R	V	This species is epiphytic, favouring subtropical rainforest, warm temperate rainforest, dry rainforest and wet sclerophyll forests. It's favoured (almost exclusive) host is <i>Araucaria cunninghamii</i> .	Unlikely	DEWHA
<i>Cadellia pentastylis</i>	V	V	Occurs on ridges and undulating terrain in pure stands or with brigalow or semi-evergreen vine thicket. Distribution is north from near Gunnedah to Carnarvon Range and Callide Valley (south-west of Rockhampton).	Likely	EPA (i); EPA (ii); DEWHA
<i>Capparis humistrata</i>	E		Shrub found only in Queensland.	Unlikely	EPA (i)
<i>Cerbera dumicola</i>	R		Shrub/small tree. Grows on ridge tops on lateritic soil.	Unlikely	EPA (i); EPA (ii)
<i>Commersonia</i> sp. <i>Cadarga</i> (G.P. Guymer 1642)		V	Shrub that grows to 1.5 – 4 m with the above-ground stems suckering from rhizomes. Known to be widespread from near Injune and west along the Great Dividing Range towards Tambo in central Queensland. It has also been recorded in Carnarvon National Park.	Unlikely	DEWHA
<i>Cossinia australiana</i>	E	E	Shrub to small tree in dry rainforest and vine thickets. Restricted distribution north from Kingaroy and Gympie to Rockhampton.	Unlikely	EPA (i); EPA (ii); DEWHA
<i>Cycas megacarpa</i>	E	E	Scattered and localised on clay-loam soils over several substrates, usually on sloping country in wet eucalypt forests or rainforests. Ranges from near Mount Morgan to near Goomeri in Qld.	Presence confirmed from field surveys	EPA (i); EPA (ii)



## Appendix A

## Pipeline Flora Survey

Scientific Name	NCA Status <sup>1</sup>	EPBC Status <sup>2</sup>	Habitat/ Distribution <sup>3</sup>	Likelihood of Presence	Source <sup>4</sup>
<i>Cyperus clarus</i>	V		Slender tufted perennial. Grows in grassland or open woodland, on heavy soils derived from basalt. Widespread in Darling Downs and Burnett districts in heavy soils; not common.	Unlikely	EPA (i); EPA (ii)
<i>Cupaniopsis shirleyana</i>	V	V	Small tree up to 10 m tall; usually seen as large bushy shrub. Endemic to Queensland, ranging from Carina, Brisbane to Bundaberg. Occurs in dry rainforest.	Unlikely	EPA (i); EPA (ii); DEWHA
<i>Dansiea elliptica</i>	R		Grows on sandy granitic soils in low elevation dry rainforest and semi evergreen vine thickets in south-eastern Queensland and rainforest margins in north-eastern Queensland.	Unlikely	EPA (i); EPA (ii)
<i>Denhamia parvifolia</i>	V	V	Shrub that grows to 3 m tall. Known from Eidsvold to Chinchilla and east of Kingaroy in Queensland. Grows in brown or brownish-red loams and clay-loams in vine thickets and softwood scrubs on hillslopes and crests.	Unlikely	EPA (ii)
<i>Desmodium macrocarpum</i>	R		Semi erect bushy woody herb which grows to approximately 40cm high. The species distribution is widespread and occurs from central to northern Qld.	Possible	EPA (i); EPA (ii)
<i>Dichanthium queenslandicum</i>	V		Endemic to Queensland where it occurs mostly on black clay soils around Emerald and more rarely on the Darling Downs.	Possible	EPA (i); EPA (ii) ; DEWHA

## Appendix A

## Pipeline Flora Survey

Scientific Name	NCA Status <sup>1</sup>	EPBC Status <sup>2</sup>	Habitat/ Distribution <sup>3</sup>	Likelihood of Presence	Source <sup>4</sup>
<i>Digitaria porrecta</i>	R	E	Loosely tufted perennial growing to 60 cm tall. Occurs in four disjunct areas. In Queensland this includes the Nebo district south-west of Mackay; the Central Highlands between Springsure and Rolleston; and from Jandowae south to Warwick. In NSW, it occurs from Graman and Croppa Creek south to the Liverpool Plains near Coonabarabran and Werris Creek. Occurs in grasslands on extensive basaltic plains; tropical and subtropical rain forests; and tropical and subtropical sub-humid woodlands.	Unlikely	DEWHA
<i>Diurus tricolor</i> (formerly <i>Diurus sheaffiana</i> )		V	Terrestrial orchid with 1 – 3 leaves up to 30 cm long and 4 mm wide. Grows in dry sclerophyll woodland and sclerophyll forest among native grass; often with native Cypress Pine. Occurs from Toowoomba in Queensland to Victoria where a single plant has been recorded. In Queensland this distribution includes the Darling Downs where it is widespread and locally common.	Unlikely	DEWHA
<i>Eucalyptus decolor</i>	R		Small to medium sized tree and is endemic to south east Queensland. It is found in two disjunct locations (Many Peaks Range south of Gladstone and ranges south of Biggenden).	Unlikely	EPA (ii)
<i>Eucalyptus raveretiana</i>	V	V	Small to medium sized tree. Always occurs along creek beds and river banks. Scattered and disjunct in central coastal and subcoastal Queensland.	Unlikely	EPA (i);
<i>Eucalyptus sphaerocarpa</i>	R		Medium-sized to tall tree. Known only from the Blackdown Tableland, Qld, where it is abundant; endemic.	Unlikely	EPA (ii)



## Appendix A

## Pipeline Flora Survey

Scientific Name	NCA Status <sup>1</sup>	EPBC Status <sup>2</sup>	Habitat/ Distribution <sup>3</sup>	Likelihood of Presence	Source <sup>4</sup>
<i>Gossypium sturtianum</i>	R		Shrub about 1.5 m high. Highly tolerant to drought; occurs in sandy or gravelly soils along dry creek beds, watercourses, gorges or rocky slopes. Occurs throughout Central Queensland and has a very patchy distribution.	Likely	EPA (i); EPA (ii)
<i>Graptophyllum excelsum</i>	R		This species is restricted to Qld, extending from near Mt Larcom north to the Chillagoe- Mt Mungana area. Typically it grows on rocky hillsides in Semi-evergreen Vine Thickets and is also recorded grassy eucalypt woodland.	Unlikely	EPA (i); EPA (ii)
<i>Grevillea cyranostigma</i>	R		Spreading shrub 0.5-2 m tall. Occurs in central Qld, endemic to the Carnarvon Range and adjacent area. Grows in eucalypt woodland or open forest, often on rocky slopes or cliffs in sandy soil over sandstone.	Possible	EPA (i); EPA (ii)
<i>Grevillea hockingsii</i>	V		Erect shrub that grows to 2.5 metres in Eucalypt woodland or open forest around rocky sandstone breakaways and occasionally on sandy alluvium flats. Occurs from three disjunct areas in Queensland including Coomingleh State Forest west of Monto; Callide Range east of Biloela; and Razor Back Range near Mt Morgan.	Possible	EPA (i); EPA (ii)
<i>Hernandia bivalvis</i>	R		Small tree that grows in dry vine forests with shallow rocky soils. Distribution is north from the Brisbane River north of Ipswich.	Unlikely	EPA (i); EPA (ii)
<i>Homoranthus decasetus</i>	R		Woody subshrub to 2m high.	Possible	EPA (i); EPA (ii)
<i>Indigofera baileyi</i>	R	-	Widespread in south-east Queensland. Found in open woodlands on granite or basalt soils.	Unlikely	EPA (i); EPA (ii)

## Appendix A

## Pipeline Flora Survey

Scientific Name	NCA Status <sup>1</sup>	EPBC Status <sup>2</sup>	Habitat/ Distribution <sup>3</sup>	Likelihood of Presence	Source <sup>4</sup>
<i>Leionema obtusifolium</i>	V	V	Small endemic shrub that grows to about 1 m high. Known from a small area of south-east Queensland, in the Helidon and Ravensbourne areas. Occurs in eucalypt forest, often with <i>Eucalyptus acmenoides</i> (white mahogany) and <i>Corymbia trachyphloia</i> (brown bloodwood) on sandstone substrates in the Helidon Hills and White Mountain SF areas, and on granite at Crows Nest NP.	Unlikely	EPA (ii)
<i>Leucopogon cuspidatus</i>	C	V	Small shrub to 1.2 m with a spreading habit. Occurs in eastern Queensland from Blackdown Tableland in the south to the Mt Stewart area near Homestead Township in the north. Most populations occur on off-shore islands in the Great Barrier Reef and adjacent mainland coastal areas, although collections have been made as far west as Blackdown Tableland. Occurs in open forest, woodland and heath on rocky slopes with granitic or serpentinite substrates.	Unlikely	DEWHA
<i>Leucopogon grandiflorus</i>	R		Grows on sandstone slopes ridge crests and cliff edges. This shrub species grows to 2 metres with a rounded or untidy growing form. Widespread throughout the Central Highlands sandstone belt and can be locally common.	Unlikely	EPA (i); EPA (ii)
<i>Macadamia integrifolia</i>	V	V	Small to medium-sized tree to 15 m high; major commercial food crop. Found in rainforests of south-east Queensland.	Unlikely	EPA (ii)
<i>Macropteranthes fitzalanii</i>	R		Occurs in notophyll and microphyll vine forests and littoral rainforests and is restricted to coastal areas of central Qld from the Proserpine area to Rockhampton.	Unlikely	EPA (i); EPA (ii)
<i>Macrozamia fearnsidei</i>	V	V	Widely scattered, on sandy soil over sandstone in the ranges north and east of Injune.	Likely	EPA (i); EPA (ii); DEWHA



## Appendix A

## Pipeline Flora Survey

Scientific Name	NCA Status <sup>1</sup>	EPBC Status <sup>2</sup>	Habitat/ Distribution <sup>3</sup>	Likelihood of Presence	Source <sup>4</sup>
<i>Macropteranthes leiocaulis</i>	R		Small to medium-sized seasonally deciduous tree. This species grows in red eucrozems or sandstone Talus within deciduous vine thickets, semi-evergreen vine thickets and araucarian microphyll vine forests. Found north from the Binjour Plateau (north-west of Gayndah).	Unlikely	EPA (i); EPA (ii)
<i>Macrozamia platyrhachis</i>	E	E	Distribution restricted to the Blackdown Tableland/ Planet Downs area of the Dawson range, central Queensland. Grows in eucalypt woodland or open forest on deep sandy soils derived from sandstone (Not of Concern RE's).	Unlikely	EPA (i); DEWHA
<i>Marsdenia hemiptera</i> Rchb.	R		Climber with twining stems to 4 m high. Grows in littoral rainforest and rarely in subtropical rainforest. Found north from Iluka, New South Wales.	Unlikely	EPA (i)
<i>Melaleuca groveana</i>	R		Paperbark shrub or small tree 2-5 m tall. Widespread, scattered populations in coastal districts north of Port Stephens to south-east Queensland. Grows in heath and shrubland, often in exposed sites at high elevations, on rocky outcrops and cliffs, and also in dry woodlands.	Unlikely	EPA (i); EPA (ii)
<i>Parsonsia larcomensis</i>	V	V	Occurs in open heathland and shrubland at or near the summits of mountain peaks from 350 to 750 m elevations and is restricted to central east and south-east Qld.	Unlikely	EPA (i); EPA (ii); DEWHA
<i>Parsonsia lenticellata</i>	R		This species is found in coastal districts in drier rainforests and transitional zones to open forest from Mackay to Port Douglas.	Unlikely	EPA (ii)
<i>Paspalidium scabrifolium</i>	R		Perennial grass with leaf blades linear or lanceolate (8-30 cm long; 4-8 mm wide). Leaf blade surfaces scabrous on both sides.	Unlikely	EPA (i); EPA (i)
<i>Phyllanthus brassii</i>	R		Grows to 3 metres in heath on granite along creek lines.	Unlikely	EPA (i)

## Appendix A

## Pipeline Flora Survey

Scientific Name	NCA Status <sup>1</sup>	EPBC Status <sup>2</sup>	Habitat/ Distribution <sup>3</sup>	Likelihood of Presence	Source <sup>4</sup>
<i>Polianthion minutiflorum</i> (formerly <i>Trymalium minutiflorum</i> )	V	V	Shrub up to 1 m high. Known from five areas in east Queensland from Redcliff Vale west of Mackay, south to Kingaroy. Grows in forest and woodland on sandstone slopes and gullies with skeletal soil, also deeper soils adjacent to deeply weathered laterite.	Unlikely	EPA (i); EPA (ii)
<i>Prasophyllum incompositum</i>	R		No information available.	Unlikely	EPA (i); EPA (ii)
<i>Quassia bidwillii</i>	V	V	Shrub or small tree to 6 m that occurs from Gympie to Mackay. Grows in rainforest communities, or on the margins of these communities.	Unlikely	EPA (i); EPA (ii); DEWHA
<i>Senna acclinis</i>	R		Erect shrub to 3 m tall. Known from scrub habitats and rainforest margins north from Gloucester area to Gladstone, west to Taroom district (Expedition NP).	Unlikely	EPA (i); EPA (ii)
<i>Taeniophyllum muelleri</i>		V	Epiphytic orchid, favouring littoral rainforest, subtropical rainforest, wet sclerophyll forests and riparian areas.	Unlikely	DEWHA
<i>Thesium australe</i>	V	V	Small strangling herb to 40 cm tall. Found scattered in Queensland, NSW, and Tasmania. Occurs in grassland or grassy woodland and often found in damp sites associated with <i>Themeda australis</i> (kangaroo grass).	Unlikely	EPA (i); EPA (i)
<i>Trymalium minutiflorum</i>	V		No information available.	Unlikely	DEWHA
<i>Wahlenbergia islensis</i>	R		Known from the Carnarvon Ranges.	Possible	EPA (i)
<i>Zieria actites</i>	V		Shrub to 1 m tall forming densely compact bush. Species is endemic to Qld and is known only from Mt Larcom north-west of Gladstone.	Unlikely	EPA (i); EPA (ii)

1 – NC Act Status: Indicates the conservation status of each taxon under the *Nature Conservation Act 1992*. The codes are: Extinct in the wild (PE), Endangered (E), Vulnerable (V), Rare (R), Near threatened (NT) Least concern (C).

2 - EPBC Act Status: Indicates the conservation status of each taxon under the *Environment Protection and Biodiversity Conservation Act, 1999*. The codes are: Marine (M), Conservation Dependent (CD), Critically Endangered (CE), Endangered (E), Extinct (EX).

3 - Information based on a number of sources including: Department of Environment and Conservation (NSW) (2005); Department of Environment and Heritage (2008); PlantNET (2008); World Wide Wattle (2007).

4 – EPA (i): Queensland Herbarium records retrieved 19/3/08. EPA (ii): Queensland Environmental Protection Agency Wildlife Online database records retrieved 30/3/08. DEWHA: Commonwealth DEWHA EPBC online MNES search generated 12/3/08.



## Appendix A

## Pipeline Flora Survey

### EPBC Act Protected Matters Report

The EPBC Act protected matters report search area was a linear search with a buffer of 5kms for the length of the pipeline including the Mainland and Curtis Island sections. The points along the pipeline centreline are as follows:

-25.6161	148.9233	-25.6237	148.6738	-25.4337	148.6221	-25.3813	148.626
-25.3375	148.6586	-25.2969	148.6679	-25.2751	148.6603	-25.2356	148.6966
-25.1423	148.7201	-25.0822	148.7203	-24.711	148.8427	-24.6869	148.9456
-24.6506	149.032	-24.6219	149.2138	-24.5542	149.3986	-24.4543	149.7445
-24.4194	149.8485	-24.4052	149.9689	-24.369	150.0372	-24.3655	150.1454
-24.2918	150.3736	-24.2664	150.5163	-24.1314	150.7391	-24.0864	150.8698
-24.039	150.9567	-23.9886	150.9734	-23.9666	150.9645	-23.8829	151.0135
-23.8663	151.0375	-23.8568	151.0726	-23.8486	151.1013	-23.8398	151.1169
-23.8274	151.1323	-23.826	151.1388	-23.8127	151.1475	-23.7852	151.1506
-23.7656	151.144	-23.7701	151.1439	-23.7505	151.1553	-23.7506	151.177
-23.7457	151.1789	-23.7447	151.1883	-23.7504	151.2017	-23.7557	151.2069
-23.7742	151.2163	-23.7774	151.2217	-23.7876	151.2208		

### Wildnet Wildlife Online database and HERBRECS database

The Wildnet database search and Queensland Herbarium HERBRECS database searches used the same coordinates as the EPBC Act search (above).

