

L | Nature Conservation



L1 Flora and Fauna Assessment

L2 Aquatic Ecology Assessment

L3 Stygofauna Assessment

L1 | Flora and Fauna Assessment





Kevin's Corner Project

Terrestrial Flora and Fauna Assessment

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LIST OF ABBREVIATIONS

%	-	Percent
°C	-	Degrees Celsius
AARC	-	AustralAsian Resource Consultants Pty Ltd
AnaBat™	-	Analyse a bat call ^{Trade Mark}
ANRA	-	Australian Natural Resources Atlas
BRC	-	Barcaldine Regional Council
cm	-	centimetre
CORVEG	-	Queensland Herbarium ecological site database
CPP	-	Coal Preparation Plant
DEEDI	-	Department of Employment, Economic Development and Innovation
DERM	-	Department of Environment and Resource Management
EA	-	Environmental Authority
EIS	-	Environmental Impact Statement
EPA	-	Environmental Protection Agency
EPBC Act	-	Environment Protection and Biodiversity Conservation Act 1999
ERE	-	Endangered Regional Ecosystem
GPS	-	Global Positioning System
ha	-	hectare(s)
HERBREC	-	Queensland Herbarium Records
HPGL	-	Hancock Galilee Pty Ltd
JORC	-	Joint Ore Reserves Committee
JS	-	Jericho Shire
km	-	kilometre(s)
LP Act	-	Land Protection (Pest and Stock Route Management) Act 2002



m	-	metre (s)
MLA	-	Mining Lease Application
mm	-	millimetre(s)
Mtpa	-	Million tonne per annum
NC Act	-	Nature Conservation Act 1992
NCWR	-	Nature Conservation (Wildlife) Regulation 2006
NES	-	National Environmental Significance
NSW	-	New South Wales
PMP	-	Pest Management Plan
QGEOP	-	Queensland Government Environmental Offsets Policy
RE	-	Regional Ecosystem
REDD	-	Regional Ecosystems Descriptions Database
SP Act	-	Sustainable Planning Act 2009
VM Act or VMA		Vegetation Management Act 1999
VMR	-	Vegetation Management Regulation 2000
WMP	-	Weed Management Plan

EXECUTIVE SUMMARY

AustralAsian Resource Consultants Pty Ltd was commissioned by Hancock Galilee Pty Ltd and URS Australia Pty Ltd to conduct a Terrestrial Flora and Fauna Assessment for the proposed Kevin's Corner Project site (the Project).

A total of nine site visits were undertaken to conduct flora and fauna surveys between June 2008 and November 2010 on the Project site and surrounding tenements. The surveys covered both wet and dry seasons, in order to capture seasonal variation in flora and fauna assemblages.

To assess the environmental values of flora and fauna communities on the Project site, the following scope of works was undertaken:

- A literature and database review to identify species of conservation significance known from the region. This review enabled such species to be targeted during the field survey components of the study;
- Standard field survey methodologies were employed to determine the composition of species inhabiting the Project site and corridors, particularly species of conservation significance; and
- Preparation of a report describing significant ecological factors and outlining possible management strategies that may be suitable to reduce any foreseeable impacts associated with the proposed activities.

SITE DESCRIPTION

The Project site is located in Central Queensland approximately 340 kilometres southwest of Mackay, and 110 kilometres west south-west of Clermont. The closest residential area to the Project is the township of Alpha, located approximately 65 kilometres south south-east of the Project site.

FIELD SURVEY METHODS

Site scoping of the Project site was conducted using aerial photography and broad ground-truthing using four-wheel drive vehicles and where terrain proved impassable, on-foot.

A number of transects were surveyed to obtain a detailed floristic inventory of the dominant and associated woody plants within each vegetation community. In order to map and confirm the extent of the vegetation communities, plots were used along the boundaries of the communities. The quality of communities was assessed with regard to their likely value and viability as a representative vegetation type.

Fauna study sites were located in areas representative of the Project's vegetation types and habitat types. In addition, habitats potentially inhabited by species of conservation significance were targeted and thoroughly assessed for species occurrence. A range of trapping and survey techniques were employed at each study site including but not limited to; pitfall trapping, Elliott (style) trapping, habitat searching, avian observation, AnaBat™ recording and spotlighting. Incidental / opportunistic records were included in the species list, in order to produce a comprehensive fauna species list for the Project site.



SURVEY RESULTS

Flora

Twenty five vegetation communities were found to inhabit the Project site with a total of 458 flora species identified. No species of conservational significance were identified on the Project site.

Twenty four of the 25 vegetation communities were classed as 'Remnant Vegetation' as defined in the *Queensland Vegetation Management Act 1999*. A summary of the conservation significance of all vegetation communities occurring on the Project site and their equivalent Regional Ecosystems (REs) is provided in Table 1.

Table 1 Vegetation Communities and Corresponding Conservational Status

Vegetation Community	RE or Ecological Community	EPBC Status	VMA (1999) Status	DERM Biodiversity Status
Brigalow Open Woodland	10.3.3a	Not Listed	Least Concern	No Concern at Present
	10.4.5	Not Listed	Least Concern	Of Concern
	10.9.3	Not Listed	Least Concern	Endangered
	11.3.5	Not Listed	Least Concern	Of Concern
Silver-leaved Ironbark Open Woodland	10.3.28a	Not Listed	Least Concern	No Concern at Present
	10.5.5a	Not Listed	Least Concern	No Concern at Present
	10.7.11a	Not Listed	Least Concern	No Concern at Present
	11.8.4	Not Listed	Least Concern	No Concern at Present
Poplar Box Open Woodland	10.3.27a	Not Listed	Least Concern	Of Concern
	10.5.12	Not Listed	Least Concern	No Concern at Present
	11.3.2	Not Listed	Least Concern	Of Concern
Silver-leaved Ironbark/Poplar Box Mixed Woodland	10.5.5a	Not Listed	Least Concern	No Concern at Present
	10.5.12	Not Listed	Least Concern	No Concern at Present
White Cypress Pine Woodland	11.5.5b	Not Listed	Least Concern	No Concern at Present



Vegetation Community	RE or Ecological Community	EPBC Status	VMA (1999) Status	DERM Biodiversity Status
Gidgee Open Woodland	10.3.4	Not Listed	Least Concern	Of Concern
Fringing Riparian Woodland	10.3.12a	Not Listed	Least Concern	No Concern at Present
	10.3.13a	Not Listed	Least Concern	Of Concern
	10.3.14	Not Listed	Least Concern	Of Concern
Weeping Bottlebrush Heath	10.7.7	Not Listed	Least Concern	No Concern at Present
Thozets Box Open Woodland	10.7.5	Not Listed	Least Concern	Of Concern
Lancewood Woodland	10.7.3b	Not Listed	Least Concern	No Concern at Present
	10.10.1b	Not Listed	Least Concern	No Concern at Present
Queensland Yellowjacket Low Woodland	10.5.1c	Not Listed	Least Concern	No Concern at Present
Rustyjacket Open Woodland	10.10.4	Not Listed	Least Concern	No Concern at Present
Natural Grasslands of the Queensland Central Highlands and the northern Fitzroy Basin	11.8.11	Endangered	Of Concern	Of Concern
Non-remnant Grassland	Not Classed	Not Listed	Not Listed	Not Listed

Fauna

A total of 163 vertebrate fauna species were identified on the Project site during the surveys, comprising 26 reptiles, 92 birds, 35 mammals and 10 amphibians.

Species of Conservational Significance

Migratory and Marine Listed Avian Species

Twenty-four avian species listed as Migratory and/or Marine under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) were observed on the Project site during the survey periods.

Squatter Pigeon (southern subspecies)

The southern squatter pigeon (*Geophaps scripta scripta*) was recorded during the survey within the Non-remnant Grassland vegetation community and is listed as Vulnerable under both the *Environment Protection and Biodiversity Conservation Act 1999* and Schedule 3 of the *Nature Conservation Wildlife Regulation 2006* (NCWR).

Little Pied Bat (Chalinolobus picatus)

Although not identified on the Project site during the survey period, the little pied bat (*Chalinolobus picatus*) (listed as Near Threatened under Schedule 5 of the NCWR) was identified on the adjacent Alpha Coal Project site and surrounds during previous surveys. Given that the little pied bat was identified approximately 25 km away from site, can make nightly trips of over 30 km in search of waterholes, (Van Dyk & Strahan 2008), and coupled with the presence of suitable habitat for *C. picatus* on both sites, it is likely that this species utilises areas found within the Project site.

Pest Fauna

Eight introduced pest fauna species were recorded during the field surveys, including the cane toad (*Rhinella marina*), house mouse (*Mus musculus*), feral cat (*Felis catus*), feral pig (*Sus scrofa*), european rabbit (*Oryctolagus cuniculus*), feral goat (*Capra hircus*) and dingo / wild dog (*Canis familiaris dingo*), the latter five of which are declared as 'Class 2' pests under the *Land Protection (Pest and Stock Route Management) Act 2002*.



POTENTIAL IMPACTS

The potential Project impacts (in terms of the land area that will be disturbed) upon areas of conservation significance are presented in Table 2

Table 2 Vegetation Communities with Corresponding Conservation Status and Disturbance Areas

Vegetation Community	EPBC Status	RE	DERM Biodiversity Status	Total Area on Site (ha)	Total Cleared Area (Proposed) (ha)	Area of subsidence (ha)
Brigalow Open Woodland	NL	10.3.3a	NCAP	1,036	234.1	643.5
		10.4.5	OC	71.1	0	0
		10.9.3	E	16.7	0	16.7
		11.3.5	OC	34.4	5.7	0
Silver-leaved Ironbark Open Woodland	NL	10.3.28a	NCAP	559.3	70.8	464.2
		10.5.5a	NCAP	11,870	2,022	5,499
		10.7.11a	NCAP	692.5	63.8	0
		11.8.4	NCAP	197.7	28.5	0
Poplar Box Open Woodland	NL	10.3.27a	OC	894.6	174.3	685
		10.5.12	NCAP	4,072	542.2	2,480
		11.3.2*	OC	20.1	4.5	0
Poplar-Ironbark Mixed Woodland	NL	10.5.5a	NCAP	1,763	991.8	778.3
		10.5.12				
White Cypress Pine Woodland	NL	11.5.5b	NCAP	3	0	3
Gidgee Open Woodland	NL	10.3.4	OC	1	0	1
Fringing Riparian Woodland	NL	10.3.12a	NCAP	341.8	97.9	0
		10.3.13a	OC	575.4	146.8	326.7
		10.3.14	OC	1,099	541.2	593.5

Vegetation Community	EPBC Status	RE	DERM Biodiversity Status	Total Area on Site (ha)	Total Cleared Area (Proposed) (ha)	Area of subsidence (ha)
Weeping Bottlebrush Heath	NL	10.7.7	NCAP	704.3	120.1	242.5
Thozets Box Open Woodland	NL	10.7.5	OC	228.6	62.3	75.7
Lancewood Woodland	NL	10.7.3b	NCAP	2,168	147.2	572.1
		10.10.1b	NCAP	115.9	0	115.9
Queensland Yellowjacket Low Woodland	NL	10.5.1c	NCAP	1,235	80.1	9.2
Rustyjacket Woodland	NL	10.10.4	NCAP	296.6	0	296.6
'Natural Grasslands of the Queensland Central Highlands and the northern Fitzroy Basin'	E	11.8.11	OC	169.7	22.3	0
Non-remnant Grassland	NL	NL	NL	10,200	2,988	6,704
Total Areas				38,365.7	8,343.6	19,506.9

E – Endangered; OC – Of Concern; NCAP – No Concern at Present; NL – Not Listed

Impacts on Flora

Vegetation communities within and adjacent to the Project site are important for reasons such as maintaining biodiversity of flora species, providing intact stands of vegetation communities which currently are under pressures elsewhere ('Endangered' and/or 'Of Concern' regional ecosystems), carbon sequestration and for providing natural mitigation strategies to issues such as increased soil salinity (which can potentially lead to scalding of the soil surface), erosion and downstream sedimentation.



Potential impacts on floral species and vegetation community integrity include:

- Land clearing may reduce the available habitat for certain floral species, in particular species which thrive only in one general soil type, such as sandy loam or clay soils;
- Edge effects may result in an alteration in microclimatic conditions, thereby reducing plant health and increasing susceptibility to disease;
- Loss of integrity and connectivity in vegetation communities listed as having a high biodiversity status;
- Spread and introduction of weed seeds / propagules on footwear, machinery, vehicles and materials required for mine operation and construction; and
- Potential for additional weed invasion from earthworks activities in sensitive areas, particularly along watercourses.
- Land subsidence as a result of mining activities may become prevalent; however this is expected to be minimal given the low degree of projected subsidence and is therefore unlikely to cause significant impacts to vegetation communities.

The REs identified on site will be impacted to varying degrees depending on the disturbance footprint of the Project. Of particular interest are those identified within the EPBC Act as 'Endangered' including RE 11.8.11 and RE 11.3.2, those within DERM's Biodiversity Status Categories as 'Of Concern' and the Endangered Regional Ecosystem (ERE) 10.9.3. Details of these communities and their potential impacts include:

- The Natural Grasslands of the Queensland Central Highlands and the northern Fitzroy Basin (RE 11.8.11) is listed as 'Endangered' under the EPBC Act and 'Of Concern' under the VM Act and DERM's Biodiversity Status. Based on proposed plans for the Project, disturbance within this community will be required (22.3 ha);
- The Poplar Box Open Woodland (RE 11.3.2) is listed as 'Of Concern' under the DERM Biodiversity status and VM Act. 4.5 ha of this community are proposed to be disturbed as a result of mining activities;
- The Poplar Box Open Woodland RE 10.3.27a is listed as 'Of Concern' under DERM's Biodiversity Status. The overall condition of this RE on the Project site has been reduced by cattle grazing and weed invasion. Based on proposed disturbance plans for the Project and current infrastructure, clearing within this RE will be required (174.3 ha)
- The Brigalow Open Woodland (RE 10.4.5 and RE 11.3.5) vegetation communities are listed as 'Of Concern' throughout Queensland under the DERM's Biodiversity Status due to total grazing pressures, in particular pasture degradation and significant loss of groundcover. RE 10.4.5 is not located within the proposed surface disturbance footprint however RE 11.3.5 will be impacted (approximately 5.7 ha). The Brigalow Open Woodland (RE 10.9.3) is listed as 'Endangered' under the DERM Biodiversity Status. No disturbance is planned within this RE;
- The Gidgee Open Woodland (10.3.4) is listed as 'Of Concern' under the DERM Biodiversity Status. Based on proposed infrastructure plans for this community, no disturbance will occur;



- The Fringing Riparian Woodland (RE 10.3.13 and RE 10.3.14) vegetation communities are listed as 'Of Concern' under DERM's Biodiversity Status throughout Queensland. A combined total of 244.7 ha falls under the surface disturbance footprint, however this doesn't include any offsite impacts on downstream vegetation as a result of waterway diversions;
- The Thozets Box Open Woodland (RE 10.7.5) is listed as 'Of Concern' under DERM's Biodiversity Status. Based on proposed plans for the Project, 62.3 ha will be impacted as a result of clearing activities.

