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ENERGY AND INFRASTRUCTURE

QUEENSLAND CURTIS LNG PROJECT (UPSTREAM COMPONENT)

Supplementary Flora and Fauna Assessment

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1 INTRODUCTION

QGC Limited, a wholly-owned subsidiary of the BG Business, is proposing to expand its coal seam gas extraction activities in the Surat Basin to supply coal seam gas for export, via a gas export pipeline and a liquefied natural gas (LNG) processing facility on Curtis Island, near Gladstone.

QGC was required to submit an Environmental Impact Statement (EIS) to meet the requirements of a significant project approval under the Queensland Government's *State Development and Public Works Organisation Act 1971 (SDPWO Act)*. Furthermore, the EIS was also required to address Matters of National Environmental Significance (MNES) under the Australian Government's *Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)*. The draft EIS for the Queensland Curtis LNG Project was released to the public and was available for public comment on the 28th of August 2009.

QGC is also required by both the Australian and the Queensland Government to submit a supplementary EIS. The supplementary EIS will address submissions that have arisen throughout the commentary process, provide further information about the project and to identify and discuss Project design changes that have occurred since the release of the EIS.

In addition to addressing relevant submissions, this report will provide details of the additional studies and surveys that have been carried out to supplement the Gas Field's technical flora and fauna assessment included in *Appendix 3.2* of the draft EIS.

In particular, this report will identify and discuss:

- Environmental values of areas that due to land access constraints could not be surveyed prior to the release of the draft EIS
- Environmental values of areas that were not included within the Gas Field's initial design footprint but now as a result of design changes may be affected by gas extraction activities
- Any additional potential impacts on environmental values that may arise due to any proposed changes to the Gas Field design
- Potential cumulative impacts on environmental values as a result of this development and other development within the region.

2 BACKGROUND

The flora and fauna assessments that were undertaken for and included within the draft EIS considered publically available databases, published information and involved detailed field surveys of the Gas Fields undertaken specifically for the Project.

These flora and fauna assessments considered the potential for and the known occurrences of protected plants, animals and vegetation communities listed under the Australian Government's *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), the Queensland *Nature Conservation Act 1992* (NC Act) and the Queensland *Vegetation Management Act 1999* (VM Act). This study also considered Regionally Significant Species and areas of Special Biodiversity Value as identified in the Queensland Department of Environment and Resource Management (DERM) Biodiversity Planning Assessment (BPA) for the Brigalow Belt Bioregion. DERM Environmentally Sensitive Areas (ESAs) and general biodiversity values, evaluated in terms of common flora and fauna and habitat corridors, were also mapped and described.

The field surveys were undertaken by botanists over a total period of 25 days. The flora surveys involved the ground truthing of 126 sites. Of these, 46 were assessed to the Tertiary level and the remaining 80 to a Quaternary level. These flora site surveys were conducted in accordance with Queensland Herbarium survey methods described in Nelder *et al.* (2005).

The fauna surveys initially involved a rapid assessment of fauna habitat conducted in conjunction with the flora surveys. Then detailed fauna surveys were undertaken by ecologists over a total period of 17 days. Detailed fauna surveys were conducted using pit fall traps, bat traps, ultrasonic bat recording, remote cameras, observational bird transects and night spotlighting. The detailed fauna surveys were undertaken within representative areas of intact native vegetation as it is assumed that such areas would provide the best indication of fauna abundance and diversity (Pennay *et al.* 2002).

The findings of the desktop and field studies, a discussion of the potential impacts of the Gas Field development and recommended mitigation measures were presented in a technical flora and fauna report included in *Appendix 3.2* of the draft EIS.

3 KEY DESIGN CHANGES AND/OR INFORMATION GAPS

3.1 Additional proposed infrastructure

Since the release of the draft EIS, refinements to the Project design have led to an increase in the amount of infrastructure that is proposed to be sited within the Gas Fields. In terms of flora and fauna, the inclusion of additional infrastructure will be relevant to the area of vegetation that will be required to be cleared.

A comparison of the amount of infrastructure proposed in the draft EIS as opposed to what is now proposed in the supplementary EIS and how this will affect the Project's clearing footprint is set out in *Table 1*.

The siting of gas field infrastructure will be progressive over the life of the project and therefore in not possible, at this stage, to define the exact location of all proposed gas infrastructure. However, since the release of the draft EIS some preliminary investigations have been undertaken in proposed Central Processing Plant (CPP) locations. As part of these preliminary investigations, flora and fauna surveys have been conducted and the findings of these surveys summarised in this report.

Table 1: Comparison of clearing footprints presented in the draft EIS and the supplementary EIS

Proposed Infrastructure	Infrastructure footprint used in the draft EIS			Infrastructure footprint used in the supplementary EIS		
	Number/ Length	Clearing pad/corridor	Total Area	Number/ Length	Clearing pad/corridor	Total Area (ha)
Gas Wells	6000	1 ha	6,000 ha	6,000	1 ha	6,000 ha
Borrow Pits	Not Included			53	8 ha	420 ha
Gas/ Water Gathering Line Easements	2500 km	10-25 m width	3,750 ha	Total 13,431 km of which 9,235 km easement required	15 – 30 m easement width	15,600* ha
Gas Trunklines (including power)	1200 km	30 m	3,600 ha	Total 1,615 km gas + 555 km water + 1615 km underground transmission line which requires 600 km easement	20 – 46 m easement width	1,600** ha
Gas Collection Laterals	100 km	40 m	400 ha	No longer differentiated from the Gas Collection Header		
Field Compressors	27	5 ha	135 ha	53	7 ha + 1 ha laydown area	424 ha
Central Processing Plants	9	7 ha	63 ha	4	19 ha +1 ha laydown area	80 ha
Water Treatment Plants	3	8 ha	24 ha	3	25 ha	75 ha
Ponds, including brine ponds and brine evaporation basins		Various from 4 – 11 ha	550 ha	135 (excluding existing ponds)	Various from 0.3 ha to 140 ha	665 ha
Salt landfill			Salt Landfill area not specified	3	16 ha	50 ha
Access Tracks	2000 km	4 m width	800 ha	4,500 km	3.6 m width	1,600 ha
Construction Camps	5	10-15 ha	65 ha	10	25 ha	250 ha
Total Area	15,387 ha			26,764 ha		

*Areas calculated on worst case

**This area has decreased due to the co-location of infrastructure within the Gas Trunkline easements

3.2 Gas tenements ATP 768 and PL 171

The gas tenements ATP 768 and PL 171 were included in the Project design after the field work was complete. As such, the flora and fauna assessment of these tenements presented in the draft EIS was limited to a desktop assessment. For an overview of all QGC Gas Field tenements please refer to *Figure 1*.

These tenements have since been subject to flora and fauna surveys and the findings of these studies have been presented in *Section 5*.

3.3 Other Development in the Region

The draft EIS identified and discussed potential cumulative impacts on flora and fauna that may result from both the Project and other existing, known or proposed projects located within the vicinity of the Gas Fields. An additional project that was not considered in the draft EIS, and which information was publicly available is the Surat Gladstone Project Pipeline. A comparison of the proposed projects considered in the draft EIS as opposed to what has been considered in the supplementary EIS is presented in *Table 2*.

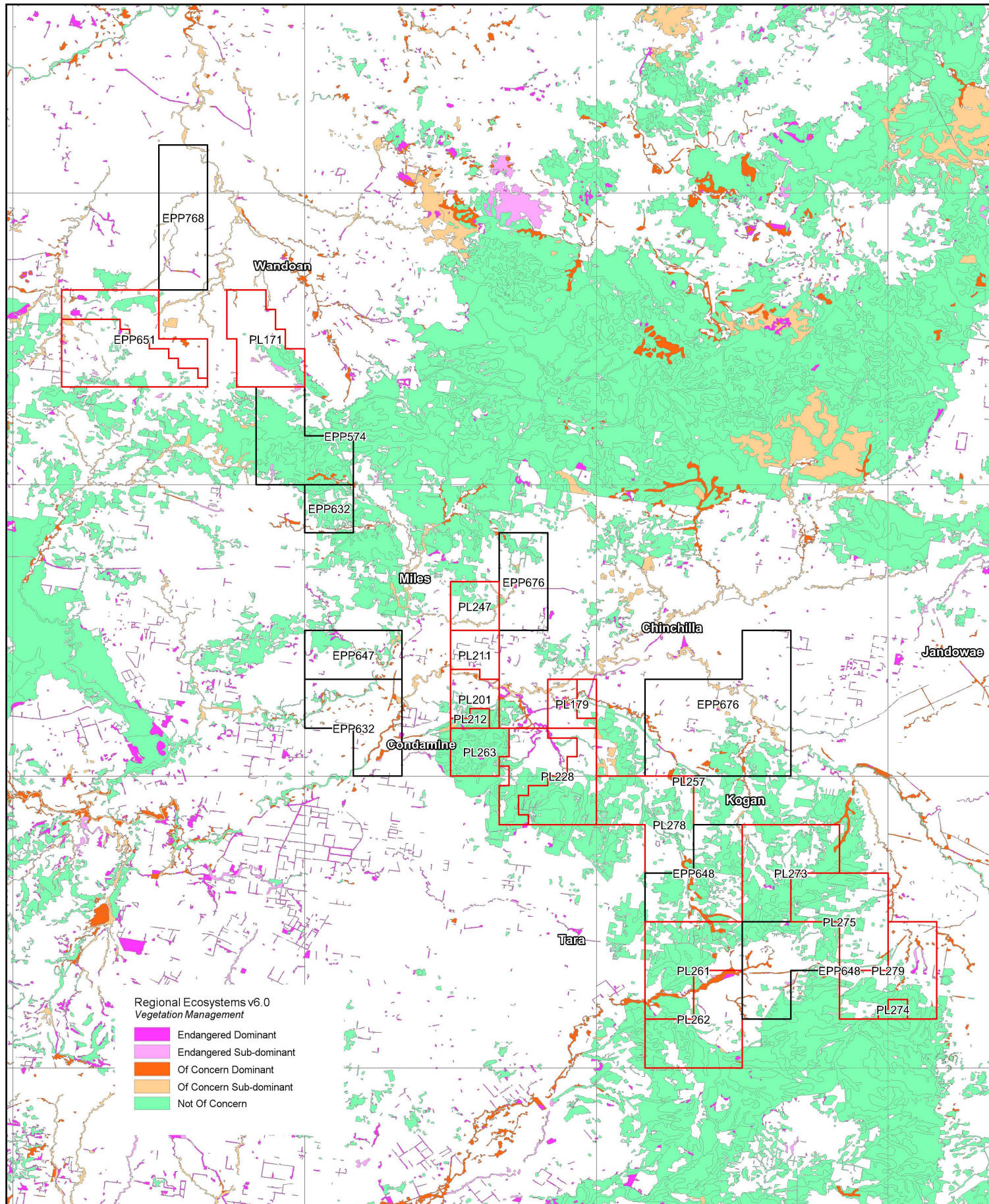
Table 2: Comparison of Proposed Projects considered in the EIS and the supplementary EIS

Proposed Projects	Presented in the EIS	Presented in the supplementary EIS
Other QGC Tenements (excluding Sunshine Gas)	X	X
Condamine Power Station	X	X
Spring Valley Power Station	X	X
New Acland Coal Mine Stage 3	X	X
Wondoan Coal Project	X	X
Felton Mine and Pilot Plant	X	X
Linc Energy Underground Coal Gasification	X	X
Kunioon Open Cut Mine	X	X
Nathan Dam and Pipelines	X	X
Gladstone LNG Project	X	X
Surat Gladstone Pipeline		X

The Surat Gladstone Pipeline Project originates in the Surat Basin, passing through the QGC tenement ATP 676, before running approximately parallel to the QCLNG Export Pipeline and crossing the Narrows over to Curtis Island, refer to *Figure 2*.

3.4 Change in DERM Nature Refuge layer

The latest version of the DERM Nature Refuge Dataset (June 2009) was released after the draft EIS and therefore was not considered the previous terrestrial ecology assessment of the Gas Field. This dataset has since been reviewed and it has been



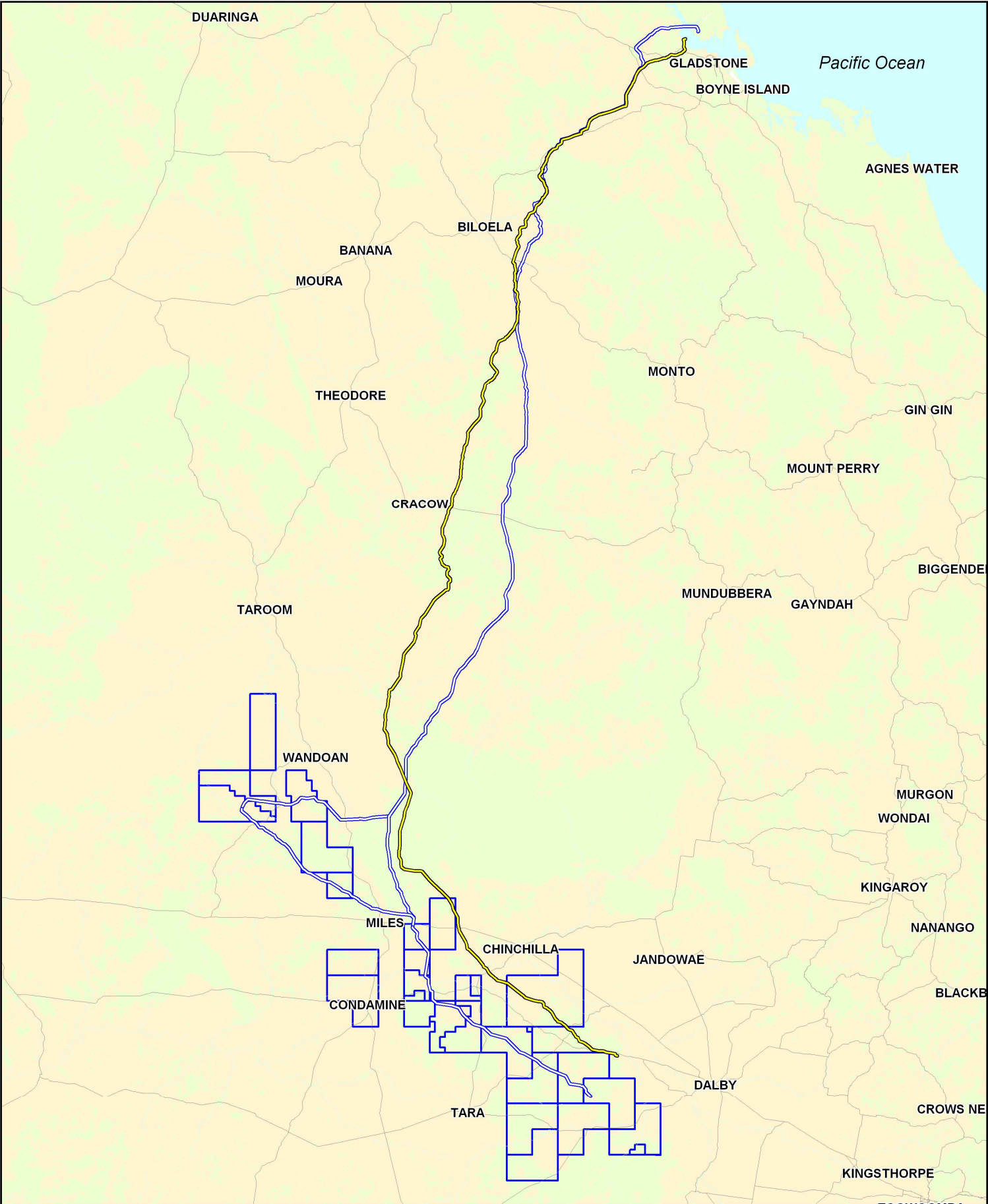
CLIENT: Queensland Gas Company
PROJECT: Queensland Curtis LNG Project
TITLE: Figure 1.
DATE: 02-December-2009
DATA SOURCE:
Mining Tenement Information copyright State of Queensland
(Dept. Mines and Energy)
SCALE: 1:750,000 (A3) GDA94 Lat/Long
-10 0 10 20 30 40
Kilometres

LEGEND
CSG Fields - Authority to prospect
CSG Fields - Petroleum Lease/Petroleum Lease Application

DATE	DRAWN	APPROVED	DRAWING NO.	REVISION

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CLIENT: Queensland Gas Company

PROJECT: Queensland Curtis LNG Project

TITLE: Figure 2.

