Wandoan Coal Project Western coal seam methane water supply pipeline Terrestrial ecology impact assessment

November, 2008

Wandoan Joint Venture

Parsons Brinckerhoff Australia Pty Limited ABN 80 078 004 798

Level 4, Northbank Plaza
69 Ann Street
Brisbane QLD 4000
GPO Box 2907
Brisbane QLD 4001
Australia
Telephone +61 7 3854 6200
Facsimile +61 7 3854 6500
Email brisbane@pb.com.au

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Author: Peter Monsted – Senior Ecologist

Josie Stokes – Senior Ecologist

Ben Lewis – Zoologist, Lewis Ecological Consulting

Chris Hansen – Associate / Senior Botanist, Place Design Group.

Signed:

Reviewer: Martin Predavec – National Technical Executive -Ecology

Signed:

Approved by: Helen D'Arcy – Senior Environmental Engineer

Signed:

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Acronyms

Acronym	Definition
CHPP	Coal Handling and Preparation Plant
CG	Coordinator General
DEWHA	The Department of the Environment, Water, Heritage and the Arts
DME	Queensland Department of Mines and Energy
EPP	Environmental Protection Policy
EIS	Environmental Impact Statement
EPA	Environmental Protection Agency, a department of the Queensland Government.
EPBC Act	Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*
EA	Environmental Authority as issued under the EP Act.
EP Act	*Environmental Protection Act 1994*
GAB	Great Artesian Basin
IDAS	Integrated Development Assessment System
IP Act	Queensland *Integrated Planning Act 1997*
KCP	Queensland Nature Conservation (Koala) Conservation Plan 2006
LP Act	Queensland *Land Protection (Pest and Stock Route Management) Act 2002*
MDL	mineral development licence
ML	Million litres
MLA	Mining lease application
MNES	Matters of National Environmental Significance
MR Act	Queensland *Mineral Resources Act 1989*
Mtpa	million tonnes per annum
NC Act	Queensland *Nature Conservation Act 1992*
NC Regulation	Queensland Nature Conservation (Wildlife) Regulation 2006
NRL	Northern Range Limit
NRW	Queensland Department of Natural Resources and Water
QPWS	Queensland Parks and Wildlife Service
RE	Regional Ecosystem
ROM coal	Run of Mine coal
SDPWO Act	Queensland *State Development and Public Works Organisation Act 1971*
SRL	Southern Range Limit
TOR	Terms of Reference
VM Act	Queensland *Vegetation Management Act 1999*
WJV	Wandoan Joint Venture
WRL	Western Range Limit

Executive summary

The Wandoan Coal Project (the Project) comprises the development of thermal coal resources immediately west of Wandoan, a small rural town situated approximately 350 km northwest of Brisbane and 60 km south of Taroom. The coal reserves for this Project exist within three mining lease applications (MLA areas 50229, 50230 and 50231) and will be developed as an open cut mine with related infrastructure. The Project is being developed by the Wandoan Joint Venture (WJV), a partnership which includes Xstrata Coal Queensland Pty Ltd (XCQ), ICRA RPW Pty Ltd and Sumisho Coal Australia Pty Ltd. PB, together with Xenith Consulting Pty Ltd, and Sedgman Limited, have been commissioned by the WJV to undertake the planning and prefeasibility design and assessment of the coal mine and associated works.

Under current plans, coal mined from the MLA areas is to be processed (washed) on site, requiring a constant and reliable supply of water. With coal production estimated at 30 million tonnes per annum (Mt/a), an annual raw water demand is anticipated to peak at 9,100 megalitres (ML) of water (with demand for water increasing to 11,400 ML/a, should mine production increase to 40 Mt/a). In order to meet this demand, water will need to be sourced from outside the MLA areas.

A number of options are currently being considered for the supply of raw water to the Project for mine operations. One of these options is the use of by-product water from coal seam methane (CSM) from extraction wells located at Spring Gully and Fairview, approximately 100 km west of the Wandoan Coal Project site. For this to occur, a new pipeline is needed to transfer CSM by-product water from an existing reverse osmosis water treatment plant at Spring Gully to the Wandoan Coal Project site. The construction of this water pipeline is the subject of Volume 3 of Environmental Impact Statement (EIS) and this terrestrial ecology impact assessment.

In preparation of the EIS, PB have undertaken technical studies of terrestrial ecology to address the requirements of the Terms of Reference and other relevant state and Commonwealth policies relating to biodiversity. The approach to the terrestrial ecological impact assessment involved a desk-based assessment of literature and relevant databases followed by field surveys. The literature and database review was used to identify ecologically sensitive areas and compile a list of significant conservation species for consideration in the EIS based on known records or predicted habitat in the study area and surrounds.

Field surveys were undertaken in the study area to verify the presence of and provide site specific descriptions of vegetation communities, species or their habitats in the study area in August 2008 (late winter). Flora and fauna surveys of the eastern section of the study area within the MLA areas were undertaken in Spring 2007 and Autumn 2008 for the Terrestrial ecology impact assessment of the MLA and infrastructure and are the subject of the Terrestrial ecology impact assessment supporting Volume 1 of the EIS. As such, the pipeline corridor in the MLA areas was not surveyed in August 2008. The assessment of impacts to terrestrial ecology however includes remnant and non-remnant vegetation and species of plant and animal identified, or considered likely to occur, within the habitats along the pipeline corridor within the MLA.

Survey of terrestrial flora involved verification of Regional Ecosystem (RE) type and remnant status as mapped by the Environmental Protection Agency, mapping and description of other regrowth vegetation (non-remnant vegetation) and compilation of a comprehensive list of species of plant that occur in the study area. The survey method for terrestrial flora was based on the approach outlined in the Queensland Herbarium's *Methodology for Survey and Mapping of Regional Ecosystems and Vegetation Communities*

in Queensland. The flora survey method also used sample techniques and methods used for the Herbarium's CORVEG secondary and tertiary site data collection.

Survey of terrestrial fauna aimed to compile a comprehensive list of species of animals that occur in the study area and their habitats. The surveys involved a range of survey methods, providing a census of terrestrial vertebrate fauna. These surveys included trapping, ultrasonic bat detection, spotlighting, call broadcast and active searches for herpetofauna, birds and other incidental evidence of fauna. In addition to these census techniques, fauna habitat assessments were also done to provide a basis for the assessment of likelihood of Rare and Threatened species to occur in the study area and surrounds.

The study area was found to be largely cleared of remnant vegetation as a result of grazing and dryland agriculture. The remaining remnant vegetation was generally restricted to the main drainage lines traversing the study area and regrowth within the Roma Taroom Road and Goldens Bimbadeen Road corridors. Vegetation along these drainage lines was dominated by RE 11.3.25 (*Eucalyptus tereticornis* or *E. camaldulensis* woodland fringing drainage lines) with RE 11.3.2 (*Eucalyptus populnea* woodland on alluvial plains) spreading across the floodplains. The remnant vegetation along these drainage lines forms continuous linear patches that form part of a wider regional corridor network. This vegetation is also recognised as having regional significance under the Biodiversity Planning Assessment for the Brigalow Belt bioregion. Vegetation within the road reserves was dominated by *Acacia harpophylla* analogous with RE 11.9.5 and small areas of highly modified Semi-evergreen vine thicket (analogous with RE 11.9.4).

RE 11.9.5 has a conservation status of Endangered under the VM Act and is also consistent with the Brigalow (*Acacia harpophylla* dominant co-dominant) Endangered ecological community listed under the Commonwealth EPBC Act. The majority of regrowth vegetation analogous with RE 11.9.5 is located in the Roma Taroom Road reserve between Barton and Kangaroo Creek was consistent with Brigalow (*Acacia harpophylla* dominant co-dominant) Endangered ecological.

RE 11.9.4 has a conservation status of Endangered under the Queensland *Vegetation Management Act 1999* (VM Act), however this only applies to patches of remnant vegetation, of which none occur in the Study Area. Vegetation analogous with RE 11.9.4 (remnant and non-remnant) is however consistent with Semi-evergreen vine thickets of the Brigalow Belt (North and South) and Nandewar Bioregions, and Endangered ecological community listed under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*.

The field surveys of the study area identified 265 species of plant (217 native species) and 144 species of vertebrate fauna (136 native species) in the Study Area. This included three Rare or Threatened species animal:

- Brigalow Scaly-foot (*Paradelma orientalis*)
- Little Pied Bat (Chalinolobus picatus)
- Golden-tailed Gecko (*Diplodactylus taenicauda* syn. *Strophurus taenicauda*).

No Threatened species of plant was recorded. However, one Threatened species of plant and thirteen Rare or Threatened species of animal are considered likely to occur in the study area and surrounds:

- *Homopholis belsonii* (Belsons Panic, a grass)
- Rough Frog (*Cyclorana verrucosa*)
- Dunmall's Snake (*Furina dunmalli*)

- Freckled Duck (*Stictonetta naevosa*)
- Cotton Pygmy-goose (*Nettapus coromandelianus*)
- Grey Falcon (*Falco hypoleucos*)
- Square-tailed kite (*Lophoictinia isura*)
- Black-necked stork (*Ephippiorhynchus asiaticus*)
- Greater Long-eared Bat (*Nyctophilus timoriensis*)
- Australian Painted Snipe (*Rostratula australis*)
- Squatter Pigeon (southern race) (*Geophaps scripta scripta*)
- Australian Painted Snipe (*Rostratula australis*)
- Glossy Black-cockatoo (*Calyptorhynchus lathami*)
- Black-chinned Honeyeater (*Melithreptus gularis*).

The proposed pipeline has potential to result in a range of direct and indirect impacts to Threatened ecological communities, species, their habitats, and other biodiversity that occur in the study area and surrounds. However, based on the findings of the winter fields surveys, impacts to significant biodiversity including the Brigalow (*Acacia harpophylla* dominant and co-dominant) and Semi-evergreen Vine Thickets endangered ecological communities and habitat of the Brigalow Scaly-foot and the Golden-tailed Gecko, were avoided by locating the proposed pipeline route in private properties to the north of the Roma Taroom Road and Goldens Bimbadeen Road which are already cleared.

Nonetheless, the proposed pipeline will still result in a range of direct and indirect impacts to Threatened ecological communities, species, their habitats, and other biodiversity that occur in the study area and surrounds. These potential impacts include:

- loss of vegetation and habitats
- habitat fragmentation and loss of connectivity
- direct mortality
- increase in weeds and pest species
- noise and dust during construction.

Assessment of the significance of impacts were completed for: Threatened species that were either recorded in the study area or considered likely to occur; Migratory species for which the study area is at their distributional range limit; Threatened ecological communities; and Endangered remnant REs. For ecological communities and species listed under the EPBC Act, impact assessments were completed in accordance with the *EPBC Act Policy Statement 1.1 Significant Impact Guidelines*. As the *Vegetation Management Act 1999* and *Nature Conservation Act 1992* do not outline factors for consideration in assessing impacts, the assessment was based on consideration of the following factors: the conservation value of the area affected for the species or community; the importance of the individuals and habitats being affected to maintaining long-term viability of the population or community; and if the impacts will be long-term, permanent and irreversible. The impact assessments also considered the range of impact mitigation measures proposed to avoid, reduce and mitigate environmental impacts.

The impact assessments concluded that the proposed pipeline was unlikely to result in a significant impact to any Threatened species of plant or animal, RE or ecological community. Nonetheless, the impacts of the proposed pipeline are acknowledged and will be minimised as part of the detailed design.

Prior to the start of construction, detailed mitigation measures should be developed and presented in a biodiversity management plan relating to the construction and operation of the pipeline. The plan should include:

- detailed design of mitigation measures such as fauna underpasses and overpasses and fencing (as required)
- general impact mitigation
- staff/contractor inductions and continuing education of staff
- pre-clearing surveys and fauna salvage/translocation
- rehabilitation and revegetation of adjoining habitat
- weed control
- pest management
- ecological monitoring.

The plan should include clear objectives and actions for the proposed pipeline including:

- minimise human interferences to flora and fauna
- minimise vegetation clearing/disturbance
- minimise impact to Threatened species and communities
- minimise impacts to aquatic habitats and species
- ongoing monitoring of impacts on flora and fauna.

In addition, where there is residual loss or degradation of vegetation and habitat after detailed design and determination of mitigation measures, compensation in the form of compensatory habitat, land rehabilitation and/or contribution to research should be employed (i.e. offsets). As such, a Green Offsets Package should address the residual impacts associated with construction and operation of the southern CSM water supply pipeline should this option be included in the Project. The Green Offsets Package should be developed in consultation with the Environmental Protection Agency and the Department of the Environment, Water, Heritage and the Arts giving consideration to relevant State and Commonwealth policies relating to offsets (outlined below):

- Queensland Government Environmental Offsets Policy
- State policy for vegetation management offsetting
- Environmental offsets for impact on Matters of National Environmental Significance.

1. Introduction

1.1 Background

The Wandoan Coal Project ('the Project') comprises the development of thermal coal resources immediately west of Wandoan, a rural town situated approximately 350 km northwest of Brisbane and 60 km south of Taroom (see Figure 1-1). The coal resources for this Project exist within three mining lease applications (MLA areas 50229, 50230 and 50231) which cover a combined area of roughly 32,000 ha (see Figure 1-2). The coal resources in this area will be developed as an open cut mine with related infrastructure (described further in Section 1.3).

The Project is being developed by the Wandoan Joint Venture (WJV), a partnership which includes Xstrata Coal Queensland Pty Ltd (XCQ), ICRA RPW Pty Ltd and Sumisho Coal Australia Pty Ltd.

PB, together with Xenith Consulting Pty Ltd, and Sedgman Limited, have been commissioned by the WJV to undertake the planning and prefeasibility design and assessment of the coal mine and associated works (preparation of the Volume 4 of the Environmental Impact Statement (EIS) associated with the Glebe Weir Raising and Pipeline has been conducted by MWH on behalf of Sunwater).

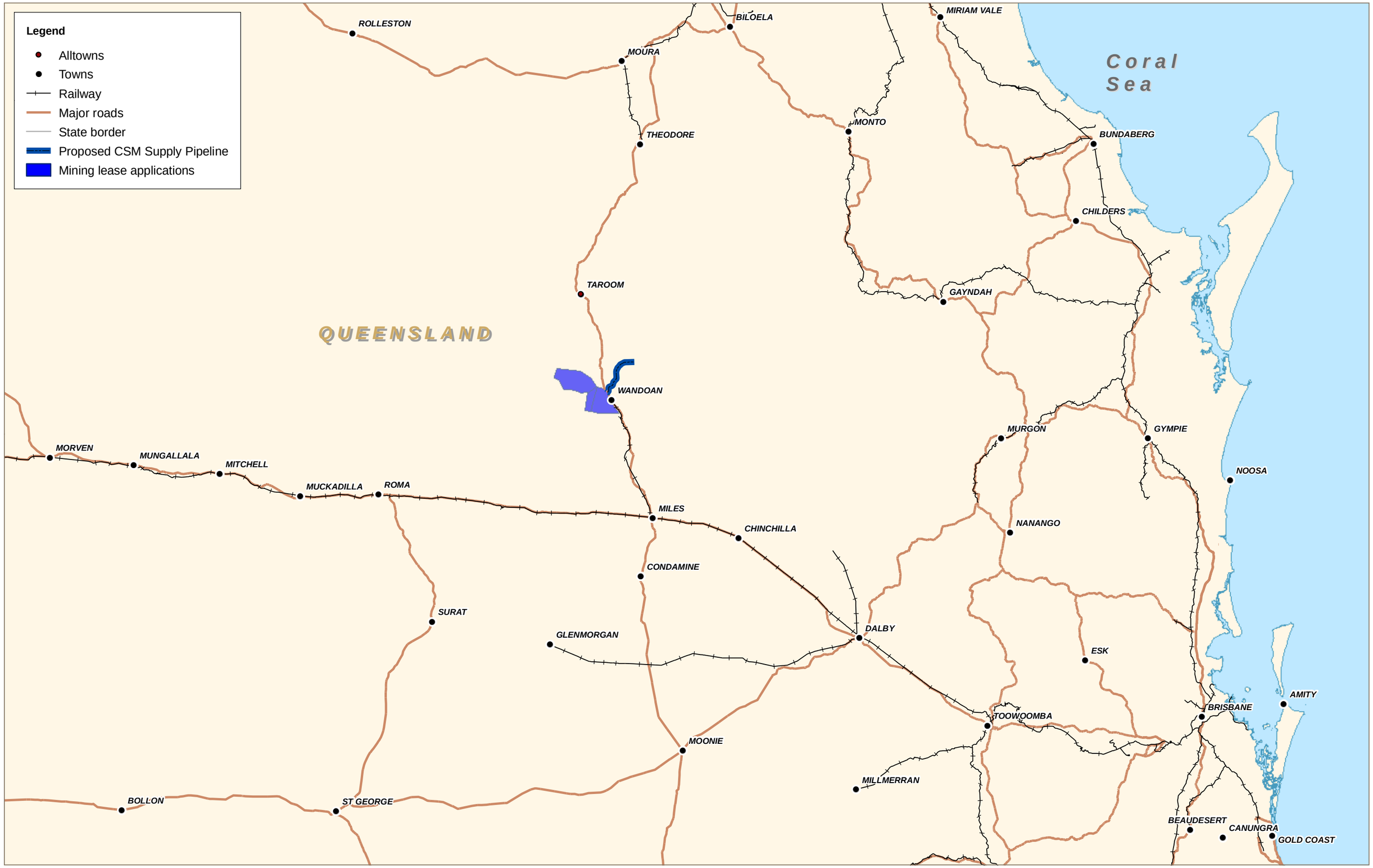
In preparation of the Environmental Impact Statement (EIS), PB have undertaken technical studies of terrestrial ecology with the assistance of Lewis Ecological Services and Place Environmental. Aquatic Ecology has been assessed separately by frc environmental.

1.2 Context and scope of this assessment

1.2.1 Structure of the environmental impact assessment and the ecological assessments

The Project was declared a significant project requiring EIS by the Coordinator-General in December 2007 under the *State Development and Public Works Organisation Act 1971* (SDPWO Act). Terms of Reference (ToR) for the Project were prepared therefore in accordance with S.29 and S.30 of the SDPWO Act to identify those matters that should be addressed in the EIS. The ToR is based on the initial outline of the proposed Project given in the Proponent's Initial Advice Statement dated December 2007.

On 21 July 2008, the Commonwealth Department of the Environment, Water, Heritage and the Arts (DEWHA) decided that the Project was a controlled actions as they are likely to have a significant impact on listed threatened species and ecological communities and which are Matters of National Environmental Significance under the *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act). As such, the DEWHA confirmed that as per section 75 of the EPBC Act, the Project will require assessment and approval by the Minster for the Environment, Heritage and the Arts (Commonwealth) before it can proceed. A summary of Matters of National Environmental Significance and the likely impacts of the Project on them are presented in Attachment J of this Technical Report.



J:\A442-ENG\PROJ\2133006C__Wandoan_prefea\10_GIS\Projects\Env\Technical Report\Figure 1-1 Project Location.mxd

Source: Roads, QLD State Digital Road Network (2004); Towns, Coastline , boundaries, 1:250K Topo, Geoscience Australia (2006)

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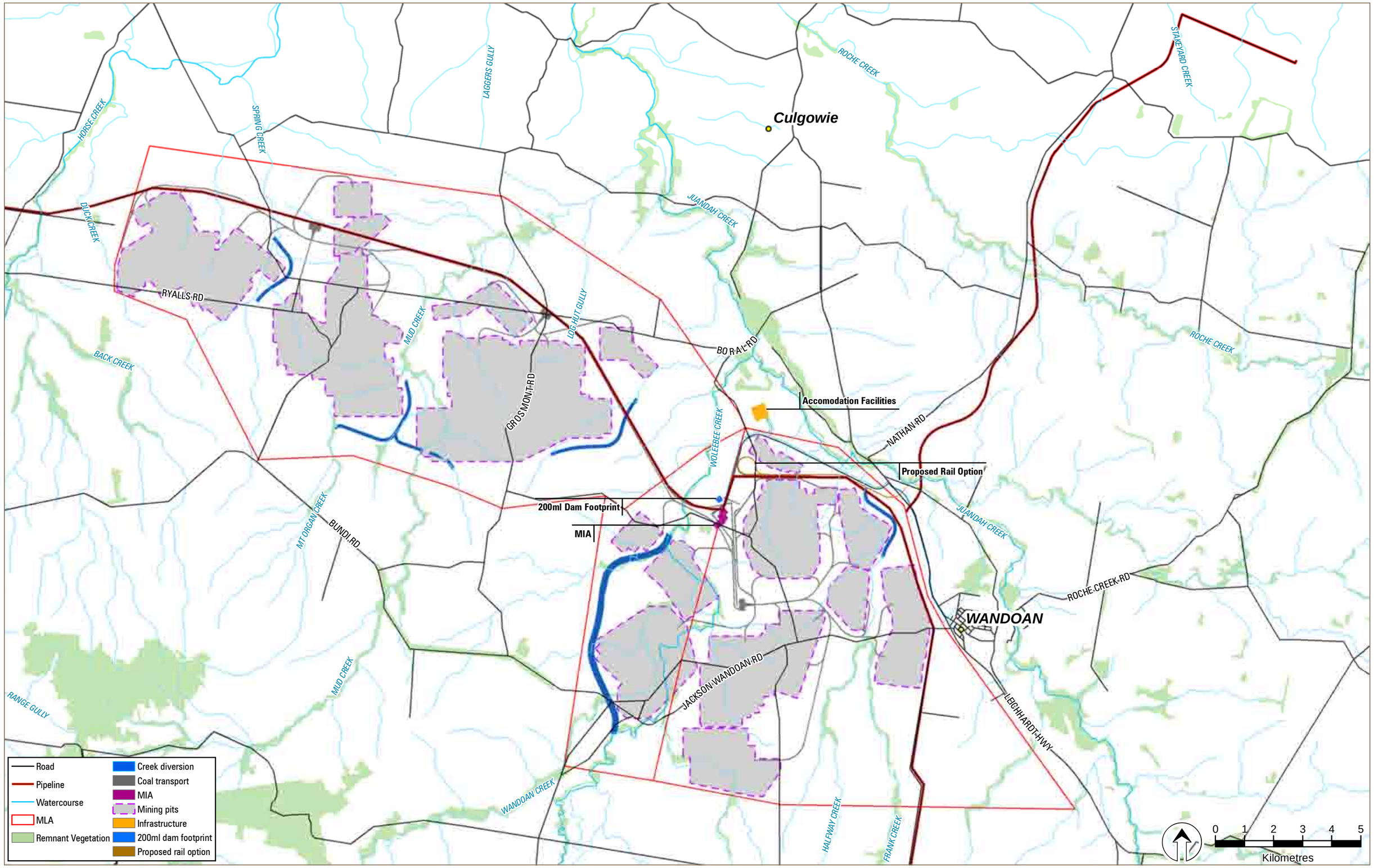
0 25 50 75 100 125
Kilometers

Figure 1-1
Project Location



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Source: Roads, QLD State Digital Road Network (2004); Towns, creeks 1:250K Topo, Geoscience Australia (2006)

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Figure 1-2

Study Area

Given the scale of the Project, the EIS associated with the Wandoan Coal Project has been divided into four inter-related EIS. A terrestrial ecological impact assessment has been prepared to support each Volume of the EIS.

Volume 1 – MLA area and surrounds: assessment of lands and infrastructure associated with MLA areas, the mine accommodation facilities, Wandoan township, Great Artesian Basin (GAB) construction and potable water extraction, and the gas supply pipeline from the lateral Peat-Scotia gas pipeline. Volume 1 is the overarching assessment document to which Volumes 2, 3 and 4 contribute.

Volume 2 – Southern CSM water pipeline: assessment of a pipeline option to supply Coal Seam Methane (CSM) water from the Condamine Power Station approximately 101 km south of the MLA areas.

Volume 3 – Western CSM water pipeline: assessment of a pipeline option to supply CSM water from the Origin Energy Spring Gully Reverse Osmosis Plant approximately 91 km west of the MLA areas. This is the subject of this assessment.

Volume 4 – Glebe Weir Raising and Pipeline: provides impact assessment of the Glebe Weir Raising and Pipeline water supply option, located approximately 80 km north-east of the Project on the Dawson River (the preparation of the environmental impact assessment associated with the Glebe Weir Raising and Pipeline has been conducted by MWH on behalf of Sunwater).

An Integrated EIS Summary collates and summarises all four volumes in a separate stand-alone document, providing an overarching view of the Project.

Scope of the terrestrial ecological assessment

The terrestrial ecological impact assessment was prepared to provide a description of the environmental values, and identify potential impacts and mitigation measures, relating to sensitive environmental areas, terrestrial flora and terrestrial fauna. A separate terrestrial ecological impact assessment was prepared for each EIS volume.

The objectives of the terrestrial ecological assessment were to:

- identify and map areas that are ecologically sensitive in proximity to the Project including:
  - important habitats of species listed under the *Nature Conservation Act 1992* (NC Act) and/or the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). A summary of Matters of National Environmental Significance and the likely impacts of the Project on them are presented in Attachment J of this Technical Report.
  - regional ecosystems (REs) recognised by the Environmental Protection Agency (EPA) as ‘Endangered’ or ‘Of concern’ or ‘Not of concern’ but where permits are no longer granted due to being at threshold levels, and/or ecosystems listed as ‘Critically Endangered’ ‘Endangered’ or ‘Vulnerable’ under the EPBC Act
  - ecosystems that provide important ecological functions, such as riparian vegetation, important buffer to a protected area, refugia or important habitat corridors between areas

  - protected areas that have been proclaimed under the NC Act or are under consideration for proclamation.
- describe and map terrestrial flora in proximity to the proposed pipeline including:
  - location and extent of vegetation types including recognised RE type descriptions and any areas of national, state or regional significance
  - location of vegetation types of conservation significance
  - vegetation map unit descriptions, including a list of species present
  - their relationship to RE their value as habitat for fauna and conservation of specific Rare floral and faunal assemblages or community types discussed
  - the current extent (bioregional and catchment) of protected vegetation types of conservation significance within the protected areas (e.g. national parks, conservation parks, resource reserves, nature refuges etc)
  - any plant communities of cultural, commercial or recreational significance
  - the distribution and abundance of significant exotic and weed species.
- describe and map terrestrial fauna present or likely to be present in the area including:
  - species diversity (i.e. a species list) and indicative abundance of animals, including amphibians, birds, reptiles, mammals (including bats)
  - any species that are poorly known but suspected of being Rare or potentially Threatened
  - habitat requirements and sensitivity to changes, including movement corridors and barriers to movement
  - the existence of feral or exotic animals, including maps of major pest infestations
  - existence of any Rare, Threatened or otherwise noteworthy species/communities in the Study Area, including discussion of range, habitat, breeding, recruitment, feeding and movement requirements, and current level of protection (e.g. any requirements of protected area management plans)
  - use of the area by Migratory and nomadic birds in particular areas for breeding or significant congregations.
- provide an assessment of the potential impact on terrestrial flora, fauna and environmentally sensitive areas. This assessment outlines:
  - the significance of impacts at a local, catchment, bioregional, state or national levels
  - direct (or short term) and indirect (or long-term) impacts due to loss of range/habitat, food supply, nest sites, breeding/recruiting potential or movement corridors
  - cumulative effects of direct and indirect impacts
  - impacts on Rare and Threatened or otherwise noteworthy species
  - threatening processes leading to progressive loss
  - identification of the conservation importance of identified populations at the regional, state and national levels.

- outline measures to mitigate the impacts of the proposed pipeline on terrestrial flora, fauna and environmentally sensitive areas. These measures include:
  - methods to ensure rapid rehabilitation of disturbed areas following construction, including the species chosen for revegetation which should be consistent with the surrounding associations. Details of any post construction monitoring programs and what benchmarks would be used for review of monitoring should be included
  - methods of minimising the potential for the introduction and/or spread of weeds or plant disease
  - measures to minimise wildlife capture and mortality during construction and operation
  - methodologies to avoid injuries to native fauna as a result of the Project's construction and operational works
  - methods for minimising the introduction of feral animals, and other exotic fauna such as declared pest ant species (fire ants and yellow crazy ants).

1.3 Western CSM water supply pipeline details and study area

For the purpose of this assessment the following definitions apply:

- **footprint:** the extent of direct impacts of the Project. This was taken to be the 20 m corridor required for construction of the pipeline
- **study area:** the study site and any additional areas that could potentially be affected by the proposal either directly or indirectly, such as ancillary construction areas. In this case it is taken to be a 100 m corridor along the western CSM water supply pipeline from Origin Energy's reverse osmosis plant at Spring Gully to the Wandoan Coal Project MLA areas (refer Figure 1-2)
- **region:** a bioregion defined in a national system of bioregionalisation. For this study, this is the Brigalow Belt bioregion as defined in the Interim Biogeographic Regionalisation for Australia (1995).

Under current plans, coal mined from the MLA areas is to be processed (washed) on site, requiring a constant and reliable supply of water. With coal production estimated at 30 million tonnes per annum (Mt/a), an annual raw water demand is anticipated to peak at 9,100 megalitres (ML) (with demand for water increasing to 11,400 ML/a, should mine production increase to 40 Mt/a). In order to meet this demand, water will need to be sourced from outside the MLA areas.

A number of options are currently being considered for the supply of raw water to the Project for mine operations. One of these options is the use of by-product water from coal seam methane (CSM) from extraction wells located at Spring Gully and Fairview, approximately 100 km west of the Wandoan Coal Project site. For this to occur, a new pipeline is needed to convey by-product water from an existing reverse osmosis water treatment plant at Spring Gully to the Wandoan Coal Project site.

Six water supply pipeline route options were considered in determining the preferred alignment, as discussed in Chapter 2 Project Needs and Alternatives for Volume 3. The options assessment involved a review of available desktop information, data sources and reconnaissance field observations.

The proposed pipeline will deliver CSM by-product water from Origin and Santos CSM wells beginning at the Spring Gully CSM water treatment plant then heading south-east across several existing Petroleum Leases to Roma-Taroom Road (refer Figure 1-2). The precise alignment through these leases has not yet been finalised and will be the subject of future negotiations between the lease holders and Wandoan Joint Venture. The proposed pipeline then follows Roma-Taroom Road in a north-easterly direction until the north-western property boundary of Lot 9 on plan AB127. From this point the pipeline turns east along the property boundary between Lot 9 on plan AB127 and Lot 8 on plan AB127. The proposed pipeline will traverse the eastern portion of Lot 9 on plan AB127 to meet Goldens Bimbadeen Road, from which the pipeline travels east to the intersection with Ferrets Road. From this point, the proposed pipeline continues in an easterly direction following the southern property boundary of Lot 132 on plan SP121742. The pipeline then cuts across the south-east corner of this property across to the south-western corner of Lot 58 on plan FT556, on to the western boundary of the Wandoan Coal Project MLA 50229.

The landscape traversed by the study area is highly modified as a result of vegetation clearing associated with agricultural activities, including grazing of cattle and cropping. As such, vegetation remaining in the road reserve is of high conservation value. The western CSM water supply pipeline will therefore be located within private property (within cleared pastures) to the north of Roma-Taroom Road and Goldens Bimbadeen Road to avoid impacts to native vegetation and associated fauna habitats.

The proposed alignment within the MLA to the termination point at the proposed mine infrastructure area of the Wandoan Coal Project site will be subject to change dependent on the final mine layout in order to avoid proposed pit areas and other mine infrastructure.

The proposed western CSM water supply pipeline is approximately 91 km in length and includes a lift pump station at the point of supply (most likely adjacent to the existing Spring Gully reverse osmosis plant). The pipeline will generally be located underground and constructed using a section trench and backfill method. Construction of the pipeline will necessitate a 20 m wide corridor to accommodate the pipeline trench, and vehicle and plant access. Mapped drainage line crossings will utilise trenchless technology to minimise impacts to riparian and aquatic habitats. An easement of approximately 10 m will be required post construction to maintain the pipeline.

2. Relevant legislation

This section outlines the State and Commonwealth legislation and statutory framework relevant to this technical report with specific reference application of state legislation, policy, permits and licenses relating to the protection of biodiversity. Refer to Chapter 3 of Volume 3 for further details of the key approvals applying to the proposed pipeline.

2.1 State assessment framework

The Wandoan Coal Project will require assessment and approval under a range of State planning legislation including the *State Development and Public Works Organisation Act 1971 Act* (SDPWO Act), the *Mineral Resources Act 1989* (MR Act), the *Environmental Protection Act 1994* (EP Act) and the *Integrated Planning Act 1997* (IP Act). The application of these Acts to various components of the Wandoan Coal Project will in turn determine the application of state legislation, policy, permits and licenses relating to the protection of biodiversity as outlined below.

2.1.1 *State Development and Public Works Organisation Act 1971 Act*

The SDPWO Act provides for '*state planning and development through a coordinated system of public works organisation, for environmental coordination and for related purposes*' to facilitate large projects in Queensland (p. 11, SDPWO Act). On 21 December 2007, the Coordinator-General (CG) declared under section 26 of the SDPWO Act that the Project was a significant project for which an EIS is required. The process followed for this EIS is specified by the SDPWO Act. This process is as follows:

- public notification of the EIS by the Wandoan Joint Venture (section 33 of the SDPWO Act)
- all properly made submissions about the EIS and any other material the CG considers relevant to the Project, will be reviewed by the CG (section 35(1) of the SDPWO Act)
- assuming that the CG requires additional information about the EIS, then the WJV will prepare a Supplementary EIS (section 35(2) of the SDPWO Act)
- the CG will evaluate the EIS and Supplementary EIS, taking into consideration the matters raised in (section 35(4) of the SDPWO Act)
- the CG's report is then provided to the Commonwealth Minister for DEWHA and the approval process under the EPBC Act then commences.

In reference to the above, the CG's Report is applied to approvals requirements under various Acts, and may state conditions for the following any Project development applications that would be assessed using the Integrated Development Assessment System under the IP Act, the CG's report can state conditions that must attach to the development approval, that the development approval must be for part only of the development or be for a preliminary approval only (section 39 of the SDPWO Act).

2.1.2 *Mineral Resources Act 1989*

The *Mineral Resources Act 1989* (MR Act) provides for the '*assessment, development and utilisation of mineral resources to the maximum extent practicable consistent with sound economic and land use management*' (p. 31, MR Act).

The MR Act does not apply however to the assessment or approval of the western CSM water supply pipeline.

2.1.3 *Integrated Planning Act 1997*

The IP Act is Queensland's principle planning legislation and coordinates planning at the local, regional and State levels. The IP Act is applicable to the Project where development is 'assessable development' under schedule 8 of the IP Act (to the extent it is not otherwise exempt or self-assessable under the Planning Scheme for Taroom Shire, 2006). Such development applications will be assessed using the Integrated Development Assessment System (IDAS) process.

An aspect of the Project will require an approval under the IP Act if it involves 'development' (as defined under section 1.3.2 and section 1.3.5 of the IPA). However, the Project has been declared a significant project under the SDPWO Act and as such the environmental impact assessment will be controlled through the SDPWO Act EIS process.

2.1.4 *Environmental Protection Act 1994*

The *Environmental Protection Act 1994* (EP Act) provides the key legislative framework for environmental management and protection in Queensland. The EP Act utilises a number of mechanisms to achieve its objectives including the *Environmental Protection Regulation 1998,* Environmental Protection Policies (EPPs) and establishing a general environmental duty.

2.1.5 *Nature Conservation Act 1992*

The *Nature Conservation Act 1992* (NC Act) provides for the conservation of nature through protection of all native plants, birds, reptiles, mammals and amphibians in Queensland, along with a limited range of invertebrates (some butterflies, spiders and scorpions), freshwater fish and the grey nurse shark (other aquatic species are protected by the Queensland Department of Primary Industries and Fisheries and the Great Barrier Reef Marine Park Authority). The NC Act is based on principles aimed at conserving biological diversity, ecologically sustainable use of wildlife, ecologically sustainable development and international criteria developed by the World Conservation Union (International Union for the Conservation of Nature 2001) for establishing and managing protected areas. It includes the Nature Conservation (Wildlife) Regulation 2006 (NC Regulation), which lists plants and animals 'Extinct in the Wild', 'Endangered', 'Vulnerable', 'Rare', 'Near Threatened' and 'Least Concern' wildlife (see Glossary for definitions of these terms).

Actions affecting protected native flora and fauna are regulated under the NC Act. Accordingly, some or all of the following permits may be required for the proposed pipeline:

- Protected Animals Movement Permits (section 88 of the NC Act)
- Protected Plants Clearing Permits (section 89 of the NC Act)

- Wildlife Movement Permits (section 97 of the NC Act) for wildlife not protected under the NC Act but found in certain areas covered by conservation plans created and implemented under the NC Act.

2.1.6 Nature Conservation (Koala) Conservation Plan 2006 and Management Program 2006 to 2016

The *Nature Conservation (Koala) Conservation Plan 2006* (KCP) (Environmental Protection Agency & Queensland Parks and Wildlife Service 2005) is subordinate legislation to the NC Act that was prepared following listing of the koala as a Vulnerable species within the South East Queensland bioregion (the koala is listed as 'Least Concern' in the Brigalow Belt Bioregion). The plan aims to promote the continued existence of viable Koala populations in the wild, prevent the decline of Koala habitats and promote future land use and development that is compatible with the survival of Koala populations in the wild. Under the Plan, and the Nature Conservation (Koala) Management Program 2006–2016, the State has been divided into three districts to direct management regimes. The study area falls within Koala District C of the plan. This places restrictions on the methods of clearing in Koala habitat (discussed further in Section 7 under impact mitigation measures).

The KCP also provides a policy for offsets for net benefits to koalas and koala habitat for situations that impact high quality koala habitat. This policy only applies to south-east Queensland and therefore does not apply to the study area. Offsets developed for the proposed pipeline will however follow the intent of the KCP offsets policy.

2.1.7 *Vegetation Management Act 1999*

The *Vegetation Management Act 1999* (VM Act) regulates the conservation and management of vegetation communities and clearing of vegetation. It provides a framework for identification, description and mapping of Regional Ecosystems (REs) and remnant vegetation by the Queensland Herbarium as 'Endangered', 'Of Concern' or 'Not of Concern' under the VM Act (see Glossary for definitions of these terms).

Vegetation clearing for the proposed pipeline is dependant initially on whether the clearing will occur on, or off, a mining lease area. Accordingly, the following is noted:

- under schedule 8, table 4, item 1A (j) of the IP Act, a development permit is not required for the clearing of vegetation on an MLA where the clearing supports a mining activity
- clearing of native vegetation on the MLA associated with non-mining related elements of the Project however may require a permit under the VM Act
- where off a mining lease, applications can be made to clear remnant assessable vegetation under section 22A(2)(a) of the VM Act. Due to the Project having been declared to be a Significant Project under the SDPWO Act, such applications will be accompanied by a Property Vegetation Management Plan.

Note the approvals regime for clearance of native vegetation in Queensland is complex. A number of other Acts regulate or have implications for vegetation clearing (e.g. clearing native vegetation on a road reserve triggers approval under the *Land Act 1994*). The full implications for vegetation clearing permits and offsets will be determined at such time as detailed design for the proposed pipeline occurs.

To assist in the regulation of vegetation clearing, the VM Act requires the Minister to prepare policies relating to vegetation management including:

- State Policy for Vegetation Management (Department of Natural Resources and Water 2006)
- Regional vegetation management codes
- Policy for Vegetation Management Offsetting (Department of Natural Resources and Water 2007).

The application of these policies and code(s) is dependent on land tenure and the purpose or intent of vegetation clearing. Schedule 8 Table 4 of the IP Act identifies mining activities as being exempt with respect to approval for clearing of native vegetation on MLAs. As such, the requirements of the aforementioned policies and codes do not strictly apply to vegetation clearing associated with mining-related activities in the MLA area, but will apply to other areas of the pipeline. The intent of the relevant vegetation management code(s) and associated Policy for Vegetation Management Offsetting have, nevertheless, been considered when assessing impacts and mitigation opportunities for the Project as these are the most widely accepted tools for assessment and mitigation of vegetation impacts in Queensland. The application of the aforementioned policy instruments in the context of the current EIS is explained below.

Regional Vegetation Management Code for Brigalow Belt and New England Tablelands Bioregions

The Regional Vegetation Management Code for Brigalow Belt and New England Tablelands Bioregions (Department of Natural Resources and Water 2006) is used in the assessment of development applications for clearing of vegetation within the southern Brigalow Belt bioregion, under the IP Act.

Part S of the Regional Vegetation Management Code for Brigalow Belt and New England Tablelands Bioregions (the Regional Vegetation Code) specifically outlines the performance requirement and acceptable solutions for clearing of vegetation for projects declared to be a significant project under the SDPWO Act. The stated acceptable solution represents one way in which the relevant performance requirement may be met. Applicants can, however, propose an alternative solution to meet the performance requirement.

In relation to terrestrial ecological impacts, Part S specifies that projects assessed under the SDPWO Act must ‘maintain the current extent’ of:

- remnant Endangered, Of Concern and other REs (listed in Table 5 of the Regional Vegetation Code) the that are of regional significance
- essential habitat as shown on an essential habitat map.

The Regional Vegetation Code defines ‘maintain the current extent’ as:

- not clearing or
- ensuring the regional ecosystem structure and function are maintained or
- providing an offset in accordance with the policy in force at the date the application was properly made for vegetation management offsets administered by the Department of Natural Resources and Water (NRW). (This is likely to be the current policy on offsets,

The Policy for Vegetation Management Offsetting (Department of Natural Resources and Water 2007).

Policy for Vegetation Management Offsetting

The Policy for Vegetation Management Offsetting (Department of Natural Resources and Water 2007) applies to an offset proposed to meet a performance requirement under a Regional Vegetation Management Code. The policy specifies seven offset criteria relating to:

1. Limitations on offset vegetation.
2. Selection and location of appropriate regional ecosystems.
3. Remnant mapping.
4. Obtaining ecological equivalence.
5. Ensuring ongoing management.
6. Ensuring the offset is legally secured (as defined in the policy).
7. Other requirements.

Offsets for the proposed pipeline are discussed further in Section 9.

2.1.8 *Land Protection (Pest and Stock Route Management) Act 2002*

The *Land Protection (Pest and Stock Route Management) Act 2002* (LP Act) lists declared plants and animals which are targeted for control because they have, or could have, serious economic, environmental or social impacts. There are legal obligations associated with the control supply, sale, keeping and transport of declared species. Under the Act, land managers in Queensland have a responsibility to manage declared pests on their lands.

A number of listed pest species were recorded in the study area and mitigation measures relating to their control have been included within this technical report.

2.2 Commonwealth assessment framework

The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) relates to actions that involve or impact matters of national environmental significance. The EPBC Act identifies seven matters of national environmental significance:

- World Heritage properties
- National Heritage places
- Wetlands of international importance (Ramsar wetlands)
- Threatened species and ecological communities
- Migratory species
- Commonwealth marine areas
- Nuclear actions (including uranium mining).

Where a project or action has potential to significantly impact on a matter of national environment significance, it should be referred to the Department of the Environment, Water,

Heritage and the Arts (DEWHA) to determine whether the development is a controlled action under the Act. If the Minister determines that the proposed action is controlled under the EPBC Act, a formal assessment process is required.

The Wandoan Coal Project has been referred under the EPBC Act as four inter-related referrals:

- Wandoan Coal Project Mine and Infrastructure (referral reference number 2008/4284)
- Wandoan Coal Project - Coal Seam Methane Water Supply South (referral reference number 2008/4287)
- **Wandoan Coal Project Coal Seam Methane Water Supply West (referral reference number 2008/4283, the subject of this assessment)**
- Wandoan Coal Project Glebe Weir Raising (referral reference number 2008/4285).

On the 21 July 2008, DEWHA determined that the actions listed above are controlled actions with the western CSM water supply pipeline identified as an action that involves potential clearing and habitat fragmentation of Endangered ecological communities including Brigalow (*Acacia harpophylla* dominant and codominant) and Semi-evergreen vine thicket of the Brigalow Belt (North and South) and Nandewar bioregions.

As such, the proposed pipeline will require assessment and approval by the Minster for the Environment, Heritage and the Arts (Commonwealth) before it can proceed. The proposed pipeline will however be assessed through the Queensland Environmental Impact Statement Process under the bilateral agreement between the Australian Government and the State of Queensland relating to Environmental Assessment (pursuant to Section 45 of the EPBC Act, Department of the Environment and Heritage 2004).

Matters of National Environmental Significance are dealt with in Section 5.2. A summary of Matters of National Environmental Significance and the likely impacts of the proposed pipeline on them are presented in Attachment J of this Technical Report.

3. Methods

This section outlines the methods used to gather information relating to ecologically sensitive areas and species of plants and animals that are known or likely to occur in the study area and surrounds. The approach to this assessment involved two key phases:

- **desk-based assessment of literature and relevant databases:** used to identify ecologically sensitive areas and compile a list of conservation significant species for consideration in the EIS based, on known records or predicted habitat in the study area and surrounds
- **field surveys:** used to verify the findings of the desk-based assessment and provide a detailed description of the environmental values of the Study Area.

3.1 Contributors and qualifications

The contributors to the preparation of this technical report, their qualifications and role are listed in Table 3-1.

Table 3-1: Contributors and their roles

Name	Association	Qualification	Role
Martin Predavec	PB	BSc(Hons), PhD	Ecology lead
Peter Monsted	PB	BSc	Botanist – field surveys and reporting
Josie Stokes	PB	BSc	Zoologist – field surveys and reporting
Ed Meyer	PB	BSc(Hons), PhD	Zoologist - technical review
Chris Hanson	Place Environmental	BMedSc, BSc (Hons)	Botanist – field surveys and reporting
Ben Lewis	Lewis Ecological Services	BAppSci(Hons)	Zoologist – field surveys and reporting
Greg Ford	Consultant Ecologist	BAppSci	Bat call analysis

All work was carried out under the necessary permits, including:

- Animal Ethics Permit from the Department of Primary Industries and Fisheries Animal Ethics Committee. Permit number CA 2007/10/223. Expires 31st October 2010
- Queensland Parks and Wildlife Service Scientific Purposes Permit issued under the Nature Conservation Regulation 1994. Permit Number WISP02443404. Expires 4th October 2009
- Department of Primary Industries and Fisheries Scientific Use Registration. Registration No: 064. Expires 13th March 2009.

3.2 Nomenclature

3.2.1 Flora

Nomenclature for vascular plants follows Henderson (2002). Scientific names of plants have been used in this report.

Common names of plants have been provided the first time a species is mentioned (where available) and again thereafter for Threatened species of plant, or for plant names used in names of fauna habitat types. Exotic species have been denoted in the text with '*' (e.g. **Cenchrus ciliaris*).

3.2.2 Fauna

The nomenclature for vertebrate fauna follows the Queensland Parks and Wildlife Services (QPWS) *WildNet database* (2008a) and Census of Australian Vertebrates (CAVS) database (Department of the Environment Water Heritage and the Arts 2008a).

Common names are used in this report for species of animal followed by scientific name the first time the species is mentioned. Scientific and common names are included in species lists in the relevant appendices.

3.3 Literature and database review

Relevant literature, online-resources and numerous databases were reviewed to compile a list of conservation significant species and other environmentally sensitive areas for consideration in the EIS including:

- records of Threatened species listed under the EPBC and NC Acts and Priority taxa for the Brigalow Belt Bioregion as identified in the Brigalow Belt South Biodiversity Planning Assessment expert panel reports for flora and fauna ('Priority taxa' (Environmental Protection Agency and Environmental Planning Southwest Queensland 2002a, 2002b)
- records of Migratory species listed under the EPBC Act
- Endangered and Of Concern REs mapped within in the study area and surrounds
- State Wildlife Corridors
- Essential or Critical habitat
- areas of local, regional and state biodiversity significance (Biodiversity Planning Assessment mapping)
- Matters of National Environmental Significance (MNES) in the study area and surrounds listed under the EPBC Act including world heritage properties, natural heritage properties and significant wetlands
- recovery plans.

Table 3-2 provides a summary of the databases, on-line resources and literature reviewed including the area used for database searches.

Table 3-2: Literature and database review

Database/data source name	Organisation maintaining database/data source	Search date and parameters [1]	Search area	Publication version	Data type
Protected Matters Search Tool	Department of the Environment, Water, Heritage and the Arts	5 September 2008	S 25.83166667 E 149.03888889 to S 26.13027778 E 149.91388889 (latitude / longitude decimal)	—	Matters of National Environmental Significance listed under the EPBC Act
Atlas of Australian Birds	Birds Australia	25 August 2008	20 km buffer around study area	—	Records of birds including Threatened species
WildNet database	Queensland Parks and Wildlife Service	5 September 2008	20 km buffer around study area	—	Records of vertebrate fauna including Threatened species
Queensland Museum database	Queensland Museum	5 September 2008	20 km buffer around study area	—	Records of vertebrate fauna including Threatened species
HERBRECS and CORVEG database	Queensland Herbarium (2008)	21 August 2008	20 km buffer around study area	—	Records of vascular flora including Threatened species
Regional Ecosystem Mapping 1997– 2003	Environmental Protection Agency (Accad *et al.* 2006)	—	Regional extent	Version 5.0	Regional Ecosystems
Biodiversity Planning Assessment	Environmental Protection Agency (2003)	—	Brigalow Belt Bioregion	Version 1.2	Wildlife Corridor, Essential Habitat and biodiversity significance levels mapping
State wildlife corridors mapping.	Environmental Protection Agency (2004b)	—	Regional extent	Version 1.0	State Wildlife Corridor mapping
Brigalow Belt South Biodiversity Planning Assessment flora	Environmental Protection Agency (2002b)	—			Bioregional Priority taxa (flora)

Database/data source name	Organisation maintaining database/data source	Search date and parameters [1]	Search area	Publication version	Data type
expert panel report					
Brigalow Belt South Biodiversity Planning Assessment fauna expert panel report	Environmental Protection Agency (2002a)	—			Bioregional Priority taxa (fauna)
Register of critical habitat	Department of the Environment, Water, Heritage and the Arts (2008e)	1 September 2008	-	—	Critical habitat listed under the EPBC Act
EPBC listed Key Threatening Processes	Department of the Environment, Water, Heritage and the Arts (2008b)	1 September 2008	—	—	Key Threatening Processes listed under the EPBC Act
Recovery plans made or adopted	Department of the Environment, Water, Heritage and the Arts (2008d)	1 September 2008	—	—	Recovery plans developed for species listed under the EPBC Act
Recovery and conservation plans	Environmental Protection Agency (2008)	1 September 2008	—	-	Recovery and conservation plans developed for communities and species of state conservation significance
Koala Districts and Koala Habitat Areas	Environmental Protection Agency & Queensland Parks and Wildlife Service (2005)	5 September 2008	—	-	Koala Districts and Koala Habitat Areas

1. Database searches were done prior to field surveys and reviewed in the preparation of this report

3.4 Field surveys

The literature and database review identified regional ecosystems (REs) and species with potential to occur in the study area. Field surveys were undertaken to verify the presence of vegetation communities, species or their habitats including:

- verification of the remnant status of vegetation communities
- verification of RE type of remnant vegetation, or analogous RE type of regrowth (non-remnant vegetation)
- identification of nationally Threatened ecological communities listed under the EPBC Act
- identification of all vascular species of plant in the study area
- identification of all vertebrate species of animal in the study area
- identification the location and/or likely extent of Threatened species and Priority taxa of terrestrial plant and animal and their habitats.

Flora and fauna surveys of the proposed western CSM water supply pipeline were undertaken between 4 and 11 August 2008 (late winter).

Flora and fauna surveys of the northern section of the study area within the MLA were undertaken in Spring 2007 and Autumn 2008 for the Terrestrial ecology impact assessment of the MLA and infrastructure and are the subject of the Terrestrial ecology impact assessment supporting Volume 1. As such, the pipeline corridor in the MLA was not surveyed in August 2008. The assessment of impacts to flora and fauna however includes remnant and non-remnant vegetation and species of plant and animal identified, or considered likely to occur, within the habitats along the pipeline corridor within the MLA.

3.4.1 Survey weather conditions

Weather conditions during the survey period were generally cool, with maximum daily temperatures ranging from 16°C to 25°C (Bureau of Meteorology 2008, Taroom weather station October 2007). Daily minimum temperatures ranged from -3°C to 7°C with sub-zero temperatures recorded most nights. Conditions were also generally dry, with no rainfall recorded at Taroom during surveys (Bureau of Meteorology 2008, Taroom weather station October 2007).

Rainfall in the year prior to surveys was near average across western Queensland and central districts, but well below average in south-eastern districts. Monthly rainfall totals through March, May and June were generally well below average. Rainfall at Taroom in the month prior to surveys, however, was almost twice the July average (Bureau of Meteorology 2008, Taroom weather station October 2007).

More detailed information on weather conditions for this survey periods is provided in Attachment A, and Chapter 7 of the EIS provides a description of the climate of the region.

3.4.2 Terrestrial flora

Survey of terrestrial flora was based on the approach outlined in the Queensland Herbarium's *Methodology for Survey and Mapping of Regional Ecosystems and Vegetation Communities in Queensland* (Neldner *et al.* 2005), which recognises four types of survey,

each requiring a decreasing level of detail in terms of the data collected: Primary, Secondary, Tertiary and Quaternary sites (as described below). The flora survey method also used sample techniques and methods used for CORVEG secondary and tertiary site data collection (refer Appendix 2 of Neldner *et al.* 2005).

The terrestrial flora survey also involved targeted searches and traverses, as well as validation of remnant status and RE type mapping by the EPA (Environmental Protection Agency 2007). The location of terrestrial flora survey effort is shown in Figure 3-1. A summary of the flora survey effort involved in survey and mapping of sites across the study area is provided in Table 3-3.

Table 3-3: Summary of flora survey effort

Survey technique	Measure of effort	Total effort
Primary sites	surveys sites	0
Secondary sites	surveys sites	16
Tertiary sites	surveys sites	39
Quaternary sites	surveys sites	0

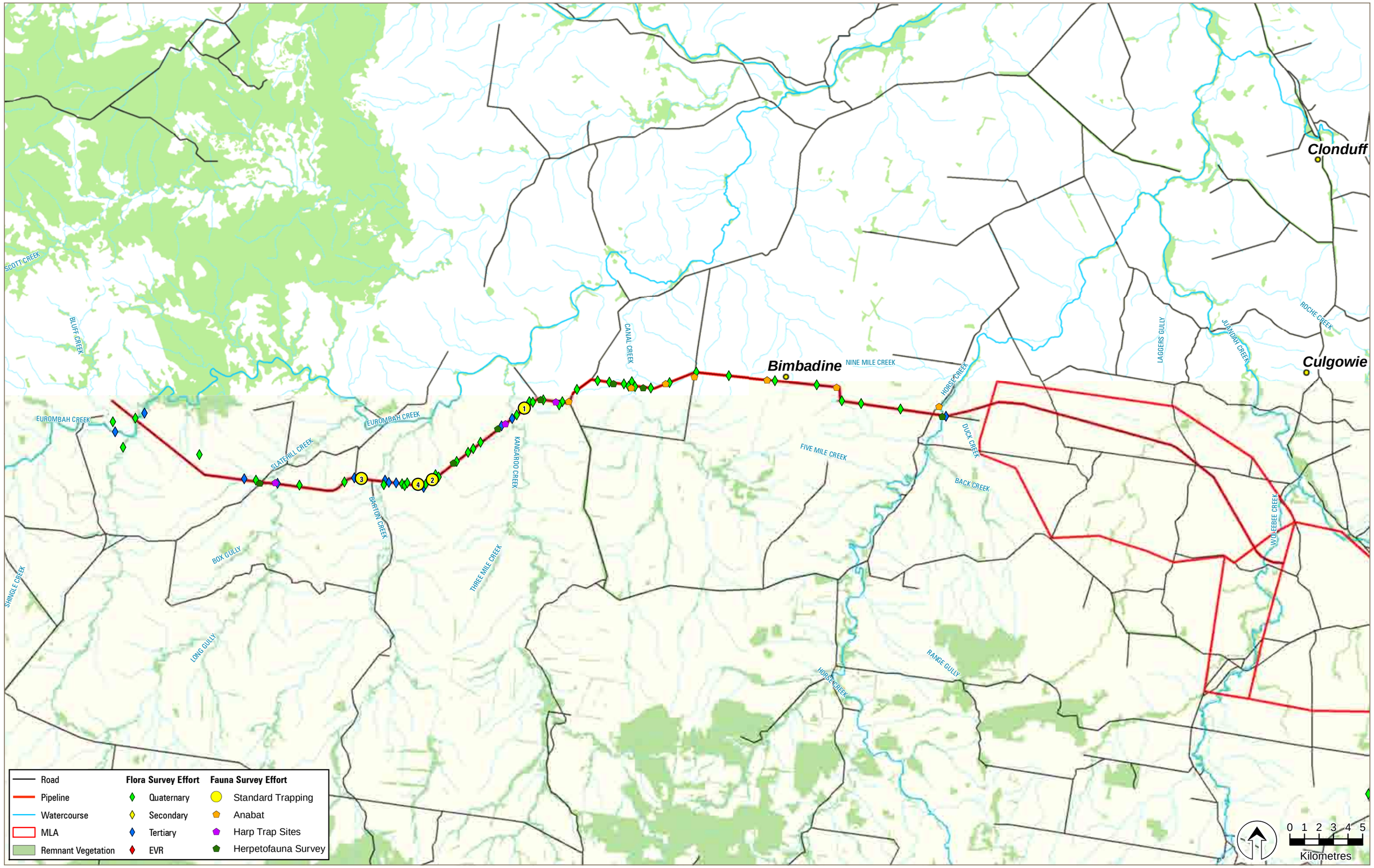
Primary sites

Primary sites are permanently marked plots where the individual tree and shrub species are marked or permanently located so that the growth of individual plants can be monitored over time. Primary sites will often include the collection of secondary site attributes with additional data depending on the aims of the specific project. No Primary sites were established for this assessment.

Secondary sites

Secondary sites are used for classification and detailed descriptions of REs and vegetation communities. Location and physical environment details are recorded in addition to broader features such as landform, slope, soils, geology, ground layer composition (i.e. proportion of litter, rocks, bare ground etc), disturbance and habitat quality are also recorded. At secondary sites a range of sample techniques are used to describe flora composition and vegetation structure:

- **quadrat survey:** Floral composition and abundance is recorded within a 20 m x 20 m quadrat. The abundance of species within the quadrat is recorded based on the percentage of crown/vegetative cover (in which the crown or cover of each plant is tabled to be opaque) using a modified Braun-Blanquet cover-abundance scale (Mueller-Dombois & Ellenberg 1974) as follows:
  - sparse, <5%
  - any number, <5%
  - 5 – 25%
  - 25 – 50%
  - 50 – 75%
  - 75 – 100%



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Source: Roads, QLD State Digital Road Network (2004); Towns, creeks 1:250K Topo, Geoscience Australia (2006)

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Figure 3-1

Flora and Fauna Survey

- **random meander/traverses/targeted searched:** additional species with the same RE patch (i.e. species not recorded within the quadrat) are also recorded and assigned a relative abundance of dominant, abundant, frequent, occasional or Rare
- **vegetation structure:** the vegetation community structure was described following the CORVEG methodology (refer Appendix 2 of Neldner *et al.* 2005) which recognises up to seven layers or strata of vascular plants within a community. For each stratum, the following data is collected
  - height: median, maximum and minimum
  - total crown cover (the percentage of an area covered by the horizontal projection of the spread of a species' foliage (Walker & Hopkins 1990)) based on crown separation estimate: closed or dense, mid-dense, sparse, very sparse up to five predominant species: dominant, co-dominant, associated, suppressed or occasional.
- **tree basal area (Bitterlich Method)**: another measure of structure that calculates the cross-sectional area of tree stems in m^2/ha.

For this assessment, Secondary site surveys were undertaken at representative sites (non-randomly selected) with at least one site in each of the RE types within the study area.

Tertiary sites

Tertiary sites provide a rapid assessment to validate REs based on location, environmental and overall structural information (as per the secondary site) in addition to a comprehensive list of woody species (based on a random meander or traverse). Generally only the dominant or conspicuous species in the ground layer are recorded; however any species not previously recorded within an RE were also recorded for this assessment so as to provide a comprehensive cumulative species list for the study area.

A random meander search was performed within all sites to assess the presence or likelihood of presence of Rare and Threatened flora species and communities and their habitats identified from database searches.

Tertiary sites were done within the study area in both remnant and non-remnant vegetation representing all RE types (Figure 3-1).

Quaternary sites

Quaternary are 'plotless' sites used primarily as a record of field traverses and to verify RE mapping and provide the minimum data to validate vegetation communities and remnant status. In cases where the results of the quaternary site were inconclusive, a tertiary site could be established to collect more data. No quaternary sites were performed however for this assessment.

In addition to Secondary, Tertiary and Quaternary sites, large areas of the study area were traversed on foot. The purpose of this type of assessment was to ensure adequate site coverage and to establish a comprehensive floral species list for the Study Area. This method was also used for the detection of Rare and Threatened species, especially in non-remnant vegetation and remnant vegetation outside of standardised survey sites.

Regional ecosystems validation

REs and remnant status of vegetation mapped by the EPA (2007) was validated in the field using data collected via the methods described above, in conjunction with relevant geological mapping and explanatory notes (Bureau of Mineral Resources Geology and Geophysics 1971) as well as high resolution satellite imagery from 2006 to 2008.

Mapping of non-remnant vegetation and refinement of existing RE mapping were carried out in the field using a tablet computer (Xplore C2V) with a built in ArcPad Geographic Information System (GIS) software (accuracy of ± 5 m, precision equivalent to 1:500 scale).

Plant species identification

Field species identifications were aided by the following sources: Anderson (2003), Auld and Medd (2002), Brooker and Kleinig (2004), Harden (2005), Moore (1983; 1986; 1989), Stanley and Ross (1996), Tothill and Hacker (2002), Wheeler et al. (1984), and Williams, Harden and McDonald (1984). Voucher specimens of Threatened species of plant, or species unable to be identified in the field, were sent to the Queensland Herbarium for identification or verification.

3.5 Terrestrial vertebrate fauna

The likely occurrence of faunal species in the study area was investigated by assessing the suitability of available habitat for fauna as well extensive opportunistic and systematic targeted surveys. Fauna habitat assessment and surveys were focused predominantly on Threatened species, EPBC Act listed Migratory birds and Priority taxa for the southern Brigalow Belt bioregion.

3.5.1 Fauna habitat assessment

While targeted surveys can confirm the presence of species, a lack of records does not necessarily indicate the absence of the species from a site when suitable habitat is present. By the very nature of their rarity, Threatened and Migratory species and Priority taxa are often difficult to detect. Suitable habitat is, therefore, an important factor to consider when determining the potential presence of such species.

For this study, suitability of habitat for fauna was assessed on the basis of RE mapping, aerial photograph interpretation and ground-truthing. Habitats were delineated by grouping vegetation communities/REs according to their structure and/or underlying geology (i.e. characteristics that determine the type of fauna likely to use them).

A field proforma was used to record vegetation composition, foraging resources, habitat structure and groundcover assemblages over a 50 x 50 m quadrat (0.25 ha). Data were also collected on the extent of tree hollow resources, foraging resources (including *Allocasuarina* and *Casuarina* trees utilised by Glossy Black-cockatoos (*Calyptorhynchus lathami*), hydrological features, disturbance and other habitat attributes generally associated with Threatened species and other Priority taxa for the southern Brigalow Belt bioregion.

The condition of habitats within the study area was categorised as follows:

- **good:** a full range of fauna habitat components are usually present (e.g., old growth trees, fallen timber, feeding and roosting resources) and habitat linkages to other remnant ecosystems in the landscape are intact

- **moderate:** some fauna habitat components are often missing (e.g. old growth trees, fallen timber), although linkages with other remnant habitats in the landscape are usually intact, but sometimes degraded
- **poor:** many fauna habitat elements have been lost, including old-growth trees and fallen timber; tree canopies are also often highly fragmented. Habitat linkages with other remnant ecosystems in the landscape have usually been severely compromised by extensive past clearing.

3.5.2 Fauna survey techniques

The fauna survey methodology involved two types of fauna survey sites: standard sites and supplementary sites. Four standard trapping sites were selected to ensure a range of habitats were sampled and where applicable preference was given to remnant vegetation within each of these habitats (refer Figure 3-1 and Attachment D for a detailed summary of fauna survey effort). An additional 18 supplementary sites were selected to provide a comprehensive survey of fauna assemblages and to ensure more discrete habitats such as roadside Brigalow, riparian zones and water storage areas were subject to at least some level of survey (refer Figure 3-1).

At each of the standard sites the following survey methods were used:

- habitat assessment (as described above)
- ground trapping (10 x Elliott traps, 5 x pitfall traps, 4 x funnel traps)
- harp trapping (1 x harp left *insitu* for 2 nights)
- spotlighting (2 people x 30 minute survey)
- ultrasonic bat detection (Anabat) (1 night)
- herpetofauna active searches (2 people x 20 min)
- general bird surveys (2 people x 40 min)
- fauna features traverse (2 people x 30 min).

Supplementary sites were selected to target specific habitat features likely to be used by Rare and Threatened fauna. Supplementary sites aimed to increase the spatial coverage of survey across the study area, while sampling discrete fauna habitat types (e.g. wetland habitats) or sites with specific fauna microhabitat elements (e.g. tree hollows).

At each supplementary site, at least one of the following survey techniques was undertaken:

- harp trapping
- waterbird census
- general bird surveys
- ultrasonic bat detection
- herpetofauna active searches
- fauna features traverse
- nocturnal vehicle traverses
- spotlighting.

The fauna survey methods used at standard sites and supplementary sites are described below.

Ground trapping

Elliott traps (A Type) were used to census small ground dwelling fauna over a four night period. Transects of ten Elliott A traps were established at 15 m intervals and baited with a mixture of peanut butter, honey and oats ('Universal bait'). Traps were checked early each morning and re-baited as necessary. This fauna survey technique resulted in 40 trap nights at each of the four sites for a total of 160 trap nights.

Pitfall traps were used to census small ground dwelling mammals, frogs and reptiles over a four night period. Pitfall traps were set in lines of five traps (20 litre buckets) interconnected with plastic fencing (400 mm builders damp coarse) with bucket space intervals of approximately 5 m.

Additionally, two funnel traps (750 mm x 20 mm; WA Poultry Equipment) were set against each end of the drift fence (for a total of 4 funnel traps per line) to target larger vertebrates, particularly snakes that may escape from a pitfall trap.

Microchiropteran surveys

Some species of microchiroptera (insectivorous microbats) are easily identified from their unique echolocation calls, while other species can only be reliably detected or identified through trapping (Parnaby 1986; Woodside & Taylor 1985). In addition, different species are more likely to be captured by different trapping techniques. As such, a combination of ultrasonic detection and harp trapping were used to census microbats.

Stationary ultrasonic bat detection surveys were undertaken using the Z-CAIM digital system (Anabat II Z-CAIM – Titley Electronics, Ballina). This technique was employed at all four standard sites and at seven supplementary sites to increase the spatial coverage of survey effort across the study area (Figure 3-1). At each site the unit was left operating for a period of at least 10 hrs to maximise the likelihood of sampling different species that are active at different periods during the night. Overall survey effort for this technique was estimated at 140 hrs detection time.

One standard harp trap (Ausbat 4.2 m^2) was used to capture microbats along tracks, flyways along riparian habitats, easements and around focal trees at each of the four standard sites and at three supplementary sites (Figure 3-1). Harp traps were left *in situ* for two consecutive nights at each site resulting in a total survey effort of 14 trap nights. All captured microbats were identified to species level using Churchill (1998) and released at dusk.

Herpetofauna active searches

Diurnal herpetofauna surveys were undertaken at each of the four standard sites and at eight supplementary sites (refer Figure 3-1 and Attachment D). Each herpetofauna survey involved two people actively searching for a 20 minute period and included surveying for basking reptiles, actively turning rocks, logs, raking debris and peeling decorticating bark. Species were identified using Wilson (2005).

Spotlighting and nocturnal drive transects

Walk traverse spotlight surveys were undertaken by two people using either a 50 or 100 watt variable hand held spotlights over a standardised 30 minute census period (i.e. 1 person hour of effort). This approach was employed at each of the four standard sampling sites

(4 person hours of effort) to target nocturnal herpetofauna, arboreal, flying, and large ground dwelling mammals. Spotlight surveys were not undertaken at any of the supplementary sites due to the cooler conditions experienced throughout the survey period. Spotlighting during colder weather is an ineffective method of detection for principal target species such as nocturnal reptiles, compared to active diurnal herpetofauna searches.

Nocturnal drive transects were undertaken over 4 evenings between 5 and 8 August 2008 covering approximately 170 km over approximately 3.5 hrs. This technique involved the slow driving (i.e. 40–50 km/h) on dirt roads and tracks in order to observe active nocturnal fauna including frogs, reptiles and a range of ground-dwelling and arboreal mammals.

