

# **Ecological Assessment Report**

## **IDP-213 - M70 to M17 Loop**

### **Gathering Line**

<b>Date</b>	<b>Rev</b>	<b>Reason For Issue</b>	<b>Author</b>	<b>Checked</b>
January 2016	A	Draft for Review	Angela Whitehall	
January 2016	0	Final	Angela Whitehall	Mitch Bird

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## Abbreviations

Abbreviation	Definition
CSG	Coal Seam Gas
DERM	Department of Environment and Resource Management
DEHP	Department of Environment and Heritage Protection
E	Endangered
EA	Environmental Authority
EPBC Act	Environment Protection and Biodiversity Conservation Act 1999
ESA	Environmentally Sensitive Area
GIS	Geographic Information System
GLNG	Gladstone Liquefied Natural Gas
GLNG ESC Manual	GLNG Project Upstream Activities Erosion and Sediment Control Manual
HMAT	Habitat Mapping Assessment Tool
JV	Joint Ventures
LNG	Liquefied Natural Gas
M	Migratory
NC Act	Nature Conservation Act 1992
NEAL	National Environmental Alert List
NCP	No Concern at Present
NT	Near Threatened
OC	Of Concern
PL	Petroleum Lease
PWMP	Pest and Weed Management Plan
RCAP	Roma Conventional Abandonment Project
RE	Regional Ecosystem
SLC	Special Least Concern
SSMP	Significant Species Management Plan
TAR	Type A Restricted Plant
TEC	Threatened Ecological Community
V	Vulnerable
WONS	Weeds of National Significance

## 1. Introduction

### 1.1. Project Description

The Gladstone Liquefied Natural Gas (GLNG) Project (the GLNG Project) involves the construction and operation of coal seam gas fields (CSG Fields) in the Bowen and Surat Basins, a gas transmission pipeline (GTP) and an LNG liquefaction and export facility (LNG Facility) in Gladstone, Queensland.

The CSG field's component of the Project is operated by Santos Ltd (Santos) on behalf of the GLNG joint venture. The Commonwealth Minister for the Department of the Environment (DOTE) (formerly the Department of Sustainability, Environment, Water, Populations and Communities (SEWPaC) granted conditional approvals to the Project under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) on 22 October 2010. These include approval no. 2008/4059 which relates to the CSG Fields component of the Project (EPBC Approval).

The evaluation report for the Project under the *State Development and Public Works Organisation Act 1971* (Qld) (SDWPO Act) was prepared by the Co-ordinator General and published in May 2010 (CG Report). The CG Report included an evaluation of the CSG Fields.

The development of the CSG fields will be undertaken pursuant to petroleum authorities under the *Petroleum and Gas (Production and Safety) Act 2004*, and the *Petroleum Act 1923*, environmental authorities under the *Environment Protection Act 1994 (Qld)* (EP Act), the EPBC Approval and in accordance with the requirements of the *Nature Conservation Act 1992 (Qld)* (NC Act).

### 1.2. Scope and Purpose

The IDP-213 - M70 to M17 Loop Gathering Line is located on Springwater property and within Hallett State Forest. Lot 9 AB202 and Lot 8 SP261936 respectively. The proposed infrastructure consists of an east-west section on Springwater property and a north-south section within Hallett State Forest which is consequently a Category C ESA in accordance with the environmental authority. These areas can be seen in Attachment 8.1 – Project Area. The ecological values of the east west section have been significantly reduced through historical clearing for the purposes of agriculture and more recently disturbance for Santos' CSG operations. The north-south section of the proposed infrastructure which occurs in Hallett State Forest has a higher level of ecological value due to it being the large tract of intact vegetation. Despite periodical forestry harvesting and scattered CSG activities, this area harbours a high level of ecological value.

## 2. Site Location

The proposed pipeline is located adjacent to existing CSG infrastructure within PL99 within the Fairview Gas field. The closest major towns are Injune approximately 41km to the West and Taroom to the East.



Figure 1 Locality Plan

## 3. Methodology

The survey was undertaken on the 20<sup>th</sup> and 21<sup>st</sup> January 2016 by Angela Whitehall.

