

Arrow Energy Ltd
20 January 2011

Arrow Bowen Pipeline

Desktop Review of Ecological Values



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Prepared for

Arrow Energy Ltd

Prepared by

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Executive Summary

Arrow Bowen Pipeline Pty Ltd (Arrow) is proposing to construct the Arrow Bowen Pipeline (ABP), a 600 km long gas transmission pipeline from coal seam gas fields in the Bowen Basin (near Moranbah) to Gladstone. Arrow commissioned AECOM Australia Pty Ltd (AECOM) to undertake a desktop assessment of ecological values that will inform an Initial Advice Statement and assist Arrow to plan further investigations to be undertaken for an Environmental Impact Statement. The desktop investigation collated available spatial and non spatial ecological data for the ABP and a 5 km buffer and used this information to assess the significance of potential impacts of the proposed pipeline at Australian, Queensland and regional levels. The assessment focused on impacts to Matters of National Environmental Significance (MoNES), which are protected under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and Environmentally Sensitive Areas (ESAs), which are protected under the Queensland *Environmental Protection Act 1994* (EP Act).

The ABP route runs through the Brigalow Belt Bioregion, which contains lowlands, ranges and plateaus characterised by a diverse range of ecosystems including brigalow forest, eucalypt forest and woodland, grassland, dry rainforest, cypress pine woodland and riparian communities. Queensland Herbarium mapping identifies 41 regional ecosystems (REs) within the right of way (ROW) and 79 REs within the 5 km buffer.

The Queensland Herbarium has specimens of 963 vascular plant species within the buffer area, including 795 native species and 168 introduced species. The Queensland Herbarium collection contains 6 pteridophytes (ferns), 6 gymnosperms (cycads and conifers) and 951 species of angiosperms (flowering plants).

The ABP transects or lies adjacent to a variety of fauna habitats including wetlands, woodlands, vine thickets and grasslands. The Queensland Museum and Department of Environment and Resource Management (DERM) Wildnet searches indicate that 25 amphibian, 352 birds, 28 bony fish, 74 mammals and 91 reptile species have been recorded within the buffer area.

The pipeline route has been selected to minimise clearing of remnant vegetation and other areas of ecological value. Only 474 ha (about 20%) of the ROW contains remnant vegetation, with the remaining 80% mapped as non-remnant. The majority of mapped REs within the ROW are Eucalypt woodlands on Cainozoic sand plains and Cainozoic igneous rocks, which are common and widespread throughout the region.

Matters of National Environmental Significance

Desktop ecological investigations have identified the following MoNES within the ROW and / or 5 km buffer:

- four Endangered ecological communities (EECs);
- 18 flora species and 21 fauna species listed as threatened under the EPBC Act;
- 94 fauna species listed as migratory under the EPBC Act;
- eight weeds of national significance and six invasive feral animals; and
- three nationally important wetlands.

Based on RE mapping, it is likely that pipeline construction will require clearing of up to 25.5 ha of EEC within the ROW, including:

- 11.2 ha of Brigalow (*Acacia harpophylla* dominant and co-dominant);
- 9.6 ha of natural grasslands of the Qld Central Highlands and the northern Fitzroy Basin; and
- 4.6 ha of semi-evergreen vine thickets of the Brigalow Belt.

Another EEC, Weeping Myall woodlands, may also occur within poplar box woodland (RE 11.3.2). While the ROW contains 42.4 ha of RE 11.3.2, Weeping Myall woodlands form only a very small component of this RE. It is therefore unlikely that the ROW contains this EEC.

The ROW may contain suitable habitat for 18 EPBC listed flora species, including five Endangered species and 13 Vulnerable species. Based on an analysis of preferred habitat, the ROW contains:

- likely habitat for one Endangered species (*Cycas megacarpa*) and one Vulnerable species (*Eucalyptus raveretiana*);
- possible habitat for four Endangered species and ten Vulnerable species; and
- unlikely habitat for two Vulnerable species.

The ROW may contain suitable habitat for 21 fauna species listed as threatened under the EPBC Act, including one Critically Endangered species, three Endangered species and 17 Vulnerable species. Based on an analysis of preferred habitat, the ROW contains:

- likely habitat for two Vulnerable species (Squatter Pigeon *Geophaps scripta scripta* and Grey-Headed Flying-fox *Pteropus poliocephalus*);
- possible habitat for two Endangered species and 11 Vulnerable species; and
- unlikely habitat for one Critically Endangered species, one Endangered species and four Vulnerable species.

A total of 94 species listed as migratory under the EPBC Act potentially occur along the ABP. Based on an analysis of preferred habitat, 32 species are considered likely to occur, 51 species are possibly present and 11 species are unlikely to occur within the ROW. No known significant breeding areas for migratory species have been recorded along the proposed pipeline route, so the proposed pipeline is unlikely to have significant impacts on migratory species.

Invasive species recorded within the ABP buffer include eight weeds of national significance and six feral animals.

The ABP does not transect or lie adjacent to any world heritage areas or Ramsar wetlands. The Great Barrier Reef World Heritage Area and Marine Park adjoins the coast of north and central Queensland. Although the ROW does not directly impact the Great Barrier Reef region, it runs through the Calliope, Fitzroy and Burdekin catchments, which flow into the Great Barrier Reef lagoon. The only Ramsar wetland that lies within the same catchment as the ABP is the Shoalwater and Corio Bays area, which is located approximately 60 km north-east of the proposed pipeline route.

The ABP lies within 5 km of three nationally important wetlands (Fitzroy River Delta, Fitzroy River Floodplain, and Lake Elphinstone) and within 10 km of Port Curtis. World heritage areas, Ramsar wetlands and nationally significant wetlands are not transected by the proposed pipeline ROW, so are unlikely to be impacted by construction or operating activities provided that appropriate mitigation measures are implemented.

Environmentally Sensitive Areas

Desktop investigations have identified the following ESAs of ecological significance within the ROW and / or 5 km buffer:

- Endangered REs (Category B);
- Of Concern REs (Category C);
- state forests (Category C);
- nature refuges (Category C);
- referable wetlands (Category C); and
- essential habitat (Category C).

The ABP does not transect any protected area estate, but lies within 5 km of six state forests and four nature refuges. These are unlikely to be impacted by construction or operating activities provided that appropriate mitigation measures are implemented.

The ROW contains two categories of referable wetland. Wetland protection areas (WPAs) are wetlands of high ecological significance within catchments of the Great Barrier Reef (GBR). Wetland management areas (WMAs) are wetlands of general ecological significance within the GBR catchment and wetlands of general to high ecological significance in other parts of Queensland. While the proposed route avoids most wetlands, DERM wetland mapping indicates that it is likely that pipeline construction will require clearing of up to 99.7 ha of referable wetlands (including trigger area buffers).

This includes:

- clearing of up to 1.3 ha of WPAs, comprising two palustrine wetlands, and 17.6 ha of WPA trigger areas (500m buffers around WPA wetlands); and
- clearing of up to 16.8 ha of WMAs, comprising 36 riverine wetlands, four palustrine wetlands and two estuarine wetlands, and 64 ha of WMA trigger areas (100m buffers around WMA wetlands).

The ABP transects 362 watercourses that are mapped by DERM at a scale of 1:100,000. The majority of watercourses crossed by the pipeline are small ephemeral streams, but 20 watercourses are stream order 5 or above. Major crossings include one crossing of the Fitzroy River and five crossings of the Isaac River. Pipeline construction has the potential to directly and indirectly impact on ecological values of watercourses and wetlands.

Based on RE mapping, it is likely that pipeline construction will require clearing of up to 474 ha of remnant vegetation (about 20% of the ROW). This includes:

- clearing of up to 11 Endangered REs with a maximum area of 16.3 ha within the ROW, which represents about 0.7% of the total area within the ROW; and
- clearing of up to 14 Of Concern REs, with a maximum area of 130.3 ha within the ROW, representing about 5.6% of the total area within the ROW.

Potential impacts of pipeline construction to regrowth vegetation include:

- clearing of up to 125.5 ha of high value regrowth (HVR) vegetation, comprising:
 - 40.6 ha of HVR of Endangered RE;
 - 61.5 ha of HVR of Of Concern RE;
 - 23.4 ha of HVR of Least Concern RE;
- clearing of up to 11.7 ha of regrowth watercourse vegetation (only in the northern 39 km of the ABP).

Based on biodiversity planning assessments (BPAs) by DERM, the ROW contains 508 ha of vegetation of biodiversity significance, including 359.6 ha of state significance, 90.6 ha of regional significance and 57.8 ha of local significance. The ABP transects four terrestrial biodiversity corridors and 51 riparian corridors identified in the BPA. The ROW contains a total area of 706.7 ha that is mapped as corridor, but only 294.8 ha of this area is remnant vegetation, with the remainder being cleared or regrowth.

The ROW contains 7 ha of essential habitat, including:

- 6.3 ha of essential habitat for Little Pied Bat (*Chalinolobus picatus*) from KP 77 to 78; and
- 0.7 ha of essential habitat for Black Ironbox (*Eucalyptus raveretiana*) from KP 377 to 378.

The ROW may contain suitable habitat for 29 flora species listed under the Queensland NC Act, including six Endangered species, 11 Vulnerable species and 12 Near Threatened species. Based on an analysis of preferred habitat, the ROW contains:

- likely habitat for one Endangered species (*Cycas megacarpa*), one Vulnerable species (*Eucalyptus raveretiana*) and three Near Threatened species (*Cerbera dumicola*, *Desmodium macrocarpum* and *Macropteranthes leiocaulis*);
- possible habitat for five Endangered species, ten Vulnerable species and seven Near Threatened species; and
- unlikely habitat for two Near Threatened species.

The ROW may contain suitable habitat for 38 fauna species listed under the Queensland NC Act, including six Endangered species, 18 Vulnerable species and 14 Near Threatened species. Based on an analysis of preferred habitat, the ROW contains:

- likely habitat for three Vulnerable species (Squatter Pigeon *Geophaps scripta scripta*, Glossy Black-cockatoo *Calyptorhynchus lathami* and Estuarine Crocodile *Crocodylus porosus*) and three Near Threatened species (Black-necked Stork *Ephippiorhynchus asiaticus*, Little Pied Bat *Chalinolobus picatus* and Common Death Adder *Acanthophis antarcticus*);

- possible habitat for three Endangered species, 14 Vulnerable species and nine Near Threatened species; and
- unlikely habitat for three Endangered species, one Vulnerable species and two Near Threatened species.

The majority of the waterways and wetlands intersected by the pipeline are likely to be ephemeral and contain limited habitat for aquatic species. The majority of aquatic flora species recorded within the pipeline buffer are common and widespread. One grass, *Paspalidium udum*, is considered to be Vulnerable under the NC Act, and could potentially occur in freshwater wetlands along the pipeline.

Threatened aquatic fauna mapped within the pipeline buffer include the Estuarine Crocodile, Green Turtle and Fitzroy River Turtle. A number of threatened birds may also utilise aquatic habitats for feeding, roosting and / or nesting, including Freckled Duck, Radjah Shelduck, Little Tern, Australian Painted Snipe, Cotton Pygmy-goose, Sooty Oystercatcher, Yellow Chat and Black-necked Stork. Estuarine Crocodiles are known from numerous locations within the Fitzroy River system and have been recorded nesting at the Conroy crossing of the Fitzroy River, about 11 km upstream of the proposed ABP crossing. The Fitzroy River Turtle is found in the Fitzroy River and its tributaries. The sandy banks of the Fitzroy River at the Redbank and Glenroy crossings provide good nesting habitat for the Fitzroy River Turtle and are only 1.5 and 11 km upstream of the proposed ABP crossing, respectively. Green Turtles are likely to inhabit coastal waters in central and northern Queensland, but these areas will not be significantly impacted by the ABP.

The pipeline buffer contains 34 weeds declared under the *Land Protection (Pest and Stock Route Management) Act 2002* (LP Act), including 22 species listed as Class 2 weeds and 12 species listed as Class 3 weeds. Five feral animals declared under the LP Act have also been recorded within the pipeline buffer.

Mitigation and Further Studies

Further desktop and field investigations will be undertaken to:

- develop a comprehensive survey program that targets areas of high ecological significance;
- ground-truth vegetation, wetlands, watercourse crossings, corridors, habitat for EVNT species and other areas of high ecological significance;
- undertake targeted surveys for EVNT species where areas of suitable habitat are found;
- conduct comprehensive fauna surveys within representative habitats along the ABP;
- identify route refinements that avoid or minimise potential impacts to ecological values; and
- assess other options to avoid, mitigate or offset potential impacts.

While detailed mitigation measures cannot be developed without field surveys, measures are likely to include:

- minor re-alignments of the proposed pipeline route to avoid or minimise clearing of areas of high ecological value (e.g. Endangered and Of Concern REs, habitat for EVR flora species, wetlands) and areas of remnant vegetation generally;
- sequential progression of pipeline construction, with clean-up, restoration and rehabilitation initiated as soon as backfilling is complete;
- scheduling of construction activities in environmentally sensitive locations to avoid the wet season;
- use of minimum clearing widths in areas of remnant vegetation;
- effective sediment and erosion control systems to minimise indirect impacts on surrounding areas;
- implementation of a weed management program, including effective weed hygiene procedures, regular weed monitoring during and after construction and weed control works as required; and
- investigation into use of horizontal directional drilling techniques to avoid impacts on major watercourses.

Rehabilitation will include (as a minimum):

- re-profiling to original or stable contours;
- re-establishing surface drainage lines and other land features;
- ripping or scarifying compacted areas where necessary to facilitate vegetation growth (with consideration given to soil type and land system);

- use of geofabric (e.g. jute matting) to hold soil in place during re-establishment, where necessary;
- stockpiling topsoil and vegetation for later use in reinstatement;
- replacing sub-soil and topsoil in correct soil horizon profile in trench;
- spreading stockpiled topsoil and seed stock (i.e. cleared vegetation) in an even layer on re-profiled surfaces;
- seeding with sterile grasses and / or native species, where required; and
- monitoring and maintenance (e.g. weed control, repair of erosion control devices) of rehabilitation areas.

With appropriate mitigation, impacts of pipeline construction on vegetation are likely to be limited to the direct removal of a maximum of 474 ha of remnant vegetation, 125.5 ha of high value regrowth vegetation and 11.7 ha of regrowth watercourse vegetation within the 40 m ROW.

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1.0 Introduction

Arrow Bowen Pipeline Pty Ltd (Arrow), a wholly owned subsidiary of Arrow Energy Pty Ltd (Arrow Energy), is proposing to construct a 600 km long transmission pipeline from Arrow Energy's coal seam gas (CSG) fields in the Bowen Basin at Red Hill (north of Moranbah) to Gladstone.

Arrow is preparing an Initial Advice Statement (IAS) as part of an application to the Queensland Department of Environment and Resource Management (DERM) to prepare a voluntary Environmental Impact Statement (EIS) under Chapter 3, Part 2 of the *Environmental Protection Act 1994* (EP Act). This desktop review of ecological values provides technical information to inform the IAS and assist Arrow to plan further investigations to be undertaken for the EIS.

1.1 Overview

The Arrow Bowen Pipeline (ABP) comprises a main line approximately 487 km long (from near Glenden to a pipeline junction 20 km west of Gladstone), a 52 km header line (from near Lake Elphinstone to the mainline near Coppabella) and four short lateral lines that connect to the existing North Queensland Gas pipeline (**Map 1** in IAS). Locations along the pipeline are measured as kilometre points (KPs) with KP 0 at the northern / western end of the line.

Numerous route options were assessed using a range of criteria, including topography, geology, existing land uses, cultural heritage values, social issues and ecological values. The present route was selected to maximise avoidance of Endangered and Of Concern regional ecosystems (REs). Vegetation clearing, in general, is minimised by utilising pre-existing clearings where practicable. The preferred route will be further refined based on detailed specialist field assessments including ecological, cultural, engineering and construction surveys during the EIS process.

The proposed pipeline will be buried, comprised of welded steel and constructed in accordance with AS 2885, Pipelines – Gas and Liquid Petroleum and other applicable standards and regulations. The pipeline will have a minimum technical design life of 40 years, however with ongoing integrity management the operational life is expected to exceed this period. Construction will require a right-of-way (ROW) with a width of 40 m for clear and grade, trenching and spoil placement, stringing, pipeline welding and laying. A narrower construction width may be considered for sensitive watercourse crossings and ecosystems where significant ecological values are encountered. As part of construction, the pipeline trench will be backfilled and restored, typically within three months of clear and grade.

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2.0 Methods

Desktop investigations of the proposed ABP were conducted in November and December 2010.

2.1 Study Area - ROW and Buffers

The study area considered in this report is the Revision A version of the ABP (including the main line, header line and four lateral lines). Information was collated for several buffers around the line to provide regional context and allow for spatial gaps in data sets. Buffers used along the entire line were ± 20 m (which represents the 40 m ROW that will be cleared during pipeline construction), ± 1 km and ± 5 km.

The density of flora and fauna specimens collated from Queensland Herbarium, Queensland Museum and Wildnet databases was significantly lower in the north-western half of the pipeline (i.e. west of the Broadsound Range from KP 0 to KP 310) than in the south-eastern half. To compensate for the discrepancy in specimen density, a larger buffer of ± 10 km was utilised for flora and fauna database searches west of the Broadsound Range, while the standard 5 km buffer was used in the section east of the range.

2.1.1 Percentage of Buffer Statistic

The impact of the ROW on significant ecological values was analysed by comparison of the area within the ROW to the area within the surrounding 5 km buffer. The 40 m wide ROW covers an area of 2,334 ha, which comprises about 0.4% of the 5 km buffer (with a total area of 577,065 ha). If the area of a specific ecological value (e.g. remnant vegetation) in the ROW is less than 0.4% of the area in the 5 km buffer, the ROW would have a lower impact on the value than would be predicted by a comparison of total areas. A “% of buffer” statistic below 0.4% therefore indicates that the pipeline route has been selected to reduce areas of that value. This statistic has been calculated for spatial ecological values where areas can be mapped.

2.2 Taxonomic Nomenclature

Scientific names of plants used in this report follow the Queensland Herbarium (Bostock and Holland, 2007). Scientific and common names of vertebrate animals used in this report follow the CSIRO List of Australian Vertebrates (Clayton *et al.*, 2006).

2.3 Determination of Significance Level

Ecologically Sensitive Areas (ESAs) are described and categorised (Category A, B and C) in the Queensland *Environmental Protection Act* 1994 (EP Act) and supporting regulations, codes and authorities.

The significance of vegetation communities is described as per their listings in the Australian *Environment Protection and Biodiversity Conservation Act* 1999 (EPBC Act) as Critically Endangered, Endangered or Vulnerable. The significance of Regional Ecosystems (REs) is described as per their listings in the Queensland *Vegetation Management Act* 1999 (VM Act) as Endangered, Of Concern and Least Concern, and classification of their biodiversity status by DERM as Endangered, Of Concern and No Concern at present.

Listed EVNT (Endangered, Vulnerable or Near Threatened) flora and fauna species are defined as those taxa listed in the EPBC Act as Critically Endangered, Endangered or Vulnerable and / or listed in the *Nature Conservation Act* 1992 (NC Act) as Endangered, Vulnerable or Near Threatened. Migratory fauna species are those listed as Migratory species under the EPBC Act. All other native flora and fauna species are designated as being Least Concern.