DATE: 03-December-2009

DATA SOURCE:
1:250,000 Topographic Raster copyright Geoscience Australia
Mining Tenement Information copyright State of Queensland (Dept. Mines and Energy)

SCALE: 1:1,000,000 (A3) GDA94 Lat/Long

-20

-10

0

10

20

30

40

Kilometres

LEGEND

- Surat to Gladstone Pipeline Project
- Queensland Curtis LNG Project
- QLD TOPO250K_WATERCOURSELINE
- QLD TOPO250K_ROADS

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found that that no new refuge areas are located within or in close proximity to the Gas Fields.

4 ADDITIONAL STUDIES

4.1 Field surveys of ATP 768 and PL 171

Since the release of the draft EIS, additional field surveys have been undertaken within the QGC tenements ATP 768 and PL 171. The methodology and findings of these additional surveys is provided for in *Section 4.1.1* and *Section 5* respectively.

4.1.1 Flora field assessment

Field surveys of the QGC Tenements ATP 768 and PL 171 were conducted between 16-19 September 2009 by Senior Botanist Wayne Harris (CV provided in *Attachment 1*).

The field assessment included:

- Investigation of the presence / absence or likely presence / absence of EVR¹ flora species and communities identified in Commonwealth and State legislation
- Ground truthing of 16 sites through the tenements. These sites were detailed Tertiary level assessments. Tertiary assessments included targeted searches for potential EVR and Regionally Significant species (in accordance with the BPA for the Brigalow Belt Bioregion). Comprehensive flora species lists and detailed abundance data were not collected or considered necessary for the purposes of this assessment.

The flora site surveys were in accordance with the Queensland Herbarium vegetation survey methods described in Neldner *et al.* (2005). The following data was collected for the Tertiary sites:

- Confirmation of RE type
- General description of vegetation
- Structural characteristics of vegetation (based on life forms, approximate height and relative dominance)
- Groundcover characteristics
- Vegetation condition (integrity) as either pristine, excellent, very good, good, average, degraded or completely degraded
- Occurrence of weed species
- Dominant species in each structural component of the vegetation
- Patch size and shape

¹ 'EVR' has been used to describe all species listed under the EPBC Act as extinct in the wild, critically endangered, endangered, vulnerable, and conservation dependent and under the *NC Act* as extinct in the wild, endangered, vulnerable, rare, and near threatened.

- Landscape characteristics
- Soil characteristics
- Notes on particular sensitivities to the proposed impacts.

Locations of survey sites are shown in *Figure 3*. For a summary of the dominant plant species and condition of each survey site please refer to *Attachment 2*.

GPS coordinates were taken using hand held GPS (accuracy +/- 10-20 m) to identify survey site locations and to assist in validating the existing Queensland Herbarium RE mapping.

General distributions of declared and other significant pest plants within the two tenements were also noted while travelling between survey sites.

4.1.2 Fauna field assessment

Detailed fauna surveys of tenements ATP 768 and PL 171 were conducted from the 16th to the 19th of September 2009 by fauna Principal Ecologist Bruce Thomson (CV provided in Attachment 1).

Surveys in these tenements comprised a total of 24 hours of daytime observational transects, 8 hours of night spotlighting and 3 hours of ultrasonic recording for bats. Incidental fauna recordings were also made while in transit.

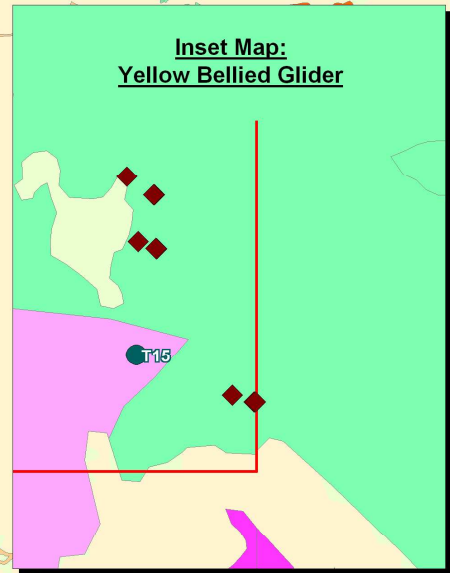
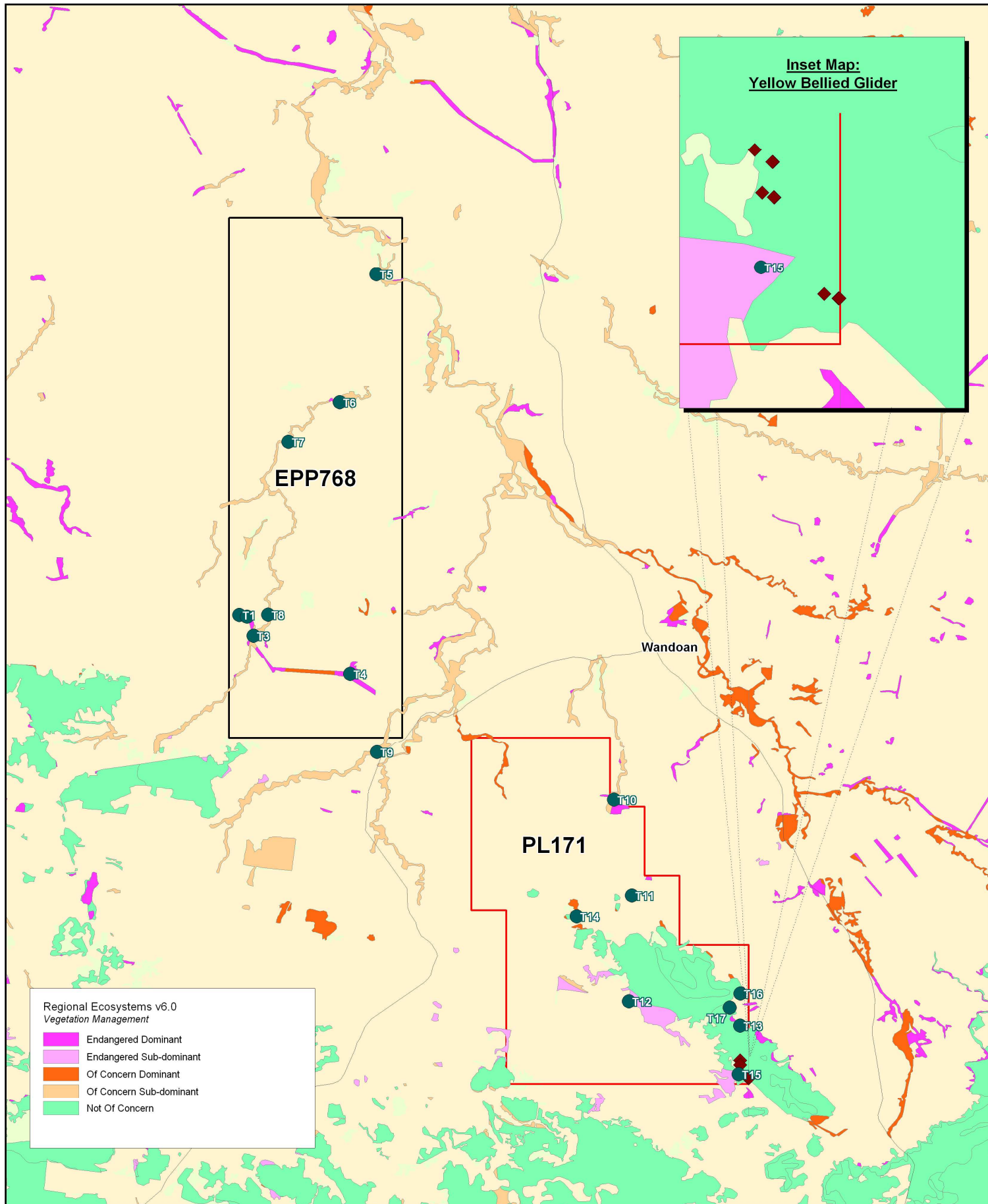
4.1.3 Mapping of Environmentally Sensitive Areas

In order to evaluate the conservation significance of areas in the tenements ATP 768 and PL 171 the following data was overlaid against the original Environmentally Sensitive Areas ESA's mapping that was discussed in *Section 5.2, Appendix 3.2* of the draft EIS.

- The BMM methodology (the GIS product referred to as a Bioregional Planning Assessment; BPA)
- DERM's Environmentally Sensitive Areas
- Threatened Species and Ecological Communities (*EPBC Act*)
- Endangered REs (*VM Act*) (incorporated within BMM Methodology)
- Of concern REs (*VM Act*)
- Woodlands fringing drainage lines (RE 11.3.25)
- Wetlands (RE 11.3.27).

As previously mentioned, no nature refuges occur within the tenements, and so it was not necessary to overlay this new data layer for the purposes of assessing ESA's.

Numerical values were assigned to the criteria in order to allow the summation of an overall score. In some cases where several BMM criteria evaluated a number of co-dependant attributes, only one of these was used in the analysis in order to prevent



Regional Ecosystems v6.0
Vegetation Management

- Endangered Dominant
- Endangered Sub-dominant
- Of Concern Dominant
- Of Concern Sub-dominant
- Not Of Concern

CLIENT: Queensland Gas Company

PROJECT: Queensland Curtis LNG Project

TITLE: Figure 3.

DATE: 02-December-2009

DATA SOURCE:
Mining Tenement Information copyright State of Queensland
(Dept. Mines and Energy)

SCALE: 1:250,000 (A3) GDA94 Lat/Long

-5 0 2.5 5 7.5 10
Kilometres

LEGEND

- Yellow Bellied Glider (6)
- Flora Survey Sites
- CSG Fields - Authority to Prospect
- CSG Fields - Petroleum Lease/Petroleum Lease Application

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double or triple scoring of essentially the same attribute. In the case of threatened species status, both Commonwealth and State values were used, since they are appraised through separate processes and thus may differ markedly. The attributes and the values used in the analysis are set out in *Table 4*.

The mapping derived from this process was used to identify ESAs and formed the basis for the development of the constraints mapping presented in *Section 7*.

Table 4. Attributes and values used in the assessment of Environmentally Sensitive Areas

Attribute	Category	Value	Comments
EPA's Environmentally Sensitive Areas mapping	A	2	
	B	1	
Threatened ecological communities		2	Identified through RE mapping units.
Threatened species (EPBC Act)	Extinct	0	Extrapolated to the underlying RE polygon.
	Extinct in the wild	0	
	Crit. endangered	4	
	Endangered	4	
	Vulnerable	3	
	Cons. dependent	1	
	Not listed	0	
EVR Taxa (NC Act)	Extinct	0	
	Endangered	4	
	Vulnerable	4	
	Rare	1	
	Common	0	
BAMM Crit.A Habitat for EVR Taxa		4	
BAMM Crit.B Ecosystem Value (State)	Endangered	3	
	Of concern	2	
	Not of concern	1	
	Non-remnant	0	
BAMM Crit.C Tract Size	Very High	4	
	High	3	
	Medium	2	
	Low	1	
	0	0	

Attribute	Category	Value	Comments
BAMM Crit.D Rel. Size of RE (State)	Very High	4	
	High	3	
	Medium	2	
	Low	1	
BAMM Crit.E Condition		-	Not used.

4.2 Field survey of proposed Central Processing Plant sites

Proposed sites for Central Processing Plants were inspected on the 11th and 12th November 2009 at Woleebee Creek and Kumbarilla Park. All sites were located in cleared pasture.

The proposed site near Woleebee Creek had been located to avoid fragmented areas of regenerating Brigalow (mapped as non-remnant) and the Kumbarilla Park site had been previously cleared (also mapped as non-remnant).

4.3 Recalculation of clearance footprints

Gas Field development is dependant on the location of gas extraction, which will be progressive over the life of the project. As a result of this the exact location of Gas Field infrastructure has not been determined and therefore the location and areas of vegetation to be removed is still unknown.

The clearing areas that were presented in the draft EIS were based on a worst case clearing scenario for the siting of approximately 15,400 ha of Gas Field infrastructure. These calculations did not take into account the ability of field infrastructure to avoid small non-linear ecological communities/REs that are listed as endangered under the *EPBC Act* and *VM Act*.

The clearing areas that have been presented in this report is based on the proposed siting of approximately 26,800 ha of Gas Field infrastructure. The methodology used to calculate these areas has been amended in order to account for the ability of field infrastructure to avoid relatively small ecological communities/REs listed as endangered under the *EPBC Act* and *VM Act*.

For a comparison of the worst case clearing areas presented in the draft EIS in comparison to that which has been calculated for the supplementary EIS see *Table 8* of this report.

4.4 Review of Queensland Wetland mapping

In addition to Wetlands of International importance (Ramsar wetlands) and the Wetlands of National Significance (Directory of Important Wetlands) datasets that were reviewed for the draft EIS, the Queensland Wetlands Mapping (DERM, Version 2.0, September 2009) was assessed to identify any water bodies and wetland REs that occur within the Gas Fields.

4.5 AquaBAMM review for the Condamine-Balonne Catchment

The Aquatic Biodiversity Assessment and Mapping Methodology (AquaBAMM) assessment of the Condamine catchment, otherwise known as the Condamine Aquatic Conservation Assessment (ACA), was not available at the time of the assessment for the draft EIS. The scope of the Condamine ACA covers some riverine and wetland areas within the central and eastern tenements of the Gas Fields.

This aquatic assessment has since been reviewed and the findings of this assessment have been discussed in the context of this development.

The Condamine ACA aimed to address issues relating to aquatic fauna, aquatic and riparian flora and wetland ecology for the Condamine Catchment's non-riverine and riverine wetlands. The study divides the catchment into 305 smaller sub-catchment areas and assigns each different conservation/ecological values. The ecological values that are considered for the purposes of the Condamine ACA include naturalness, biodiversity, potential to provide habitat for threatened species, connectivity and special features. These values are then combined to calculate an overall conservation score, otherwise known as an AquaScore. As recommended by the Condamine ACA, all sub-catchment areas with an overall AquaScore of 'Very High' were considered for the purposes of this assessment.

5 EXISTING ENVIRONMENT

5.1 Regional ecosystems/vegetation communities

The Queensland Herbarium RE mapping (Version 5.0, 2005) indicate that 15 REs occur within gas tenements ATP 768 and PL 171. *Table 5* shows the area of each RE which, based on the existing Queensland Herbarium RE mapping, occurs:

- Within ATP 768 and PL 171
- Within a 10 km buffer of the tenements
- Within the Brigalow Belt South Bioregion.