The ecological survey was undertaken in accordance with Santos Methodology for Conducting Ecological Assessments “the Methodology”. The extent of disturbance (project area) is illustrated in Attachment 8.1 – Project Area.

### 3.1. Survey Limitations

Ecological surveys often fail to record all flora and fauna species present within a site due to a variety of reasons, particularly the seasonality of the survey. In this context, it is noted that some flora species do not persist over all seasons and all climatic variants of a particular season. Some flora species are more prominent in certain seasons and climatic conditions when flowers and/or fruits are produced.

In addition, the limited time spent on site, the scope of the fauna survey (i.e. no trapping and no nocturnal survey) and the time of day the survey was undertaken all limit the overall survey effort and associated species detected. The assessment of the project area was limited to a diurnal survey and therefore nocturnal and cryptic species were highly unlikely to be detected. A dedicated fauna

survey was not conducted. Instead the fauna habitat values based on ecological characteristics of the project were the focus of this assessment and features captured in Santos GIS. Assumptions were then made with the use of HMAT as to the likelihood of EVNT fauna species presence.

Where ecological surveys are unable to be conducted at the optimal times the precautionary principle applies and listed species are presumed to occur where the relevant habitat features are present. Santos applies the precautionary principle using Santos' prior knowledge of the region and ecological surveys. Regardless of the time of surveying, remnant / non-remnant vegetation types and important habitat features (including microhabitat features) remain evident and are recorded during ecological surveys.

In addition to results from this assessment, a literature review of previous ecological and fauna surveys was conducted and results taken into account.

## 4. Results and discussion

### 4.1. Water

#### 4.1.1. Watercourses

A desktop review of the Santos GIS database ("Ordered Drainage" layers) indicates there are 3 mapped watercourses in or within 100m of the project area. These are all Stream Order 1s. Photographs of these drainage features are provided in Attachment 8.3 – Photographs of ordered drainage and Attachment 8.4 – Map of watercourse numbers. Coordinates are provided in the table below.

**Table 1 Location of stream order 1 photograph points.**

WC number	Stream Order	Easting	Northing
1	1	695367	7150759
2	1	696970	7150094
3	1	696949	7146886

#### 4.1.2. Wetlands

A review of the Santos Referable Wetlands GIS layer and a Map of Referable Wetlands sourced from the DEHP shows no referable wetlands are located within the project area. No referable wetlands will be impacted by the proposed activities.

#### 4.1.3. Lakes

A desktop review of the Santos GIS database indicated there are no lakes in the project area. The field assessment verified the absence of lakes in the project area.

#### 4.1.4. Springs

A desktop review of the Santos GIS database showed no springs in or within 200 metres of the project area. The field assessment verified the absence of springs within the project area, however survey limitations did not allow an assessment of the entire 200m buffer.

#### 4.1.5. Floodplains

A review of Santos GIS database indicated that the project area is not within a floodplain. The field assessment verified the absence of a floodplain within the project area.

## 4.2. Vegetation

#### 4.2.1. Vegetation Communities

DNRM mapping indicates the area supports non remnant vegetation and remnant vegetation classified as 11.10.9. The ecological assessment found the mapping to be correct in the project area.

The north south arm of the project area is completely represented by the Least Concern regional ecosystem of 11.10.9; *Callitris glaucophylla* woodland on coarse grained sedimentary rocks. This regional ecosystem was sampled at assessment sites 2 and 3. Quaternary results can be seen in Attachment 8.2 – Baseline Data Sheets and Photographs.

Despite the dominance of *A. leuhmannii* and absence of *C. glaucophylla* at site 2, the vegetation structure is still deemed to fit within the framework of regional ecosystem 11.10.9 due to the recent (within 5 years) evidence of commercial logging of large *Callitris* trees and hence their almost absence within the floristic structure.

