


# GLNG Gas Transmission Pipeline


## Pre-Clearance Survey Report for KP312 to KP408.81

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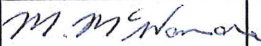
**PREPARED BY:**

Title	Name	Signature	Date
Senior Environmental Scientist	Richard Pidgeon		13.03.13

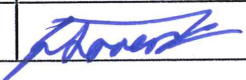
**REVIEWED BY:**

Title	Name	Signature	Date
Senior Ecologist (SEWPaC Approved)	Chris Schell		13.03.13

**ENDORSED BY:**

Title	Name	Signature	Date
Senior Environmental Adviser	Mark McNamara		13.03.13

**APPROVED BY:**

Title	Name	Signature	Date
Project Manager – Pipeline	Greg Jones		13.03.13

DATE	REV	REASON FOR ISSUE	AUTHOR	ENDORSED	APPROVED
13.03.13	A	Issued as Final	CS	MMcN	GJ

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## Abbreviations

CAMBA	China-Australia Migratory Bird Agreement
cm	Centimetre
CSG	Coal Seam Gas
Cwlth	Commonwealth
DBH	Diameter Breast Height
DEHP	Department of Environment and Heritage Protection
DEWHA	Department of Water, Heritage and the Arts
E	Endangered
EA	Environmental Authority
EIS	Environmental Impact Statement
EP Act	<i>Environmental Protection Act 1994</i>
EPBC Act	<i>Environment Protection and Biodiversity Conservation Act 1999</i>
ESA	Environmentally Sensitive Areas
EVNT	Endangered, Vulnerable and Near Threatened species
GIS	Geographical Information System
GLNG	Gladstone Liquefied Natural Gas
GTP	Gas Transmission Pipeline
GTP RoW	Gas Transmission Pipeline Right of Way
ha	Hectares
HERBRECS	Queensland Herbarium database
HVR	High Value Regrowth
JAMBA	Japan-Australia Migratory Bird Agreement
KP	Kilometre Point
LC	Least Concern
LNG	Liquefied Natural Gas
LP Act	<i>Land Protection (Pest and Stock Route Management) Act 2002</i>
m	Metre
Mi	Migratory
mm	Millimetres
MNES	Matters of National Environmental Significance
NC Act	<i>Nature Conservation Act 1992</i>
NT	Near Threatened
PESS	Pre-Clearance Ecological Survey Sheet
PWMP	Pest and Weed Management Plan
QLD	Queensland
RE	Regional Ecosystem
REDD	Regional Ecosystem Description Database
ROKAMBA	Republic of Korea-Australia Migratory Bird Agreement
RoW	Right of Way

SEIS	Supplementary Environmental Impact Statement
SEQ	South East Queensland
SEVT	Semi-evergreen Vine Thicket
SEWPaC	Department of Sustainability, Environment, Water, Population and Communities
SMP	Species Management Plan
SO	Stream Order
SSMP	Significant Species and Ecological Communities Management Plan
TEC	Threatened Ecological Communities
The Project	The GLNG GTP Project
V	Vulnerable
VM Act	<i>Vegetation Management Act 1999</i>
WONS	Weeds of National Significance

## Definitions

In this pre-clearance survey report, the following definitions apply:

### Glossary

Term	Meaning
Ancillary work areas	All areas outside of the Marine Crossing Early Works footprint required to develop and operate the GTP. This includes laydown sites, stockpile areas, construction areas, camps, low hazard dams and pump areas, and access tracks (permanent and temporary)
Approximately	Used throughout the document as a way to quantify impacts, particularly when working with decimal places. Use of this term should not be interpreted that the impacts are greater than those provided. For the purposes of this document, quantities have been rounded up and therefore actual impacts are slightly less than indicated in the SSMP
Bioregion	A geographic area characterised by a combination of physical and biological characteristics, for example, terrain, climate and ecological communities
Breeding places	An animal breeding place is a place being used by a protected animal to incubate or rear the animal's offspring if: <ul style="list-style-type: none"> <li>• The animal is preparing, or has prepared, the place for incubating or rearing the animal's offspring</li> <li>• The animal is breeding, or is about to breed, and is physically occupying the place; or the animal and the animal's offspring are physically occupying the place, even if the occupation is only periodical</li> <li>• The animal has used the place to incubate or rear the animal's offspring and is of a species generally known to return to the space place to incubate or rear offspring in each breeding season for the animal</li> </ul>
Core habitat	'Core habitat' consists of 'essential habitat' in which the species is known and the habitat is recognised under relevant recovery plans or other relevant plans/policies/regulations. Also included within this category are populations that are limited geographically within the region
Directly adjacent to the RoW	Within 100 m of the RoW
Disturbance	Any activity that has an impact on the environment. This may include clearance of trees, movement of soil, blasting of rock, construction of man-made structures, and also extends to human activities resulting in noise, light, pollution or rubbish
Disturbance limit	Proposed extent of potential habitat to be cleared within the Marine Crossing Early Works footprint, Ancillary work areas and the associated Access Road areas
Ecological community	An assemblage of native species that: <ol style="list-style-type: none"> <li>inhabits a particular area in nature</li> <li>meets the additional criteria specified in the regulations (if any) made for the purposes of this definition</li> </ol> <p>Ecological communities include all the species of plants, animals and micro-organisms that naturally occur together in a particular area or environmental domain in nature in assemblages which can change over time</p>
Endangered (EPBC Act)	When a native species that is not critically endangered and is facing a very high-risk of extinction in the wild in the near future as determined in accordance with the prescribed criteria
Essential habitat	'Essential habitat' is an area containing resources that are considered essential for the maintenance of populations of the species (eg potential habitat for breeding, roosting, foraging, shelter, for either migratory or non-migratory species). 'Essential habitat' is defined from known records and/or expert advice (including the findings of pre-clearance surveys)

Term	Meaning
General habitat	'General habitat' consists of areas or locations that are used by transient individuals or where species may have been recorded but where there is insufficient information to assess the area as essential/core habitat. 'General habitat' also includes areas defined from known records or habitat that is considered to potentially support a species according to expert knowledge of habitat relationships, despite the absence of specimen backed records. 'General habitat' may include areas of suboptimal habitat for species
Gilgai	Gentle mounds and depressions associated with swelling and cracking clay soils on alluvial floodplains
High value regrowth	High-value regrowth vegetation is mature native vegetation that hasn't been cleared since 31 December 1989
Microhabitat	A small, specialized habitat that provides a unique habitat for certain species. Microhabitats may include rocky outcrops, piles of woody debris, leaf litter
Migratory species	Those animals that migrate to Australia and its external territories, or pass through or over Australian waters during their annual migrations
Nocturnal	Active by night
Population	Of a species or ecological community relating to an occurrence of the species or community in a particular area
Pre-clearance survey	An ecological survey undertaken by an approved ecologist in accordance with relevant Commonwealth Survey guidelines and/or industry practices
Regional Ecosystems (REs)	Vegetation communities that are consistently associated with a particular combination of geology, land form and soil in a bioregion
Remnant vegetation	Remnant woody vegetation is defined as vegetation where the dominant canopy has >70% of the height and >50% of the cover relative to the undisturbed height and cover of that stratum and is dominated by species characteristic of the vegetation's undisturbed canopy
Roost habitat	Where a bat spends its day
RoW	Right of Way – GTP alignment including ancillary works areas
Sensitive area	An area known or potentially providing habitat for threatened species
Significant fauna species	A fauna species listed as threatened pursuant to the EPBC Act or the NC Act
Targeted survey	A survey specifically targeting a key ecological feature, including habitat features such as hollow-bearing trees, burrows and nests
Threatened ecological community	An ecological community listed under the EPBC Act as Critically Endangered, Endangered or Vulnerable
Threatened species	A plant or animal assigned a conservation status (Vulnerable, Endangered or Critically Endangered) under the EPBC Act
Translocation	The term translocation for the purposes of this management plan will follow the guidelines for translocation of threatened plants in Australia (Vallee <i>et al</i> 2004) which includes the following: seed collection and propagation; propagation via cuttings or tissue culture; direct seeding; transplantation of seedlings or mature plants; and the transfer of soil, leaf litter or brush
Unavoidable impacts	Impacts as a result of the construction activities within the Marine Crossing Early Works footprint and Ancillary work areas on core, essential (known and potential) and general habitat for threatened fauna, including migratory species. Unavoidable impacts also include direct impacts on threatened flora populations and threatened ecological communities
Unlikely habitat	'Unlikely habitat' areas are those areas that do not contain records of the particular species and contain no habitat values to support the presence or existence of resident or migratory individuals or populations of the species
Vulnerable (EPBC Act)	A native species that is not critically endangered or endangered and is facing a high-risk of extinction in the wild in the medium term future as determined in accordance with the prescribed criteria

# 1 Introduction

## 1.1 Background

Santos GLNG has awarded Saipem Australia (Saipem) the detailed design, procurement and construction of the 420 km long gas transmission pipeline (GTP), a joint venture between Santos GLNG Pty Ltd (Santos), PAPL (Downstream) Pty Ltd (Petronas) and Total GLNG Australia (TOTAL). This pipeline will transport the extracted and compressed Coal Seam Gas (CSG) from the gas fields between Roma and the Arcadia Valley to the LNG processing facility at Curtis Island, off Gladstone (hereafter referred to as the GTP Project).

In order to meet the *Environmental Protection and Biodiversity Act 1999* (EPBC Act) approval (Referral 2008/4096) Conditions 5, 6 and 7, pre-clearance surveys have to be undertaken. In addition, these surveys are also undertaken to support clearing permit applications under the *Queensland Nature Conservation Act 1992* (NC Act) and associated regulations. In addition, the surveys were undertaken to meet the conditions in Schedule F of the Department of Environment and Heritage Protection (DEHP) Environmental Authority PEN102664411 dated 12 February 2013, which specifically requires identification of Endangered, Vulnerable or Near-threatened fauna species and identification and marking of hollow-bearing trees.

This report details the methodology and results of an ecological survey conducted by Aurecon for a 97 km section of the 420 km GTP right of way (RoW) (Alignment A8 with minor amended alignment changes) between KP312 and KP408.81 (refer Figure 1). The results include identification of habitat features, particularly with respect to threatened flora and fauna species, ground-truthing of Regional Ecosystem (RE) mapping and Threatened Ecological Communities (TEC) in addition to general landscape, habitat modifications and occurrence of weeds and pests.



## 1.2 Scope of works

In accordance with the requirements of conditions 5, 6 and 7 of the EPBC Act controlled action approval and requirements under the NC Act and the DEHP Environmental Authority for PPL166, the scope of the ecological investigations for the pre-clearance surveys included:

- Threatened flora and fauna species under both the EPBC Act and NC Act
- TEC and migratory species pursuant to the EPBC Act
- Ground-truthing of category A, B and C environmentally sensitive areas (ESA) under the *Environmental Protection Act 1994* (EP Act)
- Assessment of the type and ecological value of vegetation not classified as being remnant or high value regrowth vegetation by DEHP (ie standalone paddock trees, stands of apparently intact vegetation)
- Opportunistic observations of fauna or evidence of fauna activity (eg droppings, recent scratch marks etc)
- Detailed assessment of fauna habitat features (eg logs, hollows or rocky outcrops etc)
- Observations of areas of disturbance or habitat modification (eg fire, clearing or thinning of vegetation)
- Wetlands, springs, watercourses and ephemeral creeks
- Pest species (including both flora and fauna)



## GLNG Gas Transmission Pipeline Corridor

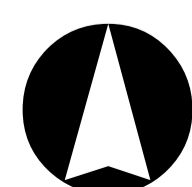
-  Kilometre Post Distance Marker (km)
-  GLNG GTP ROW and Ancillary Work Areas



Source:  
Gas Transmission Pipeline (GTP): Santos, Apr 2012.  
Aerial: BING, Feb 2011.

**GLNG GTP RoW and  
Pre-Clearance Ecology Survey  
Project Area  
KP312 to KP408.81  
Figure 1**

Map by: RB P:\GIS\Projects\214208\_Santos\_EMP\SEMP\_357.mxd 14/02/2013 09:23



A1 scale: 1:600,000  
0 20 40 60 km

GLNG No: XXXX-XX-XXXX  
Coordinate system: GCS\_GDA\_1994

Date: 14/02/2013

Version: a

### 1.3 Pre-clearance surveys

The KP312 to KP408.81 section (including ancillary works areas) of the RoW alignment was surveyed in full through surveys undertaken by Ausecology and Footprints Environmental Consultants in 2012 and Aurecon in 2013 with areas possessing habitat potentially suitable for MNES fauna species targeted to assess the micro habitat attributes in more detail. The surveys included:

**Table 1.1 Pre-clearance surveys undertaken within KP312 to KP408.81 of the GTP RoW**

Pre-clearance survey	Source	Team members	Field work dates
Pre-clearance ecological survey for KP312 to KP341	Ausecology	Lead by Ralf Regeer (Senior Ecologist) (DSEWPaC approved ecologist for the GLNG GTP Project) with assistance from Jason Halford (Ecologist), Robbie Kristenson (Ecologist), Simon Bush (Ecologist) and Kathie Grigg (Ecologist)	25 to 30 August 2012
Pre-clearance ecological survey for KP341 to KP409	Ausecology	Lead by Ralf Regeer (Senior Ecologist) (DSEWPaC approved ecologist for the GLNG GTP Project) with assistance from Robbie Kristenson (Ecologist), Simon Bush (Ecologist) and Lainie Grigg (Ecologist)	5 to 10 October 2012
Pre-clearance ecological survey for NC Act and EPBC Act listed fauna species within KP350 to KP413	Footprints Environmental Consultants	Lead by Andrew Veary (BSc (Hons) and Elle Veary (BAppSc) (DSEWPaC approved ecologists for the GLNG GTP Project) with assistance from Dr Kris Murray (PhD).. Greg Ford (BAppSc, Grad Dip Resource Management) of Balance Environmental, was commissioned by Footprints Environmental Consultants to undertake the Anabat microchiropteran bat call recording analysis and Barbara Triggs of Dead Finish, undertook the hair tube sample analysis	Mid-December 2011 to end of March 2012
Pre-clearance ecological survey for EPBC Act listed fauna species within KP312 to KP408.81	Aurecon	Lead by Dr Chris Schell (Senior Ecologist/Environmental Scientist) (DSEWPaC approved ecologist for the GLNG GTP Project) with assistance from Leesa Leathbridge (Ecologist), Emma Joss (Environmental Scientist), Kim Tuart-Haynes (Environmental Scientist) and Dylan McWhinney (Environmental Scientist)	21 to 24 January 2013

Dr Chris Schell (Aurecon) has verified the pre-clearance ecological surveys and report.

## 2 Survey methodology

### 2.1 Introduction

The pre-clearance surveys for this section of the GTP alignment were undertaken over four periods between mid-December 2011 and 25 January 2013.

In order to assess the ecological values of the site, the following activities were conducted:

- Initial desktop review of existing information on the vegetation communities, flora species and fauna species of the study area
- Baseline botanical surveys and broad habitat assessment to confirm and enhance information collated during the desktop review
- A targeted threatened fauna species habitat assessment within areas determined to be conducive to the occurrence of significant species, as identified from the desk-top assessments, reviews of the baseline botanical surveys and vegetation habitat assessments

Detailed methods for each of these components are provided in Sections 2.2 to 2.5.

### 2.2 Desktop review

A desktop study was undertaken before conducting the KP312 to KP408.81 pre-clearance ecological survey. The following databases were interrogated:

- HERBRECS data encompassing the Moura to Gladstone area to account for previously unmapped outlying populations/individuals
- Regrowth Vegetation Map (DEHP) v2.1
- Property Map of Assessable Vegetation (DEHP)
- VM Act RE and Remnant Map v6.1 (DEHP)
- VM Act Essential Habitat Map v3.1 (DEHP)
- ESA mapping (DEHP)
- Wildlife Online database search (DEHP)
- Referable Wetlands mapping (Queensland wetland data Version 3) (DEHP)
- EPBC Act Protected Matters Search (DSEWPaC)
- Environment Australia Database
- Curtis Coast Regional Coastal Management Plan (2003)
- Regional assessments which have relevance to the ecological values of the study site, ie. Covacevich *et al* 1997; Deer 1996; McDonald *et al* 1991; Young *et al* 1999; McFarland *et al* 1999; and Woinarski & Catterall 2004
- Commonwealth survey methodology guidelines for threatened species groups as follows;
  - Micro-bats (DEWHA, 2010a)
  - Birds (DEWHA, 2010b)
  - Mammals (DSEWPaC, 2011a)
  - Reptiles (DSEWPaC, 2011b)

– Frogs (DEWHA, 2010c)

- Gladstone Liquefied Natural Gas EIS (Santos 2010a)
- Gladstone Liquefied Natural Gas Transmission Pipeline, Technical Note – Narrows Crossing. Unpublished Technical Note on the construction of the underground pipeline (Santos 2010)
- Gladstone Liquefied Natural Gas Project Review of Shorebird Impacts within the Kangaroo Island Wetlands and the Narrow Crossing area (Footprints Environmental Consultants 2010)
- Australia Pacific LNG Project EIS (Australia Pacific LNG 2010)
- Queensland Curtis LNG Project EIS (Queensland Curtis LNG 2010)
- Recent surveys undertaken for other LNG proponents for which reports are publically available eg APLNG pre-clearance survey report (Worley Parsons 2011)

A number of Commonwealth guidelines and recommendations listed in existing reports and approvals were also used as references for the pre-clearance surveys and this report. These existing reports and guidelines are presented in Table 2.1. This information assisted the development of the survey methodology and provided supporting information for the findings associated with this report.

All data derived from the Government environmental databases listed above, have limitations regarding the accuracy and integrity of the information. Species record data received through the Queensland Herbarium (HERBRECS) may vary in accuracy and can be dated over 50 years ago, which may not always provide an accurate representation of current species for the region. All database searches have been used for reference only and do not replace full field assessments.

**Table 2.1 Document reference list**

<b>Document title</b>	<b>Source</b>
Coordinator-General's evaluation report for an environmental impact statement - Gladstone Liquefied Natural Gas—GLNG project	QLD Government (2010)
Level 1 Environmental Authority (PEN103428811) (PPL 167)	DEHP (2012a)
Level 1 Environmental Authority (PEN102664411) (PPL 166)	DEHP (2013a)
EPBC Act Approval 2008/4096	DSEWPaC (2010)
GLNG Gas Transmission Pipeline - EPBC Environmental Management Plan Mainland GTP (3380-GLNG-4-8.2-0020)	GLNG (2012a)
GLNG Gas Transmission Pipeline Species Management Plan (SMP) (3380-GLNG-3-1.3-0036)	GLNG (2012b)
GLNG Gas Transmission Pipeline Pest and Weed Management Plan (PWMP) (3380-GLNG-3-1.3-0006)	GLNG (2012c)
GLNG Gas Transmission Pipeline Aquatic Values Management Plan Mainland KP0-KP406 and Curtis Island KP410-KP420 (3380-GLNG-3-1.3-0128)	GLNG (2012d)
GLNG Gas Transmission Pipeline Significant Species Management Plan (3380-GLNG-4-1.3-0104)	GLNG (2013a)
GLNG Gas Transmission Pipeline Cycas megacarpa Translocation and Management Plan (3380-GLNG-4-1.3-0013)	GLNG (2013b)
Aurecon Queensland Fauna Survey Manual	Aurecon (2012)
GLNG Aquatic Values Assessment Major Watercourses KP200 – KP406 (3380-GLNG-4-1.3-0084)	FRC Environmental (2012)

## 2.3 Field surveys

### 2.3.1 Flora field survey

The 97 km section (ie KP312 to KP408.81) of the 420 km GTP RoW running from the Anglo American coal haul road to the GLNG early works location adjacent to 'The Narrows', was surveyed on foot (where access was permitted by land holders) with emphasis placed on the following ecological features:

- Locations of Type A species listed under the provisions of the Queensland NC Act as these require translocation prior to construction. Type A Restricted Plants as defined in the *Nature Conservation Act (Regulation) 2006* include the families *Cycadaceae*, *Orchidaceae*, and *Zamiaceae*; and species in the genera *Brachychiton*, *Livistona*, *Platycerium* and *Xanthorrhoea*
- Locations of Class 2 declared weeds as listed under the provisions of the Queensland *Land Protection (Pest and Stock Route) Management Act 2002* (LP Act) and weeds of national significance (WONS) as these require treatment prior to construction
- Verification of high value regrowth or remnant vegetation mapped as 'endangered' or 'of concern' under the provisions of the Queensland VM Act, as these need to be reported to DEHP prior to construction
- Locations of Endangered, Vulnerable and Near Threatened species (EVNT) flora species as listed under the provisions of the NC Act and/or the EPBC Act, that require a clearing permit before construction can commence. The presence of potential fauna habitat (hollow-bearing trees, scats, rocky outcrops etc)
- Targeted habitat areas associated with threatened fauna species listed under the provision of the EPBC Act and/or the NC Act within and adjacent to the Mainland GTP RoW potentially occurring within the RoW
- Assessment of the type and ecological value of vegetation not classified as being remnant or high value regrowth vegetation under the provisions of the VM Act (ie standalone paddock trees, stands of apparently intact vegetation)
- Wetlands, gilgai/melon holes, springs, watercourses and ephemeral creeks
- Observations of areas of disturbance (eg fire or thinning of vegetation)

Data collected during the Aurecon field surveys was recorded using one Toughbook (J3500 Tablet PC – Motion computing) with an integrated GPS. The Toughbook's were uploaded with GIS environmental constraints layers (eg RE Mapping, ESA mapping etc) and the GTP ROW. Handheld Garmin GPS units (GPS map 78s) were also used during the field investigations. It should be noted that while efforts were made to ensure the GPS co-ordinates provided in this report are accurate, a margin of error approximately +/- 15 m is expected due to the limitations of the devices used and the recording environment.