Table 5: Regional ecosystems / ecological communities mapped as occurring within Tenements ATP 768 and PL 171

Ecological communities/RE		Status	Regional Ecosystem Area (Ha)				Sites	Area within 10km buffer of tenements	% within 10km buffer of tenements	Area within Bioregion (ha)	% within Bioregion
RE	Description	VM Act	EPBC Act	ATP 768	PL 171	Total Area					
11.10.1	<i>Corymbia citriodora</i> open forest on coarse-grained sedimentary rocks	NOC	-	0.0	802.3	802.3	T13	8,181.3	9.8	886,060.0	0.09
11.3.19	<i>Callitris glaucophylla</i> , <i>Corymbia</i> spp. And/or <i>Eucalyptus melanophloia</i> open-forest to woodland on Cainozoic alluvial plains	NOC	-	3.8	2.2	6.0	T9, T10	248.8	2.4	93,392.0	0.01
11.3.2	<i>Eucalyptus populnea</i> woodland on alluvial plains	OC	-	3.8	2.2	6.0	T9, T10	1,383.6	0.4	535,750.2	0.00
11.3.25	<i>Eucalyptus tereticornis</i> or <i>E. camaldulensis</i> woodland fringing drainage lines	NOC	-	473.4	10.3	483.7	T3, T6, T7, T8, T9, T10	2,831.7	17.1	488,209.4	0.10
11.5.1	<i>Eucalyptus crebra</i> , <i>Callitris glaucophylla</i> , <i>Angophora luehmannii</i> woodland on Cainozoic sand plains/remnant surfaces	NOC	-	0.0	1,079.5	1,079.5		4,001.8	27.0	482,867.1	0.22
11.5.5	<i>Eucalyptus melanophloia</i> , <i>Callitris glaucophylla</i> woodland on Cainozoic sand plains/remnant surfaces. Deep red sands	NOC	-	0.0	306.7	306.7	T12, T15	468.0	65.6	134,878.6	0.23
11.7.2	<i>Acacia</i> spp. Woodland on Cainozoic lateritic duricrust. Scrap retreat zone	NOC	-	0.0	50.6	50.6	T13	1,278.6	4.0	374,752.7	0.01
11.7.4	<i>Eucalyptus decorticans</i> and/or <i>Eucalyptus</i> spp., <i>Corymbia</i> spp., <i>Acacia</i> spp., <i>Lysicarpus angustifolius</i> on Cainozoic lateritic duricrust	NOC	-	0.0	37.2	37.2		1,376.5	2.7	226,997.8	0.02
11.7.6	<i>Corymbia citriodora</i> or <i>Eucalyptus crebra</i> woodland on Cainozoic lateritic duricrust	NOC	-	0.0	462.7	462.7		1,055.4	43.8	344,575.0	0.13
11.8.3	Semi-evergreen vine thicket on Cainozoic igneous rocks	OC	E	0.0	7.7	7.7		7.7	100.0	26,481.7	0.03
11.9.10	<i>Eucalyptus populnea</i> , <i>Acacia harphophylla</i> open forest on fine-grained sedimentary rocks	OC	-	122.8	60.6	183.4	T3, T6, T7, T8	773.3	23.7	84,260.4	0.22

Ecological communities/RE		Status	Regional Ecosystem Area (Ha)				Sites	Area within 10km buffer of tenements	% within 10km buffer of tenements	Area within Bioregion (ha)	% within Bioregion
RE	Description	VM Act	EPBC Act	ATP 768	PL 171	Total Area					
11.9.4	Semi-evergreen vine thicket or <i>Acacia harpophylla</i> with a semi-evergreen vine thicket understorey on fine grained sedimentary rocks	OC	E	0.0	47.6	47.6	T14	188.5	25.3	56,887.6	0.08
11.9.5	<i>Acacia harpophylla</i> and/or <i>Casuarina cristata</i> open forest on fine-grained sedimentary rocks	E	E	154.9	83.7	238.6	T2, T4, T11, T12, T15, T16, T17	1,533.1	15.6	145,843.8	0.16
11.9.6	<i>Acacia melvillei</i> +/- <i>A. harpophylla</i> open forest on fine-grained sedimentary rocks	E	E	0.4	4.2	4.7	T16, T17	84.1	5.5	377.8	1.23
11.9.7	<i>Eucalyptus populnea</i> , <i>Eremophila mitchelli</i> shrubby woodland on fine-grained sedimentary rocks	OC	-	12.3	0.0	12.3	T6	216.3	5.7	108,832.1	0.01

E = Endangered under both *EPBC Act* and *VM Act*, OC = Of Concern under the *VM Act*, NOC = Not of Concern under the *VM Act*

5.1.1 EPBC Act listed ecological communities

Tenements ATP 768 and PL 171 contain two threatened ecological communities listed as endangered under the *EPBC Act*. These are represented by four regional ecosystems, namely:

- Brigalow woodland / open forest communities – REs 11.9.5 and 11.9.6; and
- Semi-evergreen vine thicket communities – REs 11.8.3 and 11.9.4.

Small remnants of Brigalow are present within both tenements. They are mapped as occurring in the southern section of ATP 768 and throughout the middle and southern section of PL 171. The Semi-evergreen vine thicket (SEVT) communities occur only within PL 171 and are concentrated in the middle section of the tenement (refer to *Figure 4*).

The field surveys verified that these remnants of Brigalow and SEVT were all as mapped. For a summary of the condition and the species present within these remnants refer to *Attachment 2*.

The surveyed SEVT and Brigalow communities (sites T12, T13, T14, T15, T16, T17), which occur on the edge of the Cherwondah State Forest, in the south eastern corner of PL 171 were found to be in a good condition. This was attributed to these remnants adjoining a State Forest area which restricts cattle access.

The remaining Brigalow remnants within ATP 768 and PL 171 (sites T1, T2, T3, T4, T5, T6, T8) were generally long narrow roadside remnants. These remnants were found to be heavily grazed with weed species present. Overall, the condition of these remnants was considered to be average.

5.1.2 VM Act endangered REs

The REs 11.9.5 and 11.9.6, which are listed as endangered under the *EPBC Act*, are also listed as endangered under the *VM Act*. As such, the discussion provided in *Section 5.1.1* also applies.

No other REs listed as endangered under the *VM Act* occur within the tenements ATP 768 and PL 171.

5.1.3 VM Act of concern REs

Five of concern REs occur within tenements ATP 768 and PL 171. These include:

- Two SEVT communities - REs 11.8.3 and 11.9.4
- Three eucalypt woodland communities - REs 11.3.2, 11.9.7 and 11.9.10.

The REs 11.8.3 and 11.9.4 are representative of the *EPBC Act* listed SEVT community and therefore the discussion in *Section 5.1.1* also applies.

The RE 11.3.2 was surveyed in a mixed community of 11.3.25/11.3.19/11.3.2 (70:15:15). This vegetation community occurred along a dry creek line dominated by the tree species *Eucalyptus camaldulensis* (River Red Gum). Field assessment of this area found it to be in a degraded condition as a result of extensive cattle grazing, previous fires and the subsequent infestation of the environmental weed Buffel Grass (site T9).

WORKSPACE: G:\GOC\GUL\GData\Work Request\WB_CGC_00807
MAP: G:\GOC\GUL\GData\Work Request\WB_CGC_00807

CLIENT: Queensland Gas Company

PROJECT: Queensland Curtis LNG Project

TITLE: Figure 4.

DATE: 02-December-2009

DATA SOURCE:
Mining Tenement Information copyright State of Queensland
(Dept. Mines and Energy)

SCALE: 1:75,000 (A3) GDA94 Lat/Long

-1

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1

2

3

4

Kilometres

LEGEND

CSG Fields - Authority to prospect

CSG Fields - Petroleum Lease/Petroleum Lease Application

Brigalow RE
Area: 612 Ha

SEVT RE
Area: 54.23Ha

DATE	DRAWN	APPROVED	DRAWING NO.	REVISION

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The RE 11.9.10 was surveyed in the mixed community of REs 11.3.25/11.9.10 (80:20) at two locations (sites T3 and T7). It was also assessed within the mixed community 11.3.25/11.9.10/11.9.7 (site T6, 90:5:5). These communities all occurred on dry creek lines and were found to be degraded due to cattle grazing and the infestation of Buffel Grass.

5.1.4 VM Act not of concern REs

Desktop study results show eight REs listed as not of concern, under the VM Act occurring within ATP 768 and PL 171. These are:

- Six Eucalypt woodland communities – REs 11.10.1, 11.3.19, 11.5.1, 11.5.5, 11.7.4, 11.7.6
- One Riparian woodland community – RE 11.3.25
- One Acacia woodland community – RE 11.7.2.

The not of concern REs surveyed occurred within a mixed community and were found to be heavily infested with Buffel Grass. The only exception is RE 11.5.5 which occurred within a mixed community made up of REs 11.5.5/11.9.5 (site T12) and was found to be in good condition.

5.2 Flora values

No EVR flora species was recorded within the tenements ATP 768 and PL 171.

5.3 Fauna values

5.3.1 EVR fauna

At least 55 fauna records were obtained from the fauna surveys of tenements ATP 768 and PL 171.

The only species of significance observed was *Petaurus australis* (Yellow-bellied Glider) which is recognised as a regionally significant species by DERM's Biodiversity Assessment for the Brigalow Belt Bioregion (Criteria H species). These records were obtained in mature *Corymbia citriodora* forest on the edge of Cherwondah State Forest (See Figure 3). Overall, based on the findings of all fauna survey work that has been conducted in the Gas Fields, it can be concluded that this species occurs sporadically throughout the Gas Fields within this type of forest in State Forests.

Subsequent to the publication of the draft EIS an undescribed land snail (*Adclarkia* sp. A) has been observed in the southern portion of Kumbarella Park (Jensen, pers comm.). Habitat preferences for this snail are unknown, but could be similar the habitat of a closely related species which occurs primarily in riparian habitats.

The approximate locations of these yellow-bellied glider records are shown in Figure 3.

5.3.2 Fauna habitat

The recent survey of tenements ATP 768 and PL 171 identified parts of Cherwondah State Forest to have significant fauna conservation values. These areas were found to contain an extensive mesa formation with steep rocky scree slopes. Pockets of SEVT occur in sheltered aspects at the base of the scree slopes.

This area has been classified as a 'Very High' ecological constraints zone, refer to *Section 7*.

5.4 DERM Environmentally Sensitive Areas

All Environmentally Sensitive Areas (ESAs) that occur within or in proximity to the proposed Gas Fields were identified using DERM Environmentally Sensitive Area online mapping (refer to *Figure 5*). Three ESAs are mapped as occurring within the Gas Fields these include:

- Category B Endangered Regional Ecosystems (Biodiversity Status)
- Category C State Forests
- Category C River Improvement areas

5.4.1 Category B endangered regional ecosystem (Biodiversity)

At least nine REs that are listed as endangered under the DERM Biodiversity Status occur within the Gas Fields. These REs, their description and status is presented in *Table 6*.

Table 6 – Endangered regional ecosystems (Biodiversity) present within the Gas Field

Regional ecosystem/ Ecological community	Description	EPBC Act status	VM Act status	Biodiversity status
11.3.1	<i>Acacia Harpophylla</i> and/or <i>Casuarina cristata</i> open forest on alluvial plains	-	E	E
11.4.3	<i>Acacia harpophylla</i> and/or <i>Casuarina cristata</i> shrubby open forest on Cainozoic clay plains	-	E	E
11.4.7	<i>Eucalyptus populnea</i> with <i>Acacia harpophylla</i> and/or <i>Casuarina cristata</i> open forest to woodland on Cainozoic clay plains	-	E	E
11.4.10	<i>Eucalyptus populnea</i> or <i>E. pilligaensis</i> , <i>Acacia harpophylla</i> , <i>Casuarina cristata</i> open forest to woodland on margins of Cainozoic clay plains	-	E	E
11.4.12	<i>Eucalyptus populnea</i> woodland on Cainozoic clay plains	-	E	E
11.9.4	Semi-evergreen vine thicket or <i>Acacia harpophylla</i> with a semi-evergreen vine thicket understorey on fine grained sedimentary rocks	E	OC	E
11.9.5	<i>Acacia harpophylla</i> and/or <i>Casuarina cristata</i> open forest on fine-grained sedimentary rocks	E	E	E
11.9.6	<i>Acacia melvillei</i> +/- <i>A. harpophylla</i> open forest on fine-grained sedimentary rocks	E	E	E
11.9.10	<i>Eucalyptus populnea</i> , <i>Acacia harpophylla</i> open forest on fine-grained sedimentary rocks	-	OC	E

5.4.2 Category C State Forest areas

At least 10 state forests occur within the Gas Fields. These state forests and the areas of each forest that fall within the Gas Fields are presented in *Table 7*.

Table 7 – State Forests present within the Gas Fields

State Forest	Ha
Mount Organ	44
Hinchley	1,059
Cherwondah	1,699
Gurulmundi	11,358
Condamine	9,496
Braemar	12,852
Daandine	1,042
Weranga	580
Vickery	2,159
Kumbarilla	16,699
Total	56,988

The recent survey of tenements ATP 768 and PL 171 identified parts of Cherwondah State Forest as significant in terms of fauna conservation. This State Forest contains an extensive mesa formation with steep rocky scree slopes. Pockets of SEVT occur in sheltered aspects at the base of the scree slopes. This area has now been classified as a very high ecological constraints zone, see *Section 7*.

5.4.3 Category C River Improvement area

One Category C river improvement area is also mapped as occurring across five tenements (i.e. PL 279, PL 275, PL 273, ATP 676, and ATP 648).

This river improvement area falls within the jurisdiction of the Wambo River Improvement Trust. This trust has the primary role to plan, design, finance, undertake and maintain stream improvement works for the benefit of the community within its river improvement area. Measures that will be adopted to meet the objectives of this trust have been discussed in *Appendix 3.2, Section 8* of the draft EIS.