Impacts on Fauna

The construction of mine infrastructure has the potential to affect fauna populations through habitat loss, population isolation, edge and barrier effects, and an increase in mortality from mine activities and increased traffic in road use. The development of mine infrastructure will involve landscape modification procedures through vegetation clearing, a recognised threatening process that can affect different taxa in various ways. The following potential impacts on fauna may result from the proposed works at the Project site:

- Land clearing and mining activities may reduce the available breeding and foraging habitat for fauna native species;
- Increased risk of fauna mortality resulting from vehicle strike and the destruction of tree hollows;
- Vegetation clearing will result in a localised reduction in the amount of roost and nesting sites, microhabitats and potential foraging areas for many fauna species. This would add population pressure (such as competition for roost sites, mates and food resources) to resident bats in these adjacent areas and may potentially lead to decreased population viability;
- Increased habitat fragmentation and loss of connectivity from roadways and other mine infrastructure. Species most vulnerable to barrier effects are habitat specific fauna and low mobility species (where even a small reduction in movements can reduce genetic continuity within a population, hence reducing the effective population size);
- Low mobility species utilising the Project site have the potential to become genetically isolated. This occurs when individuals from a population within one fragment are unable to interbreed with individuals from populations in adjoining fragments;
- An increase in noise, vibration and dust associated with the construction and operational phases of the Project may lead to the displacement of native species from their current home ranges;
- An increase of introduced fauna species identified as utilising the Project site may occur, including the cane toad, feral pig, european rabbit, house mouse and feral goat; and
- Mine-related infrastructure, such as sediment dams, may be accessible to fauna and may be additional water sources.

Potential impacts on Species of Conservational Significance are expected to be minimal. The distribution of observed avian species listed as Migratory and/or Marine under the EPBC Act species is widespread throughout eastern Queensland, and the local populations on the Project site are unlikely to constitute an 'ecologically significant proportion' of the total population of the species.



Furthermore, the Project site is not at the limit of these species' range, nor are these species considered to be declining within the region. Additionally, extensive areas of habitat suitable for the southern squatter pigeon exist on the Project site, and within the local region. It is likely some of the available squatter pigeon habitat will be disturbed by mining activities, however it is considered unlikely that there will be a significant impact on the regional population of the species, due to the broad extent of habitat in the local region. Additionally, habitat will be provided for the squatter pigeon via the removal of grazing from areas adjacent to mining activities

MANAGEMENT RECOMMENDATIONS

Suggested strategies to minimise the impacts on native flora and fauna, and recommendations regarding rehabilitation of the Project site, are outlined below.

Where possible, the avoidance of environmental impacts has been included in both the Project planning and design phases. There will also be ongoing opportunities to further avoid impacts at a local scale through the detailed design process.

Clearing of vegetation in the Well Creek and Sandy Creek should be minimised, in order to maintain habitat connectivity and provide a movement corridor for small terrestrial fauna species. Whilst this community will be physically fragmented, the actual degree of habitat fragmentation is highly dependent on the mobility of the organism in question (McIntyre and Hobbs 1999) and disconnected areas may continue to be utilised by some species if kept intact. Given the abundance of this community in the wider region it is unlikely the disturbance will have a significant impact on its ecological value or habitat provision.

Native vegetation removal should be conducted only after the areas to be cleared have been obviously delineated / identified to equipment operators / supervisors and approval to remove vegetation has been obtained from environmental staff.

Measures should be taken to minimise harm to affected fauna communities by inspecting the vegetation that is to be disturbed, prior to clearing, in order to ascertain whether any fauna are present. If fauna is present, they should be given the opportunity to move on naturally, before vegetation clearing occurs.

To maintain the integrity of vegetated land that is not cleared, appropriate erosion and sediment controls are recommended, in order to prevent sediment deposition in remaining habitat. Maintenance of retained areas of existing vegetation would also provide a source of seed for mine rehabilitation works.

Vegetation offsets will be developed under the EPBC Act, in order to redress disturbance impacts for the single, off-lease EPBC threatened ecological community (Natural grasslands of the Queensland central highlands and the northern Fitzroy basin) and also potential impacts upon the EPBC Act threatened species that have been identified on the Project site (Squatter pigeon (*Geophaps scripta scripta*), cattle egret (*Ardea ibis*) and the rainbow bee-eater (*Merops ornatus*)).

An offsets options analysis will be conducted for this Project, in order to identify potential offset areas that comply with both federal and state offset policy requirements. This options analysis will include desktop analysis, field assessment of potential off-set sites, review and refinement of habitat mapping, management of habitat fragmentation and liaison with regulatory bodies and landowners.

Further details of the offset strategy for this Project are presented in Appendix Z of the EIS.



It is recommended that the methodologies for the rehabilitation / revegetation works for the Project use the most appropriate species for the landscape elements of the site. Species chosen for revegetation are presented in EIS Section 26 - Decommissioning and Rehabilitation. Areas such as the overburden emplacement will be assessed for species to ensure long-term stability and rehabilitation success. Recreated landforms will be contoured to resemble the original local topography. Methodologies for revegetation will depend on the available growth media characteristics and agreed post-mining land use. Methods of preparing areas for revegetation, and techniques for establishing new vegetation will be assessed and incorporated into a managed revegetation program, considering matters such as direct seeding (especially for native species) and collection (seed should preferably be collected from the site to ensure it is genetically adapted to local conditions). Various advisory guidelines are available to assist in revegetation methodology (e.g. DERM Revegetation methods).

A segment of the Staff Induction Program will be allocated to informing staff of the conservation values, both on the Project site and surrounding areas, in order to increase staff awareness of the species present. This segment could include photographs, brief descriptions and management requirements of native species.

Under the Land Protection (Pest and Stock Route Management) Act 2002, land managers must take reasonable steps to ensure that lands are kept free of Class 2 pests. Given this legal requirement, in addition to the potential for these species to impact the environmental values of the Project site, management strategies for each of the Class 2 pests are detailed in section 8.4.2.



1.0 INTRODUCTION

AustralAsian Resource Consultants Pty Ltd (AARC) was commissioned by Hancock Galilee Pty Ltd (HGPL) and URS Australia Pty Ltd to conduct a Flora and Fauna Assessment of the proposed Kevin's Corner Coal Project (the Project).

The Kevin's Corner Coal Project is a proposed coal mining and export operation in central Queensland. The Project is located on Mining Lease Application (MLA) 70425. Mining will comprise of both open cut and underground operations. The coal will be treated by a coal preparation plant (CPP) and conveyed to a rail load out facility. The Project will involve the development of a rail spur connecting the mine to the proposed Hancock Coal, Alpha Coal Project railway. The Project will be an approximately 30 million tonne per annum thermal coal mine.

Initially all product coal is planned for export, however domestic use will be explored. The Project has scheduled mine life of 30 plus years, with sufficient Joint Ore Reserves Committee (JORC) compliant resources to significantly extend the Project life beyond 30 years.

1.1 SCOPE OF STUDY

To assess the ecological values of flora and fauna communities on the Project site, the following scope of works was undertaken:

- A literature and database review to identify species of conservation significance known from the region (the results of this review are presented in Appendix A). This review enabled such species to be targeted during the field survey component of the study;
- Field surveys employing standard methodologies to determine the composition of terrestrial and aquatic flora and fauna species which inhabit the Project site, particularly species of conservation significance; and
- The preparation of a report for HGPL which describes the significant ecological features identified and outlining possible management strategies to reduce any foreseeable impacts that are associated with the proposed mining activities.



2.0 PROJECT AND SITE DESCRIPTION

Sections 2.1 to 2.6 describe the relevant aspects of the Project site, including location, local geography, topography, local water courses, regional climate and current land uses.

2.1 PROJECT LOCATION

The Project site is located in Central Queensland approximately 340 kilometres (km) southwest of Mackay and 110 km west south-west of Clermont. The closest residential area to the Project is the township of Alpha, located approximately 65 kilometres south south-east of the Project site. The regional location of the Project site is presented in Figure 1.

2.2 LOCAL WATERWAYS AND CATCHMENT

There are five main creek-lines within the Project tenement: Well Creek, Middle Creek, Sandy Creek, Rocky Creek and Little Sandy Creek. These creeks are tributaries of the Belyando River which flows in a northerly direction and eventually meets up with the Burdekin River. The Belyando Catchment covers an area of approximately 73,335 square kilometres and is one of the main sub-catchments in the Burdekin Basin (Australian Natural Resources Atlas, 2007). A number of small ephemeral drainages also exist on the Project site (refer to Figure 2 for details of the local water courses).

2.3 LOCAL GEOLOGY

The Project deposit lies in the Galilee Basin within the late Permian Colinlea and Bandanna Formations. The coal bearing strata sub-crop is a linear, north-south trending belt in the central portion of the basin and is essentially flat lying. No major regional-scale fold and fault structures have been identified from the regional maps of the Project site. There are four major coal seams within the deposit, which vary in thickness from 5 m to 8 m. The predominant soil type in the vicinity of the Project is a massive yellow earth.