The east west arm of the project area is non remnant vegetation and is highly disturbed due to CSG and agricultural activities. Despite this high level of disturbance, some sections still potentially support fauna species due to the retained habitat features and close locality to the large tract of intact vegetation which occurs to the south (and in some areas to the north). Some habitat features which have been retained include rock piles, hollow logs and hollow bearing trees.

#### 4.2.2. MNES and EVNT Flora Species

##### **Desktop Assessment**

A search of the EPBC Act Protected Matter Search tool database returned records of two species of listed flora (*Cadellia pentastylis*, *Tylorphora linearis*) which could potentially occur in the study area.

A Wildlife Online database search using a 4 km radius from a central coordinate identified no species listed under the NC Act.

##### **Field Assessment Results**

No EVNT flora species were observed within the project area during the field assessment.

#### 4.2.3. Pest plants

Two pest plant species declared under the *Land Protection (Pest and Stock Route Management) Act 2002 (LP Act)* and listed as Weeds of National Significance (WONS) were identified within the project area, these being the Velvety tree pear (*Opuntia tomentosa*) and Prickly Pear (*Opuntia stricta*). At all sites their presence was scattered.

#### **4.2.4. EVNT and Migratory Fauna Species**

##### ***Desktop Assessment***

A desktop review of the Santos GIS database indicated two confirmed sightings of Squatter Pigeon (*Geophaps scripta scripta*). No fauna listed under the NC Act (Qld) were indicated in this search. Commonwealth MNES identified by a search of the Protected Matters Database, included 14 threatened fauna species and 17 migratory species. The Wildlife Online search returned no significant fauna species as being potentially present in the area. A fauna survey conducted by Boobook consulting in December 2012 found two occurrences of the Golden-tailed Gecko (*Strophurus taenicauda*) at the Pony Hills East Quarry site which occurs 3.8km east of the southern most point of this infrastructure assessment area.

##### ***Field Assessment***

No MNES or EVNT fauna were observed within the project area during the field assessment. No migratory species were observed within the project area. However common migratory species such as the Rainbow Bee-eater and Cattle Egret which are known in the area are expected to incidentally use the site.

The tract of vegetation represented by the Least Concern regional ecosystem of 11.10.9 is relatively intact despite CSG operations in the area. Due to this structure and the specific habitat values within this area, it has a high potential value for fauna species, including EVNT species

#### **4.2.5. Fauna Habitat Values and Breeding Places**

Notable fauna habitat features identified during the field survey within the remnant vegetation includes a medium amount of vegetative matter in the ground with a scattering of logs, some hollow, loose bark and some large hollow bearing trees. Despite the extent of the clearing within the non remnant area, some habitat features have been retained and may provide refuge for fauna. No breeding places were identified within the project area during the field survey.

#### **4.2.6. Habitat Assessment for MNES Fauna Species**

The HMAT was used to evaluate habitat for MNES fauna within the project area. Coupled with ecologist's verification, the HMAT uses species distributions, known records, and onsite habitat features to determine the type of habitat for MNES species present within the assessment area. Table provides the results of this assessment for the project area.



**Table 4 – HMAT Assessment of MNES fauna habitat within the project area**

Species	HMAT Output		Acceptance of HMAT Output	
	Non Rem	11.10.9	Non Rem	11.10.9
Koala	Unlikely habitat	Unlikely habitat	Agree	Agree
Squatter pigeon	Unlikely habitat	Unlikely habitat	Agree	<b>Reject.</b> Past sightings in the area and suitable habitat, general habitat is present for both sites. (General Habitat)
Black-breasted button quail	Unlikely habitat	Unlikely habitat	Agree	Agree
Red Goshawk	Unlikely habitat	General habitat	Agree	<b>Reject.</b> The project area does not provide suitable habitat or essential microhabitat for this species respectively.
Large-eared pied bat	Unlikely habitat	Unlikely habitat	Agree	Agree
South-eastern long-eared bat	Unlikely habitat	General habitat	Agree	Agree
Northern quoll	Unlikely habitat	Essential habitat	Agree	<b>Reject.</b> The project area does not provide essential microhabitat for this species
Ornamental snake	General habitat	General habitat	<b>Reject.</b> An absence of moist micro-habitat features suggest the project area does not provide suitable habitat for this species.	<b>Reject.</b> An absence of moist micro-habitat features suggest the project area does not provide suitable habitat for this species.
Dunmall's snake	Unlikely habitat	General habitat	Agree	Agree
Yakka skink	General habitat	General habitat	<b>Reject.</b> General habitat and microhabitat values are not present in the area assessed.	Agree
Collared delma	Unlikely habitat	General habitat	Agree	Agree
Australian painted snipe	Unlikely habitat	Unlikely habitat	Agree	Agree
Fitzroy river turtle	Unlikely habitat	Unlikely habitat	Agree	Agree
Murray cod	Unlikely habitat	Unlikely habitat	Agree	Agree
Boggomoss snail	Unlikely habitat	Unlikely habitat	Agree	Agree