2.4 Data Sources

Ecological data was collated from the following sources:

- Queensland Herbarium HerbreCs flora specimen database;
- Queensland Museum fauna specimen database;
- Queensland Department of Environment and Resource Management (DERM) Wildnet flora and fauna record database (DERM, 2010d);
- DERM biodiversity assessments for the Brigalow Belt bioregion and biodiversity assessment mapping (EPA, 2008);

- Australian Department of Sustainability, Environment, Water, Population and Communities (DSEWPC) protected matters search (DSEWPC, 2010b);
- DSEWPC species profile and threats database (DSEWPC, 2010c);
- DERM regional ecosystem (RE) and regrowth vegetation mapping;
- DERM Regional ecosystem Description Database (Queensland Herbarium, 2009);
- DERM environmentally sensitive area (ESA) mapping;
- DERM protected area estate mapping;
- DERM referable wetland mapping, including wetland protection areas and wetland management areas (DERM, 2010b, 2010c);
- DERM watercourse mapping;
- Mapping of Ramsar wetlands and Nationally Important Wetlands in Australia (DSEWPC, 2010a);
- satellite imagery;
- published ecological information for the central Queensland region; and
- published ecological information on EVNT flora and fauna species.

2.5 Limitations

The present report assesses the Revision A alignment supplied by Arrow on 3 December 2010. Assessments of more recent alignment changes were not incorporated into this report.

It is recognised that data gained from database searches and included in the desktop components of this assessment have caveats regarding the robustness or completeness of the information. Queensland Herbarium flora data and Queensland Museum fauna data are based on specimens actually recorded as present in the given locations. The absence of any specimen records for a particular species from an area does not imply that that species does not occur in that area. Data from the EPBC protected matters search website are based on a combination of actual records, primarily from State Government databases, combined with modelled distributions of species according to their ecological characteristics.

Mapping data is also limited by scale and the age of underlying information. Most mapping produced by DERM for the Brigalow belt Bioregion is at a scale of 1:100,000, with a positional accuracy of +/-100 metres and a minimum polygon size of 5 ha or 75 metres wide for linear features. In some areas along the east coast, mapping has been conducted at 1:50,000 scale with a positional accuracy of +/-50 metres and a minimum polygon size of 1 ha or 35 metres wide for linear features.

Mapping is based on imagery and survey data collected up to a specific date. For example, the most recent Queensland Herbarium RE mapping (Version 6.0b) is mapped from 2005 imagery, so more recent clearing will not be recognised.

Many map units within RE mapping are mosaic polygons, which contain a mixture of several REs. The proportion of each RE within a mosaic polygon is estimated from aerial imagery, so area calculations based on mosaic polygons are also estimates. Further errors may be introduced when calculating the areas of REs that are transected by the 40 m ROW through mosaic polygons. It is unlikely that each RE within the mosaic will be evenly distributed and therefore any one section of the polygon is likely to have differing proportions of each of the listed REs. The actual areas of each RE occurring within the study area and 40 m ROW cannot be accurately determined until detailed field assessments of the alignment are undertaken.

3.0 Environmentally Sensitive Areas

DERM defines an environmentally sensitive area (ESA) as a location, however large or small, that has environmental values that contribute to maintaining biological diversity and integrity, has intrinsic or attributed scientific, historical, or cultural heritage value, or is important in providing amenity, harmony or sense of community. ESAs are broken down into three categories. Category A and B areas are defined in the *Environmental Protection Regulation 2008* (EP Reg), while Category C areas are generally defined in Environmental Authorities prepared for specific mining and petroleum activities.

Category A areas that have significant ecological values include national parks, marine parks, conservation parks, forest reserves, the Wet Tropics World Heritage Area and the Great Barrier Reef region. Category B areas include Endangered regional ecosystems (REs), Ramsar wetlands, state forest parks, wilderness areas, areas seaward of the highest astronomical tide, fish habitat areas and areas containing marine plants.

Category C areas typically include Of Concern REs, essential habitat, referable wetlands, nature refuges, state forests, timber reserves, declared water catchment areas, Koala habitat areas and resources reserves.

Desktop investigations have identified the following ESAs of ecological significance within the ROW and / or 5 km buffer:

- Endangered REs (Category B);
- Of Concern REs (Category C);
- state forests (Category C);
- nature refuges (Category C);
- essential habitat (Category C); and
- referable wetlands (Category C).

These ESAs are described in more detail in the following sections.

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4.0 Protected Area Estate

Areas protected under the NC Act that are adjacent to the ABP are listed in **Table 1** and mapped in **Figure 7** of the IAS. The ROW does not transect any protected area estate, but lies within 5 km of six state forests and four nature refuges. No national parks or world heritage areas occur within 5 km of the ABP.

The Great Barrier Reef World Heritage Area and Marine Park adjoins the coast of north and central Queensland. Although the ROW does not directly impact the Great Barrier Reef region, it runs through the Calliope, Fitzroy and Burdekin catchments, which flow into the Great Barrier Reef lagoon.

No areas of protected area estate are transected by the proposed pipeline ROW, so are unlikely to be impacted by construction or operating activities provided that appropriate mitigation measures are implemented.

Table 1 Protected Area Estate within the Pipeline Buffer

Estate Name	Lot and Plan	KP
Newlands Nature Refuge	4 SP171919	KP 0-8
Kemmis Creek Nature Refuge	12 WHS529	KP 0 (header)
Coolibah Nature Refuge	9 CNS42	KP 0 (lateral 4)
Eugene State Forest	65 FTY1503	KP 304-310
Develin State Forest	66 FTY1343	KP 318-319
Aricia State Forest	11 4FTY861	KP 340-345
Morinish State Forest	878 FTY842	KP 367
Mount Larcom State Forest	208 FTY1451	KP 472
Bouldercombe State Forest	950 FTY1794	KP 410.5
Pindari Nature Refuge	181 DS631	KP 450-451

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5.0 Wetlands

The Queensland Strategy for the Conservation and Management of Queensland Wetlands (EPA, 1999) defines wetlands as 'areas of permanent or periodic / intermittent inundation, whether natural or artificial, with water that is static or flowing, fresh, brackish or salt, including areas of marine water the depth of which at low tide does not exceed 6 metres'. Wetlands can be divided into four broad categories:

- Lacustrine systems include wetlands and deepwater habitats with all of the following characteristics:
 - situated in a topographic depression or a dammed river channel;
 - lacking trees, shrubs or persistent emergent plants with greater than 30 per cent areal coverage; and
 - total area exceeds 8 ha (similar wetland and deepwater habitats totalling less than 8 ha are also included in the lacustrine system if an active wave-formed or bedrock shoreline feature makes up all or part of the boundary, or if the water depth in the deepest part of the basin exceeds 2 m at low water).
- Palustrine systems are wetlands that are dominated by trees, shrubs, or persistent emergent plants, including such wetlands that occur in tidal areas where salinity due to ocean-derived salts is below 0.5 %. Palustrine systems also include wetlands that lack such vegetation, but have the following three characteristics:
 - where active waves and bedrock features are lacking;
 - where the water depth in the deepest part of basin less than 2 m at low water; and
 - the salinity due to ocean-derived salts is less than 0.5 %.
- Riverine systems includes all wetlands and deepwater habitats contained within a channel, with two exceptions:
 - wetlands dominated by trees, shrubs or persistent emergent plants; and
 - habitats with water containing ocean-derived salts in excess of 0.5 %.
- Estuarine systems are wetlands with oceanic water that is at least occasionally diluted with freshwater run-off from the land.

The ecological significance and legislative status of wetlands are assessed at international, national and state scales. The Convention on Wetlands of International Importance especially as Waterfowl Habitat (also known as the Ramsar Convention) is an intergovernmental treaty that provides a framework for national action and international cooperation on the conservation and wise use of wetlands (EPA, 1999). The Commonwealth EPBC Act protects Australian RAMSAR wetlands as a MoNES. RAMSAR wetlands are also protected under the Queensland EP Act.

The Directory of Important Wetlands in Australia (DIWA) identifies and classifies nationally important wetlands within three broad categories - marine and coastal zone wetlands, inland wetlands and human-made wetlands (Environment Australia, 2001, Miller and Deacon, 2005, DSEWPC, 2010a). The directory and associated updates provide detailed descriptions of all DIWA wetlands.

At a State level, a comprehensive mapping exercise has been undertaken for wetlands of high ecological significance (HES) and general ecological significance (GES) across Queensland. These wetlands, collectively termed referable wetlands, incorporate two layers:

- Wetland Protection Areas (WPAs) are wetlands of HES within catchments of the Great Barrier Reef (GBR). Catchments (DERM, 2010c). These wetlands have been classified using the Aquatic Biodiversity Assessment and Mapping Methodology (Clayton *et al.*, 2006). WPAs include lacustrine and palustrine wetlands, but not riverine wetlands. WPA mapping incorporates trigger areas, which are buffers up to 500 m surrounding wetlands in non-urban areas and buffers up to 100 m in urban areas. The temporary State Planning Policy for GBR Wetlands provides specific policies to protect the values of WPAs.
- Wetland management Areas (WMAs) are wetlands of GES within the GBR catchment and wetlands of GES and HES in other parts of Queensland (DERM, 2010b). The Areas of Ecological Significance method has been applied to identify HES and GES wetlands outside GBR catchments (DERM, 2010a). WMAs include lacustrine, palustrine, riverine and estuarine wetlands. A 100m trigger area buffer has been generated around WMAs.

Referable wetlands are protected under the Queensland EP Act and are listed as Category C ESAs in Environmental Authorities for Petroleum Activities. DERM acts as a concurrence agency for developable assessment that will impact on a WPA, according to the temporary State Planning Policy 1/10: Protecting Wetlands of High Ecological Significance in Great Barrier Reef Catchments. DERM has an advice agency role for developable assessment that will impact on a WMA.

Wetlands of international, national and state significance are mapped in **Map 5** of the IAS. One wetland of international significance (RAMSAR wetland) was identified during desktop searches. The Shoalwater and Corio Bay Area is located approximately 60 km north-east of the proposed pipeline route, so is unlikely to be impacted by construction or operating activities provided that appropriate mitigation measures are implemented.

The DIWA lists three nationally significant wetlands within 5 km of the proposed pipeline route (**Table 2**), including:

- Fitzroy River Delta - including marine waters; sub-tidal aquatic beds; estuarine waters; intertidal flats; marshes and forested wetlands; and coastal freshwater lagoons and marshes.
- Fitzroy River Floodplain - including riverine floodplains; seasonal / intermittent freshwater lakes; permanent freshwater ponds; and marshes, swamps and swamp forests on inorganic soils.
- Lake Elphinstone - including seasonal / intermittent freshwater lakes; and marshes, swamps and swamp forests on inorganic soils.

The southern end of the ABP also terminates approximately 10 km west of the nationally significant wetland, Port Curtis. This wetland includes all tidal areas near Gladstone and incorporates marine waters; sub-tidal aquatic beds; coral reefs; rocky and sandy marine shores; estuarine waters; and intertidal flats, marshes and forested wetlands.

Nationally significant wetlands are not transected by the proposed pipeline ROW, so are unlikely to be impacted by construction or operating activities provided that appropriate mitigation measures are implemented.

Table 2 DIWA Wetlands Mapped within 5 km of the Proposed Pipeline Route

Wetland Aggregation	Area in ROW (ha)	Area in 5 km Buffer (ha)	% in Buffer*
Fitzroy River Delta	0	5251.41	0
Fitzroy River Floodplain	0	130.76	0
Lake Elphinstone	0	300.46	0
Total	0	5682.64	0

* Percentage of area in 5 km buffer that lies within the 40 m ROW.

The ABP lies within the Calliope, Fitzroy and Burdekin River systems, which are identified as catchments of the GBR. The 5 km buffer contains 68 wetlands mapped as WPAs, including two lacustrine and 66 palustrine wetlands. The proposed ROW avoids the majority of these wetlands, transecting only two palustrine wetlands with a total area of 1.3 ha (**Table 3**). The ROW contains an additional 17.6 ha of WPA trigger areas (500 m buffers around WPA wetlands).

Table 3 WPA Wetlands Mapped within 5 km of the Proposed Pipeline Route

Wetland Type	Area in ROW (ha)	Area in 5 km Buffer (ha)	% in Buffer*
Lacustrine	0	526.65	0
Palustrine	1.34	746.46	0.18
Total WPA	1.34	1273.11	0.11
Trigger Area	17.55	8839.13	0.20
Total WPA and Trigger Area	18.89	10112.24	0.19

* Percentage of area in 5 km buffer that lies within the 40 m ROW.

The ROW transects 43 wetlands mapped as WMAs, with a total area of 80.8 ha (including the 100 m trigger area buffers). The majority of these are riverine wetlands (36 wetlands covering 14.9 ha), with the remainder comprising palustrine wetlands (4 occurrences covering 1.3 ha) and estuarine wetlands (2 occurrences covering 0.7 ha). The ROW contains an additional 64 ha of WMA trigger areas (100 m buffers around WMA wetlands). The proposed pipeline route avoids most mapped WMAs, with the area in the ROW representing only 0.16% of the 1624 WMAs mapped within the 5 km buffer (**Table 4**).

Table 4 WMA Wetlands Mapped within 5 km of the Proposed Pipeline Route

Wetland Type	Area in ROW (ha)	Area in 5 km Buffer (ha)	% in Buffer*
Estuarine	0.68	5452.70	0.01
Lacustrine	0	0.004	0
Palustrine	1.29	893.47	0.14
Riverine	14.85	9887.24	0.15
Unspecified	0.01	18.42	0.05
Total WMA	16.84	16251.84	0.10
Wetland Buffer	63.96	35222.85	0.18
Total WMA and Trigger Area	80.80	51474.68	0.16

* Percentage of area in 5 km buffer that lies within the 40 m ROW.

The proposed pipeline transects 362 watercourses that are mapped by DERM at a scale of 1:100,000. **Table 5** provides a breakdown of watercourses by stream order. The majority of watercourses crossed by the pipeline are small ephemeral streams, but 20 watercourses are stream order 5 or above. The names and locations of these watercourse crossings are provided in **Table 6**. Major crossings include one crossing of the Fitzroy River and five crossings of the Isaac River.

Table 5 Streams Transected by Proposed Pipeline Route

Stream Order	Number Transected by Pipeline
1	202
2	74
3	44
4	22
5	10
6	3
7	1
8	5
9	1
Total	362

Table 6 Major Watercourses Transected by the Proposed Pipeline

Watercourse Name	Stream Order	Location (KP)
Isaac River	5	5.5 (lateral 2)
Suttor Creek	5	14.5
Isaac River	5	52.5
Isaac River	6	129.5
Boomerang Creek	5	146.0
Stephens Creek	6	178.0
Stephens Creek	6	178.0
Rolf Creek	5	219.0
Rolf Creek	8	219.5
Bellarine Creek	8	223.0
Bellarine Creek	8	224.5
Isaac River	8	240.5
Isaac River	8	241.0
Clarke Creek	7	243.0
Apis Creek	5	291.0
Fitzroy River	9	326.0
Limestone Creek	5	378.0
Neerkol Creek	5	398.0
Six Mile Creek	5	437.0
Six Mile Creek	5	438.0
Raglan Creek	6	455.0

Pipeline construction has the potential to directly and indirectly impact on ecological values of watercourses and wetlands. Field studies will be undertaken along the proposed pipeline route to assess ecological values and identify potential route revisions and other measures to mitigate potential impacts on wetlands and watercourses.

6.0 Vegetation Communities

The regional ecosystem classification scheme, developed by DERM, provides a system for cataloguing and assessing the conservation status of vegetation communities throughout Queensland (Sattler and Williams, 1999; Neldner *et al.*, 20005). The system divides Queensland into 13 bioregions, based on broad landscape patterns that reflect geology, climate, flora and fauna groupings. Bioregions are further divided into 12 land zones that represent particular combinations of geology, landform and soil. Regional ecosystems are vegetation communities in a bioregion that are consistently associated with a particular land zone. Each unique RE is denoted by a three number code, with the first number representing the bioregion, the second number the landzone and the third number the specific RE (e.g. 11.3.25). Some REs can be further classified into distinct vegetation communities, which are denoted by a fourth letter code (e.g. 11.3.25a).

The Queensland Herbarium provides regularly updated RE mapping for Queensland and maintains the Regional Ecosystem Description Database (REDD), which contains RE descriptions, status and known ecological values (Queensland Herbarium, 2009). The most recent version is version 6.0b, which was last updated for the Brigalow Belt Bioregion in November 2009.

The ABP lies in the Brigalow Belt Bioregion, which contains lowlands, ranges and plateaus characterised by a diverse range of ecosystems including brigalow forest, eucalypt forest and woodland, grassland, dry rainforest, cypress pine woodland and riparian communities (Sattler and Williams, 1999). It transects six subregions:

- Northern Bowen Basin;
- Isaac Comet Downs;
- Nebo - Connors Ranges;
- Boomer Range;
- Marlborough Plains; and
- Mount Morgan Ranges.

Landzones mapped within the ROW include:

- 1 - Deposits subject to periodic tidal inundation;
- 3 - Quaternary alluvial systems;
- 4 - Flat to gently undulating Tertiary clay plains;
- 5 - Plains and plateaus on Tertiary land surfaces, generally with medium to coarse-textured soils;
- 7 - Exposed or shallowly covered duricrusts;
- 8 - Plains and hills on Cainozoic flood basalts;
- 9 - Gently undulating landscapes on more or less horizontally bedded fine grained sedimentary rocks;
- 10 - Plateaus, scarps and ledges with shallow soils on more or less horizontally bedded medium to coarse grained sedimentary rocks;
- 11 - Hills and lowlands on metamorphosed sedimentary rocks; and
- 12 - Hills and lowlands on granitic and other pre-Cainozoic igneous rocks.

Queensland Herbarium mapping identifies 41 REs (44 including RE sub-categories) within the ROW and 79 REs (98 including sub-categories) within the 5 km buffer. **Table 7** provides a summary of these REs, including areas within the ROW and 5 km buffer, percentage of each RE within the buffer that is transected by the ROW, status at State and Commonwealth levels, extent contained within protected area estate and other ecological values identified in the REDD. Mapped REs within the study area are shown in **Map 6** of the IAS.

The pipeline route has been selected to minimise clearing of remnant vegetation. Only 474 ha (about 20%) of the ROW contains remnant vegetation, with the remaining 80% mapped as non-remnant. The avoidance of remnant vegetation within the ROW can be demonstrated by comparing the proportions of remnant vegetation within the ROW and the surrounding 5 km buffer. The ROW forms about 0.4% of the area within the 5 km buffer, but remnant vegetation in the ROW comprises only 0.24% of the total remnant vegetation in the buffer.

The majority of REs within the ROW are Eucalypt woodlands on Cainozoic sand plains and Cainozoic igneous rocks, which are common and widespread throughout the region. The most common REs are:

- 11.5.3 - *Eucalyptus populnea* +/- *E. melanophloia* +/- *Corymbia clarksoniana* on Cainozoic sand plains/remnant surfaces (111.3 ha);
- 11.5.9 - *Eucalyptus crebra* and other *Eucalyptus* spp. and *Corymbia* spp. woodland on Cainozoic sand plains/remnant surfaces (41.5 ha); and
- 11.8.5 - *Eucalyptus orgadophila* open woodland on Cainozoic igneous rocks (50.4 ha).