Fauna features traverse

Fauna features traverses were undertaken to assess the suitability of habitat for fauna (particularly Threatened, Migratory and Priority taxa species) at each standard survey site. Sites were traversed on foot by two observers for 30 minutes, with each observer looking for features/signs suggesting the likely occurrence of fauna (e.g., nests, large hollow-bearing trees, chewed remains of fruit and *Casuarina* cones, scratch marks and scats). Suitability of habitat for fauna was assessed this way at other sites within the study area as well. Supplementary surveys were undertaken at those sites where suitable habitat for Threatened and Migratory species and Priority taxa was identified.

Fauna species identification

Identifications of species of animal was aided by the following field guides and reference material:

- general mammals – Menkhorst and Knight (2004), Strahan (1995) and Triggs (1996)
- insectivorous bats – Churchill (1998) and Menkhorst and Knight (2004)
- incidental evidence of mammals – Triggs (1996)
- birds and bird calls – Pizzey & Knight (1997), Debus (2001), Plowright (2004) and Stuart (1999)
- reptiles – Wilson (2005) and Cogger (2000)
- frogs and frog calls – Barker et al (1995), Cogger (2000) and Stewart (1998).

3.5.3 Summary of terrestrial vertebrate fauna survey effort

The fauna survey effort of the proposed pipeline is summarised below in Table 3-4. Comprehensive details of the fauna survey effort are provided in Attachment D.

Table 3-4: Summary of fauna survey effort

Survey technique	Measure of effort	Total effort
Fauna survey		
Elliott A (ground trapping)	trap nights	160
Pitfall traps (ground trapping)	trap nights	80
Funnel traps	trap nights	64
Ultrasonic bat surveys	survey nights	11
Harp traps	trap nights	14

Survey technique	Measure of effort	Total effort
Herpetofauna active searches	search hours	8
Spotlighting	search hours	4
Nocturnal drive transects	search hours	3.5
	km traversed	170
	survey nights	4

3.6 Likelihood of occurrence assessment

The likelihood of Threatened, Migratory and Priority taxa species to occur in the study area was based on the results of the desk based assessment and field surveys.

A list of the Threatened and Migratory species, REs and ecological communities that may occur in the study area and surrounds was compiled based on the results of the database searches. For animals, the likelihood of all Priority taxa for the Brigalow Belt South bioregion was also considered. Some additional Threatened species of plant and animal was also added to this list based on the professional opinion of the contributors to this assessment.

The likelihood-of-occurrence assessment was based on records collected during the field survey, previous records from the study area and surrounds, current (known) distribution range and the presence and condition of suitable habitat in the Study Area.

Species considered to have a **low likelihood of occurrence** include species not recorded during the field surveys that fit one or more of the following criteria:

- have not been recorded previously in the study area and surrounds for which the study area is beyond the current distribution range
- use specific habitat types or resources that are not present in the study area
- are considered locally extinct.

Species considered to have a **moderate likelihood of occurrence** include species not recorded during the field surveys that fit one or more of the following criteria:

- have infrequently been recorded previously in the study area and surrounds
- use habitat types or resources that are present in the study area, although generally in a poor or modified condition
- are unlikely to maintain sedentary populations, however may seasonally utilise resources within the study area opportunistically during variable seasons or migration.

Species considered to have a **high likelihood of occurrence** include species recorded during the field surveys or species not recorded that fit one or more of the following criteria:

- have frequently been recorded previously in the study area and surrounds
- use habitat types or resources that are present in the study area that are abundant and/or in good condition within the study area
- are known or likely to maintain resident populations surrounding the study area
- are known or likely to visit the site during regular seasonal movements or migration.

The likelihood-of-occurrence assessment is provided Attachment G for flora and Attachment H for fauna.

3.7 Impact assessments

Assessment of the significance of impacts were completed for Threatened species, ecological communities, and REs (Threatened and Of Concern) that were either recorded in the study area or rated as having a moderate or high likelihood of occurrence. Impact assessments were also completed for Commonwealth listed Migratory species for which the study area is at their distributional range limit (considered important habitat as defined in the *Principal Significant Impact Guidelines*) and that were rated as having a moderate or high likelihood-of-occurrence in the study area.

A profile of each Threatened ecological community and species for which an impact assessment was completed is provided in Attachment I. These profiles outline the species, communities or REs conservation status, distribution, habitat, threats, ecology and occurrence (or likelihood of occurrence) within the study area. The likely impacts of the proposed pipeline and relevant mitigation measures for each species, communities or REs is also outlined.

Impact assessments have not been undertaken for non-Threatened Priority taxa. These species were however considered in the overall discussion of the existing environment and the likely impacts, the design and implementation of impact mitigation measures and will be further considered in the development of suitable offsets.

3.7.1 Commonwealth listed communities and species

For ecological communities and species listed under the EPBC Act, impact assessments were completed in accordance with the *EPBC Act Policy Statement 1.1 Significant Impact Guidelines* (Department of the Environment and Heritage 2006).

3.7.2 State listed communities and species

An impact assessment was done for REs listed as Endangered or Of Concern under the VM Act and Threatened species listed under the NC Act to consider the significance of impacts on these species and REs. As the VM Act and NC Act do not outline factors for consideration in impact assessments, the assessment of impacts on these species/REs was based on the following questions:

- will areas of high conservation value for the species or RE be affected?
- do individual animals and/or plants and/or subpopulations that are likely to be affected by the Project play an important role in maintaining the long-term viability of the species, population or ecological community?
- do habitat features that are likely to be affected by the Project play an important role in maintaining the long-term viability of the species, population or ecological community?
- are the duration of impacts relating to the species or community long-term?
- are the impacts relating to the species or community permanent and irreversible?

3.8 Limitations

On all sites, varying degrees of non-uniformity of flora and fauna habitats are encountered. Hence no sampling technique can totally eliminate the possibility that a species is present on a site. The conclusions in this report are based upon data acquired for the site and the environmental field surveys and are, therefore, merely indicative of the environmental condition of the site at the time of preparing the report, including the presence or otherwise of significant species. Also, it should be recognised that site conditions, including the presence of Threatened species, can change with time.

The weather conditions proceeding and during the survey periods also has an influence on access to the site and the detectability and identification of species. The weather conditions during the late winter survey period were generally cool and sub-optimal for detecting herpetofauna (reptiles and frogs). The likelihood of some nectivorous species (in particular honeyeaters and flying foxes) to occur in the study area may also have been affected by a paucity of flowering canopy trees.

The cool dry weather and general season (late winter) is also a time of reduced vegetative growth and reproductive activity for many species of plant, particularly grasses and other herbaceous ground cover species. This season was however well suited for identifying many of the species of *Acacia* that were flowering.

In addition, not all properties could be accessed at the time of survey. Private property access was provided late in the survey period with insufficient time to establish fauna trapping sites. As such, RE verification and habitat assessments were done at these sites.

REs and flora and fauna habitats across these areas were inferred from desk based resources that should be verified during further seasonal surveys.

In the case of Threatened and Rare species a precautionary approach has been taken and the presence of species has been based on the suitability of habitat, particularly if the chance of detection was low due to seasonal conditions.

4. Existing environment

4.1 Regional context

The study area is located within the Taroom Downs subregion of the Brigalow Belt bioregion. The Brigalow Belt bioregion covers an area of 279,496 km^2 and is one of the largest of the 80 defined bioregions (Thackway & Cresswell 1995), extending from the Queensland coast at Gladstone, South to Dubbo in New South Wales. Geologically this region consists predominantly of Jurassic and younger deposits of the Great Artesian Basin and Tertiary deposits with elevated basalt flows. Vegetation types include *Eucalyptus* woodlands and open forests of ironbarks, Poplar Box, Spotted Gum (*Corymbia citriodora* subsp*. variegata*), Cypress Pine (*Callitris glaucophyll*a), Bloodwoods (e.g. *Corymbia trachyphloia, C. hendersonii*), Brigalow-Belah forests (*Acacia harpophylla, Casuarina cristata*) and Semi-evergreen Vine Thicket.

This bioregion has been largely cleared of woodlands for grazing and dryland agriculture, with the larger remaining areas of vegetation now occurring on the rockier hilly areas, as roadside vegetation or as relatively small isolated remnants. The study area is characteristic of country utilised for dryland agriculture and is devoid of large areas of remnant vegetation. REs and associated fauna habitats remaining in the study area are relatively homogenous as a result of the limited variation in lithology (see Section 4.3).

Significant areas of remnant vegetation surrounding the study area (at a regional scale) are located in sandstone dominated country to the north Spring Gully which are identified forming part of a State Wildlife Corridors (Environmental Protection Agency 2004b), Bioregional Wildlife Corridors (Environmental Protection Agency 2003) and significant areas of critical habitat (these areas will no be affected by the proposed pipeline).

4.2 Drainage lines

The study area traverses numerous named and unnamed drainage lines (see Figure 4-2), including:

- Durham Creek and/or Eurombah Creek on the Origin Energy petroleum lease at the western end of the study area depending of the final alignment
- potentially three minor unnamed drainage lines on the Origin Energy petroleum lease at the western end of the study area depending of the final alignment
- Kurragong Gully and an unnamed drainage line west of the Roma Taroom Road
- Slatehill Creek at the intersection with the Roma Taroom Road
- three unnamed drainage lines along the Roma Taroom Road between Slatehill Creek and Bartons Creek
- Bartons Creek the Roma Taroom Road east of the intersection of Wykola Wallumbilla Road
- two unnamed tributaries of Bartons Creek crossing the Roma Taroom Road east Bartons Creek

- Kangaroo Creek and two of its tributaries of this drainage line west of intersection of Roma Taroom Road and Canal Clifford Road
- Canal Creek and one of its tributaries between Roma Taroom Road and the Golden Brimadeen Road
- two unnamed tributaries of Nine Mile Creek along the Golden Brimadeen Road
- Horse Creek and Duck Creek east of Perretts Road
- Spring Creek, Mud Creek Log Hut Creek and other unnamed drainage lines within the MLA depending in the final alignment.

4.3 Lithology and land zones

Two geological formations and associated land zones occur within the study area (refer Table 4-1 and Figure 4-1). A third formation, the Gubberamunda sandstone, is located in close proximity to the south of the study area and may occur as small or residual unmapped occurrence in the study area.

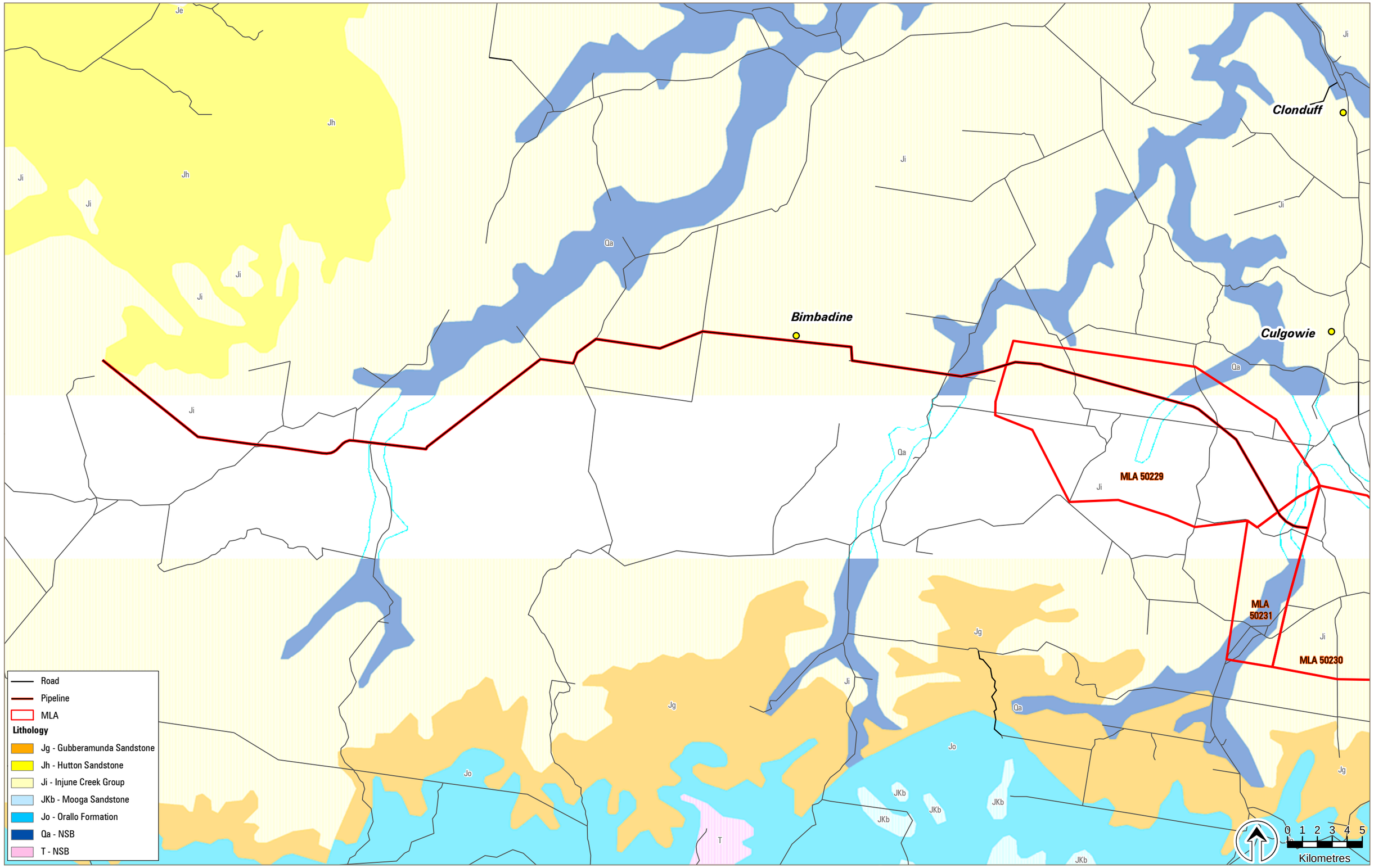
Table 4-1: Geological formation and corresponding land zone

Map symbol[1]	Formation name, age[1]	Lithology[1]	Land zone[2]
Ji	Injune Creek Group, Middle to upper Jurassic	Mudstone; labile sandstone, siltstone, some calcareous; coal	Land Zone 9
Jug	Gubberamunda sandstone, Middle to upper Jurassic	Cross bedded quartzose to subliable sandstone, some pebbly; conglomerate, siltstone. Fossil wood	Land Zone 10
Qa	Alluvium, Quaternary	Alluvium	Land Zone 3

1. Map symbol, formation name, age and lithology based on the 1:120,000 Geological Series Sheet SG 55-12 (Bureau of Mineral Resources Geology and Geophysics 1971).
2. Land zone as defined by the Environmental Protection Agency (2004a). Land zone 3 = Quaternary alluvial systems, Land Zone 9 = fine grained sedimentary rocks, Land Zone 10 = coarse-grained sedimentary rocks.

The Injune Creek Group is the main geological formation across the Study Area. This formation is traversed by Quaternary alluvium that has been deposited along Mud Creek, Horse Creek, Canal Creek, Kangaroo Creek, Bartons Creek, Statehill Creek and Durham Creek.

The Gubberamunda sandstone formation is located in close proximity to the south of the MLA. This formation is not mapped within the study area, however one RE corresponding with the Land Zone 10 was identified in the study area. It is taken that this occurrence of this RE is on a small or residual unmapped occurrence of Land Zone 10.



J:\A353-ENVPLN\REF\Ecology\Wandoan\10_GIS_Restore\Peter\Projects\2133006C_2000b_Wandoan_Lithology_Vol3.mxd VB - 01.10.08

Source: Roads, QLD State Digital Road Network (2004); Towns, creeks 1:250K Topo, Geoscience Australia (2006)

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Figure 4-1

Lithology

4.4 Regional ecosystems

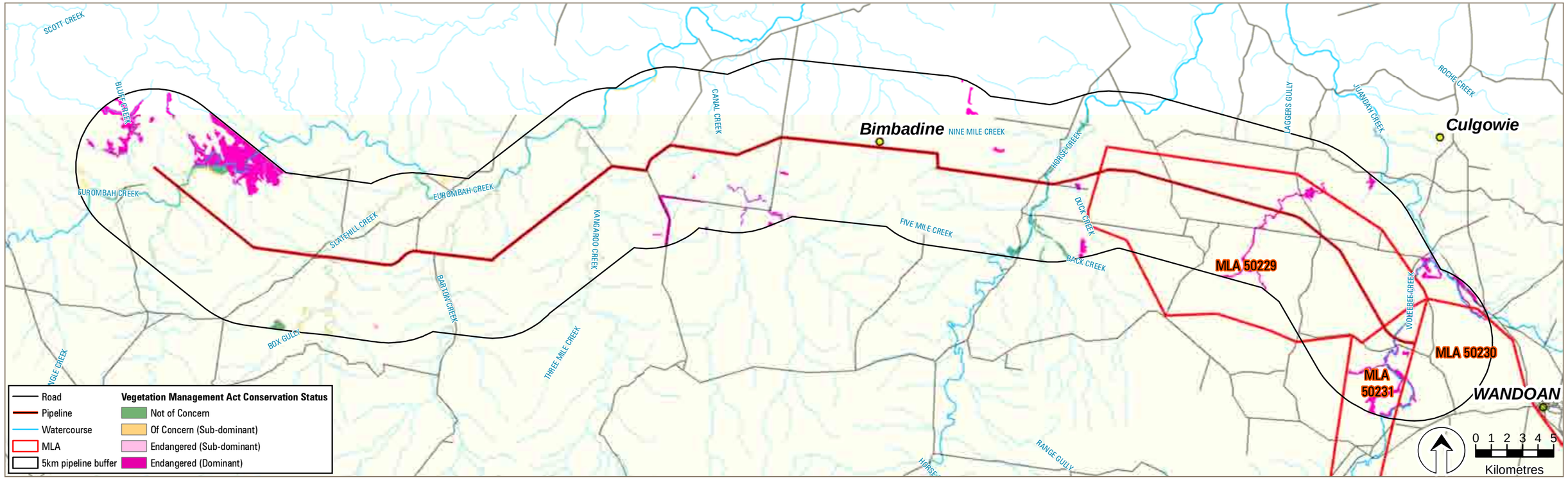
A RE is a set of vegetation communities in a bioregion that is consistently associated with a particular combination of geology, landform and soil (Sattler & Williams 1999). Seven regional Ecosystems (REs) were identified within the study area (see Table 4-3 and Figure 4-2) as described in the following sections. The mapping has been presented at 1:50,000 scale maps in Attachment E.

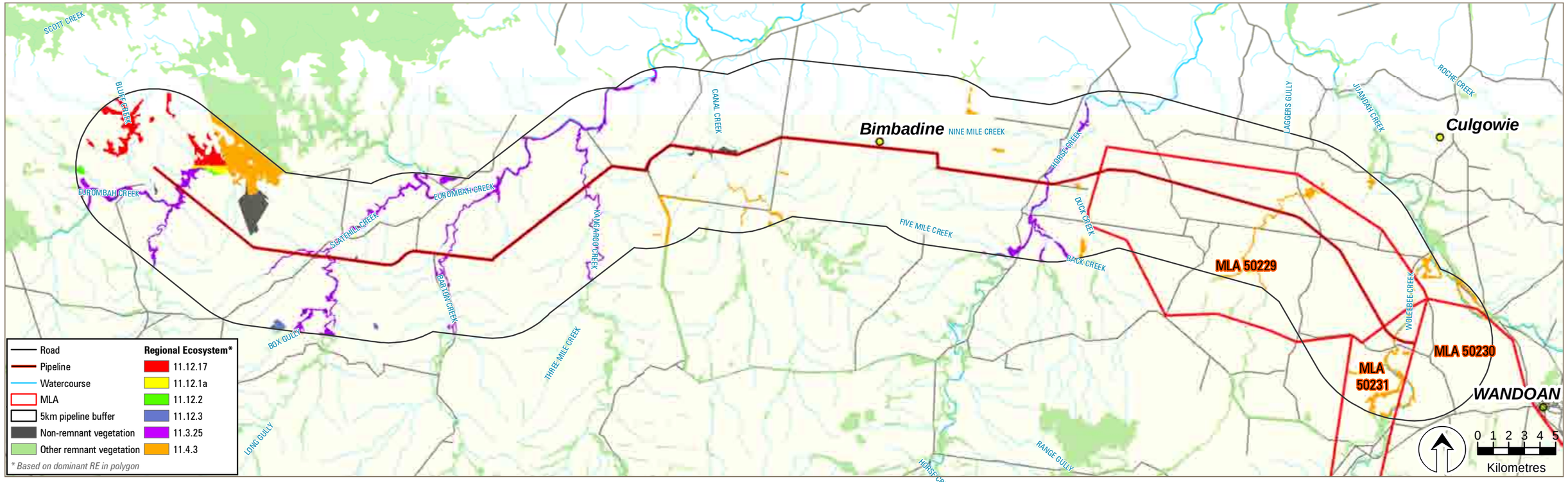
Table 4-2: Field verified regional ecosystems within the study area

RE Code	RE description (EPA 2006)	Qld VMA status	EPA Biodiversity status	EPBC Act status
11.3.2	*Eucalyptus populnea* woodland on alluvial plains	Of concern	Of concern	Not listed
11.3.25	*Eucalyptus tereticornis* or *E. camaldulensis* woodland fringing drainage lines	Not of concern	Of concern	Not listed
11.9.4	Semi-evergreen vine thicket on fine grained sedimentary rocks	Endangered	Endangered	Endangered
11.9.5	*Acacia harpophylla* and/or *Casuarina cristata* open forest on fine-grained sedimentary rocks	Endangered	Endangered	Endangered
11.9.7	*Eucalyptus populnea, Eremophila mitchellii* shrubby woodland on fine-grained sedimentary rocks	Of concern	Of concern	Not listed
11.9.10	*Acacia harpophylla*, *Eucalyptus populnea* open forest on fine-grained sedimentary rocks	Of concern	Endangered	Not listed
11.10.9	*Callitris glaucophylla* woodland on coarse-grained sedimentary rocks	Not of concern	No concern at present	Not listed

In order to be recognised under the VM Act, vegetation must be of ‘remnant’ status (refer to the Glossary for the definition of remnant vegetation). In addition to this, Queensland Herbarium remnant vegetation cover mapping is generally at the 1:100,000 scale, which delineates a minimum area for remnant vegetation of 5 ha and 75 m width limit for linear features. As such, many small patches of vegetation, regardless of condition, will not be captured by RE mapping.

The following RE descriptions are based on the composition, structure and condition of these REs (or non-remnant vegetation analogous with these REs) as recorded in the study area





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Source: Roads, QLD State Digital Road Network (2004); Towns, creeks 1:250K Topo, Geoscience Australia (2006)

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Figure 4-2

Regional Ecosystem Status Under the Vegetation Management Act

RE 11.3.2 *Eucalyptus populnea* woodland on alluvial plains

RE 11.3.2 consisted of *Eucalyptus populnea* (Poplar Box) woodland on Quaternary alluvium systems (land zone 3). This RE occurred in heterogeneous polygons as a dominant RE of at two locations and a sub-dominant component at two locations, generally in association with contiguous vegetation along creeks (RE 11.3.25) that traverse the Study Area. RE 11.3.2 occurred also in non-remnant patches in the Study Area. In general RE 11.3.2 may occur on a range of landforms on Quaternary alluvium such as floodplains, alluvial plains, alluvial fans and levees however, in the study area it occurred most frequently on the floodplain terraces beyond the high banks of the channel where it fringed the riparian vegetation (RE 11.3.25).

Canopy: *Eucalyptus populnea* dominated the sparse canopy with associated *Eucalyptus melanophloia* (Silver-leaved Ironbark) and occasional *Acacia harpophylla* (Brigalow), *Acacia salicina* (Sally Wattle), *Eucalyptus tereticornis* (Queensland Blue Gum), *Alectryon oleifolius* ssp*. elongatus* (Western Rosewood) and *Casuarina cristata* (Belah) at some sites. The canopy possessed a median height range of 14 to 16 m (refer Photo 4-1). The very sparse low tree layer generally included juvenile canopy species, *Acacia excelsa* (Ironwood) or *Lysiphyllum carronii* (Queensland Ebony), but in all cases was dominated by *E. populnea*.

Photo 4-1: RE 11.3.2 - *Eucalyptus populnea* woodland on alluvial plains

Mid-stratum: the sparse mid stratum was dominated by *Eremophila mitchellii* (Bastard Sandalwood) and/or *Geijera parviflora* (Wilga), with variously associated juvenile canopy species including *Alectryon oleifolius* ssp*. elongatus, Acacia salicina* and *Eucalyptus populnea*.

Ground layer: the mid-dense ground layer in both the remnant and non-remnant patches was dominated generally by the introduced **Cenchrus ciliaris* (Buffel Grass) and/or *Aristida calycina* var*. praealta* (Dark Wiregrass), *Chloris divaricata* (Slender Chloris), **Megathyrsus maximus* var*. maximus* (Guinea Grass), *Bothriochloa bladhii* (Forest Bluegrass), *Salsola kali*

(Soft Roly-poly), *Enchylaena tomentosa* (Red-berry Saltbush), *Calotis spp.* (burr daisies), **Verbena aristega* (Mayne's Pest), and *Einadia nutans* var. *nutans* (no common name).

Condition: two distinct patches of remnant status were identified. The remnant occurrences of this community were in moderate condition, with evidence of historic thinning. Both have been cattle excluded. Weed incursion was generally limited to the ground layer in the form of a dense cover of **C. ciliaris,* and associated **V. aristega* and **M. maximus* var. *maximus.* The shrub layer generally supported the occasional **Opuntia tomentosa* (Velvety Tree Pear, a class 2 pest under the *Land Protection (Pest and Stock Route Management) Act 2002*). The remaining non-remnant RE 11.3.2 occurred in narrow patches restricted to shallowly incised overflow channels immediately adjacent to RE 11.3.25 and was in poor condition.

Remnant status: no homogeneous polygons of remnant RE 11.3.2 are mapped within the study area (Environmental Protection Agency 2005). Remnant RE 11.3.2 occurred only as a minor component of heterogeneous polygons in which RE 11.9.10 was the dominant RE. Homogeneous polygons of RE 11.3.2 were defined during field verification and consisted of remnant and non-remnant vegetation that was generally contiguous with broader areas of RE 11.3.25 or RE 11.9.5.

Conservation status: RE 11.3.2 is listed as "Of concern" under the VM Act, and has a biodiversity status of 'Of concern'. This RE is not consistent with a threatened ecological community listed under the EPBC Act.

RE 11.3.25 *Eucalyptus tereticornis* or *E. camaldulensis* woodland fringing drainage lines

RE 11.3.25 consisted of *Eucalyptus tereticornis* (Queensland Blue Gum) open-forest to woodland on Quaternary alluvial systems (Land Zone 3) and was the most abundant remnant RE type in the Study Area. RE 11.3.25 in the study area was dominated by *Eucalyptus tereticornis* and occurred as remnant vegetation along Eurombah Creek and numerous associated tributaries. RE 11.3.25 occurred from the channel floor to the high banks as well as in overflow channels and floodplain depressions.

Canopy: *Eucalyptus tereticornis* dominated the canopy with associated *Angophora floribunda* (Rough-barked Apple), *Eucalyptus melanophloia* and *Acacia salicina* (Sally Wattle) occurring occasionally to frequently, and *Casuarina cunninghamiana* (River Oak), *Casuarina cristata* and/or *Acacia harpophylla* common at only some sites. No *E. camaldulensis* were identified in the Study Area. The community possessed a median height range of 16 to 26 m (refer Photo 4-2 and 4-3). The low tree layer was dominated primarily by juvenile canopy species and *Acacia excelsa*.

Mid-stratum: the very sparse mid stratum was generally dominated by *Geijera parviflora*, with variously associated juvenile canopy species, *Alectryon diversifolius*, *Alectryon oleifolius* ssp. *elongatus*, *Santalum lanceolatum*, *Citrus glauca, Capparis mitchellii* (Wild Orange), *Acacia decora, *Acacia farnesiana* (Mimosa Bush) and *Eremophila mitchellii* occurring occasionally.

Photo 4-2: RE 11.3.25 – *Eucalyptus tereticornis* open forest to woodland fringing drainage lines

Photo 4-3: RE 11.3.25 – *Eucalyptus tereticornis* open forest to woodland fringing drainage lines

Ground layer: the ground layer was variable in composition across the sampled areas. Upon the upper banks and immediate terraces the groundcover layer was dominated generally by the introduced pastoral grasses **Megathyrsus maximus var. maximus* (Guinea Grass) and/or **Cenchrus ciliaris*, with *Aristida calycina* var. *praealta*, *Aristida ramosa* (a speargrass), *Chloris divaricata*, *Salsola kali*, *Enchylaena tomentosa*, **Verbena tenuisecta, Einadia nutans* var. *nutans, Tetragonia tetragonoides* (New Zealand Spinach), *Atriplex muelleri* (Annual Saltbush) and *Austrostipa ramosissima* (Slender Bamboo Grass) occurring occasionally. Upon the toe of bank and terraces within the watercourse channel the groundcover layer was comprised of *Leptochloa digitata* (Umbrella Cane Grass), *Bothriochloa bladhii*, **Cynodon dactylon* (Couch), *Centipeda minima* (no common name), and sporadic *Lomandra longifolia* (Spiny-headed Mat-rush).

Condition: given the large number of properties through which the creeks traverse, and therefore, the variable land use intent and expansive distribution, RE 11.3.25 possessed a highly variable condition throughout the study area. Weed incursion was limited to the ground layer in the form of a dense cover of **Megathyrsus maximus* var. *maximus* and/or **Cenchrus ciliaris*, while the shrub layer supported occasional **Opuntia tomentosa* and **Acacia farnesiana*.

Remnant status: RE 11.3.25 was the most abundant remnant RE in the study area with large heterogeneous polygons of the RE 11.3.25 (remnant status) with RE 11.3.2 (minor component). Some additional areas of non-remnant and remnant RE 11.3.25 were also defined during field verification.

Conservation status: RE 11.3.25 is listed as 'Not of concern' under the VM Act, but has a biodiversity status of 'Of concern'. This RE is not consistent with a threatened ecological community listed under the EPBC Act.

RE 11.9.4 Semi-evergreen vine thicket on fine-grained sedimentary rocks

RE 11.9.4 is mapped as occurring regionally in the area to the north of the Origin Energy gas-field operation at Spring Gully, within the western extent of the study area (Environmental Protection Agency 2005). The pipeline corridor traversed a small heterogeneous polygon in which RE 11.9.4b occurred as the sub-dominant component along the Roma Taroom Road. Detailed survey revealed that this polygon was analogous with RE 11.3.25.

Vegetation representative of semi-evergreen vine thicket (SEVT) on fine grained sedimentary rocks (Land Zone 9) was however identified as a small, augmented patch within the broader distribution of Brigalow woodland to open forest in the central to eastern extent of the study area along Roma-Taroom Road (refer Figure 4-2). The western patch was less than 0.5 hectares in area, but was dominated by a moderately diverse composition of characteristic SEVT species (refer Photo 4-4). The eastern patch was less discernible with SEVT species being reduced to common generalists and the canopy being dominated by a sparse cover of *Eucalyptus orgadophila* (Mountain Coolibah) (see Photo 4-5). The proceeding composition describes the central occurrence.

Photo 4-4: Vegetation representative of non-remnant semi-evergreen vine thicket on sedimentary rocks (analogous to RE 11.9.4)

Photo 4-5: Vegetation representative of non-remnant semi-evergreen vine thicket on sedimentary rocks (analogous to RE 11.9.4)

Canopy: The very sparse emergent layer was dominated isolated *Eucalyptus orgadophila* and associated *Casuarina cristata* (Belah) to 15 m. The sparse canopy/low tree layer was dominated by *Geijera parviflora, Acacia harpophylla* and *Brachychiton rupestris,* with *Casuarina cristata* occurring infrequently. The canopy layer possessed a median height of 8 m and was the ecologically dominant layer.

Mid-stratum: The mid-dense to sparse mid-stratum was comprised primarily of mid-mature SEVT, which included *Geijera parviflora*, *Planchonella cotinifolia* var*. arborescens* (Yellow Lemon), *Ehretia membranifolia* (Peach Bush), *Alectryon oleifolius* ssp*. elongatus, Notelaea microcarpa* var*. microcarpa* (Narrow-leaved Mock-olive), *Pandorea pandorana* (Wonga Vine) and infrequent *Ventilago viminalis* (Vine Tree). This tall shrub layer possessed a median height of 5 m. The low shrub layer was dominated by *Planchonella cotinifolia* var*. arborescens, Croton phebalioides* (White Croton), juvenile tall shrub layer species and *Psydrax spp.* (Canthium). This stratum reached a median height of 2 m.

Ground layer: The groundcover layer possesses a mid-dense to dense cover dominated by *Oxalis spp.* with *Tetragonia tetragonoides*, *Rhagodia* spp*., Enchylaena tomentosa, Clematocissus opaca* (Forest Grape), *Olearia canescens* (no common name), *Zygophyllum apiculatum* and *Brunoniella australis* (Blue Trumpet) occurring occasionally. **Cenchrus ciliaris* dominated the road edge.

Condition: RE 11.9.4 in the study area was isolated, modified through edge effects and potentially fire and grazing pressures, and generally represented non-remnant regrowth. Weed incursion was limited generally to the dense cover of **Cenchrus ciliaris*, which in itself indicated the level of canopy fragmentation.

Remnant status: No remnant polygons of RE 11.9.4 have been mapped or identified in the Study Area. The non-remnant patches may be analogous with either non-remnant RE 11.9.5 or RE 11.9.4. The species composition however was representative of a vine thicket cohort, but the extent of the historically remnant patches may have been small, with distinct populations or patches in a broader community dominated by Brigalow. These patches were however too small to be considered mappable entities. RE 11.9.4 defined during the field verification was entirely non-remnant vegetation.

Conservation Status: RE 11.9.4 is listed as Endangered under the VM Act as well as having a biodiversity status of Endangered, however this status does not apply to the patches in the study area as they are non-remnant.

RE 11.9.4 is however consistent with the Semi-Evergreen Vine Thicket Endangered ecological community listed under the EPBC Act, regardless of size or condition.

RE 11.9.5 *Acacia harpophylla* and/or *Casuarina cristata* open forest on fine-grained sedimentary rocks

RE 11.9.5 *Acacia harpophylla* and/or *Casuarina cristata* open forest on fine-grained sedimentary rocks (Land Zone 9) occurred extensively as non-remnant vegetation within the study area (refer Figure 4-2). No remnant patches of this RE were recorded within the Study Area.

Extensive areas of non-remnant RE 11.9.5 however, were defined during the field verification across much of the Study Area, including a long linear tract of road reserve along Roma-Taroom Road that may satisfy the criteria for remnant status within several years. This regrowth patch was in good ecological condition.

The distribution of this RE within private landholdings was represented by fragmented patches of regrowth consisting of retained woodlots and/or cattle camps or stunted shrubby regrowth in ploughed paddocks.

Canopy: *Acacia harpophylla* and *Casuarina cristata* dominated the canopy, with associated *Brachychiton rupestris* and *Eucalyptus populnea* occurring infrequently and generally restricted to the periphery of the community. The highly variable median height ranged from 4 to 12 m (refer Photo 4-6 and 4-7).

Mid-stratum: Due to the broad canopy height range of this RE, the mid- stratum was found to be dominated either by juvenile canopy species or comprise of *Alectryon diversifolius* and *Geijera parviflora*, with associated *Apophyllum anomalum* (Warrior Bush), *Psydrax oleifolius, Santalum lanceolatum, Capparis mitchellii*, *Lysiphyllum carronii* and/or *Elaeodendron australe* var*. integrifolium.* The low shrub layer, where present, was generally dominated by *G. parviflora, Capparis lasiantha* (Nipan)*, Jasminum didymium* ssp*. racemosum* (no common name) and/or *Carissa ovata.*

Ground layer: The sparse ground layer was limited by the presence of a mid-dense to dense leaf litter. It was dominated by *Chloris divaricata, Enteropogon acicularis* and **Cenchrus ciliaris,* with associated *Einadia* spp*., Paspalidium caespitosum* (Brigalow Shot Grass), *Rhagodia gaudichaudiana*, *Tetragonia tetragonoides, Salsola kali* and **Emex australis* (Spiny Emex) occurring either occasionally or commonly.

Condition: This community consisted primarily of regrowth *A. harpophylla*, with evidence of thinning and use by cattle on private landholdings and in some cases within the road reserve. Small patches showed evidence of degradation from edge effects and *Amyema* spp*.* (mistletoes) were occasionally prevalent within the upper strata. Mature **Opuntia tomentosa* (Velvety Tree Pear, a class 2 pest under the *Land Protection (Pest and Stock Route Management) Act 2002*) was encountered commonly within this vegetation type.

Remnant status: Only four field-mapped polygons of RE 11.9.5 potentially possessed the height, cover and population size characteristics which were favourable for consideration of remnant status. The remainder of field-mapped RE 11.9.5 polygons consisted of regrowth vegetation or fragmented/thinned populations in which the mid-stratum facilitates the ecological dominant layer. The areas that have been mapped by the EPA as mixed polygon remnant vegetation were found to generally align with RE 11.3.2 or 11.9.10 or at least as a co-dominant component.

Conservation status: RE 11.9.5 has a VM Act status and EPA biodiversity status of Endangered. The VM Act status however only applies to remnant patches of this RE.

RE 11.9.5 may also be consistent with the Brigalow (*Acacia harpophylla* dominant and co-dominant) Endangered ecological community listed under the EPBC Act depending on condition. The long linear tract of the RE in the road reserve along Roma-Taroom Road was considered to be consistent with the EPBC Act definition (Threatened Species Scientific Committee 2001).

Photo 4-6: Vegetation representative of remnant *Acacia harpophylla* open forest on fine-grained sedimentary rocks (RE 11.9.5)

Photo 4-7: Vegetation representative of non-remnant *Acacia harpophylla* open forest on fine-grained sedimentary rocks (RE 11.9.5)

RE 11.9.7 *Eucalyptus populnea, Eremophila mitchellii* shrubby woodland on fine-grained sedimentary rocks

RE 11.9.7 *Eucalyptus populnea, Eremophila mitchellii* shrubby woodland on fine-grained sedimentary rocks (Land Zone 9) occurred in the study area entirely as non-remnant, fragmented regrowth within road reserves in association with the lower slopes or low points of gently undulated plains and rises typically dominated by monotypic stands of regrowth *Acacia harpophylla* (non-remnant RE 11.9.5). Generally occurring as small, isolated patches, this vegetation type was also associated with the topographical intergrades into *Eucalyptus populnea* woodland on alluvium (RE 11.3.2, refer Figure 4-2).

Canopy: *Eucalyptus populnea* dominates the emergent and canopy layers, while *Lysiphyllum carronii, Casuarina cristata* and *Grevillea striata* occur very infrequently. The canopy layer represented the ecologically dominant layer and possessed a median height range of 11 to 15 m (refer Photo 4-8). The sub-canopy or low tree layer was generally dominated by *Eucalyptus populnea* +/- *Lysiphyllum carronii*, with *Acacia excelsa, Alectryon oleifolius ssp. elongatus* and *Acacia harpophylla* occurring very sporadically. The sub-canopy possessed a median height of 8 m.

Photo 4-8: Vegetation representative of *Eucalyptus populnea, Eremophila mitchellii* shrubby woodland on fine-grained sedimentary rocks (analogous to RE 11.9.7)

Mid-stratum: The sparse to very sparse tall shrub layer possessed a median height of 3 m and was dominated by *Eremophila mitchellii* and *Geijera parviflora* with associated *Alectryon oleifolius* ssp. *elongatus* and *Eucalyptus populnea* occurring very infrequently. The sparse low tree layer is dominated by *Eremophila deserti* and associated to suppressed juvenile tall shrub species, *Apophyllum anomalum, Grevillea striata* and *Senna artemisioides* ssp. *coriacea*. The low shrub layer possessed a median height range of 0.5 to 1 m.

Ground layer: The ground layer was generally dominated by a mid-dense cover of **Cenchrus ciliaris* and associated *Aristida* spp*., Chloris* spp*., Enchylaena tomentosa, Tetragonia tetragonoides, and Enteropogon acicularis*.

Condition: This vegetation type was generally sparsely distributed, subject to edge effects and potentially adversely impacted by recent droughts. A large majority of the canopy and emergent *Eucalyptus populnea* were found to be in poor health with large quantities of deadwood and foliage reduced to trunk-borne epicormic shoots prevalent within all identified patches.

Remnant status: This community does not satisfy the height, cover, size or width requirements to be considered as remnant vegetation by the EPA.

Conservation status: RE 11.9.7 has a VM Act and EPA biodiversity status of Of Concern. This RE is not consistent with a threatened ecological community listed under the EPBC Act.

RE 11.9.10 *Acacia harpophylla, Eucalyptus populnea* open forest on fine-grained sedimentary rocks

RE 11.9.10 *Acacia harpophylla, Eucalyptus populnea* open forest on fine-grained sedimentary rocks generally occurred in association with smaller drainage incised an *in situ* lithology of fine grained sediments (Land Zone 9) beyond the extent of Quaternary alluvial deposition or on slopes immediately adjacent to alluvium (Land Zone 3) (refer Figure 4-2). All identified occurrences of this RE in the study area were non-remnant.

Canopy: As non-remnant vegetation, the *Eucalyptus populnea* dominated the canopy was variable in height ranging from 8 to 21 m. *Eucalyptus melanophloia* also occurred sporadically. The low tree layer in all occurrences was generally dominated by *Acacia harpophylla*, *Eucalyptus populnea* and *Casuarina cristata* while *Acacia excelsa*, *Alectryon oleifolius* ssp*. elongatus, Lysiphyllum carronii* and *Brachychiton rupestris* occurred infrequently. A variant was identified in association with a roadside 'borrow pit' on the south side of the Roma-Taroom Road. Here the canopy was dominated by *Eucalyptus melanophloia*.

Mid-stratum: The sparse mid stratum was generally dominated by *Geijera parviflora*, with variously associated juvenile canopy species, *Eremophila mitchellii, Alectryon diversifolius*, *Alectryon oleifolius* ssp*. elongatus*, *Psydrax oleifolius*, *Citrus glauca*, *Atalaya hemiglauca* (Whitewood), *Acacia decora* and *Capparis mitchellii* occurring either occasionally or quite commonly.

Ground layer: The ground layer was dominated generally by **Cenchrus ciliaris* with *Chloris divaricata*, *Aristida* spp*.*, *Enteropogon acicularis*, *Bothriochloa ewartiana* (Desert Bluegrass), *Salsola kali*, *Eragrostis* spp*.*, *Enchylaena tomentosa*, *Calotis* spp*.*, **Verbena tenuisecta*, *Sclerolaena* spp*.* (saltbushes), *Vittadinia* spp*., Sida* spp*.* and *Einadia nutans* var*. nutans* occurring occasionally.

Photo 4-9: Vegetation representative *of Acacia harpophylla*, *Eucalyptus populnea* woodland on alluvial plains (RE 11.9.10)

Condition: The non-remnant occurrences of this vegetation type occurred generally as small, fragmented patches that had been retained as shade/shelter for livestock, potential woodlots and/or stabilisation of narrowly incised drainage corridors on private property, or as narrow roadside vegetation in road reserves.

Remnant status: All occurrences of this RE identified in the study area were considered non-remnant. Remnant RE 11.9.10 has however been mapped in the study area in remnant heterogeneous and homogenous polygons (Environmental Protection Agency 2005). Field verification of the homogenous polygon at the eastern extent of the study area was found to align with RE 11.3.25.

Conservation status: RE 11.9.10 is listed as having an Of Concern conservation status under the VM Act and a biodiversity status of Endangered. The VM Act status however only applies to remnant patches of this RE.

RE 11.9.10 may be dominated or co-dominated by *Acacia harpophylla,* however it is not included in the list of REs used to define 'Brigalow (*Acacia harpophylla* dominant and co-dominant)' as listed under the EPBC Act (Environment Australia 2003).

RE 11.10.9 *Callitris glaucophylla* open forest on coarse-grained sedimentary rocks

RE 11.10.9 was represented by a small non-remnant patch within the western extent of the study area along a potential alternate route option following an existing pipeline easement on the Origin Spring Gully petroleum lease (refer Figure 4-2).

Canopy: The very sparse canopy was dominated by *Eucalyptus melanophloia* and sporadic *Eucalyptus populnea* to 17 m in height with a median height of 14 m (see Photo 4-10).

Eucalyptus populnea was generally restricted to the periphery of the community. The sparse to mid-dense sub-canopy was dominated by *Callitris glaucophylla* (White Cypress Pine). The sub-canopy possessed a median height of 11 m.

Photo 4-10: Vegetation representative of *Callitris glaucophylla* woodland on coarse-grained sedimentary soils (RE 11.10.9)

Mid-stratum: The sparse mid stratum was dominated by *Geijera parviflora*, with variously associated juvenile canopy species, *Psydrax oleifolium*, *Psydrax johnsonii* and *Eremophila mitchellii* occurring infrequently.

Ground layer: The ground layer was generally dominated by a dense cover of **Cenchrus ciliaris.*

Condition: This vegetation type occurred as a small, fragmented patch which had undergone aerial herbicide application of either Grassland® or Velper® (Glen Star, Environment Advisor, Origin Energy, pers. comm. 9 August 2008), which is utilised for the suppression of woody vegetation. Greater than 60% of the canopy trees were dead at the time of survey.

Remnant status: Within the Study Area, this community has not been mapped by the EPA (2005). Coarse-grained sedimentary soils (Land Zone 10) have been mapped as occurring within the investigation area, particularly within the vicinity of this copse. Despite the effect of herbicide application, the vegetation type is most representative of RE 11.10.9, '*Callitris glaucophylla* woodland on coarse-grained sedimentary soils', but failed to satisfy the criteria for remnant status.

Conservation Status: RE 11.10.9 is listed as having an "Not of concern" conservation status under the VM Act and a biodiversity status of "Not of Concern at present". The VM Act

status however only applies to remnant patches of this RE. This RE is not consistent with a threatened ecological community listed under the EPBC Act.

Cleared areas

The majority of study area consisted of cleared or highly disturbed vegetation (non-remnant) that is no longer analogous with a RE and generally represented open pastoral expanses or degraded road reserves dominated by pastoral grasses.

Canopy: Isolated, small patches and individual paddock trees occurred throughout cleared areas and generally aligned with canopy trees that would have historically dominated the landscape. A preference for the retention of *Brachychiton rupestris* (Queensland Bottle Tree) was observed (refer Photo 4-11 and Photograph 4-12).

Mid-stratum: The mid stratum was generally absent. Mid stratum species that occurred included small clumps of regrowth *Acacia harpophylla* and/or *Santalum lanceolatum, Alectryon diversifolius, Atalaya hemiglauca, Capparis lasiantha* (Nipan) and *Geijera parviflora* to 5 m in height (median height of 2.5 m).

Ground layer: The ground layer provided the predominant vegetative cover throughout the cleared areas and, where not overgrazed, was dominated by **Cenchrus ciliaris.* Areas subjected to continual overgrazing were found to support a range of species from the Asteraceae, Malvaceae and Chenopodiaceae families and included *Sclerolaena* spp*., Sida* spp*. *Malvastrum* spp*., Einadia* spp*., Vittadinia* spp*., Calotis* spp*., Enchylaena tomentosa, *Gamochaeta* spp*.* and *Salsola kali.* Native grasses such as *Dichanthium sericeum* (Queensland Bluegrass), *Bothriochloa* spp*., Chloris* spp*., Enteropogon* spp*.* and *Aristida* spp*.* were locally prominent in some areas but were generally infrequent.

Small melon holes, creek overflows and ancient oxbows were encountered throughout the investigation area and were found to possess variable water-holding capacity. The condition and vegetative composition of these was variable due to degree and persistence of inundation, cattle access/predation and exposure. Generally, species commonly associated with impeded drainage were encountered and included *Cyperus bifax* (no common name), *Leptochloa decipiens* (no common name), *Paspalum distichum* (Water Couch), *Ammannia multiflora* (no common name), *Eleocharis cylindrostachys* (a bog rush), *Cyperus concinnus* (no common name) and *Carex appressa* (Tall Sedge).

Remnant status: Cleared areas are not analogous with any described regional ecosystem. Although *Dichanthium sericeum* was present in some areas, the ecological condition of the cleared areas in the study area was poor (dominated by **Cenchrus ciliaris* and other exotic species) and not consistent with the any of the grassland dominated REs that occur in the region (i.e. RE 11.3.21, 11.3.31, 11.4.4, 11.4.11, 11.9.3, 11.9.12 or 11.11.17).

Conservation status: Cleared areas identified as non-remnant vegetation are not subject the provisions of the VM Act. The cleared areas in the study area are also in poor (ecological) condition and are not consistent with the Bluegrass (*Dichanthium* spp.) dominant grasslands of the Brigalow Belt Bioregions (North and South) ecological community listed under the EPBC Act.

Photo 4-11: Cleared vegetation (cropped paddock)

Photo 4-12: Cleared vegetation (road reserve)

4.4.1 Changes to RE mapping

No changes were made to the extent of remnant vegetation defined by the EPA RE mapping (2007). Much of the regrowth vegetation within the Roma Taroom Road corridor was of sufficient height and density to be considered as remnant vegetation, however these linear strips of vegetation are too narrow (under 75 m) to be mappable units of remnant vegetation. These patches of regrowth (non-remnant) vegetation were however surveyed, mapped based on aerial photography, and have been avoided where possible.

The RE type of much of the remnant vegetation defined by the EPA RE mapping (2007) was however changed based on the surveys undertaken for this assessment. Remnant vegetation in the study area consisted predominantly of riparian vegetation dominated by RE 11.3.25. Current EPA RE mapping (2007) has these polygons mapped as heterogeneous polygons consisting of RE 11.4.3/11.4.7 (percentage 70/30). The RE type of these polygons was changed for the purpose of this assessment.

4.5 Species of plant

Searches of relevant databases identified records of 249 species of plant in the study area and surrounds (see Attachment B). Field surveys undertaken for this assessment identified 265 species of plant in the Study Area, of which 217 (82%) were native (refer Attachment E). The most diverse families included the grasses (*Poaceae*), daises (*Asteraceae*), saltbushes (*Chenopodiaceae*) and hibiscus (*Malvaceae*).

The low diversity of species of plant is indicative of the low diversity of land zones and associated RE types traversed by the Study Area, and the high level of modification of remnant vegetation.

No Threatened species was recorded in the Study Area. Two Priority taxa species of plant for the Brigalow Belt South (Environmental Protection Agency and Environmental Planning Southwest Queensland 2002a) were however recorded: *Acacia melvillei* (Yaran) and *Swainsona swainsonioides* (Downy Darling Pea). *Acacia melvillei* was recorded in patches of 11.9.5 and 11.9.6 (remnant and regrowth) while *Swainsona swainsonioides* was recorded infrequently in areas of non-remnant vegetation that were not analogous with an RE (cleared areas).

Two species recorded in the study area are ‘declared plants’ listed under the *Land Protection (Pest and Stock Route Management) Act 2002* (refer Table 4-2), **Opuntia stricta* (Prickly Pear) and **O. tomentosa* (Velvet Tree Pear). **Opuntia tomentosa* was found to occur in most REs, but was most commonly found within vegetation representative of RE 11.9.5. Neither species was found to occur as a dominant species. Both these species are listed as Class 2 pests which are defined as species established in Queensland that have, or could have, an adverse economic, environmental or social impact. The management of these pests requires coordination and they are subject to programs led by local government, community or landowners. Both of these species were identified throughout the Study Area.

Several other exotic species are known from the region but were not encountered. Field surveys to be performed during more optimal conditions, such as late summer/early autumn may reveal the presence of certain herbaceous and graminoid species, particularly **Parthenium hysterophorus* (Parthenium Weed) which is also a Class 2 pest.

4.6 Fauna habitats

Five broad fauna habitat types exist within the Study Area: *Acacia harpophylla/Casuarina cristata* scrub, woodlands, riparian (Queensland Blue Gum), wetlands (natural or artificial) and cleared lands. These fauna habitats are broad groupings of the vegetation types/RE's present within the study area (refer to Section 4.2 and Table 4-3). Each broad habitat type is discussed below using site specific data where appropriate.

Table 4-3: Fauna habitats and corresponding RE mapped by EPA

Habitat type	EPA RE code
Acacia harpophylla and/or *Casuarina cristata* scrub	RE 11.9.5
Eucalypt Woodlands	RE 11.3.2 and RE 11.9.7
Riparian	RE 11.3.25
Wetland (artificial/natural)	—
Cleared lands	—

4.6.1 *Acacia harpophylla/Casuarina cristata* scrub

Acacia harpophylla/Casuarina cristata Scrub was restricted largely to the road reserves found within the study area and occurred as both remnant and non-remnant vegetation that corresponds with RE 11.9.5. More remnant forms were restricted to the Roma-Taroom Road with extensive non-remnant areas found further to the east along Goldens Bimbadeen Road. This habitat typically occurs on a range of soil types but all have deep underlying clays. Standard trapping sites 2, 3 and 4 were established in this habitat as were a number of the supplementary sites (refer Table 1, Attachment F).

Tree hollow resources occurred in varying densities from absent at some sites to around 6 trees per hectare at most sites. Generally the hollows recorded were small (<5 cm opening) or medium (5-10 cm) and were generally suitable for microbats, small arboreal snakes, arboreal reptiles including geckos.

Casuarina cristata provided a foraging resource with 20% of stems producing cones suitable for parrots and cockatoos including the Threatened Glossy Black-cockatoo, which has been previously recorded in the general area (refer Technical Report 17a of Volume 1). Various Mistletoe species provided nectar resources for fauna including nomadic honeyeaters recorded or likely to occur in the study area (e.g. Painted Honeyeater, *Grantiella picta*).

The groundcover was comprised largely of litter (25-50%) and vegetative cover (15-50%) with rock and log cover varying somewhat depending on local site conditions (refer Table 1, Attachment F). The extent of bare soil was highly variable and appeared to reflect grazing intensity and other past disturbances. Where a sufficient level of ground cover was present, there was potential for a range of conservation significant fauna to occur including the Threatened Brigalow Scaly-foot (*Paradelma orientalis)* and Dunmall's Snake (*Furina dunmalli*).

This habitat type was largely devoid of surface water except for ephemeral soaks and drainage lines, which could provide potential foraging and breeding habitat for frogs.

The disturbance regime in this fauna habitat type was influenced largely by the extent of grazing, logging, clearing for access tracks and weed incursion. The condition of *Acacia harpophylla/Casuarina cristata* Scrub habitat within the study area was variable but was generally considered to be in high condition as it provided vegetative links to riparian zones within an otherwise cleared landscape (refer Table 1, Attachment F).

4.6.2 Eucalypt woodlands

Eucalypt woodlands generally comprised areas of RE 11.3.2 and RE 11.9.7 (remnant and non-remnant) that included vegetation communities dominated by *Eucalyptus populnea* and or *E. melanophloia*. Eucalypt woodlands did not include riparian vegetation dominated by *Eucalyptus tereticornis* which has been classified separately below.

Eucalyptus populnea woodlands occurred across the alluvial plains or low hills as discrete remnants or were contiguous with other areas of *Acacia harpophylla/Casuarina cristata* scrub and/or Riparian areas. Standard trapping Site 1 was established in this habitat type, and supplementary sites were established in *Eucalyptus melanophloia* woodlands (refer Attachment F).

The structure varied across the habitat type according to the dominant vegetation community, management regime (i.e. logging, clearing, grazing intensity) and community age (refer Attachment F). Eucalypt woodlands typically ranged from 12 to 18 m tall, with a sparse crown cover (average of approximately 25% crown cover). Various species of Mistletoe were also locally abundant within the canopy of eucalypt woodlands, providing an opportunity to survey for nomadic honeyeaters (e.g. Painted Honeyeater). Some patches also contained sporadic occurrences of *Callitris glaucophylla* while the understorey was generally sparse (10 to 25% cover).

Tree hollow resources occurred in varying densities within eucalypt woodlands from almost absent (~1 per hectare) at some regenerating sites (e.g. near Slatehill Creek) to around 12 trees per hectare at Site 1. At most sites hollow bearing trees occurred at an estimated density of 7 trees per hectare and provided a range of trunk and limb hollows suitable for bats, gliders, arboreal reptiles (geckos, monitors, skinks, and snakes), possums and larger birds including parrots and cockatoos.

The groundcover was comprised largely of litter (10-40%) and vegetative cover (25-85%) with rock and log cover varying somewhat depending on local site conditions (refer Table 1, Attachment F). The extent of bare soil appears to reflect either grazing intensity or level of low and taller shrub cover at each site and seemed to vary both within and across land tenure.

The eucalypt woodlands were generally devoid of surface water except where they bordered major drainage lines associated with tributaries of Canal Creek. In these areas the water formed ephemeral pools which could potentially be utilised by frogs that select ephemeral breeding sites. The disturbance regime is largely influenced by the extent of grazing and weed incursion of each site but was generally considered to be in high condition especially in roadside fragments and riparian areas (refer Table 1, Attachment F).

4.6.3 Riparian

Riparian areas corresponded predominantly with RE 11.3.25. This fauna habitat type was dominated by large *Eucalyptus tereticornis* and occurred along the along major drainage

lines within the study area including Eurombah, Kangaroo, Canal and Horse Creeks. Although no standard trapping sites were established in this habitat, a range of targeted techniques including harp trapping, Anabat detection, herpetofauna survey and opportunistic census were employed.

Eucalyptus tereticornis in riparian areas provided the highest densities of tree hollows in the Study Area, particularly large hollows, with a range of trunk and limb hollows distributed throughout the upper and mid strata at high densities (averaging 12 trees per hectare). Hollows ranging in sizes from small (<5 cm), medium (5-15 cm) and large (>15 cm) were recorded in both limb and trunk sections and they were considered suitable refuge and breeding habitat for a wide range of fauna including bats, arboreal herpetofauna, gliders, possums and larger birds including cockatoos (which were observed utilising these hollows), parrots and common owls (i.e. Barn Owl, *Tyto alba*).

The groundcover was comprised largely of vegetative cover (15-80%) with soil, rock and log cover varying somewhat depending on local site conditions (refer Table 1, Attachment F). Sites with extensive areas of bare soil were generally found on private land tenures and associated with cattle grazing. Some sections of Barton Creek showed signs of deep cracking clays which could provide potential refuge habitat for a range of small ground dwelling mammals, reptiles and frogs.

As RE 11.3.25 was present along reaches of the various drainage lines in the Study Area, riparian habitats also formed the primary wildlife corridors at both the local and landscape scales (refer Section 4-1). These Riparian fauna habitats could provide specialised habitat niches for some Threatened fauna including but not limited to Koala (*Phascolarctos cinereus*), Greater Glider (*Petauroides volans*), hollow dependant fauna and some cover dependant species including the Northern Brown Bandicoot (*Isoodon macrourus*) which was recorded along Kangaroo Creek. The condition of riparian habitat within the study area reflected past and current land use and was generally considered to be in high condition as it provided important late winter foraging resources and abundant tree hollows (refer Table 1, Attachment F).

4.6.4 Wetland (artificial/natural)

Aquatic/Wetland habitats within the study area were restricted to artificial dams varying from 0.5-1 ha in size and containing variable densities of fringing and aquatic vegetation. These habitats included two prominent stock dams along the Roma-Taroom Road and another between the Roma-Taroom Road and Goldens-Bimbadeen Road. The most significant of these was a well vegetated dam that adjoined Kangaroo Creek in the western Study Area. This habitat type provided suitable foraging, breeding, roosting and refuge habitat for a range of common frog fauna, waterbirds and aquatic reptiles including turtles. The condition of natural and artificial wetland habitat within the study area was considered to be in poor-moderate condition (refer Table 1, Attachment F).

4.6.5 Cleared land

The majority of the study area comprised cleared areas that did not correspond with any regional ecosystems. These areas were used predominantly for grazing of cattle and/or cropping. Grazing areas generally contained scattered paddock trees or small cattle camps (small patches of Brigalow regrowth < 0.5 ha). Cropping areas were generally devoid of any tree cover other than contour strips and linear roadside reserves.

The grazing land provided limited habitat value to vertebrate fauna except where timber had been retained and left *in situ*. In such instances a range of native ground dwelling fauna including the Brigalow Scaly–foot may occur. The grazing land provided limited habitat value to native vertebrate fauna. Isolated trees with hollows provided refuge habitat for microchiropteran bats as well as nesting and foraging resources for 'edge tolerant' species of bird. Other species of tree that grow within the fragmented patches of vegetation across the Study Area, such as *Acacia harpophylla,* may also contribute to resource availability and connectivity acting as pathways for movement or dispersal for Threatened species such as the Painted Honeyeater (although not recorded in the study area during surveys for this assessment).

Cropping areas provided limited habitat value to native vertebrate fauna. Grass species grown for cattle feed (e.g. *Sorghum* spp.) and the introduced **Cenchrus ciliaris* may however provide a supplementary feeding resource for ground-dwelling mammals such as the Black-striped Wallaby (*Macropus dorsalis*) and some common granivorous species of bird. Some species of reptile and frog may potentially seek refuge within the cracking clays on the floodplains in the study area that are used for cropping. The condition of cleared land within the study area reflected past and current land use and was considered to be in extremely poor condition due to the extensive level of disturbance (refer Table 1, Attachment F).

4.7 Corridors and connectivity

Wildlife corridors can be defined as "retained and/or restored systems of (linear) habitat which, at a minimum enhance connectivity of wildlife populations and may help them overcome the main consequences of habitat fragmentation" (Wilson, A. & Lindenmayer 1995). Corridors can assist ecological functioning at a variety of spatial and temporal scales from daily foraging movements of individuals, to broad-scale genetic gradients across biogeographical regions.

Corridors serve a number of different functions in terms of biodiversity conservation including:

- providing increased foraging area for wide-ranging species
- providing cover for movement between habitat patches, particularly for cover-dependent species and species with poor dispersal ability and enhancing the movement of animals through sub-optimal habitats
- reducing genetic isolation
- facilitating access to a mix of habitats and successional stages to those species which require them for different activities (for example, foraging or breeding)
- providing refuge from disturbances such as fire
- providing habitat in itself
- linking wildlife populations and maintaining immigration and recolonisation between otherwise isolated patches. This in turn may help reduce the risk of population extinction (Wilson, A. & Lindenmayer 1995).

How species use the corridor network will depend largely on the home and activity ranges of the species, their habitat requirements and the ecological characteristics of the corridor. For example, some large or mobile species may make direct movements through

the corridor network, moving from one patch of habitat to another. These direct movements may be on the scale of a foraging expedition or a migration (Bennett 1990). Other species may have movements by single individuals punctuated by pauses in the corridor, which can last anything from a small foraging or resting bout to weeks and even months. If the corridor contains sufficient resources to maintain a population, then continuity through the corridor may be through gene flow through the resident population (Bennett 1990; Wilson, A. & Lindenmayer 1995).

Vegetation within the study area and surrounds is highly fragmented with large expanses of cleared land surrounding. Although remnant vegetation in many patches is of sufficient size to maintain viable populations of some species, in many cases there may be only limited connectivity among the patches given the extent of clearing and the distance to core areas. Even small patches may however provide stepping stones within the wider landscapes (Bennett 1993).

Remnant and non-remnant woodland vegetation in the study area is concentrated in linear patches along drainage lines (RE 11.3.25) and adjoining eucalypt woodlands (RE 11.3.2). The continuous linear patches of woodland are likely to function as a part of a local and regional corridor network that is likely to play an important role in the movement of wildlife throughout the landscape, particularly for species such as the Koala (*Phascolarctos cinereus*) and Greater Glider, which were both recorded along Woleebee Creek (within the MLA areas) (refer Figure 4-4). These continuous linear patches of woodland form part of a wider regional corridor network that is likely to play an important role in the movement of wildlife throughout the landscape. These linear patches are recognised by State Wildlife Corridor mapping (Environmental Protection Agency 2004b) and are of regional biodiversity significance under the Biodiversity Planning Assessment mapping (Environmental Protection Agency 2003) (refer to sections 5.1.4 and 5.1.6 respectively).

In addition to riparian areas, remnant and non-remnant vegetation within the road reserve is also likely to play an important role in the connectivity of vegetation and associated fauna habitats. Vegetation in the road reserve is generally less than 75 m wide, therefore too narrow to be a mappable entity of remnant vegetation (Neldner *et al.* 2005). Vegetation in the road reserve was however found at some locations to in good condition and be providing known or likely habitat for significant species (as discussed in following sections).

4.8 Species of animal

Database searches (refer Section 3.3) returned records of 237 terrestrial vertebrate species within the study area and surrounds comprising 160 species of bird, 17 species of frog, 30 species of mammal and 30 species of reptile (see Attachment C).

Field surveys of the study area recorded 144 species of vertebrate fauna including 136 native species and eight introduced species (see Attachment F). Birds were the most diverse groups of terrestrial vertebrate fauna recorded in the study area followed by mammals, reptiles and frogs respectively (refer Table 4-4).

Table 4-4: Summary of species of terrestrial fauna identified in the study area

Taxa	Native	Introduced	Total
Mammals	16	7	23
Birds	99	0	99
Frogs	4	1	5
Reptiles	17	0	17
Total	**136**	**8**	**144**

During field surveys three Rare or Threatened species were recorded in the Study Area:

- Little-pied Bat (*Chalinolobus picatus*) – Rare
- Brigalow Scaly-foot (*Paradelma orientalis*) – Vulnerable
- Golden-tailed Gecko (*Strophurus taenicauda*) – Rare.

In addition, six regionally significant species and two EPBC Act listed Migratory species were recorded in the Study Area.

Supplementary field surveys in the MLA areas recorded 232 species of animal including an additional 119 species not recorded during the current surveys in the study area including 63 species of bird, 11 species of frog, 15 species of mammal and 30 species of reptile with further information from this study provided in Volume 1 technical report 17A-1-V1.5.

Species diversity was highest in association with the non-eucalypt woodland (i.e. *Acacia harpophylla/ Casuarina cristata* Scrub) with 89 species recorded in this fauna habitat type. Species diversity was broadly comparable across fauna habitat types and the number of species recorded during surveys ranged from 45 (Wetland) to 78 species (Riparian) (refer Table 4-5).

Table 4-5: Summary of terrestrial fauna diversity associated with broad habitat types

Group	Eucalypt woodland (Ironbark dominated)	Eucalypt woodland (Poplar Box dominated)	*Acacia harpophylla* and/or *Casuarina cristata* Scrub	Riparian	Cleared	Wetland/ Dam
Mammals	6	14	16	13	12	8
Birds	35	50	58	51	39	35
Frogs	0	1	1	5	1	2
Reptiles	6	10	14	9	2	0
Total	**47**	**75**	**89**	**78**	**54**	**45**

4.8.1 Mammals

Twenty-three species of mammal were recorded during the survey (refer Attachment F) including seven species of flying mammal (microbats) and nine terrestrial and/or arboreal

mammal species. Seven introduced species of mammal were also recorded in the Study Area.

Flying mammals

Anabat ultrasonic call detection recorded medium levels of microbat activity with the Eastern Bent-wing Bat (*Miniopterus schreibersii oceanensis*), Gould's Wattled Bat (*Chalinolobus gouldii*), Little Broad-nosed Bat (*Scotorepens greyii*) and Little Pied Bat (*Chalinolobus picatus*) commonly recorded.

Four species of microbat were identified from captures in harp traps including Gould's Wattled Bat, Little Forest Bat (*Vespadelus vulturnus*), Lesser Long-eared Bat (*Nyctophilus geoffroyi*) and the Little Pied Bat.

The Little Pied Bat was the only Rare or Threatened microbat species recorded in the Study Area. This species was recorded from numerous locations in association with eucalypt woodland, non-eucalypt woodland and wooded riparian areas within the study area and was considered locally common. The Eastern Bent-wing Bat (*Miniopterus schreibersii oceanensis*), which is considered a non-Threatened Priority taxa within the Brigalow Belt South bioregion (Environmental Protection Agency and Environmental Planning Southwest Queensland 2002a), was recorded in association with dry eucalypt woodland dominated by *Eucalyptus populnea*.

One other species of microbat recorded during surveys, the Little Forest Bat is considered regionally significant due to its occurrence at or beyond its distributional limit, within the Study Area. This species was recorded in association with most habitat types except cleared and wetland areas.

Arboreal and terrestrial mammals

One arboreal species of mammal, the Common Brushtail Possum (*Trichosurus vulpecula*) was recorded in the Study Area. The Common Brushtail Possum is considered in serious decline in the Brigalow Bioregion South due to tree clearing (Environmental Protection Agency and Environmental Planning Southwest Queensland 2002a). These possums, however, were relatively common within the study area in eucalypt woodlands, non-eucalypt woodlands and riparian habitats.