### Environmentally Sensitive Areas Mapping

Environmentally sensitive areas mapping was sourced for the length of the gas transmission pipeline corridor.

### Essential Habitat Mapping

Essential Habitat mapping was reviewed for the length of the pipeline using internal mapping supplied by the EPA.

## A.2 Flora Survey Methodology

The flora survey employed an assessment of floral taxa and vegetation communities in keeping with the methodology employed by the Queensland Herbarium for the survey of Regional Ecosystems and vegetation communities (Neldner *et al.*, 2005). Preliminary identification of the vegetation communities of the project areas was conducted prior to the commencement of fieldwork. Preliminary identification included vegetation community definition from aerial photography and interpretation of 1:100 000 Regional Ecosystems coverage Version 5.2 for the region (EPA, 2005). The survey design was established in consultation with the EPA.

Preliminary community definition was used to identify locations for representative field survey sample plots to obtain floristic and structural data and ground truth communities. Field surveys involved a botanical assessment at a number of representative sites within each vegetation community, employing a number of standard methods including: modified secondary sample plots; quaternary sample plots; and random meander search area. A target of three transects per vegetation community was not achievable in some vegetation communities due to their limited extent within the study site. A number of vehicle traverses of the study site were also undertaken throughout the survey period to identify changes in landform and identify community boundaries. Community structural formation classes were assessed according to (Neldner *et al.*, 2005). Regional ecosystem classification of communities was determined as per Sattler and Williams (1999), and in accordance with the Regional Ecosystems Description Database (REDD (EPA, 2005b)).

## Appendix A

## Pipeline Flora Survey

A total of 52 secondary transects and 74 quaternary sites were surveyed along the pipeline. Final vegetation mapping was undertaken utilising field survey data and aerial photograph interpretation of stereo pair images at a scale of approximately 1:22,000 (Aerometrex, 2008).

The survey was conducted under Queensland Environmental Protection Agency Scientific Purposes Permit number WISP02056306.

### A.3 Regional Ecosystems

RE	Community Description	Area within 100 m buffer (ha)	Secondary Survey Sites <sup>1</sup>	Quaternary Survey Sites <sup>1</sup>
11.1.2a	Estuarine wetlands. Bare mud flats on Quaternary estuarine deposits, with very isolated individual stunted mangroves	29.5	-	-
11.1.4a	Estuarine wetlands. <i>Rhizophora</i> spp. open-forest on Quaternary estuarine deposits	11.0	-	-
11.1.4c	Estuarine wetlands. <i>Ceriops tagal</i> , +/- <i>Avicennia marina</i> open forest on Quaternary estuarine deposits	5.3	-	-
11.3.2	<i>Eucalyptus populnea</i> woodland on alluvial plains	43.4	18	-
11.3.3	<i>Eucalyptus coolabah</i> woodland on alluvial plains	25.9	11, 17, 19	24, 27, 28, 29
11.3.4	<i>Eucalyptus tereticornis</i> and/or <i>Eucalyptus</i> spp.	10.1	15	-
11.3.17	<i>Eucalyptus populnea</i> woodland with <i>Acacia harpophylla</i> and/or <i>Casuarina cristata</i> on alluvial plains	29.5	-	-
11.3.25	<i>Eucalyptus tereticornis</i> or <i>E. camaldulensis</i> woodland fringing drainage lines	111.6	5, 10, 12, 14, 35, 39, 20, 21, 35	2, 4, 5, 19, 20, 25, 32, 33
11.3.26	<i>Eucalyptus moluccana</i> or <i>E. microcarpa</i> woodland to open forest on margins of alluvial plains	26.2	7	1, 13
11.3.29	<i>Eucalyptus crebra</i> , <i>E. exserta</i> , <i>Melaleuca</i> spp. woodland on alluvial plains	22.0	-	-
11.4.8	<i>Eucalyptus cambageana</i> woodland to open forest with <i>Acacia harpophylla</i> or <i>A. argyrodendron</i> on Cainozoic clay plains	0.2	-	-
11.4.9a	<i>Acacia harpophylla</i> , <i>Lysiphyllum carronii</i> ± <i>Casuarina cristata</i> open-forest to woodland.	0.1	-	-
11.4.9	<i>Acacia harpophylla</i> shrubby open forest to woodland with <i>Terminalia oblongata</i> on Cainozoic clay plains	7.9	-	-
11.5.2	<i>Eucalyptus crebra</i> , <i>Corymbia</i> spp., with <i>E. moluccana</i> on lower slopes of Cainozoic sand plains/remnant surfaces	52.3	16	-
11.8.4	<i>Eucalyptus melanophloia</i> woodland on Cainozoic igneous rocks. Occurs on hillsides.	7.8	26	44
11.8.5	<i>Eucalyptus orgadophila</i> open woodland on Cainozoic igneous rocks	27	23	-



## Appendix A

## Pipeline Flora Survey

RE	Community Description	Area within 100 m buffer (ha)	Secondary Survey Sites <sup>1</sup>	Quaternary Survey Sites <sup>1</sup>
11.8.11	<i>Dichanthium sericeum</i> grassland on Cainozoic igneous rocks	2.4	22, 24	-
11.9.2	<i>Eucalyptus melanophloia</i> ± <i>E. orgadophila</i> woodland on fine-grained sedimentary rocks	4	28	-
11.9.4b	<i>Acacia harpophylla</i> predominates and forms a fairly continuous canopy. Occurs on undulating plains and rises formed mainly on shale's.	14.2	-	-
11.9.5	<i>Acacia harpophylla</i> and/or <i>Casuarina cristata</i> open forest on fine-grained sedimentary rocks	24.9	-	22
11.9.9	<i>Eucalyptus crebra</i> woodland on fine-grained sedimentary rocks	0.9	9	
11.10.1	<i>Corymbia citriodora</i> open forest on coarse-grained sedimentary rocks	164.6	8, 29, 30, 31	14, 15, 37, 38, 41
11.10.3	<i>Acacia catenulata</i> or <i>A. shirleyi</i> open forest on coarse-grained sedimentary rocks.	14.4	13	40
11.10.4	<i>Eucalyptus decorticans</i> , <i>Lysicarpus angustifolius</i> ± <i>Eucalyptus</i> spp., <i>Corymbia</i> spp., <i>Acacia</i> spp. woodland on coarse-grained sedimentary rocks, crests and scarps.	29.7	33	-
11.10.7	<i>Eucalyptus crebra</i> woodland on coarse-grained sedimentary rocks	140	32	-
11.10.8	Semi-evergreen vine thicket in sheltered habitats on medium to coarse-grained sedimentary rocks	0.8	-	-
11.10.12	<i>Eucalyptus populnea</i> woodland on medium to coarse-grained sedimentary rocks	8.7	-	-
11.10.13	<i>Eucalyptus</i> spp. and/or <i>Corymbia</i> spp. open forest on scarps and sandstone tablelands	130.1	34	34
11.10.13a	<i>Eucalyptus cloeziana</i> ± <i>E. melanoleuca</i> ± <i>Corymbia bunites</i> ± <i>E. sphaerocarpa</i> woodland to open-forest.	72.4	-	-
11.11.3	<i>Corymbia citriodora</i> , <i>Eucalyptus crebra</i> , <i>E. acmenoides</i> open forest on old sedimentary rocks with varying degrees of metamorphism and folding.	17	4, 36	8, 9
11.11.4	<i>Eucalyptus crebra</i> woodland on old sedimentary rocks with varying degrees of metamorphism and folding. Coastal ranges	5.6	-	-
11.11.4c	<i>Eucalyptus moluccana</i> dominated woodland	1.7	-	-
11.11.5	Microphyll vine forest ± <i>Araucaria cunninghamii</i> on old sedimentary rocks with varying degrees of metamorphism and folding	0.8	-	-
11.11.15	<i>Eucalyptus crebra</i> woodland on deformed and metamorphosed sediments and interbedded volcanics. Undulating plains.	173.5	4, 6, 37, 38	8, 9, 12
11.11.18	Semi-evergreen vine thicket on old sedimentary rocks with varying degrees of metamorphism and folding. Lowlands	0.2	-	-

## Appendix A

## Pipeline Flora Survey

RE	Community Description	Area within 100 m buffer (ha)	Secondary Survey Sites <sup>1</sup>	Quaternary Survey Sites <sup>1</sup>
11.12.1	<i>Eucalyptus crebra</i> woodland on igneous rocks	74.9	1, 3, 41	49
11.12.3	<i>Eucalyptus crebra</i> , <i>E. tereticornis</i> , <i>Angophora leiocarpa</i> woodland on igneous rocks especially granite	3.9	-	-
11.12.6	<i>Corymbia citriodora</i> open forest on igneous rocks (granite)	12.5	-	-
11.12.17	<i>Eucalyptus populnea</i> woodland on igneous rocks. Colluvial lower slopes	2	-	-
12.1.2	Saltpan vegetation including grassland, herbland and sedgeland on marine clay plains	23.4	-	54, 58
12.1.3	Mangrove shrubland to low closed forest. Occurs on Quaternary estuarine deposits.	21.6	44, 47	57
12.3.1	Gallery rainforest (notophyll vine forest) on alluvial plains	0.2	-	-
12.3.3	<i>Eucalyptus tereticornis</i> woodland to open forest on alluvial plains	2.5	49	59
12.3.7	<i>Eucalyptus tereticornis</i> , <i>Melaleuca viminalis</i> , <i>Casuarina cunninghamiana</i> fringing forest	2.9	-	-
12.11.6	<i>Corymbia citriodora</i> , <i>Eucalyptus crebra</i> open forest on metamorphics ± interbedded volcanics	108.5	42, 48, 50, 52	51, 56, 60-67
12.11.7	<i>Eucalyptus crebra</i> woodland on metamorphics ± interbedded volcanics	13.5	45	53, 55
12.11.14	<i>Eucalyptus crebra</i> , <i>E. tereticornis</i> woodland on metamorphics ± interbedded volcanics	11.9	43, 46, 51	-
n/a	Cleared areas (e.g. improved pastures, cropping land or non-remnant regrowth vegetation)	7,081.5	-	16, 17, 18, 23, 30

<sup>1</sup> – Where no Secondary or Quaternary site data is indicated, RE mapping has been based upon EPA RE mapping Version 5.2. The majority of these REs are located within the GSDA which is to be surveyed as part of the Phase 2 pre-construction surveys.

The tables below provide a summary of all secondary site data collected for the gas transmission pipeline flora survey.



## Appendix A

## Pipeline Flora Survey

Secondary Transect 1	
Pipeline 01/07/08	
R.E.	11.12.1
Transect Start	150.937830 ; -24.048860
Transect End (50m)	150.937392 ; -24.049070
Bearing	South West
Aspect	South
Slope	< 5%
Soil	Sandy clay loam
Weeds	-
Grazing impacts	minor
Erosion	-
Fire history	>10 years
Fauna habitat	minor hollows
Notes	road reserve serves as corridor
Strata	<b>Dominant Species</b>
Canopy (T1): 8-12 m FPC: 6%	<i>Eucalyptus crebra</i>
	<i>Eucalyptus melanophloia</i>
Mid-Storey (T2): 6-8 m	<i>Eucalyptus crebra</i>
	<i>Eucalyptus melanophloia</i>
Shrub (S1): 1-3 m FPC: 5%	<i>Eucalyptus crebra</i>
	<i>Eucalyptus melanophloia</i>
Ground (G): <1 m FPC: 37% Litter: 19% Bare: 44%	<i>Themeda triandra</i>
	<i>Hyparrhenia rufa</i>
	<i>Cymbopogon refractus</i>

## Appendix A

## Pipeline Flora Survey

Secondary Transect 2	
Pipeline 01/07/08	
R.E.	11.12.17
Transect Start	150.873014; -24.094518
Transect End (50m)	150.843483; -24.097195
Bearing	100° North East
Aspect	North
Slope	<5%
Soil	Dark brown sandy loam
Weeds	<i>Lantana montevidensis</i> *
Erosion	nil
Grazing impacts	minor
Fire history	> 10 years
Fauna habitat	occasional hollows
Notes	-
<b>Strata</b>	<b>Dominant Species</b>
Canopy (T1): 14-20 m FPC: 64%	<i>Eucalyptus populnea</i>
	<i>Corymbia tessellaris</i>
Mid-Storey (T2): 4-10 m	<i>Eucalyptus populnea</i>
	<i>Corymbia tessellaris</i>
Shrub (S1): 1-3 m FPC: <5%	<i>Petalostigma pubescens</i>
Ground (G): <1 m FPC: 32% Litter: 46% Bare: 22%	<i>Themeda triandra</i>
	<i>Cymbopogon refractus</i>



## Appendix A

## Pipeline Flora Survey

Secondary Transect 3	
Pipeline 01/07/08	
R.E.	11.12.1
Transect Start	150.730138; -24.138438
Transect End (50m)	150.730737; -24.138435
Bearing	170° East
Aspect	North
Slope	10%
Soil	Deco granite
Weeds	<i>Lantana camara</i> *
Erosion	nil
Grazing impacts	nil
Fire history	> 5 years (fire scars present)
Fauna habitat	Occasional hollows, moderate rocky outcropping
Notes	-
<b>Strata</b>	<b>Dominant Species</b>
Canopy (T1): 8-14 m FPC: 52%	<i>Eucalyptus crebra</i>
	<i>Eucalyptus melanophloia</i>
Mid-Storey (T2): 6-8 m Shrub (S1): 4-6 m FPC: <5%	<i>Erythrina vespertilio</i>
	<i>Eucalyptus</i> spp. regeneration
Ground (G): <1 m FPC: 40% Litter: 24% Bare: 30%	<i>Cymbopogon refractus</i>

## Appendix A

## Pipeline Flora Survey

Secondary Transect 4	
<b>Pipeline 02/07/08</b>	
<b>R.E.</b>	11.11.15
<b>Transect Start</b>	150.618739; -24.215008
<b>Transect End (50m)</b>	150.6186611; -24.214639
<b>Bearing</b>	320° north
<b>Aspect</b>	north
<b>Slope</b>	< 1%
<b>Soil</b>	light brown, sandy loam
<b>Weeds</b>	<i>Lantana montevidensis</i> *
<b>Erosion</b>	nil
<b>Grazing impacts</b>	moderate
<b>Fire history</b>	5 - 10 years
<b>Fauna habitat</b>	very occasional hollows, high fallen and decayed logs/debris
<b>Notes</b>	-
<b>Strata</b>	<b>Dominant Species</b>
<b>Canopy (T1): 14-18 m</b> <b>FPC: 16%</b>	<i>Eucalyptus crebra</i>
	<i>Corymbia erythrophloia</i>
<b>Mid-Storey (T2): 4-8 m</b>	<i>Eucalyptus crebra</i>
	<i>Corymbia erythrophloia</i>
<b>Shrub (S1): 2-4 m</b> <b>FPC: 5%</b>	<i>Acacia decora</i>
	<i>Acacia disparrima</i>
<b>Ground (G): &lt;1 m</b> <b>FPC: 16%</b> <b>Litter: 44%</b> <b>Bare: 40%</b>	<i>Malvastrum americanum</i>
	<i>Bothriochloa decipiens</i>



## Appendix A

## Pipeline Flora Survey

Secondary Transect 5	
Pipeline 02/07/08	
R.E.	11.3.25
Transect Start	150.617714; -24.216035
Transect End (50m)	150.617293; -24.215469
Bearing	300° West
Aspect	-
Slope	n/a
Soil	Alluvium deposits with high silicate in creek with large basalt and sandstone boulders
Weeds	typical riparian weeds
Erosion	nil
Grazing impacts	minor
Fire history	>10 years
Fauna habitat	Moderate hollows (none sighted in creek line), dense overstorey and mid -storey, potential frog habitat in creek
Notes	-
<b>Strata</b>	<b>Dominant Species</b>
Canopy (T1): 16-18 m FPC: 44%	<i>Eucalyptus tereticornis</i>
Mid-Storey (T2): 6-8 m	<i>Melaleuca linariifolia</i> <i>Eucalyptus tereticornis</i>
Shrub (S1): 1-4 m FPC: 20%	<i>Melaleuca linariifolia</i> <i>Callistemon viminalis</i>
Ground (G): <1 m FPC: 25% Litter: 9% Bare: 66%	<i>Lantana montevidensis</i> *