Table 7 REs Mapped within the Proposed Pipeline ROW and 5 km Buffer

RE Code	Area (ha)		% in Buffer*	Status #			Description	Extent ^ Reserved	Biodiversity Values ^^
	ROW	5km Buffer		EPBC	VM Act	BD			
11.1.1		213.58	0.00		LC	NC	<i>Sporobolus virginicus</i> grassland on marine clay plains	Medium	Provides estuarine wetland habitat.
11.1.2a		4626.12	0.00		LC	NC	Samphire forbland on marine clay plains (mud flats on Quaternary estuarine deposits, with very isolated stunted mangroves)	High	Provides estuarine wetland habitat.
11.1.2b		23.96	0.00		LC	NC	Samphire forbland on marine clay plains (samphire forbland on Quaternary estuarine deposits)	High	Provides estuarine wetland habitat.
11.1.4	0.44	153.22	0.29		LC	NC	Mangrove forest/woodland on marine clay plains	High	Provides estuarine wetland habitat.
11.1.4b		138.56	0.00		LC	NC	Mangrove forest/woodland on marine clay plains (<i>Avicennia marina</i> low open-shrubland to closed forest on Quaternary estuarine deposits.)	High	Provides estuarine wetland habitat.
11.1.4d	0.14	223.03	0.06		LC	NC	Mangrove forest/woodland on marine clay plains (Dominated by a range of species which form a closed forest)	High	Provides estuarine wetland habitat.
11.3.1	3.22	4337.33	0.07	E	E	E	<i>Acacia harpophylla</i> and/or <i>Casuarina cristata</i> open forest on alluvial plains	Low	Habitat for EVNT flora species including painted honeyeater <i>Grantiella picta</i> particularly in sub region 35.
11.3.1b		70.92	0.00	E	E	E	<i>Acacia harpophylla</i> and/or <i>Casuarina cristata</i> open forest on alluvial plains (palustrine wetland)	Low	Habitat for EVNT flora species including painted honeyeater <i>Grantiella picta</i> particularly in sub region 35.
11.3.2	42.33	14655.85	0.29	E where <i>Acacia pendula</i> dominant	OC	OC	<i>Eucalyptus populnea</i> woodland on alluvial plains	Low	Habitat for EVNT flora species including <i>Homopholis belsonii</i> .

RE Code	Area (ha)		% in Buffer*	Status #			Description	Extent ^ Reserved	Biodiversity Values ^^
	ROW	5km Buffer		EPBC	VM Act	BD			
11.3.2b	0.05	26.30	0.18	E where <i>Acacia pendula</i> dominant	OC	OC	<i>Eucalyptus populnea</i> woodland on alluvial plains (palustrine wetland)	Low	Habitat for EVNT flora species including <i>Homopholis belsonii</i> .
11.3.3	0.43	3966.25	0.01		OC	OC	<i>Eucalyptus coolabah</i> woodland on alluvial plains	Low	Mature trees provide hollows for fauna especially nesting birds. Associated with a high number fauna species.
11.3.3c		28.25	0.00		OC	OC	<i>Eucalyptus coolabah</i> woodland on alluvial plains (palustrine wetland)	Low	Mature trees provide hollows for fauna especially nesting birds. Associated with a high number fauna species.
11.3.4	12.65	5591.38	0.23		OC	OC	<i>Eucalyptus tereticornis</i> and/or <i>Eucalyptus</i> spp. tall woodland on alluvial plains	Low	Habitat for EVNT flora species including <i>Eucalyptus raveretiana</i> in sub regions 12 and 17.
11.3.7	3.24	1790.65	0.18		LC	OC	<i>Corymbia</i> spp. woodland on alluvial plains.	Low	Habitat of the hairy-nosed wombat <i>Lasiorhinus krefftii</i> .
11.3.10		4.24	0.00		LC	NC	<i>Eucalyptus brownii</i> woodland on alluvial plains	Low	
11.3.11	0.44	191.31	0.23	E	E	E	Semi-evergreen vine thicket on alluvial plains	Low	Habitat for EVNT flora species including <i>Actephila sessilifolia</i> , <i>Atalaya calcicola</i> and <i>Eucalyptus raveretiana</i> (within Dipperu NP).
11.3.12a		32.63	0.00		LC	NC	<i>Melaleuca viridiflora</i> , <i>M. argentea</i> +/- <i>M. dealbata</i> woodland on alluvial plains (palustrine wetland)	Low	
11.3.21	0.13	363.67	0.04	E	E	E	<i>Dichanthium sericeum</i> and/or <i>Astrebala</i> spp. grassland on alluvial plains. Cracking clay soils	Low	Habitat for EVNT flora species including <i>Thesium australe</i> , <i>Picris evae</i> , <i>Stemmacantha australis</i> , <i>Dichanthium queenslandica</i> , <i>Bothriochloa biloba</i> and <i>Digitaria porrecta</i> and fauna species including <i>Tympanocryptis pinguicollis</i> , <i>Anomalopus mackayi</i> and <i>Hemiaspis damelii</i> .

RE Code	Area (ha)		% in Buffer*	Status #			Description	Extent ^ Reserved	Biodiversity Values ^^
	ROW	5km Buffer		EPBC	VM Act	BD			
11.3.25	15.69	11126.91	0.14		LC	OC	<i>Eucalyptus tereticornis</i> or <i>E. camaldulensis</i> woodland fringing drainage lines	Low	Habitat for EVNT flora species including <i>Eucalyptus raveretiana</i> . Associated with high fauna species richness in the Taroom area. Known habitat for the EVNT freshwater turtle <i>Rheodytes leukops</i> within parts of the Fitzroy catchment. Known to be important habitat for other riparian freshwater turtle species.
11.3.25f		101.25	0.00		LC	OC	<i>Eucalyptus tereticornis</i> or <i>E. camaldulensis</i> woodland fringing drainage lines (riverine wetland or fringing riverine wetland)	Low	Habitat for EVNT flora species including <i>Eucalyptus raveretiana</i> . Associated with high fauna species richness in the Taroom area. Known habitat for the EVNT freshwater turtle <i>Rheodytes leukops</i> within parts of the Fitzroy catchment. Known to be important habitat for other riparian freshwater turtle species.
11.3.26	9.61	3061.01	0.31		LC	NC	<i>Eucalyptus moluccana</i> or <i>E. microcarpa</i> woodland to open forest on margins of alluvial plains	Low	
11.3.27		224.41	0.00		LC	OC	Freshwater wetlands	Low	Habitat for a diverse range of fauna species, particularly birds. The EVNT <i>Hydrocharis dubia</i> may occur in this RE. The EVNT <i>Aponogeton queenslandicus</i> may occur on heavy clays.
11.3.27a		330.28	0.00		LC	OC	Freshwater wetlands (lacustrine wetlands on larger ephemeral - permanent water bodies)	Low	Habitat for a diverse range of fauna species, particularly birds. The EVNT <i>Hydrocharis dubia</i> may occur in this RE. The EVNT <i>Aponogeton queenslandicus</i> may occur on heavy clays.

RE Code	Area (ha)		% in Buffer*	Status #			Description	Extent ^ Reserved	Biodiversity Values ^^
	ROW	5km Buffer		EPBC	VM Act	BD			
11.3.27b		367.61	0.00		LC	OC	Freshwater wetlands (lacustrine wetlands on billabongs no longer connected to channel flow)	Low	Habitat for a diverse range of fauna species, particularly birds. The EVNT <i>Hydrocharis dubia</i> may occur in this RE. The EVNT <i>Aponogeton queenslandicus</i> may occur on heavy clays.
11.3.27c		54.36	0.00		LC	OC	Freshwater wetlands (palustrine wetlands of mixed grassland or sedgeland on closed depressions on alluvial plains that are intermittently flooded)	Low	Habitat for a diverse range of fauna species, particularly birds. The EVNT <i>Hydrocharis dubia</i> may occur in this RE. The EVNT <i>Aponogeton queenslandicus</i> may occur on heavy clays.
11.3.27f	0.99	212.12	0.47		LC	OC	Freshwater wetlands (palustrine wetlands of <i>Eucalyptus coolabah</i> and/or <i>E. tereticornis</i> open woodland to woodland fringing swamps on old drainage courses that are intermittently flooded)	Low	Habitat for a diverse range of fauna species, particularly birds. The EVNT <i>Hydrocharis dubia</i> may occur in this RE. The EVNT <i>Aponogeton queenslandicus</i> may occur on heavy clays.
11.3.27x1b		11.83	0.00		LC	OC	Freshwater wetlands (palustrine wetlands of sedgelands to grasslands (often dominated by <i>Eleocharis dulcis</i>) on broad drainage depressions situated on old alluvial plains)	Low	Habitat for a diverse range of fauna species, particularly birds. The EVNT <i>Hydrocharis dubia</i> may occur in this RE. The EVNT <i>Aponogeton queenslandicus</i> may occur on heavy clays.
11.3.35		28.50	0.00		LC	NC	<i>Eucalyptus platyphylla</i> , <i>Corymbia clarksoniana</i> woodland on alluvial plains	Low	
11.3.36	3.22	270.13	1.19		OC	OC	<i>Eucalyptus crebra</i> and/or <i>E. populnea</i> and/or <i>E. melanophloia</i> on alluvial plains. Higher terraces	Low	
11.3.37		27.91	0.00		LC	NC	<i>Eucalyptus coolabah</i> fringing woodland on alluvial plains	Low	
11.4.1		6.67	0.00	E	E	E	Semi-evergreen vine thicket +/- <i>Casuarina cristata</i> on Cainozoic clay plains	Medium	Habitat for the EVNT plant <i>Macropteranthes leiocaulis</i>

RE Code	Area (ha)		% in Buffer*	Status #			Description	Extent ^ Reserved	Biodiversity Values ^^
	ROW	5km Buffer		EPBC	VM Act	BD			
11.4.2	0.31	401.33	0.08		OC	OC	<i>Eucalyptus</i> spp. and/or <i>Corymbia</i> spp. grassy or shrubby woodland on Cainozoic clay plains	Low	
11.4.4		39.66	0.00	E	LC	OC	<i>Dichanthium</i> spp., <i>Astrebla</i> spp. grassland on Cainozoic clay plains	None	Habitat for EVNT flora species including <i>Dichanthium queenslandicum</i> . Often occurs adjacent to lower lying areas dominated by regional ecosystems 11.4.11 and 11.3.3.
11.4.5		25.21	0.00		OC	E	<i>Acacia argyrodendron</i> woodland on Cainozoic clay plains	Low	
11.4.8	0.54	852.31	0.06	E	E	E	<i>Eucalyptus cambageana</i> woodland to open forest with <i>Acacia harpophylla</i> or <i>A. argyrodendron</i> on Cainozoic clay plains	Low	
11.4.9	1.92	2450.58	0.08	E	E	E	<i>Acacia harpophylla</i> shrubby open forest to woodland with <i>Terminalia oblongata</i> on Cainozoic clay plains	Low	Examples of this RE with seasonally ponded gilgai may contain the EVNT plant <i>Aponogeton queenslandicus</i> .
11.4.9a		11.52	0.00	E	E	E	<i>Acacia harpophylla</i> shrubby open forest to woodland with <i>Terminalia oblongata</i> on Cainozoic clay plains (<i>Acacia harpophylla</i> , <i>Lysiphyllum carronii</i> +/- <i>Casuarina cristata</i>)	Low	Examples of this RE with seasonally ponded gilgai may contain the EVNT plant <i>Aponogeton queenslandicus</i> .
11.4.11		74.83	0.00	E	OC	OC	<i>Dichanthium sericeum</i> , <i>Astrebla</i> spp. and patchy <i>Acacia harpophylla</i> , <i>Eucalyptus coolabah</i> on Cainozoic clay plains	Low	
11.4.13		1023.44	0.00		LC	E	<i>Eucalyptus orgadophila</i> open woodland on Cainozoic clay plains	Low	
11.5.2		992.87	0.00		LC	NC	<i>Eucalyptus crebra</i> , <i>Corymbia</i> spp., with <i>E. moluccana</i> on lower slopes of Cainozoic sand plains/remnant surfaces	Low	
11.5.3	111.29	26461.97	0.42		LC	NC	<i>Eucalyptus populnea</i> +/- <i>E. melanophloia</i> +/- <i>Corymbia clarksoniana</i> on Cainozoic sand plains/remnant surfaces	Low	

RE Code	Area (ha)		% in Buffer*	Status #			Description	Extent ^ Reserved	Biodiversity Values ^^
	ROW	5km Buffer		EPBC	VM Act	BD			
11.5.8c	0.63	1194.36	0.05		LC	NC	<i>Melaleuca</i> spp., <i>Eucalyptus crebra</i> , <i>Corymbia intermedia</i> woodland on Cainozoic sand plains/remnant surfaces (<i>Eucalyptus platyphylla</i> woodland on white-yellow weathered sands)	Low	
11.5.9b		719.21	0.00		LC	NC	<i>Eucalyptus crebra</i> and other <i>Eucalyptus</i> spp. and <i>Corymbia</i> spp. woodland on Cainozoic sand plains/remnant surfaces (<i>E. crebra</i> , <i>E. tenuipes</i> , <i>Lysicarpus angustifolius</i> + <i>Corymbia</i> spp)	Low	
11.5.9c	41.53	7896.59	0.53		LC	NC	<i>Eucalyptus crebra</i> and other <i>Eucalyptus</i> spp. and <i>Corymbia</i> spp. woodland on Cainozoic sand plains/remnant surfaces (<i>E. crebra</i> + <i>C. intermedia</i> + <i>E. moluccana</i> + <i>C. dallachiana</i>)	Low	
11.5.12	4.87	883.90	0.55		LC	NC	<i>Corymbia clarksoniana</i> woodland and other <i>Corymbia</i> spp. and <i>Eucalyptus</i> spp. on Cainozoic sand plains/remnant surfaces	Low	
11.5.15	0.24	411.25	0.06	E	LC	E	Semi-evergreen vine thicket on Cainozoic sand plains/remnant surfaces	Low	Habitat for EVNT flora species including <i>Fontainea fugax</i> , <i>Macropteranthes leiocaulis</i> , <i>Pomaderris clivicola</i> and <i>Cadellia pentastylis</i> and a wide range of flora and fauna species with disjunct distributions.
11.5.16		10.40	0.00	E	E	E	<i>Acacia harpophylla</i> and/or <i>Casuarina cristata</i> open forest in depressions on Cainozoic sand plains/remnant surfaces	Low	
11.5.17		11.99	0.00		E	E	<i>Eucalyptus tereticornis</i> woodland in depressions on Cainozoic sand plains/remnant surfaces	Low	Provides wetland habitat for a flora and fauna.
11.5.18		25.82	0.00		OC	OC	<i>Micromyrtus capricornia</i> shrubland on Cainozoic sand plains/remnant surfaces	Medium	

RE Code	Area (ha)		% in Buffer*	Status #			Description	Extent ^ Reserved	Biodiversity Values ^^
	ROW	5km Buffer		EPBC	VM Act	BD			
11.7.1		161.63	0.00		LC	OC	<i>Acacia harpophylla</i> and/or <i>Casuarina cristata</i> and <i>Eucalyptus thozetiana</i> or <i>E. microcarpa</i> woodland on lower scarp slopes on Cainozoic lateritic duricrust	Low	Habitat for EVNT flora species including <i>Cadellia pentastylis</i> .
11.7.2	25.99	10406.02	0.25		LC	NC	<i>Acacia</i> spp. woodland on Cainozoic lateritic duricrust. Scarp retreat zone	Low	Habitat for EVNT flora species including <i>Acacia wardellii</i> .
11.7.3	5.23	1367.86	0.38		LC	NC	<i>Eucalyptus persistens</i> , <i>Triodia mitchellii</i> open woodland on stripped margins of Cainozoic lateritic duricrust	Low	
11.7.4		303.24	0.00		LC	NC	<i>Eucalyptus decorticans</i> and/or <i>Eucalyptus</i> spp., <i>Corymbia</i> spp., <i>Acacia</i> spp., <i>Lysicarpus angustifolius</i> on Cainozoic lateritic duricrust	Low	
11.7.5		3.93	0.00		LC	NC	Shrubland on natural scalds on deeply weathered coarse-grained sedimentary rocks	Low	Habitat of EVNT flora species including <i>Acacia curranii</i> , <i>Calytrix gurlmundensis</i> , <i>Eucalyptus broviniensis</i> , <i>E. pachycalyx</i> , <i>E. viridis</i> , <i>Homoranthus decumbens</i> , <i>H. melanostictus</i> , <i>Micromyrtus carinata</i> and <i>Micromyrtus patula</i> .
11.7.6		29.25	0.00		LC	NC	<i>Corymbia citriodora</i> or <i>Eucalyptus crebra</i> woodland on Cainozoic lateritic duricrust	Low	
11.8.5	50.42	10066.62	0.50		LC	NC	<i>Eucalyptus orgadophila</i> open woodland on Cainozoic igneous rocks	Low	In southern part of bioregion, habitat for a number of EVNT flora species including <i>Bothriochloa biloba</i> , <i>Digitaria porrecta</i> , <i>Discaria pubescens</i> , <i>Indigofera baileyi</i> , <i>Picris evae</i> , <i>Stemmacantha australis</i> and <i>Thesium australe</i> .
11.8.11	9.51	6144.08	0.15	E	OC	OC	<i>Dichanthium sericeum</i> grassland on Cainozoic igneous rocks	Low	Habitat for EVNT flora species including <i>Dichanthium queenslandicum</i> and <i>Trioncinia retroflexa</i> which is currently known from three small populations.