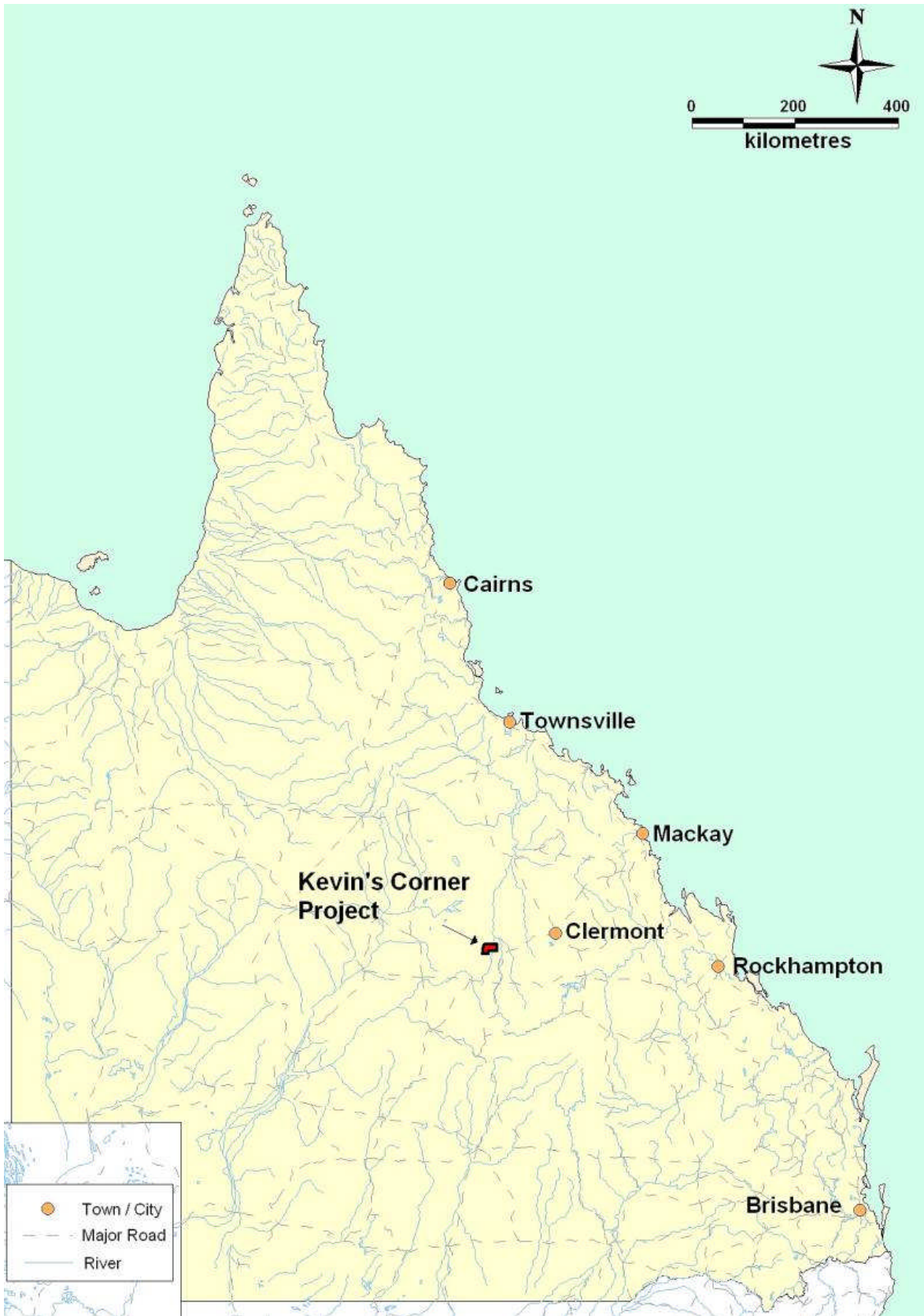


Figure 1 Regional Location of the Project site

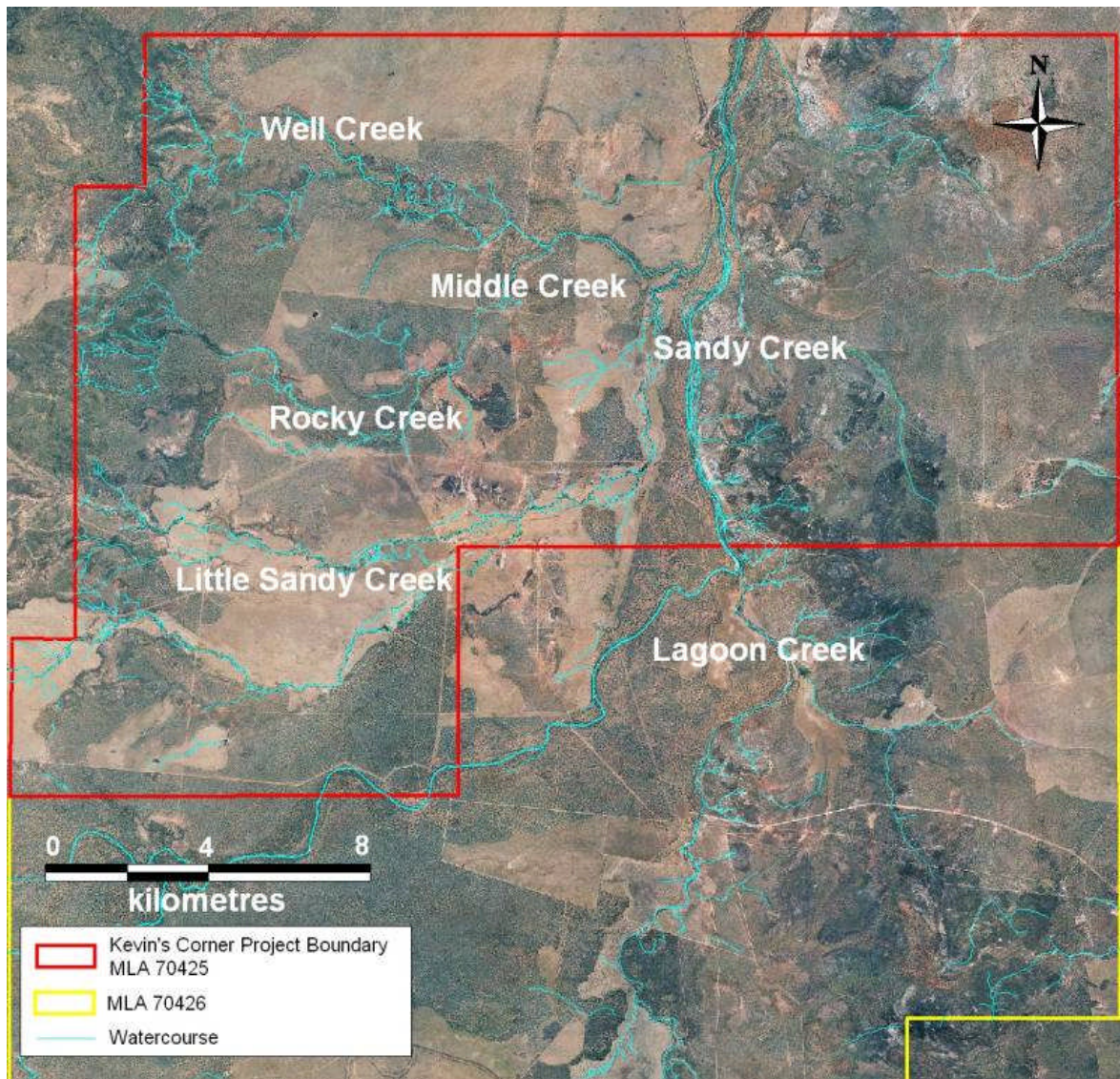


Figure 2 Watercourses within the Project site

2.4 REGIONAL CLIMATE

A climatic description of the Project site region has been compiled from regional data collected by the Australian Bureau of Meteorology (<http://www.bom.gov.au>). Rainfall and temperature data were sourced from various monitoring sites in the region including Clermont (Station 035019), Alpha (Station 035000) and Barcaldine (Station 036007). However, hourly observations from the Emerald Airport monitoring site (Station 035264) provided a more comprehensive dataset and were therefore adopted for this study.

Data trends indicate that mean annual rainfall for the region is approximately 556 millimetres (mm). Figure 3 shows that rainfall is highly seasonal; approximately 48% of rainfall occurs in the summer months between December and February and, the driest months of the year historically fall between July and September.

The surrounding regions of the Project site typically experience hot summer days, with mean maximum daylight temperatures in December-January of around 35 degrees Celsius (°C). The coldest mean daily temperatures occur in July (9°C). The temperature record for the period 1992 to 2010 is provided in Figure 4.

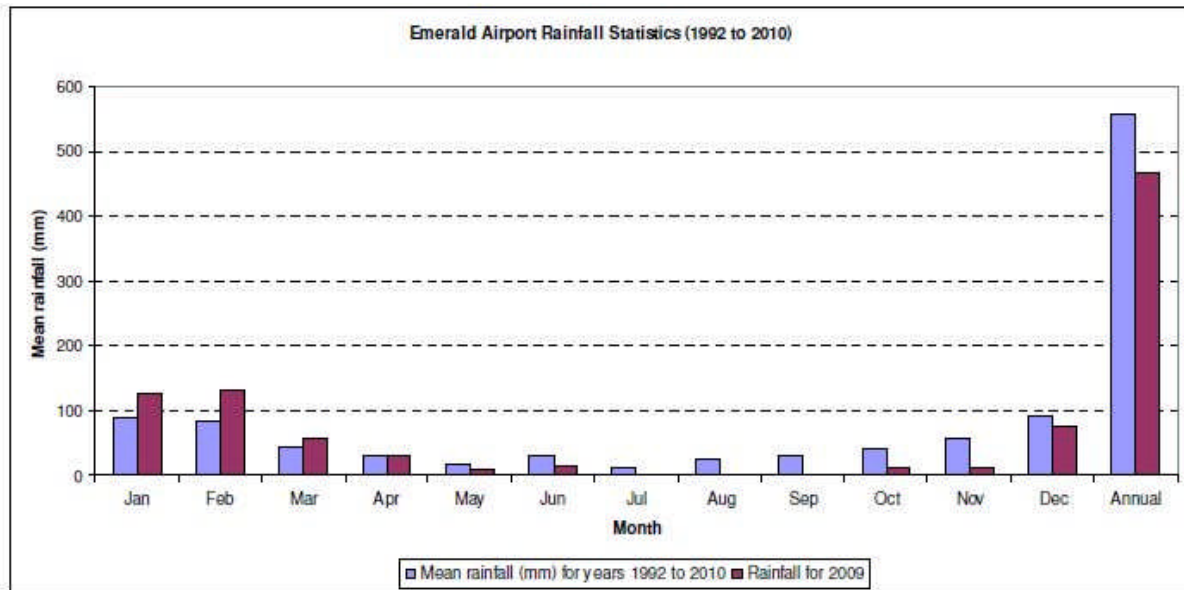


Figure 3 Rainfall Statistics for Emerald Airport (1992 to 2010)

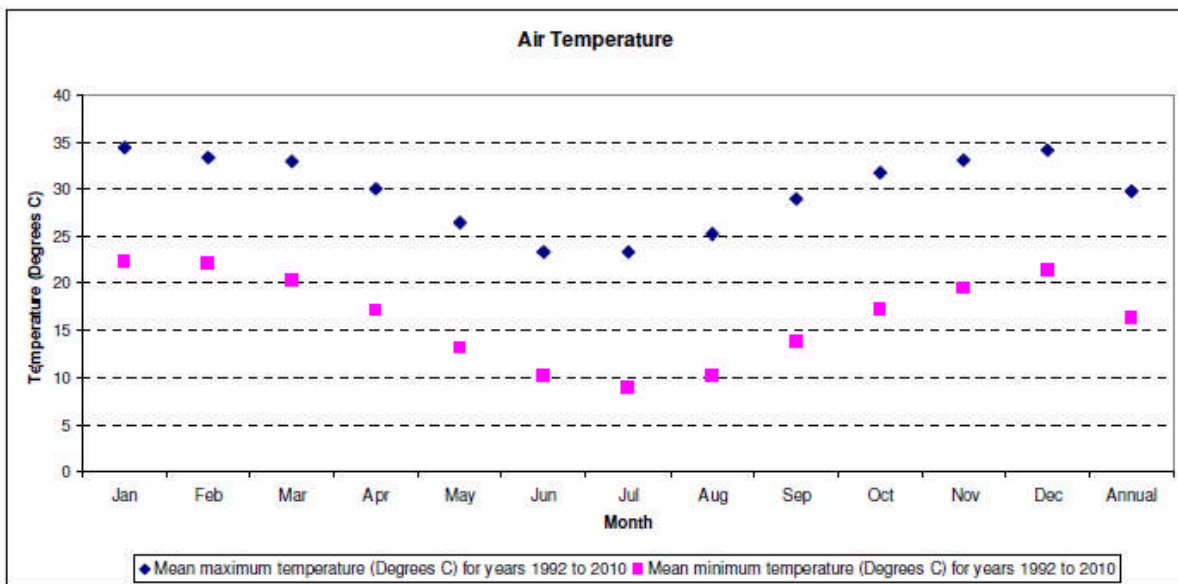


Figure 4 Temperature Statistics for Emerald Airport (1992 to 2010)

2.5 CURRENT LAND USE

Low intensity cattle grazing and coal exploration are the predominant land use activities on the Project site.

2.6 CONDITIONS PRIOR TO AND DURING THE SURVEY

Visits to the Project site have been made in order to conduct field assessments of both the Project site and the adjacent MLA 70426. These assessments have been conducted at different times of the year in order to capture seasonal variations in flora and fauna assemblages. The survey dates and temperature ranges that were experienced during each field visit are presented in Table 3, together with the rainfall recorded at Clermont Sirius St weather station for the two months leading up to each survey.

Table 3 Conditions During and Leading up to Field Surveys

Site visit	Rainfall during and prior to each field survey (mm)	Temperature range (°C)
25/06/2008 — 01/07/2008	12.8	3 – 25
08/10/2008 — 13/10/2008	54.4	17 – 34
04/03/2009 — 11/03/2009	216.9	18 – 33
28/09/2009 — 05/10/2009	1.4	9 – 35
23/11/2009 — 09/12/2009	61.4	15 – 40
15/03/2010 — 23/03/2010	338.7	17 – 30
12/04/2010 — 20/04/2010	237.2	15 – 32
22/06/2010 — 30/06/2010	17.6	13 - 25
08/11/2010 — 15/11/2010	253.3	18 -31

3.0 RELEVANT REGULATORY FRAMEWORKS

Legislation relevant to the assessment of flora, fauna and biodiversity on the Project site is discussed below.

3.1 COMMONWEALTH ENVIRONMENT PROTECTION AND BIODIVERSITY CONSERVATION ACT 1999

Under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), an action will require approval from the Federal Environment Minister if the action has, will have, or is likely to have a significant impact on a Matter of National Environmental Significance, where a Matter of National Environmental Significance is:

- World Heritage properties;
- National Heritage places;
- RAMSAR wetlands of international importance;
- Listed threatened species and communities;
- Migratory species protected under international agreements;
- Nuclear actions; and
- The Commonwealth marine environment.

Of the above Matters of National Environmental Significance, two are applicable to the Project site:

- Listed threatened species and communities; and
- Migratory species protected under international agreements.

Consequently, as EPBC listed threatened species and communities, and avian species identified as Migratory were identified from a search of the EPBC database, the Project has been referred to the Department of Sustainability, Environment, Water, Population and Communities under guidelines provided in the EPBC Act. These guidelines have been produced to assist industry and the public in interpreting the EPBC Act. The referral decision was that the Project is a controlled action requiring assessment under the EPBC Act, under the bilateral agreement with the Queensland government. This decision was made on 8 September 2009.

In addition, the EPBC Act provides for the identification and listing of key threatening processes. Based on information provided to AARC by HGPL, key threatening processes are not associated with the Project.



3.2 FEDERAL OFFSETS UNDER THE ENVIRONMENTAL PROTECTION AND BIODIVERSITY CONSERVATION ACT 1999

The purpose of the draft policy *Use of Environmental Offsets under the Environment Protection and Biodiversity Conservation Act 1999* (Department of the Environment and Water resources 2007) statement is to outline the Australian Government's position on the use of environmental offsets under the EPBC Act. Environmental offsets can be used under the EPBC Act to maintain or enhance the health, diversity and productivity of the environment as it relates to matters protected by the EPBC Act.

Environmental offsets can be applied as an approval condition under the EPBC Act for developments that have undergone assessment. They may be used when a development will result in impacts on a matter protected by the EPBC Act. Environmental offsets are not applicable to all approvals under the EPBC Act. Offsets should not be applied where the impacts of a development are considered to be minor in nature or could reasonably be mitigated. In some circumstances suitable offsets may not be available to adequately compensate for the impacts of a development and a decision on the overall acceptability of the project will need to be made.

Eight principles have been identified by the Australian Government for the use of environmental offsets under the EPBC Act. These principles are used in assessment of any proposed environmental offsets. The eight principles include:

1. Environmental offsets should be targeted to the matter protected by the EPBC Act that is being impacted.
2. A flexible approach should be taken to the design and use of environmental offsets to achieve long-term and certain conservation outcomes which are cost effective for proponents.
3. Environmental offsets should deliver a real conservation outcome.
4. Environmental offsets should be developed as a package of actions - which may include both direct and indirect offsets.
5. Environmental offsets should, as a minimum, be commensurate with the magnitude of the impacts of the development and ideally deliver outcomes that are 'like for like'.
6. Environmental offsets should be located within the same general area as the development activity.
7. Environmental offsets should be delivered in a timely manner and be long lasting.
8. Environmental offsets should be enforceable, monitored and audited.

The use of offsets under the EPBC Act is the main offsets policy applicable to the Project.



3.3 STATE VEGETATION MANAGEMENT OFFSET POLICIES

The following state government offsets policies have been developed:

- *Policy for Vegetation Management Offsets Version 2.4* (Department of Environment and Resource Management, 2009);
- *Queensland Government Environmental Offsets Policy (QGEOP)* (Environmental Protection Agency, 2008);
- *Queensland Government Policy for Biodiversity Offsets, Consultation Draft 2009* (Environmental Protection Agency, 2009); and
- *Mitigation and Compensation for Works or Activities Causing Marine Fish Habitat Loss* (Dixon and Beumer 2002).

3.3.1 Policy for Vegetation Management Offsets

The Policy for Vegetation Management Offsets Version 2.4 is enacted by the VM Act. However, the VM Act is not applicable to the Project (the *Sustainable Planning Regulation 2009* states that mining projects are not assessable under the VM Act) and therefore, the Policy for Vegetation Management Offsets does not have to be addressed for sectors of the Project which lie within the mining lease. However, for areas of the Project site (such as rail and access corridors) which lie outside the mining lease, vegetation offsets apply, The Policy for Vegetation Management Offsets provides a useful guideline for any voluntary vegetation offsets that may be considered for the Project.

The Policy for Vegetation Management Offsets applies to an offset proposed to meet a performance requirement in an applicable VMA code and is administered by DERM. This policy is applicable for any RE listed as 'Endangered', 'Of Concern', and 'Essential Habitat', 'Natural Wetland' or 'vegetation associated with watercourses' under the VMA *Vegetation Management Status*.

A vegetation management offset is a legal arrangement or agreement that, over time, guarantees to maintain the extent, structure and function of:

- Regional ecosystems;
- Essential habitat; and
- Vegetation associated with –
 - Watercourses;
 - Natural wetlands; and
 - Natural significant wetlands.

Note that this policy only applies to off-lease disturbance areas. Since these areas will be addressed via EPBC offsets, VM Act driven offsets will not be required.



3.3.2 Queensland Government Environmental Offsets Policy

The QGEOP policy document sets out the appropriate use of environmental offsets across terrestrial and aquatic ecosystems in Queensland, based on the principles of Ecologically Sustainable Development. This policy provides a generic framework for environmental offsets and guidance on when specific-issue offsets should and should not be considered.

Where loss of native vegetation is unavoidable, in addition to the QGEOP, the associated specific-issue offset policy; *Policy for Vegetation Management Offsets* (2009) provides further guidance concerning vegetation management.

If the activity will have a remaining impact on a specific-issue offsets policy environmental value, an environmental offset should be required as a condition of the EA.

The Policy for vegetation management offsets (2009) classifies particular REs as being of significant conservation value. These are termed 'critically limited remnant coverage REs' and are determined by one of the following characteristics:

- Having a remnant extent below 5% of their pre-clearing extent and less than 500 hectares in total extent, or
- that have a remnant extent less than 200 hectares, or
- that is at risk of the remnant extent falling below 200 hectares.