## Appendix A

## Pipeline Flora Survey

Secondary Transect 6	
Pipeline 02/07/08	
R.E.	11.11.3
Transect Start	150.638823; -24.218154
Transect End (50m)	150.638493; -24.218114
Bearing	260° West
Aspect	170° South
Slope	10%
Soil	Light brown clay/loam, high rock content in A horizon
Erosion	nil
Grazing impacts	minor
Fire history	> 10 years
Fauna habitat	Occasional hollows, high fallen and decayed logs/debris
Weeds	<i>Lantana montevidensis</i> *, <i>Opuntia tomentosa</i> *
Notes	Site has high amounts of regrowth present
Strata	<b>Dominant Species</b>
Canopy (T1): 10-18 m FPC: 42%	<i>Corymbia citriodora</i> subsp. <i>citriodora</i>
	<i>Eucalyptus crebra</i>
Mid-Storey (T2): 6-10 m	<i>Corymbia citriodora</i> subsp. <i>citriodora</i>
Shrub (S1): 1-3 m FPC: <5%	<i>Acacia decora</i>
	<i>Opuntia tomentosa</i> *
	<i>Xanthorrhoea johnsonii</i>
Ground (G): <1 m FPC: 14% Litter: 76% Bare: 10%	<i>Lantana montevidensis</i> *



## Appendix A

## Pipeline Flora Survey

Secondary Transect 7	
Pipeline 03/07/08	
R.E.	11.3.26
Transect Start	150.570852; -24.229147
Transect End (50m)	150.570334; -24.229380
Bearing	70° East
Aspect	-
Slope	0%
Soil	Chocolate brown sandy loam
Erosion	nil
Grazing impacts	minor
Fire history	5 – 10 years
Fauna habitat	Occasional stag trees, occasional hollows, moderate fallen and decayed logs/debris
Weeds	<i>Lantana montevidensis</i>
Notes	Site extends west to an ecotonal change to <i>Corymbia</i> and <i>E. crebra</i>
<b>Strata</b>	<b>Dominant Species</b>
Canopy (T1): 18-25 m FPC: 40%	<i>Eucalyptus moluccana</i>
	<i>Eucalyptus crebra</i>
	<i>Corymbia citriodora</i> subsp. <i>citriodora</i>
Mid-Storey (T2): 6-16 m	<i>Eucalyptus moluccana</i>
	<i>Eucalyptus crebra</i>
	<i>Corymbia citriodora</i> subsp. <i>citriodora</i>
Shrub (S1): 1-4 m FPC: 30%	<i>Alectryon diversifolius</i>
	<i>Atalaya hemiglauca</i>
Ground (G): <1 m FPC: 39% Litter: 44% Bare: 17%	<i>Jasminum simplicifolium</i>
	<i>Lantana montevidensis</i> *
	-
	-

## Appendix A

## Pipeline Flora Survey

Secondary Transect 8	
Pipeline 07/07/08	
R.E.	11.10.1
Transect Start	150.560543; -24.236105
Transect End (50m)	150.560471; -24.236168
Bearing	220° South
Aspect	90° East
Slope	3%
Soil	Red brown sandy clay loam
Erosion	nil
Grazing impacts	minor
Fire history	5 – 10 years
Fauna habitat	occasional hollows, high fallen and decayed logs/debris
Weeds	<i>Lantana montevidensis</i> *
Notes	Large extent of woodland
Strata	<b>Dominant Species</b>
Canopy (T1): 16-20 m FPC: 28%	<i>Corymbia citriodora</i> subsp. <i>citriodora</i>
	<i>Eucalyptus crebra</i>
Mid-Storey (T2): 8-12 m	<i>Corymbia citriodora</i> subsp. <i>citriodora</i>
	<i>Eucalyptus crebra</i>
	<i>Corymbia trachyphloia</i>
Shrub (S1): 1-5 m FPC: 15%	<i>Alectryon diversifolius</i>
	<i>Alphitonia excelsa</i>
Ground (G): <1 m FPC: 28% Litter: 16% Bare: 56%	<i>Lantana montevidensis</i> *
	<i>Lomandra longifolia</i>



## Appendix A

## Pipeline Flora Survey

Secondary Transect 9	
Pipeline 07/07/08	
R.E.	11.9.9
Transect Start	150.549608; -24.242377
Transect End (50m)	150.549589; -24.242720
Bearing	190° South
Aspect	flat
Slope	flat
Soil	Clayey sandy loam
Erosion	nil
Grazing impacts	minor
Fire history	> 10 years
Fauna habitat	very few hollows, minor fallen and decayed logs/debris
Weeds	<i>Lantana montevidensis</i> *, <i>Pennisetum ciliare</i> *
Notes	site contains disjunct remnant vegetation present
<b>Strata</b>	<b>Dominant Species</b>
Canopy (T1): 16-20 m FPC: 36%	<i>Eucalyptus crebra</i>
	<i>Corymbia citriodora</i> subsp. <i>citriodora</i>
Mid-Storey (T2): 8-12 m	<i>Eucalyptus crebra</i>
	<i>Corymbia citriodora</i> subsp. <i>citriodora</i>
Shrub (S1): 1-3 m FPC: 4%	<i>Petalostigma pubescens</i>
	<i>Acacia leiocalyx</i>
Ground (G): <1 m FPC: 34% Litter: 44% Bare: 22%	<i>Lomandra multiflora</i>
	<i>Melinis repens</i> *
	-
	-

## Appendix A

## Pipeline Flora Survey

Secondary Transect 10	
Pipeline 08/07/08	
R.E.	11.3.25
Transect Start	150.444; -24.284762
Transect End (50m)	150.444395; -24.285067
Bearing	140° South
Aspect	flat
Slope	flat
Soil	sandy clayey loam, alluvial deposits present
Erosion	Grazing access tracks
Grazing impacts	moderate
Fire history	1 – 5 years
Fauna habitat	minor tree hollows, minor fallen and decayed logs/debris
Weeds	<i>Macfadyena unguis-cati</i> *, <i>Bryophyllum delagoense</i> *
Notes	very high avifauna vocalisations
Strata	<b>Dominant Species</b>
Canopy (T1): 18-25 m FPC: 4%	<i>Eucalyptus tereticornis</i>
	<i>Corymbia tessellaris</i>
Mid-Storey (T2): 10-15 m	<i>Eucalyptus tereticornis</i>
	<i>Corymbia tessellaris</i>
Shrub (S1): 1-7 m FPC: 15%	<i>Acacia salicina</i>
	<i>Capparis lasiantha</i>
Ground (G): <1 m FPC: 36% Litter: 14% Bare: 50%	<i>Verbena aristigera</i> *
	<i>Megathyrsus maximus</i> *
	-
	-



## Appendix A

## Pipeline Flora Survey

Secondary Transect 11	
<b>Pipeline 08/07/08</b>	
<b>R.E.</b>	11.3.3
<b>Transect Start</b>	150.399635; -24.289586
<b>Transect End (50m)</b>	150.399915; -24.289152
<b>Bearing</b>	20° North
<b>Aspect</b>	flat
<b>Slope</b>	flat
<b>Soil</b>	dark brown, clay loam
<b>Erosion</b>	cattle access tracks and trampling
<b>Grazing impacts</b>	heavily degraded ground layer
<b>Fire history</b>	> 5 years
<b>Fauna habitat</b>	large hollow bearing trees
<b>Weeds</b>	<i>Cryptostegia grandiflora</i> *
<b>Notes</b>	site is a fauna corridor
<b>Strata</b>	<b>Dominant Species</b>
<b>Canopy (T1): 14-18 m</b> <b>FPC: 40%</b>	<i>Eucalyptus coolabah</i>
	<i>Eucalyptus tereticornis</i>
<b>Mid-Storey (T2): 8-12 m</b>	<i>Eucalyptus coolabah</i>
	<i>Eucalyptus tereticornis</i>
<b>Shrub (S1): 2 - 6 m</b> <b>FPC: 10%</b>	<i>Lysiphillum hookeri</i>
	<i>Acacia salicina</i>
<b>Ground (G): &lt;1 m</b> <b>FPC: 26%</b> <b>Litter: 28%</b> <b>Bare: 46%</b>	<i>Leptochloa digitata</i>
	<i>Achryanthes aspera</i>
	-
	-

## Appendix A

## Pipeline Flora Survey

Secondary Transect 12	
Pipeline 08/07/08	
R.E.	11.3.25
Transect Start	150.261355; -24.378493
Transect End (50m)	150.261880; -24.328278
Bearing	60° North
Aspect	flat
Slope	flat
Soil	dark brown, clay loam
Erosion	nil
Grazing impacts	minor
Fire history	> 10 years
Fauna habitat	High tree hollows, high fallen and decayed logs/debris
Weeds	Pasture spp.
Notes	Site is a fauna corridor
<b>Strata</b>	<b>Dominant Species</b>
Canopy (T1): 18-24 m FPC: 4%	<i>Eucalyptus tereticornis</i>
Mid-Storey (T2): 14-16 m	<i>Corymbia tessellaris</i>
	<i>Eucalyptus tereticornis</i>
Shrub (S1): 1-5 m FPC: <5%	<i>Melaleuca linariifolia</i>
	<i>Acacia fasciculifera</i>
Ground (G): <1 m FPC: 64% Litter: 24% Bare: 12%	<i>Themeda triandra</i>
	<i>Arundinella nepalensis</i>
	-
	-

## Appendix A

## Pipeline Flora Survey

Secondary Transect 13	
Pipeline 08/07/08	
R.E.	11.10.3
Transect Start	149.767038; -24.474676
Transect End (50m)	149.767224; -24.474581
Bearing	270° West
Aspect	south
Slope	1%
Soil	red-brown, sandy clay loam
Weeds	very few
Erosion	nil
Grazing impacts	minor
Fire history	> 5 years
Fauna habitat	very few hollows, high fallen and decayed logs/debris, dense clumps of native grass spp.
Notes	
<b>Strata</b>	<b>Dominant Species</b>
Canopy (T1): 12-14 m FPC: 60%	<i>Acacia shirleyi</i>
	<i>Eucalyptus decorticans</i>
Mid-Storey (T2): 8-12 m	<i>Acacia shirleyi</i>
Shrub (S1): 1-4 m FPC: 20%	<i>Erythroxylum australe</i>
Ground (G): <1 m FPC: 32%	<i>Entolasia stricta</i>
Litter: 46%	<i>Oplismenus aemulus</i>
Bare: 22%	-
	-



## Appendix A

## Pipeline Flora Survey

Secondary Transect 14	
Pipeline 10/07/08	
R.E.	11.3.25
Transect Start	149.851027; -24.432555
Transect End (50m)	-
Bearing	180° South
Aspect	flat
Slope	flat
Soil	clayey sand especially in the flow channel of Dawson river
Weeds	<i>Megathyrsus maximus</i> *, <i>Parthenium hysterophorus</i> *
Erosion	nil
Grazing impacts	minor
Fire history	> 10 years
Fauna habitat	very large hollow bearing trees, high fallen and decayed logs/debris, very dense understorey layer
Notes	site had a abundant avifauna present
<b>Strata</b>	<b>Dominant Species</b>
Canopy (T1): 20-26 m FPC: 28%	<i>Eucalyptus tereticornis</i>
	-
Shrub (S1): 2-8 m FPC: 40%	<i>Melaleuca linariifolia</i>
	<i>Ficus opposita</i>
Ground (G): <1 m FPC: 20%	<i>Lomandra hystrix</i>
Litter: 7%	<i>Megathyrsus maximus</i> *
Bare: 73%	-
	-

## Appendix A

## Pipeline Flora Survey

Secondary Transect 15	
Pipeline 10/07/08	
R.E.	11.3.4
Transect Start	149.849343; -24.432955
Transect End (50m)	149.849098; -24.43319
Bearing	180° South
Aspect	flat
Slope	flat
Soil	brown sandy clay loam (on river terrace)
Weeds	<i>Opuntia tomentosa</i> *
Erosion	nil
Grazing impacts	minor
Fire history	> 5 years
Fauna habitat	very large hollow bearing trees, stag trees, moderate fallen and decayed logs/debris
Notes	-
<b>Strata</b>	<b>Dominant Species</b>
Canopy (T1): 18-20 m FPC: 28%	<i>Eucalyptus tereticornis</i>
Mid-Storey (T2): 6-12 m	<i>Lophostemon suaveolens</i> <i>Corymbia tessellaris</i>
Shrub (S1): 1-2 m FPC: <5%	<i>Ficus opposita</i>
Ground (G): <1 m FPC: 21% Litter: 43% Bare: 36%	<i>Arundinella nepalensis</i> <i>Heteropogon contortus</i>

## Appendix A

## Pipeline Flora Survey

Secondary Transect 16	
Pipeline 10/07/08	
R.E.	11.5.2
Transect Start	149.849343; -24.432955
Transect End (50m)	149.760485; -24.473093
Bearing	240° West
Aspect	140° South
Slope	<1%
Soil	dark brown, sandy clay loam
Weeds	-
Erosion	nil
Grazing impacts	minor
Fire history	> 5 years
Notes	site is part of bushland across Dawson Range
Strata	<b>Dominant Species</b>
Canopy (T1): 16-20 m FPC: 8%	<i>Eucalyptus crebra</i>
	<i>Corymbia clarksoniana</i>
Mid-Storey (T2): 8-12 m	<i>Acacia shirleyi</i>
	<i>Eucalyptus crebra</i>
Shrub (S1): 2-6 m FPC: 5%	<i>Alphitonia excelsa</i>
	<i>Acacia leiocalyx</i>
	<i>Alstonia constricta</i>
Ground (G): <1 m FPC: 33% Litter: 43% Bare: 24%	<i>Oplismenus aemulus</i>
	<i>Arundinella nepalensis</i>
	<i>Malvastrum americanum</i>
	-



## Appendix A

## Pipeline Flora Survey

Secondary Transect 17	
Pipeline 11/07/08	
R.E.	11.3.3
Transect Start	149.719448; -24.46831
Transect End (50m)	149.719877; -24.468162
Bearing	240° West
Aspect	flat
Slope	flat
Soil	light brown, clay loam
Weeds	-
Erosion	cattle access tracks
Grazing impacts	heavily impacted
Fire history	> 10 years
Fauna habitat	abundant hollows, moderate fallen and decayed logs/debris
Notes	site continues into bushland
Strata	<b>Dominant Species</b>
Canopy (T1): 16-20 m	<i>Eucalyptus coolabah</i>
FPC: 40%	
Mid-Storey (T2): 4-8m	<i>Eucalyptus coolabah</i>
Shrub (S1): 1-4 m	<i>Eucalyptus coolabah</i>
FPC: 1%	
Ground (G): <1 m	<i>Muehlenbeckia florulenta</i>
FPC: 14%	
Litter: 15%	
Bare: 71%	

## Appendix A

## Pipeline Flora Survey

Secondary Transect 18	
Pipeline 11/07/08	
R.E.	11.3.2
Transect Start	149.726608; -24.468038
Transect End (50m)	149.726878; -24.468125
Bearing	110° East
Aspect	flat
Slope	flat
Soil	brown clay loam
Weeds	<i>Parthenium hysterophorus</i> *
Erosion	cattle access tracks
Grazing impacts	heavily grazed
Fire history	> 10 years
Fauna habitat	abundant hollows, moderate fallen and decayed logs/debris
Notes	-
<b>Strata</b>	<b>Dominant Species</b>
Canopy (T1): 10-14 m FPC: 48%	<i>Eucalyptus populnea</i> -
Mid-Storey (T2): 5-8 m	<i>Eucalyptus populnea</i>
Shrub (S1): 1-2 m FPC: <5%	<i>Archidendropsis basaltica</i> -
Ground (G): <1 m FPC: 40% Litter: 34% Bare: 26%	<i>Parthenium hysterophorus</i> * <i>Sida hackettiana</i> - -