RE Code	Area (ha)		% in Buffer*	Status #			Description	Extent ^ Reserved	Biodiversity Values ^^
	ROW	5km Buffer		EPBC	VM Act	BD			
11.8.13	3.08	1063.04	0.29	E	E	E	Semi-evergreen vine thicket and microphyll vine forest on Cainozoic igneous rocks.	Low	Habitat for EVNT flora species including <i>Atalaya calcicola</i> and <i>Croton magneticus</i> .
11.8.14		16.97	0.00		OC	OC	<i>Eucalyptus crebra</i> , <i>Corymbia dallachiana</i> woodland on Cainozoic igneous rocks	None	
11.8.15	0.26	227.06	0.11		E	E	<i>Eucalyptus brownii</i> or <i>Eucalyptus populnea</i> woodland on Cainozoic igneous rocks.	None	
11.9.1		441.13	0.00	E	E	E	<i>Acacia harpophylla</i> - <i>Eucalyptus cambageana</i> open forest to woodland on fine-grained sedimentary rocks	Low	
11.9.2	9.53	3575.30	0.27		LC	NC	<i>Eucalyptus melanophloia</i> +/- <i>E. orgadophila</i> woodland on fine-grained sedimentary rocks	Medium	
11.9.3		298.34	0.00	E	LC	NC	<i>Dichanthium</i> spp., <i>Astrebala</i> spp. grassland on fine-grained sedimentary rocks	Low	
11.9.4a		13.17	0.00	E	OC	E	Semi-evergreen vine thicket or <i>Acacia harpophylla</i> with a semi-evergreen vine thicket understorey on fine grained sedimentary rocks (semi-evergreen vine thicket, generally dominated by a low tree layer 5-10m high)	Low	Habitat for EVNT flora species including <i>Cadellia pentastylis</i> .
11.9.5	4.66	1771.21	0.26	E	E	E	<i>Acacia harpophylla</i> and/or <i>Casuarina cristata</i> open forest on fine-grained sedimentary rocks	Low	Habitat for EVNT flora species including <i>Jalmenus eubulus</i> , pale imperial hairstreak butterfly (Eastwood et al. 2008)
11.9.7		0.54	0.00		OC	OC	<i>Eucalyptus populnea</i> , <i>Eremophila mitchellii</i> shrubby woodland on fine-grained sedimentary rocks	Low	
11.9.7a	39.56	8630.71	0.46		OC	OC	<i>Eucalyptus populnea</i> , <i>Eremophila mitchellii</i> shrubby woodland on fine-grained sedimentary rocks (generally diverse dense tall shrub layer and ground	Low	

RE Code	Area (ha)		% in Buffer*	Status #			Description	Extent ^ Reserved	Biodiversity Values ^^
	ROW	5km Buffer		EPBC	VM Act	BD			
							layer of annual grasses on Jurassic Hooray Sandstone)		
11.9.9	37.33	7722.19	0.48		LC	NC	<i>Eucalyptus crebra</i> woodland on fine-grained sedimentary rocks	Low	
11.9.10		75.04	0.00		OC	E	<i>Eucalyptus populnea</i> , <i>Acacia harpophylla</i> open forest on fine-grained sedimentary rocks	Low	
11.9.13		163.22	0.00		OC	OC	<i>Eucalyptus moluccana</i> or <i>E. microcarpa</i> open forest on fine-grained sedimentary rocks	Low	Habitat for uncommon mallee eucalypt species including <i>E. bakeri</i> and <i>E. viridis</i> in the Inglewood-Warwick area.
11.10.1		114.98	0.00		LC	NC	<i>Corymbia citriodora</i> open forest on coarse-grained sedimentary rocks	High	
11.10.3		1811.71	0.00		LC	NC	<i>Acacia catenulata</i> or <i>A. shirleyi</i> open forest on coarse-grained sedimentary rocks. Crests and scarps	Medium	Habitat for EVNT flora species including <i>Acacia deuteroneura</i> , <i>A. lauta</i> , <i>A. wardellii</i> and <i>Bertya calycina</i> .
11.10.4a	0.15	8986.43	0.00		LC	NC	<i>Eucalyptus decorticans</i> , <i>Lysicarpus angustifolius</i> +/- <i>Eucalyptus</i> spp., <i>Corymbia</i> spp., <i>Acacia</i> spp. woodland on coarse-grained sedimentary rocks (small areas of <i>E. crebra</i> , <i>C. aureola</i> , <i>C. clarksoniana</i> and/or <i>A. shirleyi</i>)	High	Habitat for EVNT flora species including <i>Acacia curranii</i> , <i>A. handonis</i> , <i>A. holotricha</i> , <i>A. islana</i> , <i>A. lauta</i> , <i>A. pubicosta</i> , <i>A. tenuinervis</i> , <i>Bertya calycina</i> , <i>Calytrix islensis</i> , <i>Eucalyptus beaniana</i> , <i>E. curtisii</i> and <i>E. rubiginosa</i> .
11.10.7		7272.01	0.00		LC	NC	<i>Eucalyptus crebra</i> woodland on coarse-grained sedimentary rocks	Low	
11.10.8		385.35	0.00		OC	OC	Semi-evergreen vine thicket in sheltered habitats on medium to coarse-grained sedimentary rocks	Medium	
11.10.12	3.52	818.27	0.43		LC	NC	<i>Eucalyptus populnea</i> woodland on medium to coarse-grained sedimentary rocks	Low	
11.11.1	3.33	5190.81	0.06		LC	NC	<i>Eucalyptus crebra</i> +/- <i>Acacia rhodoxylon</i> woodland on old sedimentary rocks with varying degrees of metamorphism and folding	Medium	

RE Code	Area (ha)		% in Buffer*	Status #			Description	Extent ^ Reserved	Biodiversity Values ^^
	ROW	5km Buffer		EPBC	VM Act	BD			
11.11.3		1000.68	0.00		LC	NC	<i>Corymbia citriodora</i> , <i>Eucalyptus crebra</i> , <i>E. acmenoides</i> open forest on old sedimentary rocks with varying degrees of metamorphism and folding. Coastal ranges	Medium	
11.11.4		829.69	0.00		LC	NC	<i>Eucalyptus crebra</i> woodland on old sedimentary rocks with varying degrees of metamorphism and folding. Coastal ranges	Low	
11.11.4c		443.21	0.00		LC	NC	<i>Eucalyptus crebra</i> woodland on old sedimentary rocks with varying degrees of metamorphism and folding. Coastal ranges (<i>E. moluccana</i> dominated woodland)	Low	
11.11.5	0.00	1142.68	0.00		LC	NC	Microphyll vine forest +/- <i>Araucaria cunninghamii</i> on old sedimentary rocks with varying degrees of metamorphism and folding	Medium	
11.11.5a		112.12	0.00		LC	NC	Microphyll vine forest +/- <i>Araucaria cunninghamii</i> on old sedimentary rocks with varying degrees of metamorphism and folding (vine thicket, usually with no <i>A. cunninghamii</i> emergents)	Medium	
11.11.7		1039.73	0.00		LC	OC	<i>Eucalyptus fibrosa</i> subsp. (Glen Geddes), <i>E. xanthope</i> woodland on serpentinite	Low	Habitat for EVNT flora species including <i>Corymbia xanthope</i> , <i>Hakea trineura</i> , <i>Capparis thozetiana</i> , <i>Leucopogon cuspidatus</i> , <i>Neoroepera buxifolia</i> , <i>Pimelea leptospermoides</i> , <i>Pultenaea setulosa</i> , <i>Stackhousia tryonii</i> , <i>Marsdenia brevifolia</i> , <i>Cycas ophiolitica</i> , <i>Bursaria reevesii</i> , <i>Capparis humistrata</i> and <i>Macrozamia serpentina</i> .

RE Code	Area (ha)		% in Buffer*	Status #			Description	Extent ^ Reserved	Biodiversity Values ^^
	ROW	5km Buffer		EPBC	VM Act	BD			
11.11.10	0.23	3230.88	0.01		OC	OC	<i>Eucalyptus melanophloia</i> woodland on deformed and metamorphosed sediments and interbedded volcanics	Low	
11.11.10a	0.05	170.83	0.03		OC	OC	<i>Eucalyptus melanophloia</i> woodland on deformed and metamorphosed sediments and interbedded volcanics (<i>E. moluccana</i> , <i>E. tereticornis</i> prominent on lower slopes)	Low	
11.11.13		56.14	0.00		OC	OC	<i>Acacia harpophylla</i> or <i>A. argyrodendron</i> , <i>Terminalia oblongata</i> low open forest on deformed and metamorphosed sediments and interbedded volcanics	Low	
11.11.14	0.88	602.06	0.15	E	E	E	<i>Acacia harpophylla</i> open forest on deformed and metamorphosed sediments and interbedded volcanics	Low	
11.11.15	19.71	4327.48	0.46		LC	NC	<i>Eucalyptus crebra</i> woodland on deformed and metamorphosed sediments and interbedded volcanics	Low	
11.11.15a		3.73	0.00		LC	NC	<i>Eucalyptus crebra</i> woodland on deformed and metamorphosed sediments and interbedded volcanic (<i>E. crebra</i> , <i>E. exserta</i> woodland)	Low	
11.11.16	2.04	211.02	0.97		OC	OC	<i>Eucalyptus cambageana</i> , <i>Acacia harpophylla</i> woodland on old sedimentary rocks with varying degrees of metamorphism and folding. Lowlands	Low	
11.11.18	0.88	368.46	0.24	E	E	E	Semi-evergreen vine thicket on old sedimentary rocks with varying degrees of metamorphism and folding.	Low	
11.11.21		66.65	0.00		OC	E	Semi-evergreen vine thicket on serpentinite	Low	Habitat for EVNT flora species including <i>Quassia bidwillii</i> and <i>Neoroepora buxifolia</i> .
11.12.1	1.88	5413.17	0.03		LC	NC	<i>Eucalyptus crebra</i> woodland on igneous rocks	Low	

RE Code	Area (ha)		% in Buffer*	Status #			Description	Extent ^ Reserved	Biodiversity Values ^^
	ROW	5km Buffer		EPBC	VM Act	BD			
11.12.2	2.09	2001.68	0.10		LC	NC	<i>Eucalyptus melanophloia</i> woodland on igneous rocks	Low	
11.12.3		2.57	0.00		LC	OC	<i>Eucalyptus crebra</i> , <i>E. tereticornis</i> , <i>Angophora leiocarpa</i> woodland on igneous rocks especially granite	Low	
11.12.4		1558.97	0.00		LC	NC	Semi-evergreen vine thicket and microphyll vine forest on igneous rocks	High	
11.12.6a		5.73	0.00		LC	NC	<i>Corymbia citriodora</i> open forest on granite (<i>Eucalyptus crebra</i> + <i>C. citriodora</i> and/or <i>E. acmenoides</i> + <i>Lophostemon suaveolens</i> woodland to open-forest)	Low	
11.12.21		10.77	0.00	E	E	E	<i>Acacia harpophylla</i> open forest on igneous rocks. Colluvial lower slopes	Low	
Non-remnant	1859.66	381443.64	0.49						
Ocean		86.60	0.00						
Water		129.03	0.00						
Total	2333.93	577065.11	0.40						

* Percentage of area in 5 km buffer that lies within the 40 m ROW.

Status under EPBC Act, VM Act and biodiversity status recognised by Qld DERM: E = Endangered; OC = Of Concern; LC = Least Concern; NC = No Concern at Present.

^ Extent reserved in Qld protected area estate: High = > 10% of pre-clearing extent reserved; Medium = 4-10%; Low = < 4%.

^^ Biodiversity values recognised in REDD.

6.1 EPBC Listed Communities

An EPBC protected matters search identified four Endangered Ecological Communities (EECs) that may occur within or adjacent to the ABP. For each EEC, the EPBC nomination recommendation lists REs that are considered to form components of the EEC (DSEWPC, 2010c).

Table 8 describes EECs, REs included in the EEC and areas of those REs within the ROW and 5 km buffer. The ROW contains 67.9 ha of remnant REs that form components of EECs (approximately 0.2% of the area within the 5 km buffer). However, 42.4 ha of this total is poplar box woodland (RE 11.3.2). The Weeping Myall Woodlands EEC forms only a very small proportion of the area mapped as RE 11.3.2, so it is likely that none of the 42.4 ha within the ROW contains the EEC. This would reduce the area of EEC mapped within the ROW to 25.5 ha. Field surveys will be required to ground-truth the presence of Weeping Myall Woodlands and other EECs within the ROW.

Table 8 EPBC Listed EECs and Equivalent REs within the ROW and the 5 km Buffer

EPBC Community Description	EPBC Act Status*	Equivalent RE	Area in ROW (ha)	Area in 5km Buffer (ha)	% in Buffer^
Brigalow (<i>Acacia harpophylla</i> dominant and co-dominant)	E	11.3.1	3.22	4,408.24	0.07
		11.4.8	0.54	852.31	0.06
		11.4.9	1.92	2,462.09	0.08
		11.9.5	4.66	1,771.21	0.26
		11.11.14	0.88	602.06	0.15
Natural grasslands of the Qld Central Highlands and the northern Fitzroy Basin	E	11.3.21	0.13	363.67	0.04
		11.8.11	9.51	6,144.08	0.15
Semi-evergreen vine thickets of the Brigalow Belt	E	11.3.11	0.44	191.31	0.23
		11.5.15	0.24	411.25	0.06
		11.8.13	3.08	1,063.04	0.29
		11.11.18	0.88	368.46	0.24
Weeping Myall Woodlands (only small component of RE)	E (where <i>A. pendula</i> dominates)	11.3.2	42.37	14,682.15	0.29
Total			67.87	33,319.87	0.2

* Status under EPBC Act: E = Endangered.

^ Percentage of area in 5 km buffer that lies within the 40 m ROW.

6.2 State Listed Communities

Queensland's vegetation management framework regulates the clearing of native vegetation, including native woody vegetation mapped as remnant vegetation, and non-remnant vegetation mapped as high-value regrowth and watercourse regrowth. It protects biodiversity and addresses land degradation problems such as salinity, soil degradation, erosion and declining water quality.

6.2.1 Remnant Vegetation

For the purposes of ESAs, the biodiversity status of a remnant RE, not the status under the *Vegetation Management Act 1999* (VM Act), is considered. The biodiversity status of an RE is assigned by DERM and is based on an assessment of the condition of remnant vegetation in addition to the pre-clearing and remnant extent of a regional ecosystem. This differs from the VM Act status, which is only based on an assessment of the pre-clearing and remnant extent of an RE. **Table 9** compares the criteria used to assign the biodiversity status and VM Act status of REs.

Table 9 Criteria used to Assign Biodiversity Status and VM Act Status of REs

RE Classification	Abbreviation	Criteria
Endangered	E	<p>VM Act criteria:</p> <ul style="list-style-type: none"> remnant* vegetation is < 10 % of its pre-clearing** extent across the bioregion; OR 10-30 % of its pre-clearing extent remains and the remnant vegetation is < 10,000 ha. <p>Additional biodiversity status criteria:</p> <ul style="list-style-type: none"> < 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 < 10,000 ha; OR it is a rare regional ecosystem subject to a threatening process.
Of concern	OC	<p>VM Act criteria:</p> <ul style="list-style-type: none"> remnant* vegetation is 10-30 % of its pre-clearing** extent across the bioregion; OR > 30 % of its pre-clearing extent remains and the remnant extent is < 10,000 ha. <p>Additional biodiversity status criteria:</p> <ul style="list-style-type: none"> 10-30 % of its pre-clearing extent remains unaffected by moderate degradation and / or biodiversity loss.
Least Concern (VM Act) No concern at present (BD Status)	LC NC	<p>VM Act criteria:</p> <ul style="list-style-type: none"> remnant* vegetation is > 30 % of its pre-clearing** extent across the bioregion and the remnant area is > 10,000 ha. <p>Additional biodiversity status criteria:</p> <ul style="list-style-type: none"> the degradation criteria listed above for endangered or of concern regional ecosystems are not met.

* Remnant woody vegetation is defined as vegetation where the dominant canopy has >70% of the height and >50% of the cover relative to the undisturbed height and cover of that stratum and is dominated by species characteristic of the vegetation's undisturbed canopy. For further clarification and mapping methods for remnant vegetation see Neldner *et al.* (2005).

** Pre-clearing vegetation is defined as the vegetation present before clearing.

6.2.1.1 VM Act Status

The ABP transects 10 REs listed as Endangered under the VM Act and 9 REs listed as Of Concern. **Table 10** summarises the areas of these REs within the ROW and 5 km buffer. The ROW contains only 16 ha of Endangered RE, which represents about 0.13% of the area of Endangered RE within the 5 km buffer. Of Concern REs occupy 110.4 ha of the ROW. The largest areas of Of Concern RE include 42.4 ha of RE 11.3.2 / 11.3.2b (*Eucalyptus populnea* woodland on alluvial plains) and 39.6 ha of RE 11.9.7a (*Eucalyptus populnea*, *Eremophila mitchellii* shrubby woodland on fine-grained sedimentary rocks).

Table 10 Endangered and Of Concern REs under the VM Act within the ROW and the 5 km Buffer

RE	Description	VM Act Status*	Area (ha)		% in ^ Buffer
			ROW	5km Buffer	
11.3.1	<i>Acacia harpophylla</i> and/or <i>Casuarina cristata</i> open forest on alluvial plains	E	3.22	4337.33	0.07
11.3.11	Semi-evergreen vine thicket on alluvial plains	E	0.44	191.31	0.23
11.3.21	<i>Dichanthium sericeum</i> and/or <i>Astrebla</i> spp. grassland on alluvial plains. Cracking clay soils	E	0.13	363.67	0.04
11.4.8	<i>Eucalyptus cambageana</i> woodland to open forest with <i>Acacia harpophylla</i> or <i>A. argyrodendron</i> on Cainozoic clay plains	E	0.54	852.31	0.06
11.4.9	<i>Acacia harpophylla</i> shrubby open forest to woodland with <i>Terminalia oblongata</i> on Cainozoic clay plains	E	1.92	2450.58	0.08
11.8.13	Semi-evergreen vine thicket and microphyll vine forest on Cainozoic igneous rocks.	E	3.08	1063.04	0.29
11.8.15	<i>Eucalyptus brownii</i> or <i>Eucalyptus populnea</i> woodland on Cainozoic igneous rocks.	E	0.26	227.06	0.11
11.9.5	<i>Acacia harpophylla</i> and/or <i>Casuarina cristata</i> open forest on fine-grained sedimentary rocks	E	4.66	1771.21	0.26
11.11.14	<i>Acacia harpophylla</i> open forest on deformed and metamorphosed sediments and interbedded volcanics	E	0.88	602.06	0.15
11.11.18	Semi-evergreen vine thicket on old sedimentary rocks with varying degrees of metamorphism and folding.	E	0.88	368.46	0.24
11.3.2	<i>Eucalyptus populnea</i> woodland on alluvial plains	OC	42.33	14655.85	0.29
11.3.2b	<i>Eucalyptus populnea</i> woodland on alluvial plains	OC	0.05	26.30	0.18
11.3.3	<i>Eucalyptus coolabah</i> woodland on alluvial plains	OC	0.43	3966.25	0.01
11.3.4	<i>Eucalyptus tereticornis</i> and/or <i>Eucalyptus</i> spp. tall woodland on alluvial plains	OC	12.65	5591.38	0.23
11.3.36	<i>Eucalyptus crebra</i> and/or <i>E. populnea</i> and/or <i>E. melanophloia</i> on alluvial plains. Higher terraces	OC	3.22	270.13	1.19
11.4.2	<i>Eucalyptus</i> spp. and/or <i>Corymbia</i> spp. grassy or shrubby woodland on Cainozoic clay plains	OC	0.31	401.33	0.08
11.8.11	<i>Dichanthium sericeum</i> grassland on Cainozoic igneous rocks	OC	9.51	6144.08	0.15
11.9.7a	<i>Eucalyptus populnea</i> , <i>Eremophila mitchellii</i> shrubby woodland on fine-grained sedimentary rocks	OC	39.56	8630.71	0.46
11.11.10	<i>Eucalyptus melanophloia</i> woodland on deformed and metamorphosed sediments and interbedded volcanics	OC	0.23	3230.88	0.01
11.11.10a	<i>Eucalyptus melanophloia</i> woodland on deformed and metamorphosed sediments and interbedded volcanics	OC	0.05	170.83	0.03
11.11.16	<i>Eucalyptus cambageana</i> , <i>Acacia harpophylla</i> woodland on old sedimentary rocks with varying degrees of metamorphism and folding. Lowlands	OC	2.04	211.02	0.97
	Total		126.40	55525.78	0.23

* Status under Queensland VM Act: E = Endangered; OC = Of Concern.

^ Percentage of area in 5 km buffer that lies within the 40 m ROW.