### 2.3.2 Fauna field survey

Fauna were recorded by the following methods as detailed below:

- Opportunistically in association with the vegetation surveys conducted by Aurecon. Fauna was identified by direct observation and/or via characteristic vocalisations (eg bird and frog calls)
- Targeted active searches for rare and threatened species by Footprints Environmental Consultants

The survey methodologies used by Footprints Environmental Consultants for the targeted fauna surveys were based on the individual significant species survey guidelines recommended by the Federal Government. The methods used included Cage/Elliott Type B Trapping for mid-sized ground mammals, pitfall trapping for reptiles and frogs, diurnal bird surveys, diurnal herpetofauna ground searches, nocturnal ground searches, insectivorous bat surveys, hair tube surveys, remote trigger cameras, targeted area searches, call playback surveys, driving spotlight transects and inferential evidence. The details regarding each of these methodologies are outlined below.

### **Cage/Elliott Type B trapping**

Mid-sized ground mammals were surveyed using medium sized cage traps and Elliott type B traps. These were deployed at eight locations covering the primary habitats and survey areas of the study site. At each survey site, ten traps were set along a transect which optimised sampling coverage of each sub-habitat type at that location. Traps were opened for three consecutive nights at each survey site, providing a minimum total trapping effort of 30 trap nights per site (ie number of traps open multiplied by the number of nights), totalling 330 trap nights for the survey. Traps were baited with either salami, peanut butter-oats mix or half a pilchard. Fish oil was sprayed around the entrance to each trap. Baits were replaced as required.

### **Pitfall trapping**

Pitfall traps were employed to survey for reptiles and frogs. Each trap line consisted of five, 20 litre plastic buckets sunk in to the ground approximately five metres apart and connected by a drift fence line (30 cm high, embossed, polyethylene dampcourse) pitfall trap lines were set at eight survey sites as discussed above. Traps were opened for a minimum of three consecutive nights providing a total trapping effort of 15 trap nights per site, totalling 120 trap nights for the survey.

### **Diurnal bird surveys**

Diurnal birds were surveyed using timed (20 minutes per session), area search methods which were comprised of early morning census. The total minimum census time varied for each of the targeted species depending on the recommended survey methodology. Area searches were conducted at eight survey sites and at other selected locations where suitable habitat for target species were supported. Census surveys were undertaken within three hours of sunrise and sunset. Birds were identified from either direct observations and/or their call vocalisations.

### **Diurnal herpetofauna ground searches**

Dedicated active daytime ground searches were conducted for a minimum period of one-person hour at each of the eight survey sites and at other selected locations where suitable habitat for target species was supported. Surveys were conducted on each of the survey days to locate active/inactive reptiles and inactive frogs. Total search effort for each of the targeted species was dictated by the recommended survey methodology applicable. This method involved:

- Rolling logs and rocks
- Raking soil at the base of trees and shrubs

- Searching under decorticating /exfoliating bark on logs and standing dead or live trees
- Examination under debris

Additionally, as part of the active searches, upper section of trees was scanned with binoculars searching for basking or active arboreal/scansorial reptiles. Ground search sessions were conducted prior to 11 am.

### **Nocturnal ground searches**

Spotlighting searches were undertaken on foot using 30-watt hand-held spotlights and headlamps. These were conducted for two person hours at eight survey sites and at other selected locations where suitable habitat for target species was supported. Searches were conducted for 60 minutes per site and replicated as dictated by survey requirements for the threatened species of interest.

During each nocturnal spotlighting session, approximately one person hour was dedicated to arboreal searches with the remaining time spent on ground searches for nocturnal herpetofauna and ground mammals (ie bandicoots). Arboreal surveys targeted mammals (ie possums and gliders), nocturnal birds (ie owls and nightjars), reptiles (ie snakes and geckos) and flying mammals (ie flying foxes and fruit bats).

### **Insectivorous bat surveys**

The survey program for insectivorous bat fauna was undertaken using electronic bat detectors and harp traps, as dictated by the relevant threatened species survey guidelines. Anabat detection involved both remote and active detection techniques with an Anabat II detector, used to record the ultrasonic signals of active bats. Remote detection (ie equipment programmed for unattended, fixed point, overnight detection of microbat calls) was conducted over four survey nights at eight primary survey sites. Active Anabat detection was employed during nocturnal spotlighting surveys.

Ultrasonic bat calls and locality details were recorded during the survey and subsequently analysed by Greg Ford (Balance Environmental) for species identification.

Harp trapping was undertaken at four sites within areas of the GTP RoW that supported suitable habitat for the targeted species, with the level of effort dictated by the relevant survey guidelines. These surveys produced a total of 20 harp trap night per survey site, totalling 80 trap nights.

### **Hair tube surveys**

Hair tubes (a cylindrical tube with a mesh-sealed bait container at one end, with double sided sticky tape attached to the top side of the entrance to the tube) were specifically employed to survey for the northern quoll at those site that supported potentially suitable habitat, or were in close proximity to areas that may support northern quoll. Twenty hair tubes, baited with salami, were deployed at eight survey sites for 14 night/days.

### **Remote trigger cameras**

Two remote trigger cameras were deployed at 11 sites for 14 nights and days, totalling 154 camera trap nights/days. These cameras were deployed to survey specifically for northern quoll. Incidental observations of other fauna were noted where relevant.

### **Targeted area searches**

A series of rapid biodiversity assessments and target species surveys were undertaken in a range of representative and/or distinctive habitat types throughout the study site. Areas surveyed excluded those areas subject to the primary survey program as previously discussed.

For diurnal activities, each survey area, nominally comprised of up to one or two hectares, was surveyed for up to one person hour. At each selected survey area, a combination of active diurnal ground searches, primarily for reptiles, and bird surveys were undertaken. For nocturnal assessments, an area of approximately two hectares was surveyed for a minimum of one survey person hour where spotlighting searches on foot were undertaken using 30-watt spotlights and headlamps.

Targeted area searches were also undertaken for specific species, such as Glossy black cockatoo, in specific habitat types, such as stands of *Casuarina littoralis* and *C. torulosa* which are known Glossy black cockatoo food trees. Searches for *Casuarina* orts (characteristically chewed seed pods) were undertaken in such habitat types.

### **Call playback surveys**

Nocturnal call playback surveys for Powerful owl were undertaken at potentially suitable locations throughout the study site.

The procedure included broadcasting, through a vehicle's stereo system, powerful owl calls for approximately three to five minutes. Several minutes of listening for responses and visual scanning of the immediate surrounds with a hand-held spotlight followed the call playback.

Call recordings for nocturnal mammals and birds were sourced from Stewart (2000).

### **Driving spotlight transects**

Driving spotlight searches (driver plus one observer with a 100-watt spotlight) were undertaken from a 4WD along the road/track network within the study site primarily to survey for larger arboreal and ground mammals (eg Owls, Koalas, Echidnas, Macropods, Possums, Foxes, Cats and Dogs).

### **Inferential evidence**

Inferential evidence of fauna occurrence was sought and found throughout the study site.

This included:

- Visual inspection of trees for trunk scratches/rubbings
- Searches for both predator and non-predator scats (eg northern quoll and yakka skink latrine sites)
- Fauna tracks
- Other signs of fauna occurrence (eg shed skins/nests etc)

Only definitive evidence was used to record a species occurrence on the study site. Scats or pellets found were either identified in the field (using Triggs 1999).



## Hollow bearing tree mapping

As an additional element to the survey program, the location of any trees bearing hollows, within approximately 60 m of the centreline of the RoW alignment (at the time of commissioning by GLNG), were marked by GPS.

## Targeted area searches within KP350 to KP383

The section of GTP RoW between KP350 and KP383 is approximately 33 km in length and predominantly traverses through grazing paddocks mostly devoid of vegetation, except for sections of riparian vegetation at creek crossings. This area was surveyed using species-specific targeted methodologies, including:

- Diurnal and nocturnal ground searching – eg Brigalow scaly-foot (EPBC Act/NC Act listed)
- Driving spotlighting – eg Powerful owl (NC Act listed)
- Frog census and searches – eg Tusked frog (NC Act listed)
- Bird census and area searches – eg Squatter pigeon (EPBC Act/NC Act listed)
- Overnight and active Anabat surveys – eg Large-eared pied bat (EPBC Act/NC Act listed)
- Call playback – eg Powerful owl

## 2.4 Weeds

Declared plants under the provisions of the Queensland LP Act are those species that have, or could potentially cause, serious economic, environmental or social impacts.

“A **Class 1** pest is one that has the **potential** to become a very serious pest in Queensland in the future. By law, all landholders are required to keep their land free of Class 1 pests.

A **Class 2** pest is one that has already **spread over** substantial areas of Queensland. However, its impact is so serious that control is needed to avoid further spread onto properties that are still free of the pest. By law, all landholders must try to keep their land free of Class 2 pests and it is an offence to possess, sell or release these pests without a permit.

A **Class 3** pest is one that is commonly **established** in parts of Queensland but its control by landowners is not deemed to be warranted unless the plant is impacting, or has the potential to impact, on a nearby 'environmentally significant area' (eg a national park)” (DAFF, 2012),

Furthermore, weeds that warrant a nationally strategic approach are listed on the Weeds of National Significance (WoNS) list. This list was established in 1999 and was recently reviewed in April 2012. The assessment of WoNS is based on four major criteria:

- Invasiveness
- Impacts
- Potential for spread
- Socio-economic and environmental values

Although both the LP Act declared weeds and WoNS were the focus of the survey, the presence of other environmental weeds was noted during site assessments. Environmental

weeds were considered to be those species that may have a high invasive capacity or non-native flora species that are considered to be undesirable for cropping and grazing practices.

## 2.5 Watercourses

All watercourses encountered during the pre-clearance ecological surveys were recorded and verified to determine if they meet the definition of a watercourse under the provisions of the Queensland *Water Act 2000*.

The following data was recorded (where applicable) for each watercourse as per the requirements identified in the GLNG Aquatic Values Management Plan Mainland KP0 to KP406 and Curtis Island KP410 to KP420 (GLNG, 2012d):

- Riparian zone and condition (eg weeds, erosion, vegetation present and regrowth/remnant)
- Physical habitat features of the channel (eg undercut banks, in-stream timber, overhanging and trailing-bank vegetation, substrate diversity and deep pools)
- Biological diversity and overall ecological values of each watercourse (ie aquatic flora, macroinvertebrate, fish, turtles and platypus)
- Animal breeding places for conservation significant species and riverine corridors for aquatic animal migration
- Habitat for species with high conservation value, with specific focus on *Eseya albagula* (White-throated snapping turtle), *Rheodytes leukops* (Fitzroy river turtle) and *Ornithorhynchus anatinus* (Platypus)

Although these areas were assessed from an overall potential habitat perspective, precedence on the aquatic values of each watercourse shall be given to the GLNG Aquatic Values Management Plan Mainland KP0 to KP406 and Curtis Island KP410 to KP420 (GLNG, 2012d).

### 3 Pre-clearance survey results – Flora

#### 3.1 Desktop analysis

##### 3.1.1 Referable wetlands

The desktop surveys undertaken for the RoW between KP312 and KP408.81, determined that there are no wetland protection areas under the referable wetlands mapping. However, various wetland management areas are mapped as intersecting the RoW and are primarily associated with some of the major creeks and rivers, as well as related tributaries and overflow areas.

Table 3.1 summarises the Wetland Management Areas mapped to intersect the RoW in the section KP312 to KP408.81.

**Table 3.1 Mapped wetland areas intersecting the RoW in section KP312 to KP408.81**

KP location	Wetland Protection Area (WPA) or Wetland Management Area (WMA)
KP360.35 to KP360.42	WMA
KP362.54 to KP362.75	WMA
KP406.81 to KP406.81	WMA
KP407.49 to KP407.56	WMA
KP407.87 to KP407.89	WMA

##### 3.1.2 Threatened Ecological Communities

One EPBC Act listed TEC has been mapped within or in close proximity to the GTP RoW:

- Semi-evergreen Vine Thicket (SEVT) - RE 11.11.18 Semi-evergreen vine thicket on old sedimentary rocks with varying degrees of metamorphism and folding. Lowlands (DEHP, 2013g)

##### 3.1.3 Environmentally Sensitive Areas

Two ESA categories (Category B and Category C) were mapped (DEHP) for the GTP RoW within section KP312 to KP408.81. A summary of the features that have resulted in the Category B and Category C areas is presented in Table 3.4.

**Table 3.2 Mapped ESA categories**

ESA	Presence (mapped) in GTP RoW section KP312 to KP408.81
Category A	No Category A ESA features were mapped within the KP312 to KP408.81 section
Category B	Endangered vegetation community RE 11.11.18 Mapped Endangered HVR between KP364.67 and KP383.12

ESA	Presence (mapped) in GTP RoW section KP312 to KP408.81
Category C	Essential Habitat for <i>Acacia pedleyi</i> Essential Habitat for <i>Cycas megacarpa</i> Of Concern vegetation community RE 11.3.4 Of Concern vegetation community RE 11.3.25 Of Concern HVR Essential Habitat for <i>Graptophyllum excelsum</i> Essential Habitat for Coastal sheath-tail bat Callide Timber Reserve Targinnie State Forest Wetland Management Areas as listed

### 3.1.4 Type A species

Type A restricted plants are listed and protected under the NC Act and its provisions. These plants include native plants such as orchids, bottle trees, grass trees and other popular horticultural species that are not considered sufficiently rare to be classified as near threatened or threatened plants, but are harvested and traded to the extent that a potential threat to the species might exist. Hence, these plants are protected to ensure populations are not depleted to the point where they become threatened. Table 3.5 contains a list of Type A listed species mapped as being possibly present in the KP312 to KP408.81 GTP RoW section as extracted from HERBRECS database and other reports reviewed during the Ausecology survey.

**Table 3.3 Type A listed species expected in GTP RoW KP312 to KP408.81 section**

Scientific name	Common name
<i>Brachychiton australis</i>	Broad-leaved bottle tree
<i>Brachychiton populneus</i>	Kurrajong
<i>Brachychiton rupestris</i>	Queensland bottle tree or Narrow-leaved bottle tree
<i>Cymbidium canaliculatum</i>	Black orchid
<i>Dockrillia bowmanii</i>	Scrub pencil orchid
<i>Livistona decora</i>	Ribbon fan palm
<i>Macrozamia macleayi/miquelii</i>	Macrozamia
<i>Xanthorrhoea johnsonii</i>	Grass tree

### 3.1.5 Commonwealth and State Government EVNT species

Under the provisions of the EPBC Act native flora and fauna species are categorised in one of the following classes:

- Extinct
- Extinct in the wild
- Critically endangered (CE)
- Endangered<sup>1</sup> (E)
- Vulnerable<sup>1</sup> (V)

<sup>1</sup> This report will refer to EVNT species in the context of both the QLD NC Act and the Commonwealth EPBC Act as highlighted

- Conservation dependent

Under the provisions of the NC Act native wildlife (ie flora and fauna) is categorised in one of the following classes:

- Extinct in the wild
- Endangered<sup>1</sup> (E)
- Vulnerable<sup>1</sup> (V)
- Near threatened<sup>1</sup> (NT)
- Least concern (LC)
- Special least concern (SLC)

Some of the species previously recorded as EVNT species under the NC Act have been delisted to least concern. Species can be delisted if their population sizes have increased (or are increased due to increased survey efforts in a particular area), their threats have been abated or reduced, with the result that it is then considered that their population sizes are now deemed sufficiently large enough to be delisted to a 'least concern' status.

Table 3.6 lists the EVNT species as recorded in the HERBRECS database and Wildlife Online database supplemented with data records of previous surveys undertaken by GLNG.

**Table 3.4 EVNT species recorded in the HERBRECS database as occurring in the Moura to Gladstone section, which contains the GTP RoW KP312 to KP408.81 region**

Scientific name	Common name	NC Act	EPBC Act
<i>Acacia pedleyi</i>	Pedley's wattle	Vulnerable	-
<i>Acacia pubicosta</i>	NCN	Near threatened	-
<i>Acacia spania</i>	NCN	Near threatened	-
<i>Acacia storyi</i>	Story's wattle	Near threatened	-
<i>Actephila sessilifolia</i>	Scrub daphne	Near threatened	-
<i>Alyxia sharpei</i>	Rough alyxia	Near threatened	-
<i>Atalaya collina</i>	Yarwan whitewood	Endangered	Endangered
<i>Bertya pedicellata</i>	NCN	Near threatened	-
<i>Bosistoa transversa</i>	Three-leaved bosistoa	-	Vulnerable
<i>Cadellia pentastylis</i>	Ooline	Vulnerable	Vulnerable
<i>Capparis humistrata</i>	NCN	Endangered	-
<i>Cerbera dumicola</i>	NCN	Near threatened	-
<i>Cossinia australiana</i>	Cossinia	Endangered	Endangered
<i>Cupaniopsis shirleyana</i>	Wedge-leaf tuckeroo	Vulnerable	Vulnerable
<i>Cycas megacarpa</i>	NCN	Endangered	Endangered
<i>Cyperus clarus</i>	NCN	Vulnerable	-
<i>Dansiea elliptica</i>	Dansiea	Near threatened	-
<i>Dichanthium queenslandicum</i>	King blue grass	Vulnerable	Vulnerable
<i>Eleocharis blakeana</i>	Blake's spikerush	Near threatened	-
<i>Graptophyllum excelsum</i>	Scarlet fushia	Near threatened	-

Scientific name	Common name	NC Act	EPBC Act
<i>Grevillea hockingsii</i>	Hocking's wattle	Vulnerable	-
<i>Hernandia bivalvis</i>	Grease nut	Near threatened	-
<i>Macropteranthes fitzalanii</i>	NCN	Near threatened	-
<i>Macropteranthes leiocaulis</i>	Southern bonewood	Near threatened	-
<i>Marsdenia hemiptera</i>	Rusty vine	Near threatened	-
<i>Melaleuca groveana</i>	Grove's paperbark	Near threatened	-
<i>Parsonsia larcomensis</i>	Mt Larcom silk pod	Vulnerable	-
<i>Paspalidium scabrifolium</i>	NCN	Near threatened	-
<i>Polianthion minutiflorum</i>	NCN	Vulnerable	Vulnerable
<i>Rhaponticum australe</i>	Austral cornflower	Vulnerable	Vulnerable
<i>Rutidosia crispata</i>	NCN	Vulnerable	-
<i>Samadera bidwillii</i>	Quassia	Vulnerable	Vulnerable
<i>Senna acclinis</i>	Brush senna	Near threatened	-
<i>Solanum dissectum</i>	NCN	Endangered	-
<i>Solanum elachophyllum</i>	NCN	Endangered	-
<i>Solanum johnsonianum</i>	NCN	Endangered	-
<i>Whalenbergia islensis</i>	Cliff bluebell	Near threatened	-
<i>Zieria actites</i>	NCN	Endangered	-

**Table notes:** NCN = No common name

## 3.2 Survey results

### 3.2.1 Environmentally Sensitive Areas

Two ESA categories (Category B and Category C) were confirmed, as described in Table 3.7.