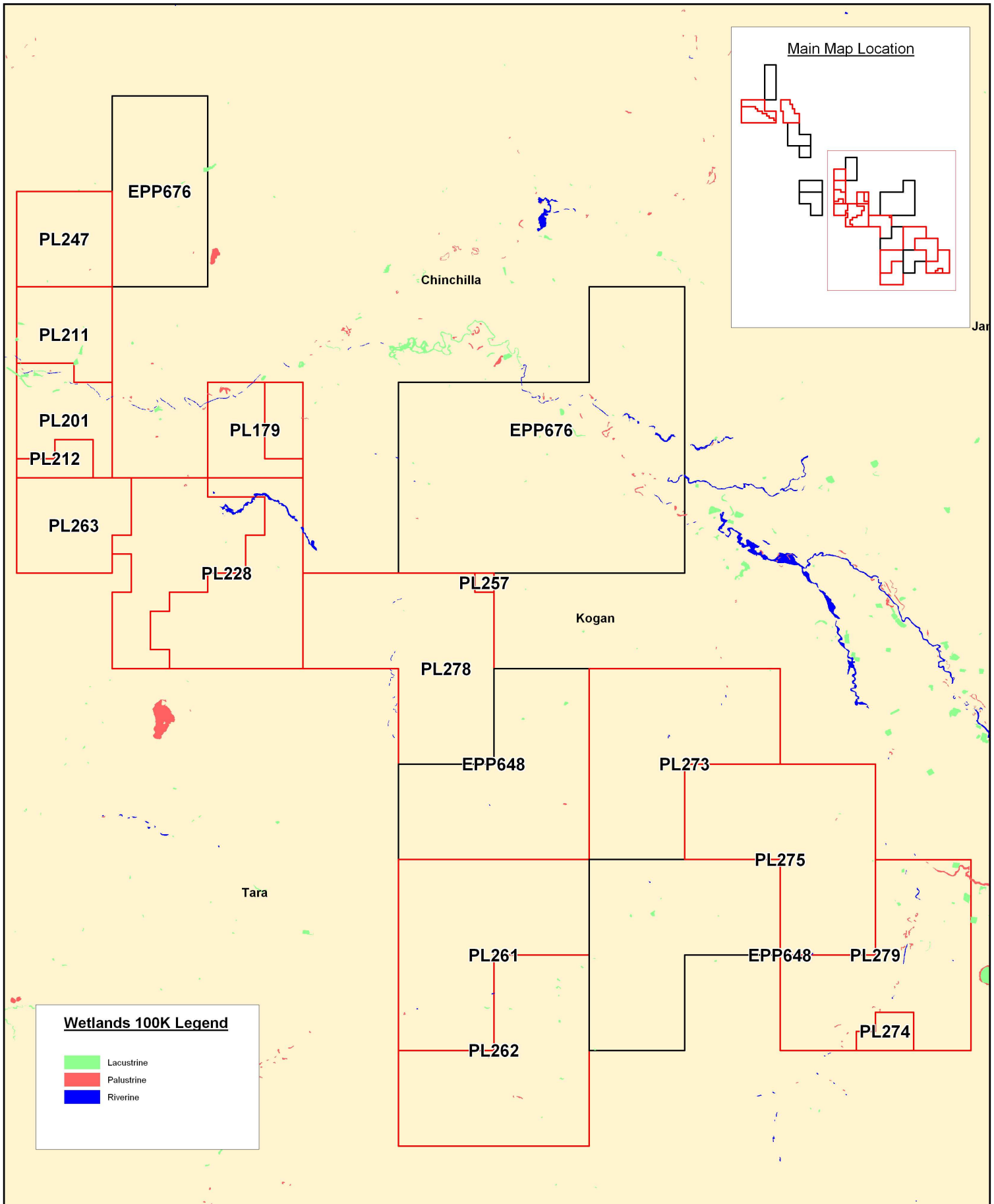
5.5 Aquatic ecology and wetlands

Review of the Queensland Wetlands mapping identified several additional water bodies and wetlands REs occurring within the Gas Field to those which were presented in the draft EIS. Many of these are artificial wetlands such as dams, ringtanks, weirs and levee banks. Others include riverine wetlands such as REs 11.3.2b, 11.3.3c, 11.3.24a, 11.3.25b, 11.3.25g, 11.3.27b, 11.3.27c, and 11.4.3a (*Figures 6 and 7*)

Satellite imagery interpretation indicates that the majority of these riverine fringing wetlands (i.e. riparian areas) are dry ephemeral watercourses located adjacent to riparian vegetation that is mostly grazed and in degraded-to-average condition.

The scope of the Condamine ACA covers some of the riverine and wetland areas in the western and central tenements (*Figure 8*).

Overall findings from the Condamine ACA indicate that riverine, palustrine and lacustrine wetlands in the Condamine River Catchment were generally in good ecological condition. Additionally, the Condamine River Catchment is described as containing significant aquatic ecosystem conservation values (i.e. Lake Broadwater) despite being intensively farmed and developed for most of its area, with consequent pressures on and in the aquatic ecosystems.



CLIENT: Queensland Gas Company

PROJECT: Queensland Curtis LNG Project

TITLE: Figure 6.

DATE: 02-December-2009

DATA SOURCE:
Mining Tenement Information copyright State of Queensland
(Dept. Mines and Energy)
Queensland Wetland Data 100K (May_2009) - DERM

SCALE: 1:250,000 (A3) GDA94 Lat/Long

-5

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Kilometres

LEGEND

CSG Fields - Authority to prospect

CSG Fields - Petroleum Lease/Petroleum Lease Application

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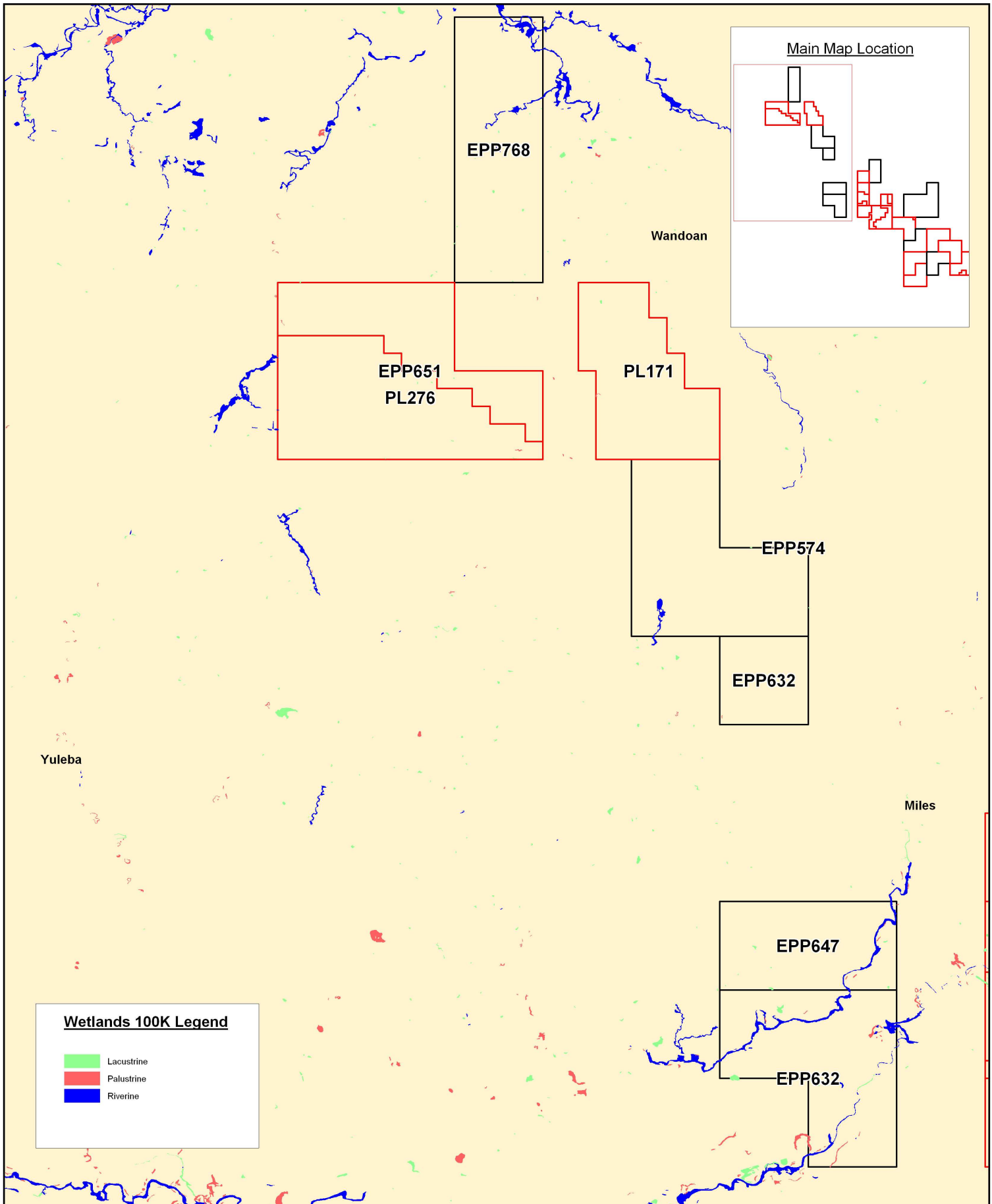
NEW SOUTH WALES

WORKSPACE: G:\QCC\QUG\QUGData\Work Request\WB_CSG_00897

MAP: G:\QCC\QUG\QUGData\Work Request\WB_CSG_00897

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CLIENT: Queensland Gas Company

PROJECT: Queensland Curtis LNG Project

TITLE: Figure 7.

DATE: 02-December-2009

DATA SOURCE:
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Queensland Wetland Data 100K (May_2009) - DERM

SCALE: 1:250,000 (A3) GDA94 Lat/Long

-5 0 2.5 5 7.5 10
Kilometres

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Condamine
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WORKSPACE: G:\QCC\QUG\QUGData\Work Request\WB_CGC_00807
MAP: G:\QCC\QUG\QUGData\Work Request\WB_CGC_00807

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Four sub-catchments with an AquaScore of 'Very High' occur within or downstream of the central QGC tenements. These sub-catchments are made up of the section of the Condamine River which extends from Chinchilla to Miles. These sub-catchments have been classified as high ecological value and have been highlighted in *Figure 8*.

6 POTENTIAL IMPACTS

6.1 Ecological communities and regional ecosystems

As a result of the increase in the amount of gas infrastructure that is to be placed within the Gas Fields the estimated worst case clearing of remnant vegetation that may be cleared has increased. The data presented in *Table 8* provides a comparison of the worst case clearing areas presented in the draft EIS as opposed to the estimate of worst case clearing areas based on the changes to the project footprint since the draft EIS.

Table 8 – Comparison of the draft EIS and supplementary EIS worst case vegetation loss areas

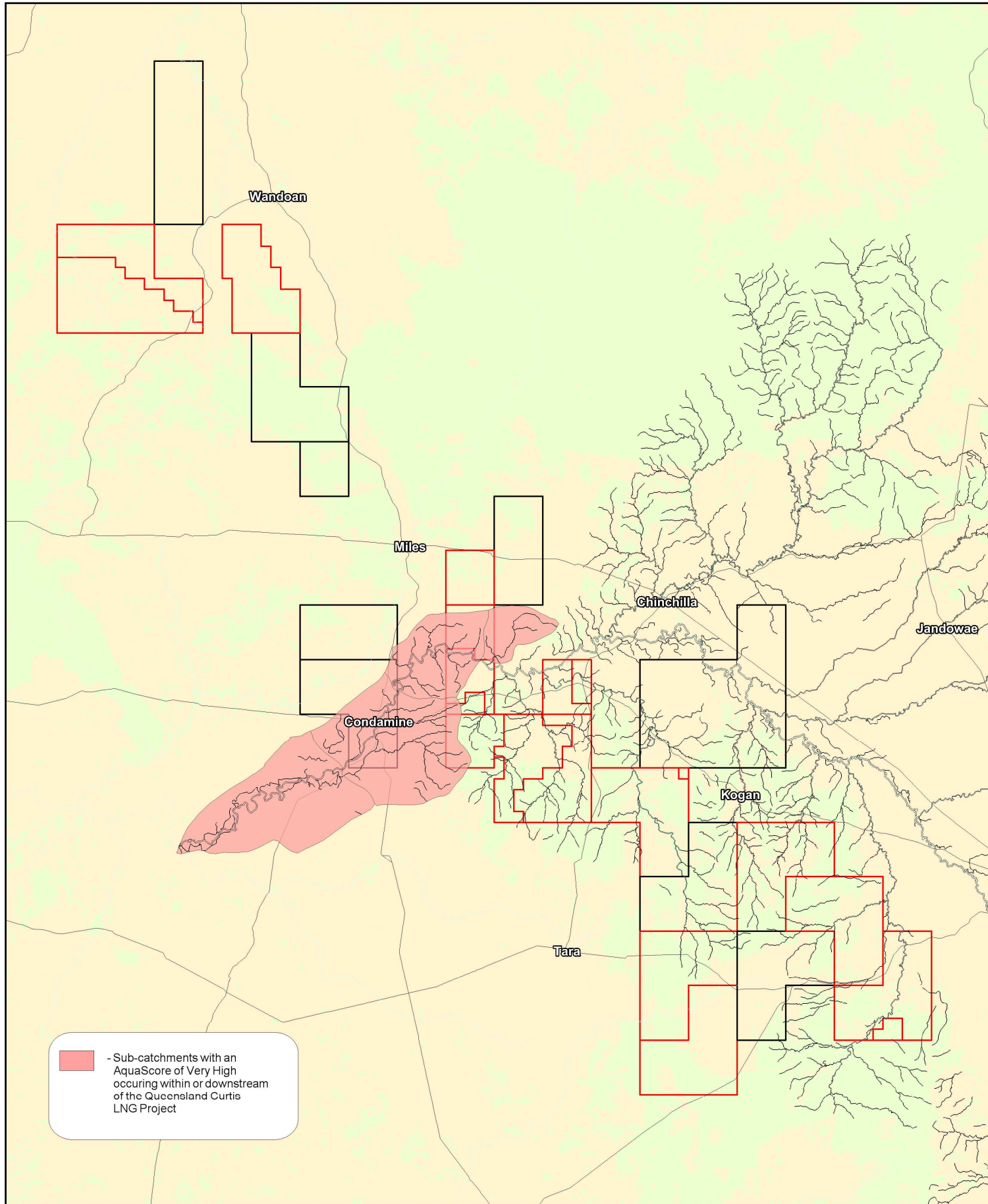
RE/Ecological community status	Clearing extent draft EIS (ha)	Clearing extent supplementary EIS (ha)
<i>EPBC Act</i> listed*	117	73
Endangered	128	108
Of concern	215	308
Not of concern	4,624	9,088
TOTAL	4,966	9,577

**EPBC Act* listed communities are overlapping (and not additional to) *VM Act* REs

There is a notable reduction in the clearing extent of *EPBC Act* and *VM Act* endangered ecological communities/REs presented in the draft EIS in comparison to the current clearing areas. This is primarily due to improved analysis of the ability to avoid the endangered remnants within the Gas Field (i.e. many endangered remnants are not exceedingly long and will be avoided by all field infrastructure) as well as some improvements in planned infrastructure locations from the perspective of impacts on endangered remnants.

In order to place the potential impacts of the new Gas Field infrastructure footprint within a local and bioregional perspective, the following estimates have been made and presented in *Table 9*:

- The total known area of *EPBC Act* listed ecological communities within the Gas Fields and the estimated extent of area, and percentage of area that may be impacted. This estimate coincides with (and is not additional to) the areas estimated for endangered, of concern and not of concern REs under the *VM Act*
- The total area of *VM Act* endangered, of concern and not of concern REs within the Gas Fields and the estimated extent and percentage of the total area that may be impacted
- Comparisons are also made with the overall extent of these RE categories within the Bioregion.



CLIENT: Queensland Gas Company

PROJECT: Queensland Curtis LNG Project

TITLE: Figure 8.