Note that no critically limited remnant coverage REs have been observed on the Project site.

Also note that this policy is not of direct relevance to this Project as it provides guidelines for the use of offsets in general.

3.3.3 Queensland Government Policy for Biodiversity Offsets, Consultation Draft 2009

A specific-issue offset policy proposed under the QGEOP, which seeks to compensate for loss in biodiversity values and address projects that were previously exempt from offsetting requirements.

The requirements of this policy will not have to be addressed, since Project impacts will be dealt with via the EPBC Act offsets.

3.3.4 Mitigation and Compensation for Works or Activities Causing Marine Fish Habitat Loss

Since no marine habitat loss will occur, this particular policy does not apply to the Project.

3.4 QUEENSLAND VEGETATION MANAGEMENT ACT 1999

Although the Vegetation management Act 1999 (VM Act) does not apply to the clearing of vegetation on the Project site, the scientific basis for biodiversity conservation is still valid and can be used to assess the conservation significance of the vegetation communities on the Project site.



The *Vegetation Management Act 1999* (VM Act) was proclaimed on Thursday the 14th of September 2000 as part of a planning framework for the management of native vegetation across Queensland. The *Vegetation Management Regulation 2000* (VMR) prescribes the status of each Regional Ecosystem (RE) identified to occur within Queensland. In addition, the VM Act details the conservation status categories of REs which are subsequently listed below, as is the definition of Remnant Vegetation:

'Endangered' Regional Ecosystems:

- <10 per cent (%) of pre-clearing extent remaining; and
- 10-30% of pre-clearing extent remaining and remnant <10,000 hectares (ha).

'Of Concern' Regional Ecosystems:

- 10-30% of its pre-clearing distribution remains; and
- 30% of the pre-clearing extent remains and the remnant vegetation remaining is <10,000 ha.

'No Concern at Present' Regional Ecosystems:

- >30% of the pre-clearing distribution remains and remnant vegetation remaining is >10,000 ha.

'Remnant Vegetation' means any vegetation where the predominant canopy:

- Covers more than 50% of the undisturbed predominant canopy;
- Averages more than 70% of the vegetation's undisturbed height; and
- Is composed of species characteristic of the vegetation's undisturbed predominant canopy.

3.5 QUEENSLAND DEPARTMENT OF ENVIRONMENT AND RESOURCE MANAGEMENT BIODIVERSITY STATUS

The Department of Environment and Resource Management (DERM) Biodiversity Status is the status assigned by the DERM to REs to assist with biodiversity planning in Queensland. Unlike the status of REs under the VM Act, the DERM Biodiversity Status is based on an assessment of the condition of remnant vegetation in addition to the pre-clearing and extent of a regional ecosystem. It takes into account other threatening processes in addition to land clearing.

Such processes include:

- The reduction in biodiversity within the REs;
- Weed invasion;
- Grazing pressures;
- Inappropriate fire management;
- Fragmentation; and



- Infrastructure development.

3.6 QUEENSLAND NATURE CONSERVATION ACT 1992

The NC Act is relevant to the Project site should any protected flora or fauna species (as detailed in the NCWR) be found on the Project site.

Conceivably, the most relevant portions of the *Nature Conservation Act 1992* (NC Act) to the Project site are the sections which pertain to Wildlife and Habitat Conservation. The class of wildlife¹ to which the NC Act applies includes protected wildlife, which is defined as:

- Wildlife which is extinct in the wild;
- Endangered wildlife;
- Vulnerable wildlife;
- Near threatened wildlife; and
- Least concern wildlife.

Species listed under the above classes are published in the associated *Nature Conservation (Wildlife) Regulation 2006* (NCWR).

The NC Act defines 'threatening processes' as any process that is capable of:

- Threatening the survival of any protected area, area of major interest, protected wildlife, community of native wildlife or native wildlife habitat; or
- Affecting the capacity of any protected area, area of major interest, protected wildlife, community of native wildlife or native wildlife habitat to sustain natural processes.

3.7 QUEENSLAND LAND PROTECTION (PEST AND STOCK ROUTE MANAGEMENT) ACT 2002

The Land Protection (*Pest and Stock Route Management*) Act 2002 (LP Act) is relevant to the Project site in regards to the control and management of declared pest plant (weed) and animal species. The objectives of the LP Act are to consolidate, amend and provide laws for the management, control, prohibition, and regulation of the introduction, spread and keeping of certain plants and animals declared under the Act. Classes of Pest described in the LP Act include:

- *Class 1* – one that is not commonly present in Queensland, and if introduced would cause an adverse economic, environmental or social impact;

¹ Under the Nature Conservation Act 1992, Wildlife is defined to be any taxon of an animal, plant, protista, prokaryote, or virus.

- *Class 2* – one that is somewhat established in Queensland and has, or could have, a substantial adverse economic, environmental or social impact; and
- *Class 3* – extensive in Queensland and has, or could have, an adverse economic, environmental or social impact.

Under the LP Act, landholders must ensure that all reasonable steps have been taken to ensure the effective management of declared weeds and that they not be spread throughout the Project site.

3.8 OFFSETS FOR NET BENEFIT TO KOALAS AND KOALA HABITAT

As this policy is enacted by the Sustainable Planning Act 2009 (SP Act) which is not applicable to the project, the *Offsets for Net Benefit to Koalas and Koala Habitat 2006* (Department of Environment and Resource Management 2010) do not apply.

However, the *Offsets for Net Benefit to Koalas and Koala Habitat 2006* (Department of Environment and Resource Management 2010) provides a framework and direction for the use of environmental offsets to provide net benefit for koala conservation for unavoidable development in high quality koala habitat in south-east Queensland, as required by the koala conservation criteria contained in the *Nature Conservation (Koala) Conservation Plan 2006 and Management Program 2006–2016* (Environmental Protection Agency 2006).

This policy provides a useful guideline to propose voluntary koala habitat offsets for the Project, even though this is not a legal requirement. The Project site lies within the 'Lowest Threat' koala management district, as defined in the *Nature Conservation (Koala) Conservation Plan 2006 and Management Program 2006–2016* (Environmental Protection Agency 2006). Although there is evidence of decline in this district, koalas are classified as of 'Least Concern' wildlife under the NC Act due to a generally lower perceived threat to their survival.

Whilst the development impacts required to be offset under this policy are restricted to habitat loss, the offsetting actions that can be taken to demonstrate net benefit are not. Preference is given to habitat protection and restoration measures, but other actions, such as projects to reduce vehicle mortality on koalas, are able to count towards meeting the required value of the offset package. The required value of the offset package is 1.5 times the value of the residual habitat impact for that proportion of an offset package that comprises high quality habitat measures and 2.5 for the balance of the offset package. To be classified as being of high quality for the purposes of this policy, habitat measures must be in or adjoining the same Koala Conservation Area, Koala Sustainability Area, or contiguous Koala Conservation Area / Koala Sustainability Area cluster as the development impact and must involve either protecting habitat that can be cleared (without an obligation for replacement) under an existing development approval or improving habitat values through rehabilitation of cleared areas.



4.0 DATABASE SEARCH AND LITERATURE REVIEW

Database searches collate information on flora and fauna species identified in the region from previous surveys, community records and other sources. A review of such databases facilitates the formulation of specific field survey techniques for certain flora and fauna species known from the region. The results of these database searches revealed several flora and fauna species of conservation significance from the greater Alpha region. The results from these database searches are presented in Appendix B.

4.1 REGIONAL FLORA OF CONSERVATION SIGNIFICANCE

The following databases were searched for historical records of flora within the broader area (100 km buffer surrounding the Project site):

- EPBC Act Protected Matters Search Tool (Department of Sustainability, Environment, Water, Population and Communities 2010): This database provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act for a nominated area.
- Queensland Herbarium HERBREC Searches: This database provides information including taxon names and specimen data.
- Wildlife Online Database (DERM): This database contains records of all flora and fauna collected from previous surveys, including Queensland Museum surveys as well as records from the public.

The Project site is located within the Desert Uplands Bioregion of central northern Queensland. This bioregion comprises an area of over 7 million ha and is dominated by sandstone ranges and sand plains. Review of database searches indicated the potential presence of 86 species of conservation significance listed under the EPBC Act and NC Act within the Desert Uplands Bioregion. These species and their habitat requirements are attached in Appendix F. Complete results from the database searches are provided in Appendix B and summarised in Table 5.

Desktop research also revealed the possible presence of several ecological communities of conservation significance listed under Queensland and Commonwealth legislation. These communities are listed in Table 4 below.

Table 4 Vegetation Communities of Conservation Significance Potentially on the Project site

RE or Community	Description	EPBC Status	VM Act Status	DERM Biodiversity Status
10.3.2	<i>Acacia argyrodendron</i> with or without <i>Eucalyptus cambageana</i> open woodland on alluvial plains (eastern)	Not Listed	Least concern	Of Concern
10.3.4	<i>Acacia cambagei</i> low open woodland to low woodland on alluvial plains	Not Listed	Least concern	Of Concern
10.3.14	<i>Eucalyptus camaldulensis</i> and/or <i>E. coolabah</i> open woodland along channels and on floodplains	Not Listed	Least concern	Of Concern
10.3.25	<i>Eremophila mitchellii</i> with or without <i>Lysiphyllum carronii</i> shrublands to low woodlands. <i>Senna artemisioides</i> sometimes forming a shrub stratomon alluvial plains	Not Listed	Of Concern	Endangered
10.3.27, 11.3.2	<i>Eucalyptus populnea</i> open woodland on alluvial plains	Not Listed	Least concern	Of Concern
6.4.2, 11.3.1, 11.4.3*	Brigalow (<i>Acacia harpophylla</i> dominant and co-dominant)	Endangered	Various	Various
11.3.21, 11.4.4, 11.4.11†	Natural Grasslands of the Queensland Central Highlands and the northern Fitzroy Basin	Endangered	Various	Various
11.2.3, 11.3.11, 11.4.1#	Semi-evergreen vine thickets of the Brigalow Belt (North and South) and Nandewar Bioregions	Endangered	Various	Various
Not Applicable	The community of native species dependent on natural discharge of groundwater from the Great Artesian Basin	Endangered	Not Classed	Not Classed
Not Applicable	Weeping Myall Woodlands	Endangered	Various	Various

* Others include RE 11.4.7, 11.4.8, 11.4.9, 11.4.10, 11.5.16, 11.9.1, 11.9.5, 11.9.6, 11.11.14, 11.12.21, 12.8.3, 12.9-10.6 and 12.12.26

† Others include RE 11.8.11, 11.9.3, 11.9.12, 11.11.17.

Others include RE 11.5.15, 11.8.3, 11.8.6, 11.8.13, 11.9.4, 11.9.8, 11.11.18.



Table 5 Flora of Conservation Significance Potentially on the Project Site

Botanical Name	Common Name	Conservation Status	
		EPBC Act	NC Act
<i>Acacia ramiflora</i>		Vulnerable	Not Listed
<i>Acacia spania</i>		Not Listed	Near Threatened
<i>Bertya pedicellata</i>		Not Listed	Near Threatened
<i>Cadellia pentastylis</i>	Ooline	Vulnerable	Not Listed
<i>Cerbera dumicola</i>		Not Listed	Near Threatened
<i>Corymbia clandestina</i>		Vulnerable	Vulnerable
<i>Desmodium macrocarpum</i>		Not Listed	Near Threatened
<i>Dichanthium queenslandicum</i>	King Blue-grass	Vulnerable	Not Listed
<i>Eriocaulon carsonii</i>	Salt Pipewort, Button Grass	Endangered	Not Listed
<i>Micromyrtus rotundifolia</i>		Not Listed	Vulnerable
<i>Sporobolus partimpatens</i>		Not Listed	Near Threatened

4.2 REGIONAL FAUNA OF CONSERVATION SIGNIFICANCE

The following databases were searched for historical records of fauna within the broader area adjacent to the Project site:

- EPBC Act Protected Matters Search Tool (Department of Sustainability, Environment, Water, Population and Communities 2010): This database provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act for a nominated area.
- Birds Australia Database – This database contains only bird records which are collected from the public, particularly members of Birds Australia. Birds Australia has quite stringent data screening policies and misidentifications are considered rare.
- Wildlife Online Database (DERM): This database uses records collected from previous surveys, including the Queensland Museum surveys as well as records from the public. While screening of data occurs, some mis-identifications are possible.

Literature and database searches indicated that 56 fauna species of conservation significance have been identified in the region of the Project site (determined as a 100 km 'buffer' surrounding the MLA). These species are listed in Appendix B and summarised in Table 6.

Table 6 Fauna of Conservation Significance Potentially on the Project Site

Scientific Name	Common Name	Conservation Status	
		EPBC Act	NC Act
Birds			
<i>Geophaps scripta scripta</i>	Squatter pigeon (southern subspecies)	Vulnerable	Vulnerable
<i>Erythrotriorchis radiatus</i>	Red Goshawk	Vulnerable	Endangered
<i>Lophoictinia isura</i>	Square-tailed Kite	Not Listed	Near Threatened
<i>Melithreptus gularis</i>	Black-chinned Honeyeater	Not Listed	Near Threatened
<i>Neochima ruficauda</i>	Star Finch (eastern and southern)	Endangered	Not Listed
<i>Poephila cincta cincta</i>	Black Throated Finch	Endangered	Not Listed
<i>Rostratula australis</i>	Australian Painted Snipe	Vulnerable	Not Listed

Mammals			
<i>Dasyurus hallucatus</i>	Northern Quoll	Endangered	Not Listed
<i>Lasiorhinus krefftii</i>	Northern Hairy-nosed Wombat	Endangered	Not Listed
<i>Nyctophilus timoriensis</i>	Greater Long Eared Bat, Southern Long Eared bat	Vulnerable	Not Listed
<i>Sminthopsis douglasi</i>	Julia Creek Dunnart	Endangered	Not Listed
Reptiles			
<i>Ctenotus capricorni</i>	Capricorn ctenotus	Not Listed	Near Threatened
<i>Denisonia maculata</i>	Ornamental Snake	Vulnerable	Not Listed
<i>Egernia rugosa</i>	Yakka skink	Vulnerable	Vulnerable
<i>Furina dunmalli</i>	Dunmall's Snake	Vulnerable	Not Listed
<i>Lerista allanae</i>	Allan's Lerista	Endangered	Not Listed
<i>Paradelma orientalis</i>	Brigalow Scaly Foot	Vulnerable	Not Listed
<i>Rheodytes leukops</i>	Fitzroy River Turtle	Vulnerable	Not Listed

Note that the Fitzroy River Turtle and the Hairy-nosed Wombat have very limited ranges and therefore, these species probably do not exist on the Project site.