**Table 3.5 Confirmed ESA Categories contained within the GTP RoW between KP312 and KP408.81**

ESA	Survey result: presence in GTP RoW KP312 to KP408.81
Category B	Endangered vegetation community RE 11.11.18 present in RoW at KP401.75 to KP401.87
Category C	Targinnie State Forest Of Concern vegetation community RE 11.10.8 present within the RoW at KP315.08 to KP315.33 <u>Of Concern vegetation community RE 11.3.25 present within the RoW at:</u> KP317.80 to KP317.95 KP318.70 to KP318.76 KP319.13 to KP319.37 KP320.49 to KP320.64 KP334.49 to KP334.55 KP339.00 to KP340.80 KP344.22 to KP344.28 KP345.50 to KP345.61 KP352.30 to KP352.42 KP360.29 to KP360.38 KP364.76 to KP364.83

ESA	Survey result: presence in GTP RoW KP312 to KP408.81
	KP368.44 to KP368.47 KP377.99 to KP378.16 <u>Of Concern vegetation community RE 11.12.3 present within the RoW at:</u> KP339.00 to KP340.80 KP341.00 to KP341.14 <u>Of Concern vegetation community RE 11.3.4 present within the RoW at:</u> KP377.99 to KP378.16 KP383.67 to KP383.87 KP386.19 to KP386.42 KP405.34 to KP406.78 KP407.18 to KP407.41 <u>Essential habitat present within the RoW for:</u> <i>Acacia pedleyi</i> (confirmed) <i>Cycas megacarpa</i> (confirmed) <i>Graptophyllum excelsum</i> <i>Taphozous australis</i> (Coastal sheathtail bat) <u>Wetland Management Areas present within the RoW at:</u> KP362.54 to KP362.75 KP407.49 to KP407.56 KP407.87 to KP407.89

### 3.2.2 Threatened Ecological Communities

One TEC was identified as occurring within the GTP RoW between KP312 and KP408.81. Table 3.8 provides information associated with the observed TEC and the location within the GTP RoW during the pre-clearance ecological surveys.

**Table 3.6** TECs present within the GTP RoW between KP312 and KP408.81, their location, status and condition





TEC	Survey result: presence in GTP RoW KP312 - KP408.81	KP location(s)	Status: non-remnant, remnant or HVR	Condition <sup>1</sup>
Semi-Evergreen Vine Thicket (SEVT) - RE 11.11.18 Semi-evergreen vine thicket on old sedimentary rocks with varying degrees of metamorphism and folding. Lowlands	Present	KP401.82 to KP401.93	Remnant	Fair

**Table notes:** 1 Condition is expressed as good, fair or poor. This is based on a visual interpretation of the vegetation community taking in to account species diversity, coverage, and presence/abundance of weed species and height of vegetation. However a full biocondition assessment was not undertaken





### 3.2.3 Type A Species mapped within KP312 to KP408.81 of the GTP RoW

Eight Type A species were mapped at various locations along the GTP RoW as described in Table 3.9.

**Table 3.7 Type A species mapped within the GTP RoW between KP312 and KP408.81**

Scientific name	Significance of species	Photograph
<i>Brachychiton australis</i>	Type A restricted species under the NC Act, to prevent commercial overharvesting of species. Found associated with Brigalow and SEVT communities	 <p>Ausecology (2012)</p>
<i>Brachychiton populneus</i>	Type A restricted species under the NC Act, to prevent commercial overharvesting of species. Found associated with Brigalow and SEVT communities	 <p>Ausecology (2012)</p>
<i>Brachychiton rupestris</i>	Type A restricted species under the NC Act, to prevent commercial overharvesting of species. Found associated with Brigalow and SEVT communities	 <p>Ausecology (2012)</p>
<i>Cymbidium canaliculatum</i>	Type A restricted species under the NC Act, to prevent commercial overharvesting of species. Found associated with large habitat and paddock trees and often in riparian zones	 <p>Ausecology (2012)</p>






Scientific name	Significance of species	Photograph
<i>Geodorum densiflorum</i>	Type A Restricted species under the NC Act, to prevent commercial overharvesting of species	 <p>Ausecology (2012)</p>
<i>Livistona decora</i>	Type A Restricted species under the NC Act, to prevent commercial overharvesting of species	 <p>Ausecology (2012)</p>
<i>Macrozamia macleayi/ miquelii</i>	Type A Restricted species under the NC Act, to prevent commercial overharvesting of species	 <p>Ausecology (2012)</p>
<i>Xanthorrhoea johnsonii</i>	Type A Restricted species under the NC Act, to prevent commercial overharvesting of species. Found associated with large habitat and paddock trees and often in riparian zones	 <p>Ausecology (2012)</p>

### 3.2.4 EVNT Species mapped within KP312 to KP408.81 of the GTP RoW

Four EVNT species are present and mapped within the GTP RoW as described in Table 3.10.

**Table 3.8 EVNT Species mapped within the GTP RoW between KP312 and KP408.81**

Scientific name	Significance of species	Photograph
<i>Acacia pubicosta</i>	Listed as Near Threatened under the provisions of the NC Act	Not observed during this survey due to the growing location being affected by fire
<i>Acacia pedleyi</i>	Listed as Vulnerable under the provisions of the NC Act	 <p>Ausecology (2012)</p>
<i>Cycas megacarpa</i>	Listed as Endangered under the provisions of the EPBC Act and NC Act	 <p>Aurecon (2013)</p>
<i>Desmodium macrocarpum</i>	Listed as Near Threatened under the provisions of the NC Act	 <p>Ausecology (2012)</p>

## 4 Pre-clearance survey results – fauna

### 4.1 Desktop analysis

Tables 4.1 and 4.2 identify the fauna species that may occur in the RoW based on desktop analyses. These species were the focus of opportunistic fauna sightings within the GTP RoW (KP312 to KP408.81). Species identified in Tables 4.1 and 4.2 were deemed significant either under the provisions of the EPBC Act, NC Act, JAMBA and/or ROKAMBA and/or CAMBA. The notes contained within Tables 4.1 and 4.2 refer to their preferred habitat and their potential to occur (or existing record) within the GTP RoW.

**Table 4.1 Potential conservation significant fauna species within the GTP RoW between KP312 and KP408.81**

Scientific name	Common name	EPBC/ NC Act listing	Notes
<b>Amphibians</b>			
<i>Adelotus brevis</i>	Tusked frog	- / V	Habitat is rainforests, open forests and woodlands in association with water (Queensland Museum, 2013). Found under logs and in hollows/rock crevices beside streams and ponds (Meyer <i>et al</i> , 2001). <b>Potentially in GTP RoW</b> . Identified in Kroombit Tops National Park to the south
<b>Reptiles</b>			
<i>Delma torquata</i>	Collared delma	V / V	Ground-dwelling. The Collared delma is often associated with westerly facing ridge-top areas which support dry open Eucalypt and Acacia dominated woodlands with a 3 to 10 cm depth of leaf litter and a sparse understorey of tussock grass and shrubs or SEVT. Within this habitat the Collared delma can be located under weathered loose rocks, flattish bedrock outcroppings, logs or mats of leaf litter, or in cracks and crevices among tussock grasses. It is often found in areas with many small rocks (less than 30 cm) and fewer large rocks, and in areas with reasonably sparse vegetation. (Curtis <i>et al</i> , 2012; EPA, 2006a). <b>Potentially in GTP RoW</b>
<i>Denisonia maculata</i>	Ornamental snake	V / V	Ground-dwelling. Suitable habitat is lower-lying subtropical areas with deep-cracking clay soils and adjacent slightly elevated ground of clayey and sandy loams, is the preferred habitat for this species. The species is also found in vegetation of woodland and shrub land, including some Brigalow ( <i>Acacia harpophylla</i> ), and also riverside woodland and open forest, particularly on natural levees. Restricted to the Dawson and Fitzroy Rivers drainage systems (DEHP, 2013a). <b>Potentially in GTP RoW</b>
<i>Furina dunmalli</i>	Dunmall's snake	V / V	Ground-dwelling. Suitable habitat is open forest and woodland, particularly Brigalow ( <i>Acacia harpophylla</i> ) forest and woodland growing on floodplains of deep-cracking black clay and clay loam soils, provide habitat for this species. Most of the habitat supporting this species has been extensively modified for agriculture and grazing (DEHP, 2013b). <b>Potentially in GTP RoW</b>
<i>Ophioscincus cooloolensis</i>	Cooloola snake skink	- / NT	Worm-like burrower of south-east Queensland. Suitable habitat includes coastal heaths, woodlands and rainforest on white sands at Cooloola and Fraser Island. Disjunct record from Kroombit Tops (Wilson, 2005). <b>Unlikely in GTP RoW</b>

Scientific name	Common name	EPBC/ NC Act listing	Notes
<i>Paradelma orientalis</i>	Brigalow scaly foot	V / V	Ground-dwelling. The Brigalow scaly-foot is found on sandstone ridges in woodlands and vine thickets, and in open forests and woodlands, especially ironbark, Cypress pine, Brigalow, Bull oak, Spotted gum and vine scrubs. The species is found in a wide variety of remnant and non-remnant open forest to woodland habitats. The species is known to persist in highly disturbed vegetation types, for example those areas invaded by Buffel grass ( <i>Pennisetum ciliaris</i> ), Parthenium ( <i>Parthenium hysterophorus</i> ) and other weeds (Brigalow Belt Reptiles Workshop, 2010). <b>Potentially in GTP RoW</b>
<i>Egernia rugosa</i>	Yakka skink	V / V	Yakka skink habitat is amongst dense ground vegetation, fallen timber or rock outcrops in open dry sclerophyll forest (ironbark) or woodland, Brigalow forest, open shrub land, and lancewood forest on coarse gritty soils in the vicinity of low ranges, foothills and undulating terrain with good drainage (Cogger 2000; DEHP, 2013c; Richardson, 2006). Important microhabitats for this species include rocky outcrops, hollow logs, animal burrows and ground cover (including perennial grass clumps, leaf litter, rocks, fallen timber etc) (Richardson, 2006). <b>Potentially in GTP RoW</b>
<i>Strophurus taenicauda</i>	Golden tailed gecko	- / NT	Arboreal. The golden-tailed gecko lives in open woodland and open forest where it shelters under loose bark and hollow limbs (DEHP, 2013d). <b>Potentially in GTP RoW</b>
<b>Mammals</b>			
<i>Chalinolobus dwyeri</i>	Large-eared pied bat	V / V	The species requires a combination of sandstone cliff/escarpment to provide roosting habitat that is adjacent to higher fertility sites, particularly box gum woodlands or river/rainforest corridors that are used for foraging (DSEWPaC, 2013a). <b>Potentially in GTP RoW</b>
<i>Chalinolobus picatus</i>	Little pied bat	- / NT	Occurs most frequently in dry, open woodland communities throughout its range but has also been recorded in dry sclerophyll forests dominated by <i>Corymbia citriodora</i> , <i>Eucalyptus moluccana</i> , <i>Eucalyptus tereticornis</i> and ironbark species, Araucarian notophyll vine forests, <i>Callitris/Allocasuarina</i> dominated forests with scattered eucalypt emergents such as <i>Eucalyptus dealbata</i> and <i>Eucalyptus fibrosa</i> , Mulga ( <i>Acacia aneura</i> ) woodlands, <i>Eucalyptus largiflorens</i> woodlands and riverine <i>Eucalyptus camaldulensis</i> dominated communities (Environment Australia, 1999). <b>Potentially in GTP RoW</b>

Scientific name	Common name	EPBC/ NC Act listing	Notes
<i>Nyctophilus corbeni</i>	South-eastern long-eared bat	V / V	Occurs in a range of inland woodland vegetation types, including box, ironbark and cypress pine woodlands. The species also occurs in Buloke, Brigalow, Belah and Smooth-barked apple ( <i>Angophora leiocarpa</i> ) woodland; River red gum ( <i>Eucalyptus camaldulensis</i> ) forests lining watercourses and lakes, Black Box ( <i>Eucalyptus largiflorens</i> ) woodland and dry sclerophyll forest. Throughout inland Queensland, the species habitat is dominated by various eucalypt and bloodwood species, and various types of tree mallee with it being most abundant in vegetation with a distinct canopy and a dense cluttered shrub layer (DSEWPaC, 2013b) <b>Potentially in GTP RoW</b>
<i>Taphozous australis</i>	Coastal sheathtail bat	- / V	Species rarely found further than a few kilometres from the ocean, where it roosts in sea caves, rock fissures and abandoned structures. Only uses habitat that are within a kilometre or so from the ocean; such habitats include dune scrubs and coastal paperbark swamps, where it forages just above the canopy (Van Dyck & Strahan, 2008). <b>Potentially in GTP RoW</b>
<i>Dasyurus hallucatus</i>	Northern quoll	E / LC	Occupies a diversity of habitats across its range which includes rocky areas, eucalypt forest and woodlands, rainforests, sandy lowlands and beaches, shrubland, grasslands and desert. The habitat generally encompasses some form of rocky area for denning purposes with surrounding vegetated habitats used for foraging and dispersal. Dens are made in rock crevices, tree holes or occasionally termite mounds (Threatened Species Scientific Committee 2005). <b>Potentially in GTP RoW</b>
<i>Pteropus poliocephalus</i>	Grey-headed flying fox	V / LC	Endemic to eastern Australia and Australia's second largest bat. Feeds on the blossoms, fruits and leaves of many plants. Roosts by day in "camps", commonly in dense riparian vegetation (Van Dyck & Strahan, 2008). <b>Unlikely in GTP RoW</b>
<i>Ornithorhynchus anatinus</i>	Platypus	- / SLC	Found in and near freshwater creeks, slow-moving rivers, lakes joined by rivers, and built water storages such as farm dams. They build a simple burrow in a river bank, just above water level and often among a tangle of tree roots (DEHP, 2013e). <b>Potentially in GTP RoW</b> in larger creek systems
<i>Phascolarctos cinereus</i>	Koala	V / SLC	Koalas live in a range of temperate, sub-tropical and tropical forest, woodland and semi-arid communities dominated by eucalypt species (DSEWPaC, 2013c). This species is also known to utilise highly fragmented areas. Reliant on particular Eucalypt species for food trees but will use a variety of trees for shelter. <b>Potentially in GTP RoW</b> within forested areas of the RoW
<i>Tachyglossus aculeatus</i>	Echidna	- / SLC	Inhabit a wide range of terrestrial habitats wherever there are enough ants or termites including desert, rainforest, open forest, bushland and farmland (Wildlife Preservation Society of Queensland, 2013) Usually found among rocks in hollow logs, under vegetation or piles of debris, under tree roots and sometimes in wombat and rabbit burrows. <b>Likely in GTP RoW</b>

Scientific name	Common name	EPBC/ NC Act listing	Notes
<i>Xeromys myoides</i>	Water mouse	V / V	Prefers mangrove and salt marsh communities, sedge lakes near foredunes, and coastal freshwater swamps (Van Dyck & Strahan, 2008). <b>Unlikely directly within RoW</b> , Previously recorded just outside the RoW in the mangrove systems (Footprints, 2012a)

**Table 4.2 Potential conservation significant bird species within the GTP RoW between KP312 and KP408.81**

Scientific name	Common name	EPBC/NC Act listing	JAMBA/CAMBA/ ROKAMBA/Bonn	Notes
<i>Ardea modesta</i>	Eastern great egret	Migratory / -	JAMBA/CAMBA	Inhabits shallow points in a wide range of wetland habitats. These include swamps and marshes, margins of rivers and lakes, damp or flooded grasslands, pastures or agricultural lands, reservoirs, sewage treatment ponds, drainage channels, salt pans and salt lakes, salt marshes, estuarine mudflats, tidal streams, mangrove swamps, coastal lagoons and offshore reefs (DSEWPaC, 2013d). <b>Likely in GTP RoW</b>
<i>Ardea ibis</i>	Cattle egret	Migratory / -	JAMBA/CAMBA	Occurs in tropical and temperate grasslands, wooded lands and terrestrial wetlands. Often observed in moist, low-lying poorly drained pastures with an abundance of high grass; avoiding low grass pastures (DSEWPaC, 2013e). <b>Likely within GTP RoW</b> , potentially as foraging amongst cattle
<i>Ephippiorhynchus asiaticus</i>	Black-necked stork	- / NT	N/A	Inhabits wetlands, such as floodplains of rivers with large shallow swamps and pools, and deeper permanent bodies of water. Occasionally individuals will stray into open grass, woodland areas or flooded paddocks in search of food (Birds in Backyards, 2013a). <b>Potentially in GTP RoW</b>
<i>Erythrotriorchis radiatus</i>	Red goshawk	V / E	N/A	The Red goshawk nests in large trees, frequently the tallest and most massive in a tall stand, and nest trees are invariably within 1 km of permanent water (DSEWPaC, 2013f). Red goshawks occupy a range of habitats, often at ecotones, including coastal and sub-coastal tall open forest, tropical savannahs crossed by wooded or forested watercourses, woodlands, the edges of rainforest and gallery forests along watercourses, and wetlands that include Melaleuca and Casuarina species (EPA, 2006b). <b>Unlikely in GTP RoW</b>

Scientific name	Common name	EPBC/NC Act listing	JAMBA/CAMBA/ROKAMBA/Bonn	Notes
<i>Geophaps scripta scripta</i>	Squatter pigeon	V / V	N/A	Ground dwelling. Occurs mainly in grassy woodlands and open forests that are dominated by eucalypts. It has also been recorded in sown grasslands with scattered remnant trees, disturbed habitats (ie around stockyards, along roads and railways, and around settlements). The species is commonly observed in habitats that are located close to bodies of water (DSEWPaC, 2013g). <b>Previously recorded in the GTP RoW</b>
<i>Grantiella picta</i>	Painted honey-eater	- / V	N/A	Prefers dry open forests and woodlands, and is strongly associated with mistletoe. It may also be found along rivers, on plains with scattered trees and on farmland with remnant vegetation (Birds in Backyards, 2013b). <b>Potentially in GTP RoW</b>
<i>Haliaeetus leucogaster</i>	White-bellied sea eagle	Migratory / -	CAMBA	Is found in coastal habitats and around terrestrial wetlands in tropical and temperate regions of mainland Australia and its offshore islands. The habitats are characterised by the presence of large areas of open water (larger rivers, swamps, lakes, the sea). Birds have been recorded in (or flying over) a variety of terrestrial habitats (Marchant & Higgins, 1993). Builds a very large nest of sticks generally in a tall, live tree near water. <b>Potentially in GTP RoW</b>
<i>Hirundapus caudacutus</i>	White-throated needle tail	Migratory / -	JAMBA/CAMBA	Is almost exclusively aerial and although they occur over most types of habitat, they are probably recorded most often above wooded areas, including open forest and rainforest (DSEWPaC, 2013h). Spend the non-breeding season in Australasia, mainly in Australia. <b>Unlikely to be found directly in GTP RoW</b> ; if found it will be flying overhead
<i>Lophoictinia isura</i>	Square-tailed kite	- / NT	N/A	Forages over coastal and sub-coastal, eucalypt-dominated open forests and woodlands, and inland riparian woodland. It particularly favours productive forests on the coastal plain, box-ironbark-gum woodlands on the inland slopes, and Coolibah / River red gum on the inland plains (Marchant & Higgins, 1993). <b>Potentially within GTP RoW</b>
<i>Melithreptus gularis</i>	Black-chinned honeyeater	- / NT	N/A	Is found in the upper levels of open eucalypt forests and woodlands dominated by box and ironback eucalypts and is often found along waterways (Birds in Backyards, 2013c). <b>Potentially in GTP RoW</b>

Scientific name	Common name	EPBC/NC Act listing	JAMBA/CAMBA/ROKAMBA/Bonn	Notes
<i>Merops ornatus</i>	Rainbow bee-eater	Migratory / -	JAMBA	Occurs mainly in open forests and woodlands, shrub lands, and in various cleared or semi-cleared habitats, including farmland and areas of human habitation (Higgins, 1999). Uses stream banks for nesting; the breeding season extends from August to January. <b>Likely in GTP RoW</b>
<i>Neochmia ruficauda ruficauda</i>	Star finch	E / E	N/A	Mainly occurs in grasslands and grassy woodlands, often in close proximity to fresh water (DSEWPaC, 2013i). <b>Potentially in GTP RoW</b>
<i>Ninox strenua</i>	Powerful owl	- / V	N/A	Found in open forests and woodlands, as well as along sheltered gullies in wet forests with dense understoreys, especially along watercourses. Requires old growth trees to nest (Birds in Backyards, 2013d). <b>Potentially in GTP RoW</b>
<i>Poephila cincta</i>	Black-throated finch	E / E	N/A	Found in grassy, open woodlands and forests, typically dominated by <i>Eucalyptus</i> , <i>Corymbia</i> and <i>Melaleuca</i> , and occasionally in tussock grasslands or other habitats (for example freshwater wetlands), often along or near watercourses, or in the vicinity of water (DSEWPaC, 2013j). <b>Potentially within GTP RoW</b>
<i>Rostratula australis</i>	Australian painted snipe	V (Migratory) / V	CAMBA	Generally inhabits shallow terrestrial freshwater (occasionally brackish) wetlands, including temporary and permanent lakes, swamps and claypans. They also use inundated or waterlogged grassland or saltmarsh, dams, rice crops, sewage farms and bore drains. Typical sites include those with rank emergent tussocks of grass, sedges, rushes or reeds, or samphire; often with scattered clumps of lignum <i>Muehlenbeckia</i> or canegrass or sometimes tea-tree ( <i>Melaleuca</i> ) (DSEWPaC, 2013k). <b>Unlikely in GTP RoW</b>