6.2.1.2 Biodiversity Status

The ABP transects 11 REs with a Biodiversity Status of Endangered and 12 Of Concern REs. **Table 11** summarises the areas of these REs within the ROW and 5 km buffer. The ROW contains only 16.3 ha of Endangered RE, which represents about 0.13% of the area of Endangered RE within the 5 km buffer. Of Concern REs occupy 130.3 ha of the ROW, representing about 0.23% of the area within the 5 km buffer. The largest areas of Of Concern REs within the ROW include:

- 42.4 ha of RE 11.3.2 / 11.3.2a (*Eucalyptus populnea* woodland on alluvial plains);
- 39.6 ha of RE 11.9.7a (*Eucalyptus populnea*, *Eremophila mitchellii* shrubby woodland on fine-grained sedimentary rocks); and
- 15.7 ha of RE 11.3.25 (*Eucalyptus tereticornis* or *E. camaldulensis* woodland fringing drainage lines).

Table 11 REs with Endangered and Of Concern Biodiversity Status within the ROW and the 5 km Buffer

RE	Description	VM Act Status*	Area (ha)		% in ^ Buffer
			ROW	5km Buffer	
11.3.1	<i>Acacia harpophylla</i> and/or <i>Casuarina cristata</i> open forest on alluvial plains	E	3.22	4337.33	0.07
11.4.8	<i>Eucalyptus cambageana</i> woodland to open forest with <i>Acacia harpophylla</i> or <i>A. argyrodendron</i> on Cainozoic clay plains	E	0.54	852.31	0.06
11.4.9	<i>Acacia harpophylla</i> shrubby open forest to woodland with <i>Terminalia oblongata</i> on Cainozoic clay plains	E	1.92	2450.58	0.08
11.9.5	<i>Acacia harpophylla</i> and/or <i>Casuarina cristata</i> open forest on fine-grained sedimentary rocks	E	4.66	1771.21	0.26
11.3.11	Semi-evergreen vine thicket on alluvial plains	E	0.44	191.31	0.23
11.3.21	<i>Dichanthium sericeum</i> and/or <i>Astrelba</i> spp. grassland on alluvial plains. Cracking clay soils	E	0.13	363.67	0.04
11.5.15	Semi-evergreen vine thicket on Cainozoic sand plains/remnant surfaces	E	0.24	411.25	0.06
11.8.13	Semi-evergreen vine thicket and microphyll vine forest on Cainozoic igneous rocks.	E	3.08	1063.04	0.29
11.8.15	<i>Eucalyptus brownii</i> or <i>Eucalyptus populnea</i> woodland on Cainozoic igneous rocks.	E	0.26	227.06	0.11
11.11.14	<i>Acacia harpophylla</i> open forest on deformed and metamorphosed sediments and interbedded volcanics	E	0.88	602.06	0.15
11.11.18	Semi-evergreen vine thicket on old sedimentary rocks with varying degrees of metamorphism and folding.	E	0.88	368.46	0.24
11.3.2	<i>Eucalyptus populnea</i> woodland on alluvial plains	OC	42.33	14655.85	0.29
11.3.2b	<i>Eucalyptus populnea</i> woodland on alluvial plains	OC	0.05	26.30	0.18
11.3.3	<i>Eucalyptus coolabah</i> woodland on alluvial plains	OC	0.43	3966.25	0.01
11.3.4	<i>Eucalyptus tereticornis</i> and/or <i>Eucalyptus</i> spp. tall woodland on alluvial plains	OC	12.65	5591.38	0.23
11.3.7	<i>Corymbia</i> spp. woodland on alluvial plains.	OC	3.24	1790.65	0.18
11.4.2	<i>Eucalyptus</i> spp. and/or <i>Corymbia</i> spp. grassy or shrubby woodland on Cainozoic clay plains	OC	0.31	401.33	0.08
11.3.25	<i>Eucalyptus tereticornis</i> or <i>E. camaldulensis</i> woodland fringing drainage lines	OC	15.69	11126.91	0.14
11.3.27f	Freshwater wetlands	OC	0.99	212.12	0.47
11.3.36	<i>Eucalyptus crebra</i> and/or <i>E. populnea</i> and/or <i>E. melanophloia</i> on alluvial plains. Higher terraces	OC	3.22	270.13	1.19
11.8.11	<i>Dichanthium sericeum</i> grassland on Cainozoic igneous rocks	OC	9.51	6144.08	0.15
11.9.7a	<i>Eucalyptus populnea</i> , <i>Eremophila mitchellii</i> shrubby woodland on fine-grained sedimentary rocks	OC	39.56	8630.71	0.46

RE	Description	VM Act Status*	Area (ha)		% in ^ Buffer
			ROW	5km Buffer	
11.11.10	<i>Eucalyptus melanophloia</i> woodland on deformed and metamorphosed sediments and interbedded volcanics	OC	0.23	3230.88	0.01
11.11.10a	<i>Eucalyptus melanophloia</i> woodland on deformed and metamorphosed sediments and interbedded volcanics	OC	0.05	170.83	0.03
11.11.16	<i>Eucalyptus cambageana</i> , <i>Acacia harpophylla</i> woodland on old sedimentary rocks with varying degrees of metamorphism and folding. Lowlands	OC	2.04	211.02	0.97
	Total		146.6	69066.72	0.21

* Biodiversity status recognised by Queensland DERM: E = Endangered; OC = Of Concern.

^ Percentage of area in 5 km buffer that lies within the 40 m ROW.

6.2.2 Regrowth Vegetation

Regulated regrowth vegetation includes:

- areas mapped by DERM as high-value regrowth (HVR) vegetation of REs that are Endangered, Of Concern and Least Concern, and have not been cleared since 31 December 1989;
- areas of native woody vegetation within 50m of a regrowth watercourse identified by DERM as a priority GBR catchment; and
- areas mapped as a category C area on a Property Map of Assessable Vegetation (PMAV).

The ROW contains 125.5 ha of HVR vegetation, which represents about 0.33% of the area of HVR within the 5 km buffer (**Table 12**). This includes 40.6 ha of HVR of Endangered RE, 61.5 ha of HVR of Of Concern RE and 23.4 ha of HVR of Least Concern RE. Mapped HVR vegetation within the study area is shown in **Map 6** of the IAS.

Table 12 High Value Regrowth Vegetation within the ROW and the 5 km Buffer

Regrowth Status*	Area in ROW (ha)	Area in 5km Buffer (ha)	% in Buffer^
E (dominant)	20.88	8426.59	0.25
E (sub dominant)	19.74	3432.60	0.58
OC (dominant)	29.79	9554.85	0.31
OC (sub dominant)	31.71	5826.10	0.54
LC	23.35	10739.54	0.22
Total Regrowth	125.47	37979.68	0.33

* Status under Queensland VM Act: E = Endangered; OC = Of Concern; LC = Least Concern.

^ Percentage of area in 5 km buffer that lies within the 40 m ROW.

Only the northern 39 km of the ABP transects watercourses mapped as GBR priority watercourses by DERM. The ROW contains 11.7 ha of regrowth watercourses, which represent about 0.27% of the total area within the 5 km buffer.

6.3 Impacts on Vegetation

With appropriate mitigation, impacts of pipeline construction on vegetation are expected to be limited to the direct removal of a maximum of 474 ha of remnant vegetation, 125.5 ha of high value regrowth vegetation and 11.7 ha of regrowth watercourse vegetation within the 40 m ROW. Field assessments will be undertaken to ground-truth vegetation within the ABP and identify potential route revisions that reduce impacts on vegetation, especially Endangered EECs and Endangered and Of Concern REs, wherever possible.

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7.0 Essential Habitat

Essential habitat is vegetation where a species that is listed as EVNT under the Queensland NC Act has been recorded. DERM uses essential habitat mapping to regulate vegetation clearing in such a way as to prevent the loss of biodiversity.

The biological and/or non-biological habitat requirements of a species are covered by specifying essential habitat factors and can include, but are not limited to:

- vegetation - the species or types of vegetation with which the EVNT species is associated;
- regional ecosystem - the regional ecosystem(s) with which the EVNT species is most commonly associated;
- land zone - the underlying geology associated with a regional ecosystem;
- altitude - the range of altitudes at which the EVNT species is found;
- soils - the type of soil on which the EVNT species is most commonly found; and
- position in landscape—a precise description of the landscape features the EVNT species is commonly associated with (e.g. creek bank, levees, lower slopes, hillsides and ridges).

Essential habitat for two species, Little Pied Bat (*Chalinolobus picatus*) and Black Ironbox (*Eucalyptus raveretiana*) is mapped within the ROW (**Map 7** of IAS). The amount of Essential Habitat for each species within the ROW is shown in **Table 13**. The ROW contains 6.95 ha of essential habitat, which is about 0.2% of the 3474.1 ha mapped within the 5 km buffer.

Table 13 Essential Habitat within the ROW

Species	Common Name	Area within ROW (ha)	Location within ROW
<i>Chalinolobus picatus</i>	Little Pied Bat	6.25	KP 77 - 78
<i>Eucalyptus raveretiana</i>	Black Ironbox	0.70	KP 377 - 378
Total		6.95	

The ROW contains 6.25 ha of remnant vegetation mapped as essential habitat for Little Pied Bat, which is listed as Near Threatened under the NC Act. This species is associated with areas of dry eucalypt woodland and open forest (e.g. *Eucalyptus melanophloia*, *E. populnea*, *E. crebra*, *E. moluccana*, *E. tereticornis*, *Corymbia citriodora* and *C. tessellaris*) at altitudes from 0 to 850 m above sea level. The bat is known to roost in caves, rock outcrops, mine shafts, tunnels, tree hollows and disused buildings. It can tolerate high temperatures and dryness but needs access to nearby open water. It feeds on moths and possibly other flying invertebrates.

The ROW contains 0.7 ha of essential habitat for Black Ironbox, which is listed as Vulnerable under the NC Act and the EPBC Act, near the crossing of Limestone Creek. This species occurs along rivers, creeks and watercourses on clay and loam soils. The distribution of the species overlaps with three EPBC listed EECs (Brigalow, semi-evergreen vine thickets and natural grasslands of the Queensland central highlands and the northern Fitzroy basin).

Field assessments along the proposed pipeline route will assess the presence of suitable habitat for these species within the ROW and undertake targeted surveys in areas of suitable habitat. Measures to avoid, mitigate or offset impacts will be developed where surveys identify the presence of significant essential habitat.

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8.0 Biodiversity Status

DERM has conducted comprehensive biodiversity planning assessments (BPAs) for bioregions within Queensland using the biodiversity assessment and mapping methodology (EPA, 2002). This methodology provides a consistent approach for assessing biodiversity values at the landscape scale in Queensland. It ranks areas of remnant vegetation into state, regional and local biodiversity significance, using a range of ecological criteria including size, rarity, diversity, fragmentation, habitat condition, resilience, threats, habitat for EVNT species and ecosystem processes. A key output of the BPA is identification and mapping of terrestrial biodiversity corridors and riparian wildlife corridors throughout Queensland. The most recent BPA for the Brigalow Belt Bioregion is version 1.3 (EPA, 2008).

The ROW contains 508 ha of vegetation of biodiversity significance, which represents about 0.25% of the total area of biodiversity significance mapped within the 5 km buffer (**Table 14**). This includes 359.6 ha of state significance, 90.6 ha of regional significance and 57.8 ha of local significance.

Table 14 Areas of BPA Status within the ROW and the 5 km Buffer

BPA Status *	Area in ROW (ha)	Area in 5km Buffer (ha)	% in Buffer ^
Local	57.76	23085.37	0.25
Regional	90.64	38143.10	0.24
State	359.58	137352.30	0.26
State Habitat for EVNT taxa		1235.92	0.00
Total	507.98	199816.68	0.25

* Status assigned by DERM in BPA.

^ Percentage of area in 5 km buffer that lies within the 40 m ROW.

The ABP transects four terrestrial biodiversity corridors and 51 riparian corridors identified in the BPA. These corridors are mapped in **Map 8** of the IAS and the areas of each corridor type within the ROW and the 5 km buffer are provided in **Table 15**. The ROW contains 706.7 ha of mapped corridor, which represents about 0.39% of the total corridor area within the 5 km buffer. However, a large proportion of the area identified within BPA corridors is non-remnant vegetation with low ecological value in its present condition. This is because corridors are buffered lines that connect existing core habitat areas and often traverse extensive areas of heavily cleared and highly fragmented landscape. Terrestrial corridors are typically 10 km wide (i.e. use a 5 km buffer), while riparian corridors are generally 2 km wide.

Table 15 BPA Wildlife Corridors within the ROW and the 5 km Buffer

BPA Corridor Status / Type *	Area in ROW (ha)	Area in 5km Buffer (ha)	% in Buffer ^
Regional Riparian	204.28	54263.12	0.38
State Riparian	36.47	19991.61	0.18
State Terrestrial	460.49	101772.81	0.45
State Terrestrial / Riparian	5.44	5206.11	0.10
Total	706.67	181233.65	0.39

* Status and type of corridor assigned by DERM in BPA.

^ Percentage of area in 5 km buffer that lies within the 40 m ROW.

The impact of the ABP on the current ecological value of corridor areas can be assessed by analysing the area of remnant vegetation in the ROW that is mapped within or adjoining the identified corridors. Remnant vegetation in corridors is mapped in **Map 8** of the IAS and areas within the ROW and the 5 km buffer are calculated in **Table 16**. The ROW contains 294.8 ha of remnant vegetation within corridors. This figure is less than half the area identified as BPA corridor, indicating that over half of the BPA corridors within the ROW are non-remnant. Field assessments will be undertaken to ground-truth corridors within the ABP and identify potential route revisions that reduce impacts on landscape connectivity, wherever possible.

Table 16 Remnant Vegetation Mapped in BPA Wildlife Corridors within the ROW and the 5 km Buffer

BPA Corridor Status / Type *	Area in ROW (ha)	Area in 5km Buffer (ha)	% in Buffer ^
Regional Corridor Vegetation	4.39	8760.17	0.05
State Corridor Vegetation	290.37	97824.29	0.30
Total	294.76	106584.46	0.28

* Status and type of corridor assigned by DERM in BPA.

^ Percentage of area in 5 km buffer that lies within the 40 m ROW.

9.0 Flora

The ABP transects or lies adjacent to a large variety of habitats, which support a wide diversity of native flora species. The Queensland Herbarium has specimens of 963 vascular plant species within the buffer area, including 795 native species and 168 introduced species. The Queensland Herbarium collection contains 6 pteridophytes (ferns), 6 gymnosperms (cycads and conifers) and 951 species of angiosperms (flowering plants). Density of plant specimens in the north-western half of the pipeline (i.e. west of the Broadsound Range from KP 0 to KP 310) is significantly lower than in the south-eastern half, probably due at least in part to lower accessibility and less intensive collecting effort in this portion of Queensland. To compensate for this discrepancy in specimen density, a larger buffer of 10 km was utilised around the pipeline route west of the Broadsound Range, while the standard 5 km buffer was used in the section east of the range.

9.1 EVNT Flora

Table 17 lists EVNT flora species recorded within buffers of 1 km and 5 km from the proposed pipeline route (and within 10 km in the north-western section). Species data was collated from Queensland Herbarium, Wildnet and EPBC databases. A total of 33 EVNT species were recorded, comprising 3 gymnosperms and 30 angiosperms. The 10 km buffer recorded 29 species and the 5 km buffer had 24 species. The 1 km buffer contained only 5 species. No EVNT species were recorded within the 40 m ROW. Queensland Herbarium threatened species records are mapped in **Map 7** of the IAS.

EPBC listed flora include five Endangered species and 13 Vulnerable species. Flora listed under the Queensland NC Act include six Endangered species, 11 Vulnerable species and 12 Near Threatened species.

Table 17 EVNT Flora Species Recorded within the Pipeline Buffer

Scientific name	Group	Family Name	Status* EPBC	Status* NC Act	Buffer^(km)			Source^^
					1	5	10	
<i>Bertya pedicellata</i>	Angiosperm	Euphorbiaceae		NT	1	1	1	QH, W
<i>Bosistoa transversa</i> (syn. <i>B. selwynii</i>)	Angiosperm	Rutaceae	V			1		EPBC
<i>Capparis humistrata</i>	Angiosperm	Capparaceae		E		1	1	QH, W
<i>Cerbera dumicola</i>	Angiosperm	Apocynaceae		NT		1	1	QH, W
<i>Corymbia xanthope</i>	Angiosperm	Myrtaceae	V	V		1		W
<i>Cossinia australiana</i>	Angiosperm	Sapindaceae	E	E		1		EPBC
<i>Cupaniopsis shirleyana</i>	Angiosperm	Sapindaceae	V	V		1	1	QH, EPBC
<i>Cycas megacarpa</i>	Gymnosperm	Cycadaceae	E	E		1	1	QH, W
<i>Cycas ophiolitica</i>	Gymnosperm	Cycadaceae	E	E			1	EPBC
<i>Cyperus clarus</i>	Angiosperm	Cyperaceae		V		1	1	QH
<i>Dansiea elliptica</i>	Angiosperm	Combretaceae		NT			1	W
<i>Desmodium macrocarpum</i>	Angiosperm	Fabaceae		NT	1	1	1	QH, W
<i>Dichanthium queenslandicum</i>	Angiosperm	Poaceae	V	V	1	1	1	QH, W
<i>Dichanthium setosum</i>	Angiosperm	Poaceae	V	NT			1	QH, W
<i>Digitaria porrecta</i>	Angiosperm	Poaceae	E	NT			1	EPBC
<i>Eucalyptus raveretiana</i>	Angiosperm	Myrtaceae	V	V	1	1	1	QH, W
<i>Graptophyllum ilicifolium</i>	Angiosperm	Acanthaceae	V	V		1	1	W
<i>Hernandia bivalvis</i>	Angiosperm	Hernandiaceae		NT			1	W
<i>Lepidium hyssopifolium</i>	Angiosperm	Brassicaceae	E				1	W
<i>Leucopogon cuspidatus</i>	Angiosperm	Ericaceae	V			1	1	EPBC
<i>Lissanthe brevistyla</i>	Angiosperm	Ericaceae		V		1	1	QH, W
<i>Macropteranthes leiocaulis</i>	Angiosperm	Combretaceae		NT	1	1	1	QH, W
<i>Macrozamia serpentina</i>	Gymnosperm	Zamiaceae		E		1	1	QH, W

Scientific name	Group	Family Name	Status* EPBC	Status* NC Act	Buffer^(km)			Source^^
					1	5	10	
<i>Marsdenia hemiptera</i>	Angiosperm	Apocynaceae		NT		1	1	QH, W
<i>Ozothamnus eriocephalus</i>	Angiosperm	Asteraceae	V	V		1	1	QH, W
<i>Paspalidium scabrifolium</i>	Angiosperm	Poaceae		NT		1	1	QH, W
<i>Paspalidium udum</i>	Angiosperm	Poaceae		V			1	W
<i>Pimelea leptospermoides</i>	Angiosperm	Thymelaeaceae	V	NT		1	1	QH, W
<i>Pultenaea setulosa</i>	Angiosperm	Fabaceae	V	V		1	1	QH, W
<i>Quassia bidwillii</i>	Angiosperm	Simaroubaceae	V	V			1	EPBC
<i>Sannantha brachypoda</i>	Angiosperm	Myrtaceae		NT			1	QH, W
<i>Solanum elaeagnifolium</i>	Angiosperm	Solanaceae		E		1	1	QH, W
<i>Taeniophyllum muelleri</i>	Angiosperm	Orchidaceae	V			1		EPBC

* Status under EPBC Act and NC Act: E = Endangered; V = Vulnerable; NT = Near Threatened.