DATE: 03-December-2009

DATA SOURCE:
Mining Tenement Information copyright State of Queensland (Dept. Mines and Energy)
Biodiversity Assessment data copyright of Queensland Environmental Protection Agency

SCALE: 1:750,000 (A3) GDA94 Lat/Long

-10 0 10 20 30 40
Kilometres

LEGEND

— Condamine Aquatic Conservation Assessment

CSG Fields - Authority to Prospect

CSG Fields - Petroleum Lease/Petroleum Lease Application

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Table 9 - Worst case vegetation loss

RE Status	Estimated extent within the QGC Fields (ha)	Worse case vegetation loss (ha)	Estimated Extent Remaining (ha)	Estimated % Cleared in the QGC Field	Estimated % cleared in the Bioregion.
<i>EPBC Act</i> listed*	4,039	73	3,966	1.7	0.018
Endangered	4,415	108	4,307	1.8	0.026
Of concern	7,403	308	7,095	4.2	0.025
Not of concern	159,434	9088	150,346	5.5	0.207
TOTAL	175,291	9,577	165,714	5.5	0.148

**EPBC Act* listed Communities are overlapping (and not additional to) *VM Act* REs

Due to the small shape of the SEVT and Brigalow fragments that occur within the south eastern section of PL 171 it is expected that Gas Field infrastructure will be able to avoid these areas. Thus no clearing is anticipated to occur within these remnants.

The remaining Brigalow communities within ATP 768 and PL 171 are generally linear in shape and extend along fencelines or occur within road reserves. The field surveys indicated that the majority of these remnants suffer from edge effects and have been invaded by Buffel Grass and other environmental weeds which compromise their integrity as native habitats. In some cases, these linear remnants may be unavoidable, and pipelines and associated infrastructure may need to transect them for short distances.

Overall, total worst case remnant vegetation clearing within the Gas Fields is projected to increase from 4,966 to 9,577 ha. It should be noted however, that this is a worst case scenario and with the implementation of mitigation measures the actual amount of vegetation clearing is likely to be less than this. In accordance with the original guidelines presented in the draft EIS, remnant vegetation, in particularly *EPBC Act* and *VM Act* listed, endangered and of concern REs will be avoided wherever possible. Pre-clearing ground surveys will be undertaken in all areas of remnant vegetation to identify these REs as well as EVR species and significant fauna habitat values. With the implementation of the mitigation measures described here and in *Appendix 3.2, Section 8* of the draft EIS, the risk of significant impacts on flora and fauna are minimised.

6.2 EVR flora

No EVR flora species were recorded within the Gas Fields during the additional surveys.

6.3 EVR fauna

No threatened fauna species listed under either the *EPBC Act* or the *NC Act* were identified within the Gas Fields during additional fauna survey work.

The only species of significance that was observed is the Yellow-bellied Glider. This species is listed as a regionally significant species according to the DERM's Biodiversity Assessment for the Brigalow Belt Bioregion (Criteria H species). As with the populations previously recorded for the draft EIS, these records were obtained in mature *Corymbia*

citriodora forest. This species was found to occur sporadically across the tenement area in this forest type and was generally confined to State Forests. They are known to sap feed on specific 'feed trees' at certain times of the year, although none were found feeding in this manner during any of the surveys and no feed trees were found in areas where the records were obtained.

The impacts of clearing *Corymbia citriodora* forest would be significant for this species, although the habitats in which they occur are assigned the highest priority for conservation in the zoning scheme and relatively little clearing is anticipated in these areas. It is thus anticipated that impacts will be minimal and if pre-clearance surveys detect the presence of the glider or feed trees, appropriate measures will be taken to conserve these areas.

As discussed in *Section 5.3.1* an undescribed land snail (*Adclarkia* sp. A) has been identified in the southern portion of Kumbarilla Park. The identification of this snail may be of scientific interest. Mitigation measures to avoid significant impacts on this species are embodied in guidelines that have been developed to protect riparian and aquatic habitats. They relate to minimal clearing and minimal placement of infrastructure in riparian areas and preclearance surveys before construction activities.

6.4 Potential impacts on fauna habitat values

Surveys in tenements ATP768 and PL171 identified escarpments and plateaux in Cherwondah State Forest as significant fauna habitats and refugial areas. The area has been assigned a numerical value and has been classified as a 'Very High' ecological constraint zone.

Other areas within these tenements were largely cleared and heavily grazed. Thus conservation values were minimal.

In summary, impacts on fauna habitat that occurs in the field may increase as a result of the larger area of vegetation to be cleared. However, due to the environmental condition of much of the area as it now exists (e.g. Buffel Grass, inappropriate fire regimes, detailed in *Section 7.3.8, Appendix 3.2* of the draft EIS) and also considering the constraints placed upon development in areas of high conservation value through the constraints mapping approach (described in *Section 8.2, Appendix 3.2* of the draft EIS), it is expected that the risk of significant impacts on habitat values that occur within the fields will remain minimal.

6.5 Potential impacts on DERM Environmentally Sensitive Areas

Due to the progressive nature of the development of gas infrastructure within the fields it is not possible to definitely state the location of all infrastructure, or the area of Category B regional ecosystems (Biodiversity Status) that will be impacted by the Project.

However, the ecological constraints mapping presented in the draft EIS dictates that all non-linear infrastructures will be excluded from all Category B areas. Note that in some circumstances it may be impossible for linear infrastructure, such as access tracks and gathering lines, to avoid crossing long narrow strips of these remnant areas. If this is the case, this linear infrastructure will, wherever practicable, be aligned to cross the narrowest areas and/or any existing tracks that may occur within these remnants. Unavoidable clearing will be offset in accordance with agency requirements as detailed in the QCLNG Draft Submission on Vegetation and Biodiversity Offsets presented in the supplementary EIS.

All infrastructure to be placed within State Forests will only occur after consultation with the relevant government agencies.

The Project will liaise with the agencies and the Wambo River Improvement Trust in confirm requirements in relation to activities within the River Improvement Area. All watercourses in these areas are protected within the ecological constraints zones and management measures specified in the draft EIS.

6.6 Potential impacts on aquatic ecology and wetlands

Review of the Queensland Wetlands Mapping lead to the identification of additional wetland areas within the Gas Fields. The review of the Condamine ACA confirmed that riverine areas of high ecological and conservation value occur within and downstream of the QGC tenements. However, despite this additional knowledge and the increase in the scale of field infrastructure, potential impacts on aquatic ecological values are expected to be the same as those presented in *Section 7.5, Appendix 3.2* of the draft EIS. These impacts include sedimentation, nutrification and accidental release of Associated Water.

Proposed mitigation measures for the Project identify wetland systems, including ephemeral drainage lines, as key areas for biodiversity and recommend a series of guidelines to help protect these areas (See *Section 7*). These guidelines recommend minimal disturbance to riparian and wetland systems, with minimal clearances in riparian areas (only to occur when no other alternatives exist) and complete protection of identified wetlands.

Provided that the recommended mitigation measures are adopted, combined with the fact that most watercourses in the area are dry ephemeral streams, the proposed Gas Field development will be unlikely to have a significant impact on any wetlands or riverine systems.

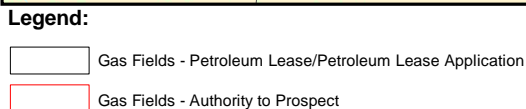
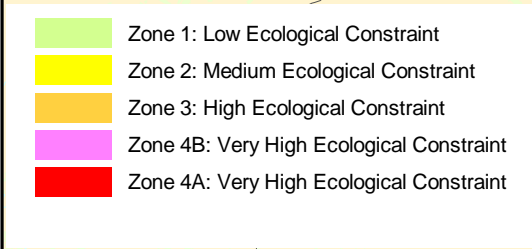
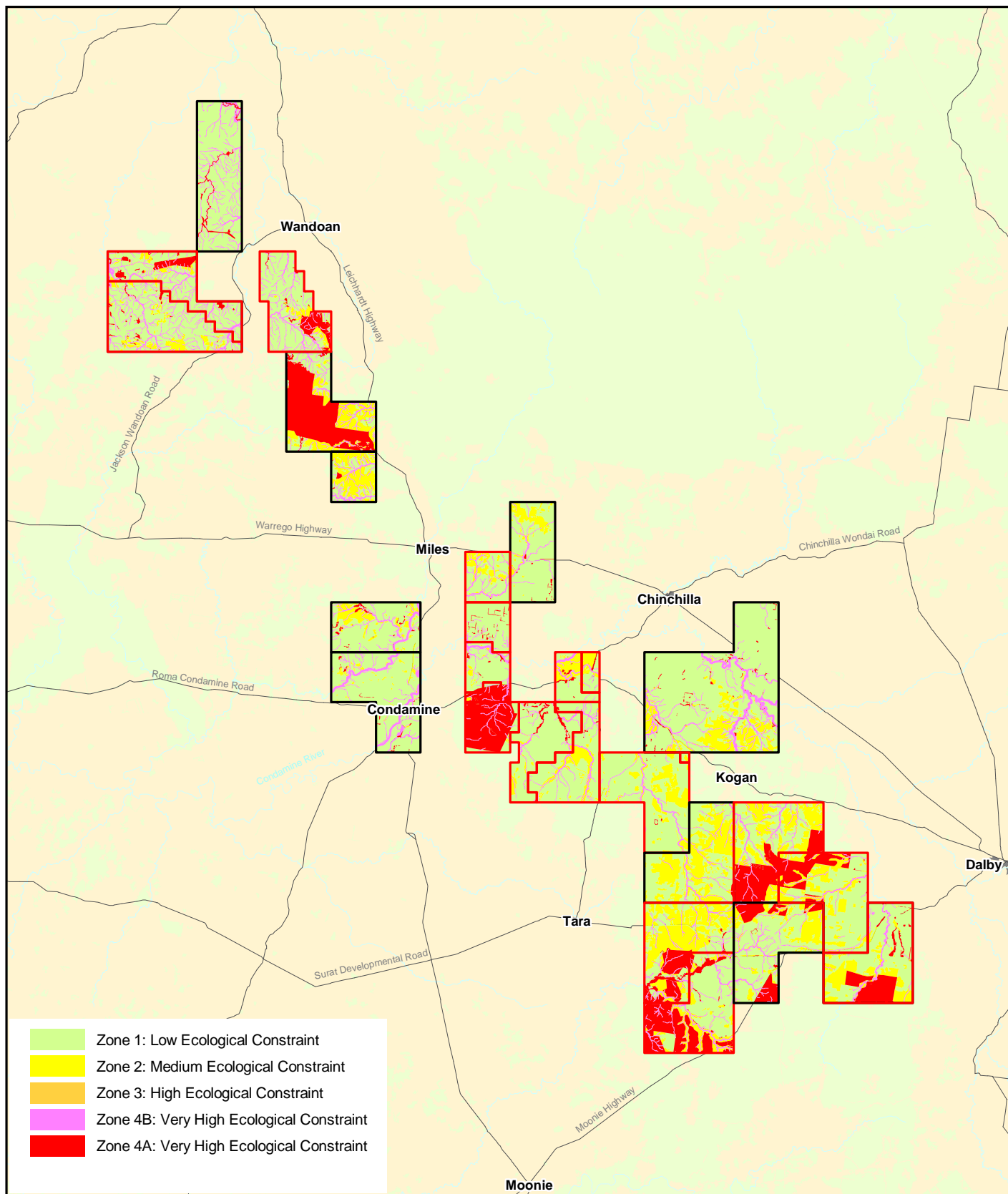
6.7 Cumulative impacts

The only project that was not considered in the EIS, and which information was publicly available is the Surat to Gladstone Project Pipeline. The cumulative impacts of this proposed pipeline has been discussed in the Supplementary Flora and Fauna Assessment for the Pipeline Component of the Project presented in the supplementary EIS.

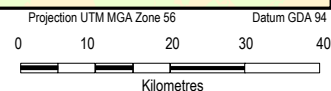
7 MITIGATION AND REHABILITATION RECOMMENDATIONS



Since the publication of the draft EIS, additional surveys of the northern tenements have identified the conservation values of Cherwondah State Forest. This area has been now been classified as a '4a Very High' ecological constraints zone in the ecological constraints mapping (described in *Section 8.7, Appendix 3.2* of the draft EIS). This area is comprised of an elongated plateau with rocky scree slopes and protected environments in sheltered gullies with areas of SEVT. This has been the only change made to the ecological constraints mapping since the release of the draft EIS (see *Figures 9 and 10*).

Areas classified as 4a and 4b zones include areas of highest ecological value and it recommended that all non-linear infrastructure avoids these areas. In a small number of instances linear infrastructure (e.g. collection lines, pipelines and access tracks) will be unable to avoid transecting linear remnants and watercourses of very high ecological value.



Source Note:
 Regional Ecosystems v5.0 copyright QLD Herbarium
 QLD Protected Areas copyright Environment Protection Agency
 DCDB data copyright State of Queensland (2008)



 <div>QUEENSLAND CURTIS LNG</div> <div>A BG Group business</div>	Project Queensland Curtis LNG Project		Title Gas Fields - Ecological Constraints Zones
	Client QGC - A BG Group business		
 <div>ERM</div> <div>Environmental Resources Management Australia Pty Ltd</div>	Drawn Mipela	Figure: 10	Disclaimer: Maps and Figures contained in this Report may be based on Third Party Data, may not be to scale and are intended as Guides only. ERM does not warrant the accuracy of any such Maps and Figures.
	Approved CDIP	File No: QC02-T-MA-00109	
	Date 04.01.10	Revision A	

Zoning Cherwondah State Forest as a 'very high' ecological constraints zone will help protect the ecological values of the Brigalow and SEVT remnants located therein and the high value fauna habitats (e.g. *Corymbia citoriodora* forests) for the Yellow-bellied Glider which was recorded during the additional field survey work.

All wetland and riverine (riparian) areas and areas identified by the Condamine ACA as having high ecological significance have been classed as very high ecological constraints areas. This zoning classification recommends that minimal clearing occurs in riparian areas and complete exclusion from wetlands. In some instances, it may be impossible for linear infrastructure to avoid crossing watercourses (riparian areas). Provided that unavoidable impacts are minimised, combined with the fact that most disturbances are likely to be temporary, potential impacts that may result from these watercourse crossings are projected to be minor. The list of mitigation guidelines provided for in *Section 8.3 of Appendix 3.2* of the draft EIS remain adequate.

8 RESPONSE TO SUBMISSIONS

8.1 DERM (Submitter Number 32)

Summary of submission

Reference should be made to least concern, near threatened, rare, vulnerable, endangered wildlife and DERM Back on Track species prioritisation process.

Response to submission

Throughout the supplementary EIS the term 'EVR' has been used to describe all species listed under the *Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)* as extinct in the wild, critically endangered, endangered, vulnerable, and conservation dependent and under the *Nature Conservation Act 1992 (NC Act)* as extinct in the wild, endangered, vulnerable, rare, and near threatened.

The DERM Back on Track species prioritisation framework has been referenced and will be used in the development of management plans for EVR species that may be significantly impacted by the proposed development. See *Volume 4, Chapter 7, Section 7.6* of the draft EIS.

Summary of submission

The management of clearing activities should be discussed in regard to avoiding disturbance of intact remnants, fragmentation, edge effects and loss of habitat values.

Response to submission

Wherever possible, QCG will avoid clearing native vegetation as infrastructure will be preferentially placed within existing cleared areas and access tracks. Any linear and other infrastructure that are required to be built through vegetation will be subject to an environmental clearance which will identify the presence of EVR plant species and key habitat elements such as large mature trees with hollows. These key environmental values will be avoided wherever possible and clearance widths will be reduced to minimise fragmentation, barrier and edge effects and loss of habitat values. In many cases, linear infrastructure will use existing corridors which are numerous in the

tenement areas. These take the form of roads and tracks, old seismic lines, cleared boundaries and internal fence lines.

Pre-clearance surveys will be conducted prior to all clearing of native vegetation to further minimise fragmentation, edge effects and loss of habitat values.