Scientific name	Common name	EPBC/NC Act listing	JAMBA/CAMBA/ ROKAMBA/Bonn	Notes
<i>Turnix melanogaster</i>	Black-breasted button quail	V / V	N/A	Ground dwelling. Restricted to rainforests and forests, mostly in areas with 770-1200 mm rainfall per annum. Prefers drier low closed forests, particularly semi-evergreen vine thicket. Many reports are from dry forest described as bottle tree scrub, comprising Brigalow ( <i>Acacia harpophylla</i> ), Belah ( <i>Casuarina cristata</i> ) and Narrow leaved bottle tree ( <i>Brachychiton rupestris</i> ), with or without emergent Hoop pine ( <i>Araucaria cunninghamii</i> ), with a shrub understorey and thick litter layer. Much of this vegetation type, especially in the Fitzroy and Dawson valleys has been grossly depleted (DSEWPaC, 2013i). Will utilise areas infested with lantana. <b>Potentially within GTP RoW</b> within areas containing a thick understorey stratum
<i>Accipiter novaehollandiae</i>	Grey goshawk	- / NT	N/A	Found in a variety of forest types, especially tall closed forests, including rainforests (Birds in Backyards, 2013e). <b>Potentially in GTP RoW</b>
<i>Esacus magnirostris</i>	Beach-stone curlew	- / V	N/A	Is usually found on open, undisturbed beaches, islands, reefs, and estuarine intertidal sand and mudflats, preferring beaches with estuaries or mangroves nearby. However, this species also frequents river mouths, offshore sandbars associated with coral atolls, reefs and rock platforms and coastal lagoons (DEHP, 2013f). <b>Potentially in GTP RoW</b> . Previously recorded in close proximity to RoW (Footprints, 2012b)
<i>Nettapus coromandelianus</i>	Cotton-pygmy goose	- / NT	N/A	Is an almost entirely aquatic species. Preferred habitat is deep freshwater lagoons, swamps and dams, particularly those with waterlilies or other floating vegetation, such as <i>hydrilla</i> , <i>ceratophyllum</i> , <i>vallisneria</i> , <i>najas</i> , <i>lemna</i> and <i>chara</i> (Marchant & Higgins, 1990). <b>Unlikely in RoW</b>
<i>Numenius madagascariensis</i>	Eastern curlew	- / NT	JAMBA/CAMBA/ ROKAMBA/Bonn	Most commonly associated with sheltered coasts, especially estuaries, bays, harbours, inlets and coastal lagoons, with large intertidal mudflats or sandflats, often with beds of seagrass (DSEWPaC, 2013n). <b>Potentially in GTP RoW</b> , most likely just outside RoW associated with tidal flats close to The Narrows

Scientific name	Common name	EPBC/NC Act listing	JAMBA/CAMBA/ROKAMBA/Bonn	Notes
<i>Sternula albifrons</i>	Little tern	Migratory / E	JAMBA/CAMBA/ROKAMBA/Bonn	Inhabits sheltered coastal environments, including lagoons, estuaries, river mouths and deltas, lakes, bays, harbours and inlets, especially those with exposed sandbanks or sand-spits, and also on exposed ocean beaches (DSEWPaC, 2013m). <b>Potentially in GTP RoW</b> , most likely just outside RoW associated with tidal flats close to The Narrows

Further details for the species identified in Tables 4.1 and 4.2 can be obtained from the Species Management Plan (SMP) (GLNG, 2012b) and the Significant Species Management Plan (SSMP) (GLNG, 2013a).

## 4.2 Survey results

Fourteen fauna species of significance (listed under the provisions of the NC Act and/or the EPBC Act) were opportunistically identified within or in close proximity to the GTP RoW (KP312 to KP408.81) (refer Table 4.3).

**Table 4.3 Fauna species observed within the GTP ROW between KP312 and KP408.81**

Scientific name	Common name	EPBC Act / NC Act / JAMBA / CAMBA / ROKAMBA / Bonn	KP location
<b>Birds</b>			
<i>Geophaps scripta scripta</i>	Squatter pigeon	V / V / - / - / - / -	KP376.45 (x2) KP350 to KP380 KP384 to KP386 KP397 to KP408
<i>Haliaeetus leucogaster</i>	White-bellied sea-eagle	Migratory / - / - / CAMBA / - / -	KP360.33* KP384 to KP386 KP397 to KP408
<i>Lophoictinia isura</i>	Square-tailed kite	- / NT / - / - / - / -	KP397 to KP408
<i>Merops ornatus</i>	Rainbow bee-eater	Migratory / - / JAMBA / - / - / -	KP314.80# KP326.07# KP333.15# KP341.45# (x2) KP342.35 KP344.25 KP350 to KP380 KP365.25 KP384 to KP386 KP397 to KP408 KP408
<i>Monarcha melanopsis</i>	Black-faced monarch	Marine / - / - / - / - / Bonn	KP397 to KP408
<i>Pandion cristatus</i>	Eastern osprey	Marine / - / - / - / - / Bonn	KP397 to KP408
<i>Myiagra cyanoleuca</i>	Satin flycatcher	Migratory / - / - / - / - / Bonn	KP352.3
<i>Ephippiorhynchus asiaticus</i>	Black-necked stork	- / NT / - / - / - / -	KP397 to KP408

Scientific name	Common name	EPBC Act / NC Act / JAMBA / CAMBA / ROKAMBA / Bonn	KP location
<i>Esacus magirostris</i>	Beach-stone curlew	- / V / - / - / - / -	KP397 to KP408
<i>Egretta sacra</i>	Eastern reef egret	Migratory / - / - / CAMBA / - / -	KP397 to KP408
<b>Mammals</b>			
<i>Phascolarctos cinereus</i>	Koala	V / V / - / - / - / -	KP325.4 to KP326.7* KP375.634 KP374.45 KP397 to KP408
<i>Tachyglossus aculeatus</i>	Short-beaked echidna	- / SLC / - / - / - / - / -	KP340 to KP341^ KP366.05 KP350 to KP380 KP397 to KP408

**Table notes:** # Species identified just out of the RoW  
 \* Flying directly above GTP RoW  
 ^ Evidence of diggings  
 \*\* Scratches most likely belonging to the koala

## 5 Declared weeds and feral pests



### 5.1 Declared weeds







A total of thirteen declared weed species as listed under the provisions of the LP Act were identified as occurring within the GTP RoW (KP312 to KP408.81). These species are presented in Table 5.1 and Table 5.2. Seven of the thirteen species are also listed as weeds of national significance (WoNS). Further information and management measures for declared weeds and feral pests can be found in the GLNG Gas Transmission Pipeline Pest and Weed Management Plan (GLNG, 2012c).






**Table 5.1 WoNS and LP Act listed weeds observed within the GTP RoW between KP312 to KP408.81**

Scientific name	Common name	WoNS listed	LP Act Class
<i>Acacia nilotica</i>	Prickly acacia	Yes	2
<i>Bryophyllum delagoense</i>	Mother-of-millions	No	2
<i>Cascabela thevetia</i>	Yellow oleander	No	3
<i>Celtis sinensis</i>	Chinese celtis	No	3
<i>Cryptostegia grandiflora</i>	Rubber vine	Yes	2
<i>Lantana camara</i>	Lantana	Yes	3
<i>Lantana montevidensis</i>	Creeping lantana	No	2
<i>Macfadyena unguis-cati</i>	Cats claw creeper	Yes	2
<i>Opuntia stricta</i>	Prickly pear	Yes	2
<i>Opuntia tomentosa</i>	Velvet tree pear	Yes	2
<i>Parthenium hysterophorus</i>	Parthenium	Yes	2
<i>Schinus terebinthifolius</i>	Broad-leaved pepper tree	No	3
<i>Sporobolus pyramidalis</i>	Giant rat's tail grass	No	2

**Table 5.2 WoNS and LP Act listed weeds found within the GTP RoW between KP312 and KP408.81**

Description	Significance of species	Photograph
<i>Acacia nilotica</i> (Prickly acacia)	WoNS listed; this is a Class 2 declared weed under the LP Act	 Ausecology (2012)
<i>Bryophyllum delagoense</i> (Mother-of-millions)	Class 2 declared weed under the LP Act. Poisonous to livestock	 Ausecology (2012)

Description	Significance of species	Photograph
<i>Cascabela thevetia</i> (Yellow oleander)	Class 3 declared weed under the LP Act	 <p>Ausecology (2012)</p>
<i>Celtis sinensis</i> (Chinese celtis)	Class 3 declared weed under the LP Act	 <p>Ausecology (2012)</p>
<i>Cryptostegia grandiflora</i> (Rubber vine)	WoNS listed this is a Class 2 declared weed under the LP Act	 <p>Ausecology (2012)</p>
<i>Lantana camara</i> (Lantana)	WoNS listed, this is a Class 3 declared weed under the LP Act	 <p>Ausecology (2012)</p>
<i>Lantana montevidensis</i> (Creeping lantana)	Class 3 declared weed under the LP Act	 <p>Ausecology (2012)</p>
<i>Macfadyena unguis-cati</i> (Cats claw creeper)	WoNS listed, this is a Class 3 declared weed under the LP Act	 <p>Ausecology (2012)</p>

Description	Significance of species	Photograph
<i>Opuntia stricta</i> (Prickly pear)	WoNS listed, this is a Class 2 declared weed under the LP Act	 Ausecology (2012)
<i>Opuntia tomentosa</i> (Velvet tree pear) found throughout GTP RoW from KP312 to KP341	WoNS listed this is a Class 2 declared weed under the LP Act	 Ausecology (2012)
<i>Parthenium hysterophorus</i>	WoNS listed, this is a Class 2 declared weed under the LP Act	 Ausecology (2012)
<i>Schinus terebinthifolius</i> (Broadleaved pepper tree)	Class 3 declared weed under the LP Act	 Ausecology (2012)
<i>Sporobolus pyramidalis</i> (Giant rat's tail grass)	Class 2 declared weed under the LP Act	 Ausecology (2012)

**Table notes:** <sup>1</sup>Further information pertaining to control methods for LP Act declared species can be found on the Queensland Government Department of Agriculture, Fisheries and Forestry Declared Plants of Queensland webpage: [http://www.daff.qld.gov.au/4790\\_7005.htm](http://www.daff.qld.gov.au/4790_7005.htm)

## 5.2 Other environmental weeds

While mapping for this pre-clearance survey focused on the WoNS and LP Act listed weeds, details of other non-native flora species identified as being of environmental concern/undesirable were noted during field investigations. These species are presented in Table 5.3.

While these weeds are a low priority and consisted primarily of annual species, they were noted as they may potentially become a nuisance as a result of population explosion following ground disturbance in areas where they currently exist. Native species occurring within their natural range have not been listed as weeds as these species can be, at worst, a mild nuisance for agriculturalists. However species such as native chenopods can provide food and shelter for many species of native fauna.

**Table 5.3 Other environmental weeds identified within the GTP RoW between KP312 and KP408.81**

Family	Scientific name	Common name
Asteraceae	<i>Ageratum houstonianum</i>	Blue billygoat weed
Papaveraceae	<i>Argemone spp.</i>	Mexican poppy
Aristolochiaceae	<i>Aristolochia elegans</i>	Dutchman's pipe
Asteraceae	<i>Bidens pilosa</i>	Spanish needle or Beggar's ticks
Crassulaceae	<i>Bryophyllum pinnatum</i>	Resurrection plant
Asteraceae	<i>Cirsium vulgare</i>	Spear thistle
Asteraceae	<i>Conyza bonariensis</i>	Flaxleaf fleabane
Poaceae	<i>Cynodon dactylon</i>	Green couch grass
Cyperaceae	<i>Cyperus involucratus</i>	Umbrella sedge
Poaceae	<i>Eragrostis curvula</i>	African lovegrass
Verbenaceae	<i>Glandularia aristigera</i>	Mayne's pest
Apocynaceae	<i>Gomphocarpus physocarpus</i>	Balloon cotton bush
Cactaceae	<i>Hylocereus undatus</i>	Dragon fruit
Poaceae	<i>Hyparrhenia rufa</i>	Thatch grass
Poaceae	<i>Megathyrsus maximus var. pubiglumis</i>	Green panic
Poaceae	<i>Melinis repens</i>	Red natal grass
Portulacaceae	<i>Portulaca pilosa subsp. pilosa</i>	Hairy pigweed
Euphorbiaceae	<i>Ricinus communis</i>	Castor oil
Caesalpinaceae	<i>Senna pendula var. glabrata</i>	Easter cassia
Malvaceae	<i>Sida cordifolia</i>	Bala, Country mallow, Flannel weed
Poaceae	<i>Sorghum halepense</i>	Johnson grass
Verbenaceae	<i>Verbena bonariensis</i>	Purple-top verbena
Verbenaceae	<i>Verbena incompta</i>	Purple-top verbena
Asteraceae	<i>Xanthium occidentale</i>	Noogoora burr
Rutaceae	<i>Citrus x limon</i>	Bush lemon

*Hyparrhenia rufa* (Thatch grass) was identified growing in the area, in particular along road sides and in some areas within the GTP RoW and has been regarded as an environmental weed. This tall grass is mainly a weed of roadsides and disturbed sites; however it is starting to spread away from these habitats and is beginning to dominate native pastures and grasslands. It replaces native grasses, particularly after fires, and dominates the understorey of open woodland areas. This adds to the fuel load of these areas, which increases the frequency and intensity of future fires and leads to a destructive cycle, eventually replacing the native savannahs and woodlands with exotic grassland (Queensland Government, 2011a).

*Eragrostis curvula* (African lovegrass) was identified growing in the open grazing area between the Callide and Calliope Ranges. *Eragrostis curvula* has already invaded large parts of Australia and is a major environmental weed in this country. It is currently regarded as a significant environmental weed in Victoria, the ACT, New South Wales, Queensland and Western Australia (Queensland Government, 2011b).

### **5.3 Feral pests**

Five feral fauna species declared as Class 2 species under provisions of the LP Act have been observed within the GTP RoW (KP312 to KP408.81). These species include *Sus scrofa* (feral Pig), *Canis lupus dingo* (wild Dog), *Felis catus* (feral Cat), *Oryctolagus cuniculus* (Rabbit) and *Vulpes vulpes* (Red fox).

*Rhinella marina* (Cane toad), a key threatening process listed under the EPBC Act, has also been recorded in various locations throughout the GTP RoW (KP312 to KP408.81).






## 6 Habitat features




Habitat features present in the open pasture sections of the GTP RoW from KP341.3 to KP397.8 and KP402 to KP404.07 section were concentrated at the water features in the form of hollow bearing trees and fallen logs. Fallen logs were also present in much lower densities throughout the open pasture sections but were often isolated and exposed. There were also a high number of hollow-bearing trees (*Eucalyptus moluccana*) with high potential for habitat at KP388.97 to KP389.20.

A few nests were located in the GTP RoW, some of which were active at the time of the survey. Rocky outcrops were very sparse in comparison to previous sections (KP0 to KP312).

The vegetated areas contained more habitat features in the form of fallen logs, hollow bearing trees and trees with loose bark. Furthermore, fallen debris was much more prominent in these vegetated areas, in particular from KP398.84 to KP399.61, where rainforest species were present in RE 11.11.3. Within this same section heavy infestations of *Lantana camara* (Lantana), have been chemically treated close to the track providing habitat in the form of dense stands of dead thicket and a significant layer of leaf litter. A summary of the key habitat features located within the GTP RoW between KP312 to KP408.81 are listed in Table 6.1.

**Table 6.1** Habitat features identified within GTP RoW between KP312 and KP408.81

Description	Ecological value	Photograph
Fallen logs, large branches, log/timber	Habitat for reptiles (snakes, geckos etc), small mammals and birds	 <p>Ausecology (2012)</p>
Trees of various sizes with loose bark – trees can be dead or alive	Habitat for reptiles (snakes, geckos etc) and bats	 <p>Ausecology (2012)</p>
Dead tree	Strong value in hollows	 <p>Ausecology (2012)</p>

Description	Ecological value	Photograph
Intact Birds nest in tree	Nesting sites and habitat for birds which provide important ecological functions such as pollination, insect eradication, and rodent predation	 <p>Ausecology (2012)</p>
Terrestrial Termite nest	A number of species live inside and feed on termites and their eggs such as Echidna, Red-naped snake, Blind snake, Geckoes, Spotted python etc and Goannas lay their eggs in the termite nest	 <p>Ausecology (2012)</p>
Rocky outcrops	Provides habitat and shelter for fauna species (fauna hides in the (small) cracks of the rocks)	 <p>Ausecology (2012)</p>

## 7 Isolated Trees

Isolated trees contained within paddocks were prominent features within this section of the GTP RoW (KP312 to KP408.81). Species that commonly occurred as isolated trees are presented in Table 7.1. At the local scale, ecological functions of isolated trees contained within paddocks may include:

- Provision of a distinct microclimate
- Increased soil nutrients
- Increased plant species richness
- Habitat for animals

At the landscape scale, ecological roles include:

- Landscape-scale tree cover
- Limited connectivity for animals
- Genetic connectivity for tree populations
- Provision of genetic material and focal points for potential future large-scale ecosystem restoration

**Table 7.1 Common paddock trees within the GTP RoW between KP312 and KP408.81**

Scientific name	Common name	Value
<i>Corymbia erythrophloia</i>	Inland bloodwood	Mature plants provide shelter and habitat for small bird species
<i>Corymbia tessellaris</i>	Moreton bay ash	Low to medium value in hollows
<i>Erythrina vespertilio</i>	Bat's wing coral tree	Mature plants provide shelter and habitat for small bird species
<i>Eucalyptus crebra</i>	Narrow-leaved ironbark	Strong value in hollows in mature trees, particularly old specimens
<i>Eucalyptus melanophloia</i>	Silver-leaved ironbark	Medium value in hollows
<i>Eucalyptus moluccana</i>	Grey box	Medium value in hollows in mature trees; strong value in hollows in old specimens
<i>Eucalyptus populnea</i>	Poplar box	Medium value in hollows in mature trees; strong value in hollows in old specimens
<i>Eucalyptus tereticornis</i>	Queensland blue gum	Strong value in hollows in mature trees, particularly old specimens
<i>Ficus rubiginosa</i>	Rock fig	Spreading densely shading tree when mature

## 8 Watercourse Assessments

A total of 32 watercourse crossings were identified between KP312 and KP408.81 of the GTP RoW. These areas and their respective location along the GTP RoW are provided in Table 8.1. Watercourses were assessed to verify that they are consistent with the definition of a watercourse under the *Water Act 2000*. Further information with respect to watercourse aquatic values is provided in the GLNG Gas Transmission Pipeline Aquatic Values Management Plan Mainland KP0-KP406 and Curtis Island KP410-KP420.