^ Location of species record: Within 1 km, 5 km or 10 km buffer of proposed ABP (10 km buffer only used in section from KP 0 - 310).

^^ Source of data: QH = Queensland Herbarium; W = DERM Wildnet; EPBC = EPBC protected matters search.

Table 18 assesses the likelihood of occurrence for each the 33 EVNT species within the pipeline ROW, based on:

- knowledge of preferred habitats for the species from published information and previous survey experience;
- the presence of suitable habitat for the species within and adjacent to the ROW using RE mapping; and
- the proximity of Queensland Herbarium specimen records to the ROW.

Based on this analysis, five EVNT flora species are considered likely to occur within the ROW, 24 species may possibly occur and four species are considered unlikely to be present. Field assessments along the proposed pipeline route will assess the presence of suitable habitat for these species within the ROW and undertake targeted surveys in areas of suitable habitat. Measures to avoid, mitigate or offset impacts will be developed where surveys identify the presence of EVNT species or significant areas of suitable habitat.

Table 18 Preferred Habitat Analysis of EVNT Flora Species Potentially Occurring in Pipeline ROW

Scientific name	Preferred Habitat	Likelihood of occurrence
<i>Bertya pedicellata</i>	Restricted to central Queensland. Associated with <i>Corymbia trachypholia</i> , <i>Acacia catenulata</i> , <i>A. curvinervia</i> , and <i>A. shirleyi</i> .	Possible
<i>Bosistoia transversa</i>	Alluvial flats in rainforest areas.	Unlikely
<i>Capparis humistrata</i>	Stony hard ridges and serpentinite soils in eucalypt woodland with a shrubby understorey. Also occurs on the margins of brigalow forest on sandy soil.	Possible
<i>Cerbera dumicola</i>	Vine thickets and lancewood thickets throughout Central Queensland	Probable
<i>Corymbia xanthope</i>	Restricted between Rockhampton and Marlborough and on South Percy Island. Occurring on soils derived from serpentinite	Possible
<i>Cossinia australiana</i>	Dry rainforests and vine thickets from Kingaroy and Gympie to Rockhampton. area	Possible
<i>Cupaniopsis shirleyana</i>	Depauperate rainforests from Brisbane to Mt Larcom near Gladstone.	Possible
<i>Cycas megacarpa</i>	Stony clay loams on hill tops and steep slopes. Commonly in spotted gum and ironbark open forest and woodland with a grassy understorey.	Probable
<i>Cycas ophiolitica</i>	Tall open forest dominated by <i>Lophostemon confertus</i> and on complex notophyll vine forest margins. Grows on rocky soils derived from tertiary basalts on hill slopes and crests from 25-73m altitude.	Possible
<i>Cyperus clarus</i>	Grows in grassland or open woodland, on heavy soils derived from basalt.	Possible
<i>Dansiea elliptica</i>	Sandy granitic soils on rainforest margins, dry rainforests and vine thickets.	Possible

Scientific name	Preferred Habitat	Likelihood of occurrence
<i>Desmodium macrocarpum</i>	Occurs in open woodland and open forest communities.	Probable
<i>Dichanthium queenslandicum</i>	Component of Queensland Bluegrass grasslands on black cracking clay soils.	Possible
<i>Dichanthium setosum</i>	Grassy woodland and open forest.	Possible
<i>Digitaria porrecta</i>	Grows on rich soils in grasslands, grassy woodlands or grassy forests.	Possible
<i>Eucalyptus raveretiana</i>	Creek beds and riverbanks in coastal and subcoastal areas from Ayr and Charters Towers south to Duaringa in central Queensland.	Probable
<i>Graptophyllum ilicifolium</i>	Drainage lines with rocky substrates including quartz, feldspar, blackwood quartz sienite and sedimentary rocks. Found in vegetation dominated by tall to very tall mixed notophyll forest.	Possible
<i>Hernandia bivalvis</i>	Dry rainforest and vine scrubs.	Possible
<i>Lepidium hyssopifolium</i>	Originally occurred in eucalypt and/ or <i>Allocasuarina</i> woodland with a grassy understorey, and native temperate grasslands. Now inhabits heavily modified, non-natural environments, usually amongst exotic pasture grasses and weed species.	Possible
<i>Leucopogon cuspidatus</i>	Mountain tops on poor skeletal soils, amongst granite or serpentinite outcrops.	Possible
<i>Lissanthe brevistyla</i>	Steep hillsides in eucalypt woodlands usually on red gravelly soil or on loose stony slopes.	Possible
<i>Macropteranthes leiocaulis</i>	Deciduous vine thickets, semi-evergreen vine thickets and araucarian microphyll vine forests on red ferrosols or sandstone talus.	Probable
<i>Macrozamia serpentina</i>	Leichardt and Port Curtis Districts between Marlborough and Yaamba, north of Rockhampton. It grows at altitudes between 8 and 16 m in low woodland with a mixed grassy and shrubby understorey in red clay loams over serpentinites. Associated canopy species include <i>Corymbia xanthope</i> and <i>Eucalyptus fibrosa</i> .	Possible
<i>Marsdenia hemiptera</i>	Notophyll vine forests in gorges or low lying areas near watercourses	Unlikely
<i>Ozothamnus eriocephalus</i>	Known from elevations of between 38 and 95 m in a range of habitat types, including disturbed notophyll vine forest, margins of gallery rainforest, microphyll vine forest, open eucalypt forest and on rocky ridges within <i>Eucalyptus</i> and <i>Acacia</i> scrub.	Possible
<i>Paspalidium scabrifolium</i>	Brigalow forests and woodlands.	Possible
<i>Paspalidium udum</i>	Floodplains and poorly drained swampy areas up to 1 m deep.	Possible
<i>Pimelea leptospermoides</i>	Restricted from near Marlborough to Balnagowan near Yeppoon in central Qld, in tall to low open forests and woodland growing on serpentine soils.	Possible
<i>Pultenaea setulosa</i>	Wet to dry sclerophyll forest, subalpine woodland to heaths. Sandy loam on sedimentary rock, granite, porphyry, volcanic substrates, siliceous soil or serpentinite soils.	Possible
<i>Quassia bidwillii</i>	Below 65 m in rainforests, open forest, woodland and mangroves.	Possible
<i>Sannantha brachypoda</i>	Known from sites near Rolleston, Woorabinda and Theodore in sandstone gullies or on the sandy alluvials adjacent to sandstone ridges.	Unlikely
<i>Solanum elachophyllum</i>	Cracking clay soils associated with <i>Acacia harpophylla</i> , <i>Casuarina cristata</i> , <i>Macropteranthes</i> or <i>Eucalyptus cambageana</i> .	Possible
<i>Taeniophyllum muelleri</i>	Epiphytic vine on the branches of rainforest trees in coastal areas.	Unlikely

9.2 Aquatic Flora

The majority of the waterways and wetlands intersected by the pipeline are likely to be ephemeral and contain limited habitat for aquatic species. Nevertheless, numerous aquatic and semi-aquatic flora species have been recorded in wetlands within the pipeline buffer (**Table 19**).

The majority of these aquatic species are common and widespread. One grass, *Paspalidium udum*, is considered to be Vulnerable under the NC Act, and could potentially occur in freshwater wetlands along the proposed pipeline.

Several aquatic and semi-aquatic weeds are present in the pipeline buffer, including Hymenachne, Water Hyacinth and Salvinia.

Table 19 Native Aquatic Flora Species Recorded within the Pipeline Buffer

Scientific Name	Family	Plant Group	Habitat
<i>Abildgaardia ovata</i>	Cyperaceae	Angiosperm	Semi-aquatic
<i>Aponogeton queenslandicus</i>	Aponogetonaceae	Angiosperm	Freshwater
<i>Bruguiera gymnorhiza</i>	Rhizophoraceae	Angiosperm	Estuarine
<i>Ceratophyllum demersum</i>	Ceratophyllaceae	Angiosperm	Freshwater
<i>Cyperus</i> species	Cyperaceae	Angiosperm	Freshwater, semi-aquatic
<i>Eleocharis dietrichiana</i>	Cyperaceae	Angiosperm	Freshwater
<i>Fimbristylis</i> species	Cyperaceae	Angiosperm	Freshwater, semi-aquatic
<i>Ischaemum australe</i>	Poaceae	Angiosperm	Semi-aquatic
<i>Juncus</i> species	Juncaceae	Angiosperm	Freshwater, semi-aquatic
<i>Ludwigia octovalvis</i>	Onagraceae	Angiosperm	Semi-aquatic
<i>Ludwigia peploides</i>	Onagraceae	Angiosperm	Freshwater
<i>Marsilea exarata</i>	Marsileaceae	Pteridophyte	Freshwater
<i>Nymphaea gigantea</i>	Nymphaeaceae	Angiosperm	Freshwater
<i>Ottelia alismoides</i>	Hydrocharitaceae	Angiosperm	Freshwater
<i>Paspalidium udum</i>	Poaceae	Angiosperm	Freshwater
<i>Persicaria attenuata</i>	Polygonaceae	Angiosperm	Freshwater
<i>Persicaria hydropiper</i>	Polygonaceae	Angiosperm	Freshwater
<i>Persicaria lappathifolia</i>	Polygonaceae	Angiosperm	Freshwater
<i>Persicaria orientalis</i>	Polygonaceae	Angiosperm	Freshwater
<i>Persicaria prostrata</i>	Polygonaceae	Angiosperm	Freshwater
<i>Polygonum plebeium</i>	Polygonaceae	Angiosperm	Freshwater
<i>Potamogeton crispus</i>	Potamogetonaceae	Angiosperm	Freshwater
<i>Potamogeton pectinatus</i>	Potamogetonaceae	Angiosperm	Freshwater
<i>Pseudoraphis paradoxa</i>	Poaceae	Angiosperm	Freshwater
<i>Pseudoraphis spinescens</i>	Poaceae	Angiosperm	Freshwater
<i>Schoenoplectus litoralis</i>	Cyperaceae	Angiosperm	Freshwater
<i>Scleria mackaviensis</i>	Cyperaceae	Angiosperm	Semi-aquatic
<i>Scleria polycarpa</i>	Cyperaceae	Angiosperm	Semi-aquatic
<i>Suaeda arbusculoides</i>	Chenopodiaceae	Angiosperm	Estuarine
<i>Tecticornia indica</i>	Chenopodiaceae	Angiosperm	Estuarine
<i>Tecticornia pergranulata</i>	Chenopodiaceae	Angiosperm	Estuarine

9.3 Introduced Flora

Searches of the Queensland Herbarium, DERM Wildnet and EPBC databases identified 236 introduced flora species within the pipeline buffer. Invasive species, including Weeds of National Significance (WoNS) and other introduced plants considered to pose a particular threat to biodiversity, that may occur in the ROW are listed in **Table 20**. Weeds declared under the *Land Protection (Pest and Stock Route Management) Act 2002* (LP Act) include:

- 22 species listed as Class 2 weeds; and
- 12 species listed as Class 3 weeds.

Eight Weeds of National Significance also occur within the subject area. Measures to minimise the introduction and spread of weeds during pipeline construction and operations will be developed during the EIS.

Table 20 Invasive Plants Recorded within the Pipeline Buffer

Scientific Name	Common Name	LP Act Status*	National Status^
<i>Acacia nilotica subsp. indica</i>	Prickly Acacia	Class 2	WoNS
<i>Asparagus aethiopicus</i>	Asparagus Fern	Class 3	
<i>Asparagus africanus</i>	Asparagus Fern	Class 3	
<i>Asparagus plumosus</i>	Climbing Asparagus Fern	Class 3	
<i>Baccharis halimifolia</i>	Groundsel Bush	Class 2	
<i>Bryophyllum delagoense</i>	Mother of Millions	Class 2	
<i>Bryophyllum x houghtonii</i>	Mother of Millions hybrid	Class 2	
<i>Cascabela thevetia</i>	Yellow Oleander	Class 3	
<i>Cinnamomum camphora</i>	Camphor Laurel	Class 3	
<i>Cryptostegia grandiflora</i>	Rubber Vine	Class 2	WoNS
<i>Eichhornia crassipes</i>	Water Hyacinth	Class 2	
<i>Harrisia martini</i>	Harrisia Cactus	Class 2	
<i>Hymenachne amplexicaulis</i>	Hymenachne	Class 2	WoNS
<i>Jatropha gossypifolia</i>	Bellyache Bush	Class 2	
<i>Lantana camara</i>	Lantana	Class 3	WoNS
<i>Lantana montevidensis</i>	Creeping Lantana	Class 3	
<i>Macfadyena unguis-cati</i>	Cat's Claw Creeper	Class 3	
<i>Opuntia streptacantha</i>	Cardona Pear	Class 2	
<i>Opuntia stricta</i>	Common Pest Pear	Class 2	
<i>Opuntia tomentosa</i>	Velvety Tree Pear	Class 2	
<i>Parkinsonia aculeata</i>	Parkinsonia	Class 2	WoNS
<i>Parthenium hysterophorus</i>	Parthenium Weed	Class 2	WoNS
<i>Pennisetum setaceum</i>	Fountain Grass	Class 3	
<i>Prosopis pallida</i>	Mesquites	Class 2	WoNS
<i>Salvinia molesta</i>	Salvinia	Class 2	WoNS
<i>Schinus terebinthifolius</i>	Broad-leaved Pepper Tree	Class 3	
<i>Spathodea campanulata subsp. nilotica</i>	African Tulip Tree	Class 3	
<i>Sphagneticola trilobata</i>	Singapore Daisy	Class 3	
<i>Sporobolus fertilis</i>	Giant Parramatta Grass	Class 2	
<i>Sporobolus jacquemontii</i>	American Rat's Tail Grass	Class 2	
<i>Sporobolus natalensis</i>	Giant Rat's Tail Grass	Class 2	
<i>Sporobolus pyramidalis</i>	Giant Rat's Tail Grass	Class 2	
<i>Thunbergia grandiflora</i>	Blue Thunbergia	Class 2	
<i>Ziziphus mauritiana</i>	Indian jujube; Chinee Apple	Class 2	

* Species declared under LP Act.

^ Species listed as Weeds of National Significance.

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10.0 Fauna

The ABP transects or lies adjacent to a variety of fauna habitats including wetlands, woodlands, vine thickets and grasslands. The Queensland Museum and DERM Wildnet searches indicate that 25 amphibian, 352 bird, 28 bony fish, 74 mammal and 91 reptile species have been recorded within 10 km of the proposed pipeline route. As for flora (**Section 9**), a larger buffer of 10 km was utilised around the north-western section of the pipeline route west of the Broadsound Range, while a smaller 5 km buffer was used in the section east of the range to compensate for the discrepancy in specimen collection density.

10.1 EVNT Fauna

Table 21 lists EVNT fauna species recorded within 5 km of the proposed pipeline route (and within 10 km in the north-western section). Species data was collated from Queensland Museum, Wildnet and EPBC databases. A total of 42 EVNT species were recorded, including one amphibian, 23 birds, eight mammals and ten reptiles. No EVNT species were recorded within the 40 m ROW or the 1 km buffer. Queensland Museum threatened species records are mapped in **Map 7** of the IAS.

EPBC listed fauna include one Critically Endangered species, three Endangered species and 17 Vulnerable species. Fauna listed under the Queensland NC Act include six Endangered species, 18 Vulnerable species and 14 Near Threatened species.

Based on analysis of habitat preferences, seven EVNT fauna species are considered likely to occur within the ROW, 27 species may possibly occur and eight species are considered unlikely to be present. Field studies along the proposed pipeline route will assess the presence of suitable habitat for these species within the ROW and undertake targeted surveys in areas of suitable habitat. Measures to avoid, mitigate or offset impacts will be developed where surveys identify the presence of EVNT species or significant areas of suitable habitat.

10.2 Migratory Species

A total of 94 species listed as migratory under the EPBC Act were identified by the DERM Wildnet, Queensland Museum and EPBC protected matters searches (**Table 22**). Of the 94 species identified by the searches as potentially occurring in the subject area:

- 11 are unlikely to occur based on habitat preferences;
- 14 could possibly be recorded as some of their habitat occurs within the subject area;
- 25 will probably be recorded as their habitat occurs within the subject area and they are relatively common;
- 7 will probably be recorded at farm dams;
- 12 will possibly be recorded at farm dams; and
- 25 could possibly be recorded in any estuarine wetlands.

No known significant breeding areas for migratory species have been recorded along the proposed pipeline route.

10.3 Aquatic Fauna

Numerous native fish species have been recorded within the project area including one species of Rainbow Fish, five species of gudgeon, three species of catfish, perch, garfish, grunters and eels. No threatened fish have been recorded within the project study area. One introduced species, the Mosquitofish (*Gambusia ambigua*), has been recorded within the study area.

EVNT aquatic species recorded from within the pipeline buffer include the Estuarine Crocodile, Green Turtle and Fitzroy River Turtle. A number of EVNT birds may also utilise aquatic habitats for feeding, roosting and / or nesting, including Freckled Duck, Radjah Shelduck, Little Tern, Australian Painted Snipe, Cotton Pygmy-goose, Sooty Oystercatcher, Yellow Chat and Black-necked Stork.

In Queensland, estuarine crocodiles are known to occur between Gladstone and Cape York Peninsula, and throughout the Gulf of Carpentaria. Although most commonly seen in tidal reaches of rivers, they also occur in freshwater lagoons, rivers, and swamps hundreds of kilometres inland from the coast. Recent surveys by DERM identified crocodiles at four locations in the lower Fitzroy River (Sullivan *et al.*, 2010), all downstream of the proposed ABP route. However, crocodiles have been recorded nesting at the Conroy crossing of the Fitzroy River, about 11 km upstream of the proposed ABP crossing (Inglis and Howell, 2009).

The Fitzroy River Turtle is found in rivers with large deep pools with rocky, gravelly or sandy substrates, connected by shallow riffles but in the dry season it may be found in large slow-flowing pools and non-flowing permanent water holes. Preferred areas have high water clarity, and are often associated with Ribbonweed (*Vallisneria* sp.) beds. Common riparian vegetation associated with this species includes Blue Gums (*Eucalyptus tereticornis*), River Oaks (*Casuarina cunninghamiana*), Weeping Bottlebrushes (*Callistemon viminalis*) and Paperbarks (*Melaleuca linariifolia*) (DSEWPC, 2010c). The Fitzroy River Turtle is only known to inhabit the Fitzroy River and its tributaries, including the Dawson, Mackenzie and Connors Rivers and Marlborough Creek. Known sites include Boolburra, Gainsford, Redbank Crossing, Glenroy Crossing, Theodore, Baralaba, Duaringa, and Gogango. This restricted distribution is fragmented by dams and weirs. The closest known locations to the ABP route are the Redbank and Glenroy crossings of the Fitzroy River, which are only 1.5 and 11 km upstream of the proposed ABP crossing of the Fitzroy River, respectively. The sandy banks in this area provide good nesting habitat for the Fitzroy River Turtle (Inglis and Howell, 2009).

Green Turtles are likely to inhabit coastal waters in central and northern Queensland, but these areas will not be significantly impacted by the ABP.