One small ground-dwelling species of mammal, the Common Dunnart (*Sminthopsis murina*) was captured in a pitfall trap in association with *Acacia harpophylla/ Casuarina cristata* Scrub. Although this is not a Threatened species, it was considered rare within the study area in comparison to other small ground dwelling mammals, such as the introduced House Mouse (*Mus musculus*), which was commonly recorded in all fauna habitat types.

One medium size ground-dwelling mammal, the Northern Brown Bandicoot (*Isoodon macrourus*) was recorded in one of the supplementary sites within the study area (Kangaroo Creek). The animal was dead, most likely attacked by a Red Fox or wild dog/Dingo. The Northern Brown Bandicoot is a non-Threatened Priority taxon and is considered to be in decline in many parts of the Brigalow Bioregion South (Environmental Protection Agency and Environmental Planning Southwest Queensland 2002a).

Five large ground-dwelling mammals, the Eastern Grey Kangaroo (*Macropus giganteus*), Red-necked Wallaby (*Macropus rufogriseus*), Swamp Wallaby (*Wallabia bicolor*), Black-striped Wallaby (*Macropus dorsalis*) and Red Kangaroo (*Macropus rufus*) were recorded within the study area in association with most fauna habitat types. Of these, only the Black-

striped Wallaby, which was commonly observed within the Study Area, is considered to be a non-Threatened Priority taxon within the Brigalow Bioregion South (Environmental Protection Agency and Environmental Planning Southwest Queensland 2002a).

One monotreme, the Short-beaked Echidna (*Tachyglossus aculeatus*) was recorded within the Study Area. While the animal identified was a dead specimen, tracks and scats of this species were recorded in most fauna habitat types, with the exception of cleared and wetland areas.

All six exotic species of mammal recorded were ground-dwelling species. The Brown Hare (*Lepus capensis*), Rabbit (*Oryctolagus cuniculus*) and House Mouse (*Mus musculus*) were the most commonly encountered species. Evidence of Feral Pig (*Sus scrofa*), Wild Dog (*Canis lupus dingo*) and Feral Cat (*Felis catus*) in the form of scats, diggings and tracks, or direct observation were recorded occasionally throughout the study area suggesting they may use the study area in varying densities.

4.8.2 Birds

Birds were the most diverse group of terrestrial vertebrate fauna with 99 species recorded during the field surveys (see Attachment F). Most of these were common species associated with woodland, grassland and/or wetland habitat. No Threatened bird species listed under the NC Act and/or EPBC Act were recorded during field surveys. Two Migratory species listed pursuant to the EPBC Act, the Great Egret (*Ardea alba*) and Cattle Egret (*Ardea ibis*) and two non-Threatened Priority taxa: the Grey-crowned Babbler (*Pomatostomus temporalis temporalis*) and the Grass Owl (*Tyto capensis*) were also recorded. The Grey-crowned Babbler was recorded at most of the standard trapping sites and at several supplementary sites indicating it was common within the Study Area. The Grass Owl was recorded calling in areas where there was a high abundance of the introduced House Mouse.

4.8.3 Frogs

Five species of frog comprising three families were recorded during the current field surveys (refer Attachment F). Frog diversity was highest in the riparian habitats where over-wintering sites (e.g. logs and rocks) were plentiful. None of the species of frog recorded are at their distributional limit or are considered to be Priority taxa. One introduced species of amphibian, the Cane Toad (*Rhinella marinus*), was recorded in association with three habitat types: Cleared, Wetland and *Acacia harpophylla* and/or *Casuarina cristata* scrub.

4.8.4 Reptiles

Seventeen species of reptile were recorded during the current field surveys, comprising three species of gecko, one species of pygopod lizard, nine species of skink, three species of snake, and one species of dragon (see Attachment F for details). One non-Threatened Priority taxa species, the Shingleback Lizard (*Trachydosaurus rugosus asper*) was recorded opportunistically as a dead specimen. Two Rare or Threatened Priority taxa, the Golden-tailed Gecko (*Strophurus taenicauda*) and the Brigalow Scaly-foot (*Paradelma orientalis*), were detected through active herpetofauna searches and both were found in association with *Acacia harpophylla/ Casuarina cristata* Scrub habitat type.

5. Threatened biodiversity and other significant matters

This section summarises the biodiversity matters of national, state and regional significance identified from the desk based assessment and field surveys.

5.1 Matters of National Environmental Significance

Matters of National Environmental Significance are listed and protected under the EPBC Act. The Act identifies seven Matters of National Environmental Significance:

- World Heritage properties
- National heritage places
- wetlands of international importance (Ramsar wetlands)
- Threatened species and ecological communities
- Migratory species
- Commonwealth marine areas
- nuclear actions (including uranium mining).

Matters of National Environmental Significance relating to biodiversity are discussed below in relation to the proposed project based on the results of the EPBC Protected Matters Search Tool (Department of the Environment Water Heritage and the Arts 2008c), desktop review of databases and literature and the results of field surveys.

A summary of Matters of National Environmental Significance and the likely impacts of the proposed pipeline on them are presented in Attachment J of this Technical Report.

5.1.1 Threatened ecological communities

Three Threatened ecological communities listed under the EPBC Act are known or predicted to occur in the Study Area:

- Brigalow (*Acacia harpophylla* dominant and co-dominant)
- semi-evergreen vine thickets of the Brigalow Belt (North and South) and Nandewar Bioregions
- the community of native species dependent on natural discharge of groundwater from the Great Artesian Basin.

Brigalow (*Acacia harpophylla* dominant and co-dominant) corresponded with remnant RE 11.9.5 in the Study Area. The listing of Brigalow (*Acacia harpophylla* dominant and co-dominant) under the EPBC Act does not automatically dismiss non-remnant vegetation, rather species composition and structural elements typical of that found in undisturbed areas of the listed Brigalow are determining factors. However, regrowth areas that has not regained the structure and species composition typical of remnant Brigalow (generally regrowth under 15 years), will not qualify as the listed Brigalow ecological community (Anon 2003). Significant areas of non-remnant vegetation identified in the road reserve along the

Roma Taroom Road are mature and correspond with this ecological community (refer Figure 5-1). However, these areas will not be affected by the proposed pipeline, either directly (i.e. through clearing) or indirectly.

Semi-evergreen vine thickets of the Brigalow Belt (North and South) and Nandewar Bioregions is considered likely to occur in the study area (Department of the Environment Water Heritage and the Arts 2008c), however no remnant vegetation consistent with the ecological community is mapped within the study area (Environmental Protection Agency 2005). Non-remnant vegetation mapped within the study area that was analogous with RE 11.9.4 however is consistent with the ecological community (refer Figure 5-1). These patches were however small, fragmented and highly modified in structure and composition.

The community of native species dependent on natural discharge of groundwater from the Great Artesian Basin (GAB) occurs around natural surface discharge points of aquifers in the Triassic, Jurassic and Cretaceous sedimentary sequence of the GAB. No such springs were identified in the study area and as such the community is unlikely to occur.

5.1.2 Threatened species

Five Threatened species of plant and eleven Threatened species of animal listed under the *Environment Protection and Biodiversity Conservation Act 1999* have been recorded or have the potential to occur within the proposed pipeline study area and surrounds based on the Department of the Environment, Water, Heritage and the Arts Protected Matters Search Tool (Department of the Environment Water Heritage and the Arts 2008c) (refer Attachments G and H).

Of these species, two species of plant and five species of animal have a moderate or greater chance of occurring (refer Table 5-1). One threatened species, the Brigalow Scaly-foot, was recorded.

Table 5-1: EPBC Act listed Threatened species predicted to occur in the Study Area

Name	Conservation status[1]	Likelihood of occurrence
Plants		
Eriocaulon carsonii	E	Low
Cadellia pentastylis	V	Low
Diuris tricolor (syn *Diuris sheaffiana*)	V	Moderate
Commersonia sp. Cadarga (G.P.Guymer 1642)	V	Low
*Homopholis belsonii**	V	High
Mammals		
Large-eared Pied Bat (*Chalinolobus dwyeri*)	V	Low
(Eastern) Greater Long-eared Bat (*Nyctophilus timoriensis*)	V	Moderate
Birds		
Australian Painted Snipe (*Rostratula australis*)	V	Moderate

Name	Conservation status[1]	Likelihood of occurrence
Black-breasted Button-quail (*Turnix melanogaster*)	V	Low
Squatter Pigeon (southern race) (*Geophaps scripta scripta*)	V	Moderate
Red Goshawk (*Erythotriorchis radiatus*)	V	Low
Star Finch (*Neochmia ruficauda ruficauda*)	E	Low
Reptiles		
Fitzroy Tortoise (*Rheodytes leukops*)	V	Low
Brigalow Scaly-foot (*Paradelma orientalis*)	V	Recorded
Yakka Skink (*Egernia rugosa*)	V	Low
Dunmall's Snake (*Furina dunmalli*)	V	Moderate

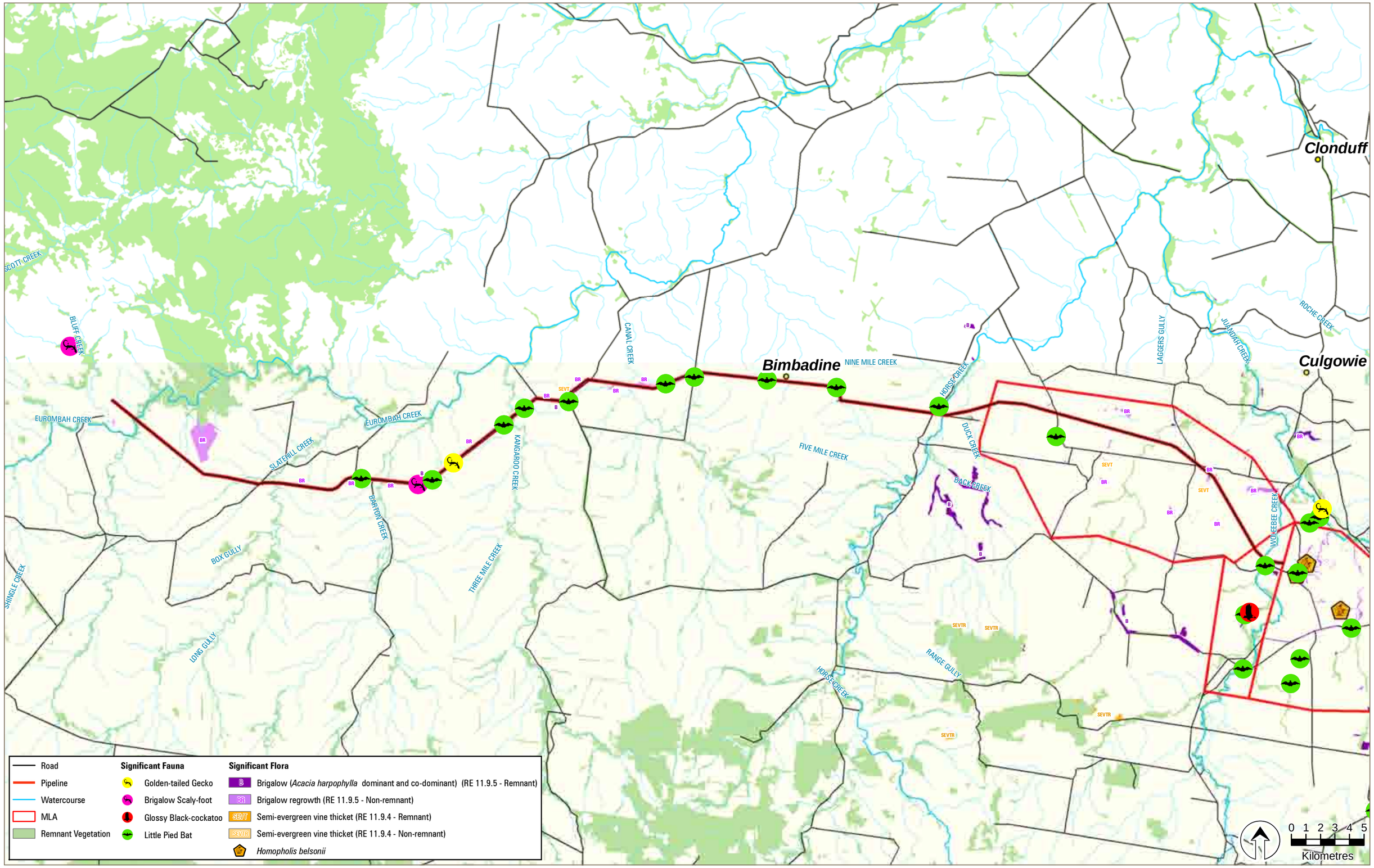
1. Conservation status. E = Endangered, V = Vulnerable (EPBC Act)
2. * *Homopholis bensonii* was not predicted to occur in the study area by the Protected Matters Search Tool (Department of the Environment Water Heritage and the Arts 2008c)

Homopholis bensonii was considered likely to occur based on the presence of RE 11.9.5 and non-remnant vegetation analogues with this RE in the Study Area. This species was detected at several locations within the MLA areas within non-remnant vegetation analogues with RE 11.9.5. Reference sites where the species was recorded in the MLA areas were visited prior to the commencement of the winter surveys and approximately 5% of specimens were in the early stages of inflorescence at that time (inflorescences are near essential to distinguish from other species of grass). As such, the survey period was not ideal for detecting this species and targeted surveys in late summer to early autumn would be required to detect the species if present.

The Vulnerable Brigalow Scaly-foot (*Paradelma orientalis*) was the only EPBC Act listed Threatened species of animal detected during the surveys undertaken for this assessment (refer Figure 5-1). One adult of this species was captured during active herpetofauna searches at Site 4. It was sheltering under fallen bark in association with non-remnant vegetation analogous with RE 11.9.5 (*Acacia harpophylla* and/or *Casuarina cristata* open forest on fine-grained sedimentary rocks) along the proposed western CSM water supply pipeline route. Other remnant and non-remnant vegetation analogous with RE 11.9.5 in the study area could potentially provide suitable habitat for this species.

The following Threatened species of animal listed under the EPBC Act were considered to have a moderate or high likelihood of occurring within the study area based on the presence of suitable roosting, foraging or breeding habitat:

- Dunmall's Snake (*Furina dunmalli*)
- Squatter Pigeon (southern race) (*Geophaps scripta scripta*)
- (Eastern) Greater long-eared bat (*Nyctophilus timoriensis*)
- Australian Painted Snipe (*Rostratula australis*).



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Source: Roads, QLD State Digital Road Network (2004); Towns, creeks 1:250k Topo, Geoscience Australia (2006)

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Figure 5-1

Threatened and Other Significant Biodiversity

5.1.3 Migratory species

Migratory species are those protected under international agreements to which Australia is a signatory. These include the *Japan Australia Migratory Bird Agreement* (JAMBA), the *China Australia Migratory Bird Agreement* (CAMBA), *Republic of Korea Australia Migratory Bird Agreement (RoKAMBA)* and the *Bonn Convention on the Conservation of Migratory Species of Wild Animals*. Migratory species are considered to comprise 'matters of national environmental significance' and are protected under the *Environment Protection and Biodiversity Conservation Act 1999*.

Two species of bird, the Great Egret and Cattle Egret recorded within the study area are recognised under the Migratory provisions of the *Environment Protection and Biodiversity Conservation Act 1999* (refer Attachment F). These species were recorded within the study area in association with wetlands (artificial) and farm dams. No nests consistent with these species were recorded during the survey. These species display nomadic habits with numbers probably fluctuating according to seasonal conditions.

A further 11 Migratory species were predicted to occur in the wider proposed pipeline study area and surrounds based on the Department of the Environment, Water, Heritage and the Arts Protected Matters Search Tool (refer Attachment D).

Although two Migratory species of bird were recorded and other Migratory species of bird may potentially utilise resources in the Study Area, the study area is not considered 'important habitat' as defined under the *EPBC Act Policy Statement 1.1 Principal Significant Impact Guidelines* (CSIRO 2001), in that the study area does not contain:

- habitat used by a Migratory species occasionally or periodically within a region that supports an ecologically significant proportion of the population of the species
- habitat used by a Migratory species that is at the limit of the species range
- habitat within an area where the species is declining.

It is therefore unlikely that the proposal would significantly affect Migratory species predicted to occur within the Study Area. As such, significant assessments for these species are considered unnecessary, with the exception of the Satin Flycatcher (*Myiagra cyanoleuca*). The study area occurs within the western limit of the distributional range for this species and consequently, habitat for this species within the study area would be considered important habitat as defined under the EPBC Act. Though not recorded within the study area during surveys, records of the species from the study area and surrounds was identified from the desk based assessment (see Attachment C). Subsequently an impact assessment was undertaken for this species and it concluded that the proposed pipeline would not have a significant impact on this species (see Attachment I).

5.1.4 World heritage properties

World heritage properties include sites of both cultural and/or environmental heritage that are either:

- an Australian property on the World Heritage List kept under the World Heritage Convention, or
- a property declared to be a World Heritage property by the Commonwealth Environment Minister.

No records of world heritage properties listed under the EPBC Act were identified from the Protected Matters Search Tool in the study area and surrounds.

Consideration has been given to the potential impacts of the proposed pipeline on The Great Barrier Reef, the world's largest World Heritage Area. While the proposed pipeline may affect water quality and/or flow along waterways within and immediately adjacent to the Study Area, it is unlikely these impacts would extend far enough to have any significant impacts on The Great Barrier Reef.

5.1.5 Ramsar wetlands

The study area is located in the same catchment as two declared Ramsar sites: the Shoalwater/Corio Bay Area and Narran Lake Nature Reserve. Both sites are situated several hundred kilometres downstream of the Study Area.

While the proposed pipeline may affect water quality and/or flow along waterways within and immediately adjacent to the Study Area, it is unlikely these impacts would extend far enough downstream to affect the aforementioned Ramsar sites.

5.2 Matters of state significance

5.2.1 Endangered and Of Concern Regional Ecosystems

Queensland's REs have been assigned both a vegetation management status and biodiversity status, as explained below.

- **Vegetation management status:** the statutory status of an RE as defined under section 22 of the VM Act is either Endangered, Of Concern or Not of Concern. This status is based on an assessment of the pre-clearing and remnant extent of a RE, and as listed in schedules 1-5 of the Vegetation Management Regulation 2000. The vegetation management status only applies to remnant vegetation.
- **Biodiversity status:** the non-statutory status of a RE is defined by the EPA as Endangered, Of Concern or Not of Concern at Present. This status is based assessment of the condition of remnant vegetation in addition to the pre-clearing and remnant extent of a regional ecosystem. Although not the statutory status of the RE, the biodiversity status should be used as a guide for decision making.

Five REs within the study area have a VM Act status of Endangered or Of Concern (see Table 5-2 and Figure 5-1). Of these only two are present with remnant status (see Table 5-2).

Table 5-2: Endangered or Of Concern REs in the Study Area

RE Code	RE short description	VM Act status	Remnant vegetation recorded in the Study Area
11.3.2	*Eucalyptus populnea* woodland on alluvial plains	Of Concern	Yes
11.9.4	Semi-evergreen vine thicket on fine grained sedimentary rocks	Endangered	No
11.9.5	*Acacia harpophylla* and/or *Casuarina cristata* open forest on fine-grained sedimentary rocks	Endangered	No
11.9.7	*Eucalyptus populnea, Eremophila mitchellii* shrubby woodland on fine-grained sedimentary rocks	Of concern	Yes
11.9.10	*Acacia harpophylla*, *Eucalyptus populnea* open forest on fine-grained sedimentary rocks	Of concern	No

5.2.2 Threatened flora of State significance

Two Threatened plant species listed under the NC Act were identified from the desk-based assessment: *Eriocaulon carsonii* subsp. *orientale* and *Cadellia pentastylis* (refer Attachment G). *Homopholis belsonii* was also considered as this species as it was recorded in Brigalow regrowth (non-remnant vegetation analogous with RE 11.9.5) in the MLA areas as given in Volume 1 technical report TR 17A-1-V1.5.

No threatened species of plant listed under the NC Act were recorded in the study area during the winter 2008 survey period.

Eriocaulon carsonii subsp. *orientale* and *Cadellia pentastylis* were considered unlikely to occur due to lack of suitable habitat within the study area (refer Attachment E). *Homopholis belsonii* was however, considered likely to occur based on the presence of RE 11.9.5 and non-remnant vegetation analogues with this RE (Brigalow regrowth). This species has been detected at several locations within the Wandoan Coal Project MLA areas, within non-remnant vegetation analogues with RE 11.9.5. For the winter surveys reference sites where the species was recorded in the MLA were visited prior to the commencement of the winter surveys and approximately 5% of specimens were in the early stages of inflorescence at that time (inflorescences are near essential to distinguish from other species of grass). As such, the winter survey period is not considered ideal for detecting this species.

5.2.3 Threatened fauna of State significance

Sixteen Rare or Threatened species of animal listed under the NC Act were considered likely to occur within the study area and surrounds based on likelihood-of-occurrence assessment (refer Table 5-3 and Attachment C). Three of these species were detected within the study area during the field surveys undertaken for this assessment (see Attachment H).

Table 5-3 Threatened and rare species of animal predicted to occur within the study area

Name	Conservation status[1]		Likelihood of occurrence
	State	Priority Taxa	
Rough Frog (*Cyclorana verrucosa*)	R	Yes	Moderate
Dunmall's Snake (*Furina dunmalli*)	V	Yes	Moderate
Brigalow Scaly-foot (*Paradelma orientalis)*	V	Yes	High (recorded)
Golden-tailed Gecko (*Strophurus taenicauda*)	R	Yes	High (recorded)
Freckled Duck (*Stictonetta naevosa*)	R	Yes	Moderate
Cotton Pygmy-goose (*Nettapus coromandelianus*)	R	Yes	Moderate
Grey Falcon (*Falco hypoleucos*)	R	Yes	Moderate
Square-tailed kite (*Lophoictinia isura*)	R	Yes	Moderate
Black-necked stork (*Ephippiorhynchus asiaticus*)	R	Yes	High
Squatter Pigeon (southern race) (*Geophaps scripta scripta*)	V	Yes	Moderate
Pink Cockatoo (*Cacatua leadbeateri*)	V	Yes	Moderate
Glossy Black-cockatoo (*Calyptorhynchus lathami)*	V	Yes	Moderate
Black-chinned Honeyeater (*Melithreptus gularis*)	R	Yes	Moderate
Painted Honeyeater (*Grantiella picta*)	R	Yes	Moderate
Little Pied Bat (*Chalinolobus picatus*)	R	Yes	High (recorded)
Eastern Long-eared bat (*Nyctophilus timoriensis*)	V	Yes	Moderate

[1] Conservation significance: State – E = Endangered, V = Vulnerable, R = Rare (*NC Act*). Priority taxa as identified by the Brigalow Belt South Flora Expert Panel (Environmental Protection Agency and Environmental Planning Southwest Queensland 2002a).

5.3 Matters of Regional significance

5.3.1 Biodiversity Planning Assessment (BPA)

The Biodiversity Assessment and Mapping Methodology (Environmental Protection Agency 2002) has been prepared to provide a consistent approach for assessing biodiversity values at the landscape scale in Queensland. The Biodiversity Planning Assessment (BPA) draws upon EPA remnant vegetation mapping and database information and incorporates information about Threatened ecosystems or taxa, large tracts of habitat in good condition, ecosystem diversity, landscape context and connection as well as buffers to wetlands or other types of important areas for ecological processes. BPA areas are assigned one of three biodiversity significance levels:

- state significance – areas assessed as being significant for biodiversity at the bioregional or state scales

- regional significance – areas assessed as being significant for biodiversity at the sub-bioregional scale
- local significance and or other values – local values that are of significance at the local government scale.

A number of areas of regional and state significance exist in the Study Area. These correspond with remnant vegetation along Mud Creek (within the MLA areas), Horse Creek, Eurombah Creek and several of its tributaries (refer Figure 5-2).

5.3.2 Priority taxa

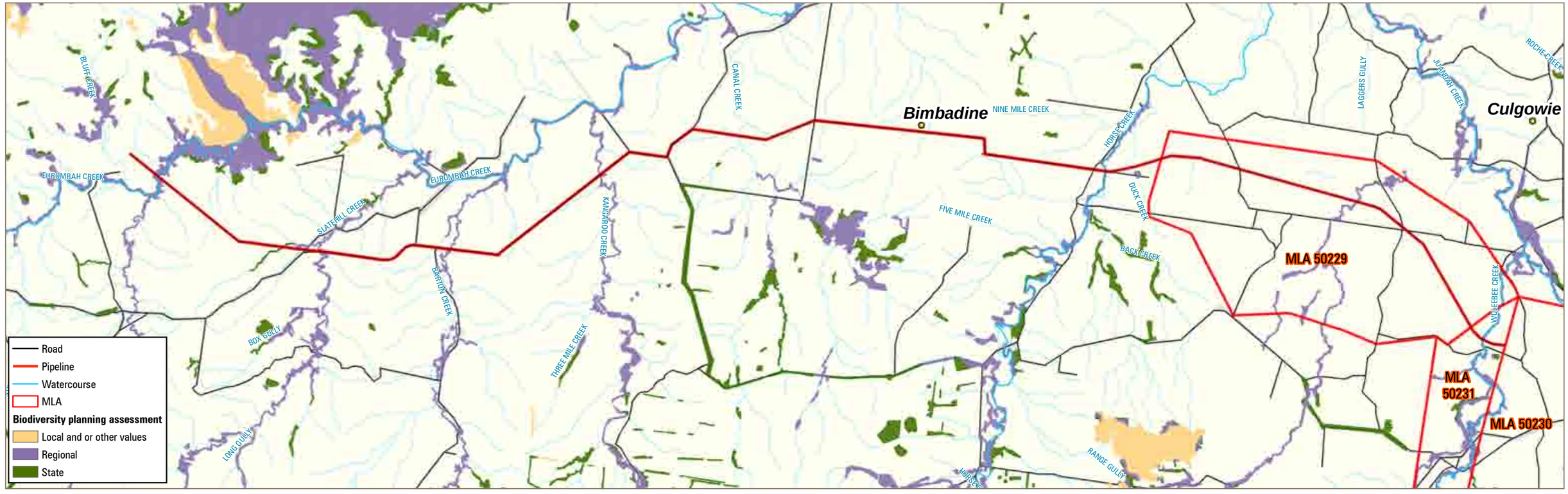
Under the Biodiversity Assessment and Mapping Methodology (Environmental Protection Agency 2002), expert panels are convened to review and refine the results of initial determination of significance of the Biodiversity Planning Assessment framework (Environmental Protection Agency and Environmental Planning Southwest Queensland 2002a, 2002b) at a Bioregional scale. These panels provide recommendations in relation to habitat for Threatened species (referred to by the expert panel as EVR Taxa) and Essential habitat for priority taxa (see Glossary for definition of Priority taxon).

Priority taxa of plant

Two priority taxa species of plant for the Brigalow Belt South (Environmental Protection Agency and Environmental Planning Southwest Queensland 2002a) were recorded in the Study Area: *Acacia melvillei* and *Swainsona swainsonioides*. *Acacia melvillei* was recorded in patches of 11.9.5 and 11.9.6 (remnant and regrowth) while *Swainsona swainsonioides* was recorded infrequently in areas of non-remnant vegetation that was analogous with an RE (cleared areas). The location of these species will be mapped as a priority of the summer seasonal survey.

Priority taxa of animal

Thirty-three non-Threatened Priority taxa species of animal for the Brigalow Belt South (Environmental Protection Agency and Environmental Planning Southwest Queensland 2002a) were considered likely to occur within the study area and surrounds based on likelihood-of-occurrence assessment (refer Attachment C). Eight of these species were detected within the study area during the field surveys undertaken for this assessment and one species was recorded in MLA 50229 during surveys of the MLA (see Table 5-4).



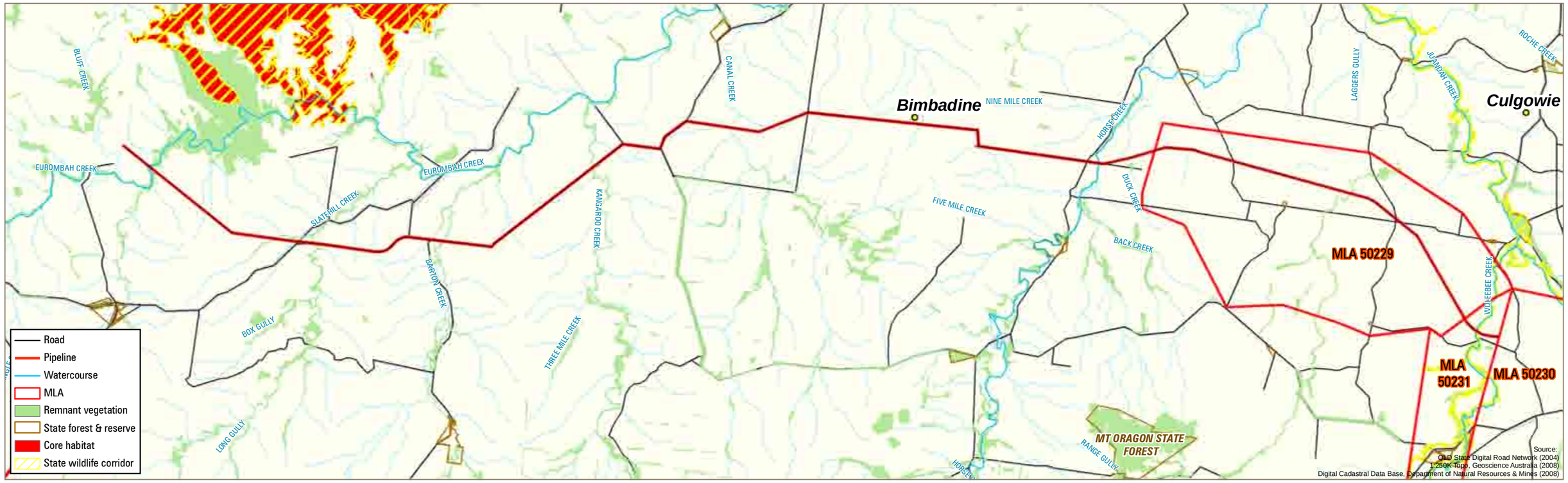


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Figure 17A-4-V3.3

State Wildlife Corridors, Core Habitats and Biodiversity Planning Assessment

Table 5-4: Priority taxa species of animal

Name	Conservation status[1]		Likelihood of occurrence
	State	Priority Taxa	
Salmon-striped Frog (*Limnodynastes salmini*)	—	Yes	High
Broad-shelled River Turtle (*Chelodina expansa*)	—	Yes	Moderate
Macquarii/ Krefft's Turtle (*Emydura macquarii/ krefftii*)	—	Yes	High (recorded during MLA surveys)
Leaden Delma (*Delma plebeia*)	—	Yes	High
Ctenotus skink (*Ctenotus ingrami*)	—	Yes	Moderate
Shingleback Lizard (*Trachydosaurus rugosus asper*)	—	Yes	High (recorded)
Striped Skink (*Ctenotus ingrami*)	—	Yes	Moderate
Jacky Lizard (*Amphibolurus muricatus*)	—	Yes	Moderate
Eastern Water Dragon (*Physignathus lesueurii*)	—	Yes	Moderate
Pale-headed Snake (*Hoplocephalus bitorquatus*)	—	Yes	High
Spotted Black-snake (*Pseudechis guttatus*)	—	Yes	Moderate
Carpentaria Snake (*Rhinoplocephalus boschmai*)	—	Yes	High
Bush Stone-curlew (*Burhinus grallarius*)	—	Yes	High
Barking Owl (*Ninox connivens*)	—	Yes	Moderate
Grass Owl (*Tyto capensis*)	—	Yes	High (recorded)
Speckled Warbler (*Chthonicola sagittata*)	—	Yes	High
White-browed Babbler (*Pomatostomus superciliosus*)	—	Yes	Moderate
Grey-crowned Babbler (*Pomatostomus temporalis*)	—	Yes	High (recorded)
Hooded Robin (*Melanodryas cucullata*)	—	Yes	Moderate
Diamond Firetail (*Stagonopleura guttata*)	—	Yes	Moderate
Yellow-bellied Glider (southern subspecies) (*Petaurus australis*)	—	Yes	Moderate
Northern Brown Bandicoot (*Isoodon macrourus*)	—	Yes	High (recorded)
Rufous Bettong (*Aepyprymnus rufescens*)	—	Yes	High
Black-striped Wallaby (*Macropus dorsalis*)	—	Yes	High (recorded)
Koala (*Phascolarctos cinereus*)	—	Yes	High
Greater Glider (*Petauroides volans*)	—	Yes	High
Squirrel Glider (*Petaurus norfolcensis*)	—	Yes	Moderate
Yellow-bellied Glider (*Petaurus australis*)	—	Yes	Moderate
Common Ringtail Possum (*Pseudocheirus peregrinus*)	—	Yes	Low

Name	Conservation status[1]		Likelihood of occurrence
	State	Priority Taxa	
Common Brushtail Possum (*Trichosurus vulpecula*)	—	Yes	High (recorded)
Little bent-wing Bat (*Miniopterus australis*)	—	Yes	Moderate
Eastern Bent-wing Bat (*Miniopterus schreibersii oceanensis*)	—	Yes	High (recorded)
Central Eastern Broad-nosed Bat (*Scotorepens sp.*)	—	Yes	Moderate
Inland Forest Bat (*Vespadelus baverstocki*)	—	Yes	Moderate

1. Conservation significance: Priority taxa as identified by the Brigalow Belt South Flora Expert Panel (EPA, 2002).

5.3.3 Other regionally significant species

The Little Forest Bat (*Vespadelus vulturnus*) was recorded in the western section of the study area from capture in a harp trap along Slatehill Creek. This species was not detected during Anabat surveys across the broader study area and it has only been recorded from surveys further to the east near Wandoan, and south towards Gurulmundi and Miles (Lewis 2008). The Little Forest Bat (*Vespadelus vulturnus*) is considered regionally significant due to its occurrence at or beyond the northern distributional limit for this species.

5.3.4 Essential habitat mapping

Essential habitat is mapped by the EPA under the Biodiversity Planning Assessment framework (Environmental Protection Agency 2003) and are used by Queensland Department of Natural Resources and Water (NRW) in determination of applications to clear vegetation.

Essential habitat is an area or location with essential resources for the maintenance of populations of Priority taxa (which includes Threatened and non-Threatened species of regional significance) (Environmental Protection Agency 2002). Essential Habitat may be defined from known records or considered potential according to expert knowledge of habitat relationships. Essential Habitat is considered known where the taxon is present (based on accurate records) and there are indications of reproduction, or where a significant number of individuals are present, or important resources (such as nest sites, roost caves, major food sources) are present, or where important movement corridors for breeding and/or non-breeding (including Migratory) individuals have been identified. Alternatively, Essential Habitat is considered possible where there exists suitable habitat of a size capable of supporting one or more breeding units, and important resources (such as nest sites, roost caves, major food sources) are present, or the area is proximal to populations, or may act as a potentially important corridor.

The study area does not traverse areas of essential habitat (see Figure 5-2). A large area of essential habitat is located to the north of Spring Gully in association with sandstone country. This essential habitat will not be affected by the proposed pipeline.

5.3.5 State wildlife corridors

A review of the state wildlife corridor mapping (Environmental Protection Agency 2004b) identified vegetation along Woleebee Creek (within the MLA areas) as forming part of a state wildlife corridor that will be cross in by the proposed pipeline (refer Figure 4-4). This corridor corresponds broadly with a bioregional wildlife corridor mapped under the Biodiversity Planning Assessment (Environmental Protection Agency 2003). Directional drilling to cross this drainage line should avoid impacts to this state wildlife corridor.

6. Potential impacts

This chapter describes the potential impacts of the proposed pipeline on the terrestrial biological environment. Management measures to avoid, remedy and mitigate these potential impacts are discussed in Section 7.

6.1 Loss of vegetation and habitats (land clearance)

The proposed pipeline will result in the loss of vegetation and associated habitats. Clearing of native vegetation has been avoided where possible through the pipeline route selection and preliminary design process. The majority of remnant and non-remnant vegetation in the study area occurred within the road reserve of Roma Taroom Road. As such, the proposed alignment has been located into adjoining private properties to the north of the road reserves. These properties are largely cleared of remnant vegetation and regrowth and are of low ecological value. In addition, impacts to riparian vegetation will be avoided through the use of directional drilling techniques (as opposed to trenching in other areas) in order to cross drainage lines.

Nonetheless, total avoidance of vegetation clearing is not possible and 9.7 ha of woodland vegetation and associated fauna habitat will be cleared as a result of the proposed pipeline based on clearing of a 20 m wide corridor for construction (refer Table 6-1). This value includes 0.6 ha of Semi Evergreen Vine Thickets as listed under the EPBC Act.

The extent may be further reduced through the detailed design phase and further examination of the RE mapping.

All patches of remnant RE 11.9.5 and non-remnant revegetation consistent with the Brigalow (*Acacia harpophylla* dominant co-dominant) Endangered ecological community have been avoided and it is unlikely that there will be any indirect impacts on this community.

Loss of vegetation has potential to result in a range of direct and indirect impacts to vegetation communities and species of plant and animal including:

- reduction in the extent of vegetation communities and associated habitats
- loss of local populations of individual species
- fragmentation of remnants of vegetation communities or local populations of individual species
- reduction in the viability of ecological communities resulting from loss or disruption of ecological functions
- destruction of flora and fauna habitat and associated loss of biological diversity (habitat removal may include removal of hollow bearing trees, loss of leaf litter layer, and result in changes to soil biota)
- riparian zone degradation
- increased habitat for invasive species.

Table 6-1: Potential vegetation clearing due to western CSM water supply pipeline

RE Code	Qld VMA status	Remnant	Non-remnant	Total
11.3.2	OC		2.7	27
11.3.25	NoC	1.3	<0.1	1.3
11.9.4	E		0.6	0.6
11.9.5*	E		2.1	2.1
11.9.7	OC		0.5	0.5
11.9.10	OC	1.4	0.2	1.6
11.10.9	NoC		0.8	0.8
Total		**2.7**	**7.0**	**9.7**

Notes: R = Remnant, NR = non-Remnant, NoC = Not of Concern, OC = Of Concern, E = Endangered. Borderline remnant status has been included in the non-remnant category. * All RE 11.9.5 (remnant and non-remnant) consistent with the Brigalow (*Acacia harpophylla* dominant and co-dominant) endangered ecological community (under the EPBC Act) have been avoided.

6.2 Habitat fragmentation and barrier effects

Habitat fragmentation is the division of a single area of habitat into two or more smaller areas, with the occurrence of a new habitat type in the area between the fragments (Andren 1994; Ford *et al.* 2001). This new dividing habitat type is often artificial and inhospitable to the species remaining within the fragments. Although the newly created habitat is generally used by some species, those species are usually generalists and are often considered aggressive, further decreasing population levels of the species remaining in the fragments. In addition to the loss of total habitat area, the process of fragmentation can impact on species within the newly created fragments in a number of ways, including barrier effects, genetic isolation and edge effects. The degree to which these potential impacts affect the flora and fauna within the newly created fragments depends on a number of variables, including distance between the fragments, local environmental conditions, the species present and mitigation measures. Some of the potential impacts are summarised below:

- **Barrier effects:** Barrier effects occur where particular species are either unable or unwilling to move between suitable areas of fragmented habitat. This could result in either a complete halt to movement or reduced level of movement between fragments.
- **Genetic Isolation:** Genetic isolation occurs where individuals form a population within one fragment are unable to interbreed with individuals from populations in adjoining fragments. Genetic isolation can lead to inbreeding and genetic drift problems for populations isolated within a fragment.
- **Edge effects:** Edge effects are where a zone of changed environmental conditions (i.e. altered light levels, wind speed and/or temperatures) occurs along the edges of habitat fragments.

Cleared areas present a barrier to the movement of some species that occur in woodland habitats (Bennett & Radford 2004; Radford & Bennett 2007). Much of the study area however is already highly cleared as a result of past land uses and the remaining vegetation and associated habitats are fragmented. Many of the species that occur in these habitats are generally species that are tolerant to habitat fragmentation and are unlikely to be further disturbed by further habitat fragmentation resulting from the proposed pipeline (i.e. introduced House mouse).

Significant species that would be sensitive to further fragmentation were also recorded in the Study Area, such as the Brigalow scaly-foot (*Paradelma orientalis*). As such, the alignment has been modified to avoid impacts to areas of known of potential habitat for this species. For these species, the effect of fragmentation is likely to be temporary during construction only. Following construction the footprint will be rehabilitated and is unlikely to form a permanent barrier to woodland dependant species.

6.3 Edge effects

Edge effects are zones of changed environmental conditions (i.e. altered light levels, wind speed and/or temperature) occurring along the edges of habitat fragments. These new environmental conditions can promote the growth of different vegetation types (including weeds) and allow invasion by pest animals specialising in edge habitats. Edge zones can be subject to higher levels of predation by introduced mammalian predators and native avian predators. The distance of edge effects can vary, with edge effects in roads having been recorded at distances greater than 1,000 m from the road surface (Forman et al. 2000). However in a comparison of edge effects in a variety of different habitat types, Bali (2000; 2005) estimated that average edge effects in roads generally occur up to 50 m away from the road edge.

Habitats within the study area are already highly fragmented as a result of past land uses practices. The small patches of remnant vegetation and regrowth in the road reserves and along the creeks are already subject to edge effects and addition clearing across these habitats will not result in the introduction of new or novel edge effects.

6.4 Mortality

Clearing of native vegetation results in direct mortality of plants and less mobile animals in the areas being cleared. This would directly impact any Threatened species occurring in the areas cleared.

Fauna injury or death has the greatest potential to occur during the construction phase when vegetation and habitats are being cleared. While some mobile species, such as birds, may be able to move away from the path of clearing, other species that are less mobile, or those that are nocturnal and restricted to tree hollows may find it difficult to move rapidly to adjoining areas of suitable habitat. Threatened species that could be affected by the clearing include microchiropteran bats and the Brigalow Scaly Foot.

There may also a chance of animals entering the pipeline trench during construction and being trapped. This would particularly be the case for ground-dwelling fauna including reptiles, amphibians and small mammals.

6.5 Weeds and pest species

Forty-eight species of weed were recorded in the study area (refer Attachment E). Amongst these were two declared plants as listed under the *Land Protection (Pest and Stock Route Management) Act 2002*: **Opuntia stricta* (Prickly Pear) and **O. tomentosa* (Velvet Tree Pear). Several other exotic species are known from the region but were not encountered. Field surveys to be performed during more optimal conditions, such as late summer/early autumn 2009 may reveal the presence of certain herbaceous and graminoid species, particularly **Parthenium hysterophorus* (Parthenium Weed) which is also a Class 2 pest.

The construction and operation of the proposed pipeline has the potential to disperse weeds into areas of remnant vegetation where weed species are currently limited. The most likely causes of weed dispersal associated with the proposal would include earthworks, movement of soil and attachment of seed (and other propagules) to vehicles and machinery. This may, in turn, reduce the habitat quality of the sites for vegetation within the Study Area. However, the study area already has weed growth therefore, the overall extent of habitat modification is not likely to increase significantly.

Eight species of introduced animals were recorded in the study area (refer Table 6-2). Amongst these were five declared pest species listed under the *Land Protection (Pest and Stock Route Management) Act 2002*. These pest species are all listed under Class 2, which are pests that are established in Queensland and have, or could have, a substantial adverse economic, environmental or social impact. Management of these pests requires coordination and they are subject to programs led by local government, community or landowners. Landowners must take reasonable steps to keep land free of Class 2 pests.

Table 6-2: Pest animals recorded in the Study Area

Common name	Species	Declared animal class[1]
Cane Toad	*Rhinella marinus* (listed as *Bufo marinus*)	Non-declared animal
Dingo/Wild Dog	*Canis lupus dingo*	Class 2
Red Fox	*Vulpes vulpes*	Class 2
Feral Cat	*Felis catus*	Class 2
Brown Hare	*Lepus capensis*	Non-declared animal
Rabbit	*Oryctolagus cuniculus*	Class 2
House Mouse	*Mus musculus*	Non-declared animal
Feral Pig	*Sus scrofa*	Class 2

1. Declared animal classes as listed under the *Land Protection (Pest and Stock Route Management) Act 2002.*

It is likely that the pest species recorded in the study area already exist in vegetation and habitats surrounding the Study Area, as such the proposal is unlikely to result in the establishment of pest species into areas where they are currently limited. However, the dispersion of these species may result on increase predation or competition pressures on native wildlife in area into which they re-establish.

6.6 Noise and dust

During construction of the pipeline there will be increased noise in the local area for a short period of time. This may cause disturbance for fauna in the area, although given the proximity of the pipeline to existing roads, it is expected that the impact of this would be minor. Access for maintenance vehicles may cause intermittent disturbance, however, as the pipeline predominantly follows existing roads, the impacts associated with this are likely to be minor.

Dust also has potential to impact surrounding vegetation and fauna habitats during construction. This impact is likely to be temporary and reversible following rehabilitation of the footprint.

6.7 Cumulative impacts

The potential biodiversity impacts of the proposed pipeline have been considered as a consequence of the construction and operation of the proposed pipeline within the existing environment. The incremental effect of multiple sources of impact (past, present and future) are referred to as 'cumulative impacts' (Contant & Wiggins 1991; Council on Environmental Quality 1978) and provide an opportunity to consider the proposed pipeline within a strategic context. This is necessary so that impacts associated with the proposed pipeline and other activities within the region are examined collectively.

Potential developments in the nearby area that may interact with the construction of the proposed pipeline include:

- other mines that may be opened in the future in the region
- the coal transport corridor for the Project.

All such developments are likely to contribute to a greater extent of vegetation clearing in the region and a further fragmentation of habitat.

6.8 Operation of the pipeline

There is a small chance of fauna mortality during the operation of the pipeline through vehicle collision from maintenance vehicles. Generally, rates of vehicle strike mortality are directly proportional to the distance of native vegetation/fauna habitat crossed by a project (Foreman *et al.* 2003) and the number of vehicles present. Considering the nature of the proposed pipeline, this impact is likely to be very low.

7. Mitigation measures

A general principle of environmental management is to, in order of preference:

- avoid environmental impacts
- reduce impacts
- mitigate the impacts
- as a last resort, once the above options have been investigated, compensate for the residual impacts using offsets.

These principles would be followed, where possible, for the western CSM water supply pipeline.

7.1 Avoiding environmental impacts

Avoiding environmental impacts has been considered where possible throughout the route selection, planning and design phases. There will also be ongoing opportunities to further avoid impacts at a local scale through the detailed design process.

The winter survey of the study area identified significant areas of non-remnant vegetation that was moderate to good condition and consistent with the Brigalow (*Acacia harpophylla* dominant and codominant) endangered ecological community listed under the EPBC Act within the road corridor along the Roma Taroom Road. Brigalow regrowth in the Goldens Bimbadeen Road reserve was also identified, although not consistent with the ecological community as listed under the EPBC Act. Brigalow Scaly Foot, a Threatened species, was also identified in the non-remnant vegetation within the Roma Taroom Road reserve. As such, the proposed alignment of the western CSM water supply pipeline was moved to the north of the road reserves in adjoining private properties which are already cleared.

7.2 Management of the mitigation process

The mitigation measures associated with the proposed pipeline are discussed below in general terms. As part of the detailed design, and prior to the start of construction, more detailed mitigation measures should be developed and presented in a biodiversity management plan relating to the construction and operation of the pipeline. The plan should include:

- detailed design of mitigation measures such as fencing (as required)
- general impact mitigation
- staff/contractor inductions and continuing education of staff
- pre-clearing surveys and fauna salvage/translocation
- rehabilitation and restitution of adjoining habitat
- weed control
- pest management

- rehabilitation protocols
- monitoring.

The plan will include clear objectives and actions for the pipeline including:

- minimise human interferences to flora and fauna
- minimisation of vegetation clearing/disturbance
- minimise impact to Threatened species and communities
- minimise impacts to aquatic habitats and species
- ongoing monitoring of impacts on flora and fauna.

The biodiversity management plan will be prepared prior to construction and detail the mitigation measures and required actions. This biodiversity management plan developed for the proposed pipeline will be an important document for the fauna/spotter catcher and aid in enacting the 'avoid and mitigate' principles during construction phase. The biodiversity management plan would include detailed information such as feral animal and pest control, monitoring activities and further detailed design measures (Refer to Table 7-1).

Table 7-1: Summary of mitigation measures

Mitigation measure	Design	Construction	Operation
▪ Further survey is required to increase the likelihood of detecting Rare and Threatened species in the study area and surrounds.	Y		
▪ Refine alignment of pipeline in light of biological knowledge and design constraints in accordance with this report.	Y		
▪ Utilise trenchless technology to cross drainage lines. Directional drilling launch and receiving pad areas should be carefully planned in order to avoid removal of mature trees. If this is not possible, the number of trees to be affected should be minimised. It is envisaged, however, that any directional drilling should take place from within the cleared easement.	Y	Y	
▪ Prepare and implement a biodiversity management plan.	Y	Y	Y
▪ Provide for designated areas in cleared and degraded land for stockpiles and equipment lay-down to minimise the overall impact of construction and avoid unnecessary vegetation and habitat removal.	Y	Y	
▪ Conduct staff/contractor inductions on site by the ecologist/fauna spotter catcher or environmental advisor.		Y	
▪ Implement dust suppression during construction.		Y	
▪ Implement appropriate erosion and sediment control strategies.		Y	
▪ Utilise preferred seed mixes for revegetation works, ideally to be collected from the study area and surrounds.		Y	
▪ Develop procedure for specific targeted species searches for those Threatened species and Priority taxa considered to have potential to occur prior to any staged development. If located, consideration should be given to translocation of individuals according to guidelines from the Australian Network for Plant Conservation (Vallee *et al.* 2004) or fauna guidelines such as those in the Nature Conservation (Koala Conservation) Plan 2006 (Environmental Protection Agency & Queensland Parks and Wildlife Service		Y	Y

Mitigation measure	Design	Construction	Operation
2005).			
▪ Prepare weed and feral animal management plans, including vehicle washdown procedures to limit edge effects such as the establishment of aggressive weeds, and the spread of annual and perennial exotic herbs.		Y	Y
▪ Pre-clear the disturbance areas prior to construction activities commencing in co-ordination with a trained ecologist or other qualified environmental specialist in order to: ‣ mark the limits of clearing in sensitive areas (e.g. Endangered and Of concern REs) to avoid unnecessary vegetation and habitat removal ‣ place transportable habitat features such as large logs and boulders in adjacent retained areas to allow their continuation as potential fauna refuge sites ‣ implement pre-clearing surveys for fauna. Pre-clearing involves removal of the understorey and smaller non-hollow bearing trees in order to disturb fauna and encourage them away from the clearing area.		Y	
▪ Except for trenching, vegetation clearing should involve only the removal of above-ground plant parts, with root systems and the soil profile left undisturbed.		Y	
▪ Areas not necessary for the operation of the pipeline should be rehabilitated in a progressive manner as construction proceeds. Revegetate areas to improve habitat value and visual amenity, including: ‣ planting of a range of locally occurring native shrubs, trees and groundcover plants, in keeping with the former vegetation types present. Choice of species would be in consultation with the Environmental Protection Agency (EPA) and should include Allocasuarina, Eucalyptus, Angophora and Corymbia species to compensate for any impacts to habitat of the Koala and other hollow dependant species ‣ increasing the overall vegetation cover within the proposed pipeline alignment area ‣ incorporating existing natural vegetation where possible ‣ linking vegetation remnants ‣ focusing on riparian vegetation to protect waterways ‣ excluding stock from rehabilitated areas		Y	Y
▪ Soil that may contain seeds of exotic species should be stockpiled away from drainage lines, and vegetated areas and weed-free soil stockpiles. Weed infested stockpiles would be covered to eliminate the spread of the soil and seed during rainfall and high wind events.		Y	
▪ No materials, spoil or machinery should be stored or parked within the drip-line of any trees.		Y	
▪ The amount of open trenching should be generally limited to 100 m per crew at any one time.	Y	Y	
▪ Trenches should be backfilled so as to cover as much open trench as practicable by the end of each day's work. If this is not possible, the ends of the open trenches would be graded to allow escape for any animals that may venture into the trench. Open trenches should be inspected each morning and any trapped animal removed by someone experienced in handling animals.		Y	

Mitigation measure	Design	Construction	Operation
animals.			
▪ Implement a flora and fauna monitoring program (as part of the greater Wandoan Coal Project flora and fauna monitoring program) aiming to better understand and manage impacts and rehabilitation actions to flora and fauna throughout the Study Area. Monitoring would also include exotic weeds and feral animals. The detailed monitoring plans would be incorporated into the biodiversity management plan for the Wandoan Coal Project.		Y	Y

7.2.1 Vegetation and habitat loss

Disturbance to areas of native vegetation and habitat has been avoided as far as possible through the route selection process and the use of direction drilling (or other trenchless pipe laying technology) to cross drainage lines. Nonetheless, total avoidance of remnant and regrowth vegetation, and associated habitats, is not possible.

Remnant and regrowth vegetation of moderate to high conservation significance should be identified as sensitive areas that are 'no-go' areas. These areas should be marked on maps provided to contractor staff, as well as on the ground using suitable fencing. No direct disturbance should occur in these areas, including vehicle access. A trained ecologist should accompany clearing crews in order to ensure disturbance in sensitive areas is minimised. The adoption of these measures will limit the extent of habitat disturbance, prevent soil compaction and damage to trees.

Temporary works area, such as access tracks or plant and material stockpile areas, should be located so as to minimise further impacts to the ecological values of the local area. These should adopt the following performance objectives:

- no vegetation communities listed as Endangered at either the national or state level should be affected outside of the 20 m construction corridor
- impacts on state listed vegetation "of concern" should be minimised
- fragmentation of remnants of vegetation/habitat should be avoided and where possible disturbance would be located at the edge of existing remnants
- where possible, access tracks and other infrastructure should be located in already disturbed areas.

Rehabilitation and revegetation of disturbed areas should be undertaken following construction to rehabilitate ecological values where possible (in areas dominated by remnant and regrowth vegetation prior to construction) or to mitigate erosion and sediment control issues in other areas (such as paddocks). The majority of the study area would be rehabilitated with pasture grasses to return it to the current condition and land use.

Revegetation should occur where impacts to remnant vegetation or other moderate to good quality non-remnant vegetation occurs. Revegetation in the areas of ecological value should aim to enhance the suitability of the site for wildlife (within operational safety bounds) and should follow the principles of at the site, block and landscape levels (Bennett *et al.* 2000):

Actions at the site level

- Use locally indigenous plant species.
- Match plant species to the landform.
- Establish natural layers in the vegetation.
- Fine-scale patchiness of vegetation:
  - promote patchiness of vegetation by planting.
- Provide ground-layer components as resources for wildlife:
  - ground-layer components assist restoration of ecosystem processes.
- Management of vegetation:
  - manage the composition and structure of revegetated habitats
  - control disturbance and degradation.

Habitats at the block level

- Size:
  - establish larger blocks for large populations
  - ensure habitats meet the area requirements of particular species
  - create large patches for diverse animal communities.
- Shape:
  - increase width to reduce edge effects
  - design the shape and width of revegetation to meet species' requirements.
- Location of blocks:
  - position revegetation to increase opportunities for recolonisation
  - build on to existing natural vegetation
  - locate new habitats away from known sources of disturbance.
- Manage for diversity of vegetation.

Planning and design at the landscape level

- The amount of suitable habitat in the landscape:
  - increase the total area of suitable habitat in the landscape
  - establish multiple populations
  - provide for species that use different habitats.
- Enhance connectivity in the landscape:
  - achieve connectivity by different configurations of habitat
  - give priority to streams and watercourses as natural corridors
  - recognise different kinds of movements through links.
- Ensure representation of ecosystems:
  - re-establish poorly represented habitats

- restore remnants of depleted vegetation types.

7.3 Mortality

Where clearing of vegetation and fauna habitats will take place, clearing protocols should be put in place, including preparing an inventory of significant habitat trees and hollows to be removed, and checking hollow-bearing trees for the presence of bird nests and arboreal animals, such as possums, glider and bats, prior to felling or pushing. Animals found to be occupying trees should be safely removed where possible before the clearing of trees. A qualified ecologist should relocate removed animals locally into nearby habitat. The ecologist should be trained as a Koala spotter as required under the NC Act.

7.4 Offsets

Residual impacts are those that remain after implementation of the proposed pipeline and all associated mitigation and other environmental management measures have been undertaken. Residual impacts for this proposed pipeline include the removal of 9.7 ha of vegetation and habitat. Where there is residual loss or degradation of vegetation and habitat after detailed design, and determination of mitigation measures, compensation in the form of compensatory habitat, land rehabilitation and/or contribution to research can be employed (i.e. offsets).

Green offsets for the proposed pipeline should be developed following consultation with EPA and DEWHA and giving consideration to relevant state and Commonwealth policy relating to offsets (outlined below).

Queensland Government Environmental Offsets Policy

The Queensland Government Environmental Offsets Policy aims to provide a supporting framework for environmental offsets in Queensland including principles and guidelines for using environmental offsets and guidance on when offsets should be uses. The Queensland Government Environmental Offsets Policy applies to decisions on development approvals under a range of approval processes including the IP Act, SDPWO Act and the EP Act.

The Queensland Government Environmental Offsets Policy outlines seven principles for seven policy principles that direct the way offsets must be used to contribute to environmental sustainable development (ESD) as follows:

1. Offsets will not replace or undermine existing environmental standards or regulatory requirements, or be used to allow development in areas otherwise prohibited through legislation or policy.
2. Environmental impacts must first be avoided, then minimised, before considering the use of offsets for any remaining impact.
3. Offsets must achieve an equivalent or better environmental outcome.
4. Offsets must provide environmental values as similar as possible to those being lost.
5. Offset provision should minimise the time-lag between the impact and delivery of the offset.
6. Offsets must provide additional protection to environmental values at risk, or additional management actions to improve environmental values.
7. Offsets must be legally secured for the duration of the offset requirement.

The Green Offsets Package developed for the Project will follow these principles and the guidelines of the Queensland Government Environmental Offsets Policy.

State policy for vegetation management offsetting

The requirements for offsets under state legislation fall under the subordinate policies of the VM Act and NC Act, specifically the:

- Regional Vegetation Management Code (Department of Natural Resources and Water 2006)
- Policy for Vegetation Management Offsets (Department of Natural Resources and Water 2007)
- Policy 2 of the Nature Conservation (Koala) Conservation Plan 2006 and Management Program 2006-2016 (The Koala Plan) (Environmental Protection Agency & Queensland Parks and Wildlife Service 2005).

The offsets strategy would be determined following detailed design of the proposed pipeline and based on the residual impacts once all reasonable alternatives to avoid impacts have been exhausted. This is also necessary in order to determine the minimum requirements for offsetting following the 'maintain existing extent' test for regional ecosystems, essential habitat and conservation status thresholds under the Regional Vegetation Management Code (Department of Natural Resources and Water 2006).

Environmental offsets for impact to Matters of National Environmental Significance

Environmental offsets for impact to Matters of National Environmental Significance may be used to maintain or enhance the health, diversity and productivity of the environment as it relates to Matters of National Environmental Significance. Environmental offsets are not applicable to all approvals under the *Environment Protection and Biodiversity Conservation Act 1999* and their requirement is assessed on a case-by-case basis. Matters of National Environmental Significance for which offsets may be required for the Wandoan Coal Project may include:

- Semi-evergreen vine thickets of the Brigalow Belt (North and South) and Nandewar Bioregions.
- *Homopholis belsonii* habitat
- Brigalow Scaly-foot (*Paradelma orientalis*) habitat.

The Australian Government has identified eight principles for the use of environmental offsets under the EPBC Act. These eight principles will be used to assess any proposed environmental offsets to ensure consistency, transparency and equity under the EPBC Act. The Australian Government's position is that:

1. Environmental offsets should be targeted to the matter protected by the EPBC Act that is being impacted.
2. A flexible approach should be taken to the design and use of environmental offsets to achieve long-term and certain conservation outcomes which are cost effective for proponents.
3. Environmental offsets should deliver a real conservation outcome.

4. Environmental offsets should be developed as a package of actions – which may include both direct and indirect offsets.
5. Environmental offsets should, as a minimum, be commensurate with the magnitude of the impacts of the development and ideally deliver outcomes that are 'like for like'.
6. Environmental offsets should be located within the same general area as the development activity.
7. Environmental offsets should be delivered in a timely manner and be long lasting.
8. Environmental offsets should be enforceable, monitored and audited (Department of the Environment and Water Resources 2007).

The Department of the Environment, Water, Heritage and the Arts define offsets as 'actions taken outside a development site that compensate for the impacts of that development – including direct, indirect or consequential impacts (Department of the Environment and Water Resources 2007). Actions that constitute a suitable offset will differ between projects and there is no prescriptive formula for what constitutes and adequate offset.

7.5 Further survey

Surveys of the western CSM water supply pipeline were completed in late winter 2008. As outlined in the limitations, the weather conditions during the late winter survey period were generally cool and sub-optimal for detecting herpetofauna (reptiles and frogs). The cool dry weather and general season (late winter) is also a time of reduced vegetative growth and reproductive activity for many species of plant, particularly grasses and other herbaceous ground cover species. In addition, not all properties could be adequately accessed at the time of survey to allow for establishment of fauna trapping sites. Species of animal across these areas were therefore inferred from habitat assessment or desk based resources and should be verified during further seasonal surveys.

As such, seasonal targeted survey for flora and fauna should be competed along this section of the Study Area. Seasonal surveys are also a requirement for the Project Terms of Reference.

8. Significance of impacts

A number of Threatened ecological communities, species of plant and species of animal have been recorded in the study area or are considered likely to occur (moderate or high likelihood), that may be affected by the proposed pipeline.

Impacts on Threatened species and communities listed under the EPBC Act are required to be assessed following the *Principal Significant Impact Guidelines*. An assessment of the significance of the impact to State-listed REs and Threatened species was also undertaken. Significance assessments for these communities and species are included in Attachment I.

It is acknowledge that field surveys were undertaken at a sub-optimal time of year (late winter) for detection of many species of plant and animal and that some sections of the study area were not accessed during this survey period. As such, seasonal surveys are proposed to increase the likelihood of detecting Threatened species if they are present in the Study Area, and define the size of the local population and extent of their habitat in the Study Area. The conclusions of the impact assessments will therefore be reviewed and revised if necessary following the seasonal surveys.

A summary of significance assessments undertaken for Threatened biodiversity is provided below in Table 8-1. The impact assessments conclude that the proposed pipeline is not likely to have a significant impact on Threatened species or communities, nor would it interfere with their recovery, assuming suitable mitigation measures are put in place.

Table 8-1: Summary of threatened biodiversity for which significance assessments were undertaken and their likelihood of being significantly affected by the Project

Name	EPBC Act [1] Status	NC Act Status [2]	VM Act	Likely to be significantly affected	Primary reason for the outcome
Ecological communities					
SEVT	E	—	E	No	Small extent (0.6 ha) of non-remnant, highly modified and poor condition EEC to be removed
Plants					
Homopholis belsonii	V	E	Y	No	Low density of occurrence within study area and availability of habitat in the local area
Reptiles					
Brigalow Scaly-foot (*Paradelma orientalis*)	V	V	—	No	Low density of animals recorded (1) and similar suitable habitat available in the surrounding landscape

Name	EPBC Act [1] Status	NC Act Status [2]	VM Act	Likely to be significantly affected	Primary reason for the outcome
Dunmall's Snake (*Furina dunmalli*)	V	V	—	No	Not recorded within study area and no important habitat present
Birds					
Squatter Pigeon (southern race) (*Geophaps scripta scripta*)	V	V	—	No	Not recorded within study area and no important habitat present
Satin Flycatcher (*Myiagra cyanoleuca*)	M	—	—	No	Not recorded within study area and no important habitat present
Australian Painted Snipe (*Rostratula australis*)	V&M	V	—	No	Not recorded within study area and no important habitat present
Pink Cockatoo (*Cacatua leadbeateri*)	—	V	—	No	Not recorded within study area and no important habitat present
Glossy Black-cockatoo (*Calyptorhynchus lathami*)	—	V	—	No	Low density of animals recorded (2), similar suitable habitat available in the surrounding landscape, and no evidence of breeding detected within Study Area
Mammals					
Eastern Long-eared Bat (*Nyctophilus timoriensis*)	V	V	—	No	Not recorded within study area and no important habitat present

1 and 2: Conservation status - State as listed under the NC Act: E = Endangered, V = Vulnerable, R = Rare. National as listed under the EPBC Act: E = Endangered, V = Vulnerable. VM Act – E = Endangered.

9. Conclusions

The western CSM water supply pipeline for the Wandoan Coal Project is located in a landscape that has been largely cleared of vegetation as a result of grazing and dryland agriculture. The remaining vegetation generally occurs in continuous linear patches along the main drainage lines traversing the study area and is dominated by RE 11.3.25 (*Eucalyptus tereticornis* or *E. camaldulensis* woodland fringing drainage lines) and regrowth vegetation with the road reserve of the Roma Taroom Road and Goldens Bimbadeen Road.

Despite being a largely cleared landscape, the remaining remnant vegetation along the drainage lines was identified as being of regional significance under the Biodiversity Planning Assessment. In addition, much of the non-remnant vegetation in the road reserves was identified to include the Brigalow (*Acacia harpophylla* dominant and co-dominant) and Semi-evergreen vine thickets endangered ecological communities listed under the EPBC Act and provides habitat for Rare and Threatened species including recorded in the Study Area, the Brigalow Scaly-foot (*Paradelma orientalis*), Little Pied Bat (*Chalinolobus picatus*) and Golden-tailed Gecko (*Diplodactylus taenicauda*). In addition to these species, a further one Threatened species of plant and thirteen Rare or Threatened species of animal were considered likely to occur in the study area and surrounds.

The impacts to remnant and non-remnant vegetation and the associated fauna habitats was largely avoided by locating the proposed pipeline within private properties north of the road reserves rather than within road reserves. The route alignment design has avoided all remnant patches of Brigalow (*Acacia harpophylla* dominant and co-dominant) and Semi-evergreen vine thickets endangered ecological communities, although 0.6 ha of poor quality (non-remnant) Semi-evergreen vine thickets may be cleared. The route will also significantly reduce the impact to Threatened species and their habitat recorded or considered likely to occur in the Study Area.

Nonetheless, 2.7 ha or remnant vegetation and 7.0 ha of non-remnant vegetation will be directly affected by the proposed pipeline, including 0.6 ha of poor quality (non-remnant) Semi-evergreen vine thickets. This figure does not account for impacts to vegetation that will be avoided through directional drilling to cross drainage lines and the extent of vegetation affected may also be further reduced during the detailed design.

Assessment of the significance of impacts associated with the proposed pipeline was done for: Threatened species that were recorded in the study area or considered likely to occur (moderate or high likelihood of occurrence), Migratory species (for which the study area is at their distributional range limit), Endangered ecological communities, and Endangered REs.

The impact assessments concluded that the proposed pipeline was unlikely to result in a significant impact to any Threatened species of plant or animal, RE or ecological communities. Nonetheless, the impacts of the proposed pipeline are acknowledged and will be reduced where possible during detailed design. Detailed mitigation measures will be developed and presented in a biodiversity management plan relating to the construction and operation of the pipeline. Furthermore, the residual impacts of the proposed pipeline will be accounted for in the Green Offsets Package developed for the Wandoan Coal Project.

References

Accad, A, Neldner, VJ, Wilson, BA & Niehus, RE 2006, *Remnant Vegetation in Queensland. Analysis of remnant vegetation 1997-1999-2000-2001-2003, including regional ecosystem information*, Queensland Herbarium, Environmental Protection Agency, Brisbane.

Anderson, E 2003, *Plants of central Queensland: their identification and uses*, Queensland Government, Brisbane.

Andren, H 1994, 'Effects of habitat fragmentation on birds and mammals in landscapes with different proportions of suitable habitat: a review', *Oikos*, vol. 71, pp. 355-66.

Anon 2003, *Brigalow regrowth and the EPBC Act*, <http://www.environment.gov.au/biodiversity/threatened/publications/pubs/brigalow-regrowth.pdf>.

Auld, BA & Medd, RW 2002, *Weeds. An illustrated botanical guide to the weeds of Australia*, Inkata Press, Port Melbourne.

Bali, R 2000, *Discussion paper - Compensating for Edge Effects*, Biosis Research for the Roads and Traffic Authority, Sydney.

——— 2005, *Discussion Paper - Compensating for Edge Effects*, Ecosense Consulting for the NSW Roads and Traffic Authority, Sydney.

Barker, J, Grigg, G & Tyler, M 1995, *A field guide to Australian Frogs*, Surrey Beatty and Sons, Sydney.

Bennett, AF 1990, *Habitat corridors: Their role in wildlife management and conservation*, Arthur Rylah Institute for Environmental Research, Melbourne.