**Table 8.1 Watercourse crossings along the GTP RoW between KP312 and KP408.81**

Watercourse name	KP location	Stream order	Vegetation status
Collards Creek	KP319.10	3	Remnant
Unnamed Minor watercourse 133	KP320.52	2	Remnant
Unnamed Minor watercourse 134	KP320.64	2	Remnant
Unnamed Minor watercourse 136	KP328.37	1	Remnant
Bell Creek	KP334.50	5	Remnant
Unnamed Minor watercourse 144	KP345.59	2	Non-remnant
Unnamed Minor watercourse 152	KP352.06	1	Remnant
Calliope River	KP352.30	3	Remnant
Unnamed Minor watercourse 154	KP353.41	1	Non-remnant
Unnamed Watercourse 9	KP354.30	3	Non-remnant
Unnamed Watercourse 10	KP359.40	4	Non-remnant
Harper Creek	KP360.30	3	Remnant
Alarm Creek	KP364.80	3	Remnant
Unnamed Minor watercourse 161	KP365.71	2	Non-remnant
Unnamed Minor watercourse 164	KP366.27	1	Non-remnant
Unnamed Minor watercourse 171	KP374.39	2	Non-remnant
Gravel Creek	KP375.60	3	Non-remnant
Unnamed Minor watercourse 172	KP375.7	1	Non-remnant
Larcom Creek (KP378.00)	KP378.00	3	Remnant
Unnamed Minor watercourse 175	KP380.73	1	Non-remnant
Larcom Creek (KP384.70)	KP384.70	3	Non-remnant
Unnamed Minor watercourse 182	KP391.1	1	Non-remnant

<b>Watercourse name</b>	<b>KP location</b>	<b>Stream order</b>	<b>Vegetation status</b>
Unnamed Minor watercourse 184	KP396.76	1	Non-remnant
Unnamed Minor watercourse 190	KP399.21	1	Remnant
Unnamed Minor watercourse 193	KP399.68	1	Non-remnant
Unnamed Minor watercourse 195	KP400.03	1	Non-remnant
Unnamed Minor watercourse 196	KP400.13	1	Non-remnant
Unnamed Minor watercourse 198	KP400.8	1	Remnant
Unnamed Minor Watercourse 202	KP406.78	1	Remnant
Humpy Creek	KP407.90	3	Non-remnant
Unnamed Minor Watercourse 203	KP408.17	1	Non-remnant
Targinnie Creek	KP408.50	2	Non-remnant

Several farm dams also occur adjacent to the GTP RoW (KP312 to KP408.81), refer Section 10. These dams were characterised by open bodies of water with no standing, fringing vegetation. Dam margins were dominated by pasture grasses.

## 9 Erosion

In general, current erosion issues within the GTP RoW between KP312 and KP408.81 were observed to be generally low to moderate in magnitude. Most erosion within this area is mainly associated with drainage features and watercourses in the form of bank erosion.




In general, current erosion issues in the KP312 to KP408.81 are low to moderate mainly due to the nature of the terrain (eg flat terrain and undulating hills). Erosion is mainly associated with drainage features and watercourses in the form of bank erosion and most notably at KP318.6 to KP318.83, associated with a steep north facing slope with limited ground layer vegetation and at KP398.06, KP402.47 and KP406.78. Erosion was also present at KP320.73 and KP328.96 in the form of bank erosion associated with the water feature at this location. A very steep slope with severe erosion present was mapped at KP338.90. A large *Lantana camara* infestation was all associated with this cliff and erosion point. Some severe erosion was present at KP388.19 and KP389.16 with smaller patches of sink-hole erosion located at KP353.44.


When vegetation is removed, erosion may become an issue if not managed properly, in particular at the steeper slopes throughout the Callide and Calliope Ranges.

## 10 Ponds and dams

Three man-made dams or natural ponds were located within the GTP RoW and also mapped was a windmill leading to a cattle watering point, tank and trough. A natural spring is present just north-west of the RoW at KP370.2. The location of these areas along the GTP RoW is provided in Table 10.1.

**Table 10.1 Ponds and dams present in the GTP RoW between KP312 and KP408.81**

KP	Status	Photo
KP373.31	Dam in use, water present	 <p>Ausecology (2012)</p>
KP374.61	Dam in use, water present; just off the GTP RoW	 <p>Ausecology (2012)</p>
KP379.97	Windmill in RoW	 <p>Ausecology (2012)</p>

KP	Status	Photo
KP403.16	Dam in use, water present; just encroaching on the GTP RoW	 <p data-bbox="1070 584 1230 607">Ausecology (2012)</p>



## 11 Specific Survey Results

### 11.1 KP312 to KP318

KP312 to KP318 consisted predominantly of *Eucalyptus/Corymbia* open forests to woodlands of various RE's on landzones 10, 11 and 3. The first part of this section is dominated by *Eucalyptus crebra* with or without *Corymbia citrodora*.



Plate 1 Characteristic vegetation between KP312 to KP315 dominated by *Eucalyptus crebra* and *Corymbia citrodora*



Plate 2 Characteristic vegetation between KP312 to KP315 dominated by *Eucalyptus crebra* and *Corymbia citrodora*



Plate 3 Characteristic vegetation between KP312 to KP315 dominated by *Eucalyptus crebra* and *Corymbia citrodora*



Plate 4 Characteristic vegetation between KP312 to KP315 dominated by *Eucalyptus crebra* and *Corymbia citrodora*

From KP312 to KP315, the area has been affected by a fire (15 to 18 months ago) impacting mainly on the understory and mid-storey layers, which are currently sparsely vegetated (refer Plate 1 to Plate 4) and with numerous specimens of *Acacia pedleyi*, listed as Vulnerable under the NC Act, burned (refer Plate 5). However, various unaffected *Acacia pedleyi* specimens were present and recruitment of species is evident, including new growth of *Acacia pedleyi*.



**Plate 5** Fire affected area between KP312 and KP315 with the dead EVNT species *Acacia pedleyi*

From KP315 to KP315.08 a patch of dense vegetation with SEVT and rainforest species was identified resembling a mixed polygon of No Concern at Present RE 11.3.26 and Of Concern RE 11.10.8 (refer Plate 6 and Plate 7). Two very large *Brachychiton rupestris* trees were present in this section. The RE 11.10.8 extends up the hill to the north-west and the GTP RoW transects it at its south-eastern boundary. The dense vegetation opens up at KP315.08 to *Eucalyptus moluccana*, *Eucalyptus crebra* and *Corymbia citriodora* overstorey with SEVT/rainforest species in the mid and understorey (up to KP315.33). Although this area is infested with declared weeds (Lantana, Cat's claw creeper and Mother-of-millions) these rainforest species will provide a good food source for fauna in the area (refer Plate 6 and Plate 7). Table 11.1 and Table 11.2 summarises the main SEVT/rainforest species identified in the densely vegetated area and the *Eucalyptus moluccana* overstorey area.

**Table 11.1** SEVT/rainforest species in the dense SEVT section (KP315 to KP315.08)

<i>Acacia fasciculifera</i>	<i>Acalypha eremorum</i>	<i>Alchornea ilicifolia</i>
<i>Alectryon diversifolius</i>	<i>Alectryon subdentatus</i>	<i>Alyxia ruscifolia</i>
<i>Arytera divaricata</i>	<i>Brachychiton rupestris</i>	<i>Bursaria spinosa</i>
<i>Capparis arborea</i>	<i>Capparis loranthifolia</i>	<i>Cissus oblonga</i>
<i>Coatesia paniculata</i>	<i>Crotalaria insularis</i>	<i>Cyclophyllum coprosmoides</i>
<i>Diospyros geminata</i>	<i>Diospyros humilis</i>	<i>Drypetes deplanchei</i>
<i>Gossia bidwillii</i>	<i>Grewia latifolia</i>	<i>Jasminum simplicifolium</i>
<i>Murraya ovatifoliolata</i>	<i>Owenia venosa</i>	<i>Psyrdrax longipes</i>
<i>Psyrdrax odorata</i>	<i>Turraea pubescens</i>	

**Table 11.2 Additional species in the *Eucalyptus moluccana* vegetation (KP315.08 to KP315.33)**

<i>Acacia crassa</i> subsp. <i>longicoma</i>	<i>Acacia pedleyi</i>	<i>Atalaya salicifolia</i>
<i>Brachychiton australis</i>	<i>Cassinia laevis</i>	<i>Cryptocarya triplinervis</i>
<i>Denhamia pittosporoides</i>	<i>Dodonaea triangularis</i>	<i>Eremophila mitchellii</i>
<i>Eustrephus latifolia</i>	<i>Flindersia australis</i>	<i>Maytenus cunninghamii</i>
<i>Myrsine variabilis</i>	<i>Notelaea microcarpa</i>	<i>Pavetta australiensis</i>
<i>Polyscias elegans</i>	<i>Santalum lanceolatum</i>	<i>Solanum furfuraceum</i>
<i>Solanum parviflora</i>	<i>Solanum stelligerum</i>	<i>Sterculia quadrifida</i>
<i>Zanthoxylum brachyandrum</i>		



Plate 6 SEVT/rainforest area at KP315 to KP315.08



Plate 7 SEVT/rainforest area at KP315 to KP315.08

At KP315.33, the forest opens up with *Eucalyptus moluccana* as the dominant species (RE 11.3.26) (refer Plate 8), changing to RE 11.10.13 (with some elements of RE 11.10.4 characterised by *Eucalyptus decorticans* on a rocky gentle slope) (refer Plate 9). The last stretch of this section is characterised by open woodlands with *Eucalyptus crebra* and *Corymbia erythrophloia* as the dominant species (RE 11.11.15).



Plate 8 *Eucalyptus moluccana* dominated tall open forest from KP315.33 to KP316.14



Plate 9 RE 11.10.13 with some elements of RE 11.10.4 at KP316.14 to KP316.45



Plate 10 Vegetation with *Eucalyptus decorticans* at KP316.2 to KP317.16



Plate 11 Open woodland vegetation of RE 11.11.15

The canopy at KP315.4 was dominated by *Eucalyptus moluccana*, and the shrub layer consisted of *Psydrax oleifolia*, *Eremophila mitchellii*, *Bursaria spinosa* and *Opuntia tomentosa* (declared weed). The ground cover was predominantly *Aristida contorta* and *Capparis* sp. Fauna species noted during the survey at KP315.4 were *Cracticus tibicen* (Australian magpie), *Pachycephala rufiventris* (Rufous whistler), *Dicrurus bracteatus* (Spangled drongo), *Pomatostomus temporalis* (Grey-crowned babbler), *Corvus orru* (Torresian crow) and *Strepera graculina* (Pied currawong). Specimens of *Acacia pedleyi* were also noted at KP315.4, and a *Desmodium macrocarpum* specimen, listed as Near Threatened under the NC Act, was noted at KP317.

Three EVNT species were identified in the KP312 to KP318 section of the GTP RoW as listed in Table 11.3. *Acacia pubicosta*, listed as Near Threatened under the NC Act, which has been previously recorded within the GTP RoW between KP312.7 to KP313 and HERBRECS records are present in the Callide Range, was not identified during this survey. This is due to the area being affected by fire within the last 9 to 12 months, with *Acacia pubicosta* not recruiting from seed at the time of the survey. *Acacia pedleyi* has been affected by the fire as well with only a small number of larger specimens present. However, currently there is significant recruitment of juvenile specimens at the small population located at KP314.36 and the KP314.71 to KP315 section, with most of the individuals between 5 and 50 cm tall. In the KP316.11 to KP316.28 section, where the fire appears to be more recent, recruitment of *Acacia pedleyi* has not yet taken place.

Five Type A species were identified in the KP312 to KP318 section. Table 11.4 lists the Type A species within the GTP RoW (KP312 to KP408.81).

Table 11.3 EVNT species identified within KP312 to KP318 of the GTP RoW

EVNT species	Number of specimens	Comments
<i>Acacia pedleyi</i>	3,011	Fire affected area; recruitment of juvenile specimens evident in some locations. 2,612 seedlings were estimated to be present and 401 larger (greater than 50 cm) individuals
<i>Desmodium macrocarpum</i>	56	-
<i>Cycas megacarpa</i>	52	Two population clusters, one located at approximately KP314.5 and the other located between KP317.7 and KP317.9

**Table 11.4 Type A species identified within KP312 to KP318 of the GTP RoW**

Type A species	Number of specimens	Comments
<i>Brachychiton australis</i>	2	-
<i>Brachychiton populneus</i>	78	A few larger specimens, but most specimens were smaller than 1.5 m tall
<i>Brachychiton rupestris</i>	46	Two very large specimens in the SEVT/rainforest section between KP315.08 to KP315.33
<i>Cymbidium canaliculatum</i>	10	-
<i>Macrozamia macleayi</i>	12	-

Declared weeds identified in this section included scattered *Opuntia* specimens (*Opuntia tomentosa* and *Opuntia stricta*) throughout and a dense infestation of *Macfadyena unguis-cati* (Cat's claw creeper) in the KP315.09 to KP315.34 section (refer Plate 12 and Plate 13). *Lantana camara* (Lantana) is present as scattered individual bushes with the occasional denser infestation and *Lantana montevidensis* (Creeping lantana) is present throughout this section. *Bryophyllum delagoense* (Mother-of-millions), flowering at the time of the survey, is present between KP315.07 and KP315.46.



**Plate 12 Weed (Cat's claw creeper) infested SEVT/rainforest area at KP315.09 to KP315.34**



**Plate 13 Weed (Cat's claw creeper) infested SEVT/rainforest area at KP315.09 to KP315.34.**

This section contains a large number of habitat trees and a large number of fallen logs. However, due to the fire that burned part of this section, fallen debris (twigs, leaves etc) other than large logs is limited.

Some minor erosion is present at the creek banks between KP315.49 and KP315.53.

Aurecon ecologists undertook further surveys at KP312.6; this confirmed that the canopy layer consisted of *Corymbia citrodora*, *Corymbia clarksoniana* and *Eucalyptus crebra*. These species were also found in the lower shrub layer along with *Alphitonia excelsa*. The ground layer was dominated by *Melinis repens*, *Eragrostis fallax*, *Cymbopogon refractus* and *Lantana montevidensis* (Creeping lantana). At the time of survey, the area had recently been burned however potential habitat features were still present. The canopy was still intact and likely to provide good perching and foraging opportunities, fissured tree bark was present along with abundant amounts of woody debris and a limited supply of leaf litter was also evident. *Aprosmictus erythropterus* (Red winged parrot) was opportunistically noted at KP312.6 during the survey.

At KP314.25, the canopy layer was comprised of *Eucalyptus crebra*, *Corymbia clarksoniana* and *Brachychiton populneus*. The shrub layer was dominated by *Bursaria spinosa*, *Acacia leiocalyx* and *Petalostigma pubescens*, while the ground layer was dominated by *Sida hackettiana*, *Sida* sp, *Alphitonia excelsa* and *Lantana montevidensis* (Creeping lantana). The key habitat features which were present at this location included canopy cover, fissured tree bark and the presence of woody debris. Fauna species noted during the survey included *Smicrornis brevirostris* (Weebill), *Strepera graculina* (Pied currawong), *Pardalotus striatus* (Striated pardalote), *Meliphaga lewinii* (Lewin's Honeyeater), *Philemon corniculatus* (Noisy friarbird), *Cacatua galerita* (Sulphur-crested Cockatoo) and *Cacomantis flabelliformis* (Fantailed cuckoo).

During the Aurecon survey, a group of approximately 20 *Acacia pedleyi*, listed as Vulnerable under the NC Act, were noted at KP314.32, and a *Desmodium macrocarpum* specimen, listed as Near Threatened under the NC Act, was noted at KP314.39.

In addition to these incidental fauna sightings, Button-quail platelets (distinctive traces created during food gathering) were also noted at KP315 and KP315.25, indicating that these species also utilise this area. Of the five button-quail species whose distribution ranges overlap the site, one species, *Turnix melanogaster* (Black-breasted button-quail), is listed as Vulnerable under the EPBC Act.

Based on the habitat structure within KP312 and KP318, suitable habitat has been identified for EPBC EVNT listed species and is presented in Table 11.5.

**Table 11.5 Suitable habitat for EPBC Act EVNT species within KP312 to KP318**

EPBC listed species	Comments
<i>Geophaps scripta scripta</i> (Squatter pigeon)	Throughout Callide Range
<i>Neochmia ruficauda ruficauda</i> (Star finch)	KP317.5 to KP318
<i>Erythrotriorchis radiatus</i> (Red goshawk)	Throughout Callide Range
<i>Poephila cincta cincta</i> (Black-throated finch)	KP316 to KP317
<i>Turnix melanogaster</i> (Black-breasted button-quail)	KP315 to KP315.25
<i>Nyctophilus corbeni</i> (South-eastern long-eared bat)	Throughout Callide Range
<i>Paradelma orientalis</i> (Brigalow scaly-foot)	KP315 to KP316.5

## 11.2 KP318 to KP324

The KP318 to KP324 section of the GTP RoW consisted of non-remnant open pastures (KP317.95 to KP318.34, KP318.61 to KP318.70, KP318.77 to KP319.15 and KP322.69 to KP324.07) or open woodland vegetation of RE 11.11.15/ RE 11.11.4 characterised by *Eucalyptus crebra* and *Corymbia erythrophloia* with or without *Corymbia citriodora* (refer Plates 14 to 21). The various creek crossings in this section resembled RE 11.3.25. From KP318 to KP318.9, the GTP RoW can be slightly realigned providing for a straight pipeline section avoiding running parallel in very close proximity to the creek at KP318.47.

Furthermore, this realignment will also result in the avoidance of remnant vegetation associated with the creek at KP318.74 with significant habitat trees and *Acacia pedleyi*, listed as Vulnerable under the NC Act.



Plate 14 Open pasture at KP318 looking east



Plate 15 Open pasture at KP319



Plate 16 Characteristic creek vegetation (RE 11.3.25)



Plate 17 Open woodland vegetation dominated by *Eucalyptus crebra* at KP320



Plate 18 *Eucalyptus crebra* dominated vegetation at approximately KP320.3 (RE 11.11.15/11.11.4)



Plate 19 *Eucalyptus crebra* dominated vegetation at approximately KP322 (RE 11.11.15/11.11.4)



Plate 20 Non-remnant vegetation with *Eucalyptus crebra* regrowth at approximately KP323



Plate 21 Non-remnant vegetation with *Eucalyptus crebra* regrowth at approximately KP323

Two EVNT species, *Cycas megacarpa*, listed as Endangered under both the NC Act and EPBC Act, and *Acacia pedleyi* were identified in this section of the GTP RoW (KP318 to KP324) and are listed in Table 11.6. Five Type A species were identified in the KP318 to KP324 section of the GTP RoW and are listed in Table 11.7.

Table 11.6 EVNT species identified in KP318 to KP324 of the GTP RoW

EVNT species	Number of specimens	Comments
<i>Cycas megacarpa</i>	85	Four population clusters located at approximately KP320.5, within KP321.3 to KP321.7, KP322.4 to KP322.7 and KP323.4 and KP323.9
<i>Acacia pedleyi</i>	9	Eight specimens located at the creek at KP318.74. One large specimen located at the creek at KP319.19



**Table 11.7 Type A species identified in KP318 to KP324 of the GTP RoW**

Type A species	Number of specimens	Comments
<i>Brachychiton australis</i>	2	Associated with the SEVT/rainforest (RE 11.10.8) area at KP315.08 to KP315.33
<i>Brachychiton populneus</i>	5	-
<i>Cymbidium canaliculatum</i>	2	-
<i>Macrozamia macleayi</i>	1	-
<i>Xanthorrhoea johnsonii</i>	1,145	-

Several declared weeds were identified in this section. *Opuntia* specimens were sparsely scattered throughout. *Lantana camara* (Lantana) was present, mainly associated with the creek and drainage lines. *Lantana montevidensis* (Creeping lantana) is present sparsely scattered throughout the GTP RoW. *Cryptostegia grandiflora* (Rubber vine) was present at the creeks located at KP319.20 and KP320.47 with the species occurring just outside the GTP RoW. *Macfadyena unguis-cati* (Cat's claw creeper) was also present at the creek located at KP319.20.

A small patch of *Parthenium hysterophorus* (Parthenium) (approximately 10 to 20 m<sup>2</sup>) was identified at KP318.05. The Parthenium is present as a dense mat of up to 5 m<sup>2</sup> with scattered plants located around the main infestation (up to a total distribution area of 20 m<sup>2</sup> at the time of the survey). The plants are present as fresh growth although some old seed heads were seen at the location.

Various habitat trees were present in the vegetated (remnant) areas of this section. In particular, large *Corymbia citriodora* trees with hollows were present at the creek at KP318.75. These can be avoided through a small realignment as discussed above. The ground layer is characterised by native grass species, with patches of the declared weed *Lantana montevidensis* (Creeping lantana). Leaf litter is limited due to the vegetation present (open ironbark/bloodwood woodland). At various locations in this section rocky outcrops are present, often with SEVT and/or rainforest species growing in the cracks of these rocks (refer Plate 22 and Plate 23). These rocks can provide habitat for fauna species.



Plate 22 Rocky outcrop at KP322.08



Plate 23 Rocky outcrop with *Euroschinus falcata* growing on it

Based on the habitat structure within KP318 to KP324, suitable habitat has been identified for EPBC listed EVNT species and is presented in Table 11.8.