4.2.1 Migratory Bird Presence

Database searches revealed a total of 45 Migratory or Marine bird species known to inhabit or pass through the Project site and surrounding area. The migrating patterns of these species were researched and used to plan field surveys so that overfly species potentially using the Project site could be recorded. The field assessment confirmed the presence of 25 of these species on the Project site. A full list of these species including their habitat requirements and migrating patterns is attached in Appendix G and summarised in **Error! Reference source not found..**



Table 7 Migratory and Marine Fauna (Birds) potentially occurring in the Kevin's Corner Project area

Scientific Name	Common Name	Migratory Species			Listed Marine Species
		Migratory Marine Birds	Migratory Terrestrial Species	Migratory Wetlands Species	
<i>Anseranas semipalmata</i>	Magpie Goose				X
<i>Apus pacificus</i>	Fork-Tailed Swift	X			X
<i>Ardea alba</i>	Great Egret	X		X	X
<i>Ardea ibis</i>	Cattle Egret	X		X	X
<i>Gallinago hardwickii</i>	Latham's Snipe			X	X
<i>Haliaeetus leucogaster</i>	White-Bellied Sea-Eagle		X		X
<i>Hirundapus caudacutus</i>	White-throated Needletail		X		X
<i>Merops ornatus</i>	Rainbow Bee-eater		X		X
<i>Myiagra cyanoleuca</i>	Satin flycatcher		X		X
<i>Nettapus coromandelianus albipennis</i>	Australian Cotton Pygmy-goose			X	X
<i>Rostratula benghalensis s. lat</i>	Painted Snipe			X	X

The migratory and marine bird species which have been identified during the database search are listed under by the following international agreements / conventions:

- Convention on the Conservation of Migratory Species of Wild Animals (The Bonn Convention);
- Japan – Australia Migratory Bird Agreement (JAMBA);
- China – Australia Migratory Bird Agreement (CAMBA); and
- Republic of Korea – Australia Migratory Bird Agreement (ROKAMBA).



4.3 ENVIRONMENTALLY SENSITIVE AREAS

A review of DERM's Environmentally Sensitive Areas mapping revealed no conservation parks, declared fish habitat areas, wilderness areas, aquatic reserves, heritage or historic areas, national estates, world heritage listings, sites listed by international treaties or agreements or areas of cultural significance relating to biodiversity and scientific reserves.

Areas within the Project site are listed as 'Endangered Regional Ecosystem' under the DERM Biodiversity Status (refer to Figure 5 for details of these areas). A Resource Reserve known as the Cudmore Resource Reserve is located within the northern section of the Project site. A National Park, the Cudmore National Park, is located approximately 700 metres west of the Project boundary. A nature refuge, on Lot 4 Plan BF 22 is located 27 km south of the Project boundary. This nature refuge was established in March 2001.



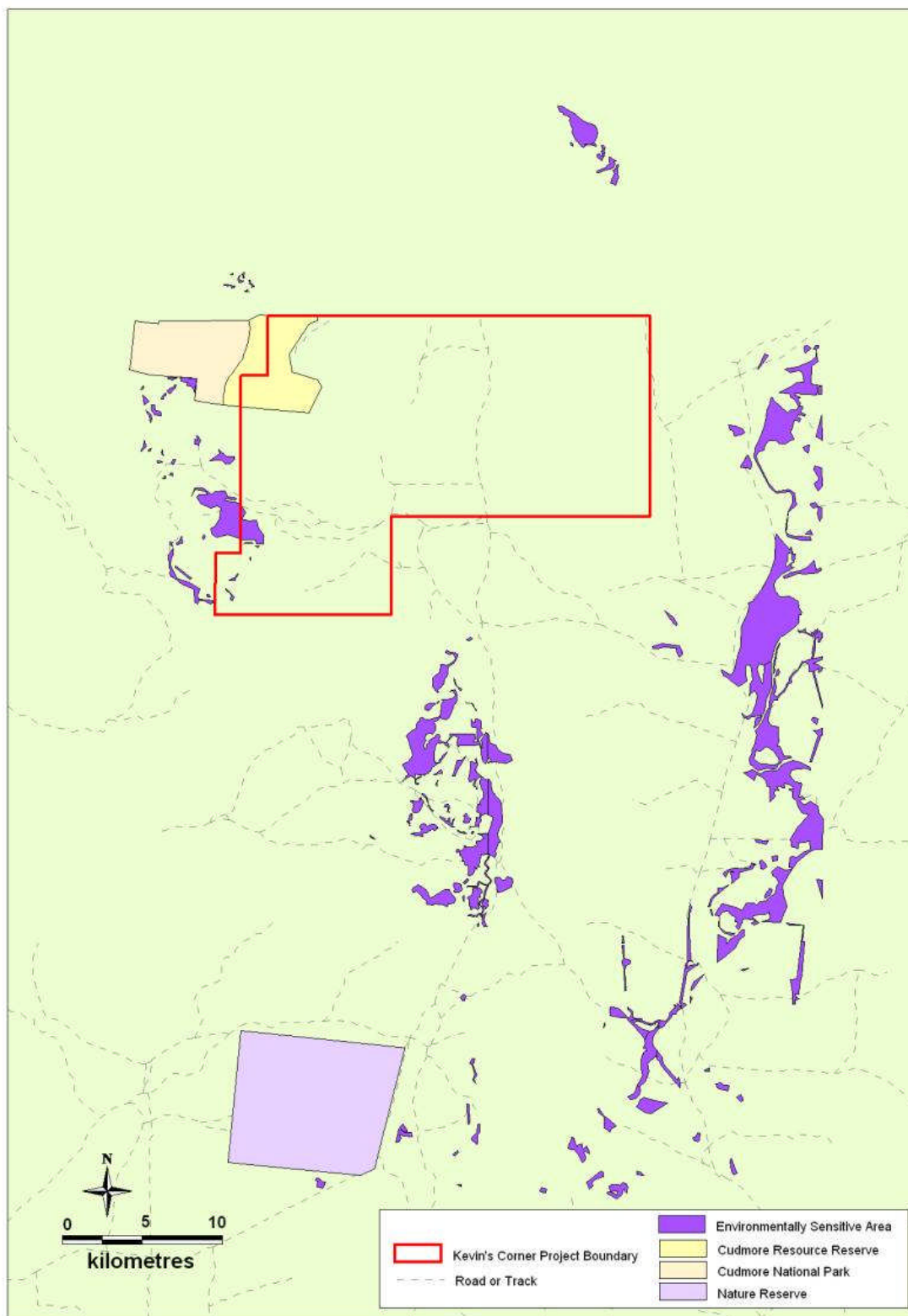


Figure 5 Environmentally Sensitive Areas

4.4 WETLANDS

4.4.1 Queensland Wetland Program

The Queensland Wetland Program wetland mapping provides detailed 1:50,000 (coastal) – 1:100,000 (inland) scale mapping of wetlands in Queensland. This program is considered to be of most relevance to the Project site due to the mapping methodology, scale of mapping, and the practice of regularly updating data.

Wetlands are not easily defined and current environmental management practice incorporates a number of different definitions and classifications. The definition of wetlands used by the Queensland Wetland Program is taken from the 'Wetland Mapping and Classification Methodology – Overall Framework document (EPA, 2005). This definition is consistent with Strategy for Conservation and Management of Wetlands (1999) but includes additional points of further clarification:

Wetlands are areas of permanent or periodic/intermittent inundation, 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. To be classified as wetland, the area must have one or more of the following attributes:

- i. At least periodically, the land supports plants or animals that are adapted to and dependant on living in wet conditions for at least part of their life cycle, or*
- ii. The substratum is predominantly undrained soils that are saturated, flooded or ponded long enough to develop anaerobic conditions in the upper layers, or*
- iii. The substratum is not soil and is saturated with water, or covered by water at some time.*

For the purposes of this report, the Queensland Wetland Program definition of a wetland is used to define such habitat. In addition, wetland classifications (e.g. palustrine, riverine) are also taken from the Queensland Wetland Program.

The map sheet for the Edwinstowe and Surbiton Regions encompass the Project site and show a remnant Regional Ecosystem unit containing areas of wetland along Well Creek. Several small lacustrine wetlands are located at the headwaters of each creek. These lacustrine wetlands have been identified as stock watering dams.

Riverine wetland regional ecosystems can provide nesting sites for birds, roosting sites for bats, food sources for migratory species, and filtration of the water moving through them by removing contaminants and nutrients.

4.4.2 Referrable Wetlands

The *Sustainable Planning Regulation 2009* defines a Referable Wetland as:

An area shown as a wetland on 'Map of referable wetlands'

The current map of Referable Wetlands in Queensland was derived from the RE mapping undertaken by the Queensland State government. The current map of Referable Wetlands includes areas dominated by wetlands but also other areas where RE mapping indicates that the area may only contain a minor proportion of wetlands. Wetlands mapping conducted as part of the Queensland Wetland Program (Section 4.4.1) is considered to provide a more detailed and more accurate indication of wetlands over the Project site.



In addition, environmental approval for level 1 mining projects is obtained through a process described in the *Environmental Protection Act 1994*. The application process is administered by DERM and is not subject to the same referral processes as applications under the *Sustainable Planning Act 2009*. As a result, Referable Wetlands are not considered further in this report.



5.0 FIELD SURVEY METHODOLOGY

Nine visits were conducted across the Project site and surrounding areas for terrestrial flora and fauna assessments. These visits were undertaken between June 2008 and November 2010 (refer to Table 3, Section 2.6 for the timing of each survey).

The flora and fauna survey methods that were employed during these assessments are discussed in Sections 5.1 to 5.3.

5.1 INITIAL SITE SCOPING

Site scoping was conducted using two methods. Firstly, aerial photography and maps of the Project site were reviewed to gain an overall perspective of the vegetation distribution. This included analysis of RE maps and those derived from the Queensland Wetland Program. Individual REs and wetlands were targeted for assessment of conservation values during the field surveys.

Secondly, accessible areas of the Project site were broadly surveyed from a vehicle. This allowed for the targeting of habitats potentially occupied by species of conservation significance and enabled survey transects to be located in areas that maximised the sampling of representative vegetation types and habitats on the Project site.

5.2 FLORA

The flora sampling regime was designed to describe all species and communities as far as possible, which are present on the Project site. Methods used were in accordance with those recommended in the draft New South Wales *Threatened Species Survey & Assessment: Guidelines for Developments and Activities (2001)* and the Queensland Herbarium *Methodology for Survey and Mapping of Regional Ecosystems and Vegetation Communities in Queensland* (Neldner *et. al* 2005).

5.2.1 Overall Approach

The field survey involved a baseline study of the Project using standard floristic survey methods. The methods employed on site were in accordance with the Queensland Herbarium's *Methodology for Survey and Mapping of Regional Ecosystems and Vegetation Communities in Queensland* (Version 3.1) and the Draft NSW Guidelines for Threatened Biodiversity and Assessment (2004).

The Queensland Herbarium Methodology describes the methods of sampling that were used in the AARC field surveys:

- *Secondary* – Consists of 20 x 50 metres (m) plots. Data recorded in these transects includes a list of all species observed from all the major layers of vegetation. Species that fall outside the plot but are typical of the community are also listed. In addition, relative abundance for individual species in each strata is recorded, including density and foliage projection cover and height for the tree and shrub layers;
- *Quaternary* or observation sites – These plots include Global Positioning System (GPS) location, the dominant species in the characteristic layer, with some landform and structural data. An intuitive classification of the vegetation is also recorded. These plots are commonly used in the ground truthing of mapping previously completed for the local area.



Field data collected using this methodology is compatible with the Queensland Herbarium CORVEG database. Example AARC flora pro-formas are attached in **Appendix H**. The level of assessment used in this study is discussed below in Sections 5.2.2 to 5.2.6.

5.2.2 Regional Ecosystem Mapping

A comprehensive vegetation survey was undertaken across the Project site in order to confirm the current RE mapping sourced from the Queensland Herbarium. Section 3.3.2.1 of the Kevin's Corner Terms of Reference states that the vegetation community mapping must be produced at a scale of 1:10 000. However, according to the Queensland Herbarium Methodology, a total of 25 observations per square kilometre are required, to delineate all polygons of 0.2ha or more in size and produce mapping to a 1:10 000 scale. Due to the size of the Project site (approximately 373.8 km²) this would entail a total of 9345 observations, including secondary plots, quaternary plots and meander transects. This was not considered practicable for the purposes of this assessment, and consequently the majority of the site was mapped at a scale of 1:50 000, with areas of conservation significance (Regional Ecosystems listed under the VM or APBC Acts) and high impact areas (such as the creek diversion) mapped at 1:25 000. Mapping at these scales discerns polygons of 5 and 1.2 hectares respectively, requiring 1 observation per square kilometre for the former, and 4 for the latter. The vegetation communities within the proposed locations of the four test pits have been mapped at 1:10 000.

The following methods were used to describe and map each vegetation community:

- A number of secondary transects (50 x 20 m plot) in each vegetation type were selected and a detailed floristic inventory of the dominant and associated woody plants (i.e. trees and shrubs) was undertaken. Secondary plots were positioned in vegetation representative of the community as a whole;
- In addition to the secondary transects, a number of quaternary transects were surveyed in order to assist with the mapping of REs;
- An assessment of the condition of the vegetation type with regard to quality and conservation value was undertaken at each transect; and
- The preparation of RE maps was undertaken through the use of aerial photographs, geological maps and ground-truthing.

The RE mapping methodology recommends a minimum number of three secondary sites per regional ecosystem type and notes that sampling adequacy can be informally determined, when additional sites do not add substantial new species or show significant structural variation to the mapping process.

5.2.3 Survey for Species of Conservation Significance

When habitat suitable for a species of conservation significance was located, a specific survey for that species was undertaken. This specific search involved the use of methods discussed in the draft New South Wales *Threatened Species Survey and Assessment Guidelines* (NSW National Parks and Wildlife Service 2001).

The method that was used in this survey was the random meander technique. As its name suggests, this technique involves traversing areas of suitable habitat in no set pattern whilst searching for the



particular plant species. If there was any uncertainty in identifying the species, a specimen was collected for classification confirmation by the Queensland Herbarium or photographs taken for species confirmation by the Queensland Museum. Random meander searches were conducted in all ecological communities found on the Project site, as well disturbed areas such as roadsides and farm dams.

5.2.4 Plant and Regional Ecosystem Identification

All dominant plants representative of each vegetation community were identified using a number of taxonomic keys and other reference materials. All REs were described in accordance with the Regional Ecosystems Descriptions Database (REDD) and Sattler and Williams (1999). The use of the terms 'Remnant' and 'Non-remnant' vegetation' are used as per the VM Act. Any plant species that could not be identified in the field were sampled and sent to the Queensland Herbarium for identification.

5.2.5 Mixed Polygons

On vegetation and RE maps, a polygon usually denotes a discrete area of one type of vegetation community. The scale at which an RE map is produced dictates the minimum area of continuous vegetation type that can be represented by one polygon. This is known as the "minimum mappable area". If distinct vegetation communities are smaller than this minimum area, then vegetation communities are put together in "mixed polygons". This approach has the consequence that when Landzone maps are combined with vegetation maps to produce REs, mixed polygons containing more than one RE can be produced. Where mixed polygons are represented on an RE map, all REs represented within the polygon are denoted.