——— 1993, 'Fauna Conservation in Box and Ironbark Forests: A Landscape Approach', *Victorian Naturalist*, vol. 110, no. 1, pp. 15-23.

Bennett, AF, Kimber, SL & Ryan, PA 2000, *Revegetation and Wildlife: A guide to enhancing revegetated habitats for wildlife conservation in rural environments*, School of Ecology and Environment -Deakin University for Environment Australia.

Bennett, AF & Radford, JQ 2004, 'Landscape-level requirements for conservation of woodland birds: are there critical thresholds in habitat cover?' in R Smithers (ed.), *Landscape Ecology of Trees and Forests*, proceedings of the Woodland Trust and the International Association of Landscape Ecology, Gloucester UK.

Brooker, MIH & Kleinig, DA 2004, *Field guide to Eucalypts, Volume 3: Northern Australia*, Blooming Books, Hawthorn, Australia.

Bureau of Meteorology 2008, *Bureau of Meteorology - Daily Weather Observations*, Bureau of Meteorology,, 2007, <http://www.bom.gov.au/climate/averages/tables/ca_nsw_names.shtml>.

Bureau of Mineral Resources Geology and Geophysics 1971, *1:250,000 geological series - explanatory notes. Roma Queensland*, Commonwealth of Australia State of Queensland,

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

Cogger, HG 2000, *Reptiles and Amphibians of Australia*, Reed Books, Sydney.

Contant, CK & Wiggins, LL 1991, 'Defining and analyzing cumulative environmental impacts', *Environmental Impact Assessment Review*, vol. 11, pp. 297-309.

Council on Environmental Quality 1978, *CEQ - Regulations for Implementing National Environmental Policy Act (NEPA) - Sec. 1508.7 Cumulative impact*, Council on Environmental Quality (United States of America), Washington DC.

CSIRO 2001, *Climate change projections for Australia*, CSIRO and Australian Greenhouse Office, Canberra.

Debus, S 2001, *The Birds of Prey of Australia. A Field Guide to Australian Raptors*, Oxford University Press, Melbourne.

Department of Natural Resources and Water 2006, *Regional Vegetation Management Code for Brigalow Belt and New England Tablelands Bioregions*, The State of Queensland (Department of Natural Resources and Water), Brisbane.

——— 2006 *State Policy for Vegetation Management*, The State of Queensland (Department of Natural Resources and Water) Brisbane.

——— 2007, *Policy for Vegetation Management Offsets*, The State of Queensland (Department of Natural Resources and Water), Brisbane.

Department of the Environment and Heritage 2004, *An agreement between the Australian Government and the State of Queensland relating to Environmental Impact Assessment*, Australian Government,

——— 2006, *EPBC Act Policy Statement 1.1 Significant Impact Guidelines*, Department of the Environment and Heritage, Canberra.

Department of the Environment and Water Resources 2007, *Draft Policy Statement: Use of environmental offsets under the Environment Protection and Biodiversity Conservation Act 1999*, Department of the Environment and Water Resources, Canberra.

Department of the Environment Water Heritage and the Arts 2008a, *Census of Australian Vertebrates*, Department of Environment and Heritage, Canberra,

——— 2008b, *Listed Key Threatening Processes*, Department of Environment and Water Resources, <http://www.environment.gov.au/cgi-bin/sprat/public/publicgetkeythreats.pl>.

——— 2008c, *Protected Matters Search Tool*, Department of the Environment, Water, Heritage and the Arts, <http://www.deh.gov.au/erin/ert/epbc/index.html >.

——— 2008d, *Recovery plans made or adopted - Common name order*,

——— 2008e, *Register of critical habitat*, Department of Environment and Heritage,, 2006.

Environment Australia 2003, *Brigalow regrowth and the EPBC Act*, Australian Government, Canberra.

Environmental Protection Agency 2002, *Biodiversity assessment and mapping methodology*, Environmental Protection Agency, Brisbane.

——— 2003, *Biodiversity Planning Assessment: Brigalow Belt version 1.2*, Queensland Government, Brisbane.

——— 2004a, *Land zone definitions*, Queensland Government,

——— 2004b, *State wildlife corridors mapping, version 1.0.*, Environmental Protection Agency, Brisbane.

——— 2005, *Regional Ecosystem Description Database (REDD) Version 4.2 (updated March 2005).* Database maintained by Queensland Herbarium Environmental Protection Agency, Brisbane.

——— 2007, *Regional Ecosystem Description Database (REDD). Version 5.2 Updated November 2007.* , Database maintained by Queensland Herbarium, Environmental Protection Agency, Brisbane.

——— 2008, *Recovery/Conservation plans*,

Environmental Protection Agency & Queensland Parks and Wildlife Service 2005, *Nature Conservation (Koala) Conservation Plan 2006 and Management Program 2006-2016 (The Koala Plan)*, Queensland Government - Environmental Protection Agency, Brisbane.

Environmental Protection Agency and Environmental Planning Southwest Queensland 2002a, *Biodiversity Planning Assessment: Brigalow Belt South Fauna Expert Panel Report*, Queensland Government,

——— 2002b, *Biodiversity Planning Assessment: Brigalow Belt South Flora Expert Panel Report*, Queensland Government,

Ford, HA, Barrett, GW, Saunders, DA & Recher, HF 2001, 'Why have birds in the woodlands of Southern Australia declined?' *Biological Conservation*, vol. 97, pp. 71-88.

Foreman, RTT, Sperling, D, Bissonette, JA, Clevenger, AP, Cutshall, CD, Dale, VH, Fahrig, L, France, R, Goldman, CR, Heanue, K, Jones, JA, Swanson, FJ, Turrentine, T & Winter, TC 2003, *Road ecology - science and solutions*, Island Press.

Forman, RTT, Sperling, D, Bissonette, JA, Clevenger, AP, Cutshall, CD, Dale, VH, Fahrig, L, France, R, Goldman, CR, Heanue, K, Jones, JA, Swamson, FJ, Turrentine, T & Winter, TC 2000, *Road Ecology. Science and Solutions.*, Island Press, Washington.

Henderson, RJF 2002, *Queensland Plants: Names and Distribution*, Queensland Herbarium, Department of Environment, Brisbane: Queensland.

Lewis, B 2008, *Proposed Water Pipeline between Spring Gully and Wandoan Coal Project: Winter Fauna Survey*.

Menkhorst, P & Knight, F (eds) 2004, *A field guide to the mammals of Australia*, 2nd edn, Oxford University Press, Melbourne.

Moore, P 2005, *A guide to plants of inland Australia*, Reed New Holland, Sydney.

Mueller-Dombois, D & Ellenberg, H 1974, *Aims and Methods of Vegetation Ecology* John Wiley & Sons, New York.

Neldner, VJ, Wilson, BA, Thompson, EJ & Dillewaard, HA 2005, *Methodology for survey and mapping of regional ecosystems and vegetation communities in Queensland*, The State of Queensland, Environmental Protection Agency, Brisbane.

Parnaby, H 1986, *A survey of bats of the rainforests of north-east New South Wales*, NSW National Parks and Wildlife Service, Coffs Harbour.

Pizzey, G & Knight, F 1997, *Field Guide to the Birds of Australia*, Angus and Robertson, Sydney.

Plowright, H 2004, *A field guide to Australian bird song* Bird Observers Club of Australia.

Queensland Herbarium 2008, *HERBRECS*, Queensland Government, Environment Protection Agency, Brisbane.

Radford, JQ & Bennett, A 2007, 'The relative importance of landscape properties for woodland birds in agricultural envionments', *Journal of Applied Ecology*, vol. 44, no. 737-747.

Sattler, PS & Williams, RD 1999, *The Conservation Status of Queensland Bioregional Ecosystems.*, Environmental Protection Agency, Brisbane.

Stanley, T & Ross, M 1983, *Flora of south-eastern Queensland: Volume 1*, Queensland Department of Primary Industries, Brisbane.

——— 1986, *Flora of south-eastern Queensland: Volume 2*, Queensland Department of Primary Industries, Brisbane.

——— 1989, *Flora of south-eastern Queensland: Volume 3*, Queensland Department of Primary Industries, Brisbane.

Stewart, D 1998, *Australian Frog Calls: Subtropical East*, Nature Sound.

Strahan, R 1995, *The Mammals of Australia*, Reed New Holland, Sydney.

Stuart, DA 1999, *Calls of threatened fauna Eastern NSW (IFOA) (Compact Disk)*, Prepared by Nature Sound for State Forests of NSW.

Thackway, R & Cresswell, ID 1995, *An Interim Biogeographic Regionalisation of Australia*, Australian Nature Conservation Agency, Canberra.

Threatened Species Scientific Committee 2001, *Commonwealth listing advice on Brigalow (Acacia harpophylla dominant and co-dominant)*, Department of Environment and Water Resources, Canberra.

Tothill, JC & Hacker, JB 1996, *The grasses of southern Queensland*, Tropical Grass Society of Australia Brisbane.

Triggs, B 1996, *Tracks, scats and other traces: a field guide to Australian mammals*, Oxford University Press, Melbourne.

Vallee, L, Hogbin, T, Monks, L, Makinson, B, Matthes, M & Rossetto, M 2004, *Guidelines for translocation of threatened plants in Australia*, Australian Network for Plant Conservation, Canberra.

Walker, J & Hopkins, MS 1990, 'Vegetation', in RC McDonald, RF Isbell, JG Speight, J Walker & MS Hopkins (eds), *Australian Soil and Land Survey Field Handbook*, 2nd edn, Inkata Press, Melbourne.

Wheeler, DJB, Jacobs, SWL & Whalley, RDB 2002, *Grasses of New South Wales*, 3rd edn, University of New England, Armidale.

Williams, JB, Harden G.J., a & Mcdonald W.J.F. 1984, *Trees & Shrubs in Rainforests of New South Wales & Southern Queensland*, University of New England, Armidale: NSW.

Wilson, A & Lindenmayer, DB 1995, *Wildlife Corridors and the Conservation of Biodiversity: A Review.*, National Corridors of Green Program, Green Australia Ltd., Canberra.

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

Woodside, DP & Taylor, KJ 1985, 'Echolocation callas of fourteen bats from eastern New South Wales', *Australian Mammology*, vol. 8, pp. 279-97.

Glossary

Term	Definition
Biodiversity	The biological diversity of life is commonly regarded as being made up of the following three components: ▪ genetic diversity – the variety of genes (or units of heredity) in any population ▪ species diversity – the variety of species ▪ ecosystem diversity – the variety of communities or ecosystems.
Critically Endangered	Designated as 'Critically Endangered' under the EPBC Act. Refer to definition of 'EPBC Act conservation status' for meaning of critically endangered under the Act.
Declared pests	An animal or plant may be declared under the Land Protection (Pest and Stock Route Management) Act 2002.
Ecological community	An assemblage of species occupying a particular area.
Endangered	Designated as 'Endangered' under the EPBC Act, NC Act and/or VM Act. Refer to definitions of 'EPBC Act conservation status', 'NC Act conservation status' and 'VM Act conservation status' for meaning of Endangered under each Act.
EPBC Act conservation status	Under the EPBC Act 1999, listed threatened species and ecological communities are assigned a conservation status of 'Extinct in the Wild', 'Critically Endangered', 'Endangered' or 'Vulnerable'. Definitions of these terms under the EPBC Act areas follows: Extinct in the Wild ▪ it is known only to survive in cultivation, in captivity or as a naturalised population well outside its past range; or ▪ it has not been recorded in its known and/or expected habitat, at appropriate seasons, anywhere in its past range, despite exhaustive surveys over a time frame appropriate to its life cycle and form. Critically Endangered ▪ it is facing an extremely high risk of extinction in the wild in the immediate future, as determined in accordance with the prescribed criteria. Endangered ▪ it is not critically endangered; and ▪ it is facing a very high risk of extinction in the wild in the near future, as determined in accordance with the prescribed criteria. Vulnerable ▪ it is not critically endangered or endangered; and ▪ it is facing a high risk of extinction in the wild in the medium term future, as determined in accordance with the prescribed criteria.
Habitat	An area or areas permanently, periodically or occasionally occupied by a species, population or ecological community, including any and all biotic and abiotic features of the area or areas occupied.
Heterogeneous RE polygon	An area (polygon) delineated on a map of regional ecosystems (REs) comprising a mixture of RE types. Mapping of hetereogenous polygons allows areas of vegetation that would normally be too small to map, to be shown at the scale which REs are normally mapped. These small areas, such as narrow stripe of riparian vegetation, often support significant biodiversity or require special

Term	Definition
	special management considerations (Neldner et al. 2005).
Homogeneous RE polygon	An area (polygon) delineated on a map of regional ecosystems (REs) comprising a single RE.
Migratory species	Species listed as 'Migratory' under the EPBC Act.
Naturalness and ecological condition	The apparent naturalness or health/ condition of an ecological community, as assessed against the following criteria: ▪ disturbance – described in terms of its cause (natural or human), its degree or severity, its extent and distribution within the community ▪ weed content – description of species abundance, horizontal and vertical distribution of each species ▪ ecological viability – measure of a community's ability to survive in the longer term ▪ ecological health – measure of regeneration, size structure and number of dead or dying plants within a community ecological relationships – the sequential relationship of one community to another, such as diurnal systems.
Near Threatened	Designated as 'Near Threatened' under the NC Act. Refer to definition of 'NC Act conservation status' for meaning of Near Threatened under the NC Act. Capitalisation of the term 'Near Threatened' in this report refers to those species listed as such under the NC Act.
NC Act conservation status	Under the NC Act, protected species are assigned a conservation status of 'Extinct in the Wild', 'Endangered', 'Vulnerable', 'Near Threatened', or 'Least Concern'. Definitions of these terms under the NC Act are as follows: Extinct in the Wild ▪ there have been thorough searches conducted for the wildlife; and, ▪ it has not been seen in the wild over a period that is appropriate for the life cycle or form of the wildlife. Endangered ▪ there have not been thorough searches conducted for the wildlife and the wildlife has not been seen in the wild over a period that is appropriate for the life cycle or form of the wildlife; or ▪ the habitat or distribution of the wildlife has been reduced to an extent that the wildlife may be in danger of extinction; or ▪ the population size of the wildlife has declined, or is likely to decline, to an extent that the wildlife may be in danger of extinction; or ▪ the survival of the wildlife in the wild is unlikely if a threatening process continues. Vulnerable ▪ its population is decreasing because of threatening processes, or ▪ its population has been seriously depleted and its protection is not secured, or ▪ its population, while abundant, is at risk because of threatening processes, or ▪ its population is low or localised or depends on limited habitat that is at risk because of threatening processes. Near Threatened ▪ the population size or distribution of the wildlife is small and may become

Term	Definition
	smaller; or ▪ the population size of the wildlife has declined, or is likely to decline, at a rate higher than the usual rate for population changes for the wildlife; or ▪ the survival of the wildlife in the wild is affected to an extent that the wildlife is in danger of becoming vulnerable. Rare ▪ Species currently listed as rare will require re-assessment to determine which of the new Threatened species categories most adequately describe their status. The category Rare will be phased out by 2010 under an amendment made in 2005 to the Nature Conservation Act 1992. Least Concern ▪ the wildlife is common or abundant and is likely to survive in the wild. Native wildlife may be prescribed as least concern wildlife even if: ▪ the wildlife is the subject of a threatening process; or ▪ the population size or distribution of the wildlife has declined; or ▪ there is insufficient information about the wildlife to conclude whether the wildlife is common or abundant or likely to survive in the wild.
Non-remnant vegetation	Vegetation that is not mapped as remnant vegetation by the EPA and/or which fails to meet the EPA's criteria for 'remnant vegetation' (see definition of 'Remnant vegetation', below). This include regrowth, heavily thinned or logged vegetation and significantly disturbed vegetation that fails to meet the structural and/ or floristic characteristics of remnant vegetation. It also includes urban and cropping land. Non-remnant vegetation may retain significant biodiversity values (Neldner *et al.* 2005).
Not of Concern	Designated as 'Not of Concern' under the VM Act. Refer to definition of 'VM Act status' for meaning of 'Not of Concern' under the Act.
Of Concern	Designated as 'of concern' under the VM Act. Refer to definition of 'VM Act status' for meaning of 'of concern' under the Act.
Rare	Listed as Rare under the NC Act. Refer to 'NC Act conservation status' for meaning of Rare under the NC Act. Capitalisation of the term 'Rare' in this report refers to those species listed under the NC Act.
Priority taxa	Flora or fauna taxa currently listed as Threatened under State or Commonwealth legislation (Presumed Extinct, Endangered, Vulnerable, Rare or of Cultural Significance), or identified in various Action Plans as being of concern (Extinct, Extinct in the Wild, Critically Endangered, Endangered, Vulnerable, Near Threatened and Conservation Dependent, for example, Garnett & Crowley 2000), most transcontinental migrants listed under international agreements (for example, CAMBA and JAMBA), as well as taxa at risk or of management concern within specific bioregions based on the written opinion of experts (for example, McFarland 1997), or taxa of scientific interest as relictual, endemic or locally significant populations (such as a flying fox camp or heronry) based on the written opinion of experts (Environmental Protection Agency and Environmental Planning Southwest Queensland 2002a, 2002b).
Regional Ecosystem (RE)	A vegetation community, within a bioregion, that is consistently associated with a particular combination of geology, landform and soil. REs may be classified under schedules 1-3 of the Vegetation Management regulation as either endangered, of concern or not of concern. Refer to 'VM Act conservation status' for meaning of endangered, of concern or not of concern under the VC Act. Capitalisation of these terms in reference to REs in this report refers to the RE status under the VM Act.
Remnant	Remnant woody vegetation is defined as vegetation where the dominant canopy

Term	Definition
vegetation	has >70% of the height and >50% of the cover relative to the undisturbed height and cover of that stratum and is dominated by species characteristic of the vegetation's undisturbed canopy (Neldner *et al.* 2005).
Threatened	A term used with reference to ecological communities, REs or species of that are Endangered, Vulnerable or Of Concern as listed under the NC Act, the VM Act or the EPBC Act (see NC Act conservation significance, the VM Act conservation significance and EPBC Act conservation significance for more details)
VM Act conservation status	Under the VM Act, REs may be classified as either 'Endangered', 'Of Concern' or 'Not of Concern'. Definitions of these terms under the VM Act are provided below. Endangered ▪ less than 10% of pre-clearing extent of remnant vegetation (see following definition) exists in the bioregion, or 10 to 30 % of pre-clearing extent remains and the remnant vegetation is less than 10 000 hectares. In addition, for biodiversity planning purposes the Environmental Protection Agency also classifies a regional ecosystem as endangered if: ▪ less than 10% of its pre-clearing extent remains unaffected by severe degradation and/or biodiversity loss; or ▪ 10-30% of its pre-clearing extent remains unaffected by severe degradation and/or biodiversity loss and the remnant vegetation is less than 10,000 hectares; or it is a rare regional ecosystem subject to a threatening process. Of Concern ▪ 10 to 30% of pre-clearing extent of remnant vegetation exists in the bioregion, or more than 30% of pre-clearing extent remains and the remnant vegetation is less than 10 000 hectares In addition, for biodiversity planning purposes the Queensland Environmental Protection Agency also classifies a regional ecosystem as of concern if: ▪ 10-30% of its pre-clearing extent remains unaffected by moderate degradation and/or biodiversity loss[4]. Not of Concern ▪ mre than 30% of pre-clearing extent of remnant vegetation exists in the bioregion, and it is greater than 10, 00 hectares. In addition, for biodiversity planning purposes the Queensland Environmental Protection Agency also classifies a regional ecosystem as not of concern if the degradation criteria listed above for endangered or of concern regional ecosystems are not met.
Vulnerable	Designated as 'Vulnerable' under the EPBC Act and/or NC Act. Refer to definitions of 'EPBC Act conservation status' and 'NC Act conservation status' for meaning of 'Vulnerable' under these Acts.

Attachment A

Weather conditions during field surveys

Table A-1: Abiotic variables recorded throughout the survey. Weather data collected from Taroom Weather Station (Taroom Post Office) Ref No – 035070 (Bureau of Metrology 2008)

Date	Minimum temperature (°C)	Maximum temperature (°C)	Rainfall (mm)	3:00 pm relative humidity (%)	3:00 pm cloud amount (oktas)	3:00 pm wind direction	3:00 pm wind speed (km/h)	3:00 pm MSL pressure (hPa)
1/08/2008	8.4	29.1	0	25	0	NNW	24	1012.7
2/08/2008	9.6	20	0	33	0	SW	17	1017.6
3/08/2008	1.1	21.4	0	33	0	W	4	1017.8
4/08/2008	2.6	25.7	0	26	1	W	4	1016
5/08/2008	6.2	25	0	40	5	NNW	24	1014.7
6/08/2008	5	20.2	0	26	0	WSW	24	1018.5
7/08/2008	1	20.9	0	30	0	NW	9	1019.6
8/08/2008	2.4	18.9	0	33	0	SE	6	1021.7
9/08/2008	1	20.4	0	27	0	SSE	9	1020.2
10/08/2008	-0.7	22.8	0	25	0	SSE	9	1017.3
11/08/2008	1.6	17	0	41	0	SW	17	1019.5
12/08/2008	-1.2	17.8	0	36	6	SSE	9	1022
13/08/2008	5.2	19.4	0	39	8	SSE	20	1022.9
14/08/2008	2.2	16.9	0	46	8	SSW	9	1021.5
15/08/2008	5.8	19.3	0	35	0	SSW	9	1015.9
16/08/2008	1.4	19.2	0	36	0	SW	17	1016.4
17/08/2008	1.7	20	0	46	7	SW	6	1019.8
18/08/2008	6.7	15.2	0	48	8	WSW	4	1024.1
19/08/2008	-0.4	19.8	0	19	0	S	9	1024.6
20/08/2008	-1.6	23	0	68	0	NNE	9	1024.1
21/08/2008	8.9	24.2	0	39	7	NNW	6	1019.9
22/08/2008	14.1	24.8	0	21	8	WSW	17	1015.1
23/08/2008	3.5	19.2	0	21	1	ESE	28	1021.6
24/08/2008	1.9	22	0	20	2	ENE	9	1023.2
25/08/2008	5.1	23.8	0	35	2	ENE	19	1021.6

Attachment B

Database Search Results – Flora

Family	*Species*	Common name	Native	Conservation status		Data source
				State	National	
Acanthaceae	*Brunoniella australis*	blue trumpet	Y	C		CORVEG WO
Acanthaceae	*Dipteracanthus australasicus subsp. corynothecus*		Y	C	-	HERBRECS
Adiantaceae	*Cheilanthes distans*		Y	C	-	HERBRECS
Adiantaceae	*Cheilanthes tenuifolia*			-	-	CORVEG
Aizoaceae	*Trianthema portulacastrum*		N	-	-	HERBRECS
Aizoaceae	*Trianthema portulacastrum*		N	-	-	HERBRECS
Aizoaceae	*Trianthema triquetra*		Y	C	-	HERBRECS
Amaranthaceae	*Gomphrena celosioides*	gomphrena weed	N	-		HERBRECS WO
Amaranthaceae	*Nyssanthes erecta*		Y	C		CORVEG WO
Amaranthaceae	*Ptilotus exaltatus var. semilanatus*		Y	C	-	HERBRECS
Amaranthaceae	*Ptilotus macrocephalus*		Y	C	-	HERBRECS
Apiaceae	*Daucus glochidiatus*	Australian carrot	Y	C		HERBRECS WO
Apiaceae	*Platysace ericoides*		Y	C	-	HERBRECS
Apocynaceae	*Carissa ovata*	currantbush	Y	C		CORVEG WO
Apocynaceae	*Carissa ovata*		Y	C	-	HERBRECS
Apocynaceae	*Marsdenia australis*	doubah	Y	C		WO CORVEG
Apocynaceae	*Marsdenia viridiflora subsp. viridiflora*		Y	C	-	HERBRECS
Apocynaceae	*Sarcostemma viminale subsp. brunonianum*		Y	C		HERBRECS WO
Araliaceae	*Hydrocotyle laxiflora*		Y	C	-	HERBRECS
Asteraceae	*Bidens bipinnata*		N	-	-	HERBRECS
Asteraceae	*Brachyscome ciliaris var. subintegrifolia*		Y	C	-	HERBRECS
Asteraceae	*Brachyscome trachycarpa*		Y	C	-	HERBRECS
Asteraceae	*Calotis cuneata*		Y	C	-	HERBRECS
Asteraceae	*Calotis dentex*	white burr daisy	Y	C		HERBRECS WO
Asteraceae	*Cassinia laevis*		Y	C	-	HERBRECS
Asteraceae	*Centaurea melitensis*	Maltese cockspur	N	-		HERBRECS WO
Asteraceae	*Centipeda minima subsp. minim*		Y	C	-	HERBRECS
Asteraceae	*Chrysocephalum apiculatum*		Y	C	-	HERBRECS
Asteraceae	*Flaveria australasica*		Y	C	-	HERBRECS
Asteraceae	*Gamochaeta pensylvanica*		N	-	-	HERBRECS
Asteraceae	*Helianthus annuus*		N	-	-	HERBRECS
Asteraceae	*Leiocarpa brevicompta*		Y	C		HERBRECS WO
Asteraceae	*Parthenium hysterophorus*		N	-	-	HERBRECS
Asteraceae	*Pycnosorus chrysanthes*	golden billy buttons	Y	C		HERBRECS WO
Asteraceae	*Rhodanthe polyphylla*		Y	C	-	HERBRECS
Asteraceae	*Rutidosis murchisonii*		Y	C	-	HERBRECS
Asteraceae	*Senecio brigalowensis*		Y	C		HERBRECS WO
Asteraceae	*Sonchus sp*		Y	C	-	HERBRECS
Asteraceae	*Vittadinia pterochaeta*		Y	C	-	HERBRECS
Asteraceae	*Vittadinia sulcata*	native daisy	Y	C		CORVEG HERBRECS WO
Boraginaceae	*Cynoglossum australe*		Y	C	-	HERBRECS
Boraginaceae	*Echium plantagineum*		N	-	-	HERBRECS
Boraginaceae	*Heliotropium europaeum*	common heliotrope	N	-		HERBRECS WO
Brassicaceae	*Lepidium bonariense*		N	-	-	HERBRECS
Brassicaceae	*Rapistrum rugosum*		N	-	-	HERBRECS
Brassicaceae	*Sisymbrium thellungii*		N	-	-	HERBRECS
Cactaceae	*Opuntia tomentosa*	velvety tree pear	N	-		CORVEG WO
Caesalpiniaceae	*Lysiphyllum carronii*		Y	C	-	HERBRECS
Caesalpiniaceae	*Senna barclayana*		Y	C	-	HERBRECS
Caesalpiniaceae	*Senna coronilloides*		Y	C	-	HERBRECS
Caesalpiniaceae	*Senna sophera var. (40Mile Scrub J.R.Clarkson+ 690*		Y	C	-	HERBRECS
Capparaceae	*Apophyllum anomalum*	broom bush	Y	C		WO
Capparaceae	*Apophyllum anomalum*		Y	C	-	HERBRECS
Capparaceae	*Capparis lasiantha*	nipan	Y	C		WO
Capparaceae	*Capparis loranthifolia var. bancroftii*		Y	C	-	HERBRECS
Capparaceae	*Capparis mitchellii Lindl.*		Y	C	-	HERBRECS
Casuarinaceae	*Casuarina cristata*	belah	Y	C		CORVEG WO
Casuarinaceae	*Casuarina cristata Miq.*		Y	C	-	HERBRECS
Casuarinaceae	*Casuarina cunninghamiana subsp. cunninghamian*		Y	C	-	HERBRECS
Celastraceae	*Elaeodendron australe var. integrifolium*		Y	C	-	HERBRECS
Chenopodiaceae	*Atriplex muelleri*		Y	C	-	HERBRECS
Chenopodiaceae	*Chenopodium carinatum*		Y	C	-	HERBRECS
Chenopodiaceae	*Einadia nutans subsp. nutans*		Y	C		CORVEG HERBRECS WO
Chenopodiaceae	*Enchylaena tomentosa*		Y	C		CORVEG HERBRECS WO
Chenopodiaceae	*Maireana enchylaenoides*		Y	C	-	HERBRECS
Chenopodiaceae	*Maireana microphylla*		Y	C	-	HERBRECS
Chenopodiaceae	*Rhagodia spinescens*		Y	C	-	HERBRECS
Chenopodiaceae	*Salsola kali*		Y	C	-	HERBRECS

Family	*Species*	Common name	Native	Conservation status		Data source
				State	National	
Chenopodiaceae	*Sclerolaena birchii*		Y	C	-	HERBRECS
Chenopodiaceae	*Sclerolaena tetracuspis*		Y	C	-	HERBRECS
Clusiaceae	*Hypericum gramineum*		Y	C	-	HERBRECS
Commelinaceae	*Commelina sp.*		Y	C		CORVEG WO
Convolvulaceae	*Convolvulus arvensis*		N	-	-	HERBRECS
Convolvulaceae	*Convolvulus graminetinus*		Y	C	-	HERBRECS
Convolvulaceae	*Cuscuta campestris*		N	-	-	HERBRECS
Cupressaceae	*Callitris endlicheri*		Y	C	-	HERBRECS
Cyperaceae	*Baumea juncea*	bare twigrush	Y	C		HERBRECS WO
Cyperaceae	*Carex inversa*		Y	C	-	HERBRECS
Cyperaceae	*Cyperus betchei subsp. betchei*		Y	C	-	HERBRECS
Cyperaceae	*Cyperus exaltatus*		Y	C	-	HERBRECS
Cyperaceae	*Cyperus gracilis*		Y	C	-	HERBRECS
Cyperaceae	*Cyperus laevigatus*		Y	C		HERBRECS WO
Cyperaceae	*Cyperus sanguinolentus*		Y	C	-	HERBRECS
Cyperaceae	*Cyperus sp.*		Y	C		CORVEG WO
Cyperaceae	*Cyperus sphaeroideus*		Y	C	-	HERBRECS
Cyperaceae	*Eleocharis atricha*		Y	C	-	HERBRECS
Cyperaceae	*Eleocharis cylindrostachys*		Y	C	-	HERBRECS
Cyperaceae	*Eleocharis plana*		Y	C	-	HERBRECS
Cyperaceae	*Fimbristylis dichotoma*		Y	C	-	HERBRECS
Cyperaceae	*Fimbristylis ferruginea*		Y	C		HERBRECS WO
Cyperaceae	*Schoenus yarrabensis*		Y	C	-	HERBRECS
Droseraceae	*Drosera burmanni*		Y	C	-	HERBRECS
Droseraceae	*Drosera peltata*		Y	C	-	HERBRECS
Eriocaulaceae	*Eriocaulon athertonense*		Y	C	-	HERBRECS
Eriocaulaceae	***Eriocaulon carsonii subsp. orientale***		**Y**	**E**	**E**	**HERBRECS WO**
Euphorbiaceae	*Acalypha eremorum*		Y	C	-	HERBRECS
Euphorbiaceae	*Chamaesyce dallachyana*		Y	C	-	HERBRECS
Euphorbiaceae	*Euphorbia tannensis subsp. eremophila*		Y	C	-	HERBRECS
Fabaceae	*Crotalaria dissitiflora subsp. dissitiflora*		Y	C	-	HERBRECS
Fabaceae	*Crotalaria incana subsp. incana*		N	-	-	HERBRECS
Fabaceae	*Desmodium varians*		Y	C	-	HERBRECS
Fabaceae	*Hovea longipes*		Y	C	-	HERBRECS
Fabaceae	*Indigofera linnaei*		Y	C	-	HERBRECS
Fabaceae	*Jacksonia scoparia*		Y	C	-	HERBRECS
Fabaceae	*Lotus australis*		Y	C	-	HERBRECS
Fabaceae	*Melilotus indicus*	hexham scent	N	-		HERBRECS WO
Fabaceae	*Rhynchosia minima var. australis*		Y	C	-	HERBRECS
Fabaceae	*Swainsona galegifolia*	smooth Darling pea	Y	C		HERBRECS WO
Fabaceae	*Trifolium subterraneum*		N	-	-	HERBRECS
Gentianaceae	*Schenkia australis*		Y	C	-	HERBRECS
Geraniaceae	*Erodium crinitum*	blue crowfoot	Y	C		HERBRECS WO
Goodeniaceae	*Goodenia fascicularis*		Y	C	-	HERBRECS
Haloragaceae	*Haloragis aspera*		Y	C	-	HERBRECS
Haloragaceae	*Haloragis heterophylla*		Y	C	-	HERBRECS
Haloragaceae	*Myriophyllum gracile*		Y	C	-	HERBRECS
Haloragaceae	*Myriophyllum verrucosum*		Y	C	-	HERBRECS
Juncaceae	*Juncus aridicola*		Y	C	-	HERBRECS
Juncaceae	*Juncus bufonius*		N	-	-	HERBRECS
Juncaceae	*Juncus continuus*		Y	C	-	HERBRECS
Juncaceae	*Juncus prismatocarpus*		Y	C	-	HERBRECS
Lamiaceae	*Spartothamnella juncea*	native broom	Y	C		WO
Lamiaceae	*Spartothamnella juncea*		Y	C	-	HERBRECS CORVEG
Loranthaceae	*Amyema congener subsp. rotundifolia*		Y	C	-	HERBRECS
Loranthaceae	*Amyema miquelii*		Y	C	-	HERBRECS
Loranthaceae	*Lysiana subfalcata*		Y	C	-	HERBRECS
Malvaceae	*Abutilon fraseri subsp. fra*		Y	C	-	HERBRECS
Malvaceae	*Abutilon oxycarpum*		Y	C	-	HERBRECS
Malvaceae	*Abutilon tubulosum var. tubulosum*		Y	C	-	HERBRECS
Malvaceae	*Hibiscus*		Y	C	-	HERBRECS
Malvaceae	*Hibiscus brachysiphonius*		Y	C	-	HERBRECS
Malvaceae	*Malvastrum americanum var. americanum*		N	-		CORVEG HERBRECS WO
Malvaceae	*Sida corrugata*		Y	C	-	HERBRECS
Malvaceae	*Sida sp.*		Y	C		CORVEG WO
Mimosaceae	*Acacia excelsa subsp. excelsa*		Y	C	-	HERBRECS
Mimosaceae	*Acacia harpophylla*	brigalow	Y	C		CORVEG WO
Mimosaceae	*Acacia harpophylla Benth.*		Y	C	-	HERBRECS

Family	*Species*	Common name	Native	Conservation status		Data source
				State	National	
Mimosaceae	*Acacia melvillei*		Y	C	-	HERBRECS
Mimosaceae	*Acacia oswaldii*		Y	C	-	HERBRECS
Mimosaceae	*Acacia triptera*		Y	C	-	HERBRECS
Mimosaceae	*Neptunia gracilis subsp. gracilis*		Y	C	-	HERBRECS
Myoporaceae	*Eremophila deserti*		Y	C	-	HERBRECS
Myoporaceae	*Eremophila mitchellii*		Y	C		CORVEG HERBRECS WO
Myoporaceae	*Eremophila sp.*		Y	C		WO
Myoporaceae	*Myoporum*		Y	C	-	HERBRECS
Myrtaceae	*Calytrix tetragona*		Y	C	-	HERBRECS
Myrtaceae	*Corymbia abergiana*		Y	C	-	HERBRECS
Myrtaceae	*Eucalyptus baileyana*		Y	C	-	HERBRECS
Myrtaceae	*Eucalyptus camaldulensis*		Y	C	-	HERBRECS
Myrtaceae	*Eucalyptus crebra*		Y	C	-	HERBRECS
Myrtaceae	*Eucalyptus melanophloia*		Y	C	-	HERBRECS
Myrtaceae	*Eucalyptus orgadophila*		Y	C	-	HERBRECS
Myrtaceae	*Eucalyptus populnea*		Y	C	-	HERBRECS
Myrtaceae	*Eucalyptus tereticornis subsp. tereticornis*		Y	C	-	HERBRECS
Myrtaceae	*Eucalyptus viridis var. viridis*		Y	C		HERBRECS WO
Myrtaceae	*Kardomia jucunda*		Y	C	-	HERBRECS
Nyctaginaceae	*Boerhavia dominii*		Y	C	-	HERBRECS
Oleaceae	*Jasminum didymum subsp. lineare*		Y	C	-	HERBRECS
Oleaceae	*Olea europaea subsp. europaea*		N	-	-	HERBRECS
Orchidaceae	*Cymbidium canaliculatum*		Y	C	-	HERBRECS
Orchidaceae	***Diuris tricolor (syn Diuris sheaffiana)***	**Tricolour Diuris**	**Y**	**LC**	**V**	**EPBC Tool**
Papaveraceae	*Argemone ochroleuca subsp. ochroleuca*		N	-	-	HERBRECS
Philydraceae	*Philydrum lanuginosum*		Y	C	-	HERBRECS
Pittosporaceae	*Auranticarpa rhombifolia*		Y	C	-	HERBRECS
Pittosporaceae	*Pittosporum angustifolium*		Y	C	-	HERBRECS
Pittosporaceae	*Pittosporum spinescens*		Y	C	-	HERBRECS
Poaceae	*Ancistrachne uncinulata*	hooky grass	Y	C		CORVEG WO
Poaceae	*Ancistrachne uncinulata*		Y	C	-	HERBRECS
Poaceae	*Aristida calycina var. praealta*		Y	C	-	HERBRECS
Poaceae	*Aristida echinata*		Y	C	-	HERBRECS
Poaceae	*Astrebla lappacea*		Y	C	-	HERBRECS
Poaceae	*Austrostipa ramosissima*		Y	C	-	HERBRECS
Poaceae	*Austrostipa verticillata*		Y	C	-	HERBRECS
Poaceae	*Avena sterilis subsp. ludoviciana*		N	-	-	HERBRECS
Poaceae	*Bromus catharticus*		N	-	-	HERBRECS
Poaceae	*Capillipedium parviflorum*		Y	C	-	HERBRECS
Poaceae	*Capillipedium spicigerum*		Y	C	-	HERBRECS
Poaceae	*Chloris gayana*		N	-	-	HERBRECS
Poaceae	*Cymbopogon obtectus*		Y	C	-	HERBRECS
Poaceae	*Cymbopogon refractus*		Y	C	-	HERBRECS
Poaceae	*Cynodon nlemfuensis*		N	-	-	HERBRECS
Poaceae	*Dichanthium sericeum subsp. serice*		Y	C	-	HERBRECS
Poaceae	*Dichelachne crinita*		Y	C	-	HERBRECS
Poaceae	*Digitaria bicornis*		Y	C	-	HERBRECS
Poaceae	*Echinochloa inundata*		Y	C	-	HERBRECS
Poaceae	*Elymus multiflorus*		Y	C	-	HERBRECS
Poaceae	*Enneapogon intermedius*		Y	C	-	HERBRECS
Poaceae	*Enteropogon acicularis*	curly windmill grass	Y	C		CORVEG HERBRECS WO
Poaceae	*Enteropogon ramosus*		Y	C	-	HERBRECS
Poaceae	*Eragrostis*		Y	C	-	HERBRECS
Poaceae	*Eragrostis alveiformis*		Y	C	-	HERBRECS
Poaceae	*Eragrostis cilianensis*		N	-	-	HERBRECS
Poaceae	*Eragrostis elongata*		Y	C	-	HERBRECS
Poaceae	*Eragrostis lacunaria*	purple lovegrass	Y	C		CORVEG WO
Poaceae	*Eragrostis megalosperma*		Y	C	-	HERBRECS
Poaceae	*Eragrostis sororia*		Y	C	-	HERBRECS
Poaceae	*Heteropogon contortus*		Y	C	-	HERBRECS
Poaceae	*Hyparrhenia sp.*		Y	C		CORVEG WO
Poaceae	*Iseilema membranaceum*		Y	C	-	HERBRECS
Poaceae	*Megathyrsus maximus*		N	-	-	HERBRECS
Poaceae	*Panicum buncei*		Y	C	-	HERBRECS
Poaceae	*Panicum coloratum*		N	-	-	HERBRECS
Poaceae	*Panicum decompositum var. decompositum*		Y	C	-	HERBRECS
Poaceae	*Paspalidium caespitosum*	brigalow grass	Y	C		CORVEG WO
Poaceae	*Paspalidium caespitosum*		Y	C	-	HERBRECS

Family	*Species*	Common name	Native	Conservation status		Data source
				State	National	
Poaceae	*Paspalidium distans*		Y	C	-	HERBRECS
Poaceae	*Paspalidium gracile*	slender panic	Y	C		CORVEG WO
Poaceae	*Paspalidium gracile*		Y	C	-	HERBRECS
Poaceae	*Paspalum dilatatum*		N	-	-	HERBRECS
Poaceae	*Pennisetum alopecuroides*	swamp foxtail	N	-		HERBRECS WO
Poaceae	*Pennisetum glaucum*		N	-	-	HERBRECS
Poaceae	*Perotis rara*		Y	C	-	HERBRECS
Poaceae	*Sarga leiocladum*		Y	C	-	HERBRECS
Poaceae	*Sporobolus actinocladus*	katoora grass	Y	C		HERBRECS WO
Poaceae	*Sporobolus caroli*	fairy grass	Y	C		CORVEG HERBRECS WO
Poaceae	***Sporobolus partimpatens***		**Y**	**R**	**-**	**HERBRECS WO**
Poaceae	*Thellungia advena*		Y	C	-	HERBRECS
Poaceae	*Tragus australianus*		Y	C	-	HERBRECS
Poaceae	*Triraphis mollis*		Y	C	-	HERBRECS
Poaceae	*Urochloa foliosa*		Y	C	-	HERBRECS
Poaceae	*Urochloa panicoides var. panicoides*		N	-	-	HERBRECS
Polygonaceae	*Emex australis*		N	-		HERBRECS WO
Polygonaceae	*Persicaria lapathifolia*		Y	C	-	HERBRECS
Proteaceae	*Grevillea decora subsp. decora*		Y	C	-	HERBRECS
Proteaceae	*Grevillea striata*		Y	C	-	HERBRECS
Ranunculaceae	*Clematis decipiens*		Y	C		HERBRECS WO
Ranunculaceae	*Clematis microphylla*		Y	C	-	HERBRECS
Rubiaceae	*Asperula conferta*		Y	C	-	HERBRECS WO
Rubiaceae	*Psydrax johnsonii*		Y	C		HERBRECS WO
Rubiaceae	*Psydrax oleifolia*		Y	C	-	HERBRECS
Rutaceae	*Citrus glauca*		Y	C	-	HERBRECS
Rutaceae	*Geijera parviflora*	wilga	Y	C		WO
Rutaceae	*Geijera parviflora*		Y	C	-	CORVEG HERBRECS
Santalaceae	*Santalum lanceolatum*		Y	C		HERBRECS WO
Sapindaceae	*Alectryon diversifolius*	scrub boonaree	Y	C		CORVEG WO
Sapindaceae	*Alectryon diversifolius*		Y	C	-	HERBRECS
Sapindaceae	*Atalaya hemiglauca*		Y	C		CORVEG WO
Sapindaceae	*Dodonaea viscosa subsp. spatulata*		Y	C	-	HERBRECS
Sapotaceae	*Planchonella pubescens*		Y	C	-	HERBRECS
Scrophulariaceae	*Mimulus gracilis*		Y	C	-	HERBRECS
Solanaceae	*Nicotiana megalosiphon*		Y	C	-	HERBRECS WO
Solanaceae	*Solanum coracinum*		Y	C	-	HERBRECS
Solanaceae	*Solanum opacum*		Y	C	-	HERBRECS
Solanaceae	*Solanum parvifolium*		Y	C		CORVEG WO
Sterculiaceae	*Brachychiton australis*		Y	C	-	HERBRECS
Sterculiaceae	***Commersonia sp. Cadarga (G.P.Guymer 1642)***		Y	LC	**V**	**EPBC Tool**
Surianaceae	***Cadellia pentastylis***	**Ooline**	**Y**	**LC**	**V**	**EPBC Tool**
Verbenaceae	*Verbena halei*		N	-	-	HERBRECS
Viscaceae	*Viscum articulatum*		Y	C	-	HERBRECS
Zygophyllaceae	*Roepera apiculata*		Y	C	-	HERBRECS

Notes

Native: Y = Yes, native. N = No, introduced

Conservation significance: State as listed under the Nature Conservation (Wildlife) Regulation 2006. LC = Of least concern, NT = Near Threatened, R= Rare, V = Vulnerable.
National as listed under the Environment Protection and Biodiversity Conservation Act 1999. V = Vulnerable. E = Endangered

Source HERBRECS (Queensland Herberium)
CORVEG (Queensland Herberium)
WO = Wildlife Online
EPBC Tool = Protected Matters Search Tool

Attachment C

Database Search Results – Fauna

Table C-1: Fauna database results for the Study Area

Class	Family	Scientific name	Common name	NCR	EPBC Act	Priority Taxa rating	Source
Birds	*Acanthizidae*	*Acanthiza apicalis*	InlandThornbill	LC	—	—	BA, WO
Birds	*Acanthizidae*	*Acanthiza chrysorrhoa*	Yellow-rumped Thornbill	LC	—	—	BA, WO
Birds	*Acanthizidae*	*Acanthiza nana*	Little Thornbill	LC	—	—	BA, WO
Birds	*Acanthizidae*	*Acanthiza pusilla*	Brown Thornbill	LC	—	—	BA, WO
Birds	*Acanthizidae*	*Acanthiza uropygialis*	Chestnut-rumped Thornbill	LC	—	—	BA
Birds	*Acanthizidae*	*Chthonicola sagittata*	Speckled Warbler	P	—	Non-EVR Priority Taxa	WO
Birds	*Acanthizidae*	*Gerygone albogularis*	White-throated Gerygone	LC	—	—	WO
Birds	*Acanthizidae*	*Gerygone fusca*	Western Gerygone	LC	—	—	BA, WO
Birds	*Acanthizidae*	*Gerygone olivacea*	White-throated Gerygone	LC	—	—	BA
Birds	*Acanthizidae*	*Smicrornis brevirostris*	Weebill	LC	—	—	BA, WO
Birds	*Accipitridae*	*Accipiter fasciatus*	Brown Goshawk	LC	—	—	BA, WO
Birds	*Accipitridae*	*Accipiter novaehollandiae*	Grey Goshawk	R	—	EVR Priority Taxa	BBS
Birds	*Accipitridae*	*Aquila audax*	Wedge-tailed Eagle	LC	—	—	BA, WO
birds	*Accipitridae*	*Aviceda subcristata*	Pacific Baza	LC	—	—	WO
Birds	*Accipitridae*	*Elanus axillaris*	Black-shouldered Kite	LC	—	—	BA, WO
Birds	*Accipitridae*	*Erythrotriorchis radiatus*	Red Goshawk	E	V	EVR Priority Taxa	DEWHA
Birds	*Accipitridae*	*Haliaeetus leucogaster*	White-bellied Sea-eagle	LC	M	—	WO, DEWHA
Birds	*Accipitridae*	*Haliastur sphenurus*	Whistling Kite	LC	—	—	BA, WO
Birds	*Accipitridae*	*Hieraaetus morphnoides*	Little Eagle	LC	M	—	BA
Birds	*Accipitridae*	*Lophoictinia isura*	Square-tailed Kite	R	—	EVR Priority Taxa	BBS
Birds	*Aegothelidae*	*Aegotheles cristatus*	Australian owlet-nightjar	LC	—	—	WO
Birds	*Alaudidae*	*Mirafra javanica*	Horsfield Bushlark	LC	—	—	BA, WO
Birds	*Anatidae*	*Anas gracilis*	Grey Teal	LC	—	—	BA, WO
Birds	*Anatidae*	*Anas rhynchotis*	Australasian shoveler	LC	—	—	BA, WO, QldMus
Birds	*Anatidae*	*Anas superciliosa*	Pacific Black Duck	LC	—	—	BA, WO
Birds	*Anatidae*	*Aythya australis*	Hardhead	LC	—	—	BA, WO
Birds	*Anatidae*	*Chenonetta jubata*	Australian wood duck	LC	—	—	BA, WO

Class	Family	Scientific name	Common name	NCR	EPBC Act	Priority Taxa rating	Source
Birds	*Anatidae*	*Cygnus atratus*	Black Swan	LC	—	—	BA, WO
Birds	*Anatidae*	*Dendrocygna eytoni*	Plumed whistling-duck	LC	—	—	BA, WO
Birds	*Anatidae*	*Malacorhynchus membranaceus*	Pink-eared Duck	LC	M	—	BA
Birds	*Anatidae*	*Nettapus coromandelianus*	Cotton Pygmy-Goose	R	M	EVR Priority Taxa	BA, WO, DEWHA
Birds	*Anatidae*	*Stictonetta naevosa*	Freckled Duck	R	—	EVR Priority Taxa	BBS
Birds	*Anhingidae*	*Anhinga novaehollandiae*	Australasian darter	LC	—	—	BA, WO
Birds	*Anseranatidae*	*Anseranas semipalmata*	Magpie Goose	LC	M	—	BA, WO, DEWHA
Birds	*Apodidae*	*Apus pacificus*	Fork-tailed Swift	LC	M	—	WO, DEWHA
Birds	*Apodidae*	*Hirundapus caudacutus*	White-throated Needletail	LC	M	—	WO, DEWHA
Birds	*Apodidae*	*Hirundo ariel*	Fairy Martin	LC	—	—	BA
Birds	*Apodidae*	*Hirundo neoxena*	Welcome Swallow	LC	—	—	BA
Birds	*Apodidae*	*Hirundo nigricans*	Tree Martin	LC	—	—	BA
Birds	*Ardeidae*	*Ardea alba*	Great Egret	LC	M	—	BA, WO, DEWHA
Birds	*Ardeidae*	*Ardea ibis*	Cattle Egret	LC	M	—	BA, DEWHA
Birds	*Ardeidae*	*Ardea intermedia*	Intermediate Egret	LC	—	—	BA
Birds	*Ardeidae*	*Ardea modesta*	Eastern Great Egret	LC	—	—	WO
Birds	*Ardeidae*	*Ardea pacifica*	White-necked Heron	LC	—	—	BA, WO
Birds	*Ardeidae*	*Egretta garzetta*	Little Egret	LC	—	—	BA
Birds	*Ardeidae*	*Egretta novaehollandiae*	White-faced Heron	LC	—	—	BA, WO
Birds	*Ardeidae*	*Nycticorax caledonicus*	Nankeen night-heron	LC	—	—	WO
Birds	*Artamidae*	*Artamus leucorynchus*	White-breasted Woodswallow	LC	—	—	BA, WO
Birds	*Artamidae*	*Artamus personatus*	Masked Woodswallow	LC	—	—	BA, WO
Birds	*Artamidae*	*Artamus superciliosus*	White-browed Woodswallow	LC	—	—	BA, WO
Birds	*Artamidae*	*Cracticus nigrogularis*	Pied Butcherbird	LC	—	—	BA, WO
Birds	*Artamidae*	*Cracticus tibicen*	Australian magpie	LC	—	—	WO
Birds	*Artamidae*	*Cracticus torquatus*	Grey Butcherbird	LC	—	—	BA, WO
Birds	*Artamidae*	*Strepera graculina*	Pied Currawong	LC	—	—	BA
Birds	*Burhinidae*	*Burhinus grallarius*	Bush Stone-curlew	P	—	Non-EVR Priority Taxa	WO

Class	Family	Scientific name	Common name	NCR	EPBC Act	Priority Taxa rating	Source
Birds	*Cacatuidae*	*Cacatua galerita*	Sulphur-crested Cockatoo	LC	—	—	BA, WO
Birds	*Cacatuidae*	*Cacatua leadbeateri*	Pink Cockatoo	V	—	EVR Priority Taxa	BBS
Birds	*Cacatuidae*	*Cacatua roseicapilla*	Galah	LC	—	—	BA
Birds	*Cacatuidae*	*Calyptorhynchus lathami*	Glossy Black Cockatoo	V	—	EVR Priority Taxa	BBS
Birds	*Cacatuidae*	*Eolophus roseicapillus*	Galah	LC	—	—	WO
Birds	*Cacatuidae*	*Nymphicus hollandicus*	Cockatiel	LC	—	—	WO
Birds	*Campephagidae*	*Coracina maxima*	Ground Cuckoo-shrike	LC	—	—	WO
Birds	*Campephagidae*	*Coracina novaehollandiae*	Black-faced Cuckoo-shrike	LC	—	—	BA, WO
Birds	*Campephagidae*	*Coracina papuensis*	White-bellied Cuckoo-shrike	LC	—	—	BA, WO
Birds	*Campephagidae*	*Coracina tenuirostris*	Cicadabird	LC	—	—	WO
Birds	*Campephagidae*	*Lalage sueurii*	White-Winged Triller	LC	—	—	BA, WO
Birds	*Caprimulgidae*	*Eurostopodus argus*	Spotted Nightjar	LC	—	—	BA
Birds	*Casuariidae*	*Dromaius novaehollandiae*	Emu	LC	—	—	WO
Birds	*Charadriidae*	*Elseyornis melanops*	Black-fronted dotterel	LC	—	—	BA, WO
Birds	*Charadriidae*	*Erythrogonys cinctus*	Red-kneed dotterel	LC	—	—	WO
Birds	*Charadriidae*	*Vanellus miles novaehollandiae*	Masked lapwing (southern subspecies)	LC	—	—	BA, WO
Birds	*Ciconiidae*	*Ephippiorhynchus asiaticus*	Black-necked Stork	R	—	EVR Priority Taxa	WO
Birds	*Cisticolidae*	*Cisticola exilis*	golden-headed cisticola	LC	—	—	WO
Birds	*Climacteridae*	*Climacteris picumnus*	Brown Treecreeper	P	—	Non-EVR Priority Taxa	BBS
Birds	*Columbidae*	*Geopelia cuneata*	Diamond Dove	LC	—	—	BA
Birds	*Columbidae*	*Geopelia humeralis*	Bar-shouldered Dove	LC	—	—	BA, WO
Birds	*Columbidae*	*Geopelia striata*	Peaceful Dove	LC	—	—	BA, WO
Birds	*Columbidae*	*Geophaps scripta*	Squatter Pigeon	V	V	EVR Priority Taxa	BA, QldMus, DEWHA
Birds	*Columbidae*	*Ocyphaps lophotes*	Crested Pigeon	LC	—	—	WO
Birds	*Columbidae*	*Phaps chalcoptera*	Common Bronzewing	LC	—	—	WO
Birds	*Coraciidae*	*Eurystomus orientalis*	Dollarbird	LC	—	—	BA, WO
Birds	*Corcoracidae*	*Corcorax melanorhamphos*	White-winged Chough	LC	—	—	WO
Birds	*Corcoracidae*	*Struthidea cinerea*	Apostlebird	LC	—	—	BA, WO

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Birds	*Corvidae*	*Corvus coronoides*	Australian Raven	LC	—	—	BA, WO
Birds	*Corvidae*	*Corvus orru*	Torresian Crow	LC	—	—	BA, WO
Birds	*Cuculidae*	*Centropus phasianinus*	Pheasant Coucal	LC	—	—	BA, WO
Birds	*Cuculidae*	*Eudynamis scolopacea*	Common Koel	LC	—	—	BA, WO
Birds	*Cuculidae*	*Scythrops novaehollandiae*	Channel-billed Cuckoo	LC	—	—	BA
Birds	*Dicruridae*	*Gymnorhina tibicen*	Australian Magpie	LC	—	—	BA
Birds	*Estrildidae*	*Stagonopleura guttata*	Diamond Firetail	P	—	Non-EVR Priority Taxa	WO
Birds	*Estrildidae*	*Taeniopygia bichenovii*	Double-barred Finch	LC	—	—	BA, WO
Birds	*Estrildidae*	*Taeniopygia guttata*	Zebra Finch	LC	—	—	WO
Birds	*Falconidae*	*Falco berigora*	Brown Falcon	LC	—	—	BA, WO
Birds	*Falconidae*	*Falco cenchroides*	Nankeen Kestrel	LC	—	—	BA, WO
Birds	*Falconidae*	*Falco hypoleucos*	Grey Falcon	R	—	EVR Priority Taxa	BBS
Birds	*Falconidae*	*Falco longipennis*	Australian hobby	LC	—	—	BA, WO
Birds	*Gruidae*	*Grus rubicunda*	Brolga	LC	M	—	BA, WO
Birds	*Halcyonidae*	*Dacelo novaeguineae*	Laughing Kookaburra	LC	—	—	BA, WO
Birds	*Halcyonidae*	*Todiramphus sanctus*	Sacred Kingfisher	LC	—	—	BA, WO
Birds	*Hirundinidae*	*Petrochelidon nigricans*	Tree Martin	LC	—	—	WO
Birds	*Jacanidae*	*Irediparra gallinacea*	Comb-crested Jacana	LC	—	—	BA, WO
Birds	*Laridae*	*Chlidonias hybrida*	Whiskered Tern	LC	—	—	WO
Birds	*Maluridae*	*Amytornis striatus*	Striated Grass Wren	R	—	—	LEWIS
Birds	*Maluridae*	*Malurus cyaneus*	Superb Fairy-wren	LC	—	—	BA, WO
Birds	*Maluridae*	*Malurus lamberti*	Variegated Fairy-wren	LC	—	—	BA, WO
Birds	*Maluridae*	*Malurus melanocephalus*	Red-backed Fairy-wren	LC	—	—	BA, WO
Birds	*Megapodiidae*	*Alectura lathami*	Australian Brush-turkey	LC	—	—	WO
Birds	*Meliphagidae*	*Acanthagenys rufogularis*	Spiny-cheeked Honeyeater	LC	—	—	BA, WO
Birds	*Meliphagidae*	*Entomyzon cyanotis*	Blue-faced Honeyeater	LC	—	—	BA, WO
Birds	*Meliphagidae*	*Epthianura crocea crocea*	Yellow Chat	V	—	—	LEWIS
Birds	*Meliphagidae*	*Grantiella picta*	Painted Honeyeater	R	—	EVR Priority Taxa	BBS

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Birds	*Meliphagidae*	*Lichenostomus chrysops*	Yellow-faced Honeyeater	LC	—	—	WO
Birds	*Meliphagidae*	*Lichenostomus leucotis*	White-eared Honeyeater	LC	—	—	WO
Birds	*Meliphagidae*	*Lichenostomus penicillatus*	White-plumed Honeyeater	LC	—	—	WO
birds	*Meliphagidae*	*Lichmera indistincta*	Brown Honeyeater	LC	—	—	BA, WO
Birds	*Meliphagidae*	*Manorina flavigula*	Yellow-throated Miner	LC	—	—	BA, WO
Birds	*Meliphagidae*	*Manorina melanocephala*	Noisy Miner	LC	—	—	BA, WO
Birds	*Meliphagidae*	*Meliphaga lewinii*	Lewin Honeyeater	LC	—	—	WO
Birds	*Meliphagidae*	*Melithreptus gularis*	Black-chinned Honeyeater	R	—	EVR Priority Taxa	BBS
Birds	*Meliphagidae*	*Myzomela sanguinolenta*	Scarlet Honeyeater	LC	—	—	BA
Birds	*Meliphagidae*	*Philemon citreogularis*	Little Friarbird	LC	—	—	WO
Birds	*Meliphagidae*	*Philemon corniculatus*	Noisy Friarbird	LC	—	—	WO
Birds	*Meliphagidae*	*Plectorhyncha lanceolata*	Striped Honeyeater	LC	—	—	WO
Birds	*Meliphagidae*	*Xanthomyza phrygia*	Regent Honeyeater	E	E	EVR Priority Taxa	BBS
Birds	*Meropidae*	*Merops ornatus*	Rainbow Bee-eater	LC	M	—	BA, WO, DEWHA
Birds	*Monarchidae*	*Grallina cyanoleuca*	Magpie-lark	LC	—	—	BA, WO
Birds	*Monarchidae*	*Myiagra cyanoleuca*	Satin Flycatcher	-	M	—	DEWHA
Birds	*Monarchidae*	*Myiagra inquieta*	Restless Flycatcher	LC	—	—	WO
Birds	*Monarchidae*	*Myiagra rubecula*	Leaden Flycatcher	LC	—	—	BA, WO
Birds	*Motacillidae*	*Anthus novaeseelandiae*	Richard's Pipit	LC	—	—	BA
Birds	*Muscicapidae*	*Acrocephalus stentoreus*	Clamorous Reed-Warbler	LC	M	—	BA
Birds	*Muscicapidae*	*Cincloramphus cruralis*	Brown Songlark	LC	M	—	BA
Birds	*Muscicapidae*	*Cincloramphus mathewsi*	Rufous Songlark	LC	—	—	WO
Birds	*Nectariniidae*	*Dicaeum hirundinaceum*	Mistletoebird	LC	—	—	BA, WO
Birds	*Neosittidae*	*Daphoenositta chrysoptera*	Varied Sittella	LC	—	—	WO
Birds	*Oriolidae*	*Oriolus sagittatus*	Olive-backed Oriole	LC	—	—	WO
Birds	*Otididae*	*Ardeotis australis*	Australian Bustard	LC	—	—	BA, WO
Birds	*Pachycephalidae*	*Colluricincla harmonica*	Grey Shrike-Thrush	LC	—	—	BA, WO
Birds	*Pachycephalidae*	*Pachycephala pectoralis*	Golden Whistler	LC	—	—	WO

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Birds	*Pachycephalidae*	*Pachycephala rufiventris*	Rufous Whistler	LC	—	—	WO
Birds	*Pardalotidae*	*Pardalotus punctatus*	Spotted Pardalote	LC	—	—	QldMus
Birds	*Pardalotidae*	*Pardalotus striatus*	Striated Pardalote	LC	—	—	WO
Birds	*Pardalotidae*	*Pyrrholaemus brunneus*	Redthroat	R	—	—	LEWIS
Birds	*Passeridae*	*Neochmia ruficauda ruficauda*	Star Finch (eastern)	E	E	EVR Priority Taxa	DEWHA
Birds	*Passeridae*	*Passer domesticus*	House Sparrow	I	—	—	BA
Birds	*Passeridae*	*Poephila cincta cincta*	Black-throated Finch	V	V	EVR Priority Taxa	BBS
Birds	*Pedionomidae*	*Pedionomus torquatus*	Plains Wanderer	V	V	EVR Priority Taxa	BBS
Birds	*Pelecanidae*	*Pelecanus conspicillatus*	Australian pelican	LC	—	—	WO
Birds	*Petroicidae*	*Eopsaltria australis*	Eastern Yellow Robin	LC	—	—	QldMus
Birds	*Petroicidae*	*Melanodryas cucullata*	Hooded Robin	P	—	Non-EVR Priority Taxa	BBS
Birds	*Petroicidae*	*Microeca fascinans*	Jacky Winter	LC	—	—	BA, WO
Birds	*Petroicidae*	*Petroica goodenovii*	Red-capped Robin	LC	—	—	QldMus
Birds	*Phalacrocoracidae*	*Microcarbo melanoleucos*	Little Pied Cormorant	LC	—	—	WO
Birds	*Phalacrocoracidae*	*Phalacrocorax melanoleucos*	Little Pied Cormorant	LC	—	—	BA
Birds	*Phalacrocoracidae*	*Phalacrocorax sulcirostris*	Little Black Cormorant	LC	—	—	WO
Birds	*Phalacrocoracidae*	*Phalacrocorax varius*	Pied Cormorant	LC	—	—	BA
Birds	*Phasianidae*	*Coturnix pectoralis*	Stubble Quail	LC	—	—	WO
Birds	*Podargidae*	*Podargus strigoides*	Tawny Frogmouth	LC	—	—	WO
Birds	*Podicipedidae*	*Podiceps cristatus*	Great Crested Grebe	LC	—	—	WO
Birds	*Podicipedidae*	*Poliocephalus poliocephalus*	Hoary-headed Grebe	LC	—	—	WO
Birds	*Podicipedidae*	*Tachybaptus novaehollandiae*	Australasian Grebe	LC	—	—	BA, WO
Birds	*Pomatostomidae*	*Pomatostomus superciliosus*	White-browed Babbler	P	—	Non-EVR Priority Taxa	BBS
Birds	*Pomatostomidae*	*Pomatostomus temporalis*	Grey-crowned Babbler	P	—	Non-EVR Priority Taxa	WO
Birds	*Psittacidae*	*Aprosmictus erythropterus*	Red-winged Parrot	LC	—	—	BA, WO
Birds	*Psittacidae*	*Lathamus discolor*	Swift Parrot	E	E & M	EVR Priority Taxa	BBS, DEWHA
Birds	*Psittacidae*	*Neophema pulchella*	Turquoise Parrot	R	—	EVR Priority Taxa	BBS
Birds	*Psittacidae*	*Northiella haematogaster*	Blue Bonnet	LC	—	—	WO

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Birds	*Psittacidae*	*Platycercus adscitus*	Pale-headed Rosella	LC	—	—	WO
Birds	*Psittacidae*	*Psephotus haematonotus*	Red-rumped Parrot	LC	—	—	WO
Birds	*Psittacidae*	*Trichoglossus chlorolepidotus*	Scaly-breasted Lorikeet	LC	—	—	BA
Birds	*Psittacidae*	*Trichoglossus haematodus moluccanus*	Rainbow Lorikeet	LC	—	—	BA, WO
Birds	*Ptilonorhynchidae*	*Chlamydera maculata*	Spotted Bowerbird	LC	—	—	BA, WO
Birds	*Rallidae*	*Fulica atra*	Eurasian Coot	LC	—	—	BA, WO
Birds	*Rallidae*	*Gallinula tenebrosa*	Dusky Moorhen	LC	—	—	BA, WO
Birds	*Rallidae*	*Porphyrio porphyrio*	Purple Swamphen	LC	—	—	WO
Birds	*Recurvirostridae*	*Himantopus himantopus*	Black-winged Stilt	LC	—	—	BA, WO
Birds	*Rhipiduridae*	*Rhipidura albiscapa*	Grey Fantail	LC	—	—	BA, WO
Birds	*Rhipiduridae*	*Rhipidura leucophrys*	Willie Wagtail	LC	—	—	BA, WO
Birds	*Rostratulidae*	*Rostratula benghalensis*	Painted Snipe	R	V&M	EVR Priority Taxa	DEWHA
Birds	*Scolopacidae*	*Gallinago hardwickii*	Latham's Snipe	LC	M	—	DEWHA
Birds	*Scolopacidae*	*Numenius minutus*	Little Curlew	LC	M	—	BBS, DEWHA
Birds	*Strigidae*	*Ninox connivens*	Barking Owl	P	—	Non-EVR Priority Taxa	BBS
Birds	*Strigidae*	*Ninox novaeseelandiae*	Boobook Owl	LC	—	—	QldMus
Birds	*Strigidae*	*Ninox strenua*	Powerful Owl	V	—	EVR Priority Taxa	BBS
Birds	*Sturnidae*	*Sturnus vulgaris*	Common Starling	I	—	—	BA, WO
Birds	*Threskiornithidae*	*Platalea flavipes*	Yellow-billed Spoonbill	LC	—	—	WO
Birds	*Threskiornithidae*	*Platalea regia*	Royal Spoonbill	LC	—	—	WO
Birds	*Threskiornithidae*	*Platelea flavipes*	Yellow-billed Spoonbill	LC	—	—	BA
Birds	*Threskiornithidae*	*Plegadis falcinellus*	Glossy Ibis	LC	—	—	WO
Birds	*Threskiornithidae*	*Threskiornis molucca*	Australian White Ibis	LC	—	—	BA, WO
Birds	*Threskiornithidae*	*Threskiornis spinicollis*	Straw-necked Ibis	LC	—	—	BA, WO
Birds	*Turnicidae*	*Turnix melanogaster*	Black-breasted Button Quail	V	V	EVR Priority Taxa	BBS, DEWHA
Birds	*Turnicidae*	*Turnix pyrrhothorax*	Red-chested Button-quail	LC	—	—	WO
Birds	*Tytonidae*	*Tyto capensis*	Grass Owl	P	—	Non-EVR Priority Taxa	BBS
Birds	*Tytonidae*	*Tyto novaehollandiae*	Masked Owl	P	—	Non-EVR Priority Taxa	BBS