## Appendix A

## Pipeline Flora Survey

Secondary Transect 19	
Pipeline 11/07/08	
R.E.	11.3.3
Transect Start	149.694532; -24.47003
Transect End (50m)	149.694577; -24.469732
Bearing	70° North
Aspect	140° South
Slope	<1%
Soil	Dark brown clayey loam (low clay content)
Weeds	<i>Cenchrus ciliaris</i> *
Erosion	nil
Grazing impacts	minor
Fire history	> 10 years
Fauna habitat	High fallen and decayed logs/debris, minor hollows
Notes	-
<b>Strata</b>	<b>Dominant Species</b>
Canopy (T1): 13-15 m FPC: 38%	<i>Eucalyptus coolabah</i>
	<i>Acacia harpophylla</i>
Mid-Storey (T2): 6-10 m	<i>Eucalyptus coolabah</i>
	<i>Acacia harpophylla</i>
Shrub (S1): 1-2 m FPC: 5%	<i>Acacia harpophylla</i>
Ground (G): <1 m FPC: 4.4% Litter: 91% Bare: 4.6%	<i>Pennisetum ciliare</i> *
	<i>Tetragonia tetragonioides</i>



## Appendix A

## Pipeline Flora Survey

Secondary Transect 20	
Pipeline 15/07/08	
R.E.	11.3.3
Transect Start	149.564755; -24.504137
Transect End (50m)	149.564553; -24.504375
Bearing	200° South
Aspect	Flat
Slope	Flat
Soil	Light brown sandy clayey loam
Weeds	<i>Parthenium hysterophorus</i> *, <i>Pennisetum ciliare</i> *, <i>Opuntia tomentosa</i> *
Erosion	nil
Grazing impacts	heavily
Fire history	> 10 years
Fauna habitat	occasional fallen and decayed logs/debris
Notes	site acts as a corridor, located adjacent wheat crop land-use
<b>Strata</b>	<b>Dominant Species</b>
Canopy (T1): 8-12 m FPC: 54%	<i>Eucalyptus coolabah</i>
Mid-Storey (T2): 4-8 m	<i>Eucalyptus coolabah</i>
Shrub (S1): 1-4m FPC: 7%	<i>Alectryon diversifolius</i>
Ground (G): <1 m FPC: 19% Litter: 18% Bare: 63%	<i>Pennisetum ciliare</i> *
	<i>Enchylaena tomentosa</i>
	<i>Capparis lasiantha</i>

## Appendix A

## Pipeline Flora Survey

Secondary Transect 21	
Pipeline 15/07/08	
R.E.	11.3.25
Transect Start	149.55875; -24.509027
Transect End (50m)	149.559385; -24.508813
Bearing	60° East
Aspect	South West
Slope	5°
Soil	light brown sandy loam
Weeds	<i>Parthenium hysterophorus</i> *
Erosion	nil
Grazing impacts	moderate
Fire history	> 10 years
Fauna habitat	occasional fallen and decayed logs/debris
Notes	-
<b>Strata</b>	<b>Dominant Species</b>
Canopy (T1): 10-12 m FPC: 56%	<i>Eucalyptus coolabah</i>
Mid-Storey (T2): 6-8 m	<i>Acacia harpophylla</i>
Shrub (S1): 2-4m FPC: <5%	<i>Acacia harpophylla</i>
Ground (G): <1 m FPC: 2%	<i>Pennisetum ciliare</i> *
Litter: 33%	<i>Enchylaena tomentosa</i>
Bare: 65%	<i>Parthenium hysterophorus</i> *

## Appendix A

## Pipeline Flora Survey

Secondary Transect 22	
Pipeline 15/07/08	
R.E.	11.8.11
Transect Start	149.409487; -24.55134
Transect End (50m)	149.409042; -24.551477
Bearing	230° West
Aspect	40°North
Slope	2%
Soil	black clay, basalt intrusions, cracking present
Weeds	<i>Parthenium hysterophorus</i> *, <i>Pennisetum ciliare</i> *
Erosion	cattle access tracks
Grazing impacts	heavily
Fire history	> 10 years
Fauna habitat	very little fauna habitat
Notes	-
<b>Strata</b>	<b>Dominant Species</b>
Shrub (S1): 1-4 m FPC: 5%	<i>Eremophila mitchellii</i>
	<i>Lysiphyllum hookeri</i>
Ground (G): <1 m FPC: 26% Litter: 10% Bare: 64%	<i>Panicum decompositum</i>
	<i>Parthenium hysterophorus</i> *
	<i>Pennisetum ciliare</i> *



## Appendix A

## Pipeline Flora Survey

Secondary Transect 23	
Pipeline 15/07/08	
R.E.	11.8.5
Transect Start	149.402327; -24.554882
Transect End (50m)	149.402007; -24.555215
Bearing	210° South
Aspect	100° East
Slope	4%
Soil	dark brown, clay loam, basalt rocks present
Weeds	<i>Parthenium hysterophorus</i> *
Erosion	cattle access tracks
Grazing impacts	heavily
Fire history	> 10 years
Fauna habitat	occasional fallen and decayed logs/debris
Notes	-
<b>Strata</b>	<b>Dominant Species</b>
Canopy (T1): 8-10 m FPC: 46%	<i>Eucalyptus orgadophila</i>
	<i>Corymbia erythrophloia</i>
Mid-Storey (T2): 4-8 m	<i>Eucalyptus orgadophila</i>
	<i>Corymbia erythrophloia</i>
Shrub (S1): 1-2 m FPC: 5%	<i>Carissa ovata</i>
Ground (G): <1 m FPC: 46% Litter: 24% Bare: 30%	<i>Cymbopogon refractus</i>
	<i>Parthenium hysterophorus</i> *
	<i>Heteropogon contortus</i>

## Appendix A

## Pipeline Flora Survey

Secondary Transect 24	
Pipeline 15/07/08	
R.E.	11.8.11
Transect Start	149.392313; -24.556367
Transect End (50m)	149.392065; -24.555977
Bearing	320° North
Aspect	220° South
Slope	5°
Soil	black clay, basalt rock, cracking present
Weeds	<i>Parthenium hysterophorus</i> *
Erosion	cattle access tracks
Grazing impacts	heavily
Fire history	> 10 years
Fauna habitat	very little habitat present
Notes	-
<b>Strata</b>	<b>Dominant Species</b>
Shrub (S1): 1-2 m FPC: 5%	<i>Citrus glauca</i>
Ground (G): <1 m FPC: 30%	<i>Salsola kali</i>
Litter: 12%	<i>Panicum decompositum</i>
Bare: 58%	<i>Parthenium hysterophorus</i> *

## Appendix A

## Pipeline Flora Survey

Secondary Transect 25	
Pipeline 16/07/08	
R.E.	Non-remnant
Transect Start	149.055907; -24.65382
Transect End (50m)	149.055903; -24.654163
Bearing	170° South
Aspect	90° East
Slope	5%
Soil	chocolate brown, clay loam, high clay content
Weeds	nil
Erosion	nil
Grazing impacts	low
Fire history	> 5 years
Fauna habitat	low habitat present
Notes	adjacent site fauna habitat greater
<b>Strata</b>	<b>Dominant Species</b>
Canopy (T1): 6-8 m FPC: 14%	<i>Eucalyptus melanophloia</i>
	<i>Corymbia erythrophloia</i>
Mid-Storey (T2): 2-4 m	<i>Eucalyptus melanophloia</i>
Shrub (S1): 1-2 m FPC: 7%	<i>Eucalyptus melanophloia</i>
Ground (G): 1-2 m FPC: 50% Litter: 20% Bare: 30%	<i>Heteropogon contortus</i>
	<i>Themeda triandra</i>



## Appendix A

## Pipeline Flora Survey

Secondary Transect 26	
Pipeline 16/07/08	
R.E.	11.8.4
Transect Start	149.039613; -24.652115
Transect End (50m)	149.03919; -24.651915
Bearing	270° West
Aspect	40° North
Slope	2%
Soil	dark brown, sandy clay loam, quartzite rocks in 'A' horizon
Weeds	-
Erosion	nil
Grazing impacts	minor
Fire history	5 – 10 years
Fauna habitat	low fallen and decayed logs/debris, occasional hollows
Notes	site adjacent to extent of bushland
Strata	<b>Dominant Species</b>
Canopy (T1): 14-18 m FPC: 38%	<i>Corymbia citriodora subsp. citriodora</i>
	<i>Eucalyptus crebra</i>
Mid-Storey (T2): 4-10 m	<i>Brachychiton populneus</i>
	<i>Corymbia citriodora subsp. citriodora</i>
Shrub (S1): 1-3 m FPC: 10%	<i>Alphitonia excelsa</i>
Ground (G): <1 m FPC: 26% Litter: 53% Bare: 21%	<i>Cymbopogon refractus</i>
	<i>Heteropogon contortus</i>

## Appendix A

## Pipeline Flora Survey

Secondary Transect 27	
Pipeline 18/07/08	
R.E.	
Transect Start	148.932078; -25.750453
Transect End (50m)	148.931727; -25.750242
Bearing	120° East
Aspect	20° North
Slope	15%
Soil	skeletal red sandy soil, large amount of sandstone rocks
Weeds	<i>Verbena aristigera</i> *, <i>Pennisetum ciliare</i> *, <i>Eriocereus martinii</i> *
Erosion	nil
Grazing impacts	minor
Fire history	> 10 years
Fauna habitat	moderate fallen and decayed logs/debris, moderate hollows
Notes	-
<b>Strata</b>	<b>Dominant Species</b>
Canopy (T1): 8-12 m FPC: 18%	<i>Eucalyptus populnea</i>
	<i>Eucalyptus melanophloia</i>
Mid-Storey (T2): 4-6 m	<i>Callitris glaucophylla</i>
	<i>Geijera parviflora</i>
Shrub (S1): 1-3 m FPC: 8%	<i>Callitris glaucophylla</i>
	<i>Eremophlia mitchellii</i>
Ground (G): <1 m FPC: 65% Litter: 5% Bare: 30%	<i>Pennisetum ciliare</i> *
	<i>Carissa ovata</i> *

## Appendix A

## Pipeline Flora Survey

Secondary Transect 28	
Pipeline 22/07/08	
R.E.	11.9.2
Transect Start	148.842235; -25.548798
Transect End (50m)	148.842377; -25.549227
Bearing	260° West
Aspect	360° North
Slope	2%
Soil	light brown clay loam
Weeds	<i>Pennisetum ciliare</i> *
Erosion	nil
Grazing impacts	nil
Fire history	> 10 years
Fauna habitat	abundant fallen and decayed logs/debris, abundant hollows
Notes	site adjacent large extent of bushland
Strata	<b>Dominant Species</b>
Canopy (T1): 12-14 m FPC: 82%	<i>Eucalyptus orgadophila</i>
Mid-Storey (T2): 6-10 m	<i>Eucalyptus orgadophila</i> <i>Acacia harpophylla</i>
Shrub (S1): 1-3 m FPC: 15%	<i>Bursaria spinosa</i> <i>Exocarpus cupressiformis</i>
Ground (G): <1 m FPC: 66% Litter: 14% Bare: 20%	<i>Heteropogon contortus</i> <i>Themeda triandra</i>



## Appendix A

## Pipeline Flora Survey

Secondary Transect 29	
Pipeline 22/07/08	
R.E.	11.10.1
Transect Start	148.848603; -25.54556
Transect End (50m)	148.848567; -25.545982
Bearing	150° South
Aspect	60° East
Slope	2%
Soil	Red brown clay loam
Weeds	None
Erosion	nil
Grazing impacts	nil
Fire history	> 5 years
Fauna habitat	moderate fallen and decayed logs/debris, occasional hollows
Notes	Dense grass in ground layer
Strata	<b>Dominant Species</b>
Canopy (T1): 8-12 m FPC: 20%	<i>Eucalyptus crebra</i>
	-
Mid-Storey (T2): 4-8 m	<i>Eucalyptus crebra</i>
Shrub (S1): 1-3 m FPC: <5%	<i>Acacia complanata</i>
Ground (G): <1 m FPC: 58%	<i>Panicum decompositum</i>
Litter: 15%	<i>Themeda triandra</i>
Bare: 27%	<i>Arundinella nepalensis</i>

## Appendix A

## Pipeline Flora Survey

Secondary Transect 30	
Pipeline 22/07/08	
R.E.	11.9.5
Transect Start	148.856578; -25.543808
Transect End (50m)	148.856694; -25.544123
Bearing	150° South
Aspect	50° East
Slope	1%
Soil	Chocolate brown, clay loam
Weeds	-
Erosion	Nil
Grazing impacts	occasional
Fire history	> 10 years
Notes	dense ground cover, site part of a large extent of bushland
<b>Strata</b>	<b>Dominant Species</b>
Canopy (T1): 10-12 m FPC: 40%	<i>Acacia harpophylla</i>
Mid-Storey (T2): 6-8 m	<i>Acacia harpophylla</i>
Shrub (S1): 1-2 m FPC: 10%	<i>Erythroxylum australe</i>
	<i>Carissa ovata</i>
Ground (G): <1 m FPC: 43% Litter: 42% Bare: 15%	<i>Cymbopogon refractus</i>
	<i>Cullen tenax</i>

## Appendix A

## Pipeline Flora Survey

Secondary Transect 31	
Pipeline 2 07/10/2008	
RE	11.10.1
Transect Start	148.958255; -24.681276
Transect End (50m)	148.958288; -24.681783
Bearing	180 <sup>0</sup> South
Aspect	west
Slope	5%
Soil	brown/red, sandy/loam, highly siliceous
Weeds	-
Erosion	Soil compaction from cattle access
Grazing impacts	minimal – moderate (scats and tracks identified)
Fire history	5 -10 years
Notes	Anthropogenic selective logging disturbance identified, grass spp. browned-off with no seed heads present, existing gas pipeline located 50 metres to north of transect.
<b>Strata</b>	<b>Dominant Species</b>
Canopy (T1): 14-18 m FPC: 90%	<i>Corymbia citriodora</i>
Mid-Storey (T2): 10-14 m	<i>Acacia shirleyi</i>
Shrub (S1): 1-3 m FPC: 15%	<i>Alphitonia excelsa</i>
Ground (G): <1 m	<i>Aristida caput-medusae</i>
FPC: 31%	<i>Cymbopogon refractus</i>
Litter: 41%	
Bare: 27%	



## Appendix A

## Pipeline Flora Survey

Secondary Transect 32	
Pipeline 2 07/10/2008	
RE	11.10.7
Transect Start	148.973100.; -24.674499
Transect End (50m)	148.971847; -24.659697
Bearing	140 <sup>o</sup> east-east-south
Aspect	north-north-east
Slope	2%
Soil	Grey/brown, sandy/loam, high organics in top layer
Weeds	-
Erosion	nil
Grazing impacts	occasional (scats identified)
Fire history	5 -10 years
Notes	grass sp. colonised to 1 metre, existing gas pipeline located to the east of the transect
<b>Strata</b>	<b>Dominant Species</b>
Canopy (T1): 14-18 m	<i>Eucalyptus crebra</i>
FPC: 86%	<i>Eucalyptus melanophloia</i>
Mid-Storey (T2): 8-12 m	<i>Eucalyptus crebra</i>
	<i>Eucalyptus melanophloia</i>
Shrub (S1): - m	<i>Alphitonia excelsa</i>
FPC: 5%	<i>Geijera parviflora</i>
Ground (G): <1 m	<i>Themeda triandra</i>
FPC: 57%	<i>Cyanthillium cinereum</i>
Litter: 38.2%	<i>Arundinella nepalensis</i>
Bare: 4.8%	