**Table 11.8 Suitable habitat for EPBC Act EVNT species within KP318 to KP324**

EPBC listed species	Comments
<i>Geophaps scripta scripta</i> (Squatter pigeon)	Throughout Callide Range
<i>Erythrotriorchis radiates</i> (Red goshawk)	Throughout Callide Range
<i>Poephila cincta cincta</i> (Black-throated finch)	Collards Creek area (KP319.1)
<i>Nyctophilus corbeni</i> (South-eastern long-eared bat)	Throughout Callide Range

### 11.3 KP324 to KP332.8

For the first half of this section, the GTP RoW between KP324 and KP332.8 is characterised by *Eucalyptus crebra* and *Corymbia erythrophloia* with or without *Corymbia citriodora* and *Eucalyptus melanophloia* (RE 11.11.15/RE 11.11.3 with some RE 11.11.4. Xanthorrhoeas, Macrozamia and Cycads grow abundantly within this section (refer Plates 24 to 27). The second half of this section resembles RE 11.12.1 and/or RE 11.12.6, with *Eucalyptus crebra* being dominant throughout and interspersed with other Eucalyptus and Corymbia species. Some areas are dominated by stands of *Corymbia erythrophloia* (refer Plates 28 to 31).



Plate 24 Vegetation at KP324 with *Corymbia citriodora* the dominant species



Plate 25 *Eucalyptus crebra* dominated vegetation at KP324.35



Plate 26 Ridgeline at KP324.75 characterised by *Eucalyptus crebra* and *Corymbia erythrophloia*



Plate 27 *Eucalyptus crebra* with *Corymbia citriodora* vegetation at approximately KP328.6



Plate 28 *Corymbia erythrophloia* vegetation at KP329.82



Plate 29 More open pasture on left of fenceline with road reserve vegetation on the right at KP330.9



Plate 30 *Eucalyptus crebra* dominated vegetation at approximately KP331.5

Plate 31 Vegetation (RE 11.12.6 at KP332.7)

One EVNT flora species was identified within KP324 to KP332.8 of the GTP RoW and is listed in Table 11.9. Four Type A species were identified in the KP324 to KP332.8 section and are listed in Table 11.10.

**Table 11.9 EVNT species identified within KP324 to KP332.8 of the GTP RoW**

EVNT species	Number of specimens	Comments
<i>Cycas megacarpa</i>	577	Four population clusters located approximately within KP324.2 to KP324.4, KP324.9 to KP326.7, KP326.8 to KP328.4 and at KP332.7

**Table 11.10 Type A species identified within KP324 to KP332.8 of the GTP RoW**

Type A species	Number of specimens	Comments
<i>Brachychiton populneus</i>	28	-
<i>Cymbidium canaliculatum</i>	9	-
<i>Macrozamia macleayi</i>	384	A large number are associated with the slope at KP325.66
<i>Xanthorrhoea johnsonii</i>	1,056	A large number are associated with the slope at KP325.66

The vegetation at KP325 was dominated by a canopy of *Eucalyptus crebra*. The lower levels of vegetation were dominated by *Corymbia erythrophloia*, *Cycas megacarpa* and *Xanthorrhoea johnsonii*. The ground layer was dominated by *Austrostipa verticillata* (Slender bamboo grass). There were a number of potential habitat features including canopy cover suitable for shelter, foraging and perching, fissured tree bark, dense ground cover, woody debris and leaf litter. The vegetation of similar age and type surrounding KP325 did not have hollows. The area is unlikely to have a significant quantity of hollow bearing trees. There was also suitable basking habitat available for reptile species. No fauna was incidentally noted during the survey.

A large number of Type A species (*Xanthorrhoea johnsonii* and *Macrozamia macleayi*) are present within the GTP RoW at KP325.66. However, the RoW is currently positioned on a steep slope to the south-east of a ridgeline that descends and ascends from the saddle. By moving the GTP RoW to the north-west, it is better positioned on the ridgeline thereby avoiding a large number of Type A species (refer Plate 32).



**Plate 32** Large number of *Xanthorrhoea johnsonii* and *Macrozamia macleayi* at KP325.66 with GTP RoW positioned on the right hand side of photo

The vegetation at KP326 was dominated by *Eucalyptus crebra* at the canopy layer with *Corymbia dallachyana*, *Corymbia erythrophloia* and *Eucalyptus crebra* present below this canopy layer. *Cycas megacarpa*, listed as Endangered under both the NC Act and EPBC Act, *Xanthorrhoea johnsonii* and regenerating canopy species were present in the shrub layer with the ground layer being dominated by *Austrostipa verticillata* (Slender bamboo grass) along with *Cymbopogon refractus* (Barb-wire grass) and *Lantana montevidensis* (Creeping lantana) which is a declared pest species. The main microhabitats present included canopy cover suitable for shelter, foraging and perching, fissured tree bark, dense groundcover vegetation, woody debris and leaf litter. Hollow bearing trees and stags were present in the canopy stratum, along with ant mounds which are suitable for foraging. Echidnas and basking habitat was available for reptile species. No incidental fauna sightings were made during the survey at KP326.

The vegetation at KP327 was also dominated by *Eucalyptus crebra* at the canopy layer, along with *Corymbia dallachyana* and *Eucalyptus melanophloia*. The vegetation below the canopy layer was dominated by *Corymbia erythrophloia* and also had specimens of *Acacia decora*, *Alstonia constricta*, *Cycas megacarpa*, *Opuntia tomentosa* (declared pest), *Brachychiton populneus* and regenerating canopy species. The ground layer was made up of *Austrostipa verticillata*, *Cymbopogon refractus* and *Lantana montevidensis* (declared pest). The canopy provided habitat opportunities as it is suitable for shelter, foraging and perching. Fissured tree bark was also present along with dense groundcover vegetation and leaf litter. There was also some limited woody debris present across the site. Stags were also noted at the site however no hollows were noted in either these stags or the surrounding trees. There was some limited basking habitat available for reptile species. *Macropus dorsalis* (Black-striped wallaby) was present during the survey.

Declared weeds in this section include *Lantana camara* (Lantana) sparsely scattered throughout with a very dense infestation at the creek at KP331.48, and *Opuntia* species which were particularly present in the more open country from KP329.52 onwards.

Habitat features in the form of fallen logs were present throughout. Hollow-bearing trees were prevalent in this section where part of the GTP RoW is present in the road reserve between KP331.87 and KP332.54 (refer Plate 33). Overall, leaf litter was limited due to the nature of the vegetation (open woodland). Scratches were found on *Corymbia citriodora* trees between KP325.4 and KP326.7, most likely from *Phascolarctos cinereus* (Koala) (refer Plate 33 and Plate 34).



Plate 33 Scratch marks on *Corymbia citriodora* trees most likely belonging to *Phascolarctos cinereus* (Koala)



Plate 34 Scratch marks on *Corymbia citriodora* trees most likely belonging to *Phascolarctos cinereus* (koala)

Plate 35 Old hollow-bearing *Eucalyptus crebra* trees in the road reserve

Based on the habitat structure within KP324 to KP332.8, suitable habitat has been identified for EPBC listed EVNT species and is presented in Table 11.11.

Table 11.11 Suitable habitat for EPBC Act EVNT species within KP324 to KP332.8

EPBC listed species	Comments
<i>Geophaps scripta scripta</i> (Squatter pigeon)	Throughout Callide Range
<i>Erythrotriorchis radiates</i> (Red goshawk)	Throughout Callide Range
<i>Nyctophilus corbeni</i> (South-eastern long-eared bat)	Throughout Callide Range

## 11.4 KP332.8 to KP338

The section KP332.8 to KP338 is characterised by open grazing pastures with some paddocks trees and limited regrowth (refer Plate 36 and Plate 38 to Plate 41). Some remnant vegetation is associated with Bell Creek (RE 11.3.25) (refer Plate 37).



Plate 36 Open pasture paddocks at KP334



Plate 37 Bell Creek crossing



Plate 38 Open pasture paddocks with sparse regrowth at KP335



Plate 39 Open pasture paddocks with sparse regrowth at KP336



Plate 40 HVR at KP337.25 with recently pushed vegetation



Plate 41 Open pasture paddocks with recently pushed vegetation (paddocks trees) at KP337.5

Two Type A species were identified in the KP332.8 to KP338 section of the GTP RoW; Table 11.12 lists the Type A species.

**Table 11.12 Type A species identified in KP332.8 to KP338 of the GTP RoW**

Type A species	Number of specimens	Comments
<i>Brachychiton populneus</i>	3	-
<i>Xanthorrhoea johnsonii</i>	11	-

Declared weeds in this section included *Lantana camara* (Lantana) mainly associated with the creeks and *Lantana montevidensis* (Creeping lantana) sparsely scattered throughout. In addition, *Opuntia* specimens were found sparsely scattered throughout.

In this section, the environmental weed *Eragrostis curvula* (African lovegrass) was identified, in some patches as a dense infestation (refer Plate 42 and Plate 43). Care is to be taken not to spread this weed to other properties.



**Plate 42 *Eragrostis curvula* in the foreground**



**Plate 43 *Eragrostis curvula***

Limited fauna habitat is present in this section due to the type of land use (open grazing paddocks). However, the area is particularly suitable for *Geophaps scripta scripta* (Squatter pigeon), listed as Vulnerable under both the EPBC Act and NC Act. In addition, at the time of the survey, snakes (two different species; no positive identification) were found sheltering underneath the bark of fallen logs (refer Plate 44).

The vegetation at KP334.5 supported a canopy layer dominated by *Casuarina cunninghamiana* and a shrub layer dominated by *Melaleuca fluviatilis*, *Ficus opposita* and *Melaleuca viminalis*. The canopy provides habitat opportunities as it is suitable for shelter, foraging and perching, fissured tree bark was also present along with dense ground vegetation, woody debris, leaf litter and riparian habitat features. Species noted during the survey at this location included *Litoria rothii* (Roth's tree frog), *Litoria rubella* (Desert tree frog), *Litoria latopalmata* (Broad-palmed frog), *Litoria fallax* (Eastern dwarf tree frog), *Uperoleia fusca* (Dusky toadlet), *Gerygone fusca* (Western gerygone), *Eurystomus orientalis* (Dollarbird), *Corvus orru* (Torresian crow), *Dacelo novaeguineae* (Laughing kookaburra), *Malurus lamberti* (Variegated fairy-wren), *Megalurus timoriensis* (Tawny grassbird) and the *Cisticola exilis* (Golden-headed cisticola).

A number of species were also noted around Bell Creek near KP335 including, *Podargus strigoides* (Tawny frogmouth), *Scythrops novaehollandiae* (Channel-billed cuckoo), *Litoria peronii* (Peron's tree frog), *Threskiornis spinicollis* (Straw-necked ibis), *Anas superciliosa* (Pacific black duck), *Eudynamis scolopacea* (Common koel), *Calyptorhynchus banksii* (Red-tailed black cockatoo), *Dacelo leachii* (Blue-winged kookaburra), *Litoria latopalmata* (Broad-palmed frog) and the *Litoria rubella* (Desert tree frog).



The Anabat records also indicated that a number of bat species are present around Bell Creek including *Chalinolobus gouldii* (Gould's wattled bat), *Chalinolobus morio* (Chocolate wattled bat), *Mormopterus beccarii* (Beccari's freetail bat) and *Nyctophilus sp* (Long-eared bat species). There were also two species recorded which could not be positively identified, these included one species which is likely to be either *Scotorepens sp.* (Central eastern broad-nosed bat) or *Scotorepens greyii* (Little broad-nosed bat), and another species which is either *Saccolaimus flaviventris* (Yellow-bellied sheath-tail bat) or *Mormopterus beccarii* (Beccari's freetail bat). Over the one hour of Anabat survey time, 24 calls were noted at this location.

At KP336.85 a depression in the landscape drains water to the north where at the time of the survey water formed a shallow wetland area (off the GTP RoW, close to Inverness Road).

Furthermore, a similar lower lying area showing ponding was found at KP337.14 where frogs were heard and seen spawning *Limnodynastes tasmaniensis* (Spotted grass frog) and *Limnodynastes peronii* (Striped marsh frog) (refer Plate 45).



**Plate 44** Fallen logs providing shelter for reptiles



**Plate 45** Ponding at KP337.14, suitable frog habitat therefore most likely attracting foraging snakes

Within KP332.8 to KP338, suitable habitat has been identified for the EPBC listed *Geophaps scripta scripta* (Squatter pigeon), which is listed as Vulnerable.

The non-remnant pasture areas of the KP332.8 to KP338 section of the GTP RoW has been identified as suitable habitat for the *Ardea ibis* (Cattle egret), *Merops ornatus* (Rainbow bee-eater) and *Vanellus miles* (Masked lapwing), which are listed migratory bird species under the EPBC Act.

## 11.5 KP338 to KP341.3

Section KP338 to KP341.3 of the GTP RoW is characterised by open forest to woodlands on undulating hills of granite rock (landzone 12) either as RE 11.12.1 (*Eucalyptus crebra* and *Corymbia erythrophloia* as dominant species), RE 11.12.6 (*Corymbia citriodora* and *Eucalyptus crebra* as dominant species) or RE 11.12.3 (*Eucalyptus crebra* and *Eucalyptus tereticornis* as dominant species). A large part of the mapped HVR was determined to be remnant vegetation.



Plate 46 *Eucalyptus crebra* dominated vegetation at KP338 looking east



Plate 47 Open vegetation on the western slope at the KP338.83 creek with a number of *Macrozamia*s



Plate 48 *Lantana* infested open forest on the eastern slope of the KP338.83 creek



Plate 49 Vegetation looking east at KP339



Plate 50 Open woodland with *Corymbia tessellaris* and *Eucalyptus crebra* vegetation at KP339.17



Plate 51 *Eucalyptus crebra* dominated vegetation at KP340



Plate 52 *Eucalyptus crebra* dominated open woodland (with subdominant *Corymbia erythrophloia*)



Plate 53 RE 11.12.3 with *Eucalyptus tereticornis* and *Corymbia tessellaris* at KP341

One EVNT species was identified in this section of the GTP RoW and is listed in Table 11.13. Four Type A species were identified in the KP338 to KP341.3 section of the GTP RoW and are listed in Table 11.14.

Table 11.13 EVNT species identified within KP338 to KP341.3 of the GTP RoW

EVNT species	Number of specimens	Comments
<i>Cycas megacarpa</i>	356	One population cluster located between KP338.2 and KP339. Specimens growing in a grazing paddock, out in the open

Table 11.14 Type A species identified within KP338 to KP341.3 of the GTP RoW#

Type A species	Number of specimens	Comments
<i>Geodorum densiflorum</i>	5	More specimens expected to be growing underneath the very dense lantana infestation on the steep slope between KP338.83 to KP339
<i>Brachychiton populneus</i>	1	-
<i>Cymbidium canaliculatum</i>	10	-
<i>Macrozamia macleayi</i>	356	-
<i>Xanthorrhoea johnsonii</i>	896	-

**Table notes:** # Due to the very dense lantana infestation on the slope between KP338.83 to KP339, a transect methodology was used to estimate the number of Type A species (*Xanthorrhoea* and *Macrozamia*). Furthermore, it is highly likely that more ground orchids (*Geodorum densiflorum*) are present growing underneath the lantana (*Lantana camara*).

Declared weeds in this section included mainly *Lantana camara* (Lantana) with dense infestations between KP338 and KP338.8 and a very dense infestation from the creek at KP338.83 to the top of the hill at KP339 (refer Plate 54 and Plate 55). In addition, *Lantana montevidensis* (Creeping lantana) was prominent throughout this section of the GTP RoW. *Opuntia tomentosa* (Velvet tree pear) was sparsely scattered throughout.



**Plate 54** Very dense Lantana infestation between KP338.83 to KP339



**Plate 55** Very dense Lantana infestation between KP338.83 to KP339

The vegetation at KP387 was comprised of *Eucalyptus tereticornis* and *Casuarina cunninghamiana* at the canopy level along with *Melaleuca bracteata* and *Melaleuca viminalis* at the shrub layer. The ground layer was comprised of *Ruella* sp (Ruella), *Bacopa* sp, *Lomandra hystrix* and *Pennisetum ciliare*. The key habitat features noted at this location included the canopy cover which is suitable for shelter, foraging and perching, fissured tree bark, a dense ground stratum, woody debris, leaf litter and watercourse habitat. A number of species were noted including *Dicaeum hirundinaceum* (Mistletoe bird), *Litoria rubella* (Desert tree frog), *Litoria fallax* (Eastern dwarf tree frog), *Litoria peronii* (Peron's tree frog), *Litoria latopalmata* (Broad-palmed frog) and traces of *Hydromys chrysogaster* (Water rat).

Various habitat trees in the form of dead trees were present in this section. Habitat logs, although present, were not abundant. In the KP340 to KP341.3 section, various *Iridomyrmex purpureus* (Meat ant) nests were showing signs of fresh *Tachyglossus aculeatus* (Short-beaked echidna) diggings as shown in Plate 56 and Plate 57.



**Plate 56** Echidna diggings in Meat ant's nest



**Plate 57** Echidna diggings in Meat ant's nest

In general, leaf litter in the KP338 to KP339 section is moderate to thick, which is characteristic of Lantana infested vegetation.

The area at KP340 was characterised by a canopy layer of *Eucalyptus crebra*, *Erythrina vespertilio*, and *Corymbia tessellaris*. The shrub layer was relatively sparse and consisted of *Erythrina vespertilio*, *Petalostigma pubescens*, *Opuntia tomentosa* (declared weed) and *Lantana montevidensis* (declared weed). The main habitat features of this area were the presence of a canopy cover suitable for shelter, foraging and perching, fissured tree bark, a

dense ground stratum, and the presence of woody debris and leaf litter. Watercourse habitat was also present. During the survey, *Coracina tenuirostris* (Cicadabird), *Falco berigora* (Brown falcon), *Accipiter fasciatus* (Brown goshawk), *Cracticus tibicen* (Australian magpie) and a *Trichoglossus haematodus* (Rainbow lorikeet) were noted at the site. A nest was also identified in a tree at KP340, which was suspected to be a *Corvus orru* (Torresian crow) nest. Another smaller finch nest was noted at KP340.79 which is suspected to be a *Taeniopygia bichenovii* (Double-barred finch) nest.

Based on the habitat structure within KP338 to KP341.3, suitable habitat has been identified for EPBC listed EVNT species and is presented in Table 11.15.

**Table 11.15 Suitable habitat for EPBC Act EVNT species within KP338 to KP341.3**

EPBC listed species	Comments
<i>Geophaps scripta scripta</i> (Squatter pigeon)	Throughout Calliope Range
<i>Nyctophilus corbeni</i> (South-eastern long-eared bat)	Throughout Calliope Range

In addition, the non-remnant pasture areas of the KP338 to KP341.3 section of the GTP RoW is suitable habitat for the *Ardea ibis* (Cattle egret), *Merops ornatus* (Rainbow bee-eater) and *Vanellus miles* (Masked lapwing), which are listed migratory bird species under the EPBC Act.

## 11.6 KP341 to KP351.9

KP341 to KP351.9 consists predominantly of open grazing pastures, with *Hyparrhenia rufa* (Thatch grass) being dominant for most of this section (refer Plate 58 and Plate 64 to Plate 65). Of concern is the environmental weed *Eragrostis curvula* (African lovegrass), which is sparsely distributed within the first half of this section. At the time of the survey, a 200 m patch of open pasture from KP342.42 to KP342.6 was recently burned (burned on 4 October 2012) (refer Plate 59).

Paddock trees (mainly *Eucalyptus melanophloia*, *Corymbia tessellaris*, *Eucalyptus populnea*, *Ficus rubiginosa* and some *Erythrina vespertilio*) are sparsely present. A dense patch of Melaleuca trees was present at KP343.22, indicating a wetter area (refer Plate 60 and Plate 61). However, no channel was identified and the area is mostly flat. In this area, parts of the GTP RoW are already cleared, most likely associated with the construction of a new fence line on the edge of the pipeline corridor as well as the clearing for the QGLNG pipeline (refer Plate 62). A small patch of *Eucalyptus melanophloia* HVR was present at KP345.84 to KP345.99 (refer Plate 63).



Plate 58 Looking west towards the Calliope Range at KP342 characterised by open pastures



Plate 59 Burned area at KP342.42 to KP342.6, with rainbow bee-eaters foraging on insects



Plate 60 Melaleuca vegetation at KP343.22



Plate 61 Melaleuca vegetation at KP343.22



Plate 62 Cleared area around KP343.45



Plate 63 *Eucalyptus melanophloia* HVR at KP345.84 to KP345.99



Plate 64 Characteristic open pasture vegetation with the occasional paddock tree and some watercourses at KP341 to KP351.9



Plate 65 Open pastures at KP350 with sparse groundcover layer

One EVNT species was identified in the KP341 to KP351.9 section of the GTP RoW at KP343.98 as summarised in Table 11.16. No Type A species were identified in this section of the GTP RoW.