5.2.6 Flora Transect Locations

Flora transects were conducted in each community found within the Project site. The locations of these transects are presented in Figure 6. In addition to the transect study locations, incidental observations of flora species were recorded with notes on the vegetation community as they were encountered. Areas of disturbance such as roadsides, dams and creek crossings were also investigated as they often provide a foothold for a number of different species, particularly invasive weeds.

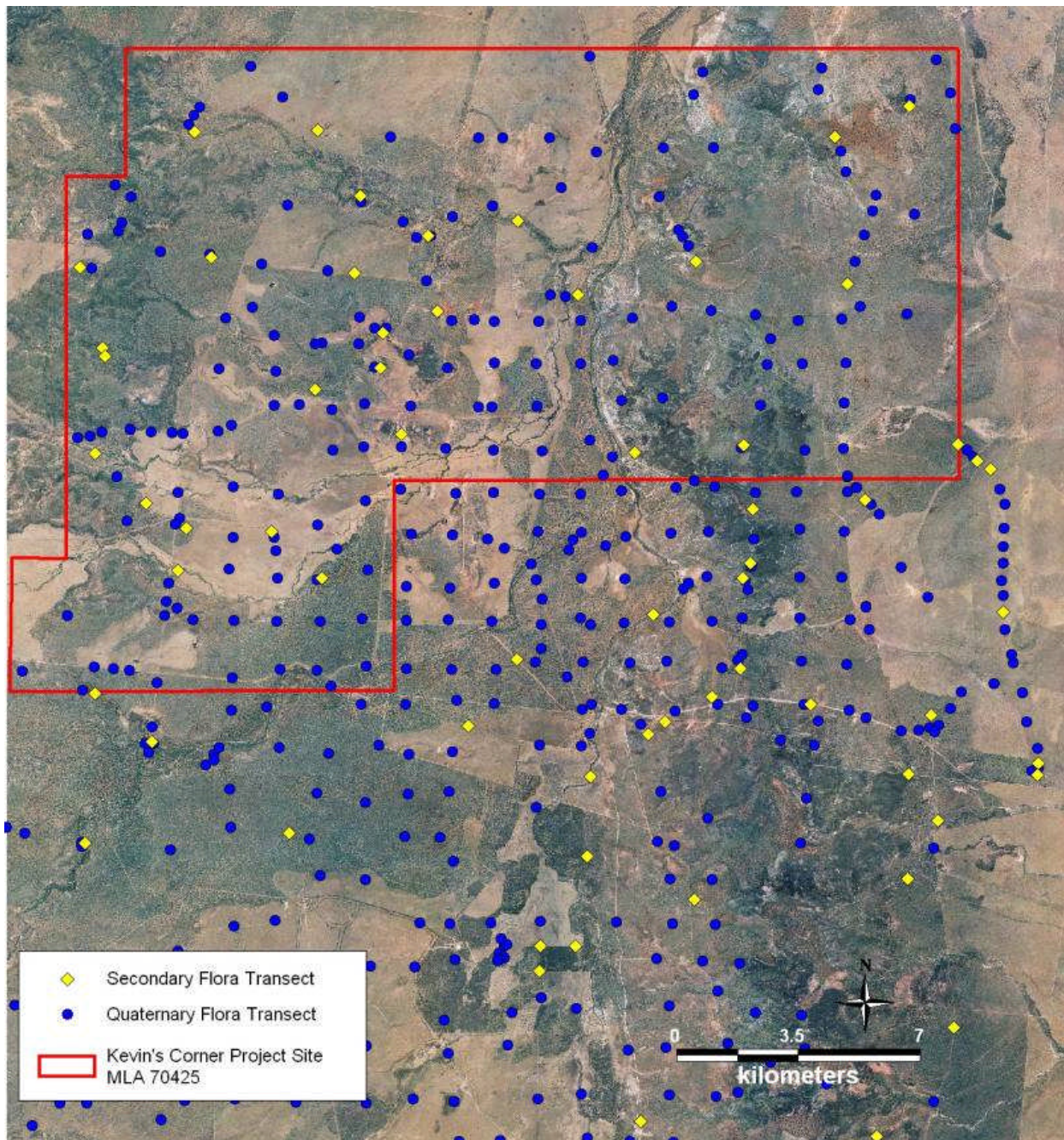


Figure 6 Flora Transect Locations

5.3 FAUNA

The fauna sampling methodology for the Project site was based on 'standard survey' techniques that are used to sample terrestrial and aquatic vertebrate fauna. Sampling of fauna was conducted primarily along transects established in each of the major vegetation communities.

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

- Habitat assessment;
- Pitfall trapping;

- Elliott trapping;
- Ultrasonic bat detection (AnaBat™);
- Funnel trapping;
- Motion sensor cameras;
- Spotlighting; and
- Active searching.

5.3.1 Nomenclature

Many fauna species, particularly frogs and reptiles, do not have widely accepted common names. Where possible, the accepted common names of wildlife have preferentially been employed in this report, with scientific names stated on all other occasions.

Nomenclature within this report follows the following references:

- Tyler and Knight (2009) for amphibians;
- Wilson (2005) for reptiles;
- Simpson and Day (2010) for birds;
- Cogger (2000) for reptiles and amphibians; and
- Menkhorst and Knight (2004) for mammals.

5.3.2 Detection Methods

A brief description of the techniques employed to survey fauna occurring on and surrounding the Project site is provided below.

Elliott trapping

Type A Elliott traps were used to target small ground-dwelling mammals inhabiting the Project site and surrounding areas. Traps were baited with a mixture of rolled oats, honey, peanut butter and vanilla essence. Elliott traps were positioned in two rows at each transect, approximately 100 m apart, with each trap separated by approximately ten metres. The overall survey effort (combining each field survey) was 1,709 Elliot trap nights.

Pitfall trapping

A pitfall trap-line was established at all primary transects to target small ground-dwelling fauna (reptilian, mammalian and amphibian). Each line consisted of a 20 centimetre (cm) tall wire-mesh drift fence running along the ground and crossing the middle of five 20 litre buckets buried flush with the soil surface. The bottoms of drift fences were buried slightly to guide target species towards a bucket. A small amount of soil, leaf litter and water (soaked into a sponge) was placed in the bottom of each bucket to provide shelter and moisture for captured wildlife. The overall survey effort was 400 pitfall trap nights.



Funnel trapping

Funnel traps were employed to catch medium and large-sized terrestrial, diurnal snakes and some of the widely foraging, medium-sized skinks, dragon and arboreal geckos, which are able to climb out of pitfall traps. Funnel traps are fundamentally similar to fish traps, being a collapsible wire frame covered with shade cloth, and with a funnel at each end. Funnel traps were placed at the end of each drift fence at the pitfall trap-lines and along fallen timber at secondary trap sites. Total funnel trap effort for all surveys was 293 trap nights.

Cage trapping

Cage Traps used during surveys are 20 cm x 20 cm x 56 cm in size and are mostly useful for capturing medium-sized fauna that are unlikely to be caught in pit and funnel traps. The overall survey effort for cage trapping was 209 trap nights.

Micro-bat surveying

Micro-bats (*Microchiroptera*s) form an extremely diverse group of wildlife and the identification of individual species requires the use of specialised survey methods due to the superficial similarity of many species, their small size and largely inaudible calls.

In order to navigate and hunt at night, micro-bats use high frequency echolocation calls, most of which are above the frequency range audible to humans (i.e. ultrasound). These echolocation calls provide an opportunity to unobtrusively survey and identify micro-bats through the use of a specialised electronic bat call recorder called AnaBat™. The AnaBat™ was utilised throughout surveys, recording micro-bat calls at each vegetation community. This method therefore represents a broad census technique which facilitates the detection of a broad suite of micro-bats which utilise the Project site and surrounding areas. Recordings were sent to an expert AnaBat™ call analyst (Mr. Greg Ford – Toowoomba, Queensland) for species identification. The overall AnaBat™ survey effort was 45 nights.

Bird surveying

A dedicated search for diurnal birds was conducted visually and aurally on mornings and afternoons of the survey in the immediate vicinity of each fauna transect. In addition, opportunistic diurnal searches were also conducted on foot in areas considered likely to have high avian diversity (e.g. vegetated creek lines, dams), or to contain cryptic or threatened bird species.

Spotlighting

Spotlighting was carried out at night in various sections of the Project site and surrounding areas in an attempt to observe nocturnal wildlife not likely to be detected by other survey methods, such as owls and arboreal mammals. Two spotlighting techniques were employed:

Walk searches: Various habitats surrounding and within the Project site were selected for spotlighting on foot, especially those considered likely to have high wildlife diversity or to contain cryptic or threatened species. These areas were randomly traversed by two ecologists equipped with spotlights and binoculars. Rock fissures, bark crevices and tree hollows were investigated where possible. A slow walking speed (approximately 1 km per hour) was maintained to facilitate intensive listening and thorough visual searching. While this technique improves the likelihood of detecting small cryptic species, it is a time consuming activity that does not permit the coverage of large areas. The total spotlight hours undertaken on foot within and surrounding the Project site was 67 hours.



Vehicle searches: Spotlighting was also conducted from a slow-moving vehicle where established roads / tracks permitted driving through areas considered likely to have high wildlife diversity or to contain cryptic or threatened species. A 55 watt 12 volt spotlight was used to scan roadside vegetation for arboreal and ground-dwelling wildlife. An advantage of this survey technique is the efficiency with which large areas can be covered, although small cryptic species can be easily overlooked. A total of 48 hours of vehicle spotlighting was undertaken throughout the course of all surveys.

Habitat searching

To further enhance the likelihood of detecting small cryptic species, opportunistic diurnal searches of likely micro-habitats were conducted at each transect and in other selected areas surrounding the Project site. Searches involved the rolling of rocks and logs, rustling through leaf litter, and the peeling back of exfoliating bark from standing trees. Observed animals were caught where possible to aid positive species identification.

Scat/Track searching

At each transect location a search of the immediate area was conducted for evidence of the presence of cryptic wildlife species through the identification of obvious tracks, scats and other signs of occupation (for example, tree trunk scratchings).

Incidental recordings

Throughout the survey period numerous wildlife species were observed or heard on the Project site during the course of routine activities, such as setting and checking trap-lines, or driving between transects. Where required, a closer inspection of detected wildlife was carried out to ensure positive species identification. All incidental observations were recorded and appropriate notes made on the surrounding habitat.

5.3.3 Fauna Transect Locations

A total of 36 fauna transect sites were established on and surrounding the Project site. Each site was subject to trapping regimes of up to four consecutive nights for pitfall traps and five consecutive nights for all other traps. The location of these fauna transects are presented Figure 7 below and include both the Project site and surrounding habitat.

Fauna transects were established across the range of vegetation communities present on the Project site. Fauna transect sites outside the Project area were also utilised in this fauna assessment, as habitat types are synonymous with habitat on the Project site. Also, most fauna species identified have the mobility to inhabit both MLAs. Those determined to occupy natural ranges large enough to potentially travel between both sites were included in the results of this study. A combination of pitfall lines, funnel, cage, Elliot traps and AnaBat™ recordings were used to assess the presence and abundance of species at these locations. Active searching and bird surveys were undertaken to supplement data from the transect sites.

Transects were positioned to maximise the potential for sampling all wildlife present by targeting the full range of habitat types present on and surrounding the Project site. Fauna trap site descriptions and photographs are provided in Appendix I.



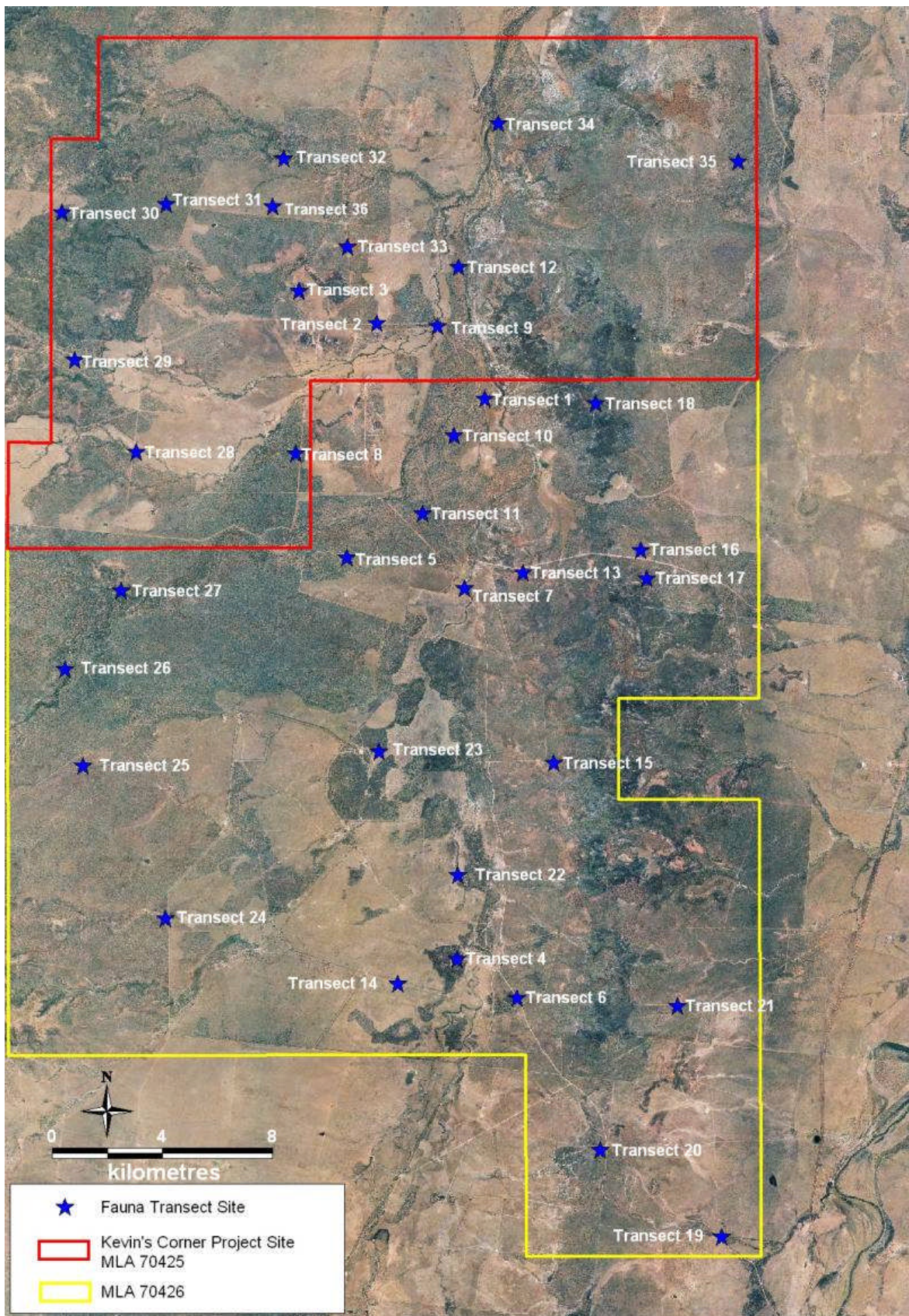


Figure 7 Fauna Trap site Locations

6.0 FLORA RESULTS AND DISCUSSION

The following sections describe the vegetation communities occurring on the Project site. This includes description of the vegetation structure and the dominant species of the canopy, subcanopy, shrub, lower shrub and ground layer. Figure 8 shows the distribution of the identified communities on and around the Project site, as well as mapped conservation areas that overlap or adjoin the Project Site. Appendix A presents a detailed list of the identified flora species found during the survey. A total of 458 flora species were identified within and adjacent to the Project site.