## Appendix A

## Pipeline Flora Survey

Secondary Transect 33	
Pipeline 2 07/10/2008	
RE	11.10.4
Transect Start	148.985976.; -24.667954
Transect End (50m)	148.986382.; -24.668640
Bearing	160 <sup>0</sup> south- south-east
Aspect	North-west
Slope	1%
Soil	grey/brown, sandy/loam, high organics in top layer
Weeds	-
Erosion	nil
Grazing impacts	nil
Fire history	5 -10 years
Notes	mid-storey vegetation dense, messy site (debris)
Strata	<b>Dominant Species</b>
Canopy (T1): 10-12 m	<i>Eucalyptus decorticans</i>
FPC: 38%	
Shrub (S1): 1-4 m	<i>Alphitonia excelsa</i>
FPC: 70%(1-4 metre)	<i>Alstonia constricta</i>
Ground (G): <1 m	<i>Aristida caput-medusae</i>
FPC: 5%	<i>Dianella revoluta</i>
Litter: 73%	
Bare: 22%	

## Appendix A

## Pipeline Flora Survey

Secondary Transect 34	
Pipeline 2 08/10/2008	
RE	11.10.13
Transect Start	149.028213; -24.653011
Transect End (50m)	149.027871; -24.652762
Bearing	310 <sup>0</sup> north-west-west
Aspect	north-north-east
Slope	Flat- hill crest
Soil	brown/grey, sandy/loam, rock content high
Weeds	nil
Erosion	nil
Grazing impacts	minimal
Fire history	<5 years – low intensity burn
Fauna Habitat	moderate fallen decayed logs/debris, very high rock outcropping
Notes	Thick vegetation in mid-storey
<b>Dominant Species</b>	
Canopy (T1): 12-14 m	<i>Corymbia cloeziana</i>
FPC: 68%	<i>Eucalyptus tenuipes</i>
Mid-Storey (T2): 6-8 m	<i>Lysicarpus angustifolius</i>
	<i>Corymbia cloeziana</i>
Shrub (S1): 1-4 m	<i>Daviesia filipes</i>
FPC: 45%	
Ground (G): <1 m	<i>Cymbopogon obtectus</i>
FPC: 25%	<i>Melinis repens*</i>
Litter: 63%	
Bare: 12 %	



## Appendix A

## Pipeline Flora Survey

Secondary Transect 35	
Pipeline 2 08/10/2008	
RE	11.3.25
Transect Start	149.855179; -24.45240
Transect End (50m)	149.856653; -24.454043
Bearing	120 <sup>0</sup> east
Aspect	north-east
Slope	flat
Soil	brown/grey, sandy/clay, dry, friable
Weeds	
Erosion	Very high – cattle have open access to area
Grazing impacts	Very high
Fire history	>10 years
Fauna Habitat	moderate fallen decayed logs/debris
Notes	Riparian vegetation scattered, cleared land surrounds the watercourse, no water flow during the time of the survey, cattle erosion very high
<b>Strata</b>	<b>Dominant Species</b>
<b>Canopy (T1): 18-22 m</b>	<i>Eucalyptus tereticornis</i>
<b>FPC: 14%</b>	<i>Eucalyptus coolabah</i>
<b>Mid-Storey (T2): 10-14 m</b>	<i>Casuarina cunninghamiana</i>
<b>Shrub (S1): 1-5 m</b>	<i>Melaleuca linariifolia</i>
<b>FPC: 60%</b>	
<b>Ground (G): &lt;1 m</b>	<i>Cynodon dactylon</i>
<b>FPC: 4.2%</b>	<i>Atriplex muelleri</i>
<b>Litter: 7%</b>	
<b>Bare: 88.8%</b>	

## Appendix A

## Pipeline Flora Survey

Secondary Transect 36	
Pipeline 2 09/10/2008	
RE	11.11.3
Transect Start	150.655635; -24.214600
Transect End (50m)	One GPS point marked
Bearing	40 <sup>0</sup> north-east
Aspect	east
Slope	25%
Soil	Brown/grey, sandy/loam, dry, friable
Weeds	<i>Lantana montevidensis</i> *, <i>Opuntia tomentosa</i> *
Erosion	Wallaby walk-through trails
Grazing impacts	occasional – lower storey disturbance
Fire history	5 - 10 years – burn scars on <i>Xanthorrhoea johnsonii</i>
Fauna Habitat	occasional fallen decayed logs/debris, moderate rock outcropping
Notes	Overall healthy site with <i>Cycas megacarpus</i> recorded adjacent site
Strata	<b>Dominant Species</b>
Canopy (T1): 16-20 m FPC: 58%	<i>Corymbia citriodora</i> subsp. <i>citriodora</i>
	<i>Eucalyptus crebra</i>
Mid-Storey (T2): 8-14 m	<i>Eucalyptus melanophloia</i>
Shrub (S1): 1-3 m FPC: 7%	<i>Acacia leiocalyx</i>
	<i>Acacia salicina</i>
Ground (G): <1 m FPC: 66% Litter: 10% Bare: 24%	<i>Cymbopogon refractus</i>
	<i>Lantana montevidensis</i> *
	<i>Panicum effusum</i>

## Appendix A

## Pipeline Flora Survey

Secondary Transect 38

Pipeline 2 09/10/2008

Secondary Transect 37	
Pipeline 2 09/10/2008	
<b>R.E.</b>	11.11.15
<b>Transect Start</b>	150.658564; -24.211193
<b>Transect End (50m)</b>	150.658780; -24.2111931
<b>Bearing</b>	130 <sup>0</sup> south-east-east
<b>Aspect</b>	North-east
<b>Slope</b>	1%
<b>Soil</b>	Yellow/cream, sandy/sandy/loam, siliceous, rocky
<b>Weeds</b>	<i>Opuntia tomentosa</i> *, <i>Lantana montevidensis</i> *
<b>Erosion</b>	nil
<b>Fire history</b>	<5 years
<b>Grazing impacts</b>	occasional
<b>Fauna Habitat</b>	occasional fallen logs/debris, very high rocky outcropping
<b>Notes</b>	<i>Cycas megacarpus</i> recorded adjacent site
<b>Strata</b>	<b>Dominant Species</b>
<b>Canopy (T1): 10-14 m</b>	<i>Eucalyptus crebra</i>
<b>FPC: 32%</b>	
<b>Mid-Storey (T2): 4-8 m</b>	<i>Eucalyptus crebra</i>
<b>Shrub (S1): 1-3 m</b>	<i>Acacia disparrima</i>
<b>FPC: 2%</b>	
<b>Ground (G): &lt;1 m</b>	<i>Lantana montevidensis</i> *
<b>FPC: 16%</b>	<i>Cyanthillium cinereum</i>
<b>Litter: 9%</b>	
<b>Bare: 75%</b>	



## Appendix A

## Pipeline Flora Survey

R.E.	11.11.15
Transect Start	150.686521; -24.2053
Transect End (50m)	150.686880; -24.2050
Bearing	60 <sup>0</sup> north-east-east
Aspect	flat
Slope	10-12%
Soil	Grey/orange, sandy/loam
Weeds	<i>Opuntia stricta</i> *, <i>Lantana camara</i> *, <i>Lantana montevidensis</i> *
Erosion	nil
Fire history	5 – 10 years
Grazing impacts	nil
Fauna Habitat	Minimal fallen debris/logs, occasional stag tree, heavy rocky outcropping
Fauna observations	avifauna vocalisations, wallaby sp. and kangaroo sp. scats
Notes	Open/sparse T1 canopy, grass sp. browned off with no seed heads
<b>Strata</b>	<b>Dominant Species</b>
<b>Canopy (T1): 12-14 m</b>	<i>Eucalyptus crebra</i>
<b>FPC: 26%</b>	<i>Eucalyptus melanophloia</i>
<b>Mid-Storey (T2): 6-10 m</b>	<i>Eucalyptus crebra</i>
	<i>Eucalyptus melanophloia</i>
<b>Shrub (S1): 1-2 m</b>	
<b>FPC: 5%</b>	
<b>Ground (G): &lt;1 m</b>	<i>Lantana montevidensis</i> *
<b>FPC: 56.2%</b>	<i>Heteropogon contortus</i>
<b>Litter: 18%</b>	
<b>Bare: 25.8%</b>	

## Appendix A

## Pipeline Flora Survey

Secondary Transect 39	
Pipeline 2 09/10/2008	
R.E.	11.3.25
Transect Start	150.694814; -24.199310
Transect End (50m)	150.695556; -24.198980
Bearing	40 <sup>0</sup> north-east
Aspect	north-east
Slope	1%
Soil	light brown, sandy, alluvial deposits, highly siliceous
Weeds	<i>Lantana camara</i> *, <i>Lantana montevidensis</i> *
Erosion	moderate – cattle tracks
Fire history	0 – 1 year
Grazing impacts	minimal
Fauna Habitat	occasional stag tree
Notes	Transect followed remnant water course direction – no flow at time of survey), vegetation colonised throughout site. North-east and south-west of site is cleared of all native vegetation.
<b>Strata</b>	<b>Dominant Species</b>
Canopy (T1): 10-18 m	<i>Casuarina cunninghamiana</i>
FPC: 50%	
Mid-Storey (T2): 6-10 m	<i>Casuarina cunninghamiana</i>
Shrub (S1): 1-3m	<i>Melaleuca linariifolia</i>
FPC: 10%	<i>Lantana camara</i> *
Ground (G): <1 m	<i>Malvastrum americanum</i>
FPC: 18%	<i>Lantana montevidensis</i> *
Litter: 34%	
Bare: 44%	

Secondary Transect 40

Pipeline2 10/10/2008

## Appendix A

## Pipeline Flora Survey

<b>RE</b>	11.12.5
<b>Transect Start</b>	150.730868; -24.133400
<b>Transect End (50m)</b>	150.731330; -24.133538
<b>Bearing</b>	North-east 50 <sup>0</sup>
<b>Aspect</b>	North-west
<b>Slope</b>	30%
<b>Soil</b>	Yellow brown sandy loam, highly siliceous
<b>Weeds</b>	<i>Opuntia tomentosa</i> *, <i>Lantana montevidensis</i> *, <i>Lantana camara</i> *
<b>Erosion</b>	Sandstone erosion evident in soil profile, fauna walk-through trails (suspected wallaby sp. trails)
<b>Grazing impacts</b>	nil
<b>Fire history</b>	<5 years
<b>Fauna Habitat</b>	occasional fallen decayed logs/debris, occasional small stag trees, high rocky outcropping
<b>Notes</b>	Site located under existing telecommunications lines
<b>Strata</b>	<b>Dominant Species</b>
<b>Canopy (T1): 8-10 m</b>	<i>Eucalyptus crebra</i>
<b>FPC: 16%</b>	
<b>Shrub (S1): 1-5 m</b>	<i>Alphitonia excelsa</i>
<b>FPC: 2%</b>	<i>Opuntia tomentosa</i> *
<b>Ground (G): &lt;1 m</b>	<i>Lantana montevidensis</i> *
<b>FPC: 68%</b>	<i>Lantana camara</i> *
<b>Litter: 8%</b>	<i>Cheilanthes sieberi</i>
<b>Bare: 24%</b>	



## Appendix A

## Pipeline Flora Survey

Secondary Transect 41	
Pipeline 2 10/10/2008	
<b>RE</b>	
<b>Transect Start</b>	150.728467; -24.136013
<b>Transect End (50m)</b>	150.728653; -24.136255
<b>Bearing</b>	east 90 <sup>0</sup> (across slope)
<b>Aspect</b>	south-east
<b>Slope</b>	35%
<b>Soil</b>	Sandy/sandy/loam, highly salacious
<b>Weeds</b>	<i>Opuntia tomentosa</i> *, <i>Lantana montevidensis</i> *, <i>Lantana camara</i> *
<b>Erosion</b>	fauna walk-through trails (suspected wallaby sp. )
<b>Grazing impacts</b>	nil
<b>Fire history</b>	5 -10 years
<b>Fauna Habitat</b>	occasional fallen decayed logs/debris, occasional stag trees and hollows, high granite rock outcropping
<b>Notes</b>	site located adjacent historically cleared telecommunication lines section (approximately 50 metres wide)
<b>Strata</b>	<b>Dominant Species</b>
<b>Canopy (T1): 8-10 m</b>	<i>Eucalyptus crebra</i>
<b>FPC: 15%</b>	<i>Corymbia erythrophloia</i>
<b>Mid-Storey (T2): 4-8 m</b>	<i>Eucalyptus crebra</i>
	<i>Corymbia erythrophloia</i>
<b>Shrub (S1): 1-2 m</b>	<i>Opuntia tomentosa</i> *
<b>FPC: 3%</b>	<i>Petalostigma pubescens</i>
<b>Ground (G): &lt;1 m</b>	<i>Lantana montevidensis</i> *
<b>FPC: 12%</b>	<i>Lantana camara</i> *
<b>Litter: 6.6%</b>	<i>Cymbopogon refractus</i>
<b>Bare: 77.4% (rocky)</b>	<i>Heteropogon contortus</i>

## Appendix A

## Pipeline Flora Survey

Secondary Transect 42	
Curtis Island 2 16/05/2008	
RE	12.11.6
Transect Start	316084; 7372361
Transect End (50m)	316083/7372313
Bearing	174 <sup>0</sup> South south east
Aspect	South west
Slope	5%
Soil	Grey/brown soil, hard, meta rocks
Weeds	-
Erosion	nil
Grazing impacts	occasional
Fire history	> 5 years
Fauna Habitat	occasional fallen decayed logs/debris
Notes	Healthy Eucalypt spp. regeneration, sparse Acacia spp. undergrowth
Strata	<b>Dominant Species</b>
Canopy (T1): 18-20 m FPC: 18%	<i>Corymbia citriodora</i> subsp. <i>citriodora</i>
	<i>Eucalyptus crebra</i>
Mid-Storey (T2): 8-10 m	<i>Corymbia citriodora</i> subsp. <i>citriodora</i>
	<i>Eucalyptus crebra</i>
Shrub (S1): 1-2 m FPC: 10%	<i>Pogonolobus reticulatus</i>
	<i>Acacia leiocalyx</i>
Ground (G): <1 m FPC: 28% Litter: 62% Bare: 10%	<i>Aristida queenslandica</i>
	<i>Themeda triandra</i>
	<i>Lomandra multiflora</i>

## Appendix A

## Pipeline Flora Survey

Secondary Transect 43	
Curtis Island 2 16/05/2008	
RE	12.11.14
Transect Start	314161; 7372431
Transect End (50m)	314165; 7372391
Bearing	166 <sup>0</sup> south south west
Aspect	252 <sup>0</sup> south west
Slope	2%
Soil	-
Weeds	<i>Opuntia stricta</i> *
Erosion	Nil
Grazing impacts	Nil
Fire history	> 5 years
Fauna Habitat	occasional fallen decayed logs/debris
Notes	
<b>Strata</b>	<b>Dominant Species</b>
<b>Canopy (T1): 17-19 m</b> <b>FPC: 31%</b>	<i>Eucalyptus crebra</i>
	<i>Eucalyptus tereticornis</i>
<b>Mid-Storey (T2): 6-10 m</b>	<i>Eucalyptus crebra</i>
	<i>Eucalyptus tereticornis</i>
<b>Shrub (S1): 1-2 m</b> <b>FPC: 40%</b>	<i>Sida hackettiana</i>
	<i>Pogonolobus reticulatus</i>
	<i>Acacia leiocalyx</i>
<b>Ground (G): &lt;1 m</b> <b>FPC: 68%</b> <b>Litter: 31%</b> <b>Bare: 1%</b>	<i>Heteropogon contortus</i>
	<i>Chloris inflata</i> *
	<i>Indigofera hirsuta</i>
	<i>Themeda triandra</i>



## Appendix A

## Pipeline Flora Survey

Secondary Transect 44	
Curtis Island 2 16/05/2008	
RE	12.1.3
Transect Start	314194; 7372686
Transect End (50m)	
Bearing	-
Aspect	-
Slope	-
Soil	-
Weeds	-
Erosion	-
Grazing impacts	-
Fire history	-
Fauna Habitat	-
Notes	Mangrove site
Strata	<b>Dominant Species</b>
Shrub (S1): - m FPC: 0%	<i>Avicennia marina</i>
	<i>Rhizophora stylosa</i>