Table 11.16 EVNT species identified within KP341 to KP351.9 of the GTP RoW

EVNT species	Number of specimens	Comments
<i>Cycas megacarpa</i>	7	Specimens growing in dense grass pastures located at KP343.98; In general, these specimens are in a poor to fair condition



Plate 66 *Cycas megacarpa* specimen as identified at KP343.98



Plate 67 *Cycas megacarpa* specimen as identified at KP343.98

Various water features were assessed in this section with only two deemed watercourses with characteristic sandy stream beds and tree-lined (RE 11.3.25) stream banks (refer Plate 68 and Plate 69).



Plate 68 Typical watercourse (KP344.25) in the KP341 to KP351.9 section with sandy streambed and tree-lined (*Melaleuca* spp) stream banks



Plate 69 Typical watercourse (KP345.58) in the KP341 to KP351.9 section with sandy streambed and tree-lined (*Melaleuca* spp) stream banks

Declared weeds found in this section of the GTP RoW include *Lantana camara* (Lantana), *Lantana montevidensis* (Creeping lantana), *Cryptostegia grandiflora* (Rubber vine), *Opuntia stricta* (Prickly pear) and *Opuntia tomentosa* (Velvet tree pear).

Limited habitat features in the form of fallen logs and dead trees are present.

Significant fauna observed in this section of the GTP RoW (KP341 to KP351.9) included several *Merops ornatus* (Rainbow bee-eater), which were using the area in the GTP RoW as general feeding habitat, in particular after the fire from the day before (4 October 2012).

Erosion in this section was limited to a few erosion points as shown in Plate 70 and Plate 71.

At KP341.2 the canopy was comprised of *Eucalyptus tereticornis*, *Corymbia tessellaris* and *Corymbia clarksoniana*. The shrub layer was dominated by *Erythrina vespertilio*, *Petalostigma pubescens* and *Melaleuca fluviatilis*. The ground layer was predominantly grasses made up of *Heteropogon contortus* and *Hyparrhenia rufa*. The key habitat features in this location are canopy cover which was suitable for shelter, foraging and perching, fissured tree bark, the presence of dense grasses, woody debris and leaf litter. The species



noted during the Aurecon field surveys included the *Corvus orru* (Torresian crow), *Manorina melanocephala* (Noisy minor), *Philemon citreogularis* (Little friarbird), *Accipiter fasciatus* (Brown goshawk), *Ardeotis australis* (Australian bustard), *Taeniopygia bichenovii* (Double-barred finch), *Geopelia humeralis* (Bar shouldered dove), *Strepera graculina* (Pied currawong), *Corcorax melanorhamphos* (White-winged chough), *Scythrops novaehollandiae* (Channel-billed cuckoo) and *Macropus parryi* (Whiptail wallaby).

The Aurecon survey undertaken at KP345.5 indicated that the canopy at this location was comprised of *Melaleuca fluviatilis*, *Eucalyptus tereticornis*, *Corymbia tessellaris*, *Eucalyptus melanophloia*, and *Corymbia clarksoniana*. The shrub layer was predominantly a mix of *Ficus opposita*, *Acacia salicina* and *Petalostigma pubescens*. The ground layer was essentially *Hyparrhenia rufa* and *Lantana montevidensis* (declared weed). The key habitat features of this site included a canopy cover suitable for shelter, foraging and perching, fissured tree bark, a dense ground stratum, the presence of leaf litter along with scattered rocky areas and watercourse habitat located along a drainage line. A *Dacelo leachii* (Blue-winged kookaburra), *Struthidea cinerea* (Apostle bird) and *Cracticus torquatus* (Grey butcherbird) were noted during the survey. Additionally hollows were also present across the site.



Plate 70 Minor erosion point at KP347.3



Plate 71 Minor erosion point at KP349.25

Within KP341 to KP351.3, suitable habitat has been identified for the EPBC listed *Geophaps scripta scripta* (Squatter pigeon), which is listed as Vulnerable.

In addition, the non-remnant pasture areas of the KP341 to KP351.3 section of the GTP RoW is suitable habitat for *Ardea ibis* (Cattle egret), *Merops ornatus* (Rainbow bee-eater) and *Vanellus miles* (Masked lapwing) which are listed migratory bird species under the EPBC Act.

**11.7 KP351.9 to KP370.8**

KP351.9 to KP370.8 of the GTP RoW consists predominantly of open grazing pastures, dominated by *Hyparrhenia rufa* (Thatch grass) with some previously cleared forestry plots (KP360.4 to KP365) (refer Plate 72 to Plate 76). The cleared forestry plots are characterised by more bare soil (up to 30 to 40%) and a lower density and height of groundcover (grasses) layer (refer Plate 74 and Plate 75) in comparison to grazing pastures (Plate 72 and Plate 73).



**Plate 72** Characteristic open pasture at KP354 facing west



**Plate 73** Characteristic open pasture at KP357 facing west



**Plate 74** Characteristic open pasture at KP361 facing west



**Plate 75** Characteristic open pasture at KP365 facing east



**Plate 76** Characteristic open pasture at KP368 facing west



**Plate 77** Characteristic open pasture at KP370 facing west

No EVNT or Type A species were identified in this section of the GTP RoW (KP351.9 to KP370.8).

Three larger watercourses are located between KP351.9 and KP370.8 namely the Calliope River, Harper Creek and Alarm Creek. All three watercourses contain vegetation consistent with RE 11.3.25. However, species dominance, sub-dominance and composition varied with several species associated more closely with individual watercourses (eg *Ficus virens* at KP352.30) (refer Plate 78). The area at KP366.7 to KP366.85 showed ponding (refer Plate 79) within the water features present providing habitat for fauna species, such as frogs. At KP370.73, a natural spring was present 45 m west of the GTP RoW.



Plate 78 Water feature at KP352.37



Plate 79 Ponding at KP 366.82

Declared weeds identified along this section include *Lantana camara* (Lantana), *Lantana montevidensis* (Creeping lantana), *Cryptostegia grandiflora* (Rubber vine) and *Opuntia tomentosa* (Velvet tree pear).

Habitat features in this section include sparsely distributed fallen logs (with hollows), mostly old nests in trees, termite mounds, diggings from Echidnas, a rocky outcrop and occasional burrows and some significant old (paddock) trees (in particular along the Mount Alma Road at KP365.4 and lining the watercourses of Calliope River, Harper Creek and Alarm Creek). A few (old) birds' nests were identified at the time of the survey and were being checked by bird species such as *Scythrops novaehollandiae* (Channel-billed cuckoo) (refer Plate 80). Although not listed under the NC Act and/or EPBC Act, various skinks and geckos were identified on or under logs, such as the *Heteronotia binoei* (Bynoe's gecko) (refer Plate 81). In addition, ponding (with water present at the time of the survey) at KP366.7 to KP366.85 provides habitat for frog species such as *Litoria nasuta* (Rocket frog) and *Litoria latopal mata* (Broad-palmed rocket frog) which were abundantly present (refer Plate 82).

The vegetation at KP352.30 around the Calliope River was dominated by *Melaleuca fluviatilis*, *Corymbia tessellaris* and *Eucalyptus camaldulensis* as a canopy layer. The species beneath this layer included *Allocasuarina cunninghamii*, *Acacia excelsa*, *Melaleuca bracteata*, *Melaleuca quinquenervia*, *Melaleuca viminalis*, *Geijera parviflora* and two declared species, *Cryptostegia grandiflora* and *Lantana camara*. The ground layer was sparse, the key species present included *Oplismenus* sp, *Cyperus difformis*, *Digitaria didactyla*, *Sida subspicata*, *Cirsium vulgare*, *Verbena tenuisecta* and *Aristida caput-medusae*. There was a wide range of potential microhabitats present in the area surrounding the Calliope River including the presence of canopy cover suitable for shelter foraging and perching, fissured tree bark, woody debris, leaf litter and limited ground cover. Additionally the river itself appears to provide good watercourse and riparian habitat potential. Hollow bearing trees were also present within this area.

A wide range of species were noted during the survey including, *Myiagra cyanoleuca* (Satin flycatcher), *Taeniopygia bichenovii* (Double-barred finch), *Trichoglossus haematodus* (Rainbow lorikeet), *Corvus orru* (Torresian crow), *Meliphaga lewinii* (Lewin's honeyeater), *Cacatua galerita* (Sulphur-crested cockatoo), *Myiagra rubecula* (Leaden flycatcher), *Entomyzon cyanotis* (Blue-faced honeyeater), *Anas superciliosa* (Pacific black duck), *Lichmera indistincta* (Brown honeyeater), *Philemon citreogularis* (Little friarbird), *Platycercus adscitus* (Pale-headed rosella), *Malurus melanocephalus* (Red-backed fairywren), *Acanthiza pusilla* (Brown thornbill), *Pardalotus striatus* (Striated pardalote), *Daphoenositta chrysoptera* (Varied sittella), *Dacelo leachii* (Blue-winged kookaburra), *Cracticus tibicen* (Australian magpie), *Melithreptus albogularis* (White-throated honeyeater), and *Litoria fallax* (Eastern dwarf tree frog). Wallaby scats were also present which may indicate that they utilise this area. Pig diggings were also noted. In addition to this, isolated pools of clear water were also present at time of inspection which may provide further habitat or resource opportunities to various species. Fallen wood on the creek bank with decored bark was also present which is likely to provide good habitat for reptiles.

The vegetation at KP356.70 was also surveyed as is representative of the cleared paddocks within the area. There were some very scattered and sparse trees present in this area including *Corymbia tessellaris*, *Eucalyptus cambageana* and *Eucalyptus tereticornis*. The shrub layer was also very sparse and was dominated by *Geijera parviflora*, *Callitris columellaris*, *Erythrina vespertilio*, *Acacia excelsa*, *Melaleuca quinquenervia* and regenerating canopy species. The ground layer was very dense and was dominated by grasses including *Cenchrus ciliaris*, *Avena* sp, *Digitaria didactyla* along with *Argemone ochroleuca*, *Glycine tabacina* and *Sida Rhombifolia*. There were very few habitat features present at this location the only notable features included the dense ground cover vegetation and cracking clays both of which may provide shelter to small animals. Several species were noted during the survey including *Egretta novaehollandiae* (White-faced heron), *Ardea pacifica* (White necked heron), *Artamus cinereus* (Black-faced woodswallow) and *Macropus giganteus* (Grey Kangaroo). The two herons were located near a drainage line.

The survey results from Harper Creek (KP360.30) also indicated that this area had a range of habitat features present. The various vegetation species present in the upper vegetation layers included *Melaleuca fluviatilis*, *Corymbia tessellaris*, *Eucalyptus camaldulensis*, *Cymbidium canaliculatum* (Type A species), *Allocasuarina cunninghamii* and *Acacia excelsa*, some of which supported hollows suitable for roost sites. The shorter shrub layer at this location consisted of scattered *Melaleuca bracteata*, *Melaleuca quinquenervia*, *Melaleuca viminalis*, *Geijera parviflora*, regenerating canopy species and *Lantana camara*, which is a declared pest species. The ground layer was a reasonably dense mix of *Oplismenus* sp, *Cyperus difformis*, *Digitaria didactyla*, *Sida subspicata*, *Cirsium vulgare*, *Verbena tenuisecta*, *Aristida caput-medusae*, *Fimbristylis dichotoma* and *Juncus* sp. The potential habitat opportunities in this area included canopy cover suitable for shelter, foraging and perching, fissured tree bark, woody debris, leaf litter and watercourse habitat. There was also limited habitat potential from the groundcover present. The species noted during the survey included *Litoria fallax* (Eastern dwarf tree frog), *Litoria peronii* (Peron's tree frog), *Litoria latopalmata* (Broad-palmed rocket frog), *Dacelo leachii* (Blue-winged kookaburra), *Dacelo novaeguineae* (Laughing kookaburra), *Phalacrocorax varius* (Pied cormorant), *Anas superciliosa* (Pacific black duck), *Cracticus tibicen* (Australian magpie), *Alcedo azurea* (Azure kingfisher), *Corvus orru* (Torresian crow), *Centropus phasianinus* (Pheasant coucal), *Scythrops novaehollandiae* (Channel-billed cuckoo), *Myiagra rubecula* (Leaden flycatcher), *Meliphaga lewinii* (Lewin's honeyeater) and *Malurus melanocephalus* (Red-backed fairywren). Kangaroo scats were also noted during the survey indicating that Kangaroos utilise this area. It was also noted that the sandy creek banks with overhanging vegetation provide good habitat value for Platypus burrows. At the time of the survey there

was a significant amount of water present in Harper Creek. The creek appears to be in good health with good in-stream habitat.

In addition to this, a number of bats were recorded using the Anabat system at Harper Creek. The species recorded included *Chalinolobus gouldii* (Gould's wattled bat), *Nyctophilus* sp. (Long-eared bat species) and one species which could not be positively identified which was likely to be either *Scotorepens* sp. (Central eastern broad-nosed bat) or *Scotorepens greyii* (Little broad-nosed bat). Over the one and a half hours of Anabat survey time, 72 calls were noted.

All *Nyctophilus* species produce distinctive near-vertical linear pulses, which are indistinguishable from each other. Four *Nyctophilus* species occur within the range of the study area; *Nyctophilus bifax*, *Nyctophilus corbeni*, *Nyctophilus geoffroyi* and *Nyctophilus gouldi*. *Nyctophilus corbeni* (South-eastern long-eared bat) is listed as Vulnerable under both the NC Act and EPBC Act, while the others are not listed as threatened species under either the NC Act or EPBC Act. Suitable habitat for *Nyctophilus corbeni* exists within the GTP RoW (KP360.30).

The areas around Calliope River, Harper Creek and Alarm Creek are likely to provide some habitat potential. The three areas had a well-defined riparian corridor dominated by *Eucalyptus tereticornis*. The area around Alarm Creek, in particular, supported old and very large *Eucalyptus tereticornis* individuals. These *Eucalyptus tereticornis* had hollows present in varied sizes from small (5 cm diameter) to large (greater than 20 cm diameter). The area around Calliope River also had numerous driftwood piles of timber debris, leaf litter etc deposited during recent high flow flood events, whereas the areas around Harper Creek and Alarm Creek had little to no ground timber and ground cover was dominated by pasture grasses. There was also evidence in these two areas of frequent and hot fires.

Fauna of significance that were sighted include *Haliaeetus leucogaster* (White-bellied sea eagle) flying over at KP360.35, *Merops ornatus* (Rainbow bee-eater) just off the RoW at KP365.24 and *Tachyglossus aculeatus* (Short-beaked echidna) hiding underneath a log at KP 366.05 (refer Plate 83). Furthermore, various large *Eucalyptus tereticornis* trees at KP365.44 showed signs of scratches, most likely from *Phascolarctos cinereus* (Koala), Possums and/or gliders (refer Plate 84).



Plate 80 *Scythrops novaehollandiae* (Channel-billed cuckoo) checking out old nests in a large *Eucalyptus tereticornis*



Plate 81 *Heteronotia binoei* (Bynoe's gecko).



Plate 82 *Litoria nasuta* (Rocket frog)



Plate 83 *Tachyglossus aculeatus* (Short-beaked echidna) hiding underneath a log



Plate 84 *Eucalyptus tereticornis* trees with scratches

Erosion in this section was limited to a few erosion points as shown in Plate 85 and Plate 86.



Plate 85 Erosion on side of pipeline at KP355.6



Plate 86 Sink hole in RoW at KP353.44

Based on the habitat structure within KP351.9 to KP370.8, suitable habitat has been identified for EPBC listed EVNT species and is presented in Table 11.17.

**Table 11.17 Suitable habitat for EPBC Act EVNT species within KP351.9 to KP370.8**

EPBC listed species	Comments
<i>Geophaps scripta scripta</i> (Squatter pigeon)	Throughout KP351.9 to KP370.8
<i>Neochmia ruficauda ruficauda</i> (Star finch)	Harper Creek (KP360.3)
<i>Botaurus poiciloptilus</i> (Australasian bittern)	Calliope River (KP352.3), Harper Creek (KP360.3)
<i>Chalinolobus dwyeri</i> (Large-eared pied bat)	Calliope River (KP352.3), Harper Creek (KP360.3)
<i>Nyctophilus corbeni</i> (South-eastern long-eared bat)	Calliope River (KP352.3), Harper Creek (KP360.3)
<i>Rheodytes leukops</i> (Fitzroy river turtle)	Harper Creek (KP360.3)

The riparian vegetation at Calliope River (KP352.3) and Harper Creek (KP360.3) provides suitable habitat for various EPBC listed migratory bird species such as *Haliaeetus leucogaster* (White-bellied sea-eagle), *Pandion cristatus* (Eastern osprey), *Merops ornatus* (Rainbow bee-eater), *Ardea modesta* (Great egret), *Rostratula australis* (Australian painted snipe), *Nettapus coromandelianus* (Cotton pygmy-goose), *Monarcha melanopsis* (Black-faced monarch), *Monarcha trivirgatus* (Spectacled monarch), *Myiagra cyanoleuca* (Satin flycatcher) and *Rhipidura rufifrons* (Rufous fantail).

In addition, the non-remnant pasture areas of the KP341 to KP351.3 section of the GTP RoW contained suitable habitat for *Ardea ibis* (Cattle egret), *Merops ornatus* (Rainbow bee-eater) and *Vanellus miles* (Masked lapwing), which are also listed migratory bird species under the EPBC Act.

**11.8 KP370.8 to KP383**

This section of GTP RoW was dominated by open grazing pastures (refer Plate 87 to Plate 91) intersected by various tree and shrub lined water features. The area between the creek at KP374.39 and Gravel Creek show evidence of melon holes. However, these are heavily degraded due to blade ploughing in the past. From Gravel Creek at KP375.63 to Larcom Creek at KP378, the pasture was recently burned. The vegetation between Larcom Creek and the Bruce Highway through to KP383 consists of grazing pastures with some stands of mature *Eucalyptus moluccana* at KP378 (refer Plate 92).



**Plate 87** Characteristic open pastures dominated by thatch grass at KP373 looking east



**Plate 88** Open pasture at KP375 looking towards Gravel Creek where shallow and degraded melon holes are present



**Plate 89** Open pasture at KP377 facing east



**Plate 90** Open pasture at KP379 facing east



**Plate 91** Open pasture at KP381 facing east



**Plate 92** *Eucalyptus moluccana* at KP383 facing east



No EVNT species were identified in this section of the GTP RoW. One Type A species was identified in the KP370.8 to KP383 section and is listed in Table 11.18.

**Table 11.18 Type A species identified in KP370.8 to KP383 of the GTP RoW**

EVNT species	Number of specimens	Comments
<i>Cymbidium canaliculatum</i>	5	One located at KP378.15 and three scattered around KP380.76

Various water features were assessed in this GTP RoW section (KP370.8 to KP383), with Larcom Creek at KP378 the most significant consisting of RE 11.3.25/11.3.4 (95/5%). Other smaller creeks are characterised mainly by *Melaleuca viminalis* as the dominant species. Declared weeds are prevalent around these creek areas. A man-made dam was located at KP373.31 and KP374.61.

The area around Larcom Creek was characterised by a high flow creek channel which was wide with gently sloping banks and the low flow stream was shallow with steep banks. There were several billabongs supported adjacent to the low flow channel. Riparian vegetation incorporated old and very large *Eucalyptus tereticornis* individuals which supported large tree hollows (greater than 20 cm); these may provide some habitat potential to local fauna. There was little to no ground timber and ground cover was dominated by pasture grasses and there was evidence of frequent and hot fires.

Declared weeds in this section include *Parthenium hysterophorus* (KP374.36), *Bryophyllum delagoense*, *Lantana camara*, *Lantana montevidensis*, *Opuntia tomentosa* and *Opuntia stricta*.

Habitat features in this section include sparsely distributed fallen logs (with hollows), dead trees and large paddock trees (mainly *Eucalyptus tereticornis* (refer Plate 93)), some covered in scratches (Koala, Possums and Petaurid gliders) (KP375.73 (refer Plate 95 and Plate 96)). At KP374.45 a *Eucalyptus tereticornis* tree just off the GTP RoW contains two large nests, one occupied by *Aviceda subcristata* (Pacific baza) at the time of the survey (refer Plate 94).

The area around this location (KP374.43 and KP375.58) was also noted as being densely vegetated with *Melaleuca* species around a drainage line. This area is likely to provide a good source of water and cover for small birds.

Of significance were two *Geophaps scripta scripta* (Squatter pigeons) within the GTP RoW at KP367.44.