Key areas of intact remnant vegetation that are currently managed for conservation include those areas within state forests. The draft EIS prescribes that where possible (e.g. central processing plants, construction camps, lay-down areas) infrastructure will be placed outside these areas. Where this is not possible (e.g. some well pads and connecting pipelines), such infrastructure will, where opportunity exists, be placed along or alongside existing cleared tracks and other already cleared corridors (e.g. powerlines and existing pipeline corridors).

The Weed Management Plan for the Project will be finalised prior to construction and will include stringent weed management requirements. In order to prevent the spread and establishment of environmental weeds in areas where they currently do not occur. Such a weed strategy is supported by the mitigation measures identified in the draft EIS.

Summary of submission

The EIS should provide a revised discussion on clearing in or adjacent to watercourses to include alternative clearing methods such as lopping and hand clearing to minimise the disturbance to the riparian soils and habitats.

Response to submission

The draft EIS recommends that infrastructure be located away from remnant vegetation wherever possible and special provisions are provided for the protection of watercourses and habitat trees that often occur along watercourses. It is also recommended that where linear infrastructure is required to cross watercourses, it does so at right angles to minimise clearing.

Where any essential works are to be located near watercourses, the sites would first be subjected to an environmental inspection and important habitat and EVR flora would be marked for avoidance/retention. At that time, other recommendations will, where required, be made in relation to the way in which the site is developed, so as to minimise erosion, maintain biodiversity and facilitate future regeneration.

Watercourses will only be crossed where unavoidable by linear infrastructure, namely access roads and pipelines. Both require vehicular access at least during construction and pipeline construction requires the removal and reapplication of topsoils to minimise erosion and facilitate rehabilitation.

Topsoil management and vehicular access require the soil surface to be free of vegetation. As such, lopping and hand clearing are generally not adequate to enable construction of pipelines or access roads and use of bulldozers and graders are generally the most appropriate method of construction.

Environmental controls which will be implemented at watercourse crossings are detailed in *Volume 3, Chapters 7 and 8* of the draft EIS.

Summary of submission

Commitments to minimising impacts to native flora and fauna and application for the clearing of native plants are required to be consistent with the requirements of the Nature Conservation Act 1992. If necessary, an offset proposal for the clearing of endangered, vulnerable, rare and near threatened plant species should be provided.

Response to submission

QGC has in existing operations and will continue to put in place mitigation measures to minimise impacts to native plants. As detailed in *Volume 3, Chapter 7, Section 7.6.1* of the draft EIS, pre-clearance surveys will be undertaken for all infrastructure enable detection, recording and if necessary translocation of any endangered, vulnerable, rare or near-threatened (EVR) plant species that may occur.

To minimise impacts on native fauna, fauna handlers will be present for, and as necessary relocate wildlife immediately prior to and during clearing activities. Qualified fauna spotters and handlers will survey the open trenches for, record and remove any trapped fauna during open trench pipeline construction.

QGC recognises that it may be required to obtain an approval prior to clearing any native plant species. QGC has commenced and will continue negotiations with DERM on this matter.

QGC proposes a suitable offset for all potential impacts on endangered, vulnerable, rare or near threatened species as listed under the *Nature Conservation Act 1992* (Qld). For further details please see the QCLNG Draft Submission on Vegetation and Biodiversity Offsets presented in the supplementary EIS.

Summary of submission

DERM Environmentally Sensitive Areas to be included for assessment should reflect those identified in Section 25 and 26 of the Environmental Protection Regulation 2008, and the attached list of Category C sensitive areas. The presence of all ESA's should be mapped and the management of each type addressed.

Response to submission

The draft EIS considered all Category A and B Environmentally Sensitive Areas as prescribed in s25 and 26 of the Environmental Protection Regulations 2008 and the Category C Areas as identified by the DERM's online Environmentally Sensitive Area mapping. The draft EIS identified all of these Environmentally Sensitive Areas within proximity to the Project and discussed the management of these areas (See *Section 7.11, Appendix 4.2* of the draft EIS).

QGC recognises that some of the category C areas that were identified in the list supplied by DERM in response to the draft EIS as not being codified in legislation or available through DERM's online mapping service or provided in the issued Terms of Reference for the Project were not addressed. Thus, the approach that was taken in the Draft EIS will also be used in the Supplementary EIS.

Any additional impacts on Environmentally Sensitive Areas that may arise due to a change in Project design since the release of the QCLNG draft EIS have been identified and are discussed in *Section 6.5* of this report.

Summary of submission (39)

The extent of clearing of all vegetation associated with the project should be defined. If the regional ecosystem mapping is incorrect on the project area then it can be amended by applying for a property map of assessable vegetation (PMAV) with the Department or obtaining a map modification with the Queensland Herbarium.

Response to submission

Native Vegetation which will be impacted by the Project includes vegetation which is recognised on the Queensland Government's existing RE Mapping as well as unmapped areas (such as road reserve and regrowth vegetation).

As the footprint of the Gas Field infrastructure is largely unknown at this stage, it is not possible to specify the footprint locations or quantify actual clearing requirements on native vegetation.

The likely impact on non-mapped vegetation is likely to be less due to the ability of infrastructure to preferentially avoid small and narrow remnants and isolated trees. The preclearance survey procedure which helps minimise impact on unmapped native vegetation is described in *Volume 3, Chapter 7, Section 7.6.1* of the draft EIS.

The state's moratorium high-value regrowth vegetation dataset was not available at the time of the draft EIS and was therefore not used. This data which has now been incorporated into the State Vegetation Mapping will be used in the Project's desktop planning to facilitate locating infrastructure so that impacts on high-value regrowth and other mapped vegetation can be minimised.

Prior to finalising infrastructure locations preclearance surveys will be used to identify and where possible avoid unmapped vegetation.

Summary of submission

At least two reference sites should be developed from which to develop benchmarks, and to provide on-going reference for environmental management and rehabilitation activities. The sites should be selected to represent the major natural ecosystems being significantly impacted by the project, and should be sufficiently removed from the project to be unaffected by the project's activities. The sites should be monitored at the same intervals and with the same methodology as that used for on-site monitoring.

Response to submission

Volume 3, Chapter 7, Section 7.6.2 of the draft EIS proposes a series of management zones with varying levels of development constraints, depending upon the perceived conservation value of each zone. As part of the development, monitoring sites will be established in each of these zones as benchmarks to be used in monitoring environmental management and the progress of revegetation and rehabilitation.

Monitored development sites and reference sites will be chosen in similar habitats and monitored using the same methodology so as to control variables that may otherwise bias results and render the comparison invalid. In addition, habitats proposed as offsets will also be monitored in order to track their rehabilitation and biodiversity status.

Detailed monitoring programs will be developed and form a separate Monitoring Plan for both the Gas Field and Pipeline Components of the Project.

Summary of submission

Provide additional information to show how adverse impacts have been avoided and why impacts were unavoidable.

Response to submission

Wherever possible, Gas Field infrastructure will be located so to avoid adverse impacts on areas of native vegetation, particularly those of high ecological significance (e.g. endangered REs, wetland areas, state forests etc). The ecological constraints mapping described in *Volume 3, Chapter 7, Section 7.6.2* of the draft EIS, designates these areas as High Ecological Constraints Zones. These areas will generally be excluded from development. In a small number of instances, it will be unavoidable that linear infrastructure (e.g. collection lines, pipeline and access tracks) will be required to transect vegetation remnants and watercourses of ecological value. In these cases, linear infrastructure will, wherever possible, be aligned through previously disturbed and/or cleared areas.

Summary of submission

An offset proposal that meets the requirements of the QGEOP and specific issue offset policies should be provided.

Response to submission

More detailed information about the proposed offsets for the Project are provided for in the QCLNG Draft Submission on Vegetation and Biodiversity Offsets provided for in the supplementary EIS. As described in that information, individual offset proposals will be commenced in 2010.

Summary of submission

Clearing areas of contiguous assessable vegetation within the landscape should be avoided wherever possible in order to ensure connectivity is maintained.

Response to submission

Clearing remnant vegetation, especially contiguous vegetation (which has high ecological function values) will be minimised as much as possible. Where existing cleared areas are adjacent to contiguous vegetation, infrastructure placement will be within the existing cleared areas wherever possible.

Large areas of contiguous remnant vegetation mostly occur in state forests and these areas are subject to a very high level of protection. In these areas, it is recommended that infrastructure be placed along or immediately adjacent to existing tracks and cleared corridors where possible.

In all areas the placement of infrastructure will be guided by pre-clearance surveys to ensure fragmentation is avoided or minimised.

Where possible, proposed infrastructure sites will be moved in order to avoid fragmentation.

Summary of submission

Table 3.7.5 in Volume 3, Chapter 7, Section 7.5.1 sets out the worst case clearing loss that may result from the gas field development. This table should be revised to show the worst case clearing areas of all vegetated communities, including those for which offsets are proposed.

Response to submission

QGC recognises that offsets should only be used as a last resort measure and, as illustrated in *Volume 3, Chapter 7, Section 7.6*, the Project has put in place a number of clearance strategies and mitigation measures to minimise clearing of remnant vegetation. The figures provided in *Table 3.7.5* provide a very worst case of vegetation loss that may occur if no mitigation measures were put in place.

The worst case clearing areas of all vegetation communities which may arise from the Gas Field component of the Project are provided for in *Section 6.1* of this report. Note that these areas have been revised to take into account results from field surveys and all changes to the Project design that have occurred since the release of the EIS.

Summary of submission

The supplementary EIS should address the impacts to fauna in both the development and operational phases of projects including potential for species composition changes due to fragmentation and edge effects, management of fauna mortality, loss of access and corridors, and use of fencing material.

Response to submission

1. The construction of the pipeline and Gas Field infrastructure will required some clearing of vegetation which will result in habitat fragmentation for some fauna species. One of the effects of such clearing is the potential change in the fauna composition. Some bird species (e.g. Noisy Miner, *Manorina malanocephala*) are found preferably in heavily disturbed and degraded patches of forest where the understorey has been grazed (e.g. Grey *et al.* 1997, 1998). In fragmented remnants these more adaptable birds also display very aggressive behaviour and actively exclude other smaller bird species (Grey *et al.* 1997, 1998, Maron, 2009). As a result, the species composition of avifauna and other fauna groups subject to clearing can potentially be altered.

However, the clearing footprint for the pipelines is relatively small compared to the effects of grazing and inappropriate fire regimes which have already substantially altered most of the vegetation communities within the study area. As such, the changes to species composition due to construction of the pipelines is most likely negligible.

Birds such as Noisy Miners, crows, magpies are already established in abundance in all areas visited during the fauna surveys including State Forest areas. These species will be monitored as part of the project's ongoing environmental evaluation, but it is not expected that any increase in the distribution of abundance of these species will be attributable to the Project.

2. The creation of further access roads in the proposed project area may increase the risk of animal mortalities (livestock or native fauna) due to increased vehicle movements during both construction and operational phases.

Road kills will be monitored and recorded by construction and operations personnel who will be instructed to report fauna/vehicular impact, and mitigations will be implemented where required. Mitigations will include reduced speed limits, signage and restriction of traffic to daylight hours where possible.

There are no locations where the concentration of wildlife movement and traffic loads would justify provision of underpasses, overpasses or glider poles. However, glider poles or special walkways for koalas to safely negotiate roads and fences could be implemented if a specific location is found by the monitoring to have a significant road mortality risk.

3. Any clearing of vegetation has the potential to create a barrier to wildlife movement. Some small mammals and birds may be deterred from crossing cleared zones and also suffer greater predation. Small ground dwelling animals, which are generally less mobile, such as burrowing reptiles and amphibians can be more sensitive to barrier effects, while highly mobile species (e.g. birds and bats) are less likely to be affected.

In almost all cases, the relatively narrow clearances required for roads and pipelines will create only minor barriers. In some cases however, where site clearances identify the potential for more serious impacts (for example, where EVR species or habitat trees are identified), special measures will be adopted to manage these. Measures will include:

- Minimal clearance of vegetation
- Re-routing to avoid critical areas (e.g. EVR plant species)
- Replacement of litter and mulched vegetation as cover, along roadside verges and across pipelines.

It is highly unlikely that the dispersed nature of the development will create significant barriers to the movement of species such as gliders or koalas. However, glider poles or special walkways for koalas to safely negotiate roads and fences could be implemented if a specific location is found by the monitoring to have a significant road mortality risk.

4. Where fencing is required within the project area, the use of barbed wire fences will be negotiated with the landholder and avoided if possible. QGC will use only non-barbed wire in areas where species such as gliders and larger bats are likely to occur (i.e. Yellow-bellied Gliders in tall Spotted Gum forests (i.e. *Corymbia citriodora*), near identified sap feeding trees).

The only exception may be where a landholder requires barb wire fencing to replace existing barbed-wire fencing.

5. Section 8.3, Appendix 3.2 of the draft EIS describes the mitigation measures to be implemented during the project's life. These include measures for minimising and offsetting impacts to fauna through revegetation, weed management, fire management and reduced infrastructure placement in areas of high conservation value.
6. Rehabilitation activities after the cessation of project activity, aimed at restoring habitat values, include the following;
- the breaking up of hardened surfaces and restoration of natural surfaces and contours unless the landholder wishes the road to remain
 - re-seeding with local native flora, where appropriate
 - the respraying of vegetative material over cleared areas
 - regular monitoring of regeneration on a monthly basis for 6 months and then bi-annually for a further two years.

Summary of submission

The findings of the AquaBAMM assessment for the Condamine-Balonne catchment should be discussed in the context of the proposed development.

Response to submission

Refer to Section 5.5 of this report.

Summary of submission

It is recommended that should any biological monitoring data be available from any DERM monitoring stations, this data should be utilised in any potential biological community impact assessments. If there is no biological data is available this should be clearly stated in the supplementary EIS.

Response to submission

A web search of the DERM monitoring sites within the study area found no reference to macro-invertebrate data. The only data available at the monitoring sites within the study area are 'flow' and 'water quality'. This was confirmed in consultation with DERM staff.

Summary of submission

The draft EIS failed to address any potential impacts on the EPBC Act listed threatened ecological community 'The community of native species dependent on natural discharge of groundwater from the Great Artesian Basin'.

Response to submission

Refer to *Volume 3, Chapter 8, Section 8.3.3* of the Draft EIS.

Summary of submission

The EIS should ensure that environmental values of groundwater dependent ecosystems are recognised, potential impacts are fully assessed and appropriate mitigation measures are adopted.

Response to submission

Groundwater dependent ecosystems (GDEs) are typically associated with surface drainage features or shallow groundwater resources related to aquifer recharge and discharge zones. The extent of GDE dependency on groundwater can range from being marginally to entirely dependent on groundwater. The Hydrogeological Framework Report for the Great Artesian Basin Water Resources Plan Area (2005) includes a discussion of the two types of GDEs that are most relevant to the QCLNG Project area:

- Springs (including recharge, discharge, and/or mound springs of the GAB)
- Rivers receiving baseflow.

There are no GDEs of *EPBC Act* concern that will be affected by the Project Gas Field development. Due to the remoteness of springs to the Project, impacts upon all springs are likely to be minimal.

Wherever the pipelines cross watercourses stringent mitigation measures will be in place to avoid disturbance to associated GDEs. These mitigation measures are discussed in *Section 8.4.1, Volume 3, Chapter 8* of the draft EIS.

Subterranean ecosystems and phreatophytic terrestrial vegetation are not included within the scope of the Terms of Reference for this EIS.