## Appendix A

## Pipeline Flora Survey

Secondary Transect 45	
<b>Curtis Island 2 16/05/2008</b>	
<b>RE</b>	12.11.7
<b>Transect Start</b>	314525; 7372719
<b>Transect End (50m)</b>	314477; 7372724
<b>Bearing</b>	274 <sup>0</sup> west
<b>Aspect</b>	10 <sup>0</sup> north
<b>Slope</b>	11%
<b>Soil</b>	Brown/red, meta rocks, hard
<b>Weeds</b>	-
<b>Erosion</b>	Nil
<b>Grazing impacts</b>	Nil
<b>Fire history</b>	-
<b>Fauna Habitat</b>	Nil
<b>Notes</b>	-
<b>Strata</b>	<b>Dominant Species</b>
<b>Canopy (T1): 18-22 m</b> <b>FPC: 25%</b>	<i>Eucalyptus crebra</i>
	<i>Corymbia intermedia</i>
<b>Mid-Storey (T2): 8-12 m</b>	<i>Eucalyptus crebra</i>
	<i>Corymbia intermedia</i>
<b>Shrub (S1): 1-3 m</b> <b>FPC: 55%</b>	<i>Sida hackettiana</i>
	<i>Acacia leiocalyx</i>
<b>Ground (G): &lt;1 m</b> <b>FPC: 46%</b> <b>Litter: 49 %</b> <b>Bare: 5%</b>	<i>Heteropogon contortus</i>
	<i>Panicum effusum</i>

## Appendix A

## Pipeline Flora Survey

Secondary Transect 46	
Curtis Island 2 17/05/2008	
RE	12.11.14
Transect Start	314772; 7372686
Transect End (50m)	314731; 7372700
Bearing	287 <sup>0</sup> west
Aspect	north
Slope	5 <sup>0</sup>
Soil	Dark brown/red/grey soil, meta rocks, moderately hard
Weeds	<i>Opuntia stricta</i> *
Erosion	-
Grazing impacts	-
Fire history	> 5 years
Fauna Habitat	-
Notes	Site located adjacent to a water course
<b>Strata</b>	<b>Dominant Species</b>
<b>Canopy (T1): 16-18 m</b> <b>FPC: 14.9%</b>	<i>Eucalyptus crebra</i>
	<i>Eucalyptus tereticornis</i>
	<i>Corymbia clarksoniana</i>
<b>Mid-Storey (T2): 6-10 m</b>	<i>Eucalyptus crebra</i>
	<i>Eucalyptus tereticornis</i>
	<i>Corymbia clarksoniana</i>
<b>Shrub (S1): 1-3 m</b> <b>FPC: 15%</b>	<i>Acacia leiocalyx</i>
	<i>Planchonia careya</i>
	<i>Sida hackettiana</i>
<b>Ground (G): &lt;1 m</b> <b>FPC: 37%</b> <b>Litter: 50%</b> <b>Bare: 13%</b>	<i>Heteropogon contortus</i>
	<i>Panicum effusum</i>
	<i>Aristida queenslandica</i>
	<i>Cyanthillium cinereum</i>
	<i>Lomandra longifolia</i>
	<i>Themeda triandra</i>



## Appendix A

## Pipeline Flora Survey

Secondary Transect 47	
<b>Curtis Island 2</b> 17/05/2008	
<b>RE</b>	12.1.3
<b>Transect Start</b>	314782; 737820
<b>Transect End (50m)</b>	-
<b>Bearing</b>	-
<b>Aspect</b>	-
<b>Slope</b>	-
<b>Soil</b>	mud
<b>Weeds</b>	-
<b>Erosion</b>	Nil
<b>Grazing impacts</b>	Nil
<b>Fire history</b>	-
<b>Fauna Habitat</b>	-
<b>Notes</b>	Mangrove site
<b>Strata</b>	<b>Dominant Species</b>
<b>Shrub (S1): 2-3 m</b> <b>FPC: 90%</b>	<i>Rhizophora stylosa</i>
	<i>Ceriops tagal</i>
	<i>Exoecaria agallocha</i>
<b>Ground (G): &lt;1 m</b> <b>FPC: %</b> <b>Litter: %</b> <b>Bare: 90%</b> <b>Roots: 10%</b>	No species within ground cover

## Appendix A

## Pipeline Flora Survey

Secondary Transect 48	
Curtis Island 2 16/05/2008	
RE	12.11.6
Transect Start	315246; 7372914
Transect End (50m)	315220: 7372953
Bearing	330 <sup>0</sup> north west
Aspect	54 <sup>0</sup> north east
Slope	3%
Soil	-
Weeds	-
Erosion	nil
Grazing impacts	nil
Fire history	-
Fauna Habitat	-
Notes	Site located down slope towards mangroves
<b>Strata</b>	<b>Dominant Species</b>
Canopy (T1): 20-24 m FPC: 21.7%	<i>Corymbia citriodora</i> subsp. <i>citriodora</i>
	<i>Eucalyptus crebra</i>
Mid-Storey (T2): 10-18 m	<i>Corymbia citriodora</i> subsp. <i>citriodora</i>
	<i>Eucalyptus crebra</i>
Shrub (S1): 1-3 m FPC: 10%	<i>Acacia leiocalyx</i>
	<i>Dodonaea lanceolata</i> var. <i>subsessilifolia</i>
	<i>Pogonolobus reticulatus</i>
Ground (G): <1 m FPC: 25% Litter: 73% Bare: 10%	<i>Heteropogon contortus</i>
	<i>Cassytha filiformis</i>
	<i>Eragrostis brownii</i>

## Appendix A

## Pipeline Flora Survey

Secondary Transect 49	
Curtis Island 2 18/05/2008	
RE	12.3.3
Transect Start	316526; 7372548
Transect End (50m)	316499; 7372582
Bearing	325 <sup>0</sup> north west
Aspect	Flat
Slope	Flat
Soil	Dark brown, alluvium deposits, hard
Weeds	-
Erosion	-
Grazing impacts	-
Fire history	-
Fauna Habitat	-
Notes	Site located adjacent river bed
Strata	<b>Dominant Species</b>
Canopy (T1): 22-28 m FPC:18.4 %	<i>Eucalyptus tereticornis</i>
Mid-Storey (T2): 12-16 m	<i>Lophostemon suaveolens</i>
Shrub (S1): 1-4 m FPC: 30%	<i>Sida hackettiana</i>
	<i>Planchonia careya</i>
Ground (G): <1 m FPC: 76% Litter: 24% Bare: 0%	<i>Heteropogon contortus</i>
	<i>Leptochloa decipiens</i> subsp. <i>decipiens</i>
	<i>Indigofera hirsuta</i>
	<i>Panicum effusum</i>
	<i>Crotalaria montana</i>
	<i>Cyperus gracilis</i>



## Appendix A

## Pipeline Flora Survey

Secondary Transect 50	
Curtis Island 2 18/05/2008	
RE	12.11.6
Transect Start	317202; 7371607
Transect End (50m)	317171; 7371639
Bearing	311 <sup>0</sup> North west
Aspect	North east
Slope	9%
Soil	-
Weeds	-
Erosion	-
Grazing impacts	moderate
Fire history	-
Fauna Habitat	-
Notes	-
<b>Strata</b>	<b>Dominant Species</b>
Canopy (T1): 14-18 m FPC: 19%	<i>Corymbia citriodora</i> subsp. <i>citriodora</i>
	<i>Eucalyptus crebra</i>
	<i>Eucalyptus exserta</i>
Mid-Storey (T2): 8-10 m	<i>Corymbia citriodora</i> subsp. <i>citriodora</i>
	<i>Eucalyptus crebra</i>
Shrub (S1): 1-3 m FPC: 20%	<i>Acacia leiocalyx</i>
	<i>Pogonolobus reticulatus</i>
	<i>Dodonaea lanceolata</i> var. <i>subsessilifolia</i>
	<i>Alphitonia excelsa</i>
Ground (G): <1 m FPC: 32% Litter: 47% Bare: 21%	<i>Aristida queenslandica</i>
	<i>Eragrostis brownii</i>
	<i>Themeda triandra</i>
	<i>Cymbopogon refractus</i>

## Appendix A

## Pipeline Flora Survey

Secondary Transect 51	
Curtis Island 2 19/05/2008	
RE	12.11.14
Transect Start	317524; 7371011
Transect End (50m)	One GPS point taken
Bearing	Light brown loam, grey fines
Aspect	225 <sup>0</sup> south west
Slope	3 <sup>0</sup>
Soil	-
Weeds	-
Erosion	-
Grazing impacts	-
Fire history	> 5 years
Fauna Habitat	-
Notes	-
<b>Strata</b>	<b>Dominant Species</b>
<b>Canopy (T1): 17-22 m</b> <b>FPC: 29.5%</b>	<i>Eucalyptus tereticornis</i>
	<i>Eucalyptus crebra</i>
<b>Mid-Storey (T2): 8-12 m</b>	<i>Eucalyptus tereticornis</i>
	<i>Eucalyptus crebra</i>
	<i>Lophostemon suaveolens</i>
<b>Shrub (S1): 1-4 m</b> <b>FPC: 40%</b>	<i>Planchonia careya</i>
	<i>Acacia leiocalyx</i>
<b>Ground (G): &lt;1 m</b> <b>FPC: 46%</b> <b>Litter: 39%</b> <b>Bare: 3%</b>	<i>Cymbopogon refractus</i>
	<i>Eragrostis brownii</i>
	<i>Leptochloa decipiens</i> subsp. <i>decipiens</i>
	<i>Sida hackettiana</i>
	<i>Cyanthillium cinereum</i>
	<i>Panicum effusum</i>
	<i>Themeda triandra</i>

## Appendix A

## Pipeline Flora Survey

Secondary Transect 52	
Curtis Island 2 19/05/2008	
RE	12.11.6
Transect Start	317915; 7370337
Transect End (50m)	317911; 7370379
Bearing	346 <sup>0</sup> North
Aspect	Undulating
Slope	-
Soil	-
Weeds	-
Erosion	-
Grazing impacts	-
Fire history	> 5 years
Fauna Habitat	-
Notes	Site located on a ridge-top in a saddle
Strata	<b>Dominant Species</b>
Canopy (T1): 17-22 m FPC: 45%	<i>Corymbia citriodora</i> subsp. <i>citriodora</i>
	<i>Eucalyptus crebra</i>
Shrub (S1): 1-3 m FPC: 5%	<i>Acacia leiocalyx</i>
	<i>Planchonia careya</i>
Ground (G): <1 m FPC: 38% Litter: 57% Bare: 5%	<i>Aristida queenslandica</i>
	<i>Panicum effusum</i>
	<i>Eragrostis brownii</i>
	<i>Bothriochloa decipiens</i> var <i>decipiens</i>
	<i>Cymbopogon refractus</i>



# Master Flora Species List

# Appendix B

## Master Flora Species List

Species	Family	Common Name	Secondary Sites and Relative Abundances <sup>1</sup>	Quaternary Sites and Relative Abundances <sup>1</sup>
<i>Acacia amblygona</i>	Mimosaceae		31U, 42U,	42C, 51U,
<i>Acacia barakulensis</i>	Mimosaceae			32U,
<i>Acacia complanata</i>	Mimosaceae	flat-stemmed wattle	29U,	
<i>Acacia decora</i>	Mimosaceae	pretty wattle	4R, 6R, 27I, 28U, 37R,	8R, 9U, 12R, 37U, 38U, 51U,
<i>Acacia disparrima</i>	Mimosaceae	hickory wattle	4R, 7U, 37U, 40U,	4C, 10U, 50C, 66C, 67C,
<i>Acacia excelsa</i>	Mimosaceae	ironwood		1U, 23U,
<i>Acacia farnesiana</i>	Mimosaceae	mimosa bush	11U,	9I, 18U, 19U,
<i>Acacia fasciculifera</i>	Mimosaceae	scrub wattle	12I,	
<i>Acacia harpophylla</i>	Mimosaceae		19U, 20U, 21U, 28U, 30U,	20U, 21U, 22U, 24I, 29U, 39U, 45A, 71D, 72A,
<i>Acacia irrorata</i> subsp. <i>irrorata</i>	Mimosaceae		1R, 2R,	
<i>Acacia leiocalyx</i>			3R, 8U, 9U, 16U, 31U, 36U, 42C, 43U, 45C, 46C, 48C, 50C, 51C, 52C,	1U, 8U, 32U, 37O, 38U, 40O, 43U, 44C, 51C, 52O, 53O, 55C, 56C, 59A, 60A, 61A, 62O, 63C, 64A, 65A, 68C, 69O, 70O, 74O,
	Mimosaceae	black wattle		
<i>Acacia longispicata</i>	Mimosaceae		26 U, 34U,	
<i>Acacia macradenia</i>	Mimosaceae	zigzag wattle		32U, 33U,
<i>Acacia pedleyi</i> #	Mimosaceae		7U,	
<i>Acacia pubicosta</i>	Mimosaceae			15U,
<i>Acacia salicina</i>	Mimosaceae	sally wattle	10U, 18U, 28U, 35U, 36U,	16R, 17U, 35C, 46C, 47C,
<i>Acacia shirleyi</i>	Mimosaceae	lancewood	13U, 16U, 29O, 31U,	22R,
<i>Acacia tenuinervis</i>	Mimosaceae		33U,	
<i>Acalypha eremorum</i>	Euphorbiaceae	acalypha		36U,
<i>Achryanthes aspera</i>	Amaranthaceae	chaff flower	2O, 11U, 16U, 31U, 32U, 39U,	2U,
<i>Adiantum atroviride</i>	Adiantaceae		51U,	
<i>Adiantum hispidulum</i> var. <i>hispidulum</i>	Adiantaceae		51U,	
<i>Ageratum houstonianum</i> *	Asteraceae	blue billy goat weed	5U, 14U,	2O,
<i>Alchornea ilicifolia</i>	Euphorbiaceae	native holly	5U, 18U,	
<i>Alectryon connatus</i>	Sapindaceae		7U,	36U,
<i>Alectryon diversifolius</i>	Sapindaceae		7U, 8U, 20U, 27U, 28O,	13U, 36U, 71U, 72O,
<i>Alectryon oleifolius</i>	Sapindaceae		19U,	
<i>Allocauarina torulosa</i>	Casuarinaceae	forest she-oak		61U,
<i>Alloteropsis semialata</i>	Poaceae	cockatoo grass	46U, 51U,	
<i>Alphitonia excelsa</i>	Rhamnaceae		8U, 16U, 26U, 29U, 31U, 32U, 33U, 37R, 40U, 41U, 43R, 50O,	14U, 15U, 23U, 32U, 40O, 41C, 51C, 52R, 55O, 61O, 70U,
		red ash		
<i>Alstonia constricta</i>	Apocynaceae	bitter bark	2U, 16U, 30U, 33U, 46U,	12U,
<i>Alternanthera pungens</i> *	Amaranthaceae	khaki weed		39U,
<i>Amyema biniflora</i>	Loranthaceae		14U,	
<i>Angophora floribunda</i>	Myrtaceae	rough-barked apple		35I,
<i>Anisomeles malabarica</i>	Lamiaceae		45U,	
<i>Archidendropsis basaltica</i>	Mimosaceae	dead finish	18U,	