Further desktop assessment on the likelihood of these species occurring in the location of the proposed crossing points of the Fitzroy River and its tributaries will be conducted. This information will be used to target field surveys during the EIS. Measures to avoid, mitigate or offset impacts will be developed where surveys identify the presence of these species or significant areas of suitable habitat.

10.4 Introduced Fauna

Feral mammals declared under the Queensland LP Act that have been recorded within the pipeline buffer include Goat (*Capra hircus*), Cat (*Felis catus*), Rabbit (*Oryctolagus cuniculus*), Pig (*Sus scrofa*) and Fox (*Vulpes vulpes*). Other vertebrate species known or likely to occur within the buffer include Cane Toad (*Bufo marinus*) and Mosquitofish (*Gambusia ambigua*).

Table 21 EVNT Fauna Species Recorded Within Pipeline Buffer and their Preferred Habitat and Likelihood of Occurrence

Family Name	Scientific Name	Common Name	EPBC Status*	NC Act Status*	Preferred Habitat	Likelihood of occurrence	Source ^
AMPHIBIANS							
Hylidae	<i>Cyclorana verrucosa</i>	Rough Frog		NT	Temporary ponds, flooded depressions and creeks in woodlands after heavy spring and summer rain.	Possible	W
BIRDS							
Accipitridae	<i>Accipiter novaehollandiae</i>	Grey Goshawk		NT	Humid forests including dense eucalypt forests	Unlikely	W
Psittacidae	<i>Cacatua leadbeateri</i>	Major Mitchell's Cockatoo		V	Woodlands dominated by Mulga (<i>Acacia aneura</i>), mallee and box eucalypts, Cypress Pine or Belah (<i>Casuarina cristata</i>).	Possible	W
Psittacidae	<i>Cacatua pastinator pastinator</i>	Western Corella	V		Only found in Western Australia.	Unlikely	W
Psittacidae	<i>Calyptorhynchus lathami</i>	Glossy Black-Cockatoo		V	Coastal forest and open inland woodland. Feeds primarily on <i>Allocasuarina littoralis</i> or <i>Allocasuarina torulosa</i> .	Probable	W
Ciconiidae	<i>Ephippiorhynchus asiaticus</i>	Black-necked Stork		NT	Open freshwater environments along the margins of billabongs, lagoons, swamps, floodplains, dams and their adjacent grasslands, pastures and woodlands.	Probable	W
Meliphagidae	<i>Epthianura crocea macgregori</i>	Yellow Chat	CE	E	Coastal grassy swamps, lagoon margins with reeds and saltbush, inland around bores overflows in swamp cane grass, cambungi, lignum and saltbush.	Unlikely	W, EPBC
Accipitridae	<i>Erythrotriorchis radiatus</i>	Red Goshawk	V	E	Tropical grassy woodlands mostly in undulating stony lands.	Unlikely	EPBC, W
Falconidae	<i>Falco hypoleucos</i>	Grey Falcon		NT	Woodlands and open forests, watercourses, scrublands heathlands and farmland.	Possible	W
Columbidae	<i>Geophaps scripta scripta</i>	Squatter Pigeon (Southern)	V	V	Open grassy woodlands on sandy soils with gravelly ridges	Probable	EPBC, W
Haematopodidae	<i>Haematopus fuliginosus</i>	Sooty Oystercatcher		NT	Inhabits rocky shorelines, rocky islets, boulders below cliffs and reefs	Possible around estuarine wetlands	W

Family Name	Scientific Name	Common Name	EPBC Status*	NC Act Status*	Preferred Habitat	Likelihood of occurrence	Source ^
Accipitridae	<i>Lophoictinia isura</i>	Square-tailed Kite		NT	Range of diverse habitats including woodland dominated by eucalypts, <i>Pandanus</i> sp., gallery forest, heath.	Possible	W
Meliphagidae	<i>Melithreptus gularis</i>	Black-chinned Honeyeater		NT	Occupies mostly upper levels of drier open forests or woodlands dominated by box and ironbark eucalypts, especially <i>E. sideroxylon</i> , <i>E. albens</i> , <i>E. microcarpa</i> , <i>E. melliodora</i> and <i>E. tereticornis</i> .	Possible	W
Estrildidae	<i>Neochmia ruficauda ruficauda</i>	Star Finch	E	E	A largely sedentary inhabitant of grasslands and riparian grassy woodlands near water.	Unlikely	EPBC
Psittacidae	<i>Neophema pulchella</i>	Turquoise Parrot		NT	Inhabits woodland and open grassland.	Unlikely	W
Anatidae	<i>Nettapus coromandelianus</i>	Cotton Pygmy-goose		NT	Deep freshwater dams, swamps and lagoons particularly with lilies of floating vegetation.	Possible	W
Strigidae	<i>Ninox strenua</i>	Powerful Owl		V	Eucalypt forests, especially tall forests in ranges.	Possible	W
Scolopacidae	<i>Numenius madagascariensis</i>	Eastern Curlew		NT	Coasts and estuaries.	Possible around estuarine wetlands	W
Estrildidae	<i>Poephila cincta cincta</i>	Black-throated Finch (southern ssp.)	E	E	Open woodland, scrubby plains, <i>Pandanus</i> sp. flats with deep cover of grasses, never far from water.	Possible	W, EPBC
Rostratulidae	<i>Rostratula australis</i>	Australian Painted Snipe	V	V	Shallow inland wetlands, brackish or freshwater that are permanently or temporarily inundated	Possible	EPBC, W
Laridae	<i>Sterna albifrons</i>	Little Tern		E	Coastal, preferring sheltered environments; may occur several kilometres from the sea in harbours, inlets and rivers.	Possible around estuarine wetlands	W
Anatidae	<i>Stictonetta naevosa</i>	Freckled Duck		NT	Freshwater swamps or creeks where it feeds on zooplankton, crustaceans and algae. Uses expansive shallow swamps for breeding, and permanent waters for refuge during drought.	Possible	W
Anatidae	<i>Tadorna radjah</i>	Radjah Shelduck		NT	Shallow pools and mudbanks or the shallow fringes of deep pools.	Possible	W

Family Name	Scientific Name	Common Name	EPBC Status*	NC Act Status*	Preferred Habitat	Likelihood of occurrence	Source ^
Turnicidae	<i>Turnix melanogaster</i>	Black-breasted Button-quail	V	V	Closed rainforest, monsoon scrub and vine thickets.	Possible in vine thicket	W, EPBC
MAMMALS							
Vespertilionidae	<i>Chalinolobus dwyeri</i>	Large-eared Pied Bat	V	V	Dry forests and woodlands, moist eucalypt forests, caves and mines.	Possible	EPBC
Vespertilionidae	<i>Chalinolobus picatus</i>	Little Pied Bat		NT	Dry sclerophyll forest, woodland and scrub in the semi-arid zone of Queensland. It is known to forage along watercourses, and infrequently inhabits caves.	Probable	W
Dasyuridae	<i>Dasyurus hallucatus</i>	Northern Quoll	E		Most abundant in rocky eucalypt woodlands but occurs in a variety of habitats. The most successful breeding occurs near creeklines, and dens are usually in hollow tree trunks.	Possible	EPBC, W
Megadermatidae	<i>Macroderma gigas</i>	Ghost Bat		V	Caves and mine shafts. Recorded in Rockhampton and Gladstone.	Possible	W
Vespertilionidae	<i>Nyctophilus corbeni</i> (formerly <i>timorensis</i>)	Greater Long-eared Bat	V	V	Mallee, bulloke (<i>Allocasuarina leuhmanni</i>) and box eucalypt dominated communities. Requires hollows for roosting.	Possible	EPBC
Macropodidae	<i>Petrogale penicillata</i>	Brush-tailed Rock-wallaby	V	V	Inhabits rock piles and cliffs with numerous crevices and ledges in vegetation ranging from rainforest to dry sclerophyll forests.	Possible	W
Pteropodidae	<i>Pteropus conspicillatus</i>	Spectacled Flying-fox	V		Rainforests.	Unlikely	EPBC
Pteropodidae	<i>Pteropus poliocephalus</i>	Grey-Headed Flying-fox	V		Sub-tropical and temperate rainforest, tall open forest, swamps, heaths and urban areas. Roosting sites usually in dense forest adjacent to waterbodies. Forages within 15 km of camp in flowering trees or rainforests, eucalypts, paperbarks and banksias.	Probable at southern end of the line	W
REPTILES							
Elapidae	<i>Acanthophis antarcticus</i>	Common Death Adder		NT	Various habitats including coastal sand dunes, rainforest, shrublands, heaths and woodlands.	Probable	W
Cheloniidae	<i>Chelonia mydas</i>	Green Turtle	V	V	Tropical and warm temperate waters worldwide.	Unlikely	EPBC

Family Name	Scientific Name	Common Name	EPBC Status*	NC Act Status*	Preferred Habitat	Likelihood of occurrence	Source ^
Crocodylidae	<i>Crocodylus porosus</i>	Estuarine Crocodile		V	Coastal rivers and swamps extending well inland via major rivers and billabongs.	Probable in lower Fitzroy catchment	W
Pygopodidae	<i>Delma torquata</i>	Adorned Delma	V	V	Open eucalypt forest with a sparse understorey of shrubs and tussock grasses, on rocky hillsides with flattish rocks or on deep-cracking soils	Possible	W, EPBC
Elapidae	<i>Denisonia maculata</i>	Ornamental Snake	V	V	Open forests, woodland and riparian habitats, particularly near water with soil cracks, fallen timber on rocky, alluvial or black soil.	Possible	W, QM, EPBC
Scincidae	<i>Egernia rugosa</i>	Yakka Skink	V	V	Variety of habitats including alluvial soils, low ridges, cypress on sands, belah, mulga, and eucalypt woodland, log piles and rabbit warrens.	Possible	EPBC, W
Elapidae	<i>Furina dunmalli</i>	Dunmall's Snake	V	V	Woodlands and dry sclerophyll forest, particularly areas with Brigalow.	Possible	EPBC, W
Elapidae	<i>Hemiaspis damelii</i>	Grey Snake		E	Floodplains of the eastern interior, reaching coastal districts near Rockhampton. It shelters under fallen timber and in soil cracks or disused burrows, usually near inland watercourses.	Possible	W
Pygopodidae	<i>Paradelma orientalis</i>	Brigalow Scaly-foot	V	V	Eucalypt woodland and Brigalow scrub and is usually found under logs, rocks and debris.	Possible	EPBC, W
Chelidae	<i>Rheodytes leukops</i>	Fitzroy River Turtle	V	V	Riverine species dependent on shallow fast-flowing water (riffle zones). Inhabits the Fitzroy River and its tributaries.	Possible along the Fitzroy and Isaac River.	QM, EPBC, W

*Status under the EPBC Act and NC Act: CE = Critically Endangered, E = Endangered, V = Vulnerable; NT = Near Threatened).

^ Source of data: QM = Queensland Museum; W = DERM Wildnet; EPBC = EPBC protected matters search.

Table 22 Migratory Species Recorded Within Pipeline Buffer and their Preferred Habitat and Likelihood of Occurrence

Family Name	Scientific Name	Common Name	Preferred Habitat	Likelihood of Occurrence	Source^
Accipitridae	<i>Accipiter cirrocephalus</i>	Collared Sparrowhawk	Forests and woodlands throughout Australia.	Possible	Wildnet
Accipitridae	<i>Accipiter fasciatus</i>	Brown Goshawk	Forests and woodlands, dry scrublands and farms.	Possible	Wildnet
Accipitridae	<i>Accipiter novaehollandiae</i>	Grey Goshawk	Humid forests including dense eucalypt forests.	Unlikely	Wildnet
Scolopacidae	<i>Actitis hypoleucos</i>	Common Sandpiper	Coastal and interior wetlands where it forages along the narrow muddy edges of billabongs, river pools, mangroves and reefs or rock beaches.	Unlikely	Wildnet
Anatidae	<i>Anas castanea</i>	Chestnut Teal	Wetlands with a preference for brackish and coastal estuaries, lakes, salt marshes, tidal mudflats and coastal islands.	Probable on any farm dams	Wildnet
Anatidae	<i>Anas gracilis</i>	Grey Teal	Most wetlands and swamps, temporary floodwaters. Nomadic and disperses to follow resources.	Probable on any farm dams	Wildnet
Anatidae	<i>Anas platyrhynchos</i>	Mallard	Lakes, farm dams, picnic areas.	Probable on any farm dams	Wildnet
Anatidae	<i>Anas rhynchotis</i>	Australasian Shoveler	Wide variety of wetlands, but prefers large permanent swamps and lakes with thick vegetation. Nomadic and disperses following food and resources.	Possible on any farm dams	Wildnet
Anatidae	<i>Anas superciliosa</i>	Pacific Black Duck	Wetlands with a preference for large lakes and swamps with shrubbery of <i>Melaleuca</i> and cumbungi.	Probable on any farm dams	Wildnet
Apodidae	<i>Apus pacificus</i>	Fork-tailed Swift	Low to very high airspace over varied habitat, rainforest to semi-desert.	Probable	Wildnet, EPBC
Accipitridae	<i>Aquila audax</i>	Wedge-tailed Eagle	Variety of habitats but prefers to hunt over open habitats, often nests in forests, arid scrublands, alpine, mallee, coastline, wetlands and farming areas.	Probable	Wildnet
Ardeidae	<i>Ardea alba</i>	Great Egret	Wetlands, flooded pastures, dams, estuarine mudflats, mangroves and reefs.	Probable	EPBC
Ardeidae	<i>Ardea ibis</i>	Cattle Egret	Moist pastures with tall grass, shallow open wetlands and margins, mudflats.	Probable	EPBC
Scolopacidae	<i>Arenaria interpres</i>	Ruddy Turnstone	Beaches and coasts with exposed rocks, stony or shell beaches, mudflats and exposed reefs.	Possible around Fishermans Landing	Wildnet
Accipitridae	<i>Aviceda subcristata</i>	Pacific Baza	Margins and spaces of gallery forests, monsoon forests and swamp forests. Woodlands.	Probable	Wildnet

Family Name	Scientific Name	Common Name	Preferred Habitat	Likelihood of Occurrence	Source^
Anatidae	<i>Aythya australis</i>	Hardhead	Large deep lakes with abundant aquatic vegetation, occasionally creeks, flooded crops, floodplains, lagoons, mangrove swamps and salt lakes.	Probable on any farm dams	Wildnet
Anatidae	<i>Biziura lobata</i>	Musk Duck	Deep permanent lakes, swamps and dams with areas of reed beds and open waters.	Possible on any farm dams	Wildnet
Ardeidae	<i>Bubulcus ibis</i>	Cattle Egret	Moist pastures with tall grass, shallow open wetlands and margins, mudflats.	Probable	Wildnet
Scolopacidae	<i>Calidris acuminata</i>	Sharp-tailed Sandpiper	Fresh or salt wetlands, muddy edges of swamps, lagoons, lakes, dams, temporary floodwaters.	Possible around estuarine wetlands	Wildnet
Scolopacidae	<i>Calidris canutus</i>	Red Knot	Tidal sands and mudflats.	Possible around estuarine wetlands	Wildnet
Scolopacidae	<i>Calidris ferruginea</i>	Curlew Sandpiper	Inter-tidal mudflats of estuaries, lagoons, mangrove channels, lakes, dams, floodwaters and flooded saltbush around inland lakes.	Possible around estuarine wetlands	Wildnet
Scolopacidae	<i>Calidris ruficollis</i>	Red-necked Stint	Tidal and inland mudflats, salt marshes, beaches, salt fields and temporary floodwaters.	Possible around estuarine wetlands	Wildnet
Psittacidae	<i>Calyptorhynchus banksii</i>	Red-tailed Black-cockatoo	Variety of habitats including tall mountain forests, open tropical forests, woodlands and open habitats.	Probable	Wildnet
Charadriidae	<i>Charadrius mongolus</i>	Lesser Sand Plover	Sheltered beaches or estuaries with large intertidal mudflats or sandbanks. Roosts during high tide on sandy beaches and rocky shores, often with other waders.	Possible around estuarine wetlands	Wildnet
Charadriidae	<i>Charadrius ruficapillus</i>	Red-capped Plover	Estuaries, beaches, inland lakes	Possible around estuarine wetlands	Wildnet
Charadriidae	<i>Charadrius veredus</i>	Oriental Plover	Inland plains	Unlikely	Wildnet
Anatidae	<i>Chenonetta jubata</i>	Australian Wood Duck	Grassy woodlands near water, farm dams and parks. Require tree hollows for nesting.	Probable	Wildnet
Laridae	<i>Chlidonias leucopterus</i>	White-winged Black Tern	Lakes, estuaries and coastal seas	Possible around estuarine wetlands	Wildnet
Accipitridae	<i>Circus approximans</i>	Swamp Harrier	Wetlands including swamps and lakes, vegetated or open waters, mangroves and floodwaters.	Possible	Wildnet
Accipitridae	<i>Circus assimilis</i>	Spotted Harrier	Open woodland, open shrubland, very open woodlands and crops.	Possible	Wildnet
Campephagidae	<i>Coracina tenuirostris</i>	Cicadabird	Foliage of rainforests, eucalypt forests, woodlands, paperbark swamps and mangroves.	Possible	Wildnet
Cuculidae	<i>Cuculus saturatus</i>	Oriental Cuckoo	Forest and woodland. Summer migrant to northern Australia.	Possible	Wildnet

Family Name	Scientific Name	Common Name	Preferred Habitat	Likelihood of Occurrence	Source^
Anatidae	<i>Cygnus atratus</i>	Black Swan	Fresh and marine open waters with abundant aquatic vegetation, mudflats, farm dams, pastures, crops and suburban parks.	Possible on any farm dam	Wildnet
Anatidae	<i>Dendrocygna arcuata</i>	Wandering Whistling-Duck	Rivers, lagoons, swamps, flooded grasslands and estuarine areas with deep water.	Probable on any farm dams	Wildnet
Anatidae	<i>Dendrocygna eytoni</i>	Plumed Whistling-Duck	Wetlands near tropical and temperate grasslands. Farm dams.	Probable on any farm dams	Wildnet
Ardeidae	<i>Egretta sacra</i>	Eastern Reef Egret	Intertidal zones on rocks, coral reefs, mangroves and mudflats.	Possible around estuarine wetlands	Wildnet
Accipitridae	<i>Elanus axillaris</i>	Black-shouldered Kite	Natural grasslands and farmland stubble, heaths and saltbush with scattered trees.	Probable	Wildnet
Charadriidae	<i>Euseyornis melanops</i>	Black-fronted Dotterel	Freshwater wetlands, shallow swamps, billabongs, temporary clay pans, coastal saline waters, tidal mud flats and shorelines.	Possible	Wildnet
Charadriidae	<i>Erythrogonys cinctus</i>	Red-kneed Dotterel	Swamp edges and shallows.	Possible on any farm dam	Wildnet
Accipitridae	<i>Erythrotriorchis radiatus</i>	Red Goshawk	Tropical grassy woodlands mostly in undulating stony lands.	Unlikely	EPBC, Wildnet
Falconidae	<i>Falco berigora</i>	Brown Falcon	Open woodlands, grasslands, farmland, and heathlands.	Probable	Wildnet
Falconidae	<i>Falco cenchroides</i>	Nankeen Kestrel	Semi-arid and arid regions; lightly timbered country, especially stony plains and lightly timbered acacia scrublands.	Probable	Wildnet
Falconidae	<i>Falco hypoleucos</i>	Grey Falcon	Woodlands and open forests, watercourses, scrublands heathlands and farmland.	Probable	Wildnet
Falconidae	<i>Falco longipennis</i>	Australian Hobby	Variety of habitats including rainforest, arid scrublands, coastal heath and alpine.	Probable	Wildnet
Falconidae	<i>Falco peregrinus</i>	Peregrine Falcon	Variety of habitats including deserts, pasture, cities, woodland, areas with cliffs and rocky outcrops and coastal islands.	Probable	Wildnet
Falconidae	<i>Falco subniger</i>	Black Falcon	Box woodlands, with ironbark, yellow box, white box, fuzzy box, apple box, stringybark.	Probable	Wildnet
Pachycephalidae	<i>Falcunculus frontatus</i>	Eastern Shrike-thrush	Moist forest habitats with trees taller than 2 m.	Unlikely	Wildnet
Fregatidae	<i>Fregata ariel</i>	Lesser Frigatebird	Tropical seas.	Unlikely	Wildnet