The conservation status of each identified vegetation community is also discussed, based upon the following criteria:

1. Each community's extent in the surrounding region;
2. The condition of the vegetation; and
3. The conservation status of corresponding REs according to the VM Act, DERM Biodiversity Status and the EPBC Act.

A total of 25 vegetation communities were identified on the Project site during the AARC field survey. 24 of these communities were classed as Remnant Vegetation as defined in the VM Act. Associations within the communities reflect different vegetation structures and compositions, which occur on different geophysical locations. The corresponding Queensland Herbarium RE classifications are noted for each of the described remnant vegetation communities.

The twenty distinct vegetation communities include:

- Community 1 – Brigalow Open Woodland (RE 10.3.3a)
- Community 2 – Brigalow Open Woodland (RE 10.4.5)
- Community 3 – Brigalow Open Woodland (RE 10.9.3)
- Community 4 – Brigalow Open Woodland (RE 11.3.5)
- Community 5 – Silver-leaved Ironbark Open Woodland (RE 10.3.28a)
- Community 6 – Silver-leaved Ironbark Open Woodland (RE 10.5.5a)
- Community 7 – Silver-leaved Ironbark Open Woodland (RE 10.7.11a)
- Community 8 – Silver-leaved Ironbark Open Woodland (RE 11.8.4)
- Community 9 – Poplar Box Open Woodland (RE 10.3.27a)
- Community 10 – Poplar Box Open Woodland (RE 10.5.12)
- Community 11 – Poplar Box Open Woodland (RE 11.3.2)
- Community 12 – Silver-leaved Ironbark/Poplar Box Mixed Woodland (RE 10.5.5a/10.5.12)
- Community 13 - White Cypress Pine Woodland (RE 11.5.5b)



- Community 14 – Gidgee Open Woodland (RE 10.3.4b)
- Community 15 – Fringing Riparian Woodland (re 10.3.12a)
- Community 16 – Fringing Riparian Woodland (RE 10.3.13a)
- Community 17 – Fringing Riparian Woodland (RE 10.3.14)
- Community 18 – Weeping Bottlebrush Heath (RE 10.7.7)
- Community 19 – Thozets Box Open Woodland (RE 10.7.5)
- Community 20 – Lancewood Woodland (RE 10.7.3b)
- Community 21 – Lancewood Woodland (RE 10.10.1b)
- Community 22 – Queensland Yellow jacket Low Open Woodland (RE 10.5.1c)
- Community 23 – Rusty jacket Open Woodland (RE 10.10.4)
- Community 24 – Natural Grasslands of the Central Highlands and northern Fitzroy Basin (RE 11.8.11)
- Community 25 - Non-remnant Grassland

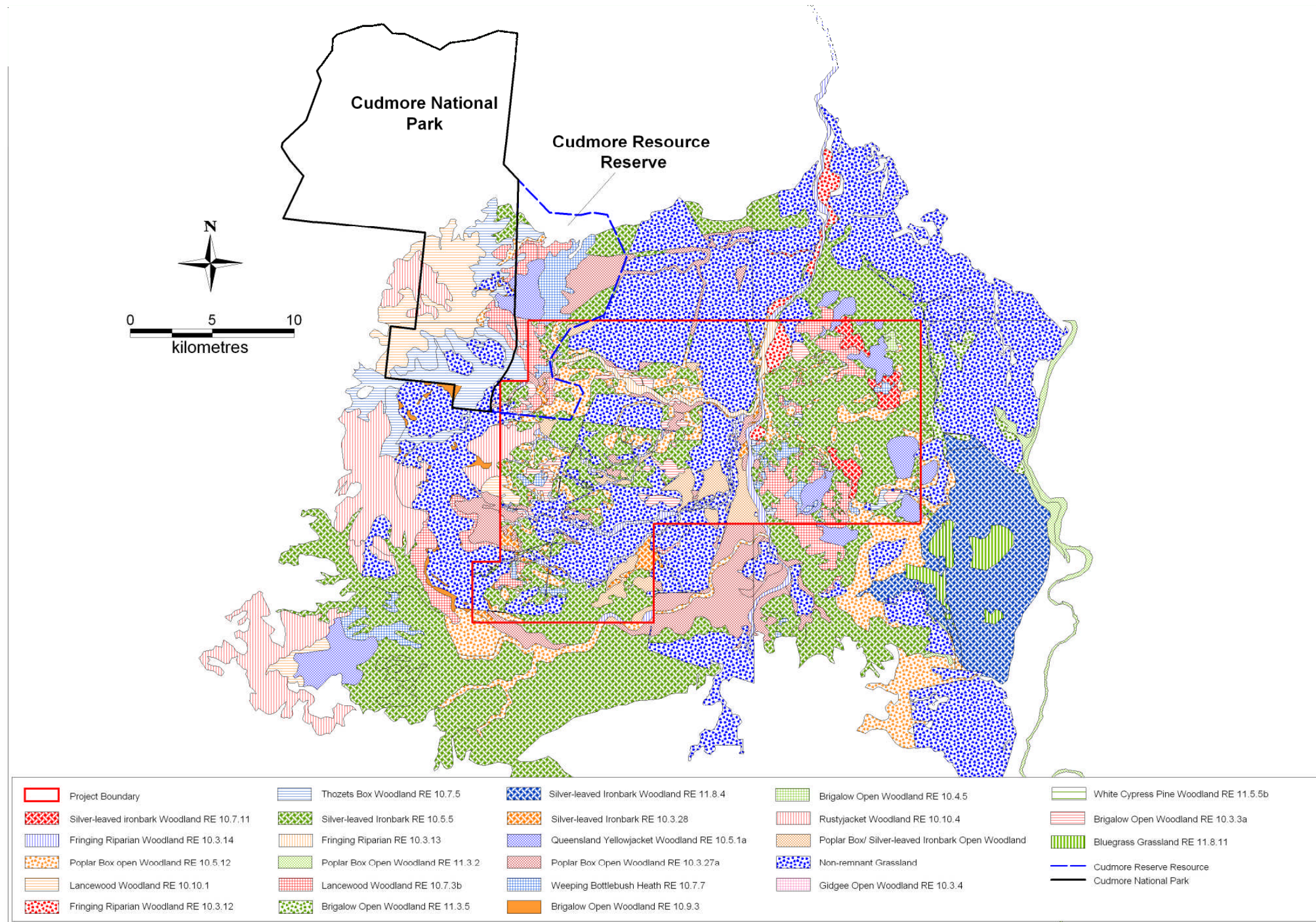


Figure 8 Vegetation Communities on the Project site

6.1 BRIGALOW OPEN WOODLAND (RE 10.3.3a)

6.1.1 Community Description and Location

The Brigalow Open Woodland (RE 10.3.3a) occurs along alluvial plains adjacent to larger creek lines, as well as occasional smaller drainage lines. Disturbance within this community is planned to occur, as the open cut pit, open cut pit water dam and site access road will traverse this community. Potentially 234.1 ha could be affected. The underground mine area also underlies approximately 643 ha of this community.

Table 8 provides a summary of the Brigalow Open Woodland (RE 10.3.3a) community's conservation status, dominant flora species and REDD description. The Brigalow Open Woodland has a very open tussock grassland ground cover, with leaf litter and fallen timber having the potential to provide sheltered habitat for fauna species.

Table 8 Community Profile – RE 10.3.3a

Regional Ecosystem	10.3.3a
REDD	10.3.3a: <i>Eucalyptus cambageana</i> open-woodland with or without <i>Acacia harpophylla</i> understorey. <i>Eucalyptus cambageana</i> dominates the very sparse canopy (17-28 m tall). <i>Acacia harpophylla</i> is occasionally present as scattered small trees (6-12 m tall) with <i>E. cambageana</i> , <i>Flindersia dissosperma</i> , <i>Lysiphyllum carronii</i> and <i>Eremophila mitchellii</i> . <i>Carissa lanceolata</i> usually dominates the very sparse shrub layer (0.5-4.0 m tall). <i>Eremophila mitchellii</i> , <i>Sydrax oleifolium</i> and <i>Atalaya hemiglauca</i> are usually present in the shrub layer. Dominant graminoids in the ground layer are variable and include <i>Enteropogon acicularis</i> , <i>Bothriochloa ewartiana</i> , <i>Paspalidium caespitosum</i> , <i>Sporobolus actinocladius</i> , <i>Oxychloris scariosa</i> , <i>Chrysopogon fallax</i> , <i>Pennisetum ciliare</i> and <i>Fimbristylis dichotoma</i> . Graminoids commonly present include <i>Heteropogon contortus</i> , <i>Sporobolus australasicus</i> , <i>Eriochloa pseudoacrotricha</i> , <i>Panicum decompositum</i> , <i>Dactyloctenium radulans</i> and <i>Aristida</i> spp. Forbs frequently present include <i>Ammannia multiflora</i> , <i>Enchylaena tomentosa</i> and <i>Sida</i> spp.. Occurs on alluvial plains.
Conservation Status	Not Listed (EPBC Act) No concern at Present (DERM Biodiversity Status)
Tree Layer	<i>Acacia harpophylla</i> (8-10 m), <i>Eucalyptus cambageana</i> (10-13 m), <i>Lysiphyllum carronii</i> Average Stem Cover count = 30, PFC = 2 % - 25 %
Shrub Layer	<i>Eremophila mitchellii</i> (2.5–3.5 m), <i>Carissa ovata</i> (1-1.5 m), <i>Acacia salicina</i> , <i>Eremophila latrobei</i> , <i>Everistia vacciniifolia</i> , <i>Petalostigma pubescens</i>



Ground Layer	<i>Paspalidium caespitosum</i> , <i>Paspalidium distans</i> , <i>Panicum decompositum</i> , <i>Sporobolus actinocladus</i> , <i>Pennisetum ciliare</i> , <i>Aristida latifolia</i> . Common forbs include <i>Sclerolaena divericata</i> , <i>Sida cleisocalyx</i>
Groundcover Observed on Site	Groundcover along each secondary transect averaged 24 % bare ground, 10 % surface pebbles and rock, 22 % leaf litter, 23 % grass, 16 % herbs and forbs and 5 % low shrub.

6.1.2 Conservation Status

No listed flora species were identified within this community. Non-native species present within the Brigalow Open Woodland include paddy's Lucerne (*Sida spinosa*), buffel grass (*Cenchrus ciliaris*), common pest pear (*Opuntia stricta*) and velvety tree pear (*Opuntia tomentosa*).

RE 10.3.3a is protected within the region at the Cudmore Resource Reserve (occurs on-site) and Cudmore National Park (off-site). The state wide remnant extent of this RE is greater than 10,000 ha and more than 30% of its pre-clearing area remains. It is classified as 'No Concern at Present under the DERM Biodiversity Status.

6.2 BRIGALOW OPEN WOODLAND (RE 10.4.5)

6.2.1 Community Description and Location

The Brigalow Open Woodland (RE 10.4.5) is located within the north-eastern portion of the Project site, along cracking black clay soil. No disturbance is planned for this community.

The Brigalow Open Woodland (RE 10.4.5) community profile, describing the conservation status and dominant floral species for this community is found in Table 9.

Table 9 Community Profile – RE 10.4.5

Regional Ecosystem	10.4.5
REDD	10.4.5: <i>Acacia cambagei</i> low woodland sometimes with <i>A. harpophylla</i> . <i>Acacia cambagei</i> dominates the very sparse to sparse canopy (6-15 m tall). Other trees often present in the canopy or occur as scattered small trees include <i>Terminalia oblongata</i> and <i>Acacia harpophylla</i> . <i>Eremophila mitchellii</i> and <i>A. cambagei</i> usually dominate the very sparse large shrub layer (2-4 m tall). <i>A. cambagei</i> , <i>Eremophila deserti</i> , <i>Senna artemisioides</i> and <i>Carissa lanceolata</i> are usually common or dominant in the small shrub layer (0.5-2 m tall). <i>Enteropogon acicularis</i> , <i>Eragrostis lacunaria</i> , <i>Tripogon loliiformis</i> and <i>Oxychloris scariosa</i> or <i>Leptochloa decipiens</i> occasionally occur as dominant graminoids in the very sparse ground layer.



	Other graminoids often present include <i>Sporobolus actinocladius</i> , <i>Enneapogon polyphyllus</i> and <i>Paspalidium caespitosum</i> . <i>Enchylaena tomentosa</i> and <i>Sclerolaena</i> spp. are forbs usually present. Occurs on plains and gently undulating downs on Cainozoic lake deposits. Cracking clay soils, usually gilgaied, and minor areas of texture contrast soils
Conservation Status	Not Listed (EPBC Act)Of Concern (DERM Biodiversity Status)
Tree Layer	<i>Acacia cambagei</i> (7-10 m), <i>Acacia harpophylla</i> (7-10 m), <i>Eucalyptus melanophloia</i> Average Stem Cover count = 16, PFC = 10% - 20%
Shrub Layer	<i>Eremophila mitchellii</i> (2.5–3.5 m), <i>Carissa lanceolata</i> (1-1.5 m), <i>Eremophila deserti</i> , <i>Eremophila maculata</i>
Ground Layer	<i>Paspalidium caespitosum</i> , <i>Enneapogon polyphyllus</i> , <i>Tripogon loliiformis</i> , <i>Eragrostis lacunaria</i> , <i>Sporobolus disjunctus</i> , <i>Sporobolus scabridus</i>
Groundcover Observed on Site	Groundcover consisted of 46% bare ground, 27% grass, 17% leaf litter, 7% herbs and 3% tree or shrub stem cover.

6.2.2 Conservation Status

No threatened species were identified within this community. Introduced and naturalised floral species within RE 10.4.5 include buffel grass (*Cenchrus ciliaris*), red natal grass (*Melinis repens*), awnless barnyard grass (*Echinochloa colona*) and common pest pear (*Opuntia stricta*).

The Brigalow Open Woodland (RE 10.4.5) is listed as 'Of Concern' under the DERM Biodiversity Status. Regionally, this RE is subject to clearing for pasture development and is prone moderate pasture degradation. There is potential for parthenium (*Parthenium hysterophorus*) (Weed of National Significance and Class 2 declared weed under the LP Act) invasion on the heavy clay soils. The cracking clays cause major physical problems for plant roots and annual plants have only a short growing season. The state wide extent of this RE included in reserves is low and includes the Moorrinya National Park. In December 2006, the state wide remnant extent was greater than 10,000 ha and entailed greater than 30% of the original pre-clearing area.