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Birds	*Zosteropidae*	*Zosterops lateralis*	Silvereye	LC	—	—	WO
Frogs	*Bufonidae*	*Rhinella marina*	Cane Toad	I	—	—	WO
Frogs	*Hylidae*	*Cyclorana alboguttata*	Greenstripe frog	LC	—	—	QldMus
Frogs	*Hylidae*	*Cyclorana brevipes*	Superb Collared-frog	LC	—	—	WO
Frogs	*Hylidae*	*Cyclorana novaehollandiae*	Eastern snapping frog	LC	—	—	WO
Frogs	*Hylidae*	*Cyclorana verrucosa*	Warty Waterholding frog	R	—	EVR Priority Taxa	WO
Frogs	*Hylidae*	*Litoria fallax*	Eastern Sedgefrog	LC	—	—	QldMus, WO
Frogs	*Hylidae*	*Litoria caerulea*	Green Treefrog	LC	—	—	WO
Frogs	*Hylidae*	*Litoria latopalmata*	Broad-palmed Rocketfrog	LC	—	—	WO
Frogs	*Hylidae*	*Litoria peronii*	Emerald spotted treefrog	LC	—	—	WO
Frogs	*Hylidae*	*Litoria rubella*	Desert treefrog	LC	—	—	WO
Frogs	*Myobatrachidae*	*Adelotus brevis*	Tusked Frog	V	—	EVR Priority Taxa	BBS
Frogs	*Myobatrachidae*	*Limnodynastes fletcheri*	Barking frog	LC	—	—	WO
Frogs	*Myobatrachidae*	*Limnodynastes ornatus*	Ornate Burrowing Frog	LC	—	—	QldMus, WO
Frogs	*Myobatrachidae*	*Limnodynastes salmini*	Salmon-striped Frog	P	—	Non-EVR Priority Taxa	WO
Frogs	*Myobatrachidae*	*Limnodynastes tasmaniensis*	Spotted Grass Frog	LC	—	—	QldMus, WO
Frogs	*Myobatrachidae*	*Limnodynastes terraereginae*	Scarlet-sided Pobblebonk	LC	—	—	WO
Frogs	*Myobatrachidae*	*Uperoleia fusca*	Dusky Toadlet	LC	—	—	BBS
Frogs	*Myobatrachidae*	*Uperoleia laevigata*	Eastern Gungan	LC	—	—	QldMus
Frogs	*Myobatrachidae*	*Uperoleia rugosa*	Chubby Gungan	LC	—	—	QldMus
Mammals	*Bovidae*	*Capra hircus*	Goat	I	—	—	WO
Mammals	*Canidae*	*Canis lupus dingo*	Dingo	I	—	—	WO
Mammals	*Canidae*	*Vulpes vulpes*	Red fox	I	—	—	WO
Mammals	*Dasyuridae*	*Dasyurus hallucatus*	Northern Quoll	P	—	Non-EVR Priority Taxa	BBS
Mammals	*Dasyuridae*	*Dasyurus maculatus maculatus*	Spotted-tail Quoll	V	E	EVR Priority Taxa	BBS
Mammals	*Dasyuridae*	*Phascogale tapoatafa*	Brush-tailed Phascogale	P	—	Non-EVR Priority Taxa	BBS
Mammals	*Dasyuridae*	*Planigale maculata*	Common Planigale	LC	—	—	WO
Mammals	*Dasyuridae*	*Planigale tenuirostris*	Narrow-nosed Planigale	P	—	Non-EVR Priority Taxa	BBS

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Mammals	*Dasyuridae*	*Sminthopsis macroura*	Stripe-faced Dunnart	LC	—	—	WO
Mammals	*Dasyuridae*	*Sminthopsis murina*	Common Dunnart	LC	—	—	WO
Mammals	*Emballonuridae*	*Saccolaimus flaviventris*	Yellow-bellied sheathtail-bat	LC	—	—	QldMus, WO
Mammals	*Equidae*	*Equus caballus*	Brumby	I	—	—	QldMus
Mammals	*Felidae*	*Felis catus*	Cat	I	—	—	WO
Mammals	*Leporidae*	*Lepus capensis*	Brown Hare	I	—	—	WO
Mammals	*Leporidae*	*Oryctolagus cuniculus*	Rabbit	I	—	—	WO
Mammals	*Macropodidae*	*Macropus dorsalis*	Black-striped Wallaby	P	—	Non-EVR Priority Taxa	WO
Mammals	*Macropodidae*	*Macropus giganteus*	Eastern Grey Kangaroo	LC	—	—	WO
Mammals	*Macropodidae*	*Macropus robustus*	Common Wallaroo	LC	—	—	WO
Mammals	*Macropodidae*	*Macropus rufogriseus*	Red-necked Wallaby	LC	—	—	WO
Mammals	*Macropodidae*	*Wallabia bicolor*	Swamp Wallaby	LC	—	—	WO
Mammals	*Molossidae*	*Mormopterus planiceps*	Southern Freetail Bat	LC	—	—	WO
Mammals	*Molossidae*	*Tadarida australis*	White-striped Freetail Bat	LC	—	—	WO
Mammals	*Muridae*	*Mus musculus*	House Mouse	I	—	—	WO
Mammals	*Muridae*	*Pseudomys patrius*	Eastern Pebble Mound Mouse	P	—	Non-EVR Priority Taxa	BBS
Mammals	*Muridae*	*Rattus rattus*	Black Rat	I	—	—	WO
Mammals	*Ornithorhynchidae*	*Ornithorhynchus anatinus*	Platypus	CS	—	Non-EVR Priority Taxa	BBS
Mammals	*Peramelidae*	*Isoodon macrourus*	Northern Brown Bandicoot	P	—	Non-EVR Priority Taxa	BBS
Mammals	*Peramelidae*	*Perameles nasuta*	Long-nosed Bandicoot	P	—	Non-EVR Priority Taxa	BBS
Mammals	*Petauridae*	*Pseudocheirus peregrinus*	Common Ringtail Possum	P	—	Non-EVR Priority Taxa	BBS
Mammals	*Phalangeridae*	*Trichosurus vulpecula*	Common Brushtail Possum	—	—	Non-EVR Priority Taxa	BBS
Mammals	*Phascolarctidae*	*Phascolarctos cinereus*	Koala	CS	—	Non-EVR Priority Taxa	WO
Mammals	*Potoroidae*	*Aepyprymnus rufescens*	Rufous Bettong	P	—	Non-EVR Priority Taxa	WO
Mammals	*Pseudocheiridae*	*Petauroides volans*	Greater Glider	LC	—	Non-EVR Priority Taxa	WO
Mammals	*Pseudocheiridae*	*Petaurus australis australis*	Yellow-bellied Glider (sth sp)	P	—	EVR Priority Taxa	BBS
Mammals	*Pseudocheiridae*	*Petaurus norfolcensis*	Squirrel Glider	P	—	Non-EVR Priority Taxa	BBS
Mammals	*Pteropodidae*	*Pteropus poliocephalus*	Grey-headed Flying Fox	P	V	Non-EVR Priority Taxa	BBS

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Mammals	*Suidae*	*Sus scrofa*	Pig	I	—	—	WO
Mammals	*Tachyglossidae*	*Tachyglossus aculeatus*	Short-beaked Echidna	LC	—	—	WO
Mammals	*Vespertilionidae*	*Chalinolobus dweryi*	Large-eared Pied Bat	R	V	EVR Priority Taxa	BBS, DEWHA
Mammals	*Vespertilionidae*	*Chalinolobus gouldii*	Goulds Wattled bat	LC	—	—	WO
Mammals	*Vespertilionidae*	*Chalinolobus nigrogriseus*	Hoary Wattled Bat	P	—	Non-EVR Priority Taxa	BBS
Mammals	*Vespertilionidae*	*Chalinolobus picatus*	Little Pied bat	R	—	EVR Priority Taxa	WO
Mammals	*Vespertilionidae*	*Kerivoula papuensis*	Golden-tipped Bat	P	—	Non-EVR Priority Taxa	BBS
Mammals	*Vespertilionidae*	*Miniopterus australis*	Little Bent-wing Bat	P	—	Non-EVR Priority Taxa	BBS
Mammals	*Vespertilionidae*	*Miniopterus schreibersii oceanenis*	Eastern Bent-wing Bat	P	—	Non-EVR Priority Taxa	BBS
Mammals	*Vespertilionidae*	*Nyctophilus bifax*	Eastern Long-eared Bat	—	V	—	DEWHA
Mammals	*Vespertilionidae*	*Nyctophilus timoriensis*	Greater Long-eared Bat	V	V	EVR Priority Taxa	BBS
Mammals	*Vespertilionidae*	*Scotorepens greyii*	Little Broad-nosed bat	LC	—	—	WO
Mammals	*Vespertilionidae*	*Scotorepens sanborni*	Northern Broad-nosed bat	LC	—	—	WO
Mammals	*Vespertilionidae*	*Scotorepens sp.*	Central Eastern Broad-nosed Bat	P	—	Non-EVR Priority Taxa	BBS
Mammals	*Vespertilionidae*	*Vespadelus baverstocki*	Inland Forest Bat	P	—	Non-EVR Priority Taxa	BBS
Mammals	*Vespertilionidae*	*Vespadelus regulus*	Southern Forest Bat	P	—	Non-EVR Priority Taxa	BBS
Reptiles	*Agamidae*	*Amphibolurus muricatus*	Jacky Lizard	—	—	Non-EVR Priority Taxa	BBS
Reptiles	*Agamidae*	*Amphibolurus nobbi*	Nobbi's Dragon	LC	—	—	WO
Reptiles	*Agamidae*	*Chlamydosaurus kingii*	Frilled Necked Lizard	P	—	Non-EVR Priority Taxa	BBS
Reptiles	*Agamidae*	*Physignathus lesueurii*	Eastern Water Dragon	P	—	Non-EVR Priority Taxa	BBS
Reptiles	*Agamidae*	*Pogona barbata*	Bearded Dragon	LC	—	—	WO
Reptiles	*Agamidae*	*Tympanocryptis lineata pinguicolla*	Grassland Earless Dragon	E	E	EVR Priority Taxa	BBS
Reptiles	*Boidae*	*Aspidites ramsayi*	Woma	R	—	EVR Priority Taxa	BBS
Reptiles	*Boidae*	*Morelia spilota*	Carpet Python	LC	—	—	WO
Reptiles	*Chelidae*	*Chelodina expansa*	Broad Shelled River Turtle	P	—	Non-EVR Priority Taxa	BBS
Reptiles	*Chelidae*	*Emydura macquarii*	Kreffts Turtle	P	—	Non-EVR Priority Taxa	BBS
Reptiles	*Chelidae*	*Rheodytes leukops*	Fitzroy Tortoise	V	V	EVR Priority Taxa	DEWHA

Class	Family	Scientific name	Common name	NCR	EPBC Act	Priority Taxa rating	Source
Reptiles	*Colubridae*	*Tropidonophis mairii*	Freshwater Snake	LC	—	—	QldMus
Reptiles	*Elapidae*	*Acanthophis antarcticus*	Common Death Adder	R	—	EVR Priority Taxa	BBS
Reptiles	*Elapidae*	*Brachyurophis australis*	Australian Coral Snake	LC	—	—	QldMus
Reptiles	*Elapidae*	*Demansia psammophis*	Yellow-faced Whip Snake	LC	—	—	QldMus, WO
Reptiles	*Elapidae*	*Denisonia maculata*	Ornamental Snake	V	—	EVR Priority Taxa	BBS
Reptiles	*Elapidae*	*Furina diadema*	Red-naped Snake	LC	—	—	QldMus
Reptiles	*Elapidae*	*Furina dunmalli*	Dunmall's Snake	V	V	EVR Priority Taxa	BBS
Reptiles	*Elapidae*	*Hemiaspis damelii*	Grey Snake	E	—	EVR Priority Taxa	BBS
Reptiles	*Elapidae*	*Hoplocephalus bitorquatus*	Pale-headed Snake	LC	—	Non-EVR Priority Taxa	QldMus, WO
Reptiles	*Elapidae*	*Pseudechis australis*	Mulga Snake	LC	—	—	QldMus
Reptiles	*Elapidae*	*Pseudechis guttatus*	Spotted Black Snake	P	—	Non-EVR Priority Taxa	BBS
Reptiles	*Elapidae*	*Pseudonaja textilis*	Eastern Brown Snake	LC	—	—	QldMus, WO
Reptiles	*Elapidae*	*Rhinoplocephalus boschmai*	Carpentaria Whip Snake	LC	—	Non-EVR Priority Taxa	WO
Reptiles	*Elapidae*	*Simoselaps australis*	Coral Snake	LC	—	—	WO
Reptiles	*Elapidae*	*Suta suta*	Myall Snake	LC	—	—	QldMus, WO
Reptiles	*Elapidae*	*Vermicella annulata*	Bandy Bandy	LC	—	—	QldMus
Reptiles	*Gekkonidae*	*Diplodactylus stenodactylus*	Crowned Gecko	P	—	Non-EVR Priority Taxa	BBS
Reptiles	*Gekkonidae*	*Diplodactylus tessellatus*	Tessellated Gecko	LC	—	—	WO
Reptiles	*Gekkonidae*	*Gehyra dubia*	Dubious Dtella	LC	—	—	QldMus, WO
Reptiles	*Gekkonidae*	*Heteronotia binoei*	Bynoe's Gecko	LC	—	—	QldMus
Reptiles	*Gekkonidae*	*Oedura tryoni*	Southern Spotted Velvet Gecko	LC	—	—	WO
Reptiles	*Gekkonidae*	*Strophurus taenicauda*	Golden-tailed Gecko	R	—	EVR Priority Taxa	BBS
Reptiles	*Myobatrachidae*	*Uperoleia fusca*	Sandy Gungan	P	—	Non-EVR Priority Taxa	BBS
Reptiles	*Pygopodidae*	*Delma inornata*	Legless Lizard	P	—	Non-EVR Priority Taxa	BBS
Reptiles	*Pygopodidae*	*Delma plebeia*	Leaden Delma	P	—	Non-EVR Priority Taxa	BBS
Reptiles	*Pygopodidae*	*Delma torquata*	Collared Delma	V	V	EVR Priority Taxa	BBS
Reptiles	*Pygopodidae*	*Lialis burtonis*	Burton's Legless Lizard	LC	—	—	QldMus, WO
Reptiles	*Pygopodidae*	*Paradelma orientalis*	Brigalow scaly-foot	V	V	EVR Priority Taxa	WO, DEWHA

Class	Family	Scientific name	Common name	NCR	EPBC Act	Priority Taxa rating	Source
Reptiles	*Scincidae*	*Anomalopus brevicollis*	Slider Skink	R	—	EVR Priority Taxa	BBS
Reptiles	*Scincidae*	*Anomalopus mackayi*	Five-clawed Worm-Skink	E	V	EVR Priority Taxa	BBS
Reptiles	*Scincidae*	*Cryptoblepharus pulcher pulcher*	Elegant Snake-eyed Skink	LC	—	—	WO
Reptiles	*Scincidae*	*Ctenotus ingrami*	Ctenotus Skink	P	—	Non-EVR Priority Taxa	BBS
Reptiles	*Scincidae*	*Ctenotus robustus*	Striped Skink	LC	—	—	WO
Reptiles	*Scincidae*	*Ctenotus taeniolatus*	Copper-tailed Skink	LC	—	—	WO
Reptiles	*Scincidae*	*Cyclodomorphus gerrardii*	Pink Tongued Lizard	P	—	Non-EVR Priority Taxa	BBS
Reptiles	*Scincidae*	*Egernia rugosa*	Yakka Skink	V	V	EVR Priority Taxa	DEWHA
Reptiles	*Scincidae*	*Egernia striolata*	Tree Skink	LC	—	—	WO
Reptiles	*Scincidae*	*Lerista fragilis*	Eastern Mulch-slider	LC	—	—	WO
Reptiles	*Scincidae*	*Morethia boulengeri*	South-eastern Morethia Skink	LC	—	—	WO
Reptiles	*Scincidae*	*Tiliqua rugosa aspera*	Shingle-back (eastern subspecies)	LC	—	Non-EVR Priority Taxa	WO
Reptiles	*Scincidae*	*Tiliqua scincoides*	Eastern Blue-tongued Lizard	LC	—	—	WO
Reptiles	*Typhlopidae*	*Ramphotyphlops proximus*	Proximus Blindsnake	LC	—	—	QldMus, WO
Reptiles	*Typhlopidae*	*Ramphotyphlops wiedii*	Brown-snouted Blind Snake	LC	—	—	QldMus
Reptiles	*Varanidae*	*Varanus varius*	Lace Monitor	LC	—	—	WO

Conservation Status:

1 **NC Act-** V= Vulnerable, E= Endangered, R= Rare, LC= Least Concern, CS= Culturally Significant, *= Introduced

2 **EPBC Act-** V= Vulnerable, E= Endangered, M= Migratory

3 **Source:**

DEWHA- Department of the Environment, Water, Heritage and the Arts (Protected Matters Search Tool)

QM- Queensland Museum

BBS- Brigalow Belt South Expert Panel Report (Fauna) - Environmental Protection Authority 2002.

WO- Wildlife Online (Wildnet)

BA- Birds Australia

Attachment D

Fauna survey effort

Table D-1: Standard trapping sites

Site No	Easting	Northing	Habitat description
1	735654	7122117	Poplar Box with *Eremopholia*, Wilga and Emu Apple
2	729315	7117195	Brigalow Roadside – *Acacia harpopyhlla* dominant
3	724442	7117275	Casuarina cristata roadside remnant
4	728342	7116873	Brigalow Roadside Remnant - Acacia harpyhlla dominant

Table D-2: Supplementary Harp trapping sites

Site No	Site reference	Easting	Northing	Date out	Date in
H1	Brigalow regrowth – Roma Taroom Road east	737830	7122548	6.8.08	8.8.08
H2	Slatehill Creek – E. tereticornis	718504	7116984	6.8.08	8.8.08
H3	Mid Roma Taroom Pop Box adjacent to Waco Station	734258	7120975	6.8.08	8.8.08

Table D-3: Supplementary Anabat sites

Site No	Site reference	Easting	Northing	Date	Site description
A1	SA1	738707	7122594	7.8.08	Roma -Taroom Road Brigalow Regrowth
A2	SA2	743020	7123539	8.8.08	*E. tereticornis* Riparian + dam on Bassingwaithe's
A3	SA3	745403	7123811	8.8.08	Brigalow Regrowth Bordering Dam Bassingwaithe's
A4	SA4	747374	7124285	8.8.08	Western End Goldens Road Brig Regrowth
A5	SA5	752372	7124082	9.8.08	Poplar Box Remnant Goldens Road
A6	SA6	757170	7123555	9.8.08	Brigalow Regrowth Goldens Road
A7	SA7	764222	7122249	9.8.08	*E. tereticornis* Riparian Eastern End Goldens Road

Table D-4: Supplementary active herpetofauna search sites

Site No	Site reference	Easting	Northing	Vegetation
WH1	Pop Box Regrowth west Slatehill Creek	717433	7116965	Pop Box regrowth
WH2	Opposite Waco Station	730774	7118352	Brigalow regrowth
WH3	Pop Box Opp Waco Station	733944	7120819	Poplar Box
WH4	Dangerfield Road	736880	7122705	Mountain Coolibah
WH5	Bassingwaith Property West	741799	7123812	Box Ironbark Riparian Woodland
WH6	Bassingwaith Middle	743837	7123540	Cas cristata Eremophelia Regrowth
WH7	Goldens road West	752372	7124082	Pop Box Rem
WH8	East Goldens Road	764445	7121530	E. tereticornis Rip

Attachment E

Flora survey results

E1. Appendix E Introduction

Appendix E provides the results of the flora surveys done along the Southern coal seam methane water supply pipeline. These results comprise:

- a comprehensive species list of all species of plant recorded in the study area sorted by regional ecosystem (RE) (Table E-1).
- 1:50,000 scale mapping of REs as mapped by the EPA in addition to non-remnant vegetation sampled in the study area, the location of flora survey points and the location of significant species of plant recorded in the study area.

FAMILY	Botanical Name	Commona Name	Native	BBS Sig.	Surveyed Regional Ecosystems						
					11.3.2	11.3.25	11.9.4	11.9.5	11.9.7	11.9.10	Cleared
ACANTHACEAE	Brunoniella australis	Blue Trumpet	Y		2		2	1	2	1	
	Hypoestes floribundum		Y					1			
	Rostellularia adscendens		Y						1		
ADIANTACEAE	Cheilanthes sieberi ssp. sieberi	Mulga Fern	Y		2		1	2	2		
AIZOACEAE	Tetragonia tetragonoides	Warrigal Greens	Y		2	1	3	2	2		2 to 3
AMARANTHACEAE	Alternanthera nodiflora	Joyweed	N			1					1
	Alternanthera denticulata	Lesser Joyweed	Y			1					1
APIACEAE	Ciclospermum leptophyllum	Slender Celery	N			2					2
	Hydrocoytle laxiflora	Pennyweed	Y			1					
APOCYNACEAE	Alstonia constricta	Bitter Bark	Y				2				
	Carissa ovata	Kunkerberry	Y				1	1			
	Parsonsia eucalyptophylla	Gnarloo	Y		2				2		
	Parsonsia lanceolata	Rough Silkpod	Y		2						
ASCLEPIADACEAE	Gomphocarpus physocarpus	Balloon Cotton	N			1					
	Marsdenia pleiadenia	Downy Milk Vine	Y						1		
	Marsdenia viridiflora ssp. viridiflora	Native Pear	Y			1	2	2	1	1	1
	Secamone elliptica		Y				1				
ASTERACEAE	Argemone ochroleuca	Mexican Poppy	N			1					
	Cirsium vulgare	Scotch Thistle	N								1
	Conyza bonariensis	Flaxleaf Fleabane	N			1					
	Gnaphalium pensylvanicum	(a) Cudweed	N			1					1
	Lactucca seriola	Prickly Lettuce	N								1
	Solvia anthemifolia	Soft Bindy-eye	N			2					1
	Sonchus oleraceus	Milk Thistle	N			1					
	Tagetes minuta	Stinking Roger	N								
	Xanthium pungens	Noogara Burr	N			2					
	Zinnia peruviana	Zinnia	N		2			1			
	Adriana tomentosa var. tomentosa		Y								
	Calotis cuneifolia	Purple Burr Daisy	Y				1	2			1
	Calotis lappulacea	Yellow Burr Daisy	Y						1		2
	Calotis scabiosifolia var. scabiosifolia	Rough Burr Daisy	Y		1				1	2	1
	Campactra barbata		Y						1		
	Centipedia minima		Y			2					1
	Dipteracanthus corynothecus		Y						2		
	Emex australis	Spiny Emex	Y		2	1	1	1	1		
	Olearia canescens		Y				2				
	Pterocaulon sphacelatum		Y			1					
	Senecio brigalowensis		Y					1			
	Senecio lautus		Y								2
	Vittadinia cuneata		Y					1	1	1	1

FAMILY	Botanical Name	Commona Name	Native	BBS Sig.	Surveyed Regional Ecosystems						
					11.3.2	11.3.25	11.9.4	11.9.5	11.9.7	11.9.10	Cleared
	Vittadinia dissecta		Y			1	1	1	2	2	1
	Vittadinia sulcata		Y		1				1		1
	Zygophyllum apiculatum	Gall Weed	Y				2				
BIGNONIACEAE	Pandorea pandorana	Wonga Vine	Y				3				
BRASSICACEAE	Lepidium bonariense	Peppercress	N			1			1		1 to 2
	Rapistrum rugosum	Turnip Weed	N			1					2
	Sisymbrium irio	London Rocket	N			1					1
	Sisymbrium thellungii	African Turnip Weed	N			2					1
CACTACEAE	Opuntia stricta	Common Prickly Pear	N(2)					1			1
	Opuntia tomentosa	Velvet Prickly Pear	N(2)		2			2	2	1	1
	Persicaria orientalis	Prince's Feather	Y								2
CAESALPINIACEAE	Leucaena leucocephala	White Popinac	N			1					
	Senna barclayana	Smooth Senna	N			1					
	Lysiphyllum carroni	Queensland Ebony	Y					2	1		1 to 2
	Senna artemisoides ssp. coriacea		Y		2	1		1	2		1
	Senna coronilloides	Brigalow Senna	Y								
CAMPANULACEAE	Pratia concolor		N			1					1
	Wahlenbergia australis	Australian Bluebell	Y			1					1
CAPPARACEAE	Apophyllum anomalum	Warrior Bush	Y					1	2		1
	Capparis lasiantha	Nipan	Y		2		1	1	1		1 to 2
	Capparis mitchellii	Native Orange	Y			1			1		1
CASUARINACEAE	Casuarina cristata	Belah	Y		2	1	2	2	2	5	3
	Casuarina cunninghamiana	River Oak	Y		2	3					
CELASTRACEAE	Denhamia oleaster	Stiff Denhamia	Y							1	
	Elaeodendron australe var. integrifolium	Narrow-leaved Red Olive Plum	Y				1				
	Maytenus cunninghamii		Y								
CHENOPODIACEAE	Atriplex muelleri	Muellers Saltbush	Y		2			1	2	3	2 to 4
	Atriplex semibaccatum	Creeping Saltbush	Y						1		1
	Chenopodium pumilo	Small Crumbweed	Y								
	Einadia hastata		Y		1	2	1	3	2		2
	Einadia nutans		Y		2			2	1		2
	Einadia polygonoides		Y		2						
	Einadia trigonos	Fish Weed	Y			1					
	Enchylaena tomentosa	Ruby Saltbush	Y		3		2	2	2	2	3 to 5
	Maireana microphylla	Small-leaved Cotton Bush	Y			1		1			1
	Rhagodia gaudichaudiana		Y			1	3	1	2		
	Salsola kali	Soft Roly Poly	Y		1			2	1	3	2
	Sclerolaena anisacanthoides	Yellow Copperburr	Y						2		1
	Sclerolaena bicornis	Goathead Burr	Y						1		
	Sclerolaena birchii	Galvanised Burr	Y			1					1

FAMILY	Botanical Name	Commona Name	Native	BBS Sig.	Surveyed Regional Ecosystems						
					11.3.2	11.3.25	11.9.4	11.9.5	11.9.7	11.9.10	Cleared
	Sclerolaena muricatus	Black Roly Poly	Y			1		2	1		2
	Sclerolaena tetracuspis	Brigalow Burr	Y								1
CONVOLVULACEAE	Convolvulus erubescens	Australian Bindweed	Y			1					
	Evolvus alsinoides	Tropical Speedwell	Y						2	1	1
CUPPRESSACEAE	Callitris glaucophylla	White Cypress Pine	Y			1					
CYPERACEAE	Carex appressa	Tall Sedge	Y			1					
	Cyperus gracilis	Whisker Grass	Y		2	2		1	2		1
EBENACEAE	Diospyros humilis	Small-leaved Ebony	Y								
EHRETIACEAE	Ehretia membranifolia	Peach Bush	Y				1	1	2		
EUPHORBIACEAE	Chamaesyce drummundii	Caustic Weed	N		1			1	2		1
	Acalypha erenorum	Soft Acalypha	Y			1					
	Breynia oblongifolia	Coffee Bush	Y				1				
	Croton phebalioides		Y				2				
	Euphorbia tannensis ssp. eremophila		Y					1			
FABACEAE	Medicago polymorpha	Burr Medic	N			1					2
	Trifolium campestre		N			1					2 to 3
	Cullen tenax	Emu Foot	Y		1						1
	Desmodium brachypodum		Y				1				
	Desmodium varians	Variable Tre-foil	Y			1			1		
	Glycine clandestine	Twining Pea	Y			1			1		
	Indigofera brevidens		Y				1				
	Lotus australis	Australian Lotus	Y								1
	Sesbannia cannabina	Seabannia Pea	Y			1					1
	Swainsona microphylla	Small-leaved Darling Pea	Y			1					
	Swainsona swainsonoides	Downy Darling Pea	Y	**Yes**		1					1
	Tephrosia brachypodon		Y								1
GERANIACEAE	Erodium crinitum	Blue Crowfoot	Y								1
GOODENIACEAE	Goodenia fascicularis	Silky Goodenia	Y						1		
	Goodenia glabra	Smooth Goodenia	Y			1					
	Scaevola spinescens	Prickly Fan Flower	Y								
HALORAGACEAE	Haloragis heterophylla		Y			1					
	Myriophyllum verrucosum		Y								3
JUNCACEAE	Juncus aridicola		Y								3
	Juncus usitatus	Common Rush	Y			1					
LAMIACEAE	Salvia reflexa		N		2						1
	Salvia plebeia	Common Sage	Y			2					
	Spartothamnella juncea	Red-fruited Stick Plant	Y		2		1	1			
LAXMANNIACEAE	Eustrephus latifolius	Wombat Berry	Y						1		
	Lomandra leucocephala var. leucocephala	Woolly-headed Mat Rush	Y		2						
	Lomandra longifolia	Spiny-headed Mat Rush	Y			1					

FAMILY	Botanical Name	Commona Name	Native	BBS Sig.	Surveyed Regional Ecosystems						
					11.3.2	11.3.25	11.9.4	11.9.5	11.9.7	11.9.10	Cleared
	Lomandra multiflora	Many-flowered Mat Rush	Y						1		
LORANTHACEAE	Amyema maidenii		Y					1			
	Amyema quandang var. bancroftii	Grey Mistletoe	Y					1			
	Amyema quandang var. quandang	Grey Mistletoe	Y					1			1 to 2
	Lysiana subfalcata	Lemon-flowered Mistletoe	Y						1		1 to 2
MALVACEAE	Malvastrum americanum	Spiked Malvastrum	N		1	1		2	1		2
	Modiela caroliana	Red-flowered Mallow	N			1					1
	Sida rhombifolia	Paddys Lucerne	N			2					2
	Abutilon fraseri	Dwarf Lantern Flower	Y				1				
	Abutilon malvifolium	Bastard Marshmallow	Y		1	1		1	2	1	
	Abutilon oxycarpum var. oxycarpum	Flannel Weed	Y		2	1	1	1			
	Hibiscus trionum	Bladder Ketmia	Y					1		1	
	Sida corrugata	Corrugated Sida	Y						1		
	Sida cunninghamii	Ridge Sida	Y		1				1		
	Sida fibulifera	Pin Sida	Y		2						
	Sida rohlenae	Shrub Sida	Y				1		2		
	Sida subspicata	Spiked Sida	Y			2					
MARSELIACEAE	Marselia drummondii	Common Nardoo	Y			1					
MARSELIACEAE	Marsilea hirsuta		Y		2						
MELIACEAE	Owenia acidula	Emu Apple	Y								1
MIMOSACEAE	Acacia farnesiana	Prickly Acacia	N		2	1					1
	Acacia amblygona		Y								
	Acacia decora	Pretty Wattle	Y			1			2		2
	Acacia excelsa	Ironwood	Y			2			2		1 to 2
	Acacia harpophylla	Brigalow	Y				4	6		1	2 to 4
	Acacia melvillei	Melville's Wattle	Y	**Yes**							1
	Acacia neriifolia		Y			1					
	Acacia oswaldii		Y						1		
	Acacia salicina	Sally Wattle	Y		2	2					1 to 2
MYOPORACEAE	Eremophila debile	Winter Apple	Y		1					1	
	Eremophila deserti	Ellangowan Poison Bush	Y		3		1	2	2	2	2
	Eremophila longifolia		Y								1
	Eremophila mitchellii	False Sandalwood	Y		3		1	1	4		3
MYRTACEAE	Angophora floribunda	Rough-barked Apple	Y			2					
	Eucalyptus melanophloia	Silver-leaved Ironbark	Y			2					1
	Eucalyptus orgadophila	Mountain Coolibah	Y				2				1
	Eucalyptus populnea	Poplar Box	Y		6	2		2	6	4	1 to 2
	Eucalyptus tereticornis	Queensland Blue Gum	Y		2	5					1
	Melaleuca bracteata	Black Tea Tree	Y			1					
	Melaleuca densispicata		Y			2					

FAMILY	Botanical Name	Commona Name	Native	BBS Sig.	Surveyed Regional Ecosystems						
					11.3.2	11.3.25	11.9.4	11.9.5	11.9.7	11.9.10	Cleared
NYCTAGINACEAE	Boerhavia sp. (n-r)		Y						1		
OLEACEAE	Jasminum didymum ssp. didymum		Y					2			
	Jasminum didymum ssp. racemosum		Y			1		2	1		1
	Jasminum lineare	Desert Jasmine	Y		1		3	2	2		1
	Jasminum volubile		Y				2				
	Notelaea microcarpa	Narrow-leaved Mock Olive	Y			1	1	2			
ORCHIDACEAE	Cymbidium canaliculatum	Cannelled Boat-lip Orchid	Y			1					1
	Oxalis corniculata var. corniculata	Creeping Oxalis	N			1		2	2		
	Oxalis exilis		Y				4				
	Oxalis sp.		Y					1			1
PITTOSPORACEAE	Auranticarpa rhombifolia	Diamond-leaved Pittosporum	Y					1			
	Bursaria incana	Prickly Pine	Y				2				
	Bursaria spinosa	Black Thorn	Y				1				
	Pittosporum angustifolium	Weeping Pittosporum	Y					2	2	1	1
	Pittosporum spinescens	Wallaby Apple	Y				1	1			1
PLANTAGINACEAE	Plantago cunninghamii		Y		2						1
POACEAE	Cenchrus ciliaris	Buffel Grass	N		3	3	2	6	5	6	4 to 6
	Chloris gayana	Rhodes Grass	N			1		1			2 to 4
	Chloris virgatus	Feathertop Rhodes Grass	N			2					2
	Cynodon dactylon	Couch	N			1					1
	Dichanthium aristatum	Angleton Grass	N			1					
	Echinochloa colona	Awnless Barnyard Grass	N			1			1		
	Hyparrhenia rufa	Thatch Grass	N							1	1
	Megathrysus maximus var. maximus	Guinea Grass	N		2	1	1	1	2		2 to 4
	Rhynchelytrum repens	Red Natal Grass	N					1			
	Sorghum bicolor	Forage Sorghum	N								2
	Urochloa mosambicensis	Sabi Grass	N			1					1
	Urochloa panicoides		N					1			1
	Ancistrachne uncinulata	Hooky Grass	Y				1	1	1		
	Aristida calycina var. praealta	Dark Wiregrass	Y		2	1		2	3		1
	Aristida jerichoensis var.jerichoensis	Jericho Wiregrass	Y			1					
	Aristida latifolia	Feathertop Wiregrass	Y		1	1		2	2	2	1
	Aristida leptopoda	White Speargrass	Y						1		1
	Aristida ramosa	Purple Wiregrass	Y					2	2	2	1
	Austrostipa ramosissimum	Stout Bamboo Grass	Y		2		2				1
	Austrostipa scaber	Rough Speargrass	Y						1		
	Austrostipa setacea		Y								
	Austrostipa verticillata	Slender Bamboo Grass	Y			2					
	Bothriochloa bladhii	Forest Bluegrass	Y		1	2			2		
	Chloris divaricata	Slender Chloris	Y		2	1		2	2		1

FAMILY	Botanical Name	Commona Name	Native	BBS Sig.	Surveyed Regional Ecosystems						
					11.3.2	11.3.25	11.9.4	11.9.5	11.9.7	11.9.10	Cleared
	Chloris truncata	Windmill Grass	Y		2				2		
	Chrysopogon sylvaticus		Y			1					
	Cymbopogon refractus	Barbed Wire Grass	Y					1	2		
	Dactyloctenium radulans	Button Grass	Y					1			1
	Dichanthium sericeum	Bluegrass	Y		1	2			1		2
	Elymus scabrus	Common Wheatgrass	Y			1					
	Ennaeopogon gracilis	Slender Nine-awn	Y		2				1	2	
	Ennaeopogon nigricans	Niggerheads	Y					2			
	Ennaeopogon obovatus	Hedgehog Grass	Y						1		
	Enteropogon acicularis	Curly Windmill Grass	Y					2	1		1
	Enteropogon ramosus	Twirly Windmill Grass	Y			1			1		
	Eragrostis elongatus	Clustered Lovergrass	Y			1					
	Eragrostis lacunaria	Purple Lovegrass	Y					2	1		
	Eragrostis parviflora	Weeping Lovegrass	Y			1					
	Eragrostis soraria	Woodland Lovegrass	Y		2				1		1
	Eriochloa crebra	Early Spring Grass	Y		2						
	Eriochloa psuedoacrotricha		Y								
	Heteropogon contortus	Bunched Speargrass	Y						1		1
	Imperata cylindrica	Blady Grass	Y			1					
	Leptochloa decipiens ssp. peacockii		Y				2	2	1	1	
	Leptochloa digitata	Umbrella Canegrss	Y			2					
	Panicum decompositum		Y					2	1		
	Paspalidium caespitosum	Brigalow Grass	Y		1		2	3	1		
	Paspalidium constrictum		Y		1			2	1		
	Paspalidium distans	Shot Grass	Y			1			1		
	Paspalidium gracile		Y		2						
	Paspalidium rarum		Y					1			
	Paspalum distichum	Water Couch	Y								2
	Sporobolus australianus	Australian Dropseed	Y					1	2	2	2
	Sporobolus caroli	Fairy Grass	Y		2			1	1	1	1
	Sporobolus creber	Slender Rat's Tail Grass	Y			2			1		
	Sporobolus diander		Y			1					
	Themeda triandra	Kangaroo Grass	Y		2	2					
	Vetivier fillipes	Vetivier	Y			1					
POLYGONACEAE	Persicaria lapathifolia		Y								3
PROTEACEAE	Grevillea striata	Beefwood	Y						2		
RANUNCULACEAE	Clematocissus opaca	Forest Grape	Y					1	2		
RHAMNACEAE	Ventilago viminalis	Vine Tree	Y				1				
RUBIACEAE	Asperula conferta var. conferta	Common Woodruff	Y		2						
	Opercularia hispida		Y						1		

FAMILY	Botanical Name	Commona Name	Native	BBS Sig.	Surveyed Regional Ecosystems						
					11.3.2	11.3.25	11.9.4	11.9.5	11.9.7	11.9.10	Cleared
	Psydrax johnsonii		Y				1	1			
	Psydrax odorata forma buxifolia	Stiff Canthium	Y				2	1	1		
	Psydrax oleifolia	Wild Lemon	Y								
RUTACEAE	Citrus glauca	Wild Lime	Y						1		1 to 2
	Geijera parviflora	Narrow-leaved Wilga	Y		4	1	3	4	3	2	1 to 2
SANTALACEAE	Santalum lanceolatum	Sandalwood	Y					2			1 to 2
SAPINDACEAE	Alectryon diversifolius	Scrub Boonaree	Y				2	1	1		1 to 2
	Alectryon oleifolius	Western Rosewood	Y		2			1	1		1 to 2
	Atalaya hemiglauca	Whitewood	Y		2	1	1	1	1		1 to 2
	Dodonaea viscosa ssp. angustifolia	(a) Hop Bush	Y						2		
	Planchonella cotinifolia var. pubescens	Yellow Lemon	Y				2		1		
SOLANACEAE	Nicotinia glauca	Tree Tobacco	N			1					1
	Solanum americanum	Blackberry Nightshade	N			2	1	1			1
	Solanum ellipticum	Potato Bush	Y		2	1		1			1
	Solanum esuriale	Potato Weed	Y						1		
	Solanum mitchellianum	Western Prickly Nightshade	Y		2		2	2			
	Solanum nemophilum		Y						2		
	Solanum parviflorum ssp. parviflorum	Small-leaved Nightshade	Y					1	2		
STERCULIACEAE	Brachychiton populneus	Kurrajong	Y			1					
	Brachychiton rupestris	Queensland Bottle Tree	Y				1	2			1
THYMELAEACEAE	Pimelea microcephala	Poison Pimelea	Y								
VERBENACEAE	Verbena aristega	Mayne's Pest	N		2	2		1	1	1	1 to 4
	Verbena bonariensis	Purple-top	N			2					1
	Verbena officinalis	Common Verbena	N			1					1
	Verbena africans		Y			1		1			
Summary											
Total number of species					65	111	55	89	103	29	97
Number of native species					56	75	52	76	94	25	68
Number of exotic species					9	36	3	13	9	4	29

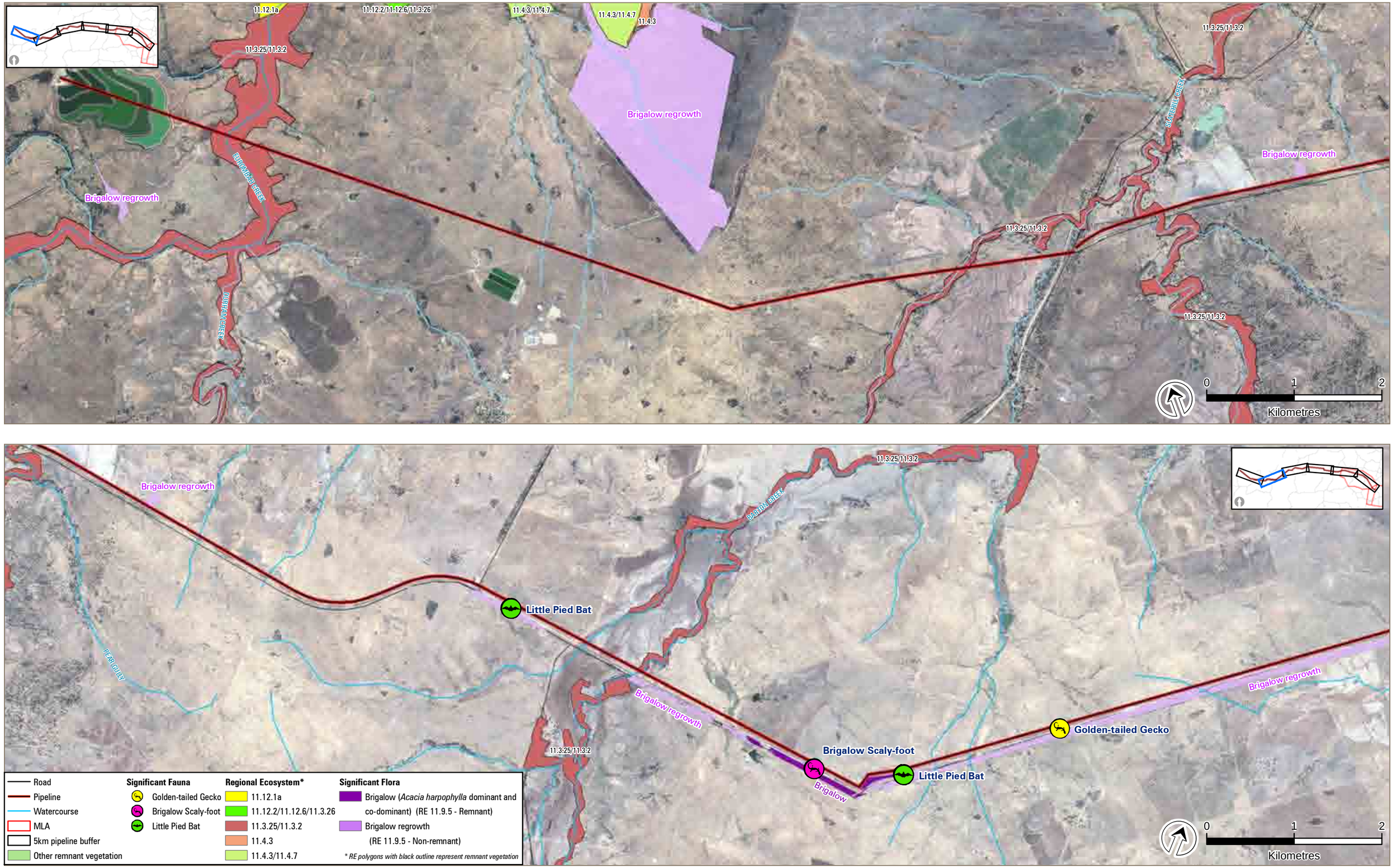
LEGEND

"Native"	**Y**	taxon indigenous to Australia
	N	introduced and/or naturalised taxon not indigenous to Australia
	(2)	Class 2 pest as defined under *Lands Protection (Stock Route and Pest Management) Act 2002* and *Regulation 2003*

"BBS Sig"	Individual taxa which are regarded as regionally significant within the Southern Brigalow Belt and/or require further investigation, as described within *Table 3: Biodiversity Planning Assessment - Brigalow Belt South Flora Expert Panel Report (EPA, 2002)*

FAMILY	Botanical Name	Commona Name	Native	BBS Sig.	Surveyed Regional Ecosystems						
					11.3.2	11.3.25	11.9.4	11.9.5	11.9.7	11.9.10	Cleared

"Surveyed Regional Ecosystems"	Vegetation communities identified on site which are representative of a described regional ecosytem (either remnant or non-remnant). Relative abundance was prescribed using the Braun-Blanquet technique. Where multiple populations or site specific surveys of one regional ecosytem have been performe relative abundance of an individual taxon was averaged across all sites and rounded up to the nearest catagory]	
	1	Few individuals contributing less than 5% cover
	2	Many individuals contributing less than 5% cover
	3	5-25% cover
	4	25-50% cover
	5	50-75% cover
	6	75-100% cover



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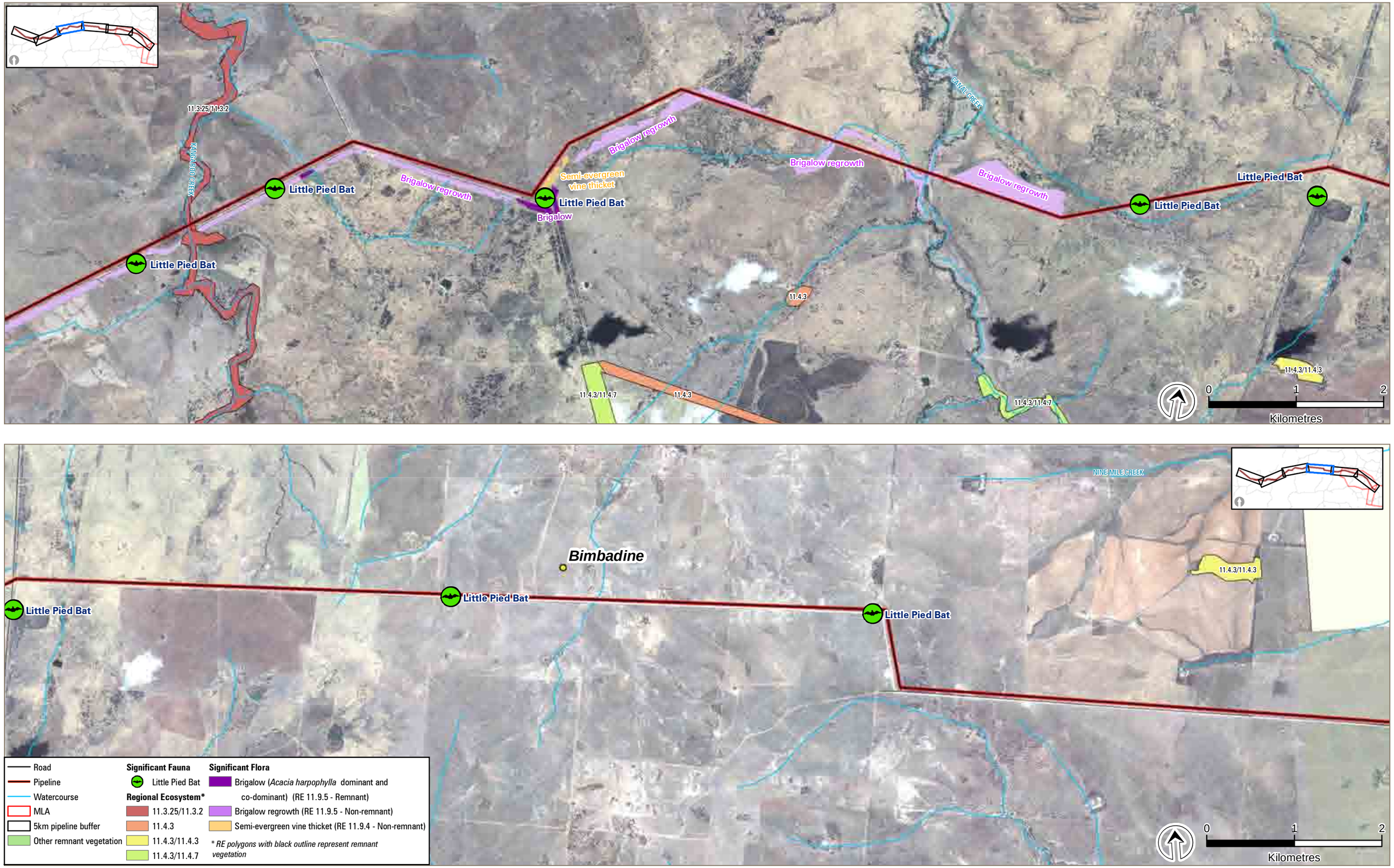
Source: Roads, QLD State Digital Road Network (2004); Towns, creeks 1:250k Topo, Geoscience Australia (2006)

PARSONS BRINCKERHOFF

Map A

1:40,000 Regional Ecosystems, non-remnant vegetation map and other significant biodiversity



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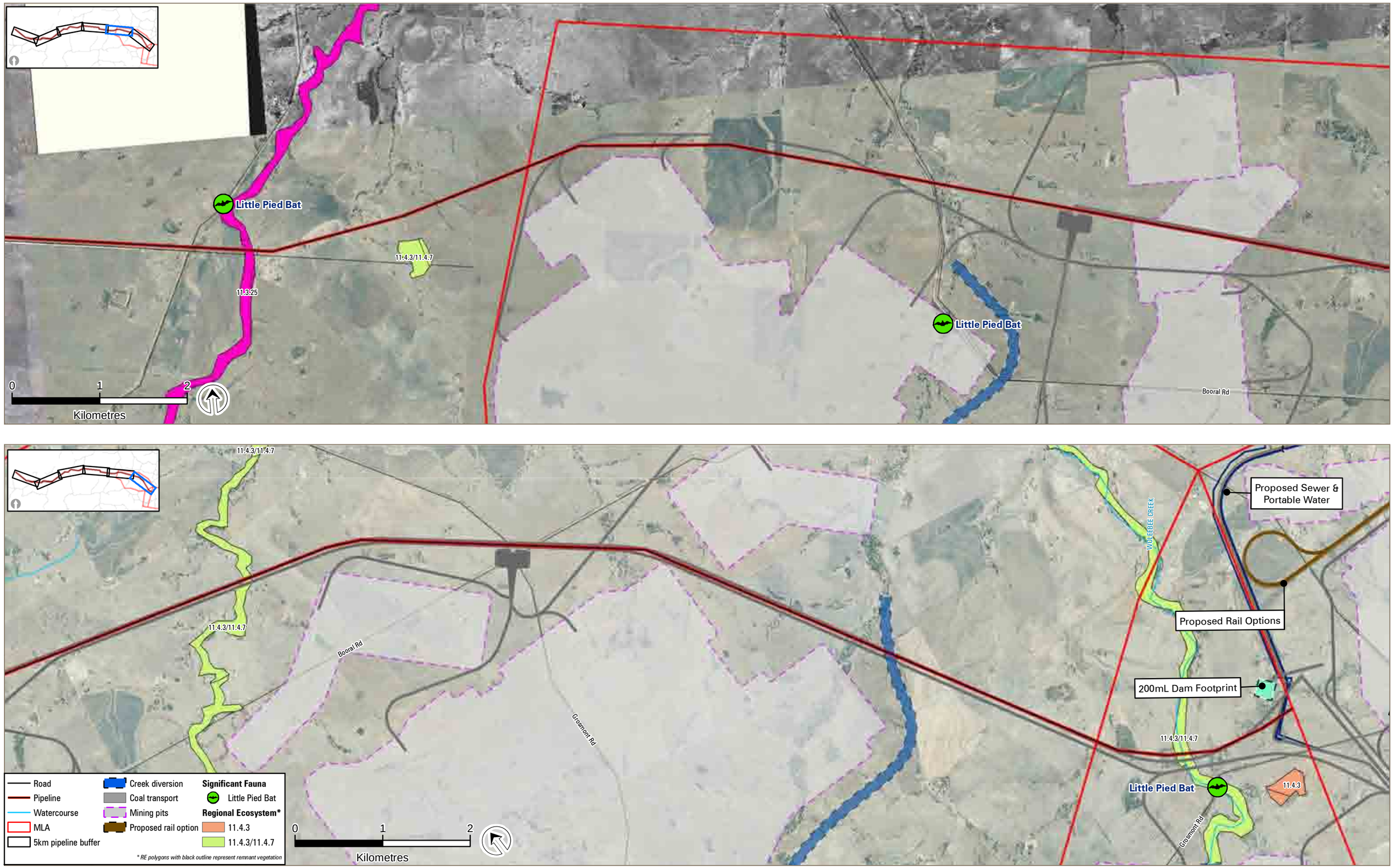
Source: Roads, QLD State Digital Road Network (2004); Towns, creeks 1:250K Topo, Geoscience Australia (2006)

PARSONS BRINCKERHOFF

Map B

1:40,000 Regional Ecosystems, non-remnant vegetation map and other significant biodiversity



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Source: Roads, QLD State Digital Road Network (2004); Towns, creeks 1:250K Topo, Geoscience Australia (2006)

PARSONS BRINCKERHOFF

Map C

1:40,000 Regional Ecosystems, non-remnant vegetation map and other significant biodiversity

Attachment F

Fauna habitat results

Table F-1: Fauna habitat results

Habitat characteristic	Acacia-Belah scrub	Ironbark woodland	Box woodland	QLD Blue Gum riparian	Cleared land	Aquatic/wetland
Standard Trapping Site	2,3,4	—	1	—	—	—
Supplementary Sites	yes	opportunistic	yes	yes	yes	yes
Topography	Low Hills and Ridges	Drainage Line, Lower and mid slopes	Alluvial Flat plus lower slopes	Alluvial Flats and Riparian Zones of Major Drainages	Variable	Alluvial and variable (farm dams)
Landuse	Private and Roadside Reserve	Private and Roadside Reserve	Private and Roadside Reserve	Private and Roadside Reserve	Private and Roadside Reserve	Private
Age Class	Remnant and Non Remnant	Remnant	Remnant and Non Remnant	Remnant	Not applicable	Not applicable
Dominant Vegetation						
Overstorey	Brigalow (*Acacia harpophylla*) 75% Belah (*Casuarina cristata*) 20% – (10-13m height, FPC 10%)	Silver-leaved Ironbark (*Eucalyptus melanophloia*) 70% Poplar Box (*Eucalyptus populnea*) 5% – (12-13 m height, FPC 10%)	Poplar Box (*Eucalyptus populnea*) 95%, Beefwood (*Grevillia striata*) 5% – (15-17 m, FPC 5-10%)	Queensland Blue Gum (*Eucalyptus tereticornis*) 95%, River She-oak (*Casuarina cunninghamiana*) 5% – (20-22 m, FPC 10-40%)	Generally scatted trees of remnant vegetation	absent
Mid Storey	Belah (*Casuarina cristata*) 15% Brigalow (*Acacia harpophylla*) 50% Wilga (*Geijera parviflora*) 15% , Queensland Ebony (*Lysiphyllum caronii*) 10% – (Height 4-8, FPC 10-15%)	Silver-leaved Ironbark (*Eucalyptus melanophloia*) – 20% Queensland Ebony (*Lysiphyllum caronii*) 10% Callitris (*Callitris glaucophylla*) – 20% Belah (*Casuarina cristaat*) 20% – (Height 7 m, FPC 5-	Queensland Ebony (*Lysiphyllum caronii*) - 15% Ironwood (*Acacia excelsa*) 20%, Western Rosewood (*Alectryon oleifolius*) 20% and Warrior Bush (*Apophyllum anomalum*) 15% - (9m , FPC 10%)	Rough-barked Apple (*Angophora floribunda*) 30% Queensland Blue Gum (*Eucalyptus tereticornis*) 60% – (10-16m, FPC 10-30%)	Generally scatted trees of remnant vegetation	absent

Habitat characteristic	Acacia-Belah scrub	Ironbark woodland	Box woodland	QLD Blue Gum riparian	Cleared land	Aquatic/wetland
		10%)				
Understorey	Wilga (*Geijera parviflora*) 55% False Sandelwood (*Eremophila mitchellii*) 20% – (Height 3-4 m, FPC 10-20%)	Wilga (*Geijera parviflora*) 25% Silver-leaved Ironbark (*Eucalyptus melanophloia*) 35% - (Height 3 m, FPC 5-15%)	Wilga (*Geijera parviflora*) 25% False Sandalwood (*Eremophila mitchellii*) 25% Western Rosewood (*Alectryon oleifolius*) 20% – (3 m, FPC 5-25%)	Tea Tree (*Melaleuca braceata*) 70% – (3-8 m, FPC 15%)	Generally scatted shrubs of remnant vegetation	absent
Groundcover	Buffel Grass (*Cenchrus ciliaris*) 65% Gall Weed (*Zygophyllum apiculatum*) 25%, Warrigal Greens (*Tetragonia tetragonoides*), Slender Chloris (*Chloris divaricata*) 10% and Brigalow Grass (*Paspalidium caespitosum*) 10% - (Height 0.1-0.7 m, FPC – 50%)	Buffel Grass (*Cenchrus ciliaris*) 85% – (Height 0.7 m, FPC – 80%)	Dark Wiregrass (*Aristida calycina var. praealtas*) 35%, Windmill Grass (*Chloris truncata*) 30%, Buffel Grass (*Cenchrus ciliaris*) 20%, Yellow Burr (*Sclerolaena anisacanthioides*) 5%, Twirly Windmill Grass (*Enteropogon ramosus*) 5% – (1.0m, FPC 5030%)	Rhodes Grass (*Chloris gayana*) 30%, Matrush (*Lomandra longifolia*) 10% - (0.5-1.0 m, FPC 15%)	Predominantly introduced grasses particularly Buffel Grass	absent
Soil Type	Clay and clay loam with deep underlying clays	Sandy Loam with underlying clays	Sandy loams with underlying clays	Range from sandy loam through dark cracking clays	Highly variable from cracking clays to sandy loams	Generally heavy clays
Fire History	>20 yrs	>20 yrs	> 20 yrs	>20 yrs	Unknown	>30 yrs
Waterbodies	Generally absent	Absent	Absent	Yes	Yes	Yes
Waterbody type	na	na	na	Ephemeral Creeks	Stock Dams	Ephemeral Wetlands
Stream Substrate	na	na	na	Clay	Clay	Clay

Habitat characteristic	Acacia-Belah scrub	Ironbark woodland	Box woodland	QLD Blue Gum riparian	Cleared land	Aquatic/wetland
Fringing Ground Vegetation	na	na	na	Occasional *Cyperus* and *Sporobolous*)	Nil	Mainly sedges (*Cyperus*) and tussock grasses (*Sporobolous*)
Riparian Vegetation	na	na	na	Grasses (*Chloris gayana*) Matrush (*Lomandra longifolia*)	Nil	Eucalyptus tereticornis
Water Quality	na	na	na	Turbid	Turbid	Turbid
Approximate Depth	na	na	na	Up to 0.5 m	Up to several metres	<0.5 m
Terrestrial Component						
Litter Depth	5-15 cm	<5 cm	2-5 cm	2-5 cm	<5 cm	nil
Humus	5-10 cm	<5 cm	0-5 cm	0-5 cm	<2 cm	nil
Groundcover Composition	55% vegetation (grasses) 25% litter 15% log 5% bare soil 0% rock 0% rubbish-rubbish **Comments** – extensive litter and log cover make this habitat suitable for fossorial reptiles	80% vegetation 10% litter 5% log 5% bare soil 0% rock 0% rubbish **Comments** – discreet habitat provides suitable tree hollow resources	35% vegetation 25% litter 15% log 25% bare soil 0% rock 0% rubbish **Comments** – habitat quality highly variable through study area	75% vegetation 11% litter 5% log 5% bare soil 4 % rock 0% rubbish **Comments** – high habitat quality but variable throughout the study area.	20-85% vegetation 0-10% litter 0-20% log (in recently cleared areas) 5-25% bare soil 0-10 % rock <5% rubbish-rubbish **Comments** – provides limited habitat to fauna	10% vegetation 5% litter 15% log 70% bare soil 0% rock 0%-rubbish **Comments** – provides habitat for nomadic and migratory wetland species including Great Egret
Tree Hollow Density (tree per ha)	0-6 per ha	7 per ha	0-10 per ha	~12 per ha	Variable depending on density and type of retained paddock trees 0-2 per ha	Nil

Habitat characteristic	Acacia-Belah scrub	Ironbark woodland	Box woodland	QLD Blue Gum riparian	Cleared land	Aquatic/wetland
Hollow Characteristics	**Trunk** – small to medium crevices and fissures **Limb** – small and medium crevices and fissures **Suitability** – bats, arboreal herpetofauna	**Trunk** – small **Limb** – small, medium and large **Suitability** – bats, gliders, possum, large birds, arboreal reptiles	**Trunk** – small, medium and large **Limb** – small, medium and large **Suitability** – bats, gliders, possum, large birds, arboreal herpetofauna	**Trunk** – small, medium and large **Limb** – small, medium and large **Suitability** – bats, gliders, possum, large birds, arboreal herpetofauna	**Trunk** – small, medium and large **Limb** – small, medium and large **Suitability** – bats, some birds and occasionally possums	Not applicable
Flowering andFruiting Trees	Belah (25% cones)	Mistletoe (5%) Belah (15% cones)	Mistletoe (20%)	Queensland Blue Gum (25%)	Nil	Nil
Landscape/Corridor Value	High. Often provides only continuous vegetated link in otherwise cleared landscape. Links other communities to riparian zones	High as its generally associated within roadside remnant or drainage lines within an otherwise cleared landscape	High as its generally associated within roadside remnant or drainage lines within an otherwise cleared landscape	High as its generally associated with uncleared drainage lines and provides important late winter spring foraging resource and abundant tree hollows	Nil	Limited from a migratory perspective (no RAMSAR sites nearby)
Disturbance History	Clearing – moderate Logging – low Roads – high Fire – nil Weeds – moderate Refuse – low Recreation – nil Grazing – moderate	Clearing – moderate Logging – moderate Roads – low Fire – nil Weeds – moderate Refuse – nil Recreation – nil Grazing – moderate	Clearing – moderate Logging – moderate Roads – low Fire – nil Weeds – low Refuse – nil Recreation – nil Grazing - moderate	Clearing – low Logging – low Roads – low Fire – nil Weeds – moderate Refuse – low Recreation – nil Grazing - high	Clearing – high Logging – nil Roads – high Fire – nil Weeds – high Refuse – low Recreation – nil Grazing - high	Clearing – high Logging – nil Roads – nil Fire – nil Weeds – low Refuse – nil Recreation – nil Grazing – high
Other Notes	Suitable habitat for reptiles particularly fossorial species including Brigalow	Provides abundant tree hollow resources for fauna	Appears to provide important habitat for hollow dependant fauna	Appears to provide important habitat for hollow dependant fauna particularly	Used by some open country specialists such as the Bustard. Some	Provide habitat for waterfowl, egrets, frogs and some species of

Habitat characteristic	Acacia-Belah scrub	Ironbark woodland	Box woodland	QLD Blue Gum riparian	Cleared land	Aquatic/wetland
	Scaly-foot and other Brigalow Belt endemics such as Golden-tailed Gecko.			those species which also have nectivorous and/or folivorous habits	microchiropteran bats of conservation value may use isolated paddock trees for roosting	snake. Also used as watering points by macropods

Family	Scientific Name	Common name	Conservation Status			Abundance	Winter 2008 survey						Habitat type associations				
			NCR	EPBC	RSF		Winter Detection Method	Standard sites 1	2	3	4	Supple-mentary sites / opportu-nistic	Non-Eucalypt woodland (Acacia - Casuarina)	Ironbark +- Callitris Woodland	Poplar Box Woodland	Riparian (E. tereticornis +- A. floribunda)	Cleared
Bufonidae	*Rhinella marinus*	Cane Toad	I	-	-	U	O,HS	•				•	•			•	
Hylidae	*Litoria caerulea*	Common Green Tree Frog	C	-	-	R	HS					•				•	
Hylidae	*Litoria latopalmata*	Broad Palmed Rocket Frog	C	-	-	R	HS					•				•	
Hylidae	*Litoria rubella*	Desert Tree Frog	C	-	-	R	HS					•				•	
Myobatrachidae	*Limnodynastes tasmaniensis*	Spotted Grassfrog	C	-	-	R	W, HS					•			•	•	•
						Site Totals		**1**	**0**	**0**	**0**	**5**	**1**	**0**	**1**	**5**	**1**
Agamidae	*Pogona barbata*	Bearded Dragon	C	-	-	C	O,HS		•		•	•	•	•	•	•	•
Boidae	*Morelia spilota*	Carpet Python	C	-	-	R	FT		•				•				
Elapidae	*Demansia psammophis*	Yellow-faced Whipsnake	C	-	-	R	HS, FT		•	•			•				
Gekkonidae	*Gehyra dubia*	Tree Dtella	C	-	-	C	HS	•	•	•	•	•	•	•	•	•	
Gekkonidae	*Heteronotia binoei*	Bynoe's Gecko	C	-	-	C	HS	•	•	•	•	•	•	•	•	•	
Gekkonidae	***Strophurus taenicauda***	**Golden-tailed Gecko**	**R**	**-**	**SigSBB**	**R**	**HS**					•	•				
Pygopodidae	***Paradelma orientalis***	**Brigalow Scaly-foot**	**V**	**V**	**SigSBB**	**R**	**HS**				•		•				
Pythonidae	*Antaresia maculosa*	Spotted Python	C	-	-	R	O	•				•			•		
Scincidae	*Carlia foliorum*	Rainbow Skink	C	-	-	U	HS,P	•	•	•	•	•	•	•	•	•	
Scincidae	*Carlia pectoralis pectoralis*	Rainbow Skink	C	-	-	R	HS, P			•		•	•		•	•	
Scincidae	*Cryptoblepharus virgatus*	Wall Skink	C	-	-	C	HS,P	•				•	•	•	•	•	
Scincidae	*Lerista fragilis*	Sand Sliding Skink	C	-	-	C	HS	•	•		•	•	•	•	•	•	
Scincidae	*Lerista punctatovittata*	Sand Sliding Skink	C	-	-	R	HS				•		•				
Scincidae	*Mentia greyii*	Skink	C	-	-	R	HS	•							•		
Scincidae	*Morethia boulengeri*	A skink	C	-	-	U	HS,P	•	•	•	•	•	•		•	•	
Scincidae	*Tiliqua rugosa*	Shingleback	C	-	SigSBB	R	Re					•	•				•
Scincidae	*Tiliqua scincoides*	Eastern Blue Tongue	C	-	-	R	HS					•				•	
						Site Totals		**8**	**8**	**6**	**8**	**12**	**14**	**6**	**10**	**9**	**2**
Canidae	*Canis lupus dingo*	Dingo/Wild Dog	I	-	-		Sc, T			•		•					•
Canidae	*Vulpes vulpes*	Red Fox	I	-	-	R	Sc, T					•			•		•
Dasyuridae	*Sminthopsis murina*	Common Dunnart	C	-	-	R	P	•							•		
Felidae	*Felis catus*	Feral Cat	I	-	-	R	O,T			•		•	•		•		
Leporidae	*Lepus capensis*	Brown Hare	I	-	-	U	O,RT			•	•	•	•		•		•
Leporidae	*Oryctolagus cuniculus*	Rabbit	I	-	-	A	O,RT	•		•	•	•	•	•	•		•
Macropodidae	*Macropus dorsalis*	Black-striped Wallaby	C	-	SigSBB	C	S, RT, O	•	•		•	•	•	•	•	•	•
Macropodidae	*Macropus giganteus*	Eastern Grey Kangaroo	C	-	-	A	O,S,RT	•	•	•	•	•	•	•	•	•	•
Macropodidae	*Macropus rufus*	Red Kangaroo	C	-	-	R	O					•					•
Macropodidae	*Macropus rufogriseus*	Red-necked Wallaby	C	-	-	U	O					•				•	•
Macropodidae	*Wallabia bicolor*	Swamp Wallaby	C	-	-	U	O,RT		•			•	•	•	•	•	
Muridae	*Mus musculus*	House Mouse	I	-	-	A	E, P, RT, HS	•	•	•	•	•	•		•	•	•
Peramelidae	*Isoodon macurus*	Northern Brown Bandicoot	C	-	SigSBB	R	Re					•				•	
Phalangeridae	*Trichosurus vulpecula*	Common Brushtail Possum	C	-	SigSBB	C	Sc	•	•	•	•	•	•	•	•	•	
Suidae	*Sus scrofa*	Feral Pig	I	-	-	U	O, D, T	•				•	•		•	•	
Tachyglossidae	*Tachyglossus aculeatus*	Short-beaked Echidna	C	-	-	C	O, RT, Sc, Re	•	•	•	•	•	•	•	•	•	
Vespertilionidae	*Miniopterus schreibersii oceanensis*	Eastern Bent-wing Bat	C	-	-	R	A					•	•				
Vespertilionidae	*Nyctophilus gouldi*	Gould's Long-eared Bat	C	-	-	R	H					•	•				
Vespertilionidae	*Chalinolobus gouldii*	Goulds Wattled Bat	C	-	-	R	A			•		•	•			•	•
Vespertilionidae	*Nyctophilus geoffroyi*	Lesser Long-eared Bat	C	-	-	R	H			•			•				
Vespertilionidae	*Scotorepens greyii*	Little Broad-nosed Bat	C	-	-	R	A			•		•	•		•	•	•
Vespertilionidae	*Vespadelus vulturnus*	Little Forest Bat	C	-	NRL	R	H					•				•	
Vespertilionidae	***Chalinolobus picatus***	**Little Pied Bat**	**R**	**-**	**SigSBB**	C	H,A	•	•	•		•	•		•	•	•
						Site Totals		**9**	**7**	**12**	**7**	**21**	**16**	**6**	**14**	**13**	**12**
Accipitridae	*Accipiter fasciatus*	Brown Goshawk	C	-	-	R	O					•	•	•			•