#### 4.2.7. Significant Impact Assessment – MNES Fauna

##### *Remnant vegetation area*

The results of the HMAT assessments identified the intact vegetation as general habitat for the:

- Red Goshawk
- South-eastern long-eared bat
- Dunmall's snake
- Yakka Skink
- Collared delma
- Squatter pigeon
- \

An assessment of the potential adverse impacts indicates that the proposed disturbance may result in a significant residual adverse impact on these six species. A disturbance limit request must be submitted and approved. For all significant residual adverse impacts a suitable offsets will be provided in accordance with the environmental approvals for the GLNG Project.

#### 4.2.8. Koala Habitat

The entire project area supports either non-remnant vegetation or vegetation not suited to koala habitat trees. The project area does not support koala habitat.

## 5. Summary and Recommendations

### 5.1. Summary

The ecological survey conducted for the proposed IDP-213 - M70 to M17 Loop Gathering Line was carried out in accordance with the environmental conditions required by relevant Commonwealth and State authorities and revealed the following key information:

- The project area occurs within a Category C ESA of State Forest.
- No breeding places were identified during the assessment however survey limitations applied to this assessment due to work being carried out during the day only.
- The project area and contains two vegetation types, these being remnant 11.10.9 and non-remnant derived grassland vegetation with some retained habitat features.
- No MNES flora species were located within the project area.
- No EVNT flora or fauna species were located within the project area or within 100m of the project area during the assessment however there have been two Squatter pigeon sightings and one Golden Tailed Gecko sighting within 4.8 km of the project area.
- The results of the HMAT assessments identified general habitat for several species of EVNT fauna.
- The project area does not support koala habitat as defined in the Koala Plan.

## 5.2.Recommendations

Due to notable fauna habitat being located in the project area, project managers should ensure an experienced fauna handler (i.e. spotter-catcher) holding a valid State Rehabilitation Permit is present to undertake a preclearance fauna habitat survey prior to and as close as practicable to clearing operations taking place. The fauna handler must also be on site to supervise the clearing of fauna habitat features and coordinate the relocation of viable fauna habitat features in accordance with the Upstream Species Management Plan for Roma, Arcadia and Fairview Coal Seam Gas (CSG) Fields and the Significant Species Management Plan.

A disturbance limit request must be submitted and approved prior to any ground disturbance activities. The disturbance limit request needs to cover the following:

- Red Goshawk
- South-eastern long-eared bat
- Dunmall's snake
- Yakka Skink
- Collared delma
- Squatter pigeon

Clearing and grading activities must be conducted in conjunction with the implementation of erosion and sediment control measures in accordance with the GLNG Erosion and Sediment Control Manual. The current condition of the area relies on the mix of grassy ground cover to maintain soil stability. Any clearing activity is likely to increase the potential risk of erosion and loss of sediment.