## Master Flora Species List

## Appendix B

Species	Family	Common Name	Secondary Sites and Relative Abundances <sup>1</sup>	Quaternary Sites and Relative Abundances <sup>1</sup>
<i>Argemone ochroleuca</i> *	Papaveraceae	mexican poppy	39U,	5U,
<i>Aristida calycina</i>	Poaceae	dark wiregrass	31U,	74C,
<i>Aristida caput-medusae</i>	Poaceae	many headed wire grass	31U, 33C,	
<i>Aristida jerichoensis</i>	Poaceae			34U,
<i>Aristida leptopoda</i>	Poaceae	white speargrass	22U,	
<i>Aristida personata</i>	Poaceae		1U, 2U, 16U,	4U,
<i>Aristida queenslandica</i>	Poaceae		46C, 50C, 51O, 52C,	51C, 52C, 53O, 55C, 60C, 62O, 63O, 66C, 68C, 70C,
<i>Arundinella nepalensis</i>	Poaceae	reed grass	12O, 15C, 16C, 26U, 29U, 32C,	32C, 42C, 74C,
<i>Asclepias curassavica</i> *	Asclepiadaceae	redhead cotton bush	39U,	2U,
<i>Atalaya hemiglauca</i>	Sapindaceae	whitewood	7U, 32I,	9U, 26U, 45U,
<i>Atalaya salicifolia</i>	Sapindaceae		7U,	
<i>Atriplex muelleri</i>	Chenopodiaceae	annual saltbush	10U, 11U, 19U, 20U, 35U,	28U,
<i>Auranticarpa rhombifolia</i>	Pittosporaceae		30U,	
<i>Austrostipa verticillata</i>	Poaceae		10U,	
<i>Avicennia marina</i>	Avicenniaceae	grey mangrove	44C,	57U, 58R,
<i>Bidens pilosa</i> var. <i>pilosa</i> *	Asteraceae	cobblers pegs	12R, 14U, 38U,	4U, 66O,
<i>Bothriochloa pertusa</i> *	Poaceae	indian bluegrass		5U, 7U, 11C, 46O,
<i>Bothriochloa decipiens</i> var <i>decipiens</i>	Poaceae	pitted bluegrass	4U, 43U,	62C,
<i>Bothriochloa erianthoides</i>	Poaceae		28U,	
<i>Brachychiton rupestris</i>	Steruliaceae	narrow-leaved bottle tree	9U, 12I, 27R,	36R,
<i>Brachychiton australis</i>	Steruliaceae	broad-leaved bottle tree	12I,	9I, 22U,
<i>Brachychiton populneus</i>	Steruliaceae	kurrajong	10R, 26U, 32U,	13R, 32R, 44U,
<i>Breynia oblongifolia</i>	Euphorbiaceae	coffee bush	1I, 3U, 5U, 16U, 32U, 51U, 52U,	9U, 37U, 66U, 69O,
<i>Brunoniella australis</i>	Acanthaceae	blue trumpet		
<i>Bryophyllum delagoense</i> *	Crassulaceae	mother of millions	10R,	13U,
<i>Bursaria incana</i>	Pittosporaceae			36U,
<i>Bursaria spinosa</i>	Pittosporaceae		6U, 9U, 28U,	
<i>Cajanus reticulatus</i>	Fabaceae			40U, 66U,
<i>Melaleuca viminalis</i>	Myrtaceae	weeping bottlebrush	5R,	2C, 3C, 4C, 5C, 35C,
<i>Callitris endlicheri</i>	Capparaceae			8U,
<i>Callitris glaucophylla</i>	Cupressaceae	cypress pine	27U, 28U,	34U, 74U,
<i>Calotis cuneifolia</i>	Asteraceae	burr daisy	41U,	12U,
<i>Calotis hispidula</i>	Asteraceae			40U,
<i>Calotis lappulacea</i>	Asteraceae		27U,	
<i>Capparis lasiantha</i>	Capparaceae	wild orange	10U, 19U, 20C,	23U, 39U,
<i>Capparis loranthifolia</i>	Capparaceae		20U,	
<i>Capparis ornans</i>	Capparaceae		1I, 16U, 31I, 32U,	
<i>Carissa ovata</i>	Apocynaceae	currant bush	6U, 7U, 20U, 23R, 27U, 28U, 30U,	1U, 14U, 21U, 23U, 36U, 39U, 45O,
<i>Cassia brewsteri</i>	Caesalpiniaceae	leichhardt bean	10U,	
<i>Cassia tomentella</i>	Caesalpiniaceae		12U,	



## Master Flora Species List

Species	Family	Common Name	Secondary Sites and Relative Abundances <sup>1</sup>	Quaternary Sites and Relative Abundances <sup>1</sup>
<i>Cassinia laevis</i>	Asteraceae		7U, 8U,	14U,
<i>Cassytha filiformis</i>	Lauraceae	dodder laurel	48U, 52U,	8I,
<i>Casuarina cristata</i>	Casuarinaceae	belah		21U,
<i>Casuarina cunninghamiana</i>	Casuarinaceae	river sheoak	14U, 39O,	2U, 3U, 4U, 35U,
<i>Celtis sinensis</i> *	Ulmaceae	chinese celtis		5R,
<i>Cenchrus echinatus</i> *	Poaceae			52I,
<i>Ceriops tagal</i>	Rhizophoraceae	yellow mangrove	47C,	
<i>Cheilanthes sieberi</i>	Adiantaceae	mulga fern	9U, 26U, 40U, 41U,	74R,
<i>Chionachne cyathopoda</i>	Poaceae		19U,	
<i>Chloris inflata</i> *	Poaceae	purpletop chloris	43O,	7C,
<i>Chloris virgata</i> *	Poaceae	feathertop rhodes grass		1U, 2U,
<i>Chrysocephalum apiculatum</i>	Poaceae	yellow buttons	1I, 6U, 37U,	33O, 41O,
<i>Cirsium vulgare</i> *	Asteraceae	spear thistle	14U,	4U, 11U,
<i>Cissus opaca</i>	Vitaceae	forest grape		36U,
<i>Citrus glauca</i>	Rutaceae	inland lime	10U, 24R,	21U, 71U,
<i>Clerodendrum floribundum</i>	Verbenaceae	lolly bush	3U, 10U,	
<i>Commelina diffusa</i>	Commelinaceae	wandering jew	14C,	
<i>Cordia dichotoma</i>	Boraginaceae			65U,
<i>Corymbia citriodora</i> subsp. <i>citriodora</i>	Myrtaceae	lemon-scented gum	6U, 7U, 8U, 9U, 26U, 31U, 32I, 36U, 38I, 42O, 50C, 52C,	15U, 32U, 33U, 41C, 42I, 44C, 48C, 50C, 51C, 56O, 59O, 60O, 61O, 62O, 63C, 64C, 65C, 66O, 67C, 68O, 69I,
<i>Corymbia clarksoniana</i>	Myrtaceae	Clarkson's bloodwood	1U, 9U, 15R, 16U, 46C,	14U,
<i>Corymbia cloeziana</i>	Myrtaceae	Gympie messmate	34U,	
<i>Corymbia erythrophloia</i>	Myrtaceae	gum-topped bloodwood	3U, 4U, 23U, 25U, 29R, 36U, 37R, 38U, 40U, 41U,	8U, 9U, 10U, 12U, 38U, 47C, 49C, 50C,
<i>Corymbia intermedia</i>	Myrtaceae	pink bloodwood	15U, 45C,	14U, 61U, 68U,
<i>Corymbia tessellaris</i>	Myrtaceae	Moreton bay ash	1I, 2I, 4I, 10U, 12U, 15U,	1U, 4U, 5U, 6U, 17U, 51U, 59I,
<i>Corymbia trachyphloia</i>	Myrtaceae	brown bloodwood	8U,	15U, 43C,
<i>Crinum flaccidum</i>	Amaryllidaceae	Murray lily	24I,	
<i>Crinum pedunculatum</i>	Amaryllidaceae	swamp lily	2I, 5R,	
<i>Crotalaria montana</i> var. <i>angustifolia</i>	Fabaceae		49C,	
<i>Crotalaria pallida</i> *	Fabaceae	streaked rattlepod		5U,
<i>Cryptostegia grandiflora</i> *	Asclepiadaceae	rubber vine	5U, 12U,	4C, 5O, 25R,
<i>Cullen tenax</i>	Fabaceae	emu foot	21U, 30U,	21U,
<i>Cupaniopsis anacardioides</i>	Sapindaceae	tuckeroo	7U,	3U,
<i>Cyanthillium cinereum</i>	Asteraceae		3U, 4U, 26U, 32U, 36O, 37U, 46C, 51C,	32U, 41O,
<i>Cycas megacarpa</i> ^	Cycadaceae		3U, 37R, 40I, 41I,	12U, 14U,
<i>Cymbidium canaliculatum</i>	Orchidaceae	black orchid	1R, 16U, 17U, 32R, 36U, 38U,	
<i>Cymbopogon oblectus</i>	Poaceae		2I, 34U,	

## Master Flora Species List

## Appendix B

Species	Family	Common Name	Secondary Sites and Relative Abundances <sup>1</sup>	Quaternary Sites and Relative Abundances <sup>1</sup>
<i>Cymbopogon refractus</i>	Poaceae	barbwire grass	1U, 2C, 3A, 7U, 8U, 9U, 23U, 25U, 26U, 30U, 31U, 33U, 36C, 37U, 38O, 40U, 41U, 42U, 45O, 48U, 50O, 51C, 52O,	1U, 15C, 33C, 34U, 41C, 42C, 43U, 44C, 51O, 60O, 68C,
<i>Cynodon dactylon</i>	Poaceae	couch	5U, 14U, 35O,	25A,
<i>Cyperus cyperoides</i>	Cyperaceae			66U,
<i>Cyperus gracilis</i>	Cyperaceae	graceful sedge	1U, 2O, 4U, 10U, 14U, 15U, 19U, 23U, 49O, 51O, 52O,	9U, 16U, 19U, 28U,
<i>Cyperus tuberosus</i> *	Cyperaceae			28U,
<i>Daviesia filipes</i>	Fabaceae		34U,	
<i>Desmodium rhytidophyllum</i>	Fabaceae		6U,	
<i>Dianella brevipedunculata</i>	Hemerocallidaceae		43I, 51U,	
<i>Dianella revoluta</i>	Hemerocallidaceae		34U,	
<i>Dichanthium aristatum</i> *	Poaceae			2U,
<i>Dichanthium sericeum</i> subsp. <i>sericeum</i>	Poaceae	Queensland blue grass	20I,	
<i>Diospyros geminata</i>	Ebenaceae		10U, 12U,	
<i>Dodonaea lanceolata</i> var. <i>subsessilifolia</i>	Sapindaceae	native hop bush	48O, 50O,	63O,
<i>Dodonaea triangularis</i>	Sapindaceae			74U,
<i>Drypetes deplanchei</i>	Putranjivaceae	yellow tulipwood		3R, 50U,
<i>Echinochloa colona</i>	Poaceae	awnless barnyard grass	5U,	16U,
<i>Einadia nutans</i>	Chenopodiaceae		22I,	36U, 72U,
<i>Elaeodendron australe</i>	Celastraceae	red olive plum	28I,	
<i>Elaeodendron australe</i> var. <i>integrifolium</i>	Celastraceae		28U,	
<i>Emilia sonchifolia</i> var. <i>sonchifolia</i> *	Asteraceae	emilia	2I,	25U, 63U,
<i>Enchylaena tomentosa</i>	Chenopodiaceae	ruby saltbush	10U, 18U, 20U, 21U,	17U,
<i>Enneapogon lindleyanus</i>	Poaceae		37U, 41U,	8U, 40U, 41U,
<i>Enneapogon pallidus</i>	Poaceae		22U,	
<i>Enteropogon unispiceus</i>	Poaceae		30U,	
<i>Entolasia stricta</i>	Poaceae	wiry panic	13C, 30U,	36U,
<i>Eragrostis brownii</i>	Poaceae	brown's lovegrass	6U, 42O, 46U, 48U, 50O, 51A, 52C,	59C, 64C,
<i>Eragrostis spartinoides</i>	Poaceae		6U,	
<i>Eremophila debilis</i>	Myoporaceae	winter apple	1U, 2O, 6U, 15U, 18U, 28U, 29U, 32U, 36U, 37U,	1U, 52O,
<i>Eremophila mitchellii</i>	Myoporaceae	false sandalwood	7U, 22I, 23R, 27U,	13U, 20U, 37U, 74O,
<i>Eriocereus martinii</i> *	Cactaceae	harrisia cactus	27U,	34R,
<i>Eriochloa pseudoacrotricha</i>	Poaceae	early spring grass		39U,
<i>Erythrina vespertilio</i>	Fabaceae	bat's wing coral tree	3R, 41I,	4R,
<i>Erythroxylum australe</i>	Erythroxylaceae	cocainne tree	13U, 30U,	
<i>Eucalyptus cambageana</i>	Myrtaceae	Dawson gum	11U,	45O,
<i>Eucalyptus coolabah</i>	Myrtaceae	coolibah	15I, 17U, 18U, 19U, 20U, 21U, 35U,	24U, 26R, 27U, 28U, 29U,

## Master Flora Species List

Species	Family	Common Name	Secondary Sites and Relative Abundances <sup>1</sup>	Quaternary Sites and Relative Abundances <sup>1</sup>
<i>Eucalyptus crebra</i>	Myrtaceae	narrow-leaved ironbark	1U, 3U, 4U, 6R, 7U, 8U, 9U, 16U, 18U, 26U, 29U, 32U, 36U, 37U, 38U, 40U, 41U, 42O, 43C, 45C, 46C, 48C, 50C, 51C, 52C,	6U, 8U, 9U, 11U, 12U, 13U, 14I, 19U, 28R, 34U, 38U, 40U, 41O, 42C, 46O, 47C, 48C, 49O, 50O, 51O, 52C, 53O, 55O, 59U, 60U, 62O, 63U, 64U, 65O, 66U, 68U, 70O, 74C,
<i>Eucalyptus decorticans</i>	Myrtaceae	gum-topped ironbark	13R, 33U,	15U,
<i>Eucalyptus exserta</i>	Myrtaceae	queensland peppermint	9U, 50R,	52O, 53U, 55U,
<i>Eucalyptus melanophloia</i>	Myrtaceae	silver-leaved ironbark	1U, 3U, 12U, 18U, 25U, 27U, 32U, 36U, 38U,	6U, 7R, 21R, 32U, 33U, 34U, 37U, 43O, 44C, 47O,
<i>Eucalyptus moluccana</i>	Myrtaceae	gum-topped box	7U,	1U, 13U,
<i>Eucalyptus orgadophila</i>	Myrtaceae	mountain coolibah	23U, 28U,	
<i>Eucalyptus populnea</i>	Myrtaceae	poplar box	2U, 18U, 27U,	20U, 26R, 34U, 36U, 71R, 72U, 73A,
<i>Eucalyptus tenuipes</i>	Myrtaceae	narrow-leaved white mahogany	34U,	
<i>Eucalyptus tereticornis</i>	Myrtaceae	river red gum	1I, 5R, 10U, 12U, 14U, 15U, 35U, 39R, 43C, 46C, 49O, 51C,	2U, 3U, 4U, 5U, 6U, 16U, 17U, 19U, 25U, 32U, 35U, 46O, 51C, 59O, 60U, 61U, 63U, 66U, 69O, 70O,
<i>Eucalyptus watsoniana</i> subsp. <i>capillata</i>	Myrtaceae	large-fruited yellow jacket	34U,	
<i>Euroschinus falcatus</i> var. <i>falcatus</i>	Anacardiaceae			12U,
<i>Eustrephus latifolius</i>	Smilacaceae	wombat berry	5U, 6U, 12U, 42U, 45I, 46R, 49O, 51U, 52U,	2U, 13U, 61U, 62U, 67U, 68U,
<i>Everistia vacciniifolia</i>	Rubiaceae		18U, 22U,	
<i>Evolvulus alsinoides</i>	Convolvulaceae	blue periwinkle	24I,	2U,
<i>Exocarpos cupressiformis</i>	Santalaceae		28I, 47I,	
<i>Ficus opposita</i>	Moraceae	sandpaper fig	10U, 12U, 14U, 15U, 39U,	2R, 17R,
<i>Ficus virens</i>	Moraceae	white fig	12R,	
<i>Flemingia parviflora</i>	Fabaceae			63U,
<i>Flindersia australis</i>	Rutaceae	crow's ash	7I,	
<i>Geijera parviflora</i>	Rutaceae	wilga	27U, 28U, 30U, 32U,	13U, 36U,
<i>Geijera salicifolia</i>	Rutaceae		7U,	
<i>Glochidion lobocarpum</i>	Phyllanthaceae			66U,
<i>Glycine tabacina</i>	Fabaceae	glycine pea	1U, 48U,	
<i>Gomphocarpus physocarpus</i> *	Asclepiadaceae	balloon cotton bush		2U, 73U,
<i>Gomphrena celosioides</i>	Amaranthaceae	gomphrena weed	15U, 27U, 28U,	
<i>Grevillea sessilis</i>	Proteaceae		33U,	
<i>Grevillea striata</i>	Proteaceae	beefwood	2O, 27U,	
<i>Grewia retusifolia</i>	Sparrmanniaceae			28U, 66R,
<i>Hardenbergia violacea</i>	Fabaceae	native sarsparilla	6U, 36U,	
<i>Helichrysum lanuginosum</i>	Asteraceae	white everlasting daisy	43C,	
<i>Heteropogon contortus</i>	Poaceae	giant speargrass	1U, 2U, 3U, 8U, 9U, 15C, 16U, 23U, 25C, 26U, 28U, 32O, 37U, 38C, 40U, 41O, 45C, 46A,	1U, 5C, 10O, 33C, 41C, 43U, 47C, 51O, 55C, 56C, 61C, 63O, 64A, 65O, 66A, 67C, 69C, 70C,