Family	Scientific Name	Common name	Conservation Status			Abundance	Winter 2008 survey						Habitat type associations				
			NCR	EPBC	RSF		Winter Detection Method	Standard sites 1	2	3	4	Supple-mentary sites / opportu-nistic	Non-Eucalypt woodland (Acacia - Casuarina)	Ironbark +- Callitris Woodland	Poplar Box Woodland	Riparian (E. tereticornis +- A. floribunda)	Cleared
Accipitridae	*Circus assimilis*	Spotted Harrier	C	-	-	R	O					•	•				•
Accipitridae	*Aquila audax*	Wedge-tailed Eagle	C	-	-	A	O	•	•		•	•	•	•	•	•	•
Accipitridae	*Haliastur sphenurus*	Whistling Kite	C	-	-	R	O					•				•	•
Aegothelidae	*Aegotheles cristatus*	Australian Owlet Nightjar	C	-	-	R	W	•				•			•		
Anatidae	*Anas rhynchotis*	Australian Shoveller	C	-	-	R	O					•					
Anatidae	*Chenonetta jubata*	Australian Wood Duck	C	-	-	R	O					•					
Anatidae	*Cygnus atratus*	Black Swan	C	-	-	R	O					•					
Anatidae	*Anas gracilis*	Grey Teal	C	-	-	U	O					•					
Anatidae	*Aythya australis*	Hardhead	C	-	-	R	O					•					
Anatidae	*Anas superciliosa*	Pacific Black Duck	C	-	-	U	O					•				•	
Anatidae	*Malacorhynchus membranaceus*	Pink-eared Duck	C	-	-	R	O					•					
Anhingidae	*Anhinga melanogaster*	Darter	C	-	-	U	O					•					
Ardeidae	*Ardea alba*	Great Egret	C	M	-	R	O					•					
Ardeidae	*Ardea ibis*	Cattle Egret	C	M	-	R	O					•					
Ardeidae	*Egretta novaehollandiae*	White-faced Heron	C	-	-	U	O					•				•	•
Ardeidae	*Ardea pacifica*	White-necked Heron	C	-	-	U	O					•				•	•
Artamidae	*Gymnorhina tibicen*	Australian Magpie	C	-	-	A	O	•	•	•		•	•	•	•	•	•
Artamidae	*Cracticus torquatus*	Grey Butcherbird	C	-	-	U	O	•		•		•	•		•	•	
Artamidae	*Cracticus nigrogularis*	Pied Butcherbird	C	-	-	C	O		•	•	•	•	•	•	•		•
Cacatuidae	*Nymphicus hollandicus*	Cockatiel	C	-	-	A	O	•	•	•	•	•	•	•	•	•	•
Cacatuidae	*Cacatua roseicapilla*	Galah	C	-	-	A	O	•	•	•		•	•	•	•	•	•
Cacatuidae	*Cacatua galerita*	Sulphur Crested Cockatoo	C	-	-	C	O	•			•	•	•	•	•	•	•
Campephagidae	*Coracina novaehollandiae*	Black-faced Cuckoo Shrike	C	-	-	C	O	•	•			•	•	•	•	•	
Campephagidae	*Coracina maxima*	Ground Cuckoo Shrike	C	-	-	C	O		•	•	•	•	•	•			•
Casuariidae	*Dromaius novaehollandiae*	Emu	C	-	-	R	O					•	•				
Centropodidae	*Centropus phasianinus*	Pheasant Coucal	C	-	-	R	O					•				•	•
Charadriidae	*Elseyornis melanops*	Black Fronted Dotterel	C	-	-	R	O					•					
Charadriidae	*Vanellus miles miles*	Masked Lapwing	C	-	-	U	O					•					•
Columbidae	*Geopelia humeralis*	Bar-shouldered Dove	C	-	-	R	O,W			•		•	•				
Columbidae	*Ocyphaps lophotes*	Crested Pigeon	C	-	-	A	O	•	•	•	•	•	•	•	•	•	•
Columbidae	*Geopelia striata*	Peaceful Dove	C	-	-	R	O			•	•	•				•	
Corcoracidae	*Struthidea cinerea*	Apostlebird	C	-	-	A	O	•	•	•	•	•	•	•	•	•	•
Corvidae	*Corvus coronoides*	Australian Raven	C	-	-	U	W	•		•		•	•	•			
Corvidae	*Corvus orru*	Torresian Crow	C	-	-	A	O		•	•	•	•	•	•	•	•	•
Dicaeidae	*Dicaeum hirundinaceum*	Mistletoebird	C	-	-	C	W	•	•	•	•	•	•	•	•	•	
Dicruridae	*Rhipidura fuliginosa*	Grey Fantail	C	-	-	C	O	•	•	•	•	•	•	•	•		
Dicruridae	*Grallina cyanoleuca*	Magpielark	C	-	-	U	O	•	•	•		•	•		•	•	•
Dicruridae	*Myiagra inquieta*	Restless Flycatcher	C	-	-	R	O					•				•	
Dicruridae	*Rhipidura leucophrys leucophrys*	Willie Wagtail	C	-	-	C	O	•	•	•		•	•	•	•	•	•
Falconidae	*Falco longipennis*	Australian Hobby	C	-	-	R	O					•	•		•		•
Falconidae	*Elanus axillaris*	Black Shouldered Kite	C	-	-	A	O		•	•	•	•		•	•	•	•
Falconidae	*Falco berigora*	Brown Falcon	C	-	-	U	O		•		•	•	•	•	•		•
Falconidae	*Falco cenchroides*	Nankeen Kestrel	C	-	-	A	O	•	•		•	•	•		•	•	
Fringillidae	*Taeniopygia guttata*	Zebra Finch	C	-	-	U	O					•	•				•
Halcyonidae	*Dacelo novaeguineae*	Laughing Kookaburra	C	-	-	U	O	•	•	•		•	•	•	•	•	•
Hirundinidae	*Hirundo ariel*	Fairy Martin	C	-	-	U	O			•		•	•				
Hirundinidae	*Hirundo neoxena*	Welcome Swallow	C	-	-	U	O					•				•	•
Maluridae	*Malurus melancephalus*	Red-backed Wren	C	-	-	U	O					•				•	•
Maluridae	*Malurus splendens*	Splendid Fairy Wren	C	-	-	R	O					•	•				

Family	Scientific Name	Common name	Conservation Status			Abundance	Winter 2008 survey						Habitat type associations				
			NCR	EPBC	RSF		Winter Detection Method	Standard sites 1	2	3	4	Supple-mentary sites / opportu-nistic	Non-Eucalypt woodland (Acacia - Casuarina)	Ironbark +- Callitris Woodland	Poplar Box Woodland	Riparian (E. tereticornis +- A. floribunda)	Cleared
Maluridae	*Malurus cyaneus*	Superb Fairywren	C	-	-	C	O	•	•			•	•			•	
Maluridae	*Malurus lamberti*	Variegated Fairywren	C	-	-	U	O	•		•		•	•	•	•	•	•
Meliphagidae	*Entomyzon cyanotis*	Blue-faced Honeyeater	C	-	-	C	O	•	•	•	•	•	•	•	•	•	
Meliphagidae	*Lichmera indistincta*	Brown Honeyeater	C	-	-	R	O	•		•		•	•		•		
Meliphagidae	*Philemon citreogularis*	Little Friarbird	C	-	-	A	O	•		•	•	•	•	•	•	•	
Meliphagidae	*Philemon corniculatus*	Noisy Friarbird	C	-	-	U	O					•	•		•	•	
Meliphagidae	*Manorina melanocephala*	Noisy Miner	C	-	-	C	O	•	•			•	•		•	•	
Meliphagidae	*Lichenostomus virescens*	Singing Honeyeater	C	-	-	A	O	•	•	•	•	•	•	•	•	•	
Meliphagidae	*Acanthagenys rufogularis*	Spiny-cheeked Honeyeater	C	-	-	C	O	•	•	•	•	•	•		•	•	
Meliphagidae	*Plectorhyncha lanceolata*	Striped Honeyeater	C	-	-	A	O	•	•	•	•	•	•	•	•	•	
Meliphagidae	*Lichenostomus chrysops*	Yellow-faced Honeyeater	C			R	o					•			•	•	
Meliphagidae	*Manorina melanotis*	Yellow- throated Miner	C	-	-	A	O	•	•	•	•	•	•	•	•	•	
Motocillidae	*Anthus novaeseelandiae*	Richards Pipit	C	-	-	A	O			•	•	•				•	•
Otididae	*Ardeotis australis*	Australian Bustard	C	-	-	C	O					•	•				•
Pachycephalidae	*Pachycephala rufiventris*	Rufous Whistler	C	-	-	U	O	•		•	•	•	•	•	•	•	
Pardalotidae	*Acanthiza reguloides*	Buff-rumped Thornbill	C	-	-	R	O				•	•	•		•		
Pardalotidae	*Acanthiza uropygialis*	Chestnut-rumped Thornbill	C	-	-	A	O	•	•	•	•	•	•	•	•	•	
Pardalotidae	*Acanthiza apicalis*	Inland Thornbill	C	-	-	R	O	•				•	•		•		
Pardalotidae	*Pardalotus striatus*	Striated Pardalote	C	-	-	A	W	•	•	•	•	•	•		•	•	
Pardalotidae	*Smicrornis brevirostris*	Weebill	C	-	-	A	O	•	•	•	•	•	•	•	•	•	
Pardalotidae	*Gerygone fusca*	Western Gerygone	C	-	-	R	W					•		•			
Pardalotidae	*Gerygone olivacea*	White Throated Gerygone	C	-	-	U	W	•				•			•	•	
Pardalotidae	*Acanthiza chrysorrhoa*	Yellow-rumped Thornbill	C	-	-	A	O	•	•	•	•	•	•		•	•	
Passeridae	*Taeniopygia bichenovii*	Double Barred Finch	C	-	-	U	O		•	•	•	•	•	•	•	•	
Pelecanidae	*Pelecanus conspicillatus*	Australian Pelican	C	-	-	R	O					•					
Phalacrocoracidae	*Phalacrocorax carbo*	Great Cormarant	C	-	-	R	O					•					
Phalacrocoracidae	*Phalacrocorax sulcirostris*	Little Black Cormorant	C	-	-	U	O					•					
Phalacrocoracidae	*Phalacrocorax melanoleucos*	Little Pied Cormorant	C	-	-	R	O					•				•	
Phasianidae	*Coturnix ypsilophora*	Brown Quail	C	-	-	R	O					•	•				•
Podargidae	*Podargus strigoides*	Tawny Frogmouth	C	-	-	R	O	•				•	•				
Podicipedidae	*Tachybaptus novaehollandiae*	Australiasian Grebe	C	-	-	U	O					•					
Podicipedidae	*Podiceps cristatus*	Great-crested Grebe	C	-	-	R	O					•					
Pomatostomidae	*Pomatostomus temporalis temporalis*	Grey-crowned Babbler (eastern)	C	-	SigSBB	C	O	•	•		•	•	•	•	•		
Psittacidae	*Northiella haematogaster*	Blue Bonnett	C	-	-	U	O		•		•	•	•	•	•	•	•
Psittacidae	*Platycercus adscitus palliceps*	Pale-headed Rosella	C	-	-	A	O	•	•		•	•	•	•	•	•	•
Psittacidae	*Trichoglossus haematodus haematodus*	Rainbow Lorikeet	C	-	-	R	O					•				•	
Psittacidae	*Psephotus haematonotus*	Red Rumped Parrot	C	-	-	C	O	•	•	•		•	•		•	•	•
Psittacidae	*Aprosmictus erythropterus*	Red Winged Parrot	C	-	-	A	O	•	•	•	•	•	•	•	•	•	•
Ptilonorhynchidae	*Chlamydera maculata*	Spotted Bowerbird	C	-	-	U	O	•		•		•	•		•		
Recurvirostridae	*Himantopus himantopus*	Black-winged Stilt	C	-	-	R	O					•					
Strigidae	*Ninox novaeseelandiae*	Southern Boobook	C	-	-	R	W					•			•		
Sylviidae	*Cisticola exilis*	Golden-headed Cisticola	C	-	-	R	O					•					•
Sylviidae	*Cinclorhamphus mathewsi*	Rufous Songlark	C	-	-	U	O					•	•				•
Threskiornithidae	*Threskiornis molucca*	Australian White Ibis	C	-	-	R	O					•					
Threskiornithidae	*Platalea regia*	Royal Spoonbill	C	-	-	R	O					•					
Threskiornithidae	*Threskiornis spinicollis*	Straw-necked Ibis	C	-	-	U	O					•				•	•
Threskiornithidae	*Platalea flavipes*	Yellow-billed Spoonbill	C	-	-	R	O					•					
Tytonidae	*Tyto alba*	Barn Owl	C	-	-	C	O,W					•	•	•	•		•
Tytonidae	*Tyto capensis*	Eastern Grass Owl	C	-	SigSBB	R	W	1							•		•

Family	Scientific Name	Common name	Conservation Status			Abundance	Winter 2008 survey						Habitat type associations				
			NCR	EPBC	RSF		Winter Detection Method	Standard sites 1	2	3	4	Supple-mentary sites / opportu-nistic	Non-Eucalypt woodland (Acacia - Casuarina)	Ironbark +- Callitris Woodland	Poplar Box Woodland	Riparian (E. tereticornis +- A. floribunda)	Cleared
						Site Totals		**1**	**0**	**0**	**0**	**0**	**58**	**35**	**50**	**51**	**39**
													89	47	75	78	54
													Non-Eucalypt	Ironbark +- Callitris	Poplar Box	Riparian (E. tereticornis	Cleared

Attachment G

Likelihood of occurrence assessment for Rare and Threatened plants

Table: Likelihood of occurrence assessment for Rare and Threatened plants

Family	Species	Common name	Conservation status		Data source	Preferred habitat	Likelihood of occurrence
			State	National			
Eriocaulaceae	*Eriocaulon carsonii subsp. Orientale*		E	E	HERBRECS WO	Restricted to flowing mound springs (NSW National Parks and Wildlife Service 2002)	Low – No mound springs within the study area.
Orchidaceae	*Diuris tricolor (syn Diuris sheaffiana)*	Tricolour Diuris	—	V	EPBC Tool	Eucalypt open forest (Stanley & Ross 1989); Sclerophyll forest among grass, often with native Cypress Pine (Callitris spp.). It is found in sandy soils, either on flats or small rises (Botanic Gardens Trust 2006). Although disturbance regimes are not known, the species is usually recorded from disturbed habitats. Associated species include Callitris glaucophylla, Eucalyptus populnea, Eucalyptus intertexta, Ironbark and Acacia shrubland (Department of Environment and Climate Change 2007).	Low – There are no records of this species from the locality, however the species is known to occur in disturbed habitats associated with or derived from Eucalypt woodlands dominated by species Eucalyptus populnea in other locals. Seasonal surveys would be required to increase likelihood of detecting this species if present.
Sterculiaceae	*Commersonia sp. Cadarga (G.P.Guymer 1642)*		—	V	EPBC Tool	Recorded from north of Chinchilla on stony ridges in eucalypt forest (Stanley & Ross 1986).	Low – stony ridges not present in study area.

Family	Species	Common name	Conservation status		Data source	Preferred habitat	Likelihood of occurrence
			State	National			
Surianaceae	*Cadellia pentastylis*	Ooline	V	V	EPBC Tool	Emergent in Semi-evergreen Vine Thicket (SEVT); pure stands on residual sandstone ranges and scarps assoc. with Acacia harpophylla, A. sparsiflora, Casuarina cristata; in localised clumps among brigalow-belah communities on undulating clay plains and low hills; in E. populnea or A. catenulata communities (QPWS 2001). Known from Moonie Range, north of Goodiwindi and Gurulmundi Reserve (EPA 2006c).	Low – no remnant SEVT (RE 11.9.4.) in study area. Small areas of non-remnant vegetation analogous with SEVT were identifed on site and inspected, however no individuals were identified.
Poaceae	*Homopholis belsonii*	Belsons Panic			PB	Grows in dry woodland (e.g. Belah) on poor soils (Department of Environment and Climate Change 2007).	High - recorded in Brigalow regrowth (non-remnant vegetation analogous with RE 11.9.5) in the Wandoan Mine Lease Application areas. This species is considered likely to occur in Brigalow regrowth along the Roma-Taroom Road. Seasonal surveys would be required to

Family	Species	Common name	Conservation status		Data source	Preferred habitat	Likelihood of occurrence
			State	National			
							increase likelihood of detecting this species if present.

Notes	
Native:	Y = Yes, native. N = No, introduced
Conservation significance:	State as listed under the Nature Conservation (Wildlife) Regulation 2006.R= Rare, V = Vulnerable.
	National as listed under the Environment Protection and Biodiversity Conservation Act 1999. V = Vulnerable. E = Endangered
Source	HERBRECS (Queensland Herberium)
	CORVEG (Queensland Herberium)
	WO = Wildlife Online
	PB = species included based on findings in Wandoan Coal Project MLA
	EPBC Tool = Protected Matters Search Tool

Appendix H

Likelihood of occurrence assessments for conservation significant fauna

Table H-1: Likelihood of occurrence assessments for conservation significant fauna

Class name	Latin name	Common name	EPBC Act status	NC Act status	Brigalow Belt priority species	Distribution and habitat	Records from desktop assessment study area	Likelihood of occurrence within study area
Frog	*Adelotus brevis*	Tusked frog	—	V	Y	Known from coast and ranges of eastern Australia including western slopes of the Great Dividing Range (Barker et al., 1995; Meyer et al., 2001). Commonest in lowland coastal areas and near-coastal ranges (Meyer et al., 2001). Associated mainly with streams and seepages in wet forest areas (Meyer et al., 2001; Robinson, 2002). Also found along well-vegetated creeks and drainage lines in more open habitat (e.g., paddocks and playing fields) (Anstis, 2002; Barker et al., 1995; Robinson, 2002). Shelters under logs, stones or leaf litter near puddles, creeks and ponds (Barker et al., 1995 and Robinson, 2002).	—	Low The study area is outside the known distribution of this species. There is no suitable habitat for this species within the Study area. There are also no known records of this species from the desktop assessment study area.
Frog	*Cyclorana verrucosa*	Rough Frog	—	R	Y	Known from inland parts of southern Queensland and northern New South Wales (Barker et al., 1995; Cogger, 2000). Associated with low-lying woodland and open forest areas on heavy clay soli and sandy loams (Environmental Protection Agency, 2002; E. Meyer, unpub. data). Breeds in flooded depressions (Cogger, 2000; Anstis, 2002; E. Meyer, unpub. data).	Yd	**Moderate** Suitable habitat exists in flooded depressions and drainages throughout study area. There are also records of this species from the desktop assessment study area.
Frog	*Limnodynastes salmini*	Salmon-striped frog	—	—	Y	Known from inland and coastal parts of southern Queensland and northern New South Wales (Barker et al., 1995; Cogger, 2000). Associated with ephemeral wetlands in areas of	Yd	**High** This species was recorded within MLA 50229, 50230, and 50231 during previous

Class name	Latin name	Common name	EPBC Act status	NC Act status	Brigalow Belt priority species	Distribution and habitat	Records from desktop assessment study area	Likelihood of occurrence within study area
						woodland and open forest (Environmental Protection Agency, 2002; Barker et al., 1995). Brigalow Belt considered the stronghold for this species in Queensland (Environmental Protection Agency, 2002).		surveys (Parsons Brinckerhoff 2008). Suitable habitat exists in flooded depressions and drainages throughout study area. There are also records of this species from the desktop assessment study area.
Frog	*Uperoleia fusca*	Dusky Toadlet	—	—	Y	Known from coastal and sub-coastal parts of eastern Australia (Barker et al., 1995). Associated with areas of open forest, shrubland, tussock grassland and woodland (Robinson, 2002). Breeds in ephemeral wetlands and dams (Barker et al., 1995; E. Meyer, unpub. Data). Largely absent from Brigalow Belt bioregion (Environmental Protection Agency, 2002).	—	Low No suitable habitat identified within study area for this species. There are also no known records of this species from the desktop assessment study area.
Reptile	*Chelodina expansa*	Broad-shelled river Turtle	—	—	Y	Associated with streams, rivers, lakes and swamps of inland south-east Australia and coastal Queensland (Cogger, 2000; Wilson, 2005). More commonly associated with larger water courses and billabongs (Environmental Protection Agency, 2002).	—	**Moderate** Potential habitat includes vegetated dams and creeks within study area. However, there are no known records of this species from the desktop assessment study area.
Reptile	*Emydura macquarii/kreffti*	Macquarii/ Krefft's turtle	—	—	Y	Associated with rivers, creeks, billabongs and lagoons of coastal and inland south-eastern (*E. macquarii*) and central eastern (*E. kreffti*) Australia (Wilson, 2005a and 2005b).	Ys	**High** Potential habitat exists in well vegetated dams and riparian zones. This species was recorded in

Class name	Latin name	Common name	EPBC Act status	NC Act status	Brigalow Belt priority species	Distribution and habitat	Records from desktop assessment study area	Likelihood of occurrence within study area
								the MLA 50229 during previous surveys (Parsons Brinckerhoff 2008).
Reptile	*Rheodytes leukops*	Fitzroy tortoise	V	V	Y	Associated with clear fast-flowing waters of the Fitzroy River and associated tributaries, central east Queensland (Wilson, 2005).	—	Low There is no suitable habitat within the study area for this species. There are also no known records of this species from the desktop assessment study area.
Reptile	*Diplodactylus stenodactylus*	Crowned Gecko	—	—	Y	Associated with a range of habitats across central and north-western Australia (Cogger, 2000). Known from shrublands on sandy and stony soils in far western Queensland. Apparent outlying population on sand plains in far west of Brigalow Belt bioregion, near Altonvale (Environmental Protection Agency, 2002; Wilson, 2005).	—	Low The study area lies outside the known distribution of this species. There is no suitable habitat identified within the Study area for this species. There are also no known records of this species from the desktop assessment study area.
Reptile	*Strophurus taenicauda*	Golden-tailed Gecko	—	R	Y	Known from eastern interior of southern Queensland (Wilson, 2005). The golden-tailed gecko is an arboreal species associated with dry open woodland and forest featuring ironbark eucalypts, cypress pine and *Acacia harpophylla* (Wilson, 2003 and 2005; Environmental Protection Agency, 2008d)	Ys	**Present** This species was recorded in the study area during field surveys. Likely to occur in other stands of *Acacia harpophylla*, *Eucalyptus populnea* and Ironbark associations found in study area.

Class name	Latin name	Common name	EPBC Act status	NC Act status	Brigalow Belt priority species	Distribution and habitat	Records from desktop assessment study area	Likelihood of occurrence within study area
Reptile	*Delma inornata*	Legless Lizard	—	—	Y	Known from dry temperate southern grasslands and grassy woodlands in inland parts of south-east Australia (Wilson, 2008). In Queensland, the species is associated with native grasslands of the Darling Downs (Wilson, 2005).	—	Low Habitat in study area unsuitable as this species is usually found in association with native grasslands. There are also no known records of this species from the desktop assessment study area.
Reptile	*Delma plebeia*	Leaden Delma	—	—	Y	Known from south-eastern and north-eastern New South Wales (Wilson, 2008). Associated mainly with dry sclerophyll forests and woodland, usually with a grassy understorey (Wilson, 2008; Cogger, 2000). In Queensland, the leaden delma is found in coastal heath and dry forest (including *Acacia harpophylla* communities) in the far south-east of the state (Wilson, 2005).	—	**Moderate** Suitable habitat for this species occurs within *Acacia harpophylla*, Ironbark and *Eucalyptus populnea* woodland and dry sclerophyll forest habitats. However, there are no known records of this species from the desktop assessment study area.
Reptile	*Delma torquata*	Collared Delma	V	V	Y	Known from south-east Queensland, from Brisbane, north to Blackdown Tableland, west to Millmerran and the Bunya Mountains (Wilson, 2005). Associated mainly with eucalypt and acacia dominated woodland on rocky terrain, though it has also been recorded from *E. tereticornis* woodland and *Acacia harpophylla* communities on alluvial soils with no significant rock cover (Department of Environment,	—	Low The study area contains only marginal habitat at best. The study area does not occur within documented distribution. There are also no known records of this species from the desktop assessment study area.

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						Water, Heritage and Arts, 2008e; Environmental Protection Agency, 2008e; Wilson, 2005).		
Reptile	*Paradelma orientalis*	Brigalow Scaly-foot	V	V	Y	Known from south-east Queensland (Wilson, 2008). Recorded from a variety of habitats including open woodland, open forest and vine thicket (Department of the Environment Water and Arts, 2008a; Environmental Protection Agency, 2008a; Wilson, 2003 and 2005). Known habitat for this species includes areas with sandy clay, deep cracking clay soil and shallow skeletal soils (Department of the Environment Water and Arts, 2008a; Environmental Protection Agency, 2008a; Wilson, 2003 and 2005). Most published records of this species are from remnant native vegetation; however it has been recorded from cultivated and grazed land suggesting some resilience to disturbance (Department of the Environment Water and Arts, 2008a)	Yds	**Present** This species was recorded in the study area during field surveys. Likely to be found in other stands of remnant *Acacia harpophylla* and quite possibly non remnant stands that support abundant log and litter cover. Less likely to occur in *Eucalyptus populnea* and Riparian communities.
Reptile	*Anomalopus brevicollis*	Slider Skink	—	R	Y	Endemic to Queensland (Wilson, 2005). Known from a variety of habitats including rainforest, vine thickets and dry sclerophylly forest, from Cracow district north to MacKay and inland to Clermont (Wilson, 2005a).	—	Low There is no suitable habitat within the study area for this species. There are also no known records of this species from the desktop assessment study area.

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Reptile	*Anomalopus mackayi*	Five-clawed Worm-skink	V	E	Y	Known from south-eastern Queensland and north-eastern New South Wales (Wilson, 2008). Known mainly from the Darling Downs with specimens recorded from Oakey and Dalby districts (Wilson, 2003). It inhabits burrows in cleared paddocks and grassland on black soil plains (Department of Environment, Water and Heritage, 2007).	—	Low The study area contains largely unsuitable habitat for this species. There are also no known records of this species from the desktop assessment study area.
Reptile	*Ctenotus ingrami*	Ctenotus Skink	—	—	Y	Associated with dry woodlands of inland central and southern Queensland as well as inland parts of northern New South Wales (Wilson, 2005 and 2008). Found on a range of soils, from heavy clay to stony soils (Wilson, 2005).	—	**Moderate** Habitat within the study area is largely unsuitable habitat for this species. There are also no known records of this species from the desktop assessment study area.
Reptile	*Cyclodomorphus gerrardii*	Pink-tongued Lizard	—	—	Y	Known from humid coastal and near-coastal environs along Australia's eastern seaboard (Wilson, 2008). Prefers moist timbered habitats (Wilson, 2005).	—	Low There is no suitable habitat within the study area for this species. There are also no known records of this species from the desktop assessment study area.
Reptile	*Egernia rugosa*	Yakka Skink	V	V	Y	The yakka skink is endemic to Queensland. Its known range extends from St George north to Coen on Cape York Peninsula (Department of the Environment Water and Arts, 2008b; Environmental Protection Agency,	Yd	Low This species has a low likelihood of occurrence due to the heavily degraded and fragmented

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						2008b; Wilson, 2003 and 2005). While occurring across a broad latitudinal range, the yakka skink is patchily distributed, with most populations known from the Brigalow Belt bioregion (Department of the Environment Water and Arts, 2008b; Environmental Protection Agency, 2008b). The species has been recorded mainly from sub-humid and arid areas in habitat ranging from rocky outcrops, to open dry sclerophyll forest, *Acacia harpophylla* scrub and open shrubland (Department of the Environment Water and Arts, 2008b; Environmental Protection Agency, 2008b; Wilson, 2005). Known habitat for the yakka skink includes lancewood forest on coarse soils associated with low ranges and areas of undulating terrain (Environmental Protection Agency, 2008b).		habitat. This species has not been detected during targeted surveys in neighbouring areas under more favourable conditions. There are also no known records of this species from the desktop assessment study area.
Reptile	*Trachydosaurus rugosus asper*	Shingleback Lizard	—	—	Y	Associated with dry woodlands, shrublands and dunefields of south-eastern Australia. (Wilson, 2008).	Yd	**Present** This species was recorded in the study area during field surveys. It is likely to inhabit most other vegetated communities in the study area.
Reptile	*Amphibolurus muricatus*	Jacky Lizard	—	—	Y	Associated with dry sclerophyll forests, heaths and woodlands in coastal and near-coastal parts of south-east Australia (Wilson, 2005 and 2008).	—	**Moderate** This species has a low-moderate likelihood of occurring within in roadside

Class name	Latin name	Common name	EPBC Act status	NC Act status	Brigalow Belt priority species	Distribution and habitat	Records from desktop assessment study area	Likelihood of occurrence within study area
								remnants particularly *Acacia harpophylla*, *Eucalyptus populnea* associations.
Reptile	*Chlamydosaurus kingii*	Frilled Lizard	—	—	Y	Found in tropical and subtropical woodlands of northern Australia, south as far as Brisbane, south-east Queensland (Wilson, 2008). Confined to coastal and near-coastal areas in south of range (Wilson, 2008). Absent from heavily cleared areas (Environmental Protection Agency, 2002).	—	Low There is no suitable habitat within the study area for this species. The study area is beyond the known distribution for this species and it is generally unlikely to occur in small fragmented woodland. There are also no known records of this species from the desktop assessment study area.
Reptile	*Physignathus lesueurii*	Eastern Water Dragon	—	—	Y	Associated with coastal and near-coastal waterways of eastern Australia (Wilson, 2008).	—	**Moderate** Potential habitat exists in riparian zones and small creeks; however there are no known records of this species from the desktop assessment study area.
Reptile	*Tympanocryptis pinguicolla*	Grassland Earless Dragon	E	E	Y	Known from a handful of localities in Victoria, southern New South Wales and south-east Queensland (Wilson, 2008). In Queensland, this species is known from highly modified agricultural areas of the Darling Downs. Its preferred habitat is associated with mixed crops, such as cotton, sorghum,	—	Low There is no suitable habitat within the study area for this species. The study area is beyond the known distribution for this species and it is generally unlikely to occur in small woodland

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						maize and sunflower interspersed with fallow land. Large areas of native and introduced grasses existing as headlands, and along drainage lines are also a feature of the farmlands where the dragon exists (Environmental Protection Agency, 2007). Soils are essentially black, cracking clays of the Condamine River flood plain (Environmental Protection Agency, 2007). This species has been recorded from near Bongeen, Mount Tyson and Brookstead on the eastern Darling Downs (Pittsworth and Jondaryan Shires) in the Brigalow Belt South bioregion. A single specimen has also been recorded from near Dalby on the Cecil Plains Road (Environmental Protection Agency, 2007).		remnants. There are also no known records of this species from the desktop assessment study area.
Reptile	*Aspidites ramsayi*	Woma	—	R	Y	Associated with dry open habitats across central and south-western Australia, east to the Condamine district, south-east Queensland (Wilson, 2008). Known from a variety of habitats: from spinifex deserts to *Acacia harpophylla* (Wilson, 2005).	—	Low This species is spatially limited within Southern Brigalow Belt and no suitable habitat exists within the study area. There are also no known records of this species from the desktop assessment study area.
Reptile	*Acanthophis antarcticus*	Common death adder	—	R	Y	Known from eastern and far southern Australia (Wilson, 2008). The common death adder is found in a variety of habitats ranging from rainforest to	—	Low There is limited potential habitat within the study area for this species.

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						heathland (Wilson, 2008). In Queensland, it is more commonly associated with wet and dry eucalypt forests/woodlands and coastal heaths (Wilson, 2005).		There are also no known records of this species from the desktop assessment study area.
Reptile	*Denisonia maculata*	Ornamental Snake	—	V	Y	Associated with low-lying seasonally flooded areas in coastal and near-coastal parts of central Queensland, from Collinsville area, south to Rockhampton and inland to Blackwater (Wilson, 2005).	—	Low There is no suitable habitat within the study area for this species. The study area is beyond the known distribution of this species. There are also no known records of this species from the desktop assessment study area.
Reptile	*Furina dunmalli*	Dunmall's Snake	V	V	Y	Known from inland south-east Queensland (Wilson, 2008). Inhabits dry forest and woodland habitats (Wilson, 2003 and 2005). Known mainly from *Acacia harpophylla* forest and woodland on cracking clay and clay loam soils (Environmental Protection Agency, 2008c)	—	**Moderate** There is limited potential habitat within the study area for this species, mainly along Roma-Taroom Road . However, there are no records for this species within the desktop assessment study area.
Reptile	*Hemiaspis damelii*	Grey Snake	—	E	Y	Known from south-east Queensland and north-eastern New South Wales (Wilson, 2008). Within Queensland, records are known from near Goondiwindi and the adjacent Darling–Riverine Plain from the Darling Downs and from the Lockyer Valley	—	Low There is some potential habitat within the study area for this species. However, there are no known records of this species from the desktop

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						(Environmental Protection Agency, 2007b and Wilson, 2005). Prefers woodlands, usually on heavier, cracking clay soils, particularly in association with water bodies (Environmental Protection Agency, 2008b and Wilson, 2005).		assessment study area.
Reptile	*Hoplocephalus bitorquatus*	Pale-headed Snake	—	—	Y	Known from coast and eastern interior of central and northern Australia (Wilson, 2008). Associated with dry sclerophyll forests and woodland, usually near watercourses or flood-prone areas (Wilson, 2005).	Yd	**Moderate** Potential habitat for this species exists around major watercourses within the study area. There are records for this species within the desktop assessment study area.
Reptile	*Pseudechis guttatus*	Spotted Black-snake	—	—	Y	Known from interior of south-east Queensland and northern New South Wales (Wilson, 2008). Associated mainly with river floodplains, dry sclerophyll forest and woodlands. Often associated with temporary wetlands (Wilson, 2005 and 2008).	—	**Moderate** There is some potential habitat within the study area for this species. However, There are no known records of this species from the desktop assessment study area.
Reptile	*Rhinoplocephalus (Cryptophis) boschmai*	Carpentarian snake	—	—	Y	Known from coast and eastern interior of Queensland (Wilson, 2005). Associated with dry woodlands, mostly west of coastal ranges. (Wilson, 2005).	—	**High** This species was recorded in the greater MLA study area during previous surveys. It was found in association with riparian zones and cleared areas.

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Birds	*Stictonetta naevosa*	Freckled Duck	—	R	Y	Known from south-eastern and far south-west Australia (Marchant and Higgins, 1990). Prefers well-vegetated freshwater wetlands. Also associated with rivers, river pools, billabongs, farm dams, sewage ponds and shallow freshwater swamps with short emergent vegetation (Marchant and Higgins, 1990).	—	**Moderate** There is limited potential habitat within the study area for this species and its occurrence would be influenced by seasonal conditions. There are no known records of this species from the desktop assessment study area.
Birds	*Anseranas semipalmata*	Magpie Goose	M	—	—	Known from coastal and near-coastal south-eastern and northern Australia (Pizzey and Knight, 2008). Associated with large seasonal wetlands, inundated grassland areas, flood plains and well-vegetated dams (Pizzey and Knight, 2008).	Yd	**Moderate** There is limited habitat within the study area for this species and its occurrence would be influenced by seasonal conditions. It may occasionally fly over the study area or utilise aquatic resources. There are records of this species from the desktop assessment study area.
Birds	*Nettapus coromandelianus*	Cotton Pygmy-goose	M	R	Y	Known from coastal and near-coastal areas of Queensland, from Cape York south to around Brisbane (Pizzey and Knight, 2008). Associated with freshwater lakes, swamps and larger impoundments, preferring wetlands with abundant floating and submerged vegetation (Garnett and Crowley, 2000; Marchant and Higgins, 1990).	Yd	**Moderate** There is limited habitat within the study area for this species and its occurrence would be influenced by seasonal conditions. It may occasionally fly over the study area or utilise

Class name	Latin name	Common name	EPBC Act status	NC Act status	Brigalow Belt priority species	Distribution and habitat	Records from desktop assessment study area	Likelihood of occurrence within study area
								aquatic resources, where there are drier conditions elsewhere in its range. There are records for this species from the desktop assessment study area.
Birds	*Ardea alba*	Great Egret	M	—	—	Found across much of Australia, except for arid parts of Western Australia (Pizzey and Knight, 2008). Associated with rivers, wetlands, estuaries, intertidal mudflats, saltmarshes, sewerage ponds, irrigation areas and farm dams (Pizzey and Knight, 2008)	Yds	**Present** This species was recorded in the study area in association with wetlands and farm dams.
Birds	*Ardea ibis*	Cattle Egret	M	—	—	Known from eastern, northern and south-western Australia (Pizzey and Knight, 2008). Found in various open habitats including paddocks, croplands, refuse tips, wetlands, intertidal mudflats and drainage ditches (Pizzey and Knight, 2008)	Yds	**Present** This species was recorded in the study area in association with wetlands and farm dams.
Birds	*Haliaeetus leucogaster*	White-bellied Sea-eagle	M	—	—	Coasts, estuaries, creeks, reservoirs, major river systems and lakes including inland Australia (Pizzey and Knight,2008).	Yd	**High** There is limited habitat within the study area for this species and its occurrence would be influenced by seasonal conditions. It may occasionally fly over the study area or utilise aquatic resources, where there are drier conditions elsewhere in its range. There are records for this

Class name	Latin name	Common name	EPBC Act status	NC Act status	Brigalow Belt priority species	Distribution and habitat	Records from desktop assessment study area	Likelihood of occurrence within study area
								species from the desktop assessment study area.
Birds	*Erythrotriorchis radiatus*	Red Goshawk	V	E	—	Inhabits wooded and forested lands of tropical and warm temperate Australia; coastal and sub coastal areas (Marchant and Higgins, 1993). Prefers forest and woodland habitat with a mosaic of vegetation types, large populations of birds and permanent water (Marchant and Higgins, 1993). Known to nest in tall trees beside permanent water, in fairly open and bird-rich forest areas (Higgins and Marchant, 1993). Records of the Red Goshawk from the southern Brigalow Belt bioregion are likely to be mis-identifications or incidental records (Environmental Protection Agency, 2002).	—	Low The study area contains mainly unsuitable habitat for this species largely due to the cleared landscape. The study area is at the distributional limit for this species. There are no known records of this species from the desktop assessment study area.
Birds	*Accipiter novaehollandiae*	Grey Goshawk	—	R	Y	Known from northern and eastern Australia (Pizzey and Knight, 2008). Inhabits wooded and forested lands of coastal and sub coastal eastern Australia where the mean annual rainfall exceeds >760 mm, preferring forest or woodland with cover for hunting (Higgins and Marchant 1993).	—	Low There is limited habitat within the study area for this species and its occurrence would be influenced by seasonal movement patterns. There are no known records of this species from the desktop assessment study area.

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Birds	*Falco hypoleucos*	Grey Falcon	—	R	Y	The grey falcon inhabits open country and wooded areas in arid and semi-arid parts of Australia (where rainfall is < 500 mm per annum) (Garnett and Crowley, 2000). It is associated primarily with lightly wooded plains of inland drainage systems (Marchant and Higgins, 1993).	—	**Moderate** There is limited habitat within the study area for this species and its occurrence would be influenced by seasonal movement patterns and prey availability. There are no known records of this species from the desktop assessment study area.
Birds	*Lophoictinia isura*	Square-tailed Kite	—	R	Y	Found throughout most of Australia except for western arid interior (Pizzey and Knight, 2008). The square-tailed kite is associated mainly with open forest, woodland and mallee in coastal and near-coastal areas (Marchant and Higgins, 1993). The species shows a preference for eucalypt woodland on fertile soils bordering grassland areas, particularly mature eucalypt forest or woodland near water, where small passerine birds are abundant (Marchant and Higgins, 1993).	—	**Moderate** There is limited habitat within the study area for this species and its occurrence would be influenced by seasonal conditions. It may occasionally fly over or forage over parts of the study area such as Woleebee Creek. There are no known records of this species from the desktop assessment study area.
Birds	*Ephippiorhynchus asiaticus*	Black-necked Stork	—	R	Y	Known from eastern and northern Australia, (Pizzey and Knight, 2008). Associated with freshwater and estuarine habitats including wetlands, lagoons, farm dam, mudflats and flooded pastures (Pizzey and Knight,	Yd	**High** There is limited habitat within the study area for this species and its occurrence would be influenced by seasonal

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						2008).		rains. It may occasionally fly over the study area or utilise aquatic resources, where there are drier conditions elsewhere in its range. There are records for this species within the desktop assessment study area.
Birds	*Rostratula australis*	Australian Painted Snipe	V and M	V	Y	Known from coastal and inland eastern and northern Australia (Pizzey and Knight, 2008). Associated with ephemeral and permanent shallow freshwater wetlands and, occasionally, brackish water wetlands (Geering et al., 2007; Marchant and Higgins, 1993. This includes natural wetlands as well as sewage farms, bore drains with rank emergent vegetation, dams and rice crops (Marchant and Higgins, 1993).	—	**Moderate** There is limited habitat within the study area for this species and its occurrence would be influenced by seasonal conditions. It may occasionally fly over the study area or utilise aquatic resources in response to rainfall events. There are no known records of this species from the desktop assessment study area.
Birds	*Burhinus grallarius*	Bush Stone-curlew	—	—	Y	Found across much of Australia, except for arid western and southern parts (Pizzey and Knight, 2008). Associated with a variety of habitats including open woodland, sandplains with spinifex and mallee; coastal scrubs, mangrove fringes and golf-courses (Pizzey and Knight, 2008).	—	**Moderate** There is some potential habitat within the study area for this species; however it is generally unlikely to occur in small woodland remnants.

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Birds	*Turnix melanogaster*	Black-breasted Button-quail	V	V	Y	Known from far south-eastern Queensland and north-eastern New South Wales (Pizzey and Knight, 2008). Black-breasted button-quail appear to prefer vine thickets and rainforest vegetation types that are periodically water-stressed, including semi-evergreen vine thicket, low microphyll vine forest, Araucarian microphyll vine forest, Araucarian notophyll vine forest scrubs that may incorporate bottle trees, *Acacia harpophylla* and *Casuarina cristata* (Mathieson and & Smith, 2006).	Yd	Low The study area contains no suitable habitat for this species largely due to the cleared landscape. The study area is at the distributional limit for this species. However, there are no known records of this species from the desktop assessment study area.
Birds	*Pedionomus torquatus*	Plains Wanderer	V	V	—	Formerly broadly distributed across inland south-eastern Australia's (Geering et al., 2007). In Queensland, range has contracted westwards to far south-west of state (Geering et al., 2007). Associated with dry open, treeless habitats (open grasslands and herbfields) (Pizzey and Knight, 2008). Past records from southern Brigalow Belt of vagrant animals (Environmental Protection Agency, 2002). Considered extinct in eastern parts of former range (Geering et al., 2007).	—	Low There is no suitable habitat within the study area for this species. The study area is beyond the known distribution of this species. There are also no known records of this species from the desktop assessment study area.
Birds	*Gallinago hardwickii*	Latham's Snipe	M	—	—	Known from eastern and western parts of Australia, including Tasmania (Pizzey and Knight, 2008). Associated with littoral zone and fringing grasses of wetlands, intertidal areas, saltmarshes, open woodland from sea level to upland areas of Great Dividing Range	—	**High** There is limited habitat within the study area for this species and its occurrence would be influenced by seasonal

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						(Pizzey and Knight, 2008)		conditions. It may occasionally fly over the study area or utilise aquatic resources in response to rainfall events. There are no known records of this species from the desktop assessment study area.
Birds	*Numenius minutus*	Little Curlew	M	—	—	Known mainly from coastal eastern and northern Australia, with scattered records from northern and south-east interior (Geering et al., 2007). Favours short, dry grasslands including lawns, racecourses and airfields (Geering et al., 2007). Found in numbers near water (Geering et al., 2007).	—	Low There is limited potential habitat within the study area for this species and its occurrence would be influenced by seasonal conditions. There are also no known records of this species from the desktop assessment study area.
Birds	*Geophaps scripta scripta*	Squatter Pigeon (southern race)	V	V	Y	The squatter pigeon (southern race) is known from dry inland and coastal parts of central and southern east Australia, from central New South Wales north to the Burdekin River, central eastern Queensland (Garnett and Crowley, 2000; Higgins and Davies, 1997; Royal Australian Ornithologists Union, 2003). The species may already be extinct in New South Wales and is rarely encountered in south-east Queensland with most recent records species from central Queensland (Garnett and Crowley,	Yd	**Moderate** There is limited potential habitat within the study area for this species. This species has been recorded 30 km to the north of the study area and there are older records from approximately 70 years ago in areas adjoining the study area.

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						2000; Higgins and Davies, 1997; Royal Australian Ornithologists Union, 2003).		
Birds	*Cacatua leadbeateri*	Pink Cockatoo	—	V	Y	Known from inland parts of southern, northern and western Australia (Pizzey and Knight, 2008). Typically found near water, along timbered watercourses; surrounding grasslands, gibber plains, and areas of saltbush (Pizzey and Knight, 2008). Also found in association with mulga woodland, stands of native cypress, casuarinas and tall mallee associated with riverine woodlands (Pizzey and Knight, 2008).	—	**Moderate** This species may occasionally move through the study area in response to dry seasonal conditions further to the west. During these times, favourable conditions may provide potential breeding opportunities within riparian habitats that support senescent *E. tereticornis.* There are no known records of this species from the desktop assessment study area.
Birds	*Calyptorhynchus lathami*	Glossy black-cockatoo	—	V	Y	Known from coastal and inland parts of south-east Australia, from eastern Victoria north to central eastern Queensland (Higgins and Davies, 1997; Royal Australian Ornithologists Union, 2003). It also occurs on Kangaroo Island, off the coast of South Australia (Higgins and Davies, 1997). Throughout its range, the glossy black cockatoo is associated mainly with eucalypt forest and woodland featuring casuarinas (Higgins and Davies, 1997; Garnett and Crowley, 2000).	—	**Moderate** This species has been recorded during previous surveys within the greater MLA area in association with *Acacia harpophylla* patches and Ironbark and/or Callitris woodlands (Parsons Brinckerhoff 2008). It has a moderate likelihood of occurring in association with *Casuarina cristata.*

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Birds	*Lathamus discolor*	Swift Parrot	E and M	E	—	Occurs along eastern seaboard, from Tasmania north to Bowen, central Queensland (Pizzey and Knight, 2008). Breeds in Tasmania, migrating to mainland areas in Autumn (Higgins, 1999). Inhabits dry open eucalypt forests and woodlands, usually box/ironbark communities, especially with red ironbark, mugga ironbark, grey box, white box or yellow gum (Higgins, 1999). Considered unlikely to occur within the southern Brigalow Belt (Environmental Protection Agency, 2002).	—	**Low** There is no suitable habitat within the study area for this species. The study area is beyond the species known distribution. There are also no known records of this species from the desktop assessment study area.
Birds	*Neophema pulchella*	Turquoise Parrot	—	R	Y	Known from coast and eastern interior of southern Queensland, News South Wales and Victoria (Pizzey and Knight, 2008). Associated with open grassy woodland areas, near permanent water and forested hills (Pizzey and Knight, 2008).	—	Low There is no suitable habitat within the study area due to the heavily modified state of native grassland and herbaceous communities. The study area is beyond the species known distribution. There are also no known records of this species from the desktop assessment study area.
Birds	*Ninox strenua*	Powerful Owl	—	V	Y	Known from coast and ranges of south-east Australia (Pizzey and Knight, 2008). Prefers open sclerophyll forests and woodlands, open and tall open wet sclerophyll forests, box/ironbark and riparian river red gum along with open	—	Low There is generally no suitable habitat for this species within the study area. The study area is beyond the species known

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						casuarina and cypress pine forests, mature pine plantations and sometimes fragmented landscapes (Higgins, 1999).		distribution. There are also no known records of this species from the desktop assessment study area.
Birds	*Ninox connivens*	Barking Owl	—	—	Y	Known form inland and coastal parts of eastern and northern Australia; also, far south-western Australia (Pizzey and Knight, 2008). Associated with a variety of habitats ranging from open forest to dense scrubs, and woodland (Pizzey and Knight, 2008). Riparian areas of the Brigalow Belt region serve as the stronghold for this species (Environmental Protection Agency, 2002).	—	**Moderate** There is limited habitat within the study area for this species and its occurrence would be influenced by seasonal conditions and prey availability. It may occasionally fly over or forage over parts of the study area such as Woleebee Creek. However, there are no known records of this species from the desktop assessment study area.
Birds	*Tyto capensis*	Grass owl	—	—	Y	Known from coastal and near-coastal parts of eastern Australia; range extending further west and north after succession of years with good rainfall (Pizzey and Knight, 2008). Associated with areas of dense grass including grassland and woodland areas with a grassy understorey (Pizzey and Knight, 2008). Also recorded from stands of cultivated sorghum, sugar cane and grain stubble, as well as coastal heath (Pizzey and Knight, 2008).	—	**Present** This species was recorded during the current surveys adjacent to Kangaroo Creek. Likely to be seasonal visitor in response to prey availability.

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Birds	*Tyto novaehollandiae*	Masked Owl	—	—	Y	Known form coastal and near-coastal parts of northern and eastern Australia (Pizzey and Knight, 2008). Associated with forest, open woodland, areas of farmland with large remnant trees, timbered watercourses and paperbark woodlands (Pizzey and Knight, 2008). Found only in extensive sandstone areas and north of Brigalow Belt bioregion; absent from all other areas of the Brigalow Belt (Environmental Protection Agency, 2002).	—	Low The study area contains little or no suitable habitat for this species. There are no known records of this species from the desktop assessment study area.
Birds	*Apus pacificus*	Fork-tailed Swift	M	—	—	Recorded throughout Australia (Pizzey and Knight, 2008). Forages aerially over all manner of habitats (Pizzey and Knight, 2008).	Yd	**High** This species is likely to forage over the entire study area on a seasonal basis. There are known records for this species within the desktop assessment study area.
Birds	*Hirundapus caudacutus*	White-throated Needletail	M	—	—	Occurs along entire eastern seaboard including Tasmania (Pizzey and Knight, 2008). Forages aerially over all manner of habitats (Pizzey and Knight, 2008).	Yd	**Moderate** This species has a moderate likelihood of utilising the air space over the entire study area on a seasonal basis. There are known records for this species within the desktop assessment study area.

Class name	Latin name	Common name	EPBC Act status	NC Act status	Brigalow Belt priority species	Distribution and habitat	Records from desktop assessment study area	Likelihood of occurrence within study area
Birds	*Merops ornatus*	Rainbow Bee-eater	M	—	—	Found throughout Australia except for arid western interior and Tasmania (Pizzey and Knight, 2008). Associated with open woodlands normally with sandy, loam soils. Breeds along open riparian habitats with exposed riverbanks, exposed road cuttings, beach dunes, cliffs and sand ridges across a range of vegetation types from mangroves to rainforests, sclerophyll forest and woodlands (Pizzey and Knight, 2008)	Yd	**High** This species and associated breeding sites were recorded within MLA 50229 along Booral Road during previous field surveys (Parsons Brinckerhoff 2008). It is likely to inhabit much of the study area on a seasonal basis. Potential breeding habitat located in banks of Eurombah Creek, adjacent to Roma Taroom Road, east of Barton Creek and near Dangarfield Road at borrow pit locations. There are known records of this species from the desktop assessment study area.
Birds	*Climacteris picumnus*	Brown Treecreeper	—	—	Y	Known from coastal and inland eastern Australia (Pizzey and Knight, 2008). Associated with drier forest, woodland and scrubs (Pizzey and Knight, 2008). In inland areas, often associated with forest red gums on water courses and lake shores (Pizzey and Knight, 2008). Few records from southern Brigalow Belt bioregion (Environmental Protection Agency, 2002).	—	Low The study area contains little or no suitable habitat for this species. There are also no known records of this species from the desktop assessment study area.

Class name	Latin name	Common name	EPBC Act status	NC Act status	Brigalow Belt priority species	Distribution and habitat	Records from desktop assessment study area	Likelihood of occurrence within study area
Birds	*Hieraaetus morphnoides*	Little eagle	M	—	—	Found across much of Australia (Pizzey and Knight, 2008). Associated with plains and foothills, open forests, woodlands and scrublands and riparian forest (Pizzey and Knight, 2008).	Yd	Low There is limited habitat within the study area for this species and its occurrence would be influenced by seasonal conditions. It may occasionally fly over the study area or utilise aquatic resources, where there are drier conditions elsewhere in its range. There are known records of this species from the desktop assessment study area.
Birds	*Pyrrholaemus brunneus*	Redthroat	—	R	—	Known from dry inland parts of southern, western and central Australia (Pizzey and Knight, 2008). Associated with dry inland scrubs, areas of saltbush and eucalypt regrowth (Pizzey and Knight, 2008).	—	Low The study area is outside the known range of this species. There is limited habitat within the study area. There are no known records of this species from the desktop assessment study area.
Birds	*Chthonicola sagittata*	Speckled warbler	—	—	Y	Known from eastern interior of south-eastern Australia (Pizzey and Knight, 2008). Associated mainly with dry woodlands including mulga and *Acacia harpophylla* communities (Pizzey and Knight, 2008). Also known from areas of vine scrub (Pizzey and Knight,	Yd	**High** This species was recorded during previous surveys within the greater MLA study area in association with roadside *Acacia harpophylla* remnants and

Class name	Latin name	Common name	EPBC Act status	NC Act status	Brigalow Belt priority species	Distribution and habitat	Records from desktop assessment study area	Likelihood of occurrence within study area
						2008).		Ironbark and/or Callitris woodlands (Parsons Brinckerhoff 2008). It has a high likelihood of occurring along the Western Pipeline route. There are known records of this species from the desktop assessment study area.
Birds	*Pomatostomus superciliosus*	White-browed Babbler	—	—	Y	Known mainly from drier parts of southern and western Australia (Pizzey and Knight, 2008). Associated with dry scrub/woodland including areas of mallee, *Acacia* and cypress pine scrub (Pizzey and Knight, 2008). Also known from timbered watercourses and areas of saltbush (Pizzey and Knight, 2008).	—	**Moderate** There is some suitable habitat within the study area but no records of this species from the desktop assessment study area. It may occasionally move into study area in response to drier seasonal conditions further inland.
Birds	*Pomatostomus temporalis*	Grey-crowned babbler	—	—	Y	Known from coastal and inland parts of eastern northern and western Australia (Pizzey and Knight, 2008). Frequents open forests, woodland, scrublands and area of farmland (Pizzey and Knight, 2008). Scarce or absent where Noisy Miner and Indian Minors abundant (Environmental Protection Agency, 2002).	Yds	**Present** This species was recorded within the study area in association with roadside *Acacia harpophylla* remnants, *Eucalyptus populnea* woodland, Ironbark and/or Callitris woodlands and Riparian areas.
Birds	*Amytornis striatus*	Striated Grasswren	—	R	—	Patchily distributed across inland parts of central, southern and western Australia (Pizzey and Knight, 2008).	—	Low There is limited habitat within the study area for

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						Associated with areas of spinifex grassland and shrubland with spinifex understorey (Pizzey and Knight, 2008).		this species which is normally associated with Spinifex and *Acacia* scrubs. There are also no known records of this species from the desktop assessment study area.
Birds	*Xanthomyza phrygia*	Regent Honeyeater	E	E	Y	Known from eastern Victoria, eastern New South Wales as well as south-east Queensland (Pizzey and Knight, 2008). This species prefers dry eucalypt woodlands and forest dominated by box and ironbark eucalypts which occur on inland slopes of the Great Divide, heavily associated with moister more fertile soil areas such as river valleys, creeks and lower slopes of foothills (Higgins et al., 2001). Vegetation types must produce copious and reliable amounts of nectar such as yellow box, white box, yellow gum, grey box, Blakely's red gum and river red gum. SEQ is at the northern limit of this species range with only small numbers having been previously recorded in SEQ (Higgins et al., 2001)	—	Low There is generally no suitable habitat for this species within the study area. The study area is beyond the species known distribution. There are also no known records of this species from the desktop assessment study area.
Birds	*Melithreptus gularis*	Black-chinned Honeyeater	—	R	Y	Known from south-east and northern Australia (Pizzey and Knight, 2008). The black-chinned honeyeater is associated with dry eucalypt woodland, particularly ironbark and box communities (Garnett and Crowley, 2000; Higgins et al., 2001).	—	**Moderate** There is limited habitat within the study area but it may occasionally move into study area particularly along riparian habitats. There are no known

Class name	Latin name	Common name	EPBC Act status	NC Act status	Brigalow Belt priority species	Distribution and habitat	Records from desktop assessment study area	Likelihood of occurrence within study area
								records of this species form the desktop assessment study area.
Birds	*Grantiella picta*	Painted Honeyeater	—	R	Y	Sparsely distributed across south-eastern and northern central Australia (Higgins et al., 2001; Royal Australian Ornithologists Union, 2003).The painted honeyeater inhabits dry sclerophyll forest and woodlands supporting mistletoes (Garnett and Crowley, 2000; Higgins et al., 2001).	—	**Moderate** There is limited habitat within the study area but it may occasionally move into study area particularly through *Acacia* dominated communities. However, there are no known records of this species from the desktop assessment study area.
Birds	*Melanodryas cucullata*	Hooded Robin	—	—	Y	Found across much of inland Australia as well as drier southern coastal areas (Pizzey and Knight, 2008). Associated with drier eucalypt forests, woodland and scrubs with woody debris (Pizzey and Knight, 2008). Also known from areas supporting mulga, casuarina and cypress pine (Pizzey and Knight, 2008).	—	**Moderate** There is some suitable habitat within the study area for this species. However, there are no known records of this species from the desktop assessment study area.
Birds	*Myiagra cyanoleuca*	Satin Flycatcher	M	—	—	Found along eastern seaboard, from Cape York south to Tasmania (Pizzey and Knight, 2008). Associated with densely vegetated gullies of wet forests, tall woodlands and dry sclerophyll forests. May also inhabit coastal forests, woodlands, mangroves and open habitats (Pizzey and Knight, 2008).	—	**Moderate** The study area falls within the western distributional limit for this species. There is limited habitat within the study area for this species, but it may occasionally move along riparian habitats. There are no

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								known records for this species from the desktop assessment study area.
Birds	*Epthianura crocea crocea*	Yellow Chat	—	V	—	Known from central and northern Australia (Pizzey and Knight, 2008). Associated with vegetation fringing seasonal wetlands, artesian bores and springs as well as saltbush plains (Pizzey and Knight, 2008).	—	Low There is little suitable habitat within the study area for this species There are also no known records of this species from the desktop assessment study area.
Birds	*Stagonopleura guttata*	Diamond Firetail	—	—	Y	Known from inland and coastal parts of south-eastern Australia (Pizzey and Knight, 2008). Associated with open eucalypt forest/woodland as well as cypress pine and *Acacia* scrubs (Pizzey and Knight, 2008). Patchily distributed within southern Brigalow Belt bioregion; no recent records from Dawson River catchment (Environmental Protection Agency, 2002).	Yd	**Moderate** There is limited habitat within the study area for this species, but it may occasionally move along riparian habitats. There are known records of this species from the desktop assessment study area.
Birds	*Poephila cincta cincta*	Black-throated Finch	V	V	Y	Known from north-eastern Australia and north-eastern New South Wales (Pizzey and Knight, 2008). The black-throated finch prefers dry open grassy woodlands, forests and grasslands of the tropics and sub tropics that have seeding grasses and free water (Higgins et al., 2006).	—	Low The study area is beyond the known distribution for this species. Any potential habitat within the study area is greatly modified through cropping and pastures and is generally unsuitable for this species. There are no known

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								records of this species from the desktop assessment study area.
Birds	*Neochimia ruficauda ruficauda*	Star Finch	E	E	—	Known from eastern, northern and western Australia (Pizzey and Knight, 2008).This species inhabits low dense, damp grasslands and sedgelands bordering watercourses, swamps and other wetlands. It is also known to occupy grassy open sclerophyll woodlands (Higgins et al., 2006). The species has disappeared from much of its former range and is considered extinct within the southern Brigalow Belt bioregion (Environmental Protection Agency, 2002).	—	Low Thought to be extinct from Southern Brigalow Belt. Any potential habitat within the study area is greatly modified through cropping and pastures and is generally unsuitable for this species. There are also no known records of this species from the desktop assessment study area.
Mammal	*Dasyurus maculatus maculatus*	Spotted-tailed Quoll	E	V	Y	Known from temperate and tropical parts of eastern Australia (Van Dyck and Strahan, 2008). Queensland records from south-east of state and Wet Tropics bioregion (Van Dyck and Strahan, 2008). Recorded from a range of habitats, including rainforest, open forest, woodland, coastal heath land and inland riparian forest from lowland and montane areas (Van Dyck and Strahan, 2008). Reliant on large tracts of remnant vegetation (Environmental Protection Agency, 2002).	—	Low The study area is beyond the known distribution limit for this species. Habitat within the study area is generally too fragmented and modified to support a viable population of this species. There are also no known records of this species from the desktop assessment study area.
Mammal	*Dasyurus hallucatus*	Northern Quoll	—	—	Y	Patchily distributed across northern Australia: from the Pilbarra to south-east Queensland (Van Dyck and Strahan, 2008). Range has declined	—	Low The study area is beyond the known distribution limit

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						significantly since European settlement (Van Dyck and Strahan, 2008). Patchily distributed in Queensland, particularly in south of range (Van Dyck and Strahan, 2008). Prefers rocky scarps, but also found in eucalypt woodland, and forest, generally within 200 km from coast (Menkhorst and Knight 2004; Van Dyck and Strahan, 2008). In southern parts of range, the northern quoll is associated mainly with dissected sandstone scarps and tablelands (e.g., Cania Gorge, Carnarvon Range) (Environmental Protection Agency, 2002).		for this species. Habitat within the study area is generally too fragmented and modified to support a viable population of this species. There are also no known records of this species from the desktop assessment study area.
Mammal	*Isoodon macrourus*	Northern brown bandicoot	—	—	Y	Known from coast and interior of eastern Australia (Van Dyck and Strahan, 2008). Associated with mesic habitats, favouring heath and forest habitats (Van Dyck and Strahan, 2008).	—	**Present** This species was recorded along Kangaroo Creek. Likely to occur along other major creek systems that support sufficient ground cover including Canal Creek and possibly Eurombah Creek. There are no known records of this species from the desktop assessment study area.
Mammal	*Perameles nasuta*	Long-nosed Bandicoot	—	—	Y	Known from coast and interior of eastern Australia (Van Dyck and Strahan, 2008). Associated mainly with mesic areas (> 750 mm rainfall per annum), favouring closed forest and	—	Low There is little potential habitat for this species. There are no known records of this species

Class name	Latin name	Common name	EPBC Act status	NC Act status	Brigalow Belt priority species	Distribution and habitat	Records from desktop assessment study area	Likelihood of occurrence within study area
						dense scrubs (Van Dyck and Strahan, 2008).		from the desktop assessment study area.
Mammal	*Aepyprymnus rufescens*	Rufous bettong	—	—	Y	Known from coastal areas and interior of eastern Australia (Van Dyck and Strahan, 2008). Associated with dry open grassy eucalypt woodland and forest (Van Dyck and Strahan, 2008). Generally absent from areas subject to heavy grazing (Environmental Protection Agency, 2002). Common north of Warrego Highway; no records south of Warrego Highway (Environmental Protection Agency, 2002).	—	**High** This species was recorded during previous surveys within the greater MLA area in association with *Eucalyptus populnea* woodland, Ironbark and/or Callitris woodlands and Riparian (Parsons Brinckerhoff 2008). There are no known records of this species from the desktop assessment study area.
Mammal	*Macropus dorsalis*	Black-striped wallaby	—	—	Y	Known from coastal and eastern interior of southern and central Queensland (Menkhorst and Knight, 2004). Also occurs on western slopes of the Great Dividing Range in New South Wales (Menkhorst and Knight, 2004). Associated with dry sclerophyll forest and *Acacia harpophylla* scrub with dense shrubby understorey (Menkhorst and Knight, 2004). Generally scarce in eastern part of southern Brigalow Belt (Environmental Protection Agency, 2002).	Yd	**Present** This species was recorded within the study area in association with *Eucalyptus populnea* woodland, Ironbark and/or Callitris woodlands, and Goldens-Bimbadeen roadside remnants.
Mammal	*Ornithorhynchus anatinus*	Platypus	—	—	Y	Known from coastal and near-coastal parts of eastern Queensland (Van Dyck and Strahan, 2008). Associated mainly with permanent creeks and rivers,	—	Low There is only limited habitat within the study

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						though also found in larger shallow impoundments (Van Dyck and Strahan, 2008).		area for this species as the creeks are ephemeral and don't appear to support any permanent pools. There are no known records of this species from the desktop assessment study area.
Mammal	*Phascolarctos cinereus*	Koala	—	—	Y	Known from coastal and inland eastern Australia (Van Dyck and Strahan, 2008). Prefers eucalypt woodland and forest. Favoured feed trees in north of range include forest red gums and narrow-leaved iron bark (Van Dyck and Strahan, 2008). In more arid areas koalas prefer habitat along watercourses and on adjacent floodplains (Van Dyck and Strahan, 2008). Declining in eastern parts of southern Brigalow Belt bioregion (Environmental Protection Agency, 2002).	Yd	High This species was recorded during previous surveys within the greater MLA area in association with *Eucalyptus populnea* woodland, Ironbark and/or Callitris woodlands and Riparian habitats (Parsons Brinckerhoff 2008). This species has a high likelihood of occurring along riparian zones such as Eurombah, Kangaroo, Canal and Horse Creeks, where *E. tereticornis* is the dominant upper canopy species. There are known records of this species from the desktop assessment study area.
Mammal	*Petauroides volans*	Greater glider	—	—	Y	Known from coastal areas and eastern interior of eastern states (Menkhorst and Knight, 2004). Found in eucalypt-dominated forest and woodlands;	Yd	**High** This species was recorded during previous surveys within the greater MLA

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						reliant on large hollow-bearing trees (Van Dyck and Strahan, 2008).		area in association Riparian habitat (Parsons Brinckerhoff 2008). This species has a high likelihood of occurring along riparian zones such as Eurombah, Kangaroo, Canal and Horse Creeks. There are known records of this species from the desktop assessment study area.
Mammal	*Petaurus petaurus australis*	Yellow-bellied Glider (southern subspecies)	—	—	Y	Known from coastal areas and near-coastal ranges of south-east Australia (Van Dyck and Strahan, 2008). Associated with open forest areas supporting large hollow-bearing eucalypts (Van Dyck and Strahan, 2008; Menkhorst and Knight, 2004).	—	**Moderate** There is suitable habitat across the study area particularly within riparian habitats and this species has a moderate likelihood of occurring. However there are no known records of this species from the desktop assessment study area.
Mammal	*Petaurus norfolcensis*	Squirrel Glider	—	—	Y	Known from coastal areas and eastern interior of Queensland and New South Wales; also known from parts of Victoria and far east South Australia (Menkhorst and Knight, 2004). Found in eucalypt-dominated forest and woodlands; reliant on large hollow-bearing trees (Van Dyck and Strahan, 2008).	—	**Moderate** There is suitable habitat across the study area particularly within riparian habitats and this species has a moderate likelihood of occurring. There are no known records of this species from the desktop

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								assessment study area.
Mammal	*Phascogale tapoatafa tapotafata*	Brush-tailed Phascogale	—	—	Y	Known from coastal and sub-coastal eastern Australia (Van Dyck and Strahan, 2008). Associated with dry sclerophyll forest and woodland as well as monsoonal forest (Menkhorst ands Knight, 2004). Forages predominantly on rough-barked eucalypts (Van Dyck and Strahan, 2008).	—	Low The study area is beyond the known distribution limit for this species. Habitat within the study area is generally too fragmented and modified to support a viable population of this species. There are also no known records of this species from the desktop assessment study area.
Mammal	*Planigale tenuirostris*	Narrow-nosed planigale	—	—	Y	Sparsely distributed across inland central eastern Australia (Menkhorst and Knight, 2004). Found in a range of habitats with cracking clay soils including open grassland, mallee scrubs and densely vegetated creek flats (Van Dyck and Strahan, 2008).	—	**High** There is limited suitable habitat across the study area and this species has a high likelihood of occurring within floodplain areas. However, there are no known records of this species from the desktop assessment study area.
Mammal	*Pseudocheirus peregrinus*	Common ringtail possum	—	—	Y	Known from coastal and sub-coastal east Australia (Menkhorst and Knight, 2008). Associated with open and closed forest, coastal scrubs and gardens (Menkhorst and Knight, 2008).	—	Low There is potential habitat across the study area within riparian habitats but this species has a low likelihood of occurring within these areas. There are no known records of this species from the

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								desktop assessment study area.
Mammal	*Trichosurus vulpecula*	Common Brushtail possum	—	—	Y	Formerly widespread, occurring across much of Australia. Has declined in arid areas (Van Dyck and Strahan, 2008). Currently known from coastal and inland parts of eastern Australia, far northern Australia and far south-western Australia (Van Dyck and Strahan, 2008). Known from a wide range of habitats. Prefers dry eucalypt forests and woodlands (Van Dyck and Strahan, 2008). Common in eastern parts of southern Brigalow Belt bioregion; scarce in west (Environmental Protection Agency, 2002).	-	**Present** This species was recorded within the study area in association with *Acacia harpophylla* remnants, *Eucalyptus populnea* woodland, Ironbark and/or Callitris woodlands and Riparian habitats.
Mammal	*Pseudomys patrius*	Eastern Pebble-mound Mouse	—	—	Y	Known from coast and eastern interior of Queensland (Van Dyck and Strahan, 2008). Predominantly associated with dry open eucalypt forest on rolling hills, usually with a grassy understorey (Van Dyck and Strahan, 2008). Rarely recorded from alluvial flats (Environmental Protection Agency, 2008).	—	Low The study area is beyond the known distribution limit for this species. Habitat within the study area is generally too fragmented and modified to support a viable population of this species. There are no known records of this species from the desktop assessment study area.
Mammal	*Pteropus poliocephalus*	Grey-headed Flying Fox	V	—	Y	The grey headed flying-fox ranges from about Townsville in the tropical north, south along the east coast, and into southern Victoria (Van Dyck and	—	Low There is limited habitat within the study area for

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						Strahan, 2008). The species roosts communally, often in hundreds of thousands, in gullies with dense vegetation canopy, and feeds on rainforest fruits, blossom from eucalypts, angophoras, banksias and tea-trees (Van Dyck and Strahan, 2008). Potential habitat in Brigalow Belt bioregion limited largely to riparian eucalypt forest/ woodland (Environmental Protection Agency, 2002).		this highly mobile species and its occurrence would be influenced by seasonal conditions such as response to mass flowering events (if foraging resources within the species normal distribution were scarce). There are also no known records of this species from the desktop assessment study area.
Mammal	*Chalinolobus dwyeri*	Large-eared pied bat	V	R	Y	The large-eared pied bat is associated mainly with areas of dry sclerophyll forest and woodland (including cypress pine woodland) (Duncan et al., 1999; Van Dyck and Strahan, 2008). Other habitats in which the species has been recorded include tall open eucalypt forest with wet forest elements, subalpine woodland and riparian vegetation in farmland (Duncan et al., 1999; Van Dyck and Strahan, 2008). In Queensland, the large-eared pied bat is known mainly from tall open forest adjacent to rain forest (Duncan et al., 1999). In the southern Brigalow Belt, it is likely to occur only in sandstone country (Environmental Protection Agency, 2002).	—	Low Potential foraging resources are present within the study area, but no roosting resources were identified in study area though. It would be more likely to roost in sandstone escarpments and gorges 100km to the north and east of the study area. There are no known records of this species from the desktop assessment study area.