## 6. Reference Documents

### 6.1.Relevant Project Management Plans and Procedures

- GLNG (2013) 3380-GLNG-3-1.3-0006 Santos GLNG Upstream - Pest and Weed Management Plan;
- GLNG (2013a) 3301-GLNG-4-1.3-0016 Santos GLNG Upstream - Procedure for Conducting Wetland Assessments;
- GLNG (2012) 0020-GLNG-41.3-0003, CSG Fields Significant Species Management Plan;
- RSGPA Fauna Management Plan (0020-GLNG-4-1.3-0073).
- Upstream Species Management Plan for Roma, Arcadia and Fairview Coal Seam Gas (CSG) Fields (231733-002-002)

### 6.2.Other Reference Documents

- Aurecon (2011) GLNG Project Upstream Activities Erosion and Sediment Control Manual, Ref 213885, 27 July 2011.
- Boobook (2013) Report on a fauna survey of Pony Hills East Quarry extension Fairview Gas Field, 8 January 2013.
- Boobook (2011), Report on inspection of Pony Hills West Quarry extension, Fairview Gas Field, 14 December 2011.

- Bostock, P.D. & Holland, A.E. (eds) (2010). Census of the Queensland Flora 2010. Queensland Herbarium, Department of Environment and Resource Management, Brisbane.
- DEHP (2014)., *Environmental Protection Act 1994* Fairview Arcadia Project Area Environmental Authority: Permit number EPPG00928713 dated 29<sup>th</sup> September 2015;
- Department of Environment & Climate Change New South Wales (DECC) 2005, *Tylophora linearis* – Profile, viewed 16 January 2016, <  
<http://www.environment.nsw.gov.au/threatenedspeciesapp/profile.aspx?id=10815>>
- DERM (2011) QH\_Springs\_db.zip data, Dataset Custodian – QLD Herbarium DERM, Dataset Date – September 2011, Metadata Date – 16-09-2011.
- EPA 2003, 'BPA BRB South Fauna Expert Panel in Brigalow Belt South Biodiversity Planning Assessment', Environmental Protection Agency, Brisbane.
- Forster, P.I., Binns, D & Robertson, G 2004, 'Rediscovery of *Tylophora linearis* P.I.Forst. (Apocynaceae: Asclepiadaceae) from New South Wales, with revision of its conservation status to vulnerable', *Austrobaileya*, vol. 6, pp. 941–947.
- Geoscience Australia (2013) Geoscience Australia (formerly AUSLIG) 250k raster);
- Neldner, V., Wilson, B., Thompson, E., Dillewaard, H. (2012). *Methodology for Survey and Mapping of Regional Ecosystems and Vegetation Communities in Queensland (Version 3.2)*, Environmental Protection Agency, Queensland.
- Pizzey, G. & Knight, F. (2007), *The Field Guide to the Birds of Australia* (8th edition) Harper Collins Publishers, NSW, Australia. 580pp.
- Queensland Government (2010) Coordinator-General's evaluation report for an environmental impact statement Gladstone Liquefied Natural Gas - GLNG project. May 2010.
- Stater et al (2001). *The Slater Field Guide to Australian Birds*. Reed New Holland. Sydney, Australia.

## Attachment 8.1 – Project Area





Drawn by:  
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**Santos**  
IDP-213-CDZ1

**M79 - M17 Loop Gathering line**  
**Northern ecological assessment area**



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## Attachment 8.2 – Baseline Data Sheets and Photographs

Site 1

<b>Related Infrastructure ID:</b>	IDP-213 - M70 to M17 Loop Gathering	<b>Request ID:</b>	
<b>Date:</b>	20/01/2016	<b>Tenement:</b>	PL99
		<b>Recorder:</b>	Angela Whitehall

<b>Locality/Coordinates:</b>	<b>Easting:</b> 696190	<b>Northing:</b> 7150350	<b>Zone:</b> 55
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Vegetation & Landzone	
<b>Site Description</b> (Describe vegetation community, disturbances, landzone and soil)	Cleared grazed paddock dominated by introduced pasture species on coarse grained sedimentary rocks. Site is within existing disturbance of CSG operations and is heavily grazed. Despite the area being non remnant, the area still retains fragmented habitat values and is adjacent to State Forest.