8.2 Banana Shire Council (Submitter Number 28)**Summary of submission**

The council proposes a condition that areas where vegetation cover is reduced to less than 10% are rapidly revegetated and stabilised to prevent loss of soil and ecosystem integrity.

Response to submission

As outlined in *Volume 4, Chapter 7, Section 7.4.1* and *Volume 3, Chapter 7, Section 7.6.3* of the draft EIS all disturbance to vegetation as a result of the Project will be rehabilitated as soon as practicable.

Summary of submission

The proponent should clarify the meaning of ‘designated weed washdown area’. If the washdown facilities are to be constructed by the proponent onsite, council advises that all vehicles, equipment and portable infrastructure, will still be required to washdown at established Shire facilities located in Taroom, Biloela, Theodore and Moura, by a Trained Weed Inspector prior to arrival and leaving the Shire. Council would also expect Weed Hygiene Declaration Certificates and Washdown Certificates to be utilised by the proponent. Landowners have the right to refuse entry to their property if these certificates are not presentable.

Response to submission

QGC Limited will be carrying out a full review of weed wash down requirements for the entire Project. Where local facilities are available and have the capacity to handle the size and volume of equipment used by the Project these will be utilised. Temporary wash down facilities will also be constructed at strategic locations (e.g. camp sites) along the pipeline route based on the direction and flow of construction.

Normally large plant and equipment that can take several days to clean down correctly are cleaned at entry to the pipeline right-of-way (ROW). This plant and equipment would not normally be washed down again until the end of construction but would travel along the cleared ROW where it would not encounter any weed material. In addition a pre-spraying program would be undertaken along the ROW to assist in weed hygiene management.

Weed hygiene certification would be required as part of the weed management program.

Landowner requirements in relation to the movement of pipe trucks, plant, equipment and other vehicles will be agreed as part of the land access negotiation agreements.

Summary of submission

Council expects a full weed management plan to be developed especially for the construction and operational stages of the development and that this weed management plan, be a condition of contract for the companies who will carry out the various stages of the gas pipeline development

Response to submission

Local Government Area Pest Management Plans have been sourced and will be used in finalising the Weed Management Plan prior to construction. It will be a contractual condition with construction and operations companies that their own Weed Management Plans be prepared, in accordance with company and local government requirements, and that construction and operations activities conform with these Plans.

8.3 Fitzroy Basin Association (Submitter Number 25)

Summary of submission

Giant Rat's Tail Grass should be considered in weed management plans, despite the fact that it was not identified in surveys. Adopt appropriate weed hygiene measures for operations (particularly with drill rigs) to prevent spread of Declared and WONS pests such as Giant Rat's Tail Grass.

Response to submission

Section 7.2.10 of Appendix 3.2 of the draft EIS describes the potential impacts associated with environmental and declared weeds (these were developed with consideration of potentially undetected species likely to occur in the area). Section 8 of Appendix 3.2 of the draft EIS discusses the mitigation guidelines in relation to weeds. These include:

- Monitoring and control of weeds during construction and operational phases of the project
- The development of a Weed Management Plan that provides more detailed assessment of the potential for weed introductions and describes appropriate weed hygiene practices to prevent the introduction and spread of weeds. The Weed Management Plan will consider and be applicable to all operational aspects of the project including drill rigs.

Declared weeds and WONS known as well as those not yet known but with potential to establish in the area will be considered in the Weed Management Plan. This includes Giant Rat's Tail Grass.

Summary of submission

EPBC Act listed endangered and of concern vegetation communities should not be cleared

Response to submission

The draft EIS recognises the importance of remnant vegetation, in particular endangered and of concern regional ecosystems. The proposed mitigation measures described in the draft EIS include avoidance of these REs wherever possible. However, in some rare instances, the linear nature of the remnants may make it impossible to place linear infrastructure without traversing small sections of them. In these cases, clearing will be kept to a minimum and construction features such as turn-around areas and spoil stockpiles will be located elsewhere. Pre-clearance surveys will be carried out to identify and protect any key features such as habitat trees.

Where endangered or of concern vegetation communities are unavoidable, the clearing will be offset as described in the QCLNG Draft Submission on Vegetation and Biodiversity Offsets provided in the supplementary EIS.

Summary of submission

More detailed vegetation or ecosystem maps (at least 1:100,000) should be provided in the EIS that identify the vegetation proposed for clearance in the Gas fields. endangered, of concern and EPBC Act listed ecosystems should be identified on these maps.

Response to submission

To view maps of a larger scale please refer to *Figures 2a-I* in *Appendix 3.2* of the draft EIS.

Summary of submission

Amend methodology for determination of Impact Significance (as described in our comments on Volume 1, Chapter 3, Section 3.2.4.2 Evaluation of Significance) and reassess the Impact Significance.

Response to submission

Please refer to *Volume 1, Chapter 3* of the supplementary EIS

Summary of submission

Request that QGC adopt additional rehabilitation procedures for well pads and associated roads located within the Gas Fields. These include:

- *All landholders to be negotiated in terms of how they wish the area to be rehabilitated*
- *That the unused portion of the well pad is either rehabilitated with native vegetation or pasture species, depending on the wishes of the landholder*
- *That the well pads are fenced off for a period of two years to allow for the rehabilitation of native species or pasture grasses.*

Landholders to be consulted to determine whether roads (associated with well establishment/operation maintenance) could be utilised and whether they wish them to remain, before they are removed and re-graded.

Response to submission

Rehabilitation will be negotiated with each landholder, including options for rehabilitation, revegetation or re-seeding of unused portions of well pads and other infrastructure sites. Where well pads are located on cattle grazing properties, every effort will be made to establish pasture species that are located in the surrounding area, so as to prevent selective grazing and 'patch grazing' by cattle. Subject to landholder, operational and safety requirements fencing of well pads for a period of least two years will be considered.

Before access roads are removed or re-graded, landholders will be consulted to determine whether the roads could be utilised and whether they wish them to remain

8.4 Upper Dawson Branch WPSQ (Submitter Number 34)

Summary of submission

Large habitat trees must be left wherever possible, in particular along watercourses.

Response to submission

In all areas but particularly riparian areas where vegetation is required to be cleared, large trees that provide habitat for fauna will be avoided and retained wherever possible. The preclearance survey requirements specified in the *Volume 3, Chapter 7, Section 7.6* of the draft EIS are designed to facilitate retention of large habitat trees.

Summary of submission

There is a very important area of remnant vine shrub on RR 661 Parish of Conoli and Gurulmundi State Forest containing Ooline and Strangler figs that is close to Collection Header. This area would be ideal for an offset and our branch would be willing to be involved in a creation of an offset plan.

Response to submission

This submission has been duly noted and this potential offset site will be considered if this vegetation type is required to compensate for an unavoidable impact. If so, QGC will liaise with the submitter in relation to potential involvement.

8.5 Western Downs Regional Council (Submitter Number 36)

Summary of submission

It will be essential that the proponent reference the latest WDRC Pest Management Plan to ensure a coordinated approach is maintained in the fight against this impact on biodiversity in the region.

Response to submission

A detailed Weed Management Plan will be developed to include the construction and operational phases of the project and will include reference all applicable Local Government Area Pest Management Plans for the Project.

9 REFERENCES

- Grey, M.J., Clarke, M.F. and Loyn, R.H. (1997) Initial changes in the avian communities of remnant eucalypt woodlands following a reduction in the abundance of Noisy Miners, *Manorina melanocephala*. *Wildlife Research* 24: 631-48.
- Grey, M.J., Clarke, M.F. and Loyn, R.H. (1998) Influence of the Noisy Miner *Manorina melanocephala* on avian diversity and abundance in remnant Grey Box woodland. *Pacific Conservation Biology* 4: 55-69.
- Maron, M. (2009) Nesting, foraging and aggression of Noisy Miners relative to road edges in an extensive Queensland forest *Emu* 109(1) 75–81.
- Neldner, V.J., Wilson, B. A., Thompson, E.J. and Dillewaard, H.A. (2005) 'Methodology for Survey and Mapping of Regional Ecosystems and Ecological Communities in Queensland'. Version 3.1. Updated Version date: 5 August 2005. September 2005. Queensland Herbarium, Environmental Protection Agency, Brisbane. 128 pp.
- Pennay, M. (2002) Vertebrate Fauna Survey, Analysis and Modelling Projects, NSW Western Regional Assessments, Brigalow Belt South. Stage 2. N. N. P. a. W. Service. Sydney, NSW, NSWPWS.

APPENDIX 1 – CURRICULA VITAE

Profile

Wayne has more than 20 years experience in biological sciences particularly in plant systematics and plant identification, environmental assessment and vegetation mapping. He has worked in Queensland, Western Australian and Victoria on consultancy assignments for industry and government. Wayne's consultancy work has included route selection, environmental surveying, vegetation mapping, and monitoring

Wayne has been involved in developing strategies and guidelines for sustainable development and the protection, enhancement and rehabilitation of species and regional ecosystems.

Qualifications

B.Sc., M.Sc., The University of Adelaide.

Completed requirements for Ph.D. at the University of Queensland, June 2009.

Affiliations

Research Associate, Queensland Herbarium.

Papers & Publications

Lavarack, P.S., Harris, W.K. & Stocker, G.
 "Dendrobium and its Relatives" 2000.
 Kangaroo Press. 287p.

Lavarack, P.S. & Harris, W.K. 2002. "Botanica's
 Pocket Orchids.
 Random House, Australia. 2002

Awards

Received the Australian Service Medal for service to the community.

Career Summary

- | | |
|--------------------|---|
| Jul 2009 - Present | <ul style="list-style-type: none"> Unidel Group – Senior Botanist |
| 1998 – Present | <ul style="list-style-type: none"> Research Associate at the Queensland Herbarium. Casual employee at the Queensland Herbarium – plant identification and vegetation assessment, poisons, advise to clients on weeds and other botanical issues. Writing of rare and threatened plant profiles. Member of the committee that developed the Regional Ecosystem framework |
| Mar – Jun 2009 | <ul style="list-style-type: none"> Vegetation mapping and condition assessment of waterways for the Murray Darling Freshwater Research Centre |
| Jan – Jun 2008 | <ul style="list-style-type: none"> National Project Coordinator for the Weed Spotters Program, run by the CRC for Weed Management. |
| 1998 – Nov 2008 | <ul style="list-style-type: none"> Consultant for biodiversity assessments of major development projects Botanical surveys and services for local shire councils and environmental groups (e.g. Desert Channels Queensland, Greening Australia, Pine Rivers Shire Council). |
| 1995 | <ul style="list-style-type: none"> Granted study leave for three years to pursue a Ph.D. at the University of Queensland in Systemic Botany. |

Areas Of Expertise

- | | |
|--|--|
| <ul style="list-style-type: none"> Botanical survey Vegetation Mapping | <ul style="list-style-type: none"> Plant classification and identification Orchids |
|--|--|

Relevant Experience

- | | |
|------------------|--|
| Botanical survey | <ul style="list-style-type: none"> Kikori River (Papua New Guinea) catchment biodiversity study, for the World Wildlife Fund for Nature. Botanical survey and vegetation mapping for the proposed 'Missing Link' railway corridor Environmental Impact Assessment for Queensland Rail. |
|------------------|--|

	<ul style="list-style-type: none">• Botanical survey of Shoalwater Bay Defence property for Department of Defence.• Botanical survey of HMAS Cerberus Defence property for Department of Defence.• Botanical survey of proposed coal slurry pipeline for Tarong Power.• Biodiversity surveys for Liquid Niugini Gas. Pipeline route and LNG site selection and botanical surveys.
Scientific biological surveys	<ul style="list-style-type: none">• Invited on two occasions to participate on botanical surveys of the Pilbara region, Western Australia for the WA government.• Survey of Mussau Island (PNG) for the National Capital Botanic Gardens, Port Moresby.• Expedition to the Torricelli Mountains, PNG for an orchid survey on behalf of the National Capital Botanic Gardens, Port Moresby.
Other relevant experience - Geological expertise	<ul style="list-style-type: none">• In the early part of his career Wayne was employed as a geologist and became Exploration Manager (Eastern Australia) for the Petroleum Division of Western Mining Corporation.

Profile

Bruce Thomson has 30 years of experience in a broad range of environmental assessment, management, concept planning, project proposal and development and conservation disciplines. He is a senior ecologist and biodiversity planner and has worked as a professional botanist, wildlife researcher and conservation manager. Bruce has managed scientific and technical staff (project management) and associated budgets and work programs. He has strong communication skills, having negotiated conservation outcomes in difficult situations with potentially hostile stakeholders; published and presented numerous industry papers, workshops and seminars; and participated in media news and documentary interviews.

Bruce's government and university background has provided experience in fauna consultancy work for the mining industry and he was appointed scientific advisor to the Queensland Government's Flying Fox Consultative Committee. Bruce has conducted field surveys throughout the Northern Territory and has conducted wildlife surveys in southeast Queensland for the Queensland Parks and Wildlife Service.

Qualifications

PhD "Social ecology of the Chocolate Wattled Bat, <i>Chalinolobus morio</i> , in southeast Queensland	University of Queensland
Masters of Business Administration (Marketing, Public Sector & Strategic Management) – includes formal qualifications in HRM	University of New England NSW
Bachelor of Applied Science (Natural Resource Management)	University of Canberra, ACT

Recent Papers & Publications

Thomson, B.G. (2004) Conservation Management of Cave-dwelling Bats in *Protected Area Management (Principles and Practices)*. Oxford University Press

Thomson, B.G., Reardon, T. and Pavey, C. (2004). *Recovery plan for cave-dwelling bats - Rhinolophus philippinensis, Hipposideros semoni and Taphozous troughoni* 2000 -2005. Report to Department of the Environment and Heritage, Canberra. Queensland Parks and Wildlife Service, Brisbane

Thomson, B.G. (2006) *Australia's Most Deadly and Dangerous Beasts*, Lothian Publishers, Melbourne

Shulz, M and Thomson, B (2007) National Recovery Plan for the Bare-rumped Sheath-tail Bat, *Saccolaimus saccolaimus*. Report to Department of the Environment and Water Resources, Canberra. Queensland Parks and Wildlife Service, Brisbane

Career Summary

2008 – Current	Unidel Group Pty Ltd – Principal Ecologist
2003 – 2008	Queensland Parks and Wildlife Service - Senior Conservation Officer (Central Office Secondment) - Bat conservation and policy development
1993 – 2002	Queensland Parks and Wildlife Service - Senior Conservation Officer (Management Planning)
1983 – 1993	Wildlife Research Section, Conservation Commission of the Northern Territory, Alice Springs - Officer in Charge, Northern Territory Southern Regional Herbarium
1981 – 1983	Northern Territory Herbarium, NT Department of Primary Production, Alice Springs - Scientific Research Officer, P2
1979 – 1981	Wildlife Research Section, Territory Parks and Wildlife Commission, Alice Springs - Technical Assistant T2

Areas Of Expertise

- Collection / identification of botanical specimens, nocturnal insects and small mammal bone material
- Elliott and large cage trapping and pit fall trapping of small mammals, reptiles and arthropods
- Extensive involvement with Aboriginal Traditional Owners in fauna survey work in the NT
- Bat survey using mist nets, bat traps, water trip lines, echo-location call analysis, transect methodologies and anecdotal observations
- Anecdotal observations of wildlife and active searching techniques
- Recording of wildlife with automated camera systems (built by Bruce Thomson)