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Mammal	***Chalinolobus picatus***	**Little-pied bat**	**—**	**R**	**Y**	The little pied bat is primarily associated with dry sclerophyll forest, woodland and mallee, though it has also been recorded from wet sclerophyll and notophyll vine forests (Churchill, 1998; Duncan et al., 1999; Van Dyck and Strahan, 2008). In south-east Queensland, it is found mainly in association with dry forest featuring spotted gums, gum-topped box, ironbark eucalypts and forest red gums (Duncan et al., 1999). In sub-humid parts of Queensland, the species has been recorded mainly from cypress pine and casuarina-dominated forest (Duncan et al., 1999).	Yds	**Present** This species was recorded from numerous locations within the study area in association with *Acacia harpophylla* remnants, *Eucalyptus populnea* woodland, Ironbark and/or Callitris woodlands and Riparian habitats. Considered locally common.
Mammal	*Chalinolobus nigrogriseus*	Hoary wattled Bat	—	—	Y	Known from coastal and inland northern and eastern Australia (Van Dyck and Strahan, 2008). Associated mainly with dry open habitats including open forest woodland, and grasslands (Van Dyck and Strahan, 2008). Roosts in tree hollows, rock crevices and buildings (Van Dyck and Strahan, 2008).	—	Low The study area is beyond the known distribution limit for this species. There are also no known records of this species from the desktop assessment study area.
Mammal	*Kerivoula papuensis*	Golden-tipped Bat	—	—	Y	Found principally in rainforest habitats and adjoining vegetation including hardwood plantations, dry sclerophyll forests and riparian rainforests (Menkhorst and Knight 2001). Known to have unusual roosting habits including use of scrubwren nests (Van Dyck and Strahan, 2008).	—	Low The study area is beyond the known distribution limit for this species. There are also no known records of this species from the desktop assessment study area.

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Mammal	*Miniopterus australis*	Little Bent-wing Bat	—	—	Y	Known from coastal eastern Australia (Van Dyck and Strahan, 2008). Associated with well-timbered habitats including rainforest, paperbark swamps, wet forest and dry sclerophyll forest (Van Dyck and Strahan, 2008). Mainly a coastal cave-dwelling species; moves inland during summer months, returning to coast in winter (Environmental Protection Agency, 2002).	—	**Moderate** This species may only occasionally forage over the study area or occur as part of broader seasonal movements. However, there are also no known records of this species from the desktop assessment study area.
Mammal	*Miniopterus schreibersii oceanenis*	Eastern bent-wing bat	—	—	Y	Known from coastal and near-coastal parts of eastern Australia (Van Dyck and Strahan, 2008). Generally found near caves, mines and tunnels in coastal areas (Menkhorst and Knight, 2004).	Ys	**Present** This species was recorded from numerous locations within the study area in association with *Acacia harpophylla* remnants, *Eucalyptus populnea* woodland, Ironbark and/or Callitris woodlands and Riparian habitats. However, no obvious breeding or roosting habitat identified during survey. There are no known records of this species from the desktop assessment study area.
Mammal	*Nyctophilus timoriensis*	(Eastern) Greater long-eared Bat	V	V	Y	The Eastern long-eared bat is known from a variety of habitats including river red gum, mallee, bulloke, box and *Acacia harpophylla*/*Casuarina cristata*-dominated communities (Duncan et al.,	—	**Moderate** This species has a moderate likelihood of occurring along main

Class name	Latin name	Common name	EPBC Act status	NC Act status	Brigalow Belt priority species	Distribution and habitat	Records from desktop assessment study area	Likelihood of occurrence within study area
						1999; Van Dyck and Strahan, 2008). In inland southern Queensland, the species is most abundant in open box/ ironbark/ cypress pine woodland (Duncan et al., 1999; Van Dyck and Strahan, 2008). Records from southern Brigalow Belt from *Acacia harpophylla* scrub, smooth-barked apple and narrow-leaved ironbark forest as well as bulloke/ cypress woodland/ forest on sandy soil. Also recorded from *Eucalyptus populnea* woodland on alluvial flats (Environmental Protection Agency, 2002).		drainage lines associated with Woleebee Creek. May also use peripheral habitats bordering this area. There are no known records of this species from the desktop assessment study area.
Mammal	*Scotorepens sp.*	Central Eastern Broad-nosed bat	—	—	Y	Known from far south-east Queensland and north-eastern New South Wales (Van Dyck and Strahan, 2008). Associated with eucalypt and *Acacia harpophylla-Casuarina cristata* forests and woodlands (Van Dyck and Strahan, 2008). Roosts in tree-hollows (Van Dyck and Strahan, 2008).	—	**Moderate** This species has a moderate likelihood of occurring in association with remnant vegetation communities supporting senescent trees. There are no known records of this species from the desktop assessment study area.
Mammal	*Vespadelus baverstocki*	Inland forest bat	—	—	Y	Known from central southern and eastern Australia (Van Dyck and Strahan, 2008). Inhabits grassland, chenopod shrublands, stony deserts, mallee, creeklines and woodlands (Van Dyck and Strahan, 2008).	—	**Moderate** This species has a moderate likelihood of occurring within the study area. However, there are no known records of this species from the desktop assessment study area.

Class name	Latin name	Common name	EPBC Act status	NC Act status	Brigalow Belt priority species	Distribution and habitat	Records from desktop assessment study area	Likelihood of occurrence within study area
Mammal	*Vespadelus regulus*	Southern Forest Bat	—	—	Y	Known from south-eastern, far southern and south-western Australia (Van Dyck and Strahan, 2008). Associated with a wide range of habitats including dry sclerophyll forest, shrubland, low shrub woodland, mixed temperate woodland and mallee (Van Dyck and Strahan, 2008).	—	Low This species has a low likelihood of occurring within the study area. There are also no known records of this species from the desktop assessment study area.

Notes: NC Act = *Nature Conservation Act 1992*: V = Vulnerable, E = Endangered, R = Rare, C = of concern, LC = Least Concern, EPBC Act = *Environment Protection and Biodiversity Conservation Act 1999*: E = Endangered, V = Vulnerable. Brigalow Belt Priority Species: Y= Listed as priority taxa by the Brigalow Belt South fauna Expert Panel in the Brigalow Belt South Biodiversity Planning Assessment (EPA, 2002). Yd= record from desktop assessment, Ys= recorded during field survey, Yds= record from desktop assessment *and* recorded during field survey.

Attachment H: References

Anstis, M., 2002, Tadpoles of South East Australia, Reed, Sydney.

Barker, J., G.C. Grigg and M.J. Tyler., 1995, A Field Guide to Australian Frogs. Surrey Beatty & Sons, Chipping Norton, New South Wales.

Churchill, S., 1998, Australian Bats, Reed New Holland, Sydney.

Cogger, H., 2000, Amphibians and Reptiles of Australia, New Holland, Sydney.

Department of the Environment and Heritage (2007). *Anomalopus mackayi* in Species Profile and Threats Database, Department of the Environment and Heritage, Canberra. Available from: http://www.deh.gov.au/sprat. Accessed 9/3/2007.

Department of the Environment, Water, Heritage and the Arts, 2008a, *Paradelma orientalis* in Species Profile and Threats Database, Department of the Environment, Water, Heritage and the Arts, Canberra. Available from: http://www.enviroment.gov.au/sprat. Accessed 2 September 2008.

Department of the Environment, water, Heritage and the Arts, 2008b, *Egernia rugosa* in Species Profile and Threats Database, Department of the Environment, Water, Heritage and the Arts, Canberra. Available form: http://www.enviroment.gov.au/sprat. Accessed 2 September 2008.

Department of Environment, Water, Heritage and Arts, 2008e, *Delma torquata* in Species Profile and Threats Database, Department of the Environment, Water, Heritage and the Arts, Canberra. Available from: http://www.environment.gov.au/sprat. Accessed 2 September 2008.

Duncan, A., Baker, G. B., and Montgomery, N., 1999, The Action Plan for Australian Bats, Environment Australia, Canberra.

Environmental Protection Agency, 2002, Brigalow Belt South Fauna Expert Panel Report, Unpublished report for Environmental Protection Agency.

Environment Protection Agency, 2007, Southeastern lined earless dragon. Available from http://www.epa.qld.gov.au/nature_conservation/wildlife/native_animals/southeastern_lined_earless_dragon. Accessed 2007.

Environmental Protection Agency, 2008, Dunmall's snake. Available from http://www.epa.qld.gov.au/nature_conservation/wildlife/az_of_animals/dunmalls_snake/. Accessed 2 September 2008.

Environmental Protection Agency, 2008a, Brigalow Scaly-foot. Available from http://www.epa.qld.gov.au/nature_conservation/wildlife/az_of_animals/brigalow_scalyfoot/. Accessed 2 September 2008.

Environmental Protection Agency, 2008b, Yakka Skink. Available from http://www.epa.qld.gov.au/nature_conservation/wildlife/az_of_animals/yakka_skink/. Accessed 2 September 2008.

Environmental Protection Agency, 2008b, Grey Snake. Available from http://www.epa.qld.gov.au/nature_conservation/wildlife/az_of_animals/yakka_skink/. Accessed 11 September 2008.

Environmental Protection Agency, 2008d, Golden-tailed Gecko. Available from http://www.epa.qld.gov.au/nature_conservation/wildlife/az_of_animals/goldentailed_gecko/. Accessed 2 September 2008.

Environmental Protection Agency, 2008e, Collared Delma. Available from http://www.epa.qld.gov.au/nature_conservation/wildlife/az_of_animals/collared_delma/. Accessed 2 September 2008.

Garnett, S.J., and Crowley, G.M., 2000, The Action Plan for Australian Birds 2000, Environment Australia, Canberra.

Geering, A., Agnew, L. and Harding, S., 2007, Shorebirds of Australia, CSIRO, Collingwood, Victoria.

Higgins, P.J, 1999, Handbook of Australia, New Zealand and Antarctic Birds, Volume 4 Parrots to Dollarbird, Oxford University Press, Melbourne.

Higgins, P.J, and Davies, S.J.J., 1997, Handbook of Australia, New Zealand and Antarctic Birds, Volume 3 Snipe to Pigeons, Oxford University Press, Melbourne.

Higgins, P.J, Peter, J.M., and Steele, W.K., 2001, Handbook of Australia, New Zealand and Antarctic Birds, Volume 5, Tyrant-flycatchers to Chats, Oxford University Press, South Melbourne, Victoria.

Higgins, P.J., Peter, J.M., and Cowling, S.J., 2006, The Handbook of Australian, New Zealand and Antarctic Birds, Volume 7 Boatbill to Starlings, Oxford University Press, Melbourne.

Higgins, P.J, Peter, J.M., and Steele, W.K., 2001, Handbook of Australia, New Zealand and Antarctic Birds, Volume 5, Tyrant-flycatchers to Chats, Oxford University Press, South Melbourne, Victoria.

Marchant, S., and Higgins, P.J., 1990, Handbook of Australian, New Zealand and Antarctic Birds, Volume 1 Ratites to Ducks, Oxford University Press, Melbourne.

Marchant, S. & Higgins, P., 1993, Handbook of Australian, New Zealand, and Antarctic Birds. Volume 2, Raptors to Lapwings, Oxford University Press, Melbourne.

Mathieson, M. and Smith, G.C., 2006, Draft National Recovery Plan for the Black-breasted Button-quail *Turnix melanogaster*, Report to Department of Environment and Water Resources, Queensland Parks and Wildlife Service, Brisbane.

Menkhorst, P. and Knight, F., 2004, A Field Guide to the Mammals of Australia, Oxford University Press, South Melbourne, Victoria.

Meyer, E., Hines, H. and Hero. J-M. 2001. Wet Forest Frogs of South-east Queensland. Griffith University, Gold Coast.

Parsons Brinckerhoff 2008, Wandoan Coal Project, MLA area and surrounds. Terrestrial ecology impact assessment, Parsons Brinckerhoff, Brisbane.

Pizzey, G., and Knight, F., 2008, The Field Guide to the Birds of Australia, Harper Collins, Melbourne, Australia.

Robinson, M., 2002, A Field Guide to Frogs of Australia, Australian Museum/Reed New Holland, Sydney.

Royal Australian Ornithologists Union, 2003, The New Atlas of Australian Birds, Royal Australian Ornithologists Union, Hawthorn East, Victoria.

Stanisic, J., 2008, Recovery Plan for the Boggomoss Snail *Adclarkia dawsonensis*, Report to Department of Environment, Water, Heritage and the Arts, Canberra. Environmental Protection Agency, Queensland.

Van Dyck, S., and Strahan, R., 2008, The Mammals of Australia, Third Edition, Reed New Holland, Sydney.

Wilson, S., 2003, Reptiles of the Southern Brigalow Belt, World Wildlife Fund, Australia.

Wilson, S., 2005, A Field Guide to Reptiles of Queensland, New Holland, Sydney.

Wilson, S., 2008, A Complete Guide to Reptiles of Australia, New Holland, Sydney.

Attachment I

Impact assessments

Contents

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I1. Introduction

One Threatened plant, seven Threatened animals, two Migratory birds and one Endangered ecological community listed under state or Commonwealth legislation were either recorded in the Study Area or identified as having a moderate to high likelihood-of-occurrence. Assessment of the significance of impacts for these species and communities has been completed (refer Table I-1).

Table I-1: Threatened species and communities for which impact assessments have been completed

Name	Conservation status[1]		Outcome of assessment	
	State	National	State	National
RE 11.9.4 Semi-evergreen vine thicket on fine grained sedimentary rocks (Semi-evergreen vine thickets of the Brigalow Belt (North and South) and Nandewar Bioregions ecological community)	E	E	No significant impact	No significant impact
Homopholis belsonii (Belsons Panic)	E	V	No significant impact	No significant impact
Brigalow Scaly-foot (*Paradelma orientalis*)	V	V	No significant impact	No significant impact
Dunmall's Snake *(Furina dunmalli)*	V	V	No significant impact	No significant impact
Squatter Pigeon (southern race) *(Geohaps scripta scripta)*	V	V	No significant impact	No significant impact
Glossy Black-cockatoo (*Calyptorhynchus lathami)*	V	—	No significant impact	—
Pink Cockatoo (*Cacatua leadbeateri*)	V	—	No significant impact	—
Eastern Long-eared Bat *(Nyctophilus sp cf timoriensis) (eastern form)*	V	V	No significant impact	No significant impact
Australian Painted Snipe (*Rostratula australis*)	V	V and M	—	No significant impact
Satin Flycatcher *(Myiagra cyanoleuca)*	—	M	—	No significant impact

1. State conservation status. E = Endangered, V = Vulnerable, National E = Endangered, V = Vulnerable for plants, animals and ecological communities (EPBC Act), M = Migratory.

For species and communities listed under the EPBC Act the significance of impacts are assessed in accordance with the *EPBC Act Policy Statement 1.1 Significant Impact Guidelines* (Department of the Environment and Heritage 2006a).

The *Vegetation Management Act 1999* and *Nature Conservation Act 1992* do not outline factors for consideration in impact assessments. As such, the following factors were used:

- will areas of high conservation value for the species or community be affected?
- do individual animals and/or plants and/or subpopulations that are likely to be affected by the Project play an important role in maintaining the long-term viability of the species, population or ecological community?
- do habitat features that are likely to be affected by the Project play an important role in maintaining the long-term viability of the species, population or ecological community?
- are the duration of impacts for the species or community long-term?
- are the impacts for the species or community permanent and irreversible?

If species or communities are listed under the EPBC Act and NC Act or EPBC Act and VM Act, then the significance of impacts has been assessed under both the EPBC Act *Policy Statement 1.1 Significant Impact Guidelines* and the general significance assessment explained above.

It is acknowledged that field surveys were undertaken at a sub-optimal time of year (late winter) for detection of many species of plant and animal and that some sections of the study area were not accessed during this survey period. As such, seasonal surveys are proposed to increase the likelihood of detecting Threatened species if they are present in the Study Area, and define the size of the local population and extent of their habitat in the Study Area. The conclusions of the impact assessments will therefore be reviewed and revised if necessary following the seasonal survey.

I2. Vegetation communities

I2.1 Brigalow (RE11.9.5)

Although present in the local area, no remnant RE11.9.5 or non-remnant RE11.9.5 consistent with Brigalow endangered ecological community (under the EPBC Act) will be removed or indirectly affected. Therefore a full impact assessment has not been completed for this community.

I2.2 Semi-evergreen vine thicket (RE 11.9.4)

Description

RE 11.9.4 Semi-evergreen vine thicket (SEVT) may occur on crests, mid-slopes, undulating plains and rises formed from fine-grained sediments. The RE 11.9.4 also includes *Acacia harpophylla* (Brigalow) with a semi-evergreen vine thicket understorey.

SEVT ecosystems are floristically diverse and variable, however typically have an uneven canopy (4–9 m high) and contain a mixture of evergreen, semi-evergreen and deciduous emergent tree species (9–18 m high). Emergents (16-25 m high) are usually present including species such as *Cadellia pentastylis* and *Brachychiton* spp. usually on better sites, and *Eucalyptus orgadophila* and *Casuarina cristata* on drier, poorer sites.

SEVT ecosystems are also characterised by a prominence of tree species with microphyll-sized leaves (2.5–7.5 cm long) and the presence of swollen-stemmed bottle trees (i.e. *Brachychiton* spp.). Vines, twining or scrambling plants are also prominent. There is commonly a tall and low shrub layer (2-6 m high) and, as the name suggests, vines are frequent.

RE 11.9.4 (and regrowth vegetation analogous with this RE) is a sub-unit of the Semi-evergreen vine thickets of the Brigalow Belt (North and South) and Nandewar Bioregions ecological community listed under the EPBC Act.

Status under state (Qld) and Commonwealth legislation

Remnant RE 11.9.4 is listed as Endangered under the VM Act. This status applies only to vegetation identified as remnant by the EPA. As no remnant RE 11.9.4 was identified in the Study Area, the significance of the Project to this RE has not been considered further at the state level.

RE 11.9.4 aligns with the Semi-evergreen vine thickets of the Brigalow Belt (North and South) and Nandewar Bioregions ecological community which is listed as Endangered under the EPBC Act. Vegetation is considered as part of the ecological community under the EPBC Act regardless of remnant status under the VM Act. .

Distribution

SEVT is widely scattered with a common structure but considerable regional variation in floristic associations. SEVT occur within Queensland, New South Wales, the Northern Territory and Western Australia. Within the Brigalow Belt Bioregions, semi-evergreen vine

thickets have been fragmented, reduced in area and degraded through land clearing and agricultural/grazing practices.

No remnant RE 11.9.4 was mapped within the Study Area (Environmental Protection Agency 2005), however some small fragmented non-remnant patches of this RE were identified and mapped during field verification of RE mapping in the Road Corridor along the Roam Taroom Road.

Habitat

RE 11.9.4 occurs on crests, mid-slopes, undulating plains and rises formed from fine-grained sediments.

Threats

RE 11.9.4 has been extensively cleared historically for cropping and pasture. As a result of clearing, SEVT (including other REs consistent with the commonwealth listing) generally occurs as fragmented patch sizes of <100 hectares. The small and fragmented occurrence of the ecological community suggests that remnant patches are subject to further degradation and decline from such threatening processes as clearing, inappropriate fire regimes, grazing and weed invasion.

Other threatening processes to SEVT include:

- fire
- weed and pasture species
- grazing
- feral animals
- overgrazing by native animals
- salinity
- climate change (Environmental Protection Agency and Queensland Parks and Wildlife Service 2007).

Specific Project impacts

The Project will result in loss of 0.6 ha of highly modified SEVT (non-remnant 11.9.4), which represents 72% of the extent within the Study Area.

I2.2.1 State impact assessment

As no RE 11.9.4 was identified in the Study Area, the significance of the Project to this RE has not been considered further at the state level.

I2.2.2 Commonwealth impact assessment

Under the EPBC Act, an action is likely to have a significant impact on an endangered community if there is a real chance or possibility that it will result in one or more of the following.

Reduce the extent of an ecological community

The Project will result in loss of 0.6 ha of highly modified SEVT (non-remnant 11.9.4). All other patches identified within the study area have been avoided by modifying the proposed pipeline route. No large areas or patches in good conditions of SEVT were identified in close proximity to the study area.

Fragment or increase fragmentation of an ecological community, for example by clearing vegetation for roads or transmission lines

SEVT in the Study Area is already fragmented by extensive clearing of the surrounding landscape and is already subject to consequential effects of fragmentation such as edge effects. As such, the Project will not increase fragmentation within the ecological community in the Study Area or surrounds.

Adversely affect habitat critical to the survival of an ecological community

Critical habitat under the EPBC Act is habitat critical to the survival of a species or ecological community. It includes areas that are necessary:

- for activities such as foraging, breeding, roosting, or dispersal
- for the long-term maintenance of the species or ecological community (including the maintenance of species essential to the survival of the species or ecological community, such as pollinators)
- to maintain genetic diversity and long term evolutionary development
- for the reintroduction of populations or recovery of the species or ecological community (Department of the Environment and Heritage 2006b).

Such habitat may be, but is not limited to: habitat identified in a recovery plan for the species or ecological community as habitat critical for that species or ecological community; and/or habitat listed on the Register of Critical Habitat maintained by the Minister under the EPBC Act.

No critical habitat has been listed for SEVT of the Brigalow Belt (North and South) and Nandewar Bioregions under the EPBC Act. The habitat within the Study Area is not considered to be critical to the survival of the community.

Modify or destroy abiotic (non-living) factors (such as water, nutrients, or soil) necessary for an ecological community's survival, including reduction of groundwater levels, or substantial alteration of surface water drainage patterns.

The Project will adversely modify the soil profile in the areas of SEVT that require clearing of vegetation such as within the construction footprint and associated ancillary areas (0.6 ha across the Study Area). The construction and operation of the water pipeline is unlikely to otherwise change abiotic factors necessary for the survival of SEVT in the Study Area.

Cause a substantial change in the species composition of an occurrence of an ecological community, including causing a decline or loss of functionally important species, for example through regular burning or flora or fauna harvesting.

The Project is unlikely to substantial change in the species composition of SEVT in the Study Area or surrounds. SEVT in the Study Area is already subject to a modified disturbance regime as a result of extensive landscape scale vegetation clearing. As a result of these

pressures, SEVT in the Study Area and surrounds has a modified species composition that would generally have a lower native diversity and higher abundances of weeds by comparison to an undisturbed site.

The Project is unlikely to result in any a change to the existing disturbance regime including changing the grazing pressure and change to the surface and ground water regime that would in turn modify species composition.

Cause a substantial reduction in the quality or integrity of an occurrence of an ecological community, including, but not limited to assisting invasive species, that are harmful to the listed ecological community, to become established; or causing regular mobilisation of fertilisers, herbicides or other chemicals or pollutants into the ecological community which kill or inhibit the growth of species in the ecological community.

SEVT in the Study Area is already subject to a modified disturbance regime as a result of extensive landscape scale vegetation clearing. As a result, SEVT in the Study Area and surrounds has is generally in poor to moderate condition and the Project is unlikely substantial reduction in the quality or integrity of SEVT that is not directly affected by the Project.

Interfere with the recovery of an ecological community

A recovery plan has not been prepared for SEVT vine thickets of the Brigalow Belt (North and South) and Nandewar Bioregions ecological community. The impacts of the Project (both direct and indirect) are unlikely to interfere with any future recovery plans for this community.

Conclusion

The Project will result in the loss of 0.6 ha of Semi evergreen vine thicket of the Brigalow Belt (North and South) and Nandewar Bioregions. The remaining patches of this ecological community that will be affected by the Project were in poor condition and subject a modified disturbance regime as a result of extensive landscape scale vegetation clearing.

Given the poor condition of the ecological community that will be affected by the Project, and that it is not playing an important role in maintaining connectivity or retaining important species, the Project is not considered likely to result in a significant impact to SEVT. Nonetheless, the Offsets Strategy that will be developed for the Project will aim to ensure that the residual impacts to the ecological community are adequately offset. This may include active management of the SEVT regrowth in the Study Area.

I3. Plants

I3.1 *Homopholis belsonii* (Belson's panic)

Description

Homopholis belsonii is a rhizomatous and/or stoloniferous perennial to 0.5 m high (although generally to 0.2 m high in the Study Area) with leaves 2–4.5 mm wide. The species flowers in summer with forming an inflorescence 8–15 cm long with primary branches 8–15 cm long coming from a common axis (Royal Botanic Gardens 2008). The inflorescence is important for field identification.

Status under state (Qld) and Commonwealth legislation

Homopholis belsonii is listed as Endangered under the NC Act and Vulnerable under the EPBC Act.

Distribution

Homopholis belsonii grows in dry woodland on poor soils north from the Warialda district (north-west plains, NSW) to the Gurulmundi district (north-west Darling Downs, Queensland).

Four small patches of *Homopholis belsonii* was identified in this non-remnant vegetation analogous with RE 11.9.5 in the Study Area. At each location, *Homopholis belsonii* occurred as a few sparsely as scattered plants (clumps) within a 1-2 m^2 area. Two or more clumps were recorded at each site, however overall density was very low (i.e. the species was rare within the Study Area).

Habitat

Homopholis belsonii is known to occur in association with woodlands dominated by *Eucalyptus populnea* and *Acacia harpophylla* in the Brigalow Belt south including RE 11.3.2, RE 11.4.3, RE 11.9.6 (Environmental Protection Agency and Environmental Planning Southwest Queensland 2002). Within the Study Area, *Homopholis belsonii* was recorded in non-remnant vegetation analogous with RE 11.9.5.

Within these communities, *Homopholis belsonii* appears to prefer shade or sheltered sites such as under logs (Environmental Protection Agency and Environmental Planning Southwest Queensland 2002).

Ecology

The ecology of this species is poorly known. The species flowers in summer.

Threats

Homopholis belsonii is threatened by inappropriate fire regimes and ongoing grazing pressure (Environmental Protection Agency and Environmental Planning Southwest Queensland 2002).

Recovery actions

A recovery plan has not been prepared for *Homopholis belsonii* by the EPA or DEWHA.

Specific Project impacts

The Project will result in direct impacts to the *Homopholis belsonii* identified in the Study Area. The Project will also result in loss of 2.1 ha of potential habitat for *Homopholis belsonii* non-remnant RE 11.9.5.

I3.1.1 State impact assessment

Will areas of high conservation value for this species be affected?

Areas of high conservation for this species will not be affected. The patches of non-remnant vegetation in which the species may occur have largely been avoided. The remaining patches that will be affected are not identified as being of local, regional or state conservation value under the Biodiversity Planning Assessment (Environmental Protection Agency 2003). The Study Area does not contain any essential habitat for priority taxa or any other conservation reserves.

Do individual animals and/or plants and/or subpopulations that are likely to be affected by the Project play an important role in maintaining the long-term viability of the species, population or ecological community?

If present, *Homopholis belsonii* in the Study Area is unlikely to play an important role in maintaining the long-term viability of the species.

Similar to other species of Panic grass (*Panicum* spp.), the inflorescence of *Homopholis belsonii* is an exerted open panicle that has appears to detach at maturity (personal observations Peter Monsted) and is dispersed by wind (as per *Panicum effusum* for example). It is considered likely that the rare occurrences of *Homopholis belsonii* in the Study Area are therefore a result of the being established from wind blown seed sourced from populations at some distance (possibly kilometres) from the Study Area. The records in the Study Area would therefore not constitute an important source of propagules for maintaining the local population.

Do habitat features that are likely to be affected by the Project play an important role in maintaining the long-term viability of the species, population or ecological community?

Homopholis belsonii was not recorded in Study area and the Brigalow regrowth (non-remnant vegetation analogous with RE 11.9.5) is common in the Study Area and therefore are not considered to possess habitat features that are a limiting factor for *Homopholis belsonii.*

Are the duration of impacts for the species long-term?

The impact of the construction of the pipeline will be long-term, particularly clearing and loss of habitat. Rehabilitation of the footprint will no prevent future re-colonisation by the species.

Are the impacts permanent and irreversible?

The impact of impacts of the mining activates and associated infrastructure will be permanent. Rehabilitation of the footprint will no prevent future re-colonisation by the species.

I3.1.2 Commonwealth impact assessment

Under the EPBC Act, an action is likely to have a significant impact on a Vulnerable species if it affects an important population of the species. Under the Principle Significant Impact Guidelines an important population is a population that is necessary for a species' long-term survival and recovery. This may include populations identified as such in recovery plans, and/or that are:

- key source populations either for breeding or dispersal
- populations that are necessary for maintaining genetic diversity
- populations that are near the limit of the species range.

Homopholis belsonii in the Study Area, if present, would not be important as defined above.

Lead to a long-term decrease in the size of an important population of a species

Homopholis belsonii in the Study Area, if present, is not an important population.

The Project may lead to a local decrease in the size of this population by direct impacts if present. Further seasonal survey will be required to determine if this species is present and if so the size of the population that would be affected.

Reduce the area of occupancy of an important population

Homopholis belsonii in the Study Area, if present, is not an important population.

The Project may lead to a local decrease in the area of occupancy of this population by direct impacts if present. Further seasonal survey will be required to determine if this species is present and if so the area of occupancy of the population that would be affected.

Fragment an existing important population into two or more populations

Homopholis belsonii in the Study Area, if present, is not an important population.

Similar to other species of Panic grass (e.g. *Panicum* spp., *Walwhalleya* spp., and other closely related genera of grasses), the inflorescence of *Homopholis belsonii* is an exerted open panicle that has appears to detach at maturity (personal observations Peter Monsted) and is dispersed by wind (as per *Panicum effusum* for example). It is considered likely that the rare occurrences of *Homopholis belsonii* in the Study Area are therefore a result of the being established from wind blown seed sourced from populations at some distance (possibly kilometres) from the Study Area. Given this dispersal strategy of the species, the Project is unlikely to create a barrier to the dispersal of the *Homopholis belsonii* or otherwise fragment the local population.

Adversely affect habitat critical to the survival of a species

Critical habitat under the EPBC Act is habitat critical to the survival of a species or ecological community. It may include areas that are necessary:

- for activities such as foraging, breeding, roosting, or dispersal

- for the long-term maintenance of the species or ecological community (including the maintenance of species essential to the survival of the species or ecological community, such as pollinators)
- to maintain genetic diversity and long term evolutionary development
- for the reintroduction of populations or recovery of the species or ecological community (Department of the Environment and Heritage 2006b).

Such habitat may be, but is not limited to: habitat identified in a recovery plan for the species or ecological community as habitat critical for that species or ecological community; and/or habitat listed on the Register of Critical Habitat maintained by the Minister under the EPBC Act.

No critical habitat has been listed for *Homopholis belsonii* under the EPBC Act. The habitat within the Study Area is not considered to be critical to the survival of *Homopholis belsonii* in accordance with EPBC Act.

Disrupt the breeding cycle of an important population

Homopholis belsonii in the Study Area, if present, is not an important population.

The ecology and breeding cycle of the *Homopholis belsonii* is poorly known (Department of Environment and Climate Change 2008). Given the likely wind dispersal strategy of the species (similar to *Panicum* spp. and *Walwhalleya* spp.) the Project is unlikely to disrupt the breeding cycle of the species.

Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline

Homopholis belsonii was not recorded in the Study Area and further seasonal survey will be required to determine if this species is present and if so the exact locations. However, the non-remnant Brigalow regrowth in which the species is likely to occur is in poor condition and unlikely to be further modified by the Project. Equivalent habitat is also common in the Study Area and surround and is not considered to possess habitat features that are a limiting factor for *Homopholis belsonii.*

Result in invasive species that are harmful to a vulnerable species becoming established in the Vulnerable species' habitat

The Project is has limited potential to result in changes to the species composition in Brigalow regrowth. Areas in moderate condition have been avoided and areas in poor condition already have established weeds present.

Introduce disease that may cause the species to decline

The Project is unlikely to introduce disease that may cause the species to decline.

Interfere substantially with the recovery of the species

A recovery plan has not been prepared to *Homopholis belsonii.*

Conclusion

Homopholis belsonii was not recorded in the Study Area and further seasonal survey will be required to determine if this species is present and if so the location, size and extent of local

populations. However, given that areas suitable habitat in good condition have been avoided through the route selection process, and remaining areas of potential habitat that will be affected are in poor conditions, the Project is considered unlikely to result in a significant impact to this species. Nonetheless, the Offsets Strategy that will be developed for the Project should ensure that the residual impacts to *Homopholis belsonii* (if detected in further surveys) are adequately offset. This may include seed collection, propagation and use in revegetation, translocation of individuals to be affected and active management of known *Homopholis belsonii* sites.

I4. Animals

For the assessment of impact on animals, the assessments under the EPBC Act are considered first and then the impacts on state-listed threatened species are considered.

I4.1 Significance assessments for Commonwealth-listed species

I4.1.1 Brigalow Scaly-foot (*Paradelma orientalis*)

Description

The Brigalow Scaly-foot is a snake-like pygopodid lizard of moderate size (snout-to-vent length up to 160 mm) endemic to the Brigalow Belt bioregion (Wilson 2003, 2005).

Status under state (Qld) and Commonwealth legislation

The Brigalow Scaly-foot is listed as Vulnerable under both the EPBC Act and NC Act.

Distribution

The Brigalow Scaly-foot's known range extends roughly from Miles north to the Bowen Basin in central Queensland (Wilson 2005).

Habitat

The species has been recorded from a variety of habitats including open woodland, open forest and vine thicket (Department of the Environment Water Heritage and the Arts 2008b; Queensland Environmental Protection Agency 2008a; Wilson 2003, 2005). Known habitat for this species includes areas with sandy clay, deep cracking clay soil and shallow skeletal soils (Department of the Environment Water Heritage and the Arts 2008b; Queensland Environmental Protection Agency 2008a; Wilson 2003, 2005). Most published records of this species are from remnant native vegetation; however it has been recorded from cultivated and grazed land suggesting some resilience to disturbance (Department of the Environment Water Heritage and the Arts 2008b).

Ecology

Specimens are usually found sheltering by day under woody debris, rocks, amidst grass tussocks and/or in deep leaf litter (Department of the Environment Water Heritage and the Arts 2008b; Wilson 2005). On suitably warm nights (> 19º C) the Brigalow Scaly-foot emerges from cover to feed on arthropods and sap from *Acacia* trees. Though largely terrestrial, Brigalow scaly-foot will climb trees and shrubs in search of sap (Department of the Environment Water Heritage and the Arts 2008b; Queensland Environmental Protection Agency 2008a). Data on reproduction are scant. Available information suggests egg-laying and hatching are likely to occur in late Spring and Summer (Department of the Environment Water Heritage and the Arts 2008b; Queensland Environmental Protection Agency 2008a).

Threats

The Brigalow scaly-foot is threatened by habitat loss due to clearing and thinning of native vegetation, inappropriate management of roadside remnant vegetation and predation by feral animals, particularly cats (Department of the Environment Water Heritage and the Arts 2008b; Queensland Environmental Protection Agency 2008a).

Habitat degradation due to grazing and road traffic is also a likely threat. Persecution of this species, as a consequence of its snake-like appearance, may also pose a threat (Queensland Environmental Protection Agency 2008a).

Recovery actions

Recovery actions as outlined by the Queensland Environmental Protection Agency (2008a) for the Brigalow scaly-foot include:

- identification of key habitat and priority areas for conservation
- development of management guidelines to protect important habitat areas on private and state-controlled land
- implementation of monitoring programs in key habitat and priority conservation areas
- protection of habitat on the stock route network and shire roadsides and reserves
- a collaborative approach to reptile conservation with government and non-government organisations, industry groups, indigenous groups and landholders
- increased community awareness of this species in Queensland.

Occurrence within the Study Area

The Study Area and adjoining lands support limited areas of dry open forest and woodland on rocky soil and/or sandy loam, much of which appears suitable for the Brigalow Scaly-foot. The Brigalow Scaly-foot was recorded the during winter surveys within the Study Area, with one animal being detected during active diurnal herpetofauna searches. The adult individual was captured sheltering beneath logs and loose bark in association with a non-remnant *Acacia harpophylla/Casuarina cristata* fragment at standard trapping site 4 along Roma-Taroom Road. The capture location comprised abundant log cover, deep litter and fallen bark from *Acacia harpophylla* (10-20%).

The Brigalow Scaly-foot appears to have a patchy distribution in the Study Area and whilst it has been recorded in a range of vegetation types all sites tend to contain abundant log (>10%) and/or litter cover (>20%). This species is likely to occur sporadically within most of the remnant *Acacia harpophylla/Casuarina cristata* fauna habitat type.

Species specific Project impacts

Potential impacts on the Brigalow Scaly-foot include, but are not limited to:

- removal of 2 hectares of non-remnant *Acacia harpophylla/Casuarina cristata* Scrub (this vegetation is not consistent with a listed Endangered community) and 3 hectares of non-remnant eucalypt woodland (RE 11.3.2) within the Study Area, which is considered to be potential Brigalow-scaly foot habitat
- direct mortality during construction
- potential trapping of animals in deep steep-walled trenches which makes them vulnerable to predation, heat stress, dehydration, and/or drowning
- displacement of animals in response to increased noise and vibration
- creation of open areas devoid of cover within areas of contiguous habitat may inhibit the movement/ dispersal of Brigalow Scaly-foot

- fragmentation of *Acacia harpophylla/Casuarina cristata* Scrub and eucalypt woodland may also increase edge effects and the risk of predation (in particular predation by feral cats and foxes)
- further establishment of feral animals and weeds.

Species specific Project mitigation

Mitigation measures for the Brigalow Scaly-foot include:

- clearing of non-remnant (RE 11.9.5) vegetation within the Study Area should minimised during design in areas of known habitat for the Brigalow Scaly-foot (i.e. road reserves) to minimise the extent of potential habitat cleared and minimise fragmentation of habitat
- undertaking seasonal surveys to clarify the distribution and abundance of the Brigalow Scaly-foot along the proposed western CSM water pipeline route, so that any important areas of habitat for the species can be refined during the design phase
- operational phases of the Project and ensure the following:
  - a pre-clearing survey and fauna rescue program is put in place where sensitive areas of habitat are the be cleared. A trained ecologist should be present during all clearing of sensitive environmental areas
  - regular backfilling of trenches so as minimise the amount of time trenches are left open
  - grading the open ends of pipeline trenches to allow trapped animals to climb out
  - placement of habitat components such as logs/woody debris and rock from areas to be cleared, in adjacent retained areas to allow the continuation of their function as potential refuge sites suitable for Brigalow Scaly-foot
  - completion of contractor/staff inductions on site by qualified ecologist/fauna spotter-catcher or environmental advisor to indicate sensitive habitats and species
  - implementation of a weed and feral animal management program as part of the overall Wandoan Coal Project
  - development of an adaptive monitoring program for the entire Wandoan Coal Project ensuring the effectiveness of mitigation measures employed.

Commonwealth significance assessment

The Brigalow Scaly-foot that occurs within the Study Area is not considered an ‘important population’ because:

- the species was recorded in very low densities (1 individual) within the Study Area, despite targeted searches
- the species is not restricted to habitat within the Study Area
- the Study Area occurs within the centre of the distributional range for this species, and therefore the species is not at the limit of its range
- habitat within the Study Area is highly fragmented and the species was recorded as an isolated individual.

Potential impacts of the construction of the Project within the Study Area on the Brigalow Scaly-foot are evaluated using EPBC Act criteria for assessing significant impacts on listed Vulnerable species below.

Will the action lead to a long-term decrease in the size of an important population of a species?

While the population of Brigalow Scaly-foot is not considered to be an important population, the Project will require the proposed clearing of 5 hectares of non-remnant vegetation which is considered to be potential habitat for the Brigalow Scaly-foot within the Study Area. Clearing of this habitat may result in mortality of some individuals, and reduce numbers of Brigalow Scaly-foot within the Study Area. This is a relatively small amount of habitat compared to the extent of similar habitat available in the local area. Given the highly fragmented habitat and low density of individuals recorded within the Study Area, the Project is unlikely to lead to a long-term decrease in the size of any important population of this species.

Will the action reduce the area of occupancy of an important population of a species?

While the population of Brigalow Scaly-foot is not considered to be an important population, the clearing of *Acacia harpophylla/Casuarina cristata* Scrub and eucalypt woodland will reduce the extent of potential habitat available to the Brigalow Scaly-foot within the Study Area. This is likely to reduce the area of occupancy of the species; however, revegetation and restoration of ground cover after construction will ensure the reduction in area of occupancy for the species is mostly short-term.

Will the action fragment an existing important population into two or more populations?

The Project will not fragment an important population of the Brigalow Scaly-foot. The indicative habitat for the Brigalow Scaly-foot within the Study Area is already fragmented and some of it is highly modified as a result of anthropogenic disturbance arising from agriculture, road infrastructure and residences. These open, cleared areas already serve as barriers to the species, and so the clearing of 5 hectares of potential habitat within the Study Area may merely serve to reinforce this barrier (as opposed to creating a new barrier). Moreover, with mitigation measures such as revegetating cleared areas and placement of habitat components into retained areas, any reinforcement of existing barriers to dispersal is likely to be short-term.

Will the action adversely affect habitat critical to the survival of a species?

Habitat along within the Study Area is not considered critical to the survival of the Brigalow Scaly-foot, as similar suitable *Acacia harpophylla/Casuarina cristata* Scrub and eucalypt woodland habitat are available within the Study Area and surrounding landscape. Effects on adjoining habitat areas are likely to be limited to short-term edge effects. These effects are considered unlikely to affect extensive areas of habitat suitable for the species. As such, the Project is unlikely to adversely affect habitat critical to the survival of the species.

Furthermore, the Project will not adversely affect habitat critical to the survival of the Brigalow Scaly-foot as no habitat within the Study Area is listed as critical habitat in any recovery plans for the species or under the Department of the Environment, Water Heritage and the Arts critical habitat register.

Will the action disrupt the breeding cycle of an important population?

While the population of Brigalow Scaly-foot is not considered to be an important population, construction within the Study Area in spring or summer may disrupt breeding for some individuals (as this is time when Brigalow Scaly-foot are most likely to be reproducing and/or

dispersing). However this is most likely to only be in areas where vegetation/habitat will be cleared/removed.

Will the action modify, destroy or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline?

Clearing for construction within the Study Area will result in the loss of potential Brigalow Scaly-foot habitat. Clearing may also result in edge effects which may affect habitat quality in areas of woodland and open forest adjoining the Study Area. This may lead to a decline of the species within the Study Area, but is unlikely to result in an overall decline of the species.

Will the action result in establishment of harmful invasive species becoming established in the species' habitat?

A number of invasive flora species and feral animals were recorded in the Study Area during field surveys for this assessment. A flora and fauna management plan will ensure the management of these species from within and immediately adjacent to the pipeline easement both during construction and operational phases of the project.

Will the action result in the introduction of disease(s) that may cause the species to decline?

There are no known transmissible diseases, or vectors of disease, likely to be introduced to the Study Area that would significantly affect the Brigalow Scaly-foot.

Will the action interfere substantially with the recovery of the species?

Actions for recovery of the Brigalow Scaly-foot include identification of key habitat and priority areas for conservation, and protection of habitat within road reserves. This is particularly important in areas where roadside remnant vegetation is the only remaining suitable habitat for the species. In this case, roadside remnant vegetation is not the only suitable habitat available to the species within the Study Area. Additionally, the majority of the existing landscape within the Study Area has been subject to anthropogenic disturbance and ongoing habitat clearance and is highly modified and fragmented. Therefore, the Project is not considered to interfere substantially with the recovery of the species.

Conclusion

Although the Project will remove approximately 5 hectares of potential habitat for the Brigalow Scaly-foot, similar suitable habitat is widespread throughout the Study Area and region. With the implementation of the aforementioned impact mitigation/avoidance measures, it is unlikely that Project will have a significant impact on the Brigalow Scaly-foot.

I4.1.2 Dunmall's Snake (*Furina dunmalli)*

Description

Dunmall's Snake is a dark-coloured elapid snake of moderate size (snout-to-vent length up to 600 mm) endemic to the Brigalow Belt bioregion (Wilson 2005).

Status under state (Qld) and Commonwealth legislation

Dunmall's Snake is listed as Vulnerable under both the EPBC Act and NC Act.

Distribution

Dunmall's Snake is known only from a few localities in the south-eastern interior of Queensland. Most records of this species are from the southern Brigalow Belt bioregion (Queensland Environmental Protection Agency 2008b; Wilson 2005).

Habitat

Dunmall's Snake inhabits dry forest and woodland habitats (Wilson 2003, 2005). It is known mainly from Brigalow (*Acacia harpophylla*) forest and woodland on cracking clay and clay loam soils (Queensland Environmental Protection Agency 2008b).

Ecology

Very little is known of the ecology of Dunmall's Snake. The species is active by night and appears to feed on small skinks and geckoes (Department of the Environment Water Heritage and the Arts 2008a; Queensland Environmental Protection Agency 2008b). It is known to shelter under fallen timber and is also likely to shelter down rock crevices and amongst leaf litter (Queensland Environmental Protection Agency 2008b).

Threats

Dunmall's Snake is threatened by habitat loss due to land clearing and thinning, inappropriate management of roadside reserves and predation by feral animals. Much of the habitat of this species has been heavily modified for agricultural use (Department of the Environment Water Heritage and the Arts 2008a; Queensland Environmental Protection Agency 2008b).

Recovery actions

Recovery actions for Dunmall's Snake as outlined by the Queensland Environmental Protection Agency (2008b) include:

- identification of key habitat and priority areas for conservation
- development of management guidelines to protect important habitat areas on private and state-controlled land
- implementation of monitoring programs in key habitat and priority conservation areas
- protection of habitat on the stock route network and shire roadsides and reserves
- investigation of the species biology, ecology and population dynamics to inform management
- a collaborative approach to reptile conservation with government and non-government organisations, industry groups, indigenous groups and landholders
- increased community awareness of this species in Queensland.

Occurrence within the Study Area

The Study Area and adjoining lands support areas of dry forest and woodland which may provide habitat for Dunmall's Snake. Preferred habitat (woodland/open forest on cracking clay soils) is, however, limited within the Study Area. Potential habitat for Dunmall's Snake within the Study Area is limited to intact remnants of *Acacia harpophylla* scrub, dry forest and woodland. This species has a moderate chance of occurring within stands of *Acacia harpophylla* and *Callitris glaucophylla* associations found in the Study Area. There were no known records of this species from the desktop assessment and despite 180 trap nights and

18 person hours of active herpetofauna searches, Dunmall's Snake was not recorded during field surveys undertaken for the current assessment.

Species specific Project impacts

Potential impacts on Dunmall's Snake include, but are not limited to:

- removal of 2 hectares of non-remnant *Acacia harpophylla/Casuarina cristata* (RE 11.9.5) and 1 hectare of non-remnant *Callitris glaucophylla* (RE 11.10.9) vegetation within the Study Area which is considered to be potential Dunmall's Snake habitat
- potential trapping of animals in deep steep-walled trenches which makes them vulnerable to predation, heat stress, dehydration, and/or drowning
- displacement of animals in response to increased noise and vibration
- creation of open areas devoid of cover within areas of contiguous habitat may inhibit the movement/ dispersal of Dunmall's Snake
- fragmentation of *Acacia harpophylla/Casuarina cristata* Scrub may also increase edge effects and the risk of predation (in particular predation by feral cats and foxes)
- further establishment of feral animals and weeds.

Species specific Project mitigation

Mitigation measures for Dunmall's Snake include:

- outside of the pipeline easement, clearing of vegetation within the Study Area will be avoided in areas of potential habitat for the Dunmall's Snake (i.e. road reserves) to minimise the extent of potential habitat cleared and minimise fragmentation of habitat
- undertaking seasonal surveys to clarify the distribution and abundance of the Dunmall's Snake along the proposed western CSM water pipeline route, so that any important areas of habitat for the species can be refined during the design phase
- a flora and fauna management plan will be implemented for construction and operational phases of the Project and ensure the following:
  - a pre-clearing survey and fauna rescue program is put in place where sensitive areas of habitat are the be cleared. A trained ecologist will be present during all clearing of sensitive environmental areas.
  - regular backfilling of trenches so as minimise the amount of time trenches are left open
  - grading the open ends of pipeline trenches to allow trapped animals to climb out
  - placement of habitat components such as logs/woody debris and rock from areas to be cleared, in adjacent retained areas to allow the continuation of their function as potential refuge sites suitable for Dunmall's Snake
  - completion of contractor/staff inductions on site by qualified ecologist/fauna spotter-catcher or environmental advisor to indicate sensitive habitats and species
  - implementation of a weed and feral animal management program
  - development of an adaptive monitoring program ensuring the effectiveness of mitigation measures employed.

Commonwealth significance assessment

If present, the population of Dunmall's Snake would not be considered an 'important population' because:

- the species was not recorded within the Study Area, despite targeted searches and is therefore clearly not abundant in the Study Area
- the species is not restricted to habitat within the Study Area
- the species is not at the limit of its range.

Potential impacts of the construction of the Project within the Study Area on Dunmall's Snake are evaluated using EPBC Act criteria for assessing significant impacts on listed Vulnerable species below.

Will the action lead to a long-term decrease in the size of an important population of a species?

Analogous habitat to that known to the species (described above) was identified throughout Study Area. Despite field surveys incorporating a multidisciplinary approach comprising pitfalls (80 pitfall nights), funnel traps (64 trap nights), 8 hours of active search and numerous other opportunistic surveys this species was not recorded. The Project will require the proposed clearing of 3 hectares of non-remnant vegetation which is considered to be potential habitat for Dunmall's Snake within the Study Area. Clearing of this habitat may result in mortality of Dunmall's Snake, consequently reducing numbers of this species within the Study Area. This is a relatively small amount compared to the extent of similar habitat available in the local area. The lack of detection of this species within the Study Area suggests Dunmall's Snake may not occur or if present it is not abundant. Given this situation, the Project is unlikely to lead to a decrease in the size of any important population of this species.

Will the action reduce the area of occupancy of an important population of a species?

Dunmall's Snake was not recorded within the Study Area during the field surveys and if present it is likely to be in very low numbers. Therefore, any habitat clearing would not reduce the area of occupancy of an important population. The clearing of woodland and/or dry forest will reduce the extent of potential habitat available to Dunmall's Snake within the Study Area and surrounds. This is likely to reduce the area of potential occupancy of the species in the Study Area, but this is not likely to be significant.

Will the action fragment an existing important population into two or more populations?

The Project will not fragment an important population of Dunmall's Snake. The indicative habitat for Dunmall's Snake within the Study Area is already fragmented and some of it is highly modified as a result of anthropogenic disturbance arising from agriculture, road infrastructure and residences. These open, cleared areas already serve as barriers to the species, and so the clearing of 3 hectares of potential habitat within the Study Area may merely serve to reinforce this barrier (as opposed to creating a new barrier). Moreover, with mitigation measures such as revegetating cleared areas and placement of habitat components into retained areas, any reinforcement of existing barriers to dispersal is likely to be short-term.

Will the action adversely affect habitat critical to the survival of a species

The Project will not affect habitat critical to the survival of Dunmall's Snake because it was not recorded during the field survey, despite targeted surveys. Habitat along within the Study Area is not considered critical to the survival of Dunmall's Snake as similar suitable woodland and open forest habitat are widespread within the Study Area and surrounding landscape. Effects on adjoining habitat areas are likely to be limited to short-term edge effects. These effects are considered unlikely to affect extensive areas of habitat suitable for the species. Furthermore, the Project will not adversely affect habitat critical to the survival of Dunmall's Snake as no habitat within the Study Area is listed as critical habitat in any recovery plans for the species or under the Department of the Environment, Water Heritage and the Arts critical habitat register.

Disrupt the breeding cycle of an important population

Considering that Dunmall's Snake was not recorded in the Study area despite targeted surveys, the Project is unlikely to disrupt the breeding cycle of an important population.

Modify, destroy or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline

Clearing for construction and operations within the Study Area will result in the loss of potential Dunmall's Snake habitat. Clearing may also result in edge effects which may affect habitat quality in areas of woodland and open forest adjoining the Study Area.

Establishment of harmful invasive species becoming established in the species' habitat

A number of invasive flora species and feral animals were recorded in the Study Area during field surveys for this assessment. The flora and fauna management plan will ensure the management of these species from within and immediately adjacent mining areas both during construction and operational phases of the Project.

Introduction of disease(s) that may cause the species to decline

There are no known transmissible diseases, or vectors of disease, likely to be introduced to the Study Area that would significantly affect Dunmall's Snake.

Substantial interference with the recovery of the species

Actions for recovery of Dunmall's Snake include identification of key habitat and priority areas for conservation, and protection of habitat within road reserves (Department of the Environment Water Heritage and the Arts 2008a). This is particularly important in areas where roadside remnant vegetation is the only remaining suitable habitat for the species. In this case, roadside remnant vegetation is not the only suitable habitat available to the species within the Study Area. Additionally, the majority of the existing landscape within the Study Area has been subject to anthropogenic disturbance and ongoing habitat clearance and is highly modified and fragmented. Therefore, the Project is not considered to interfere substantially with the recovery of the species.

Conclusion

Although the Project will remove approximately 4 hectares of potential habitat for Dunmall's Snake, similar habitat is widely available within the Study Area and surrounds. With the

implementation of the aforementioned impact mitigation/avoidance measures, it is unlikely that Project will have a significant impact on Dunmall's Snake.

I4.1.3 Squatter Pigeon (southern race) (*Geophaps scripta scripta)*

Description

This is a moderate-sized pigeon with prominent black and white facial markings and bare blue skin surrounding the eyes (Higgins & Davies 1997).

Status under state (Qld) and Commonwealth legislation

The southern race of the Squatter Pigeon is listed as Vulnerable under the EPBC Act and NC Act.

Distribution

The Squatter Pigeon (southern race) is known from dry inland and coastal parts of central and southern east Australia, from central New South Wales north to the Burdekin River, central eastern Queensland (Garnett & Crowley 2000; Higgins & Davies 1997; Royal Australian Ornithologists Union 2003). The species may already be extinct in New South Wales and is rarely encountered in south-east Queensland with most recent records species from central Queensland (Garnett & Crowley 2000; Higgins & Davies 1997; Royal Australian Ornithologists Union 2003).

Habitat

The Squatter Pigeon (southern race) favours dry open woodland areas with sparse grass cover near permanent water (Garnett & Crowley 2000; Higgins & Davies 1997). Sown pastures and dense grass cover on heavier fertile soils appear generally unsuitable for this species (Higgins & Davies 1997). Treeless areas with sparse shrub / grass cover are also unlikely to provide habitat suitable for this species (Higgins & Davies 1997).

Ecology

Squatter pigeons spend most of their time foraging on the ground and are often observed beside roads and tracks (Higgins & Davies 1997). At night, Squatter Pigeons ascend trees to roost (Higgins & Davies 1997).

The movements of this species are poorly known. Available evidence suggests this species is only locally dispersive, with little evidence for long-distance seasonal movements. There is, however, evidence to suggest that the species may disperse more widely from drought affected areas (Higgins & Davies 1997).

The diet of Squatter Pigeons comprises mainly seeds. This includes seeds from a wide range of grasses, legumes, dicot herbs and shrubs (Higgins & Davies 1997).The breeding biology of this species is poorly known. Available information suggests breeding may occur throughout the year, peaking May to June. Birds are known to nest on the ground, amidst short grass and bushes (Garnett & Crowley 2000; Higgins & Davies 1997). Due to its ground-nesting behaviour, birds may be vulnerable to predation by feral cats and foxes.

Threats

Much of this species' habitat has been modified for grazing and cropping. In NSW, over-grazing by sheep and rabbits combined with drought has resulted in the decline and

apparent extinction of this species (Garnett & Crowley 2000; Higgins & Davies 1997). Improvement of pastures for grazing of cattle *per se* does not appear to have affected this species as strongly as pasture improvement for sheep (Garnett & Crowley 2000; Higgins & Davies 1997).

Fox predation may be of particular concern with declines in New South Wales occurring in areas of high fox abundance (Higgins & Davies 1997). Given the species' apparent affinity for roadsides, fast-moving vehicular traffic may also pose a threat.

Recovery actions

Recommended actions for the recovery of this species outlined in 'The Action Plan for Australia Birds 2000' (Garnett & Crowley 2000) include:

- defining population size and distribution of the southern race in Queensland and New South Wales
- ecological research investigating the relationship between pigeon abundance, tree density and sticking rate
- monitoring of the race
- establishment of a public education and habitat/tree planting scheme.

Occurrence within the Study Area

The Study Area and adjoining lands support small areas of dry forest and woodland which may provide habitat for the Squatter Pigeon. Preferred habitat (dry open woodland areas with sparse grass cover near permanent water) is very limited within the Study Area. Potential habitat for the Squatter Pigeon within the Study Area is limited to intact remnants of *Eucalyptus populnea* woodland close to farm dams and *Eucalyptus tereticornis* woodland fringing drainage lines. This species has a moderate chance of occurring nomadically within stands of *Eucalyptus populnea* and *Eucalyptus tereticornis* woodland associations found in the Study Area. This species has been previously recorded 30 km to the north of the Study Area and there are historic records of this species from approximately 70 years ago in areas adjoining the Study Area. However, despite targeted surveys for this species, the Squatter Pigeon was not recorded during field surveys undertaken for the current assessment.

Species specific Project impacts

Potential impacts on the Squatter Pigeon include, but are not limited to:

- removal of 3 hectares of non-remnant *Eucalyptus populnea* woodland (RE 11.3.2) and 1 hectare of remnant and non-remnant *Eucalyptus tereticornis* vegetation (RE 11.3.25) within the Study Area which is considered to be potential Squatter Pigeon habitat
- displacement of animals (particularly nesting birds) due to loss of foraging habitat and shelter
- fragmentation of *Eucalyptus populnea* and *Eucalyptus tereticornis* woodland may also increase edge effects and the risk of predation (in particular predation on chicks by feral cats and foxes)
- further establishment of feral animals which could result in mortality of chicks and/or abandonment of nests
- further establishment of weeds which may result in loss of foraging and nesting habitat.

Species specific Project mitigation

Mitigation measures for the Squatter Pigeon include:

- outside of the pipeline easement, clearing of non-remnant vegetation (REs 11.3.2 and 11.3.25) within the Study Area should be avoided in areas of potential habitat for the Squatter Pigeon, especially those remnants close to permanent water sources. This will minimise the extent of potential woodland/ forest habitat cleared and minimise fragmentation of habitat
- flora and fauna management plan will be implemented for construction and operational phases of the project and ensure the following:
  - a comprehensive clearing program is put in place that includes pre-clearing survey and fauna rescue. A trained ecologist should be present during all clearing of sensitive environmental areas
  - contractor/staff inductions on site by qualified ecologist/fauna spotter-catcher or environmental advisor are completed
  - a implementation of a weed and feral animal management program as part of the overall Wandoan Coal Project
  - development of an adaptive monitoring program for the entire Wandoan Coal Project ensuring the effectiveness of mitigation measures employed.

Commonwealth significance assessment

If present, the population of the Squatter Pigeon would not be considered an 'important population' because:

- the species was not recorded within the Study Area, despite targeted searches
- the species is partly-nomadic (Pizzey & Knight 1997) and is therefore not restricted to habitat within the Study Area
- the Study Area is not at the limit of the species' range.

Potential impacts of the construction of the Project within the Study Area on the Squatter Pigeon are evaluated using EPBC Act criteria for assessing significant impacts on listed Vulnerable species below.

Will the action lead to a long-term decrease in the size of an important population of a species?

If present within the study Area, the population of Squatter Pigeon would not be considered an important population. Although analogous habitat to that known to the species (described above) was identified throughout Study Area and targeted searches were undertaken, the Squatter Pigeon was not detected within the Study Area. The Project will require the proposed clearing of 4 hectares of non-remnant vegetation which is considered to be potential habitat for the Squatter Pigeon. This is a relatively small amount compared to the extent of similar suitable habitat available elsewhere within the Study Area and surrounds, it is unlikely this will lead to a decrease in the size of any important population of this species.

Will the action reduce the area of occupancy of an important population of a species?

If present within the study Area, the population of Squatter Pigeon would not be considered an important population. The Squatter Pigeon was not recorded within the Study Area during

the field surveys and if present it is likely to be present in very low numbers. Therefore, any habitat clearing would not reduce the area of occupancy of an important population.

Will the action fragment an existing important population into two or more populations?

The Project will not fragment an important population of the Squatter Pigeon. The indicative habitat for Squatter Pigeon within the Study Area is already fragmented and some of it is highly modified as a result of anthropogenic disturbance arising from agriculture, road infrastructure and residences. These open, cleared areas already serve as barriers to the species, and so the clearing of 4 hectares of potential habitat within the Study Area may merely serve to reinforce this barrier (as opposed to creating a new barrier). Moreover, with mitigation measures such as revegetating cleared areas and weed control, any reinforcement of existing barriers to dispersal is likely to be short-term.

Will the action adversely affect habitat critical to the survival of a species

The Project will not affect habitat critical to the survival of the Squatter Pigeon. This species was not recorded during the field survey, despite targeted surveys. Habitat within the Study Area is not considered critical to the survival of the Squatter Pigeon as similar suitable woodland and open forest habitat are widespread within the Study Area and surrounding landscape.

Disrupt the breeding cycle of an important population

Considering that the Squatter Pigeon was not recorded within the Study area the Project is unlikely to disrupt the breeding cycle of an important population.

Modify, destroy or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline

While clearing for construction of the pipeline within the Study Area will result in a relatively small loss (i.e. 4 hectares) of potential foraging, nesting and roosting habitat for the Squatter Pigeon, there is suitable habitat available within the Study Area and surrounds. Clearing may also result in edge effects which may affect habitat quality in areas of woodland and open forest adjoining the Study Area. This may lead to a decline of the species within the Study Area. However, given the species is partly-nomadic and suitable habitat is available throughout the region, these impacts are unlikely to result in a significant or irreversible decline in numbers.

Establishment of harmful invasive species becoming established in the species' habitat

A number of invasive flora species and feral animals were recorded in the Study Area during field surveys for this assessment. The flora and fauna management plan will ensure the management of these species from within and immediately adjacent mining areas both during construction and operational phases of the project.

Introduction of disease(s) that may cause the species to decline

There are no known transmissible diseases, or vectors of disease, likely to be introduced to the Study Area that would significantly affect the Squatter Pigeon.

Substantial interference with the recovery of the species

Actions for recovery of the Squatter Pigeon include defining population size and distribution of the southern race in Queensland and New South Wales, monitoring and research investigating relationship between pigeon abundance, tree density and sticking rate.

The Project is not considered to interfere substantially with the recovery of the species.

Conclusion

Although the Project will remove approximately 4 hectares of potential habitat for the Squatter Pigeon, similar habitat is widely available within the Study Area and surrounds. With the implementation of the aforementioned impact mitigation/avoidance measures, it is unlikely that Project will have a significant impact on the Squatter Pigeon.

I4.1.4 Eastern Long-eared Bat (*Nyctophilus sp cf timoriensis)* (eastern form)

Description

This is a moderate-sized insectivorous bat with large prominent ears, distinguished from sympatric congeners by its larger size, proportionately larger head and broad snout (Churchill 1998; Van Dyck & Strahan 2008).

Status under state (Qld) and Commonwealth legislation

The Eastern Long-eared Bat is listed as vulnerable under both the EPBC Act and NC Act

Distribution

The Eastern long-eared bat's range extends across the Murray-Darling Basin, from eastern South Australia north-east to central Queensland (Van Dyck & Strahan 2008).

Habitat

The Eastern Long-eared Bat is known from a variety of habitats including River Red gum, Mallee, Bulloke, Box and Brigalow/Belah-dominated communities (Duncan *et al.* 1999; Van Dyck & Strahan 2008). In inland southern Queensland, the species is most abundant in open box/ironbark/Cypress pine *Callitris* woodland (Duncan *et al.* 1999; Van Dyck & Strahan 2008).

Ecology

Little is known of the biology of the Eastern Long-eared Bat. Like other long-eared bats, the species is likely to roost in tree hollows, fissures in branches or under exfoliating bark (Van Dyck & Strahan 2008).

The Eastern long-eared bat forages aerially amidst low (understorey) vegetation and may forage at ground level as well (Duncan *et al.* 1999; Van Dyck & Strahan 2008). The diet of this species comprises mainly arthropods (Van Dyck & Strahan 2008).

Mating is likely to occur in autumn with young born in late Spring and Summer (Duncan *et al.* 1999; Van Dyck & Strahan 2008). Females with young are likely to roost communally in large tree hollows during Spring and Summer (Van Dyck & Strahan 2008).

Threats

The Eastern Long-eared Bat is threatened by habitat loss, degradation and fragmentation (Duncan *et al.* 1999). Unlike other common sympatric *Nyctophilus* species, the Eastern long-

eared bat occurs at high densities only in larger areas of intact woodland/forest habitat. Habitat fragmentation may therefore be of particular concern for this species (Duncan *et al.* 1999; Van Dyck & Strahan 2008).

Recovery actions

Recovery actions for the species identified in 'The Action Plan for Australian Bats' (Duncan *et al.* 1999) include:

- investigation of habitat requirements, roost and maternity site selection, foraging behaviour, population dynamics and threatening processes
- targeted surveys in areas where clearing is imminent
- assessing the impact of timber harvesting and related activities such as grazing on the viability of populations.

Occurrence within the Study Area

The Study Area and adjoining lands support a significant amount of potential habitat for the Eastern Long-eared Bat including *Eucalyptus tereticornis* forest, *Acacia harpophylla/Casuarina cristata* woodland, *Eucalyptus populnea* woodland and *Callitris glaucophylla* woodland (the preferred habitat for the species in Queensland). This species has a moderate chance of occurring win association with remnant vegetation communities supporting senescent trees. However, there were no known records of this species from the desktop assessment and despite 9 survey nights and 16 trap nights of targeted survey techniques; the Eastern Long-eared Bat was not recorded during field surveys undertaken for the current assessment. Further the habitat within the study area is highly fragmented, which may reduce the likelihood of this species occurring.