Vegetation Communities			
<b>Mapped RE</b>	non-rem	<b>Biodiversity Status:</b>	n/a
<b>Short Description</b>	n/a		
<b>Ground Truthed RE</b>	non-rem	<b>Biodiversity Status:</b>	n/a
<b>Short Description</b>	n/a		
<b>Mapped TEC</b>	Nil		
<b>Ground Truth TEC</b>	Nil		
<b>Comments</b>	No TECs observed at the site		

EVNT and Special Least Concern Plants					
Species Name	EPBC Act	NC Act	Species Name	EPBC Act	NC Act
<i>Note: Record the following information (on Toughbook where possible): Photograph, species, count, height, DBH, location and potential for</i>					

Weeds			
Counts: R=rare (<10 plants observed); U = uncommon (11-50 plants observed); C = common (>50 plants observed);			
Species	Relative Dominance	Species	Relative Dominance
Opuntia stricta	<10 plants/ha		
Total % Weed cover :			

Watercourse, Floodplains, Referable Wetlands, Lakes and Springs*			
Feature	CDZ	Buffer	Comment
Waterways	No	No	
Watercourses	No	No	
Referable Wetlands	No	No	
Wetlands	No	No	
Lakes	No	No	
Springs	No	No	Springs were only assessed within the CDZ
Floodplains	No	No	
Discharge areas	No	No	

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## GLNG Project

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Vegetation Strata			
<i>Important: for non-remnant sites, record dominant species, cover and average height only</i>			
<b>Emergents</b>			
Cover:		%	Av Height: m Height Range: m
Species	Relative Dominance	Species	Relative Dominance
<b>Tree Layer 1</b>			
Cover:		%	Av Height: m Height Range: m
Species	Relative Dominance	Species	Relative Dominance
<b>Tree Layer 2</b>			
Cover:	3%	%	Av Height: 19 m Height Range: 17-21 m
Species	Relative Dominance	Species	Relative Dominance
Eucalyptus populnea	Associated		
Callitris glaucophylla	Dominant		
<b>Shrub Layer 1</b>			
Cover:	15	%	Av Height: 3 m Height Range: 2-4 m
Species	Relative Dominance	Species	Relative Dominance
Callitris glaucophylla	Dominant		
Ventilago viminalis	Associated		
Eucalyptus populnea	Co-dominant		
Hakea lorea	Associated		
Eremophila mitchellii	Associated		
Alphitonia excelsa	Associated		
Carissa ovata	Associated		
<b>Ground-layer</b>			
Cover:	78	%	Av Height: 0.32 m Height Range: 0-40 m
Species	Relative Dominance	Species	Relative Dominance
Cenchrus ciliaris	Dominant		
Panicum maximum	Associated		
Stylosanthes scabra	Associated		
Glandularia aristigera	Associated		
Vittadinia dissecta	Associated		



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GLNG Project

## Representative photographs Site 1



<b>Related Infrastructure ID:</b>	IDP-213 - M70 to M17 Loop Gathering	<b>Request ID:</b>	
<b>Date:</b>	20/01/2016	<b>Tenement:</b>	PL99
		<b>Recorder:</b>	Angela Whitehall

<b>Locality/Coordinates:</b>	<b>Easting:</b> 697541	<b>Northing:</b> 7148147	<b>Zone:</b> 55
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Vegetation & Landzone	
<b>Site Description</b> (Describe vegetation community, disturbances, landzone and soil)	Intact woodland dominated by A. luehmannii on gaorse-grained sedimentary rocks. Area has been subject to forestry practices with large C. glaucophylla stumps evident and regrowth present. Area is grazed by cattle and one side of the area assessed has an existing CSG linear infrastructure alongside it.