Family Name	Scientific Name	Common Name	Preferred Habitat	Likelihood of Occurrence	Source [^]
Scolopacidae	<i>Gallinago hardwickii</i>	Latham's Snipe	Open, freshwater wetlands with low, dense vegetation e.g. swamps, flooded grasslands or heathlands, around bogs and other water bodies.	Possible on any farm dam	Wildnet, EPBC
Glareolidae	<i>Glareola maldivarum</i>	Oriental Pratincole	Open plains, bare ground around swamps and claypans.	Possible	Wildnet
Gruidae	<i>Grus rubicunda</i>	Brolga	Ephemeral wetlands, saltmarsh, open grasslands including pasture, farm dams and crops.	Possible	Wildnet
Accipitridae	<i>Haliaeetus leucogaster</i>	White-bellied Sea-Eagle	Usually coastal, over islands, reefs and headlands, beaches, bays and estuaries, mangroves, lagoons and floodplains.	Probable around estuarine wetlands and the Fitzroy River	Wildnet, EPBC
Accipitridae	<i>Haliastur indus</i>	Brahminy Kite	Sheltered waterways in the tropics and subtropics, coastlines with mangroves, estuaries, mudflats.	Probable around estuarine wetlands and the Fitzroy River	Wildnet
Accipitridae	<i>Haliastur sphenurus</i>	Whistling Kite	Varied habitats including wetlands, arid regions, near watercourses, open woodlands, scrublands, farmlands, estuaries and mudflats.	Probable	Wildnet
Scolopacidae	<i>Heteroscelus brevipes</i>	Grey-tailed Tattler	Inter-tidal pools, shallows, soft surfaces of mudflats, sand beaches, rock ledges and reefs.	Possible around estuarine wetlands	Wildnet
Scolopacidae	<i>Heteroscelus incanus</i>	Wandering Tattler	Open reefs and rocky shores.	Possible around estuarine wetlands	Wildnet
Accipitridae	<i>Hieraetus morphnoides</i>	Little Eagle	Forests woodlands, open scrublands, tree-lined watercourses but avoids dense forest.	Probable	Wildnet
Recurvirostridae	<i>Himantopus himantopus</i>	Black-winged Stilt	Fresh and marine marines. Flooded paddocks and farm dams.	Possible around estuarine wetlands	Wildnet
Apodidae	<i>Hirundapus caudacutus</i>	White-throated Needletail	Breeds outside Australia Low to very high, open airspace over almost any habitat, including oceans, forests and deserts. At times gather over ranges, headlands, often in humid, unsettled weather preceding thunderstorms.	Possible	Wildnet, EPBC
Apodidae	<i>Hirundo rustica</i>	Barn Swallow	Open habitats and towns usually near water	Probable	EPBC
Scolopacidae	<i>Limosa lapponica</i>	Bar-tailed Godwit	Coastal mudflats, sandbars, shores of estuaries, salt marsh and sewerage ponds.	Possible around estuarine wetlands	Wildnet
Scolopacidae	<i>Limosa limosa</i>	Black-tailed Godwit	Sheltered bays, estuaries and lagoons with large intertidal mudflats and / or sandflats. In inland areas, found on mudflats and in water less than 1 cm deep, around muddy lakes and swamps. Has also been recorded in wet fields and sewage treatment works.	Possible around estuarine wetlands	Wildnet

Family Name	Scientific Name	Common Name	Preferred Habitat	Likelihood of Occurrence	Source^
Accipitridae	<i>Lophoictinia isura</i>	Square-tailed Kite	Diverse habitats including woodland dominated by eucalypts, <i>Pandanus</i> sp., gallery forest, heath.	Possible	Wildnet
Anatidae	<i>Malacorhynchus membranaceus</i>	Pink-eared Duck	Open water, sewerage farms, inland billabongs. Breeds on inland floodwaters.	Possible	Wildnet
Meropidae	<i>Merops ornatus</i>	Rainbow Bee-eater	Open country of woodlands, open forest, semi-arid scrub, grasslands, clearings in heavier forests, farmlands; avoids heavy forest. In breeding season, requires open clearing or paddock with loamy soil soft enough for nest tunnelling, yet firm enough to support the tunnel.	Probable	Wildnet, EPBC
Accipitridae	<i>Milvus migrans</i>	Black Kite	Open plains, timbered watercourses, rubbish dumps, abattoirs and cattle yards.	Probable	Wildnet
Dicuridae	<i>Monarcha melanopsis</i>	Black-faced Monarch	Rainforest, mangroves, eucalypt forests and woodlands.	Probable	EPBC
Dicuridae	<i>Myiagra cyanoleuca</i>	Satin Flycatcher	Forests and woodlands, mangroves, coastal heath scrubs but avoids rainforests.	Probable	EPBC
Anatidae	<i>Nettapus coromandelianus</i>	Cotton Pygmy-goose	Deep freshwater dams, swamps and lagoons particularly with lilies of floating vegetation.	Possible at any farm dam	Wildnet
Anatidae	<i>Nettapus pulchellus</i>	Green Pygmy-goose	Deep lagoons, swamps and dams with waterlilies and other floating vegetation.	Possible at any farm dam	Wildnet, EPBC
Strigidae	<i>Ninox novaeseelandiae</i>	Morepork	Areas with trees - forests, open forests and woodlands, farmland with scattered trees, parks and gardens.	Probable	QM, Wildnet
Scolopacidae	<i>Numenius madagascariensis</i>	Eastern Curlew	Coasts and estuaries.	Possible around estuarine wetlands	Wildnet
Scolopacidae	<i>Numenius minutus</i>	Little Curlew	Dry grasslands of clay and blacksoil plains, river floodplains, woodlands with grassy understorey, billabongs and freshwater swamps.	Possible	Wildnet
Scolopacidae	<i>Numenius phaeopus</i>	Whimbrel	Mudflats of estuaries, lagoons, occasionally sandy beaches, reefs and salt lakes.	Possible around estuarine wetlands	Wildnet
Anatidae	<i>Oxyura australis</i>	Blue-billed Duck	Deep water in large permanent wetlands and swamps with dense aquatic vegetation. Completely aquatic, swimming low in the water along the edge of dense cover.	Unlikely	Wildnet
Accipitridae	<i>Pandion haliaetus</i>	Osprey	Favours coastal areas, especially the mouths of large rivers, lagoons and lakes. Feed on fish over clear, open water.	Probable around estuarine wetlands	Wildnet
Threskiornithidae	<i>Plegadis falcinellus</i>	Glossy Ibis	Shallows of swamps, floodwaters, and flooded or irrigated pastures.	Possible at any farm dam	Wildnet

Family Name	Scientific Name	Common Name	Preferred Habitat	Likelihood of Occurrence	Source^
Charadriidae	<i>Pluvialis fulva</i>	Pacific Golden Plover	Estuaries, inter-tidal mudflats, beaches, reefs, salt marshes and offshore islands.	Possible around estuarine wetlands	Wildnet
Petroicidae	<i>Poecilodryas superciliosa</i>	White-browed Robin	Streams, rainforest, woodland and vine scrub.	Possible	Wildnet
Procellariidae	<i>Puffinus pacificus</i>	Wedge-tailed Shearwater	Oceanic and coastal.	Unlikely	Wildnet
Recurvirostridae	<i>Recurvirostra novaehollandiae</i>	Red-necked Avocet	Tidal flats, marshes, saltworks and shallow inland salt lakes.	Possible around estuarine wetlands	Wildnet
Rostratulidae	<i>Rostratula australis</i>	Australian Painted Snipe	Shallow inland wetlands, brackish or freshwater that are permanently or temporarily inundated.	Possible at any farm dam	EPBC, Wildnet
Laridae	<i>Sterna albifrons</i>	Little Tern	Almost exclusively coastal, preferring sheltered environments; may occur several kilometres from the sea in harbours, inlets and rivers.	Possible around estuarine wetlands	Wildnet
Laridae	<i>Sterna bengalensis</i>	Lesser Crested Tern	Coastal areas.	Unlikely	Wildnet
Laridae	<i>Sterna sumatrana</i>	Black-naped Tern	Coastal areas.	Unlikely	Wildnet
Anatidae	<i>Stictonetta naevosa</i>	Freckled Duck	Freshwater swamps or creeks where it feeds on zooplankton, crustaceans and algae. Uses expansive shallow swamps for breeding, and permanent waters for refuge during drought.	Possible at any farm dam	Wildnet
Anatidae	<i>Tadorna radjah</i>	Radjah Shelduck	Favours shallow pools and mudbanks or the shallow fringes of deep pools.	Possible at any farm dam	Wildnet
Anatidae	<i>Tadorna tadornoides</i>	Australian Shelduck	Large freshwater and brackish, dams, pastures, tall forest, margins, coastal areas with tidal flats and saltmarsh.	Possible at any farm dam	Wildnet
Scolopacidae	<i>Tringa nebularia</i>	Common Greenshank	Permanent and temporary wetlands: swamps, lakes, dams, irrigated crops, estuaries, tidal mudflats and mangroves.	Possible around estuarine wetlands	Wildnet
Scolopacidae	<i>Tringa stagnatilis</i>	Marsh Sandpiper	Coastal and inland salt or freshwater wetlands: estuaries, mudflats, mangroves, beaches, swamps, lakes, dams, billabongs, and temporary floodwaters.	Possible around estuarine wetlands	Wildnet
Charadriidae	<i>Vanellus miles</i>	Masked Lapwing	Open, short grassed areas in both natural and highly modified areas including parks, roadside grassed areas and grazed pasture.	Probable	Wildnet
Charadriidae	<i>Vanellus tricolor</i>	Banded Lapwing	Open grasslands and bare plains.	Probable	Wildnet
Scolopacidae	<i>Xenus cinereus</i>	Terek Sandpiper	Coastal mudflats, lagoons, creeks and estuaries. Favours mudbanks and sandbanks near mangroves, but also rocky pools and reefs.	Possible around estuarine wetlands	Wildnet

Family Name	Scientific Name	Common Name	Preferred Habitat	Likelihood of Occurrence	Source [^]
Muscicapidae	<i>Zoothera heinei</i>	Russet-tailed Thrush	Coastal rainforest.	Unlikely	Wildnet

[^] Source of data: QM = Queensland Museum; W = DERM Wildnet; EPBC = EPBC protected matters search.

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11.0 Conclusion

This report has identified the following primary impacts associated with construction and operation of the proposed ABP:

- clearing of up to 99.7 ha of referable wetlands, including 1.3 ha of WPAs, 16.8 ha of WMAs, 17.6 ha of WPA trigger areas (500m buffers around WPA wetlands), and 64 ha of WMA trigger areas (100m buffers around WMA wetlands);
- crossings of 362 watercourses, including 20 watercourses of stream order 5 or above;
- clearing of up to 474 ha of remnant vegetation (about 20% of the ROW) during pipeline construction;
- clearing of up to 67.9 ha of EECs listed under the EPBC Act during pipeline construction (although the actual figure is likely to be 25.5 ha, as 42.4 ha is RE 11.3.2, which is unlikely to contain any EEC);
- clearing of up to 16.3 ha of RE with a biodiversity status of Endangered and 130.3 ha of RE with a biodiversity status of Of Concern during pipeline construction;
- clearing of up to 125.5 ha of high value regrowth vegetation and 11.7 ha of regrowth watercourse vegetation;
- clearing of up to 508 ha of vegetation of biodiversity significance, including 359.6 ha of state significance, 90.6 ha of regional significance and 57.8 ha of local significance;
- clearing through four terrestrial biodiversity corridors and 51 riparian corridors, with a total area of 706.7 ha and a vegetated area of 294.8 ha;
- clearing of up to 7 ha of essential habitat, including 6.3 ha of essential habitat for Little Pied Bat and 0.7 ha of essential habitat for Black Ironbox;
- potential impacts on habitat for 33 EVNT flora species, including five EVNT flora species likely to occur, 24 species possibly present and four species unlikely to occur within the ROW;
- potential impacts on habitat for 42 EVNT fauna species, including seven EVNT fauna species likely to occur, 27 species possibly present and eight species unlikely to occur within the ROW;
- potential impacts on one aquatic EVNT flora species and two aquatic EVNT fauna species that may occur within the ROW;
- potential to spread 34 species of invasive weeds declared under the LP Act (including eight species listed as Weeds of National Significance); and
- potential to exacerbate the impacts of six invasive feral animals (including five species declared under the LP Act).

The majority of impacts occur in Eucalypt woodlands on Cainozoic sand plains and Cainozoic igneous rocks, which are common and widespread throughout the region.

Field assessments will be undertaken to:

- ground-truth vegetation, wetlands, watercourse crossings, corridors, habitat for EVNT species and other areas of high ecological significance;
- undertake targeted surveys for EVNT species where areas of suitable habitat are found;
- conduct comprehensive fauna surveys within representative habitats along the ABP;
- identify route refinements that avoid or minimise potential impacts to ecological values; and
- assess other options to avoid, mitigate or offset potential impacts.

While detailed mitigation measures cannot be developed without field surveys, measures are likely to include:

- minor re-alignments of the proposed pipeline route to avoid or minimise clearing of areas of high ecological value (e.g. Endangered and Of Concern REs, habitat for EVR flora species, wetlands) and areas of remnant vegetation generally;
- sequential progression of pipeline construction, with clean-up, restoration and rehabilitation initiated as soon as backfilling is complete;
- scheduling of construction activities in environmentally sensitive locations to avoid the wet season;
- use of minimum clearing widths in areas of remnant vegetation;
- effective sediment and erosion control systems to minimise indirect impacts on surrounding areas;

- implementation of a weed management program, including effective weed hygiene procedures, regular weed monitoring during and after construction and weed control works as required; and
- investigation into use of horizontal directional drilling techniques to avoid impacts on major watercourses.

With appropriate mitigation, impacts of pipeline construction on vegetation are likely to be limited to the direct removal of a maximum of 474 ha of remnant vegetation, 125.5 ha of high value regrowth vegetation and 11.7 ha of regrowth watercourse vegetation within the 40 m ROW.

12.0 References

- Bostock, P.D. and Holland, A.E. (2007). *Census of the Queensland Flora 2007*. Queensland Herbarium, Environmental Protection Agency, Brisbane.
- Clayton, M., Wombey, J.C, Mason, I.J, Chesser, R.T. and Wells, A. (2006). *CSIRO List of Australian Vertebrates- A reference with conservation status*. CSIRO Publishing, Collingwood.
- Clayton, P.C., Fielder, D.F., Howell, S. and Hill, C.J. (2006). *Aquatic biodiversity assessment and mapping method (AquaBAMM): a conservation values assessment tool with trial application in the Burnett River catchment*. Queensland Environmental Protection Agency, Brisbane.
- DERM. (2010a). *Method for Mapping Ecological State Interests for Land Use Planning and Development Assessment*. Version 2.0. Department of Environment and Resource Management: Brisbane.
- DERM. (2010b). *Wetland Management Area Wetland and Wetland Management Area Trigger Area Mapping*. Department of Environment and Resource Management: Brisbane. Updated data available at <http://dds.information.qld.gov.au/dds/>.
- DERM. (2010c). *Wetland Protection Area Wetland and Wetland Protection Area Trigger Area Mapping*. Department of Environment and Resource Management: Brisbane. Updated data available at <http://dds.information.qld.gov.au/dds/>.
- DERM. (2010d). *Wildnet Database*. Department of Environment and Resource Management, Brisbane. http://www.derm.qld.gov.au/wildlife-ecosystems/wildlife/wildlife_online/
- DSEWPC. (2010a). *Australian Wetlands database*. Department of Sustainability, Environment, Water, Population and Communities, Canberra. <http://www.environment.gov.au/water/topics/wetlands/database/index.html>
- DSEWPC. (2010b). *EPBC Act Protected Matters Search Tool*. Department of Sustainability, Environment, Water, Population and Communities, Canberra. www.environment.gov.au/erin/ert/epbc/index.html accessed 11 October 2010
- DSEWPC. (2010c). *Species profile and threats database*. Department of Sustainability, Environment, Water, Population and Communities, Canberra. <http://www.environment.gov.au/cgi-bin/sprat/public/sprat.pl>
- Environment Australia. (2001). *A Directory of Important Wetlands in Australia*. Third Edition. Environment Australia, Canberra.
- EPA. (1999). *Strategy for the Conservation and Management of Queensland Wetlands*. Environmental Protection Agency: Brisbane.
- EPA. (2002). *Biodiversity Assessment and Mapping Methodology*. Version 2.1. Environmental Protection Agency, Brisbane.
- EPA. (2008). *Biodiversity Planning Assessment: Brigalow Belt North Landscape Expert Panel Report*. Version 1.3. Environmental Protection Agency, Brisbane.
- Inglis, S.N. and Howell, S. (2009). *Aquatic Conservation Assessments, using AquaBAMM, for the riverine wetlands of the Great Barrier Reef catchment*. Department of Environment and Resource Management, Brisbane.
- Miller, G.J. and Deacon, G. (2005). *A review and update of Queensland site accounts in "A Directory of Important Wetlands in Australia"*. Unpublished report (updated September 2005) by the Queensland Environmental Protection Agency to Department of the Environment and Heritage, Canberra.
- Neldner, V.J., Wilson, B.A., Thompson, E.J. and Dillewaard, H.A. (2005). *Methodology for Survey and Mapping of Regional Ecosystems and Vegetation Communities in Queensland*. Version 3.1. Environmental Protection Agency, Queensland Government, Brisbane.
- Queensland Herbarium. (2009). *Regional ecosystem Description Database*. Version 6.0b. Updated November 2009. Department of Environment and Resource Management, Brisbane. Updated data available at http://www.derm.qld.gov.au/wildlife-ecosystems/biodiversity/regional_ecosystems/index.php
- Sattler, P.S. and Williams, R.D. (eds) (1999). *The Conservation Status of Queensland Bioregional Ecosystems*. Environmental Protection Agency, Brisbane.

Sullivan, S., Holden, J. and Williams, C. (2010) *Report on the distribution and abundance of the estuarine crocodile, *Crocodylus porosus*, in Queensland. Waterways of the populated east coast area. Research conducted September 2009 to February 2010.* Queensland Parks and Wildlife Service, Department of Environment and Resource Management, Brisbane.