Species specific Project impacts

Potential impacts on the Eastern Long-eared Bat include, but are not limited to:

- removal of 3 hectares of non-remnant *Eucalyptus populnea* woodland (RE 11.3.2), 1 hectare of remnant and non-remnant *Eucalyptus tereticornis* woodland (RE 11.3.25), 2 hectares of remnant and non-remnant *Acacia harpophylla/Casuarina cristata* woodland (RE 11.9.5) and 1 hectare of remnant and non-remnant *Callitris glaucophylla* woodland (RE 11.10.9) within the Study Area which is considered to be potential Eastern Long-eared Bat habitat
- direct mortality through felling of trees supporting large hollows which may be used as maternity sites by the Eastern Long-eared Bat
- displacement of roosting animals in response to increased noise and vibration, especially in vicinity of construction areas.

Species specific Project mitigation

Mitigation measures for the Eastern Long-eared Bat include:

- outside of the pipeline easement, clearing of remnant and non-remnant vegetation (Res 11.3.2, 11.3.25, 11.9.5 and 11.10.9) within the Study Area should be avoided in areas of potential habitat for the Eastern Long-eared Bat, especially those remnants supporting senescent trees. This will minimise the extent of potential woodland/ forest habitat cleared and minimise fragmentation of habitat

- where possible ancillary areas and infrastructure should be located so as to avoid impacts to areas of sensitive biodiversity
- A flora and fauna management plan will be implemented for construction and operational phases of the Project and ensure the following:
  - a comprehensive clearing program is put in place that includes pre-clearing survey and fauna rescue in sensitive ecological areas. A trained ecologist will be present during all clearing of sensitive environmental areas
  - contractor/staff inductions on site by qualified ecologist/fauna spotter-catcher or environmental advisor relating to ecologically sensitive areas are completed
  - a weed and feral animal management program is prepared for the Project
  - a monitoring program is developed and implemented to ensure the effectiveness of mitigation measures and to all adaptive changes to be made to measures should they be needed.

Commonwealth significance assessment

If present, the population of the Eastern Long-eared Bat would not be considered an 'important population' because:

- the species was not recorded within the Study Area, despite targeted searches
- there is no established breeding population that relies on maternity resources within the site for breeding or dispersal
- the populations of the species that may potentially forage in the area are not restricted to the habitat within the site due to the species large home range. Therefore the genetic diversity of the species can still be maintained by interbreeding with other populations throughout the wider area.

Potential impacts of the construction and operations of the Project within the Study Area on the Eastern Long-eared Bat are evaluated using EPBC Act criteria for assessing significant impacts on listed Vulnerable species below.

Will the action lead to a long-term decrease in the size of an important population of a species?

If present within the Study Area, a population of the Eastern Long-eared Bat would not be considered an important population. Although analogous habitat to that known to the species (described above) was identified throughout Study Area and targeted surveys were undertaken, the Eastern Long-eared Bat was not detected within the Study Area and no known records of this species were identified from the desktop assessment. The Project will require the proposed clearing of 7 hectares of remnant and non-remnant vegetation which is considered to be potential habitat for the Eastern Long-eared Bat. However most of this habitat is highly fragmented and does not represent core habitat for the species.

Will the action reduce the area of occupancy of an important population of a species?

If present within the Study Area, a population of the Eastern Long-eared Bat would not be considered an important population. The Eastern Long-eared Bat was not recorded within the Study Area. Therefore, any habitat clearing would not reduce the area of occupancy of an important population. The clearing of woodland containing hollow bearing trees will reduce the extent of potential roosting habitat available to the Eastern Long-eared Bat, but

this is unlikely to cause the species to decline as there is similar suitable habitat available with the Study Area and region.

Will the action fragment an existing important population into two or more populations?

The Project will not fragment an important population of the Eastern Long-eared Bat. The indicative habitat for Eastern Long-eared Bat within the Study Area is already fragmented and some of it is highly modified as a result of anthropogenic disturbance arising from agriculture and road infrastructure. Additionally, proposed vegetation clearing for the pipeline easement is a 20 metre wide corridor and given the species is highly mobile, the Project is unlikely to further create a barrier for this species. The Eastern Long-eared Bat which may potentially occur within the Study Area would not be considered an important population.

Will the action adversely affect habitat critical to the survival of a species

The Project will not affect habitat critical to the survival of the Eastern Long-eared Bat. This species was not recorded during the field survey, despite targeted surveys. Habitat within the Study Area is not considered critical to the survival of the Eastern Long-eared Bat as similar suitable woodland and open forest habitat are widespread within the Study Area and surrounding landscape. Not critical habitat has been listed for this species. .

Disrupt the breeding cycle of an important population

Considering that the Eastern Long-eared Bat was not recorded within the Study area, the Project is unlikely to disrupt the breeding cycle of an important population.

Modify, destroy or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline

Clearing for construction and operations within the Study Area will result in the short-term loss of potential foraging and roosting habitat for the Eastern Long-eared Bat. Clearing may also result in edge effects which may affect habitat quality in areas of woodland and open forest adjoining the Study Area. In the short-term, this may lead to a decline of the species within the Study Area. However, given the species is mobile these impacts are unlikely to result in a significant or irreversible decline in numbers.

Establishment of harmful invasive species becoming established in the species' habitat

A number of invasive flora species and feral animals were recorded in the Study Area during field surveys for this assessment. The flora and fauna management plan will ensure the management of these species from within and immediately adjacent mining areas both during construction and operational phases of the Project.

Introduction of disease(s) that may cause the species to decline

There are no known transmissible diseases, or vectors of disease, likely to be introduced to the Study Area that would significantly affect the Eastern Long-eared Bat.

Substantial interference with the recovery of the species

The Project is unlikely to interfere with the recovery of the Eastern Long-eared Bat.

Conclusion

Although the Project will remove approximately 7 hectares of potential habitat for the Eastern Long-eared Bat, similar habitat is widely available within the Study Area and surrounds. With the implementation of the aforementioned impact mitigation/avoidance measures, it is unlikely that Project will have a significant impact on the Eastern Long-eared Bat.

I4.1.5 Australian Painted Snipe (*Rostratula australis*)

Description

The Australian Painted Snipe is a stocky wading bird around 220-250 mm in length with a long pinkish bill. The adult female, more colourful than the male, has a chestnut-coloured head, with white around the eye and a white crown stripe, and metallic green back and wings, barred with black and chestnut. There is a pale stripe extending from the shoulder into a V down its upper back. The adult male is similar to the female, but smaller and duller with buff spots on the wings (Department of the Environment Water Heritage and the Arts 2003).

Status

The Australian Painted Snipe is currently listed as Vulnerable under the *Nature Conservation Act 1992* and *Environment Protection and Biodiversity Conservation Act 1999*. It is also listed as a Migratory species under the EPBC Act, as it is listed in the China–Australia Migratory Bird Agreement (CAMBA).

Distribution

The Painted Snipe is patchily distributed across eastern and northern Australia. Most records of this species are from south-eastern states, though the species has also been recorded from South Australia, the Northern Territory and Western Australia (Marchant & Higgins 1993).

Habitat

The Painted Snipe is associated with ephemeral and permanent shallow freshwater wetlands and, occasionally, brackish water wetlands (Marchant & Higgins 1993). This includes natural wetlands as well as sewage farms, bore drains with rank emergent vegetation, dams and rice crops (Marchant & Higgins 1993).

Ecology

The Painted Snipe is a cryptic species usually encountered singly or in pairs. Birds forage amidst low vegetation (typically grasses and sedges) in or near shallow water, feeding on arthropods, worms and vegetable matter (Marchant & Higgins 1993).

Breeding occurs in spring and summer possibly in response to flooding of swamps (Marchant & Higgins 1993). Eggs are laid in a depression on the ground or bowl-shaped nest of dry grass, water-weed twigs, leaves or Casuarina cladodes (Marchant & Higgins 1993).

The movements of this species are poorly understood. Some individuals appear to be nomadic while others remain resident in the one area (Department of the Environment Water Heritage and the Arts 2003; Marchant & Higgins 1993).

Threats

The main threat to the Painted Snipe is habitat modification and loss, due to changes in flood patterns and wetland drainage (Department of the Environment Water Heritage and the Arts 2003; Garnett & Crowley 2000). In some areas salinization may also pose a threat to the species (Department of the Environment Water Heritage and the Arts 2003). Trampling and browsing of cattle, resulting in the loss of sedge/grass cover, is also considered a threat (Department of the Environment Water Heritage and the Arts 2003).

As a ground–nesting species, the Painted Snipe may also be vulnerable to predation by feral animals, particularly foxes (Department of the Environment Water Heritage and the Arts 2003). The loss of grass/sedge cover due to grazing and cultivation may serve to increase the vulnerability of Painted Snipe to predation.

Recovery actions

Recovery actions for the Australian Painted Snipe outlined in 'The Action Plan for Australian Birds 2000' (Garnett & Crowley 2000) include:

- protection and management of principal breeding wetlands and wintering grounds using recent records as a guide
- rehabilitation of former breeding areas through Landcare
- monitoring of abundance at landscape level
- development of techniques for maintaining a captive population.

Occurrence within Study Area

The Study Area provides limited potential habitat for this species in the form of scattered farm dams and ephemeral wetland areas, and its occurrence would be influenced by seasonal conditions. Though containing suitable habitat for the Painted Snipe, there are no records of this species from within the Study Area and the species was not identified during field surveys. This suggests that the species is either absent or scarce within the area.

Species specific Project impacts

Potential impacts on the Painted Snipe include, but are not limited to:

- displacement of animals (particularly nesting birds) in response to increased noise and vibration
- destruction of foraging, nesting and roosting habitat
- invasion of weeds
- further establishment of feral animals which could result in mortality of chicks and/or abandonment of nests.

Species specific Project mitigation

Mitigation measures for the Painted Snipe include:

- outside of the areas necessary for mining, construction should be avoided within close proximity to wetland areas and dams.

Commonwealth significance assessment

If present, the population of the Painted Snipe would not be considered an 'important population' because:

- the species was not recorded within the Study Area, despite active surveys
- the species is mobile and not restricted to habitat within the Study Area
- significant areas of habitat important for breeding are not present in the Study Area
- the Study Area is not at the limit of the species' range.

Potential impacts of the construction of the Project within the Study Area on the Painted Snipe are evaluated using EPBC Act criteria for assessing significant impacts on listed Vulnerable species below.

Will the action lead to a long-term decrease in the size of an important population of a species?

If present within the Study Area, the Painted Snipe would not be considered an important population. Although the Study Area and surrounds contain limited suitable habitat for the Painted Snipe in the form of small farm dams and ephemeral wetland areas, the species was not identified during field surveys undertaken for this assessment. There are also no known records of this species from within the Study Area. It is unlikely this will lead to a decrease in the size of any important population of this species.

Will the action reduce the area of occupancy of an important population of a species?

If present within the Study Area, the Painted Snipe would not be considered an important population. The Painted Snipe was not recorded within the Study Area during the field surveys. Therefore, any habitat clearing would not reduce the area of occupancy of an important population.

Will the action fragment an existing important population into two or more populations?

The Project will not fragment an important population of the Painted Snipe. The indicative habitat for Painted Snipe within the Study Area is already highly fragmented and some of it is highly modified as a result of anthropogenic disturbance arising from agriculture, road infrastructure and residences. Additionally, proposed vegetation clearing for the pipeline easement is a 20 metre wide corridor and given the species is highly mobile, the Project is unlikely to further create a barrier for this species.

Will the action adversely affect habitat critical to the survival of a species

The Project will not affect habitat critical to the survival of the Painted Snipe. It was not recorded during the field survey, despite targeted surveys. Habitat within the Study Area is not considered critical to the survival of the Painted Snipe as similar suitable habitat is widespread within the Study Area and surrounding landscape. No critical habitat has been listed for this species.

Disrupt the breeding cycle of an important population

Considering that the Painted Snipe was not recorded within the Study area the Project is unlikely to disrupt the breeding cycle of an important population.

Modify, destroy or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline

Clearing for construction and operations within the Study Area will result in the loss of potential foraging, nesting and roosting habitat for the Painted Snipe. However this is not considered to be a limiting resource for this species in the Study Area or surrounding areas and is unlikely to result in a decline for this species.

Establishment of harmful invasive species becoming established in the species' habitat

A number of invasive flora species and feral animals were recorded in the Study Area during field surveys for this assessment. The flora and fauna management plan will ensure the management of these species from within and immediately adjacent mining areas both during construction and operational phases of the Project.

Introduction of disease(s) that may cause the species to decline

There are no known transmissible diseases, or vectors of disease, likely to be introduced to the Study Area that would significantly affect the Painted Snipe.

Substantial interference with the recovery of the species

The Project is not considered to interfere substantially with the recovery of the species.

Conclusion

Given that the species is highly mobile and proposed vegetation clearing for the pipeline easement is a 20 metre wide corridor and there is suitable habitat available elsewhere within the Study Area and surrounds, it is unlikely that Project will have a significant impact on the Painted Snipe.

I4.1.6 Satin Flycatcher (*Myiagra cyanoleuca*)

Description

This is a small flycatcher with dark upper- and light underparts. The common name alludes to the glossy blue-black head plumage of male birds.

Status under State (Qld) and Commonwealth legislation

The Satin Flycatcher is listed as a Migratory species under the EPBC Act. It is not listed under State (QLD) legislation.

Distribution

The Satin Flycatcher occurs along Australia's eastern seaboard, from Tasmania north to Torres Strait (Higgins *et al.* 2006). It is also known from scattered sites in Papua New Guinea and nearby offshore islands. It is generally restricted to coastal and near-coastal areas.

Habitat

The Satin Flycatcher is most commonly associated with eucalypt forest, particularly wet sclerophyll forest (Higgins *et al.* 2006). The species is also known to occur in open grassy eucalypt woodland and is often associated with gullies and watercourses ((Higgins *et al.* 2006). It is largely absent from regrowth vegetation (Higgins *et al.* 2006).

Ecology

The Satin Flycatcher breeds mainly in south-east Australia during spring and summer, migrating north in autumn; though there are some breeding records from northern and central Eastern Queensland (Higgins *et al.* 2006). The species forages mainly in trees, feeding on arthropods (Higgins *et al.* 2006). It breeds in summer and spring and nests in the outer branches of tall eucalypt trees (Higgins *et al.* 2006).

Threats

Populations in south-east Australia have been reduced by clearing and logging of eucalypt forests (Higgins *et al.* 2006).

Recovery actions

No actions have been identified for the recovery of this species nationally or in Queensland.

Occurrence within the Study Area

The Study Area supports limited areas of *Eucalyptus populnea* woodland and *Eucalyptus tereticornis* woodland fringing drainage lines which may provide habitat suitable for the Satin Flycatcher. Though not recorded during surveys undertaken for this assessment, the Satin Flycatcher has previously been recorded from the Study Area. The Study Area falls within the western range limit for this species and hence can be considered important habitat as defined under the *EPBC Act Policy Statement 1.1 Significant Impact Guidelines*.

Species specific Project impacts

Potential impacts on the Satin Flycatcher include, but are not limited to:

- removal of 3 hectares of non-remnant *Eucalyptus populnea* woodland (RE 11.3.2) and 1 hectare of remnant and non-remnant *Eucalyptus tereticornis* vegetation within the Study Area which is considered to be potential Satin Flycatcher habitat
- displacement of animals (particularly nesting birds) in response to increased noise and vibration
- further establishment of weeds.

Species specific Project mitigation

Mitigation measures for the Satin Flycatcher include:

- outside of the pipeline easement, clearing of remnant and non-remnant vegetation (Res 11.3.2 and 11.3.25) within the Study Area should be avoided in areas of potential habitat for the Satin Flycatcher.

Assessment of impacts

Impacts of the Project on the Satin Flycatcher are evaluated using EPBC Act criteria for assessing significant impacts on listed Migratory species below.

Will the action substantially modify (including by fragmenting, altering fire regimes, altering nutrient cycles or altering hydrological cycles), destroy or isolate an area of important habitat for a migratory species?

The Project will not substantially modify, destroy or isolate an area of important habitat for the Satin Flycatcher. While the Project may remove 4 hectares of potential habitat for the

Satin Flycatcher within the Study Area, there is extensive suitable habitat available elsewhere throughout the region. Given the mobility of the species it is unlikely that areas of potential habitat will be isolated as a result of the Project.

Will the action result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for the migratory species?

The Project will not result in any invasive species that is harmful to the Migratory species becoming established in an area of important habitat for the species. The Study Area already contains invasive weeds and pest animals.

Will the action seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of a migratory species?

The Project will not seriously disrupt the breeding, feeding, migration or resting behaviour of an ecologically significant proportion of the population of the Satin Flycatcher as this species is widespread across Eastern Australia (Pizzey & Knight 1997). Suitable habitat for breeding, feeding or resting exists extensively in the region.

Outcome

The Project is unlikely to have a significant impact on the Satin Flycatcher as suitable habitat for this species is abundant in the region.

I4.2 Significance assessments for State-listed threatened fauna

While there is no standard methodology for assessing the significance of impacts on Threatened species and communities in Queensland listed under the *Nature Conservation Act 1992* (NC Act) or *Vegetation Management Act 1999* (VM Act), for this assessment the significance of likely impacts were assessed using the criteria outlined below:

- Will areas of high conservation value for the species or community be affected? (Question a)
- Do individual animals and/or plants and/or subpopulations that are likely to be affected by the Project play an important role in maintaining the long-term viability of the species, population or ecological community? (Question b)
- Do habitat features that are likely to be affected by the Project play an important role in maintaining the long-term viability of the species, population or ecological community? (Question c)
- Are the duration of impacts for the species or community long-term? (Question d)
- Are the impacts for the species or community permanent and irreversible? (Question e)

These factors for consideration are addressed in Table I-1.

Table I-1: Assessment of significance for state-listed Threatened fauna likely to occur in the Study Area

Species	Significance assessment question				
	a)	b)	c)	d)	e)
Dunmall's Snake (*Furina dunmalli*)	-species not recorded during survey -no important habitat present	-species not recorded during survey	-species not recorded during survey -species would not be restricted to habitat found within the Study Area	Potential impacts from loss of habitat are not long-term. The extent of habitat removal is small and the habitat is of poor quality in relation to habitat available in the local area and region. Cleared areas for the western CSM water pipeline will be revegetated and rehabilitated following construction.	Potential impacts resulting from loss of habitat during construction of the pipeline are not permanent and irreversible, and are therefore not considered to be significant.

Species	Significance assessment question				
	a)	b)	c)	d)	e)
Brigalow Scaly-foot (*Paradelma orientalis*)	-species recorded during survey -no important habitat present -suitable habitat is widespread within the Study Area and surrounds	-species recorded in low density (isolated individual) and is not considered an 'important' population	-the Study Area contains important habitat features but these are commonly available in the surrounding landscape	Potential impacts from loss of habitat are not long-term. The extent of habitat removal is small and the habitat is of poor quality in relation to habitat available in the local area and region. Cleared areas for the western CSM water pipeline will be revegetated and rehabilitated following construction.	Potential impacts resulting from loss of habitat during construction of the pipeline are not permanent and irreversible, and are therefore not considered to be significant.
Australian Painted Snipe (*Rostratula australis*)	-species not recorded during survey -no important habitat present	-species not recorded during survey	-species not recorded during survey -species would not be restricted to habitat found within the Study Area	Potential impacts from loss of habitat are not long-term. The extent of habitat removal is small and the habitat is of poor quality in relation to habitat available in the local area and region. Cleared areas for the western CSM water pipeline will be revegetated and rehabilitated following construction.	Potential impacts resulting from loss of habitat during construction of the pipeline are not permanent and irreversible, and are therefore not considered to be significant.
Squatter Pigeon (southern race) (*Geophaps scripta scripta*)	-species not recorded during survey -no important habitat present	-species not recorded during survey	-species not recorded during survey -species would not be restricted to habitat found within the Study Area	Potential impacts from loss of habitat are not long-term. The extent of habitat removal is small and the habitat is of poor quality in relation to habitat available in the local area and region. Cleared areas for the western CSM water pipeline will be revegetated and rehabilitated following construction.	Potential impacts resulting from loss of habitat during construction of the pipeline are not permanent and irreversible, and are therefore not considered to be significant.

Species	Significance assessment question				
	a)	b)	c)	d)	e)
Pink Cockatoo (*Cacatua leadbeateri)*	-species not recorded during survey -no important habitat present	-species not recorded during survey	-species not recorded during survey -species would not be restricted to habitat found within the Study Area	Potential impacts from loss of habitat are not long-term. The extent of habitat removal is small and the habitat is of poor quality in relation to habitat available in the local area and region. Cleared areas for the western CSM water pipeline will be revegetated and rehabilitated following construction.	Potential impacts resulting from loss of habitat during construction of the pipeline are not permanent and irreversible, and are therefore not considered to be significant.
Glossy Black-cockatoo (*Calyptorhynchus lathami)*	-species recorded during survey for MLA's (Parsons Brinckerhoff 2008), however were not recorded using tree hollows for breeding -no important habitat present and *Casuarina/ Allocasuarina* feed trees are distributed throughout the Study Area and surrounds	-species recorded in low density (2 foraging individuals) and is not considered a viable population - a highly mobile species that is not at its distributional limit	-species is not restricted to habitat found within the Study Area	Potential impacts from loss of habitat are not long-term. The extent of habitat removal is small and the habitat is of poor quality in relation to habitat available in the local area and region. Cleared areas for the western CSM water pipeline will be revegetated and rehabilitated following construction.	Potential impacts resulting from loss of habitat during construction of the pipeline are not permanent and irreversible, and are therefore not considered to be significant.
(Eastern) Greater Long-eared Bat (*Nyctophilus timoriensis*)	-species not recorded during survey -no important habitat present	-species not recorded during survey -no established breeding population identified within Study Area	-species not recorded during survey -no established breeding population that relies on maternity resources identified within Study Area -species would not be restricted to habitat found within the Study Area	Potential impacts from loss of habitat are not long-term. The extent of habitat removal is small and the habitat is of poor quality in relation to habitat available in the local area and region. Cleared areas for the western CSM water pipeline will be revegetated and rehabilitated following construction.	Potential impacts resulting from loss of habitat during construction of the pipeline are not permanent and irreversible, and are therefore not considered to be significant.

Appendix I references

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

Department of Environment and Climate Change 2008, *Threatened species, populations and ecological communities*, NSW Department of Environment and Conservation, 2008, <http://www.threatenedspecies.environment.nsw.gov.au/index.aspx>.

Department of the Environment and Heritage 2006a, *EPBC Act Policy Statement 1.1 Significant Impact Guidelines*, Department of the Environment and Heritage, Canberra.

——— 2006b, *EPBC Act Policy Statement 1.2 Significant Impact Guidelines - Actions on, or impacting upon, Commonwealth land, and actions by Commonwealth agencies*, Department of the Environment and Heritage, Canberra.

Department of the Environment Water Heritage and the Arts 2003, *Australian Painted Snipe-Nationally threatened species and ecological communties information sheet*, Department of the Environment, Water, Heritage and the Arts, Canberra.

——— 2008a, *Furina dunmalli — Dunmall's Snake - Species Profile and Threats Database*, Department of the Environment Water Heritage and the Arts, viewed 2 September 2008 <http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=59254>.

——— 2008b, *Paradelma orientalis in Species Profile and Threats Database* Department of the Environment Water Heritage and the Arts, <http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=59134>.

Duncan, A, Baker, B & Montgomery, N 1999, *The Action Plan for Australian Bats*, Environment Australia, Canberra.

Environmental Protection Agency 2003, *Biodiversity Planning Assessment: Brigalow Belt version 1.2*, Queensland Government, Brisbane.

——— 2005, *Regional Ecosystem Description Database (REDD) Version 4.2 (updated March 2005).* Database maintained by Queensland Herbarium Environmental Protection Agency, Brisbane.

Environmental Protection Agency and Environmental Planning Southwest Queensland 2002, *Biodiversity Planning Assessment: Brigalow Belt South Flora Expert Panel Report*, Queensland Government,

Environmental Protection Agency and Queensland Parks and Wildlife Service 2007, *Semi-evergreen vine thicket regional ecosystems in the Brigalow Belt bioregion - an overview*, Ecosystems Conservation Branch of the Environmental Protection Agency,

Garnett, ST & Crowley, GM 2000, *The Action Plan for Australian Birds*, Environment Australia, Canberra.

Higgins, PJ & Davies, SJJ 1997, *Handbook of Australia, New Zealand and Antarctic Birds, Vol 3, Snipe to Pigeons*, Oxford University Press, Melbourne.

Higgins, PJ, Peter, JM & Cowling, SJ 2006, *Handbook of Australian, New Zealand and Antarctic Birds, Volume 7, Boatbill to Starlings*, Oxford University Press, Melbourne, Victoria.

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

Parsons Brinckerhoff 2008, *Wandoan Coal Project, MLA area and surrounds. Terrestrial ecology impact assessment*, Parsons Brinckerhoff, Brisbane.

Pizzey, G & Knight, F 1997, *Field Guide to the Birds of Australia*, Angus and Robertson, Sydney.

Queensland Environmental Protection Agency 2008a, *Brigalow Scaly-foot* Environmental Protection Agency, <http://www.epa.qld.gov.au/nature_conservation/wildlife/az_of_animals/brigalow_scalyfoot/>.

——— 2008b, *Dunmall's Snake*, Environmental Protection Agency, <http://www.epa.qld.gov.au/nature_conservation/wildlife/az_of_animals/dunmalls_snake/>.

Royal Australian Ornithologists Union 2003, *The New Atlas of Australian Birds*, Royal Australian Ornithologists Union, Hawthorn East, Victoria.

Royal Botanic Gardens 2008, *PlantNet - The Plant Information Network System of Botanic Gardens Trust (version 2.0)*, Royal Botanic Gardens, <http://plantnet.rbgsyd.nsw.gov.au/>.

Van Dyck, S & Strahan, R 2008, *Eastern Long-eared Bat in Mammals of Australia, Third Edition*, Reed New Holland, Sydney.

Wilson, S 2003, *Reptiles of the Southern Brigalow Belt*, WWF, Australia.

——— 2005, *A Field Guide to Reptiles of Queensland*, New Holland Publishers, Sydney.

Attachment J

Matters of National Environmental Significance – Summary

Contents

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J1. Introduction

Matters of National Environmental Significance (MNES) are protected under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). Details of MNES and the potential impact of the proposed pipeline are covered in detail in Volume 2 Chapter 17(a) and the Technical Report (in particular sections 5.1 and Appendix I).

However for ease of reference, this attachment summarises the information relevant to MNES, exclusively addresses the matters of NES in the proposed pipeline study area and the relevant controlling provisions, describes how the proposed pipeline is likely to impact on those matters of NES and proposes relevant mitigation measures to manage those impacts.

In June 2008, the WJV referred the Project to the Australian Government Minister for the Environment, Water, Heritage and the Arts under the EPBC Act as four inter-related EPBC Referrals addressing:

- the mine and infrastructure (EPBC 2008/4284)
- CSM (South) water supply pipeline (EPBC 2008/4287)
- CSM (West) water supply pipeline (EPBC 2008/4283)
- Glebe Weir raising and pipeline. (EPBC 2008/4285).

On 21 July 2008, the Minister determined that all four referrals were controlled actions.

This attachment covers the potential impact of the CSM (West) water supply pipeline on relevant matters of NES (EPBC 2008/4283). The controlling provisions relevant to the mine and infrastructure, CSM (South) Option and Glebe Option are covered in Volumes 1, 2 and 4 of the EIS respectively.

J1.1 Relevant controlling provisions

The controlling provisions of the EPBC Act that were determined to be relevant to the proposed pipeline are:

- Sections 18 and 18A (listed threatened species and ecological communities).

In particular, the decision letter indicated that the project was likely to have a significant impact involves the potential clearing and habitat fragmentation of endangered ecological communities including Brigalow (*Acacia harpophylla* dominant and co-dominant) and Semi-evergreen vine thickets of the Brigalow Belt (North and South) and Nandewar Bioregions.

Section 18 of the EPBC Act prohibits actions that have or will have, or are likely to have a significant impact on listed threatened species, critically endangered species, endangered species, vulnerable species, critically endangered communities or endangered communities unless an approval for the taking of the action is in operation under Part 9 of the EPBC Act. Section 18A provides that it is an offence to take an action that results, or will result, in a significant impact on a listed threatened species or ecological community.

J2. Matters of national environmental significance

This section addresses the MNES considered in the assessment and the likelihood of their occurrence in the study area. While all MNES are covered, a particular focus is threatened species and communities (the controlling provisions).

The EPBC Act identifies seven MNES:

- World Heritage properties
- National heritage places
- wetlands of international importance (Ramsar wetlands)
- threatened species and ecological communities
- migratory species
- Commonwealth marine areas
- nuclear actions (including uranium mining).

Matters of National Environmental Significance relating to biodiversity are discussed below in relation to the proposed pipeline based on the results of the EPBC Protected Matters Search Tool (Department of the Environment Water Heritage and the Arts 2008), desktop review of databases and literature and the results of field surveys.

Details of the methods used to collect data are presented in Chapter 3 of this Technical Report, while the detailed description of the ecological environment is presented in Chapter 4. Reference to specific figures and chapters are made throughout this attachment.

J2.1 Threatened ecological communities

Three Threatened ecological communities listed under the EPBC Act are known or predicted to occur in the Study Area:

- Brigalow (*Acacia harpophylla* dominant and co-dominant)
- semi-evergreen vine thickets of the Brigalow Belt (North and South) and Nandewar Bioregions
- the community of native species dependent on natural discharge of groundwater from the Great Artesian Basin.

J2.1.1 Brigalow (*Acacia harpophylla* dominant and co-dominant)

Brigalow (*Acacia harpophylla* dominant and co-dominant) corresponded with remnant RE 11.9.5 in the Study Area. The listing of Brigalow (*Acacia harpophylla* dominant and co-dominant) under the EPBC Act does not automatically dismiss non-remnant vegetation, rather species composition and structural elements typical of that found in undisturbed areas of the listed Brigalow are determining factors. However, regrowth areas that has not regained the structure and species composition typical of remnant Brigalow (generally regrowth under 15 years), will not qualify as the listed Brigalow ecological community (Anon 2003). Significant areas of non-remnant vegetation identified in the road reserve along the

Roma Taroom Road are mature and correspond with this ecological community (refer Section 4.4, Figure 5.1 and Attachment E of the Technical Report). However no area of Brigalow consistent with the endangered ecological community will be affected.

RE 11.9.5 *Acacia harpophylla* and/or *Casuarina cristata* open forest on fine-grained sedimentary rocks

RE 11.9.5 *Acacia harpophylla* and/or *Casuarina cristata* open forest on fine-grained sedimentary rocks (Land Zone 9) occurred extensively as non-remnant vegetation within the Study Area (refer Figure 4-2 of the Technical Report). No remnant patches of this RE were recorded within the Study Area.

Extensive areas of non-remnant RE 11.9.5 however, were defined during the field verification across much of the Study Area, including a long linear tract of road reserve along Roma-Taroom Road that may satisfy the criteria for remnant status within several years. This regrowth patch was in good ecological condition.

The distribution of this RE within private landholdings was represented by fragmented patches of regrowth consisting of retained woodlots and/or cattle camps or stunted shrubby regrowth in ploughed paddocks.

Canopy: *Acacia harpophylla* and *Casuarina cristata* dominated the canopy, with associated *Brachychiton rupestris* and *Eucalyptus populnea* occurring infrequently and generally restricted to the periphery of the community. The highly variable median height ranged from 4 to 12 m.

Mid-stratum: Due to the broad canopy height range of this RE, the mid- stratum was found to be dominated either by juvenile canopy species or comprise of *Alectryon diversifolius* and *Geijera parviflora*, with associated *Apophyllum anomalum* (Warrior Bush), *Psydrax oleifolius, Santalum lanceolatum, Capparis mitchellii*, *Lysiphyllum carronii* and/or *Elaeodendron australe* var*. integrifolium.* The low shrub layer, where present, was generally dominated by *G. parviflora, Capparis lasiantha* (Nipan)*, Jasminum didymium* ssp*. racemosum* (no common name) and/or *Carissa ovata.*

Ground layer: The sparse ground layer was limited by the presence of a mid-dense to dense leaf litter. It was dominated by *Chloris divaricata, Enteropogon acicularis* and **Cenchrus ciliaris,* with associated *Einadia* spp*., Paspalidium caespitosum* (Brigalow Shot Grass), *Rhagodia gaudichaudiana*, *Tetragonia tetragonoides, Salsola kali* and **Emex australis* (Spiny Emex) occurring either occasionally or commonly.

Condition: This community consisted primarily of regrowth *A. harpophylla*, with evidence of thinning and use by cattle on private landholdings and in some cases within the road reserve. Small patches showed evidence of degradation from edge effects and *Amyema* spp*.* (mistletoes) were occasionally prevalent within the upper strata. Mature **Opuntia tomentosa* (Velvety Tree Pear, a class 2 pest under the *Land Protection (Pest and Stock Route Management) Act 2002*) was encountered commonly within this vegetation type.

Remnant status: Only four field-mapped polygons of RE 11.9.5 potentially possessed the height, cover and population size characteristics which were favourable for consideration of remnant status. The remainder of field-mapped RE 11.9.5 polygons consisted of regrowth vegetation or fragmented/thinned populations in which the mid-stratum facilitates the ecological dominant layer. The areas that have been mapped by the EPA as mixed polygon

remnant vegetation were found to generally align with RE 11.3.2 or 11.9.10 or at least as a co-dominant component.

J2.1.2 Semi-evergreen vine thickets of the Brigalow Belt (North and South) and Nandewar Bioregions

Semi-evergreen vine thickets of the Brigalow Belt (North and South) and Nandewar Bioregions is considered likely to occur in the Study Area (Department of the Environment Water Heritage and the Arts 2008), however no remnant vegetation consistent with the ecological community is mapped within the Study Area (Environmental Protection Agency 2005). Non-remnant vegetation mapped within the Study Area that was analogous with RE 11.9.4 however is consistent with the ecological community (refer Figure 5-2 of the Technical Report). These patches were however small, fragmented and highly modified in structure and composition.

RE 11.9.4 Semi-evergreen vine thicket on fine-grained sedimentary rocks

RE 11.9.4 is mapped as occurring regionally in the area to the north of the Origin Energy gas-field operation at Spring Gully, within the western extent of the Study Area (Environmental Protection Agency 2005). The pipeline corridor traversed a small heterogeneous polygon in which RE 11.9.4b occurred as the sub-dominant component along the Roma Taroom Road. Detailed survey revealed that this polygon was analogous with RE 11.3.25.

Vegetation representative of semi-evergreen vine thicket (SEVT) on fine grained sedimentary rocks (Land Zone 9) was however identified as a small, augmented patch within the broader distribution of Brigalow woodland to open forest in the central to eastern extent of the Study Area along Roma-Taroom Road (refer Figure 4-2 of the Technical Report). The western patch was less than 0.5 hectares in area, but was dominated by a moderately diverse composition of characteristic SEVT species. The eastern patch was less discernible with SEVT species being reduced to common generalists and the canopy being dominated by a sparse cover of *Eucalyptus orgadophila* (Mountain Coolibah). The proceeding composition describes the central occurrence.

Canopy: The very sparse emergent layer was dominated isolated *Eucalyptus orgadophila* and associated *Casuarina cristata* (Belah) to 15 m. The sparse canopy/low tree layer was dominated by *Geijera parviflora, Acacia harpophylla* and *Brachychiton rupestris,* with *Casuarina cristata* occurring infrequently. The canopy layer possessed a median height of 8 m and was the ecologically dominant layer.

Mid-stratum: The mid-dense to sparse mid-stratum was comprised primarily of mid-mature SEVT, which included *Geijera parviflora*, *Planchonella cotinifolia* var*. arborescens* (Yellow Lemon), *Ehretia membranifolia* (Peach Bush), *Alectryon oleifolius* ssp*. elongatus, Notelaea microcarpa* var*. microcarpa* (Narrow-leaved Mock-olive), *Pandorea pandorana* (Wonga Vine) and infrequent *Ventilago viminalis* (Vine Tree). This tall shrub layer possessed a median height of 5 m. The low shrub layer was dominated by *Planchonella cotinifolia* var*. arborescens, Croton phebalioides* (White Croton), juvenile tall shrub layer species and *Psydrax spp.* (Canthium). This stratum reached a median height of 2 m.

Ground layer: The groundcover layer possesses a mid-dense to dense cover dominated by *Oxalis spp.* with *Tetragonia tetragonoides*, *Rhagodia* spp*., Enchylaena tomentosa, Clematocissus opaca* (Forest Grape), *Olearia canescens* (no common name), *Zygophyllum*

apiculatum and *Brunoniella australis* (Blue Trumpet) occurring occasionally. **Cenchrus ciliaris* dominated the road edge.

Condition: RE 11.9.4 in the Study Area was isolated, modified through edge effects and potentially fire and grazing pressures, and generally represented non-remnant regrowth. Weed incursion was limited generally to the dense cover of **Cenchrus ciliaris*, which in itself indicated the level of canopy fragmentation.

Remnant status: No remnant polygons of RE 11.9.4 have been mapped or identified in the Study Area. The non-remnant patches may be analogous with either non-remnant RE 11.9.5 or RE 11.9.4. The species composition however was representative of a vine thicket cohort, but the extent of the historically remnant patches may have been small, with distinct populations or patches in a broader community dominated by Brigalow. These patches were however too small to be considered mappable entities. RE 11.9.4 defined during the field verification was entirely non-remnant vegetation.

J2.1.3 The community of native species dependent on natural discharge of groundwater from the Great Artesian Basin

The community of native species dependent on natural discharge of groundwater from the Great Artesian Basin (GAB) occurs around natural surface discharge points of aquifers in the Triassic, Jurassic and Cretaceous sedimentary sequence of the GAB. No such springs were identified in the Study Area and as such the community is unlikely to occur.

J2.2 Threatened species

Details of all species recorded in the study area are presented in Chapter 4 of the Technical Report. Species lists and habitat information are presented in Attachments B-H.

Five Threatened species of plant and eleven Threatened species of animal listed under the EPBC Act have the potential to occur within the Study Area and surrounds based on the Protected Matters Search Tool (Department of the Environment Water Heritage and the Arts 2008) (see Table J-1, Attachments G and H).

Of these species, two species of plant and five species of animal have a moderate or greater chance of occurring (refer Table J-1). One threatened species, the Brigalow Scaly-foot, was recorded.

Table J-1: EPBC Act listed Threatened species predicted to occur in the Study Area

Name	Conservation status[1]	Likelihood of occurrence
Plants		
Eriocaulon carsonii	E	Low
Cadellia pentastylis	V	Low
Diuris tricolor (syn *Diuris sheaffiana*)	V	Moderate
Commersonia sp. Cadarga (G.P.Guymer 1642)	V	Low
*Homopholis belsonii**	V	High
Mammals		
Large-eared Pied Bat (*Chalinolobus dwyeri*)	V	Low
(Eastern) Greater Long-eared Bat (*Nyctophilus timoriensis*)	V	Moderate
Birds		
Australian Painted Snipe (*Rostratula australis*)	V	Moderate
Black-breasted Button-quail (*Turnix melanogaster*)	V	Low
Squatter Pigeon (southern race) (*Geophaps scripta scripta*)	V	Moderate
Red Goshawk (*Erythotriorchis radiatus*)	V	Low
Star Finch (*Neochmia ruficauda ruficauda*)	E	Low
Reptiles		
Fitzroy Tortoise (*Rheodytes leukops*)	V	Low
Brigalow Scaly-foot (*Paradelma orientalis*)	V	Recorded
Yakka Skink (*Egernia rugosa*)	V	Low
Dunmall's Snake (*Furina dunmalli*)	V	Moderate

1. Conservation status. E = Endangered, V = Vulnerable (*EPBC Act*)

Homopholis bensonii was considered likely to occur based on the presence of RE 11.9.5 and non-remnant vegetation analogues with this RE in the Study Area. This species was detected at several locations within the MLA areas within non-remnant vegetation analogues with RE 11.9.5. Reference sites where the species was recorded in the MLA areas were visited prior to the commencement of the winter surveys and approximately 5% of specimens were in the early stages of inflorescence at that time (inflorescences are near essential to distinguish from other species of grass). As such, the survey period was not ideal for detecting this species and targeted surveys in late summer to early autumn would be required to detect the species if present.

The Vulnerable Brigalow Scaly-foot (*Paradelma orientalis*) was the only EPBC Act listed Threatened species of animal detected during the surveys undertaken for this assessment (refer Figure 5-1 of the Technical Report). One adult of this species was captured during active herpetofauna searches at Site 4. It was sheltering under fallen bark in association with

non-remnant vegetation analogous with RE 11.9.5 (*Acacia harpophylla* and/or *Casuarina cristata* open forest on fine-grained sedimentary rocks) along the proposed western CSM water supply pipeline route. Other remnant and non-remnant vegetation analogous with RE 11.9.5 in the Study Area could potentially provide suitable habitat for this species.

J2.2.1 Migratory species

Migratory species listed under the EPBC Act are those protected under international agreements to which Australia is a signatory. These include the *Japan Australia Migratory Bird Agreement* (JAMBA), the *China Australia Migratory Bird Agreement* (CAMBA) and the *Bonn Convention on the Conservation of Migratory Species of Wild Animals*.

Two species of bird, the Great Egret and Cattle Egret recorded within the Study Area are recognised under the Migratory provisions of the *Environment Protection and Biodiversity Conservation Act 1999* (refer Attachment F). These species were recorded within the Study Area in association with wetlands (artificial) and farm dams. No nests consistent with these species were recorded during the survey. These species display nomadic habits with numbers probably fluctuating according to seasonal conditions.

A further 11 Migratory species were predicted to occur in the wider proposed pipeline Study Area and surrounds based on the Department of the Environment, Water, Heritage and the Arts Protected Matters Search Tool (refer Attachment D).

Although two Migratory species of bird were recorded and other Migratory species of bird may potentially utilise resources in the Study Area, the Study Area is not considered 'important habitat' as defined under the *EPBC Act Policy Statement 1.1 Principal Significant Impact Guidelines* (CSIRO 2001), in that the Study Area does not contain:

- habitat used by a Migratory species occasionally or periodically within a region that supports an ecologically significant proportion of the population of the species.
- habitat used by a Migratory species that is at the limit of the species range.
- habitat within an area where the species is declining.

It is therefore unlikely that the proposal would significantly affect Migratory species predicted to occur within the Study Area. As such, significant assessments for these species are considered unnecessary, with the exception of the Satin Flycatcher (*Myiagra cyanoleuca*). The Study Area occurs within the western limit of the distributional range for this species and consequently, habitat for this species within the Study Area would be considered important habitat as defined under the EPBC Act. Though not recorded within the Study Area during surveys, records of the species from the Study Area and surrounds was identified from the desk based assessment (see Attachment C). Subsequently an impact assessment was undertaken for this species and it concluded that the proposed pipeline would not have a significant impact on this species (see Attachment I).

J2.3 World heritage properties

World heritage properties include sites of both cultural and/or environmental heritage that are either:

- an Australian property on the World Heritage List kept under the World Heritage Convention, or

- a property declared to be a World Heritage property by the Commonwealth Environment Minister.

No records of world heritage properties listed under the EPBC Act were identified from the Protected Matters Search Tool in the study area and surrounds.

Consideration has been given to the potential impacts of the proposed pipeline on The Great Barrier Reef, the world's largest World Heritage Area. While the proposed pipeline may affect water quality and/or flow along waterways within and immediately adjacent to the study area, it is unlikely these impacts would extend far enough to have any significant impacts on The Great Barrier Reef, either direct or indirect.

J2.4 Ramsar wetlands

The Study Area is located in the same catchment as two declared Ramsar sites: the Shoalwater/Corio Bay Area and Narran Lake Nature Reserve. Both sites are situated several hundred kilometres downstream of the Study Area.

While the proposed pipeline may affect water quality and/or flow along waterways within and immediately adjacent to the Study Area, it is unlikely these impacts would extend far enough downstream to affect the aforementioned Ramsar sites.

J2.5 National heritage places

There are no national heritage places located near the Mine and Infrastructure Referral Area. The nearest national heritage places include the Gondwana rainforests of eastern Australia, the Great Barrier Reef and the wet tropics of Queensland.

Consideration has been given to the potential impacts of the proposed pipeline on The Great Barrier Reef, the world's largest World Heritage Area. While the proposed pipeline may affect water quality and/or flow along waterways within and immediately adjacent to the study area, it is unlikely these impacts would extend far enough to have any significant impacts on The Great Barrier Reef, either direct or indirect.

J2.6 Commonwealth marine areas

The proposed pipeline is not located near any Commonwealth marine area.

J2.7 Nuclear actions

The proposed pipeline does not include any nuclear actions.

J3. Likely impacts of the proposed pipeline on matters of national environmental significance

The relevant controlled action for the matters of NES under the EPBC Act is the construction and operation of the mine and related infrastructure, as described in Chapters 5 and 6 of this EIS (Volume 2). Details of the impacts of the project are described in Chapter 6 of this Technical Report. Given the nature of the MNES present in the study area, it is considered that the following impacts are likely to occur:

- loss of vegetation and habitats
- further habitat fragmentation
- new edge effects
- direct mortality of individuals
- increased noise and dust
- cumulative impacts.

By far the greatest impact will result from the loss of vegetation and habitat (refer Table J-2). Other impacts mentioned in the decision on referral letter were habitat fragmentation and weeds. These are discussed below.

J3.1 Vegetation and habitat clearing

The proposed pipeline will result in the loss of vegetation and associated habitats. Clearing of native vegetation has been avoided where possible through the pipeline route selection and preliminary design process. The majority of remnant and non-remnant vegetation in the Study Area occurred within the road reserve of Roma Taroom Road. As such, the proposed alignment has been located into adjoining private properties to the north of the road reserves. These properties are largely cleared of remnant vegetation and regrowth and are of low ecological value. In addition, impacts to riparian vegetation will be avoided through the use of directional drilling techniques (as opposed to trenching in other areas) in order to cross drainage lines.

Nonetheless, total avoidance of vegetation clearing is not possible and 9.7 ha of woodland vegetation and associated fauna habitat will be cleared as a result of the proposed pipeline based on clearing of a 20 m wide corridor for construction (refer Table J-2). The extent may be further reduced through the detailed design phase and further examination of the RE mapping.

However, all patches of remnant RE 11.9.5 and non-remnant revegetation consistent with the Brigalow (*Acacia harpophylla* dominant co-dominant) Endangered ecological community have been avoided. However 0.6 hectares of vegetation consistent with Semi-evergreen vine thicket (RE 11.9.4) may be affected (refer Table J-2).

Loss of vegetation has potential to result in a range of direct and indirect impacts to vegetation communities and species of plant and animal including:

- reduction in the extent of vegetation communities and associated habitats
- loss of local populations of individual species
- fragmentation of remnants of vegetation communities or local populations of individual species
- reduction in the viability of ecological communities resulting from loss or disruption of ecological functions
- destruction of flora and fauna habitat and associated loss of biological diversity (habitat removal may include removal of hollow bearing trees, loss of leaf litter layer, and result in changes to soil biota)
- riparian zone degradation
- increased habitat for invasive species.

Table J-2: Extent of vegetation clearing relating to MNES

RE Code	EPBC Status	Remnant	Non-remnant	Total
11.3.2			2.78	2.7
11.3.25		1.3	0.01	1.3
11.9.4	E		0.6	0.6
11.9.5*	E		2.1	2.1
11.9.7			0.5	0.5
11.9.10		1.4	0.2	1.6
11.10.9			0.82	0.8
Total		**2.7**	**7.00**	**9.7**

Notes: E = Endangered. Borderline remnant status has been included in the non-remnant category.

* All RE 11.9.5 (remnant and non-remnant) consistent with the Brigalow (*Acacia harpophylla* dominant and co-dominant) ecological community have been avoided.

J3.2 Habitat fragmentation

Habitat fragmentation is the division of a single area of habitat into two or more smaller areas, with the occurrence of a new habitat type in the area between the fragments (Andren 1994; Ford *et al.* 2001). This new dividing habitat type is often artificial and inhospitable to the species remaining within the fragments. Although the newly created habitat is generally used by some species, those species are usually generalists and are often considered aggressive, further decreasing population levels of the species remaining in the fragments. In addition to the loss of total habitat area, the process of fragmentation can impact on species within the newly created fragments in a number of ways, including barrier effects, genetic isolation and edge effects. The degree to which these potential impacts affect the flora and fauna within the newly created fragments depends on a number of variables, including distance between the fragments, local environmental conditions, the species present and mitigation measures. Some of the potential impacts are summarised below:

- **Barrier effects:** Barrier effects occur where particular species are either unable or unwilling to move between suitable areas of fragmented habitat. This could result in either a complete halt to movement or reduced level of movement between fragments.

- **Genetic Isolation:** Genetic isolation occurs where individuals form a population within one fragment are unable to interbreed with individuals from populations in adjoining fragments. Genetic isolation can lead to inbreeding and genetic drift problems for populations isolated within a fragment.
- **Edge effects:** Edge effects are where a zone of changed environmental conditions (i.e. altered light levels, wind speed and/or temperatures) occurs along the edges of habitat fragments.

Cleared areas present a barrier to the movement of some species that occur in woodland habitats (Bennett & Radford 2004; Radford & Bennett 2007). Much of the Study Area however is already highly cleared as a result of past land uses and the remaining vegetation and associated habitats are fragmented. Many of the species that occur in these habitats are generally species that are tolerant to habitat fragmentation and are unlikely to be further disturbed by further habitat fragmentation resulting from the proposed pipeline (i.e. introduced House mouse).

Significant species that would be sensitive to further fragmentation were also recorded in the Study Area, such as the Brigalow scaly-foot (*Paradelma orientalis*). As such, the alignment has been modified to avoid impacts to areas of known of potential habitat for this species. For these species, the effect of fragmentation is likely to be temporary during construction only. Following construction the footprint will be rehabilitated and is unlikely to form a permanent barrier to woodland dependant species.

J3.3 The significance of the impacts

Impacts on threatened species and communities listed under the EPBC Act are required to be assessed following the *Significant Impact Guidelines*. Detailed significance assessments for these communities and species are included in Attachment I of this Technical Report.

It is acknowledge that field surveys were undertaken at a sub-optimal time of year (late winter) for detection of many species of plant and animal and that some sections of the Study Area were not accessed during this survey period. As such, seasonal surveys are proposed to increase the likelihood of detecting Threatened species if they are present in the Study Area, and define the size of the local population and extent of their habitat in the Study Area. The conclusions of the impact assessments should therefore be reviewed and revised if necessary following the seasonal surveys.

A summary of significance assessments undertaken for threatened biodiversity is provided below in Table J-3. The impact assessments conclude that the proposed pipeline is not likely to have a significant impact on threatened species or communities, nor would it interfere with their recovery, assuming suitable mitigation measures are put in place.

Table J-3: Summary of threatened biodiversity for which significance assessments were undertaken and their likelihood of being significantly affected by the proposed pipeline

Name	EPBC Act Status	Likely to be significantly affected	Primary reason for the outcome
Ecological communities			
Semi-evergreen Vine Thicket	E	No	Small extent (0.6 ha) of non-remnant, highly modified and poor condition EEC to be removed
Plants			
Homopholis belsonii	V	No	Low density of occurrence within Study Area and availability of habitat in the local area
Reptiles			
Brigalow Scaly-foot (*Paradelma orientalis*)	V	No	Low density of animals recorded (1) and similar suitable habitat available in the surrounding landscape
Dunmall's Snake (*Furina dunmalli*)	V	No	Not recorded within Study Area and no important habitat present
Birds			
Squatter Pigeon (southern race) (*Geophaps scripta scripta*)	V	No	Not recorded within Study Area and no important habitat present
Satin Flycatcher (*Myiagra cyanoleuca*)	M	No	Not recorded within Study Area and no important habitat present
Australian Painted Snipe (*Rostratula australis*)	V&M	No	Not recorded within Study Area and no important habitat present
Pink Cockatoo (*Cacatua leadbeateri*)	—	No	Not recorded within Study Area and no important habitat present
Glossy Black-cockatoo (*Calyptorhynchus lathami*)	—	No	Low density of animals recorded (2), similar suitable habitat available in the surrounding landscape, and no evidence of breeding detected within Study Area
Mammals			
Eastern Long-eared Bat (*Nyctophilus timoriensis*)	V	No	Not recorded within Study Area and no important habitat present

J4. Mitigation relating to matters of national environmental significance

Mitigation measures relating to biodiversity, and hence the controlling provisions, are presented in Chapter 7 of the Technical Report, and summarised below.

J4.1 Avoiding environmental impacts on MNES

Avoiding environmental impacts has been considered where possible throughout the route selection, planning and design phases. There will also be ongoing opportunities to further avoid impacts at a local scale through the detailed design process.

The winter survey of the study area identified significant areas of non-remnant vegetation that was moderate to good condition and consistent with the Brigalow (*Acacia harpophylla* dominant codominant) endangered ecological community listed under the EPBC Act within the road corridor along the Roma Taroom Road. Brigalow regrowth in the Goldens Bimbadeen Road reserve was also identified, although not consistent with the ecological community as listed under the EPBC Act. Brigalow Scaly Foot, a Threatened species, was also identified in the non-remnant vegetation within the Roma Taroom Road reserve. As such, the proposed alignment of the western CSM water supply pipeline was to the north of the road reserves in adjoining private properties which are already cleared.

J4.2 Management of the mitigation process for MNES

The mitigation measures associated with the proposed pipeline are discussed below in general terms. As part of the detailed design, and prior to the start of construction, more detailed mitigation measures should be developed and presented in a biodiversity management plan relating to the construction and operation of the pipeline. The plan should include:

- detailed design of mitigation measures such as temporary fencing during construction (as required)
- general impact mitigation
- staff/contractor inductions and continuing education of staff
- pre-clearing surveys and fauna salvage/translocation
- rehabilitation and restitution of adjoining habitat
- weed control
- pest management
- rehabilitation protocols
- monitoring.

The plan should include clear objectives and actions for the pipeline including:

- minimise human interferences to flora and fauna

- minimisation of vegetation clearing/disturbance
- minimise impact to Threatened species and communities
- minimise impacts to aquatic habitats and species
- ongoing monitoring of impacts on flora and fauna.

The flora and fauna management plan should be prepared prior to construction and detail the mitigation measures and required actions. This flora and fauna management plan developed for the pipeline will be an important document for the fauna/spotter catcher and aid in enacting the 'avoid and mitigate' principles during the construction phase. The flora and fauna management plan would include detailed information such as feral animal and pest control, monitoring activities and further measures developed during detailed design measures Table J-4.

Table J-4: Summary of mitigation measures

Mitigation measure	Design	Construction	Operation
▪ Further survey is required to increase the likelihood of detecting Rare and Threatened species in the Study Area and surrounds.	Y		
▪ Refine alignment of pipeline in light of biological knowledge and design constraints in accordance with this report.	Y		
▪ Utilise trenchless technology to cross drainage lines. Directional drilling launch and receiving pad areas should be carefully planned in order to avoid removal of mature trees. If this is not possible, the number of trees to be affected should be minimised. It is envisaged, however, that any directional drilling should take place from within the cleared easement.	Y	Y	
▪ Prepare and implement a biodiversity management plan.	Y	Y	Y
▪ Provide for designated areas in cleared and degraded land for stockpiles and equipment lay-down to minimise the overall impact of construction and avoid unnecessary vegetation and habitat removal.	Y	Y	
▪ Conduct staff/contractor inductions on site by the ecologist/fauna spotter catcher or environmental advisor.		Y	
▪ Implement dust suppression during construction.		Y	
▪ Implement appropriate erosion and sediment control strategies.		Y	
▪ Utilise preferred seed mixes for revegetation works, ideally to be collected from the Study Area and surrounds.		Y	
▪ Develop procedure for specific targeted species searches for those Threatened species and Priority taxa considered to have potential to occur prior to any staged development. If located, consideration should be given to translocation of individuals according to guidelines from the Australian Network for Plant Conservation (Vallee *et al.* 2004) or fauna guidelines such as those in the Nature Conservation (Koala Conservation) Plan 2006 (Environmental Protection Agency & Queensland Parks and Wildlife Service 2005).		Y	Y
▪ Prepare weed and feral animal management plans, including vehicle washdown procedures to limit edge effects such as the establishment of aggressive weeds, and the spread of annual and perennial exotic herbs.		Y	Y
▪ Pre-clear the disturbance areas prior to construction activities commencing in co-ordination with a trained ecologist or other qualified environmental		Y	

Mitigation measure	Design	Construction	Operation
specialist in order to: ‣ mark the limits of clearing in sensitive areas (e.g. Endangered and Of concern REs) to avoid unnecessary vegetation and habitat removal ‣ place transportable habitat features such as large logs and boulders in adjacent retained areas to allow their continuation as potential fauna refuge sites ‣ implement pre-clearing surveys for fauna. Pre-clearing involves removal of the understorey and smaller non-hollow bearing trees in order to disturb fauna and encourage them away from the clearing area.			
▪ Except for trenching, vegetation clearing should involve only the removal of above-ground plant parts, with root systems and the soil profile left undisturbed.		Y	
▪ Areas not necessary for the operation of the pipeline should be rehabilitated in a progressive manner as construction proceeds. Revegetate areas to improve habitat value and visual amenity, including: ‣ planting of a range of locally occurring native shrubs, trees and groundcover plants, in keeping with the former vegetation types present. Choice of species would be in consultation with the Environmental Protection Agency (EPA) and should include Allocasuarina, Eucalyptus, Angophora and Corymbia species to compensate for any impacts to habitat of the Koala and other hollow dependant species ‣ increasing the overall vegetation cover within the proposed pipeline alignment area ‣ incorporating existing natural vegetation where possible ‣ linking vegetation remnants ‣ focusing on riparian vegetation to protect waterways ‣ excluding stock from rehabilitated areas.		Y	Y
▪ Soil that may contain seeds of exotic species should be stockpiled away from drainage lines, and vegetated areas and weed-free soil stockpiles. Weed infested stockpiles would be covered to eliminate the spread of the soil and seed during rainfall and high wind events.		Y	
▪ No materials, spoil or machinery should be stored or parked within the drip-line of any trees.		Y	
▪ The amount of open trenching should be generally limited to 100 m per crew at any one time.	Y	Y	
▪ Trenches should be backfilled so as to cover as much open trench as practicable by the end of each day's work. If this is not possible, the ends of the open trenches would be graded to allow escape for any animals that may venture into the trench.		Y	
▪ Implement a flora and fauna monitoring program (as part of the greater Wandoan Coal Project flora and fauna monitoring program) aiming to better understand and manage impacts and rehabilitation actions to flora and fauna throughout the Study Area. Monitoring would also include exotic weeds and feral animals. The detailed monitoring plans would be incorporated into the		Y	Y

Mitigation measure	Design	Construction	Operation
biodiversity management plan for the Wandoan Coal Project.			

J4.2.1 Further survey

Surveys of the proposed western CSM water supply pipeline were completed in later Winter 2008. Weather conditions during this survey period were generally cool and sub-optimal for detecting herpetofauna (reptiles and frogs). The cool dry weather and general season (late winter) is also a time of reduced vegetative growth and reproductive activity for many species of plant, particularly grasses and other herbaceous ground cover species. Further seasonal surveys should be undertaken in order to better detect threatened and rare species and inform detailed design.

J4.3 Residual impacts and offsets for MNES

Residual impacts are those that remain after implementation of the proposed pipeline and all associated mitigation and other environmental management measures have been undertaken. Residual impacts for the proposed pipeline include the removal vegetation and associated habitat. Where there is residual loss or degradation of vegetation and habitat after mine plan and infrastructure detailed design, and determination of mitigation measures, compensation in the form of compensatory habitat, land rehabilitation and/or contribution to research can be employed (i.e. offsets).

J4.3.1 Offsets

A Green Offsets Package for the proposed pipeline will be developed in consultation with EPA and DEWHA giving consideration to relevant state and Commonwealth policies relating to offsets, as outlined below.

Environmental offsets for impact on MNES

Environmental offsets for impacts on Matters of National Environmental Significance may be used to maintain or enhance the health, diversity and productivity of the environment as it relates to Matters of National Environmental Significance. Environmental offsets are not applicable to all approvals under the EPBC Act and their requirement is assessed on a case-by-case basis. Matters of National Environmental Significance recorded in the study area for which offsets may be required for the Wandoan Coal Project may include:

- Brigalow (*Acacia harpophylla* dominant and co-dominant)
- semi-evergreen vine thickets of the Brigalow Belt (North and South) and Nandewar Bioregions
- *Homopholis belsonii* habitat
- Brigalow Scaly-foot (*Paradelma orientalis*) habitat.

The Australian Government has identified eight principles for the use of environmental offsets under the EPBC Act. These eight principles will be used to assess any proposed environmental offsets to ensure consistency, transparency and equity under the EPBC Act. The Australian Government's position is that:

1. Environmental offsets should target the matter protected by the EPBC Act that is being impacted.
2. A flexible approach should be taken to the design and use of environmental offsets to achieve long-term and certain conservation outcomes which are cost effective for proponents.
3. Environmental offsets should deliver a real conservation outcome.
4. Environmental offsets should be developed as a package of actions — which may include both direct and indirect offsets.
5. Environmental offsets should, as a minimum, be commensurate with the magnitude of the impacts of the development and ideally deliver outcomes that are 'like for like'.
6. Environmental offsets should be located within the same general area as the development activity.
7. Environmental offsets should be delivered in a timely manner and be long lasting.
8. Environmental offsets should be enforceable, monitored and audited (Department of the Environment and Water Resources 2007).

The DEWHA define offsets as *'actions taken outside a development site that compensate for the impacts of that development — including direct, indirect or consequential impacts'* (Department of the Environment and Water Resources 2007). Actions that constitute a suitable offset will differ between projects and there is no prescriptive formula for what constitutes an adequate offset. As such, if required the DEWHA will be negotiated with through the development of the Green Offsets Package to ensure all relevant requirements are met.

Queensland Government Environmental Offsets Policy

The Queensland Government Environmental Offsets Policy aims to provide a supporting framework for environmental offsets in Queensland including principles and guidelines for using environmental offsets and guidance on when offsets should be uses. The Queensland Government Environmental Offsets Policy applies to decisions on development approvals under a range of approval processes including the IP Act, SDPWO Act and the EP Act.

The Queensland Government Environmental Offsets Policy outlines seven principles for seven policy principles that direct the way offsets must be used to contribute to environmental sustainable development (ESD) as follows:

1. Offsets will not replace or undermine existing environmental standards or regulatory requirements, or be used to allow development in areas otherwise prohibited through legislation or policy.
2. Environmental impacts must first be avoided, then minimised, before considering the use of offsets for any remaining impact.

3. Offsets must achieve an equivalent or better environmental outcome.
4. Offsets must provide environmental values as similar as possible to those being lost.
5. Offset provision should minimise the time-lag between the impact and delivery of the offset.
6. Offsets must provide additional protection to environmental values at risk, or additional management actions to improve environmental values.
7. offsets must be legally secured for the duration of the offset requirement.

The Green Offsets Package developed for the proposed pipeline will follow these principles and the guidelines of the Queensland Government Environmental Offsets Policy.

State policy for vegetation management offsetting

The requirements for offsets under state legislation fall under the subordinate policies of the VM Act and NC Act, specifically the:

- Regional Vegetation Management Code (Department of Natural Resources and Water 2006)
- Policy for Vegetation Management Offsets (Department of Natural Resources and Water 2007)
- Policy 2 of the Nature Conservation (Koala) Conservation Plan 2006 and Management Program 2006-2016 (The Koala Plan) (Environmental Protection Agency & Queensland Parks and Wildlife Service 2005).

The offsets strategy will be determined following detailed design of the proposed pipeline and based on the residual impacts once all reasonable alternatives to avoid impacts have been exhausted. This is also necessary in order to determine the minimum requirements for offsetting following the ‘maintain existing extent’ test for REs, essential habitat and conservation status thresholds under the Regional Vegetation Management Code for the Brigalow Belt and New England Tablelands Bioregions (Department of Natural Resources and Water 2006).

J5. Conclusion

The proposed western CSM water supply pipeline to supply water to the Wandoan Coal Project is located in a landscape that has been largely cleared of vegetation as a result of grazing and dryland agriculture. The remaining vegetation generally occurs in continuous linear patches along the main drainage lines traversing the Study Area and regrowth vegetation with the road corridor of the Roma Taroom Road and Goldens Bimbadeen Road.

Despite being a largely cleared landscape, much of the non-remnant vegetation in the road corridors was identified to include Brigalow (*Acacia harpophylla* dominant and co-dominant) and Semi-evergreen vine thickets. These are Endangered ecological communities listed under the EPBC Act, which provide habitat for Rare and Threatened species including recorded in the Study Area the Brigalow Scaly-foot (*Paradelma orientalis*), and Eastern Long-eared bat (*Nyctophilus timoriensis*).

The impacts to remnant and non-remnant vegetation and the associated fauna habitats have been largely avoided by locating the proposed pipeline route within private properties rather than within the road reserve. The route design has avoided all patches of Brigalow (*Acacia harpophylla* dominant and co-dominant) and the majority of Semi-evergreen vine thickets endangered ecological communities. The route will also significantly reduce the impact to Threatened species and their habitat recorded or considered likely to occur in the Study Area.

Assessment of the significance of impacts associated with the proposed pipeline was done for: Threatened species that were recorded in the study area or considered likely to occur (moderate or high likelihood of occurrence); Migratory species (for which the Study Area is at their distributional range limit); Endangered ecological communities.

The impact assessments concluded that the proposed pipeline is unlikely to result in a significant impact to any Threatened species of plant or animal, or ecological communities. Nonetheless, the impacts of the proposed pipeline are acknowledged and will be reduced where possible during detailed design. Detailed mitigation measures will be developed and presented in a biodiversity management plan relating to the construction and operation of the pipeline. Furthermore, the residual impacts of the proposed pipeline will be accounted for in the Green Offsets Package developed for the proposed pipeline.

Appendix J references

Andren, H 1994, 'Effects of habitat fragmentation on birds and mammals in landscapes with different proportions of suitable habitat: a review', *Oikos*, vol. 71, pp. 355-66.

Anon 2003, *Brigalow regrowth and the EPBC Act*, <http://www.environment.gov.au/biodiversity/threatened/publications/pubs/brigalow-regrowth.pdf>.

Bennett, AF & Radford, JQ 2004, 'Landscape-level requirements for conservation of woodland birds: are there critical thresholds in habitat cover?' in R Smithers (ed.), *Landscape Ecology of Trees and Forests*, proceedings of the Woodland Trust and the International Association of Landscape Ecology, Gloucester UK.

CSIRO 2001, *Climate change projections for Australia*, CSIRO and Australian Greenhouse Office, Canberra.

Department of Natural Resources and Water 2006, *Regional Vegetation Management Code for Brigalow Belt and New England Tablelands Bioregions*, The State of Queensland (Department of Natural Resources and Water), Brisbane.

——— 2007, *Policy for Vegetation Management Offsets*, The State of Queensland (Department of Natural Resources and Water), Brisbane.

Department of the Environment and Water Resources 2007, *Draft Policy Statement: Use of environmental offsets under the Environment Protection and Biodiversity Conservation Act 1999*, Department of the Environment and Water Resources, Canberra.

Department of the Environment Water Heritage and the Arts 2008, *Protected Matters Search Tool*, Department of the Environment, Water, Heritage and the Arts, <http://www.deh.gov.au/erin/ert/epbc/index.html >.

Environmental Protection Agency 2005, *Regional Ecosystem Description Database (REDD) Version 4.2 (updated March 2005).* Database maintained by Queensland Herbarium Environmental Protection Agency, Brisbane.

Environmental Protection Agency & Queensland Parks and Wildlife Service 2005, *Nature Conservation (Koala) Conservation Plan 2006 and Management Program 2006-2016 (The Koala Plan)*, Queensland Government - Environmental Protection Agency, Brisbane.

Ford, HA, Barrett, GW, Saunders, DA & Recher, HF 2001, 'Why have birds in the woodlands of Southern Australia declined?' *Biological Conservation*, vol. 97, pp. 71-88.

Radford, JQ & Bennett, A 2007, 'The relative importance of landscape properties for woodland birds in agricultural envionments', *Journal of Applied Ecology*, vol. 44, no. 737-747.

Vallee, L, Hogbin, T, Monks, L, Makinson, B, Matthes, M & Rossetto, M 2004, *Guidelines for translocation of threatened plants in Australia*, Australian Network for Plant Conservation, Canberra.