Vegetation Communities			
<b>Mapped RE</b>	11.10.9	<b>Biodiversity Status:</b>	No concern at present
<b>Short Description</b>	Callitris glaucophylla woodland on coarse-grained sedimentary rocks		
<b>Ground Truthed RE</b>	11.10.9	<b>Biodiversity Status:</b>	No concern at present
<b>Short Description</b>	Callitris glaucophylla woodland on coarse-grained sedimentary rocks		
<b>Mapped TEC</b>	Nil		
<b>Ground Truth TEC</b>	Nil		
<b>Comments</b>	No TECs observed in the project area		

EVNT and Special Least Concern Plants					
Species Name	EPBC Act	NC Act	Species Name	EPBC Act	NC Act

Note: Record the following information (on Toughbook where possible): Photograph, species, count, height, DBH, location and potential for

Weeds			
Counts: R=rare (<10 plants observed); U = uncommon (11-50 plants observed); C = common (>50 plants observed);			
Species	Relative Dominance	Species	Relative Dominance
Opuntia tomentosa	<10 plants/ha		
Total % Weed cover :			

Watercourse, Floodplains, Referable Wetlands, Lakes and Springs*			
Feature	CDZ	Buffer	Comment
Waterways	No	No	
Watercourses	No	No	
Referable Wetlands	No	No	
Wetlands	No	No	
Lakes	No	No	
Springs	No	No	Springs were only assessed within the CDZ
Floodplains	No	No	
Discharge areas	No	No	

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## GLNG Project

Vegetation Strata			
<i>Important: for non-remnant sites, record dominant species, cover and average height only</i>			
<b>Emergents</b>			
Cover:		%	Av Height: <input type="text"/> m Height Range: <input type="text"/> m
Species	Relative Dominance	Species	Relative Dominance
<b>Tree Layer 1</b>			
Cover:	35	%	Av Height: <input type="text"/> 15 m Height Range: <input type="text"/> 12-17 m
Species	Relative Dominance	Species	Relative Dominance
Allocasuarina luehmannii	Dominant		
Eucalyptus melanophloia	Associated		
Eucalyptus populnea	Associated		
<b>Tree Layer 2</b>			
Cover:	32	%	Av Height: <input type="text"/> 5 m Height Range: <input type="text"/> 2.5-7 m
Species	Relative Dominance	Species	Relative Dominance
Allocasuarina luehmannii	Dominant		
Callitris glaucophylla	Co-dominant	Abutilon leucopetalum	
<b>Shrub Layer 1</b>			
Cover:		%	Av Height: <input type="text"/> 1.5 m Height Range: <input type="text"/> 1-2 m
Species	Relative Dominance	Species	Relative Dominance
Geijera parviflora	Dominant		
Callitris glaucophylla	Co-dominant		
Acacia leiocalyx	Associated		
Acacia excelsa	Associated		
Petalostigma pubescens	Associated		
<b>Ground-layer</b>			
Cover:	78	%	Av Height: <input type="text"/> 0.25 m Height Range: <input type="text"/> .20-.36 m
Species	Relative Dominance	Species	Relative Dominance
Fimbristylis dichotoma	Dominant		
Plectranthus parviflorus	Co-dominant		
Cheilanthes sieberi	Associated		
Cenchrus ciliaris	Associated		
Aristida jerichoensis	Associated		
Aristida caput-medusae	Associated		
Sida cordifolia	Associated		
Sporobolus sp. (infertile)	Associated		
Evolvulus alsinoides	Associated		

# Santos

GLNG Project

## Representative photographs Site 2



Site 3

Related Infrastructure ID:	IDP-213 - M70 to M17 Loop Gathering	Request ID:	
Date:	20/01/2016	Tenement:	PL99
		Recorder:	Angela Whitehall

Locality/Coordinates:	Easting: 697567	Northing: 7148786	Zone: 55
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Vegetation & Landzone	
Site Description (Describe vegetation community, disturbances, landzone and soil)	Callitris glaucophylla woodland on coarse grained sedimentary rocks. A sparse shrub layer and solid ground layer are present. The area is subject to grazing by cattle, has some linear CSG infrastructure and forestry activities.