## Master Flora Species List

## Appendix B

Species	Family	Common Name	Secondary Sites and Relative Abundances <sup>1</sup>	Quaternary Sites and Relative Abundances <sup>1</sup>
<i>Hibiscus divaricatus</i>	Malvaceae		13I,	
<i>Hibiscus diversifolius</i>	Malvaceae		49O,	
<i>Hibiscus sturtii</i>	Malvaceae		31U,	
<i>Hyparrhenia rufa</i>	Poaceae	thatch grass	1A, 2U,	1A, 3C, 4U, 6A, 7A, 46C, 48A, 49A,
<i>Imperata cylindrica</i>	Poaceae	blady grass		4U, 32C, 65C,
<i>Indigofera hirsuta</i>	Fabaceae	hairy indigo	26U, 43O, 45O, 49C, 51U,	56C, 64O, 70O,
<i>Jacksonia scoparia</i>	Fabaceae	dogwood	6U, 31U, 42R,	
<i>Jasminum didymum</i>	Oleaceae	native jasmine	7U,	
<i>Jasminum simplicifolium</i>	Oleaceae	native jasmine	7U, 9U,	13U, 36U,
<i>Juncus polyanthemus</i>	Juncaceae		5U, 17U,	
<i>Keraudrenia hookeriana</i>	Byttneriaceae		33U,	
<i>Lantana camara</i> *	Verbenaceae	lantana	3U, 5U, 6U, 7U, 8U, 39U, 40C, 41C, 52R,	3U, 4C, 12U, 15U, 47C, 50A, 66O,
<i>Lantana montevidensis</i> *	Verbenaceae	creeping lantana	2O, 4A, 5U, 6C, 7U, 8A, 9A, 36C, 37C, 38C, 39O, 40A, 41A,	4U, 8A, 9A, 10A, 11A, 12A, 14A, 50A,
<i>Leptochloa decipiens</i> subsp. <i>decipiens</i>	Poaceae	slender cane grass	49C, 51C, 52O,	51C, 53C, 59A, 62A, 63O, 64O, 65C, 69O, 70O,
<i>Leptochloa digitata</i>	Poaceae	umbrella cane grass	5U, 7U, 11U, 20U, 21U,	13U, 19U, 29U, 31I,
<i>Lomandra confertifolia</i> subsp. <i>pallida</i>	Xanthorrhoeaceae	matrush	48R, 52O,	
<i>Lomandra hystrix</i>	Xanthorrhoeaceae	matrush	14C,	2U,
<i>Lomandra leucocephala</i>	Xanthorrhoeaceae			
<i>Lomandra longifolia</i>	Xanthorrhoeaceae	spiny-headed mat rush	12U, 46C,	44C, 67U,
<i>Lomandra multiflora</i>	Xanthorrhoeaceae	many-flowered mat rush	3U, 8U, 11U, 16U, 26U, 27U, 32U, 42O, 51O,	41O, 52O, 55R, 74O,
<i>Lophostemon suaveolens</i>	Myrtaceae	swamp box	15U, 49O, 51O,	25U, 56U, 59U, 69O,
<i>Ludwigia octovalvis</i>	Onagraceae	willow primrose	5U,	
<i>Lumnitzera racemosa</i>	Combretaceae			57U,
<i>Lysicarpus angustifolius</i>	Myrtaceae	budgeroo	33I, 34U,	
<i>Lysiphyllum hookeri</i>	Caesalpinaceae	white bauhina	10U, 12U, 18U, 19U, 20U, 21U, 22R, 24R, 35U,	19U, 20U, 24U,
<i>Macfadyena unguis-cati</i> *	Bignoniaceae	cats claw creeper	10U,	5O, 19U,
<i>Macrozamia macleayi</i>	Zamiaceae		37U,	
<i>Mallotus philippensis</i>	Euphorbiaceae	kamala		3O, 4U,
<i>Malvastrum americanum</i>	Malvaceae	spiked malvastrum	4U, 5U, 10U, 12U, 15U, 16C, 22C, 28U, 39C,	11U, 34U, 39U,
<i>Marsilea hirsuta</i>	Marsileaceae	short-fruit nardoo	35O,	
<i>Megathyrsus maximus</i> *	Poaceae	guinea grass	10A, 12C, 14C, 27U,	16U, 17C, 20U, 22C, 23C, 25C, 32C,
<i>Melaleuca bracteata</i>	Myrtaceae	black tea-tree		17I, 20U, 32U,
<i>Melaleuca leucadendra</i>	Myrtaceae	weeping tea-tree		4U, 5U,
<i>Melaleuca linariifolia</i>	Myrtaceae	snow-in-summer	5C, 10U, 12C, 14C, 35C, 39U,	2C, 3U, 5C, 24U,
<i>Melaleuca quinquenervia</i>	Myrtaceae	paper tea-tree	12I,	
<i>Melaleuca viridiflora</i>	Myrtaceae	broad leaved tea-tree	42R,	



## Master Flora Species List

Species	Family	Common Name	Secondary Sites and Relative Abundances <sup>1</sup>	Quaternary Sites and Relative Abundances <sup>1</sup>
<i>Melia azedarach</i>	Meliaceae	white cedar	10U, 39R,	25U, 35R, 50R,
<i>Melinis repens</i> *	Poaceae	red natal grass	20, 3U, 4R, 5U, 9U, 10U, 15U, 25I, 26U, 34I, 37U, 46R,	1U, 5U, 6U, 8U, 9U, 47O, 48C, 49C, 63C,
<i>Muehlenbeckia florulenta</i>	Polygonaceae	lignum	17C, 20U,	27U, 28C, 29C,
<i>Myoporum acuminatum</i>	Myoporaceae	coastal boobialla	12U,	
<i>Neptunia gracilis</i>	Mimosaceae			46U,
<i>Notelaea microcarpa</i>	Oleaceae		27U,	
<i>Nymphoides indica</i>	Menyanthaceae	water snowflake		5U,
<i>Nyssanthes erecta</i>	Amaranthaceae		4R,	
<i>Oplismenus aemulus</i>	Poaceae	creeping beard grass	9U, 13U, 14U, 16C, 18U,	4U, 22C,
<i>Opuntia stricta</i> *	Cactaceae	common prickly pear	32U, 37U,	52U, 55I,
<i>Opuntia tomentosa</i> *	Cactaceae	velvety tree pear	5U, 6R, 7U, 8U, 15U, 20I, 25U, 26U, 28U, 29U, 36R, 37R, 40U, 41U,	14U, 17R, 34U, 39U, 41I, 72O,
<i>Ottochloa gracillima</i>	Poaceae	graceful grass	30U,	
<i>Owenia acidula</i>	Meliaceae	emu apple		21R,
<i>Oxalis corniculata</i> var. <i>corniculata</i> *	Oxalidaceae	creeping oxalis	16U, 21U,	2U,
<i>Pandorea pandorana</i>	Bignoniaceae	wonga vine	23U,	8I,
<i>Panicum effusum</i>	Poaceae	hairy panicum	2U, 4U, 23U, 36C, 45C, 46C, 49C, 51C, 52C,	1U, 52C, 55O, 60C,
<i>Panicum decompositum</i>	Poaceae	native millet	3U, 9U, 17U, 22C, 24C, 25U, 29U, 38U,	27U, 37U, 38C, 40U,
<i>Parthenium hysterophorus</i> *	Asteraceae		14I, 18C, 20R, 21C, 22C, 23C, 24C,	24U, 25U, 26U, 28C, 31I,
<i>Paspalidium distans</i>	Poaceae			68O,
<i>Paspalidium globoideum</i>	Poaceae			74U,
<i>Passiflora foetida</i> *	Passifloraceae	stinking passion flower	43R,	7U,
<i>Passiflora suberosa</i> *	Passifloraceae	corky passion flower	43R, 46O, 49R, 51U,	4U, 52R, 67R,
<i>Pennisetum ciliare</i> *	Poaceae	buffel grass	3I, 9U, 19U, 20U, 21C, 22C, 26U, 27A,	18U, 21C, 23C, 26A, 31I, 34C, 35A, 36U, 39C, 46C, 71U, 72C,
<i>Peripleura hispidula</i> var. <i>setosa</i>	Asteraceae		1U,	
<i>Perotis rara</i>	Poaceae			52I,
<i>Persicaria decipiens</i>	Polygonaceae	slender knotweed	14U,	5U,
<i>Persicaria lapathifolia</i>	Polygonaceae	pale knotweed	20U,	
<i>Petalostigma pubescens</i>	Phytolaccaceae	quinine tree	2I, 9U, 31I, 41U,	12U, 41C, 50O, 52C, 53R,
<i>Phyllanthus virgatus</i>	Phyllanthaceae		2U,	
<i>Physalis minima</i>	Solanaceae	wild gooseberry		2U,
<i>Pittosporum spinescens</i>	Pittosporaceae	large-fruited orange thorn	30U,	13U, 14U,
<i>Plactranthus parviflorus</i>	Lamiaceae			
<i>Planchonia careya</i>	Lecythidaceae	cocky apple	45R, 46C, 49O, 51C, 52O,	56C, 59C, 63O, 64O, 66O, 67U,
<i>Pogonolobus reticulatus</i>	Rubiaceae	medicine bush	42O, 43U, 45O, 46O, 48O, 50O, 52U,	1U, 52C, 53O, 55O, 59C, 61O, 62U, 68O, 70U,

## Master Flora Species List

## Appendix B

Species	Family	Common Name	Secondary Sites and Relative Abundances <sup>1</sup>	Quaternary Sites and Relative Abundances <sup>1</sup>
<i>Portulaca oleracea</i>	Portulacaceae	pigweed	19U,	
<i>Portulaca pilosa</i>	Portulacaceae	pigweed	3U, 5U, 9U, 12U, 41U,	
<i>Pouteria sericea</i>	Sapotaceae	mongo		36U, 67R,
<i>Psychotria daphnoides</i>	Rubiaceae		7U,	
<i>Psydrax odorata</i>	Rubiaceae		7U, 29U,	
<i>Pterocaulon sphacelatum</i>	Asteraceae		2U,	64U,
<i>Rhizophora stylosa</i>	Rhizophoraceae	spotted mangrove	44A, 46A,	57A,
<i>Rhynchosia minima</i>	Fabaceae	rhynchosia	1U, 25U, 26U, 36U,	
<i>Ricinus communis*</i>	Euphorbiaceae	castor oil plant	14I,	5U,
<i>Rostellularia adscendens</i>	Acanthaceae		25U, 36U, 37U,	
<i>Rostellularia obtusa</i>	Acanthaceae		2I,	
<i>Salsola kali</i>	Chenopodiaceae	soft roly poly	22U, 24C,	24U, 45U,
<i>Santalum lanceolatum</i>	Santalaceae	true sandalwood	7U, 9U, 20U, 28U, 30U,	9I,
<i>Sarcocornia quinqueflora</i>	Chenopodiaceae	bead weed		54U,
<i>Sarcostemma viminalis</i>	Apocynaceae	caustic vine	28U,	
<i>Scleria brownii</i>	Cyperaceae		2U, 45O,	53O,
<i>Scleria sphacelata</i>	Cyperaceae		13U,	
<i>Scoparia dulcis *</i>	Scrophulariaceae		15U,	
<i>Secamone elliptica</i>	Apocynaceae		6R,	
<i>Senecio bragalowensis</i>	Asteraceae		10U,	12U,
<i>Senna artemisioides</i>	Caesalpiniaceae	desert cassia	28U,	39U,
<i>Sesbania cannabina</i>	Fabaceae	sesbania pea	2U,	
<i>Setaria surgens</i>	Poaceae			
<i>Sida cordifolia</i>	Malvaceae	flannel weed	4U,	
<i>Sida hackettiana</i>	Malvaceae		16U, 18U, 29U, 31U, 43A, 45A, 46C, 51O,	23U, 64O, 66C, 69A,
<i>Sida rhombifolia *</i>	Malvaceae	common flannel weed	5U, 10U, 14U,	2U, 64O, 66U,
<i>Sigesbeckia orientalis</i>	Asteraceae	indian weed	14U,	
<i>Solanum parvifolium</i>	Solanaceae		13R,	
<i>Sonchus oleraceus *</i>	Asteraceae	sow thistle	39U,	4U,
<i>Sorghum nitidum forma. aristatum</i>	Poaceae	brown sorghum	49R,	63C, 65O, 66U,
<i>Spartothamnella juncea</i>	Lamiaceae		7U, 30U,	
<i>Sporobolus caroli</i>	Poaceae	fairy grass	19U, 21U, 29U,	24R, 41C, 45U,
<i>Sporobolus creber</i>	Poaceae		5U,	
<i>Sporobolus virginicus</i>	Poaceae	saltwater couch		54I,
<i>Stachytarpheta jamaicensis *</i>	Verbenaceae	jamaican snake vine		1C,
<i>Stylosanthes scabra *</i>	Fabaceae	shrubby stylo	1U, 2O, 3U, 4U, 9U, 16U, 36U, 38U,	47U,
<i>Swainsona microphylla</i>	Fabaceae			34U,
<i>Terminalia oblongata</i>	Combretaceae	yellow-wood	12I, 20U,	
<i>Tetragonia tetragonioides</i>	Aizoaceae	New Zealand spinach	14U, 19C, 20U, 21U,	29C,
<i>Thellungia advena</i>	Poaceae		11U, 22U,	18U,
<i>Themeda triandra</i>	Poaceae	kangaroo grass	1C, 2C, 12C, 15U, 25C, 26U, 28U, 29C, 32C, 36R, 42O, 43C, 46C, 50C, 51C, 52O,	4U, 37C, 38U, 43C, 52C, 53O, 61C, 72U,

## Master Flora Species List

Species	Family	Common Name	Secondary Sites and Relative Abundances <sup>1</sup>	Quaternary Sites and Relative Abundances <sup>1</sup>
<i>Timonius timon</i> var. <i>timon</i>	Rubiaceae			65U,
<i>Tragus australianus</i>	Poaceae	small burrgrass	4U,	11U,
<i>Trema tomentosa</i>	Ulmaceae	poison peach	13R,	
<i>Tridax procumbens</i> *	Asteraceae	tridax daisy	39U,	5U,
<i>Triodia mitchellii</i>	Poaceae		34U,	
<i>Triticum</i> sp. *	Poaceae	wheat		30A, 31A,
<i>Turraea pubescens</i>	Meliaceae		7U,	
<i>Urochloa mosambicensis</i> *			1U, 10U, 18U,	1U, 7U, 18C, 19C, 20C, 21C, 22C, 23U, 24U, 26A, 28U, 49C,
	Poaceae	sabi grass		
<i>Verbena aristigera</i> *			2I, 10U, 12U, 27O, 29U,	11C, 14U, 17U, 35C, 39U, 47U, 48C, 49O, 71U,
	Verbenaceae	mayne's pest		
<i>Verbena bonariensis</i> *	Verbenaceae	purple top	24U,	
<i>Wikstroemia indica</i>	Thymelaeaceae		5U,	
<i>Xanthium spinosum</i> *	Asteraceae	bathurst burr	5U,	
<i>Xanthorrhoea johnsonii</i>	Xanthorrhoeaceae	grass tree	6R, 38U, 40U, 48U, 50R,	8R, 64R,

**Key:**

<sup>1</sup> Relative abundances: A – Abundant (>100 plants per transect); C – Common (50-100 plants); O – Occasional (20-49 plants);

U – Uncommon 5 – 20 plants; R – Rare (<5 plants); I – Incidental (recorded outside transect but within same RE).

# - Listed as Rare under the NC Act 1992

^ - Listed as Threatened under the NC Act 1992 and the EPBC Act 1999

\* - denotes exotic species