Plate 93 Large *Eucalyptus tereticornis* trees at KP374.45

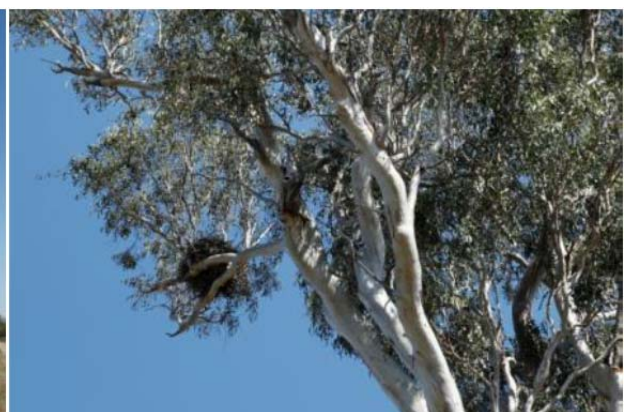


Plate 94 Occupied *Aviceda subcristata* (Pacific baza) nest just off the RoW



Plate 95 Scratches at KP375.7



Plate 96 Scratches at KP375.7

Although erosion in this section in general was limited, a few erosion points were mapped at KP374.2 and KP379.61 (refer Plate 97 and Plate 98).



Plate 97 Erosion point at KP374.2



Plate 98 Erosion at KP379.61

Based on habitat structure within KP370.8 to KP383, suitable habitat has been identified for EPBC listed EVNT species and is presented in Table 11.19.

**Table 11.19 Suitable habitat for EPBC Act EVNT species within KP370.8 to KP383**

EPBC listed species	Comments
<i>Geophaps scripta scripta</i> (Squatter pigeon)	Throughout KP370.8 to KP383
<i>Neochmia ruficauda ruficauda</i> (Star finch)	Larcom Creek (KP378)
<i>Poephila cincta cincta</i> (Black-throated finch)	Larcom Creek (KP378)
<i>Chalinolobus dwyeri</i> (Large-eared pied bat)	Larcom Creek (KP378)
<i>Nyctophilus cobeni</i> (South-eastern long-eared bat)	Larcom Creek (KP378)

The riparian vegetation at Larcom Creek (KP378) provides suitable habitat for various EPBC listed migratory bird species such as *Haliaeetus leucogaster* (White-bellied sea-eagle), *Pandion cristatus* (Eastern osprey), *Merops ornatus* (Rainbow bee-eater), *Monarcha*

*melanopsis* (Black-faced monarch), *Monarcha trivirgatus* (Spectacled monarch), *Myiagra cyanoleuca* (Satin flycatcher) and *Rhipidura rufifrons* (Rufous fantail).

In addition, the non-remnant pasture areas of the KP370.8 to KP383 section of the GTP RoW contained suitable habitat for Cattle egret (*Ardea ibis*), Rainbow bee-eater (*Merops ornatus*) and Masked lapwing (*Vanellus miles*), which are listed migratory bird species under the EPBC Act.

## 11.9 KP383 to KP397.8

The section KP383 to KP397.8 was characterised by open pastures (refer Plate 100 to Plate 104) with significant infestations of *Sporobolus pyramidalis* (Giant rat's tail grass) (refer Plate 99). Occasional sections of HVR and limited patches of remnant vegetation (in particular RE 11.3.26 dominated by *Eucalyptus moluccana*) were present (refer Plate 101).



Plate 99 Open pasture with *Sporobolus pyramidalis* at KP384 facing east



Plate 100 Open pasture at KP387 facing east



Plate 101 *Eucalyptus moluccana* (RE 11.3.26) at KP389 facing east



Plate 102 Open pasture at KP392 facing east



Plate 103 Open pasture at KP395 facing east



Plate 104 Open pasture at KP397 facing east

No EVNT species were identified in this section of the GTP RoW. Two Type A species were identified in the KP383 to KP397.8 section of the GTP RoW and are listed in Table 11.20.

**Table 11.20 Type A species identified in KP383 to KP397.8 of the GTP RoW**

EVNT species	Number of specimens	Comments
<i>Cymbidium canaliculatum</i>	11	Nine of these found situated close to KP389
<i>Xanthorrhoea johnsonii</i>	4	KP392.43

One large watercourse was assessed in this section, Larcom Creek at KP384.70. Due to the very limited number of *Eucalyptus tereticornis* trees at the crossing site, this area was identified as non-remnant (but HVR).

Declared weeds in this section include significant infestations of *Sporobolus pyramidalis* (Giant rat's tail grass) with a particularly dense infestation at KP383.14 to KP383.4 and another at KP384. In addition, *Lantana camara*, *Lantana montevidensis*, *Bryophyllum delagoense*, *Cryptostegia grandiflora*, *Opuntia stricta* and *Opuntia tomentosa* are present.

Habitat features are present in the form of dead trees (with hollows) and fallen logs (refer Plate 105 and Plate 106). This was identified as the key habitat potential in this area, as there were no shrubs and the ground cover was dominated by native grasses at KP385.5 with no ground timber present at KP385. Additionally, there was evidence of frequent cattle activity in these areas. There was also some evidence of fire, most likely from the common land management practise of regular burning off in the local area.



**Plate 105** *Todiramphus macleayii* (Forest kingfisher) nest in arboreal termite mound in *Eucalyptus moluccana* tree at KP389



**Plate 106** Hollow-bearing *Eucalyptus moluccana* trees common in the RE 11.3.26 at KP389

Erosion in this section was limited to some minor sheet and gully erosion at KP388.19 and KP389.16 (refer Plate 107 and Plate 108).



Plate 107 Sheet erosion at KP388.19



Plate 108 Sheet and gully erosion at KP389.16 in *Eucalyptus moluccana* vegetation

Within KP383 to KP397.8, suitable habitat has been identified for the EPBC listed *Geophaps scripta scripta* (Squatter pigeon), which is listed as Vulnerable.

In addition, the non-remnant pasture areas of the KP383 to KP397.8 section of the GTP RoW contained suitable habitat for *Ardea ibis* (Cattle egret), *Merops ornatus* (Rainbow bee-eater) and *Vanellus miles* (Masked lapwing), which are also listed migratory bird species under the EPBC Act.

**11.10 KP397.8 to KP408.81**

The section KP397.8 to KP408.81 was mostly vegetated from KP397.8 to KP401.3 and from KP404.6 to KP408.81 with some open pasture and orchards between KP401.3 and KP404.6. From KP397.8 the GTP RoW follows a drainage line in relatively open (HVR) country (refer Plate 109) before crossing a small cleared hill at KP398.5. From the creek at KP398.84 the GTP RoW was bordering or crosses through some remnant vegetation of RE 11.11.3 with *Corymbia citriodora*, *Eucalyptus crebra* and *Eucalyptus tereticornis* in the overstorey and *Lophostemon confertus* in the sub-canopy layer. Numerous *Xanthorrhoea* and *Macrozamia* specimens as well as a few *Cycas megacarpa* are present in the understorey. This area has been mapped by DEHP as RE 11.11.15/RE 11.11.18, and although some SEVT/rainforest species are present as summarised in Table 11.21, it was not deemed as RE 11.11.18 (refer Plate 111). To the south-east of the GTP RoW a track with dead *Lantana camara* (Lantana) was present (refer Plate 110 and Plate 112).

**Table 11.21 Main species present from KP399.27 to KP399.52**

<i>Cyclophyllum coprosmoides</i>	<i>Diospyros geminata</i>
<i>Drypetes deplanchei</i>	<i>Mallotus claoxyloides</i>
<i>Mallotus philippensis</i>	<i>Melia azedarach</i>
<i>Streblus brunonianus</i>	<i>Xanthorrhoea johnsonii</i>



**Plate 109 GTP RoW at KP398**



**Plate 110 Cleared open area at KP398.9**



**Plate 111 RE 11.11.1 with *Lophostemon confertus*, *Xanthorrhoea johnsonii* and *Macrozamia* spp**



**Plate 112 Track to the south-east of GTP RoW at KP399.4**

From KP400 to KP400.6, the vegetation changes to open pasture infested with *Lantana camara* before turning into HVR of predominantly *Lophostemon confertus* with some *Eucalyptus crebra* and *Macrozamia*'s in the understorey between KP400 to the top of the ridge at 400.36 (refer Plate 113). The GTP RoW steeply descends a dense *Lantana camara* and *Cryptostegia grandiflora* (Rubber vine) infested area with a few SEVT/rainforest species (refer Plate 114) before passing through open areas with some HVR and remnant vegetation (refer Plate 115).



Plate 113 *Lophostemon confertus* regrowth at KP400.3



Plate 114 Lantana and Rubber vine infested slope at KP400.5

At KP401.82 the GTP RoW transects a stand of SEVT resembling RE 11.11.18 (refer Table 11.22 and Plate 116), before opening up to grazing pastures to KP404.6 (refer Plate 117 and Plate 118).

**Table 11.22 SEVT species of RE 11.11.18 at KP401.82 to KP401.93**

<i>Acronychia pauciflora</i>	<i>Alyxia ruscifolia</i>
<i>Archidendropsis thozetiana</i>	<i>Brachychiton australis</i>
<i>Breynia oblongifolia</i>	<i>Cyclophyllum coprosmoides</i>
<i>Drypetes deplanchei</i>	<i>Flindersia australis</i>
<i>Gossia acmenoides</i>	<i>Hovea longifolia</i>
<i>Mallotus clooxyloides</i>	<i>Mallotus philippensis</i>
<i>Strychnos psilosperma</i>	



Plate 115 Remnant RE 11.11.3 at KP401.06 to KP401.3



Plate 116 SEVT (RE 11.11.18) at KP401.82 to KP401.93





Plate 117 Open pasture at KP402.5



Plate 118 Open pasture with *Acacia disparrima* regrowth at KP404.3

From KP404.6 to KP408.81 the GTP RoW is located in mainly remnant and HVR vegetation (refer Plate 119 to Plate 121). Large parts of the vegetation resemble RE 11.3.4, either as remnant or HVR, with some RE 11.3.26 in sections. Vegetation has recently been cleared in various sections for forestry purposes (approximately KP405) and the QCLNG haul road (approximately KP407) (refer Plate 122).



Plate 119 Remnant RE 11.11.3 at KP404.8



Plate 120 Remnant RE 11.3.4 at KP406



Plate 121 RE11.3.26 at KP407.25



Plate 122 Cleared vegetation (Forestry) at approximately KP405

From KP407.4 to KP408.66 the GTP RoW traverses through HVR of RE 11.3.4 with some non-remnant sections. The non-remnant sections are open grassy areas or areas that can be influenced by tidal overflow and commonly contained *Sporobolus virginicus* (Marine couch).

One EVNT species, *Cycas megacarpa* was identified within this section of the GTP RoW and the locations are listed in Table 11.23. Five Type A species were identified in the KP397.8 to KP408.81 section of the GTP RoW and are listed in Table 11.24.

Table 11.23 EVNT species identified within KP397.8 to KP408.81 of the GTP RoW

EVNT species	Number of specimens	Comments
<i>Cycas megacarpa</i>	3	Located at KP399.25, KP399.31 and KP399.32

**Table 11.24 Type A species identified in KP397.8 to KP408.81 of the GTP RoW**

EVNT species	Number of specimens	Comments
<i>Cymbidium canaliculatum</i>	2	-
<i>Brachychiton australis</i>	18	-
<i>Livistona decora</i> (formerly <i>decipiens</i> )	2	KP399.23 and KP405.87
<i>Macrozamia</i> spp	258	<i>Macrozamia macleayi</i> and/or <i>miquelii</i>
<i>Xanthorrhoea johnsonii</i>	142	-

Various water features are present within the GTP RoW; some with tidal flows (refer Plate 123 and Plate 124).



**Plate 123 Targinnie Creek at KP408.5**



**Plate 124 Humpy Creek at KP407.87**

The surveys indicated that the area around KP398.1 did not have a high habitat value potential. There were no hollows noted, and ground timber was absent with sparse ground cover dominated by grasses. Surface stones and gravel were common, with rocks, stones and outcropping common on adjacent hill slopes. There was extensive evidence of cattle activity and the site had been recently burned resulting in a very simplified structure of all habitats being observed.

Declared weeds in this section included *Lantana camara*, *Sporobolus pyramidalis* (at KP397.8), *Macfadyena unguis-cati*, *Bryophyllum delagoense*, *Cryptostegia grandiflora*, *Opuntia stricta* and *Opuntia tomentosa*.

Localised dense infestations of *Bryophyllum pinnatum* are present at KP407.87 to KP408. Although this species is not listed, it is a serious environmental weed.

Numerous habitat trees and logs were observed throughout the GTP RoW in this section due to its vegetated nature. Opportunistic fauna sightings include *Merops ornatus* (Rainbow bee-eater) and *Geophaps scripta scripta* (Squatter pigeon).

Erosion is limited and mainly associated with water features such as at KP398.06, KP402.47 and KP406.78 (refer Plate 125 to Plate 127). Some sheet erosion is present at KP407.53 (refer Plate 128)



Plate 125 Creek bank erosion at KP398.06



Plate 126 Minor erosion at drainage feature at KP402.47



Plate 127 Creek bank of tidal creek at KP406.78



Plate 128 Sheet erosion at KP407.53

Hollows and stags within KP400 to KP400.36 were sparse and small. Surface boulders, rocks, stones and outcropping were extensive. Frequent fires have resulted in a very simplified ground structure with the site deliberately burned as a part of local land managed practices shortly after the trapping, but not before the completion of the hair tube and remote trigger camera surveys.

At KP401.3, hollows in both trees and stags were uncommon in this area. Ground timber was very sparse, with only a few, fallen, hollow stages. There were no exposed rocks or stones observed. Cattle activity was extensive and cattle were frequently observed during the survey. In addition, frequent fires have resulted in a very simple ground structure with the site deliberately burned as part of local land management practises during the trapping survey.

Additional surveys were undertaken at KP405, KP406.9 and in close proximity to KP408.81 to assess the habitat potential of these areas. The survey undertaken at KP405 showed that hollows in both trees and stags were common. Ground timber was sparse, ranging from fallen sticks to a couple of large hollow logs and there were no exposed rocks or stones evident. Frequent fires have also resulted in a very simple ground structure being observed.

KP406.9 supported a number of large trees which had a diameter of over 80 cm. Hollows in both trees and stags were abundant with hollow recorded over 30 cm diameter. Ground timber was abundant, ranging from fallen sticks to large hollow logs and there were no exposed rocks or stones observed. There was little evidence of cattle activity or fire at this site.

KP408.81 was quite different to the previous sites as hollows were uncommon, recorded in both trees and stags, recorded to approximately 10 cm. Ground timber was common ranging from fallen sticks to a few, large hollow logs. There were no exposed rocks or stones on the alluvial flats, but some rock outcropping was evident on the rise. There was little evidence of cattle activity or fire at this site.

The vegetation at KP406 was dominated by *Corymbia citriodora* and *Eucalyptus crebra*. The shrub layer was comprised of *Lophostemon suaveolens*, *Corymbia tessellaris*, *Corymbia citriodora* and *Pogonolobus reticulatus*. Fissured tree bark, woody debris, leaf litter and limited ground cover were the only noted habitat features. The area investigated had also been recently burnt. A *Dacelo novaeguineae* (Laughing kookaburra) and *Ninox connivens* (Barking owl) were both sited at this location.

Based on habitat structure within KP397.8 to KP408.81, suitable habitat has been identified for EPBC listed EVNT species and is presented in Table 11.25.

**Table 11.25 Suitable habitat for EPBC Act EVNT species within KP397.8 to KP408.81 of the GTP RoW**

EPBC listed species	Comments
<i>Geophaps scripta scripta</i> (Squatter pigeon)	Cleared areas within KP397.8 to KP404
<i>Neochmia ruficauda ruficauda</i> (Star finch)	KP405.5 to KP407.5
<i>Turnix melanogaster</i> (Black-breasted button-quail)	KP400.3 and SEVT vegetation within KP401.82 to KP401.93
<i>Erythrotriorchis radiatus</i> (Red goshawk)	KP405.5 to KP407.5
<i>Nyctophilus cobeni</i> (South-eastern long-eared bat)	KP405.5 to KP407.5
<i>Xeromys myoides</i> (Water mouse)	Estuarine area (KP408.3 to KP408.7)
<i>Dasyurus hallucatus</i> (Northern quoll)	Larcom Range (KP400.3)
<i>Furina dunmalli</i> (Dunmall's snake)	Larcom Range (KP400.3 and KP401.2)
<i>Paradelma orientalis</i> (Brigalow scaly-foot)	Larcom Range (KP400.3) and KP405.5 to KP407.5
<i>Egernia rugosa</i> (Yakka skink)	Larcom Range (KP400.3) and KP405.5 to KP407.5
<i>Delma torquata</i> (Collared delma)	Larcom Range (KP400.3)

The woodland vegetation within KP405.5 to KP407.5 provides suitable habitat for various EPBC listed migratory bird species such as *Merops ornatus* (Rainbow bee-eater), *Monarcha melanopsis* (Black-faced monarch), *Monarcha trivirgatus* (Spectacled monarch), *Myiagra cyanoleuca* (Satin flycatcher) and *Rhipidura rufifrons* (Rufous fantail).

In addition, the non-remnant pasture areas of the KP405.5 to KP407.5 section of the GTP RoW contained suitable habitat for *Ardea ibis* (Cattle egret), *Merops ornatus* (Rainbow bee-eater) and *Vanellus miles* (Masked lapwing), which are also listed migratory bird species under the EPBC Act.

## 12 Conclusion

The GTP RoW section located between KP312 and KP408.81 was surveyed by experienced ecologists between mid-December 2011 and 25 January 2013. Results of these surveys are presented in detail within this report. This report is to be used during planning, construction and rehabilitation phases, and is to be implemented by Saipem and Santos GLNG Environment Officers and contribute to the SSMP as required pursuant to the EPBC Referral approval conditions.

Three EVNT flora species were identified of which were *Acacia pedleyi* (listed as Vulnerable under the NC Act), *Cycas megacarpa* (listed as Endangered under both the NC Act and EPBC Act) and *Desmodium macrocarpum* (listed as Near Threatened under the NC Act).

Eight Type A species listed under the NC Act were identified during these surveys and included *Brachychiton rupestris* (Narrow-leaved bottle tree), *Brachychiton populneus* (Kurrajong), *Brachychiton australis* (Broad-leaved bottle tree), *Macrozamia macleayi*, *Macrozamia moorei*, *Xanthorrhoea johnsonii* (Forest grass tree), *Cymbidium canaliculatum* (Black orchid), *Livistona decora* and *Geodorum densiflorum*.

Four EVNT fauna species were identified within this section of the GTP RoW (KP312 and KP408.81) with suitable habitat identified for 26 more significant species. The four identified fauna species of significance (listed under the provisions of the NC Act and/or the EPBC Act) included *Geophaps scripta scripta* (Squatter pigeon), *Phascolarctos cinereus* (Koala), *Ephippiorhynchus asiaticus* (Black-necked stork) and *Esacus magnirostris* (Beach stone-curlew). *Tachyglossus aculeatus* (Short-beaked echidna), which is listed as Special Least Concern under the NC Act, was also identified during the pre-clearance survey.

Migratory bird species listed under the EPBC Act were also identified. These included *Lophoictinia isura* (Square-tailed kite), *Merops ornatus* (Rainbow bee-eater), *Anseranas semipalmata* (Magpie goose), *Egretta sacra* (Eastern reef egret), *Haliaeetus leucogaster* (White-bellied sea-eagle), *Himantopus himantopus* (Black-winged stilt), *Monarcha melanopsis* (Black-faced monarch), *Pandion cristatus* (Eastern osprey), *Myiagra cyanoleuca* (Satin flycatcher) and *Cuculus optatus* (Oriental cuckoo).

In addition to the EVNT flora and fauna species, thirteen declared weed species were observed, of which seven are also listed as WoNS.

One EPBC Act listed TEC was identified, which was:

- Semi-Evergreen Vine Thicket - RE 11.11.18 Semi-evergreen vine thicket on old sedimentary rocks with varying degrees of metamorphism and folding. Lowlands (DEHP, 2013g)

Various patches of vegetation along the alignment, particularly riparian vegetation associated with watercourse crossings such as Callide River, Harper Creek and Larcom Creek and vegetation communities present within Callide, Calliope and Larcom Ranges, are regarded as potential habitat for EVNT and other fauna species.

In general, erosion present is low to moderate, with a few erosion risk areas mainly associated with creek lines.

## 13 References

- Birds in Backyards (2013a) *Black-necked stork*, Accessed [Online] February 2013, Available from: <http://www.birdsinbackyards.net/species/Ephippiorhynchus-asiaticus>
- Birds in Backyards (2013b) *Painted honeyeater*, Accessed [Online] February 2013, Available from: <http://www.birdsinbackyards.net/species/Grantiella-picta>
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