Relevant Experience

Flora	<ul style="list-style-type: none"> • Botanical surveys, species inventories and biodiversity assessments for projects such as the Yulara development at Ayers Rock • Acquisition planning for national parks such as Kings Canyon NP, Gregory NP on the Victoria River and parts of the Tanami Desert including type specimens for newly recognised species • Monitored and conducted ecological studies on two rare and endangered plant species and described two new species from the northern parts of WA • Curated the NT Herbarium
Fauna	<ul style="list-style-type: none"> • Involved in the initial capture and captive breeding of the Bilby and Rufous Hare Wallaby (Alice Springs, NT) • Academic supervision of Masters research project on bat roosting ecology • Researched bat behaviour when negotiating steel grills (on mine entrances) • Conducted flying fox taste and smell deterrent chemical trials for fruit crop protection • Research into the social ecology of the Chocolate Wattled Bat (PhD) • Genetic research at Queensland Biosciences Precinct University of Qld, St Lucia
Conservation Management	<ul style="list-style-type: none"> • Researched and developed concept plans / project proposals for sustainable development of tourism on Queensland Park's estates • Co-authored original concept plan for multi-million dollar, Alice Springs Desert Park • Developed and assisted implement conservation planning strategies in SE Qld • Protected roosting habitat for rare and threatened bat species • Designed and provided advice on the construction of several experimental 'artificial caves' in mining areas • Developed a Species Recovery Plan for three species of Qld endangered bats • Negotiated and implemented ongoing, cooperative research programs
Other Scientific Services – advisory and public relations	<ul style="list-style-type: none"> • Scientific advisor / founding member - Qld Gvt's Flying Fox Consultative Committee • Advised Melbourne Botanic Gardens, Sydney Botanic Gardens, Mt Isa and numerous local authorities in greater Brisbane • Provided range of botanical services to the NT Government
Communication	<ul style="list-style-type: none"> • Negotiated conservation outcomes in difficult situations with potentially hostile stakeholders, as in the case of fruit growers and flying foxes and grazing lessees in State Forests • Worked closely with Aboriginal groups to conduct surveys • Presented scientific and conservation papers at international scientific conventions • Wrote survey reports, ministerial briefing notes and popular publications and provided high level advice to senior government staff and conducted workshops • Participated in radio and TV interviews for news reports, documentaries and children's programs to promote conservation
Administrative and Financial	<ul style="list-style-type: none"> • Recruited, managed, supported and trained effective teams and participated in strategic planning and enterprise bargaining processes • Administered budgets up to \$150,000 • Applied for and administered numerous grants ranging from \$5,000 to \$35,000 • Coordinated regional industrial placement program for University students • Applied for and implemented EPA license conditions for administrative purposes • Coordinated and supervised management plans for national parks.

APPENDIX 2 – FLORA DATA RECORDED FROM ATP768 AND PL171

Site No.	Coordinates	Aspect and soils	RE	Dominant species	Height	Flora Species	Condition
T1	-26.10583 149.7558	Flat plain; sandy soil	Non remnant	<i>Acacia harpophylla</i>	15m	<i>Acacia harpophylla</i> <i>Acacia pendula</i> <i>Amyema quandang</i> <i>Ancistrachne uncinulata</i> <i>Atalaya hemiglauca</i> <i>Atriplex</i> sp. <i>Casuarina cristata</i> <i>Geigeria parviflora</i> <i>Jasminum didymum</i> <i>Myoporum desertii</i> <i>Pennisetum ciliare</i> <i>Sclerolaena</i> sp. <i>Tetragonia tetragonioides</i>	Infested with Buffel grass and heavily grazed
T2	-26.10694 149.7594	Flat plain; sandy soil	11.9.5	<i>Acacia harpophylla</i>	15m	<i>Acacia harpophylla</i> <i>Acacia pendula</i> <i>Amyema quandang</i> <i>Ancistrachne uncinulata</i> <i>Atalaya hemiglauca</i> <i>Atriplex</i> sp. <i>Casuarina cristata</i> <i>Geigeria parviflora</i> <i>Jasminum didymum</i> <i>Myoporum desertii</i> <i>Opuntia</i> sp. <i>Pennisetum ciliare</i>	Infested with Buffel grass and heavily grazed
T3	-26.11611 149.7628	Small drainage line; sandy soil	11.3.25 11.9.10	<i>Eucalyptus populneum</i>	25m	<i>Acacia harpophylla</i> <i>Acacia salicina</i> <i>Acacia</i> spp. <i>Eucalyptus crebra</i> <i>Eucalyptus melanophloia</i> <i>Eucalyptus populneum</i> <i>Geigeria parviflora</i>	Infested with Buffel grass and heavily grazed

						<i>Lomandra leucocephala</i> <i>Melaleuca bracteata</i> <i>Pennisetum ciliare</i> <i>Themeda australis</i>	
T4	-26.13444 149.8092	Gentle slope; soils sandy	11.9.5	<i>Acacia harpophylla</i>	12m	<i>Acacia harpophylla</i> <i>Acacia stenophylla</i> <i>Atalaya hemiglauca</i> <i>Brachychiton rupestris</i> <i>Enchylaena tomentosa</i> <i>Jasminum didymum</i> <i>Myoporum desertii</i> <i>Pennisetum ciliare</i> <i>Sclerolaena</i> sp. <i>Psydrax oleifolius</i>	Infested with Buffel grass and heavily grazed
T5	-25.94222 149.8219	Drainage line; gravelly sandy soil	Non remnant	<i>Eucalyptus coolabah</i>	16m	<i>Acacia harpophylla</i> <i>Acacia stenophylla</i> <i>Apophyllum anomalon</i> <i>Aristida</i> spp. <i>Atalaya hemiglauca</i> <i>Capparis loranthifolia</i> <i>Carissa ovata</i> <i>Casuarina cristata</i> <i>Eremophila mitchellii</i> <i>Eucalyptus camaldulensis</i> <i>Eucalyptus coolabah</i> <i>Eucalyptus populneum</i> <i>Geigeria parviflora</i> <i>Jasminum didymum</i> <i>Jasminum racemosum</i> <i>Lysiphyllum carronii</i> <i>Opuntia</i> sp. <i>Parsonsia</i> sp. <i>Pennisetum ciliare</i>	Infested with Buffel grass and heavily grazed

						<i>Ventilago viminalis</i>	
T6	-26.00389 149.8042	Creek line; sandy soil	11.3.25 11.9.10 11.9.7	<i>Eucalyptus camaldulensis</i>	22m	<i>Acacia harpophylla</i> <i>Acacia pendula</i> <i>Acacia</i> spp. <i>Acacia stenophylla</i> <i>Angophora florabunda</i> <i>Eremophila mitchellii</i> <i>Eucalyptus camaldulensis</i> <i>Eucalyptus populneum</i> <i>Lomandra longifolia</i> <i>Lysiphyllum carronii</i> <i>Pennisetum ciliare</i>	Infested with Buffel grass and heavily grazed
T7	-26.02278 149.7794	Creek line; sandy soil	11.3.25 11.9.10	<i>Eucalyptus camaldulensis</i>	22m	<i>Acacia pendula</i> <i>Angophora florabunda</i> <i>Eucalyptus coolabah</i> <i>Eucalyptus microcarpa</i> <i>Eucalyptus populneum</i> <i>Pennisetum ciliare</i>	Infested with Buffel grass and heavily grazed
T8	-26.10583 149.7697	Creek line; sandy soil	Non remnant	<i>Eucalyptus camaldulensis</i>	22m	<i>Acacia harpophylla</i> <i>Acacia salicina</i> <i>Acacia</i> spp. <i>Apophyllum anomalon</i> <i>Atalaya hemiglauca</i> <i>Casuarina cunninghamii</i> <i>Eucalyptus camaldulensis</i> <i>Eucalyptus populneum</i> <i>Geigera parviflora</i> <i>Opuntia</i> sp. <i>Pennisetum ciliare</i>	Infested with Buffel grass and heavily grazed
T9	-26.17194 149.8222	Creek line; sandy soil	11.3.25 11.3.19 11.3.2	<i>Eucalyptus camaldulensis</i>	22m	<i>Acacia salicina</i> <i>Acacia</i> spp. <i>Atalaya hemiglauca</i> <i>Enchylaena tomentosa</i>	Infested with Buffel grass and heavily grazed. Also fire effected

						<i>Eucalyptus camaldulensis</i> <i>Eucalyptus populneum</i> <i>Geigera parviflora</i> <i>Owenia acidula</i> <i>Pennisetum ciliare</i>	
T10	-26.195 149.9361		11.3.25 11.3.19 11.3.2	<i>Acacia harpophylla</i>	15m	<i>Acacia harpophylla</i> <i>Acacia stenophylla</i> <i>Brachychiton rupestris</i> <i>Casuarina cristata</i> <i>Cymbidium canaliculatum</i> <i>Geigera parviflora</i> <i>Pennisetum ciliare</i> <i>Psydrax oleifolius</i>	Infested with Buffel grass and heavily grazed
T11	-26.24111 149.9447	Flat plain; sandy soil	11.9.5	<i>Casuarina cristata</i>	14m	<i>Acacia harpophylla</i> <i>Alectryon diversifolius</i> <i>Alstonia constricta</i> <i>Atalaya hemiglauca</i> <i>Auranticarpa rhombifolia</i> <i>Brachychiton rupestris</i> <i>Capparis arborea</i> <i>Cassinia</i> sp. <i>Casuarina cristata</i> <i>Corymbia tessellaris</i> <i>Enchylaena tomentosa</i> <i>Eremophila mitchellii</i> <i>Eucalyptus crebra</i> <i>Eucalyptus populneum</i> <i>Geigera parviflora</i> <i>Hakea lorea</i> <i>Jasminum didymum</i> <i>Jasminum simplicifolium</i> <i>Olearia canescens</i> <i>Owenia acidula</i>	Lightly grazed

						<i>Pennisetum ciliare</i> <i>Petalostigma pubescens</i>	
T12	-26.29194 149.9433	Gentle slope; sandy soil	11.5.5 11.9.5	<i>Callitris glaucophylla</i>	18m	<i>Acacia podalyrifolia</i> <i>Acacia</i> spp. <i>Atalaya hemiglauca</i> <i>Brachyscome</i> sp. <i>Breynia oblongifolia</i> <i>Callitris glaucophylla</i> <i>Capparis arborea</i> <i>Capparis lasiantha</i> <i>Cassinia</i> sp. <i>Corymbia tessellaris</i> <i>Eucalyptus populneum</i> <i>Geigeria parviflora</i> <i>Hakea lorea</i> <i>Jasminum didymum</i> <i>Lomandra leucocephala</i> <i>Myoporum acuminatum</i> <i>Senna artemisioides</i> <i>Sida</i> sp.	Lightly grazed
T13	-26.30361 149.9969	Rocky gully and creel bed; sandy soil	11.9.5	<i>Casuarina cristata</i>	16m	<i>Acacia harpophylla</i> <i>Alectryon diversifolius</i> <i>Alectryon oleifolius</i> <i>Atalaya hemiglauca</i> <i>Auranticarpa rhombifolia</i> <i>Brachychiton rupestris</i> <i>Carissa ovata</i> <i>Casuarina cristata</i> <i>Corymbia citriodora</i> <i>Dianella</i> sp. <i>Diospyros</i> sp. <i>Dodonaea triangularis</i> <i>Eremophila mitchellii</i>	Lightly grazed

						<i>Erythoxylum australis</i> <i>Eucalyptus crebra</i> <i>Geigera parviflora</i> <i>Opuntia</i> sp. <i>Owenia acidula</i> <i>Parsonsia</i> sp. <i>Pennisetum ciliare</i>	
T14	-26.25111 149.9183	Hill slope and gully; soil rocky and sandy	11.9.4	<i>Acacia harpophylla</i>	16m	<i>Acacia harpophylla</i> <i>Alectryon diversifolius</i> <i>Alstonia constricta</i> <i>Apophyllum anomalon</i> <i>Auranticarpa rhombifolia</i> <i>Brachychiton rupestris</i> <i>Breynia oblongifolia</i> <i>Capparis loranthifolia</i> <i>Carissa ovata</i> <i>Casuarina cristata</i> <i>Citrus australis</i> <i>Eremophila desertii</i> <i>Eremophila mitchellii</i> <i>Erythoxylum australis</i> <i>Exocarpos latifolius</i> <i>Flindersia collina</i> <i>Geigera parviflora</i> <i>Jasminum didymum</i> <i>Jasminum simplicifolium</i> <i>Lysicarpus angustifolius</i> <i>Macropteranthes leiocaulis</i> <i>Maytenus cunninghamii</i> <i>Myoporum acuminatum</i> <i>Notelaea microcarpa</i> <i>Opuntia</i> sp. <i>Owenia acidula</i>	Lightly grazed

						<i>Pennisetum ciliare</i> <i>Pittosporum spinescens</i> <i>Psydrax odorata brevifolia</i> <i>Psydrax oleifolius</i> <i>Santalum lanceolatum</i> <i>Trophis scandens</i>	
T15	-26.32694 149.9961	Flat terrane; sandy soil	11.5.5/ 11.9.5	<i>Callitris glaucophylla</i>	16m	<i>Acacia leiocalyx</i> <i>Alphitonia excelsa</i> <i>Aristida caput-medusae</i> <i>Callitris glaucophylla</i> <i>Carex</i> sp. <i>Corymbia citriodora</i> <i>Dianella</i> sp. <i>Diospyros</i> sp. <i>Dodonaea triangularis</i> <i>Eragrostis</i> sp. <i>Erythroxylum australe</i> <i>Eucalyptus crebra</i> <i>Eucalyptus populneum</i> <i>Lysicarpus angustifolius</i> <i>Macropteranthes leiocaulis</i> <i>Opuntia</i> sp. <i>Panicum</i> sp. <i>Petalostigma pubescens</i> <i>Schoenus</i> sp. <i>Themeda australis</i>	Lightly grazed
T16	-26.28833 149.9969	Hill slope and gully; soil rocky and sandy	11.9.4	<i>Croton insularis</i>	6m	<i>Acalypha eremorum</i> <i>Alectryon diversifolius</i> <i>Alectryon oleifolius</i> <i>Alstonia constricta</i> <i>Ancistrachne uncinulata</i> <i>Aristida</i> spp. <i>Auranticarpa rhombifolia</i>	Lightly grazed

						<i>Brachychiton rupestris</i> <i>Breynia oblongifolia</i> <i>Bursaria incana</i> <i>Carissa ovata</i> <i>Corymbia citriodora</i> <i>Croton insularis</i> <i>Denhamia pittosporoides</i> <i>Diospyros</i> sp. <i>Eremophila mitchellii</i> <i>Eucalyptus crebra</i> <i>Exocarpos latifolius</i> <i>Flindersia collina</i> <i>Geigeria parviflora</i> <i>Jasminum simplicifolium</i> <i>Lysicarpus angustifolius</i> <i>Macropteranthes leiocaulis</i> <i>Notelaea microcarpa</i> <i>Owenia acidula</i> <i>Pandorea</i> sp. <i>Pennisetum ciliare</i> <i>Petalostigma pubescens</i> <i>Pittosporum spinescens</i> <i>Trophis scandens</i>	
T17	-26.295 149.9917	Hill slope and gully; soil rocky and sandy	11.9.4	<i>Croton insularis</i>	6m	<i>Acacia harpophylla</i> <i>Alstonia constricta</i>	Lightly grazed