Vegetation Communities			
Mapped RE	11.10.9	Biodiversity Status:	No concern at present
Short Description	Callitris glaucophylla woodland on coarse-grained sedimentary rocks		
Ground Truthed RE	11.10.9	Biodiversity Status:	No concern at present
Short Description	Callitris glaucophylla woodland on coarse-grained sedimentary rocks		
Mapped TEC			
Ground Truth TEC			
Comments	No TEC observed in the project area		

EVNT and Special Least Concern Plants					
Species Name	EPBC Act	NC Act	Species Name	EPBC Act	NC Act

Note: Record the following information (on Toughbook where possible): Photograph, species, count, height, DBH, location and potential for

Weeds			
Counts: R=rare (<10 plants observed); U = uncommon (11-50 plants observed); C = common (>50 plants observed);			
Species	Relative Dominance	Species	Relative Dominance
Opuntia stricta	<10 plants/ha		
Total % Weed cover :			

Watercourse, Floodplains, Referable Wetlands, Lakes and Springs*			
Feature	CDZ	Buffer	Comment
Waterways	No	No	
Watercourses	No	No	
Referable Wetlands	No	No	
Wetlands	No	No	
Lakes	No	No	
Springs	No	No	Springs were only assessed within the CDZ
Floodplains	No	No	
Discharge areas	No	No	

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Vegetation Strata			
<i>Important: for non-remnant sites, record dominant species, cover and average height only</i>			
<b>Emergents</b>			
Cover:	<input type="text"/>	%	Av Height: <input type="text"/> m Height Range: <input type="text"/> m
Species	Relative Dominance	Species	Relative Dominance
<b>Tree Layer 1</b>			
Cover:	<input type="text"/>	42 %	Av Height: <input type="text"/>
			11 m Height Range: <input type="text"/>
			10-12 m
Species	Relative Dominance	Species	Relative Dominance
Callitris glaucophylla	Dominant		
Allocasuarina luehmannii	Associated		
<b>Tree Layer 2</b>			
Cover:	<input type="text"/>	16 %	Av Height: <input type="text"/>
			6 m Height Range: <input type="text"/>
			5-7 m
Species	Relative Dominance	Species	Relative Dominance
Callitris glaucophylla	Dominant		
Eucalyptus melanophloia	Associated		
Allocasuarina luehmannii	Associated		
<b>Shrub Layer 1</b>			
Cover:	<input type="text"/>	4 %	Av Height: <input type="text"/>
			1 m Height Range: <input type="text"/>
			1-1.5 m
Species	Relative Dominance	Species	Relative Dominance
Alphitonia excelsa	Associated		
Petalostigma pubescens	Associated		
Acacia leiocalyx	Associated		
<b>Ground-layer</b>			
Cover:	<input type="text"/>	75 %	Av Height: <input type="text"/>
			0.35 m Height Range: <input type="text"/>
			.30-.40 m
Species	Relative Dominance	Species	Relative Dominance
Fimbristylis dichotoma	Dominant		
Aristida sp.	Associated		
Evolvulus alsinoides	Associated		
Sida cordifolia	Associated		
Plectranthus parviflorus	Associated		
Cheilanthes sieberi	Associated		
Aristida caput-medusae	Associated		
Chrysopogon fallax	Dominant		
Glandularia aristigera	Associated		
Conyza bonariensis	Associated		

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## Representative photographs Site 3



## Attachment 8.3 – Photographs of ordered drainage

Watercourse 1





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## Watercourse 2



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## Watercourse 3

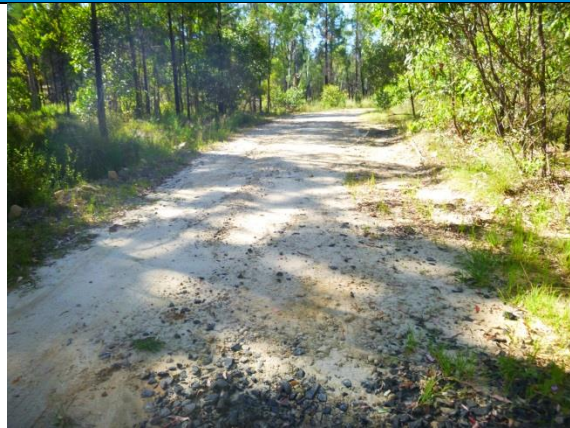
Upstream



Downstream



Looking away Fairview 31



Looking towards Fairview 31



## Attachment 8.3 – Photographs of ordered drainage