6.3 BRIGALOW OPEN WOODLAND (RE 10.9.3)

6.3.1 Community Description and Location

The Brigalow Open Woodland (RE 10.9.3) occurred in the southwest portion of the Project in small, disjunct patches. This community will not incur surface disturbance, although workings will occur below the surface over approximately 17 ha.



Table 10 summarises REDD description, conservation status and community vegetation structure.

Table 10 Community Profile – RE 10.9.3

Regional Ecosystem	10.9.3
REDD	10.9.3: <i>Acacia harpophylla</i> low open-woodlands to woodlands or <i>Eucalyptus cambageana</i> open-woodland with or without <i>Acacia harpophylla</i> understorey or open-tussock grassland. Occurs on flat to undulating terrain with shallow clay soils overlying fine-grained Mesozoic sediments.
Conservation Status	Not Listed (EPBC Act)Endangered (DERM Biodiversity Status)
Tree Layer	<i>Acacia cambagei</i> (8-12 m), <i>Acacia harpophylla</i> (9-12 m)
Shrub Layer	<i>Atalaya hemiglauca</i> , <i>Senna artemisioides</i> , <i>Carissa ovata</i> , <i>Erythroxylum australe</i>
Ground Layer	<i>Paspalidium caespitosum</i> , <i>Sporobolus actinocladius</i> , <i>Sporobolus disjunctus</i> , <i>Sporobolus scabridus</i> , <i>Aristida inaequiglumis</i> , <i>Aristida latifolia</i> , <i>Pennisetum ciliare</i>

6.3.2 Conservation Status

No threatened species were identified inhabiting this community.

The Brigalow Open Woodland community (RE 10.9.3) is listed as 'Endangered' under the DERM Biodiversity Status. Potential threats to this community are mainly from tree clearing, high susceptibility to salinity, weed infestation particularly from parthenium, over grazing and soil erosion. This RE is considered rare (800 ha in total area) for the bioregion, and occurs in a scattered and disjunct distribution. It is considered a naturally restricted RE. The status of naturally restricted is not a threatening process in itself, however, the ecosystem is considered threatened as one comparatively small event may lead to extinction (Mitchell et al, 2002). RE 10.9.3 is represented in the Cudmore National Park.

6.4 BRIGALOW OPEN WOODLAND (RE 11.3.5)

6.4.1 Community Description and Location

The Brigalow Open Woodland (RE 11.3.5) has been identified using DERM's Regional Ecosystem Mapping tool as occurring within the eastern portion of the Project site, along the proposed railway and roadway corridors. However, due to restrictions associated with site access of the railway corridor, data on this RE is yet to be collected. 5.7 ha of this community may potentially be disturbed.

Table 11 summarises the Brigalow Open Woodland (RE 11.3.5) community profile.



Table 11 Community Profile – RE 11.3.5

Regional Ecosystem	11.3.5
REDD	11.3.5: <i>Acacia cambagei</i> +/- <i>A. harpophylla</i> low woodland or open-forest sometimes clumped, on Cainozoic alluvial plains. <i>Acacia cambagei</i> dominates the canopy (8-16 m high) sometimes in association with <i>A. harpophylla</i> as a sub-dominant. <i>Eucalyptus coolabah</i> , <i>E. largiflorens</i> (subregion 35) or <i>Acacia harpophylla</i> may be present. Often <i>Eremophila mitchellii</i> is present as an open low tree layer (1.5-4 m high) or as scattered shrubs to small trees. <i>Psyrax oleifolia</i> and <i>Atalaya hemiglauca</i> are occasionally present. A small shrub layer sometimes occurs dominated by <i>Senna artemisioides</i> with or without suckers of <i>Acacia cambagei</i> or both species may occur as scattered shrubs. The ground layer is often poorly formed except under the canopy where there is usually a very sparse cover of dominants which include <i>Paspalidium caespitosum</i> , <i>Sporobolus actinocladus</i> and <i>Brachyachne convergens</i> . Other graminoids frequently present are <i>Bothriochloa ewartiana</i> , <i>Iseilema vaginiflorum</i> , <i>Eragrostis microcarpa</i> and <i>Aristida latifolia</i> . Occurs on levees on alluvial plains which are rarely flooded. Associated soils are often texture contrast with sandy surfaces
Conservation Status	Not Listed (EPBC Act)Of Concern (DERM Biodiversity Status)
Tree Layer	<u><i>Acacia cambagei</i></u> (8-12 m), <u><i>Acacia harpophylla</i></u> (9-12 m)
Shrub Layer	<u><i>Atalaya hemiglauca</i></u> , <u><i>Senna artemisioides</i></u> , <i>Carissa ovata</i> , <i>Erythroxylum australe</i>
Ground Layer	<u><i>Paspalidium caespitosum</i></u> , <i>Sporobolus actinocladus</i> , <i>Sporobolus disjunctus</i> , <i>Sporobolus scabridus</i> , <i>Aristida inaequiglumis</i> , <i>Aristida latifolia</i> , <i>Pennisetum ciliare</i>

6.4.2 Conservation Status

No threatened species have been targeted for searches within this community.

The Brigalow Open Woodland (RE 11.3.5) is listed as Least Concern under the VM Act and Of Concern under the DERM Biodiversity Status. Reserves in which this RE occurs in include the Culgoa Floodplain National Park, Epping Forest National Park, Nairana National Park, Mazeppa National Park and the Narrien Range National Park. In December 2006, the remnant bioregional extent of this RE was greater than 10,000 ha and greater than 30% of the original pre-cleared area remained. The 'Of Concern' listing under DERM's Biodiversity Status is due to broad scale vegetation clearing, increasing fragmentation and loss of remnant area.



6.5 SILVER-LEAVED IRONBARK OPEN WOODLAND (RE 10.3.28a)

6.5.1 Community Description and Location

The Silver-leaved Ironbark Open Woodland (RE 10.3.28a) occurs along headwaters of Well Creek, and the alluvial plains of Sandy Creek and Little Sandy Creek. Infrastructure plans for the Project include an access road through this community and potential disturbance may equate to 70.8 ha. Mining activities will also occur below this community over approximately 464 ha.

The community profile for the Silver-leaved Ironbark Open Woodland (RE10.3.28a) is summarised in Table 12 below.

Table 12 The Silver-leaved Ironbark Community Profile – RE 10.3.28a

Regional Ecosystem	10.3.28a
REDD	10.3.28a: <i>Eucalyptus melanophloia</i> dominates the very sparse to sparse canopy (8-18 m tall). <i>Corymbia dallachiana</i> is occasional present in the canopy or subcanopy. A low tree layer or shrub layer are usually absent although there can be scattered small trees and shrubs present. <i>Aristida benthamii</i> , <i>Sehima nervosum</i> , <i>Digitaria brownii</i> , <i>Chrysopogon fallax</i> , <i>Enneapogon polyphyllus</i> , <i>Schizachyrium fragile</i> and <i>Eriachne mucronata</i> occur as dominants and some co dominants. Other graminoids usually present include <i>Aristida</i> spp., <i>Panicum effusum</i> , <i>Tripogon loliiformis</i> and <i>Heteropogon contortus</i> . Forbs usually present include <i>Evolvulus alsinoides</i> , <i>Rostellularia adscendens</i> , <i>Sauropus trachyspermus</i> and <i>Brunoniella australis</i> . Occurs on sandy alluvial fans
Conservation Status	Not Listed (EPBC Act)Least Concern (VM Act) No concern at Present (DERM Biodiversity Status)
Tree Layer	<i>Eucalyptus melanophloia</i> (10-13 m), <i>Corymbia dallachiana</i> (9-11 m) Average Stem Cover count = 12, PFC = 7 % - 25 %
Shrub Layer	<i>Petalostigma pubescens</i> (2-3 m), <i>Carissa ovata</i> (1-2 m)
Ground Layer	<i>Heteropogon contortus</i> , <i>Aristida latifolia</i> , <i>Aristida bigandulosa</i> , <i>Digitaria brownii</i> , <i>Enneapogon polyphyllus</i> , <i>Chrysopogon fallax</i>
Groundcover Observed on Site	A mid dense grassy groundcover with an average of 27 % bare ground, 21 % leaf litter, 45 % grass, 5 % herbs and forbs and 2 % shrubs.

6.5.2 Conservation Status

No flora species of conservational significance were identified within this community, which is consistent with all database searches undertaken prior to the site visit. This vegetation community has been colonised with several introduced species, including red natal grass (*Melinis repens*), buffel



grass (*Cenchrus ciliaris*), common pest pear (*Opuntia stricta*), shrubby stylo (*Stylosanthes scabra*) and blackberry nightshade (*Solanum nigrum*).

RE 10.3.28 is protected within Cudmore National Park, Cudmore Resource Reserve and White Mountains National Park (located 80 km from Hughenden). In December 2006, the state wide remnant extent of RE 10.3.28 was greater than 10,000 ha and greater than 30% of the pre-clearing area remained. It is not listed under the EPBC Act and classified as 'No Concern at Present' under the DERM Biodiversity Status.

Largely for RE 10.3.28, the top soils on upper slopes are susceptible to sheet erosion while on the lower slopes the top soils are deeper and have better water-holding capacity but are subject to flooding and salting. Revegetation after loss of top soil and exposure of the clayey subsoil is expected to be difficult and very slow.

6.6 SILVER-LEAVED IRONBARK OPEN WOODLAND (RE 10.5.5a)

6.6.1 Community Description and Location

The Silver-leaved Ironbark Open Woodland (RE 10.5.5a) is the dominant vegetation community on the Project site. It occurs along orange and red sandy plains. Planned infrastructure within this community includes the open cut pit, pit water dams, creek diversion levees, product stockpiles, environmental dams drain, clean water storage, light industrial area, train load out facility, dragline construction pad, construction camp, accommodation village, security facility, airport, access road, powerlines and water pipeline. Around 2,020 ha of this community will be cleared or otherwise impacted as a result of mine construction activities. Additionally, the underground mine area in the western portion of site underlies nearly 5,500 ha of this vegetation community.

Table 13 summarises the REDD, conservation status and dominant flora species for this community.

Table 13 Community Profile – RE 10.5.5a

Regional Ecosystem	10.5.5a
REDD	10.5.5a: <i>Eucalyptus melanophloia</i> open-woodland. <i>Eucalyptus melanophloia</i> dominates the very sparse canopy (8-19 m tall). <i>Corymbia plena</i> and <i>C. dallachiana</i> are occasionally co dominants in the canopy. <i>Petalostigma pubescens</i> and <i>Acacia spp.</i> occasionally occur as dominants or as scattered tress in the very sparse to mid-dense low tree layer. <i>Carissa lanceolata</i> , <i>Sydrax oleifolius</i> and <i>Maytenus cunninghamii</i> frequently occur in the very sparse to sparse shrub layer (0.5-4 m tall). <i>Triodia pungens</i> is often dominant in the very sparse to mid-dense ground layer. <i>Aristida spp.</i> , <i>Bothriochloa ewartiana</i> , <i>Eriachne mucronata</i> , <i>Eragrostis lacunaria</i> and <i>Heteropogon contortus</i> occasionally occur as dominant or co-dominant graminoids. Other commonly occurring graminoids include <i>Enneapogon polyphyllus</i> , <i>Chrysopogon fallax</i> and <i>Themeda triandra</i> . <i>Evolvulus alsinoides</i> , <i>Dipteracanthus australasicus</i> and <i>Rostellularia adscendens</i> are occasionally occurring forbs. Occurs on sand plains



Conservation Status	Not Listed (EPBC Act)Least Concern (VM Act) No concern at Present (DERM Biodiversity Status)
Tree Layer	<i>Eucalyptus melanophloia</i> (10-13 m), <i>Corymbia dallachiana</i> (9-12 m), <i>Petalostigma pubescens</i> , <i>Archidendropsis basaltica</i> , <i>Alphitonia excelsa</i> , <i>Acacia coriacea</i> Average Stem Cover count = 16, PFC = 8 % - 25 %
Shrub Layer	<i>Carissa lanceolata</i> (1-1.5 m), <i>Maytenus cunninghamii</i> (1-2 m), <i>Acacia leiocalyx</i> , <i>Acacia coleii</i> var. <i>coleii</i> , <i>Acacia lazaridis</i> ,
Ground Layer	<i>Triodia pungens</i> , <i>Heteropogon contortus</i> , <i>Bothriochloa ewartiana</i> , <i>Eragrostis lacunaria</i> , <i>Aristida latifolia</i> , <i>Aristida calycina</i> , <i>Themeda triandra</i>
Groundcover Observed on Site	A relatively dense grassy groundcover with an average of 21 % bare ground, 19 % leaf litter, 53 % grass, 5 % herbs and forbs and 2 % shrubs.

6.6.2 Conservation Status

No flora species of conservational significance were identified within RE 10.5.5a. This vegetation community has been colonised with several introduced species, including red natal grass (*Melinis repens*), buffel grass (*Pennisetum ciliare*), common pest pear (*Opuntia stricta*), shrubby stylo (*Stylosanthes scabra*) and blackberry nightshade (*Solanum nigrum*).

RE 10.5.5a is protected within Cudmore National Park and Cudmore Resource Reserve. In December 2006 its state wide remnant extent was greater than 10,000 ha and more than 30% of the pre-clearing area remained. Current threatening processes for the state wide occurrence of RE 10.5.5a includes clearing for pasture development. It is not listed under the EPBC Act and is classified as 'No Concern at Present under the DERM Biodiversity Status

6.7 SILVER-LEAVED IRONBARK OPEN WOODLAND (RE 10.7.11a)

6.7.1 Community Description and Location

The Silver-leaved Ironbark Open Woodland (RE 10.7.11a) occurs along the eastern portion of the Project site, along low hill slopes. Planned disturbance within this community comprises of approximately 63.8 ha and includes the clean water storage, accommodation village and construction camp.

The community profile for this community is summarised in Table 14. The Silver-leaved Ironbark Open Woodland (RE 10.7.11a) has a predominantly rocky groundcover and was sparsely grassed.



Table 14 Community Profile – RE 10.7.11a

Regional Ecosystem	10.7.11a
REDD	<p>10.7.11a: <i>Eucalyptus melanophloia</i> open-woodland on Tertiary surface. <i>Eucalyptus melanophloia</i> dominates the very sparse canopy (8-14 m tall). <i>Corymbia dallachiana</i> is often present in the canopy. <i>Acacia coriacea</i> is present in the small tree layer (3-7 m tall). <i>Acacia tenuissima</i> is often present as scattered shrubs or in the very sparse shrub layer (0.6-2 m tall).</p> <p><i>Triodia pungens</i> usually dominates the very sparse to mid-dense ground layer. <i>Themeda triandra</i>, <i>Eriachne mucronata</i> and <i>Cymbopogon bombycinus</i> are usually present. Occurs on ferricrete</p>
Conservation Status	<p>Not Listed (EPBC Act)</p> <p>No concern at Present (DERM Biodiversity Status)</p>
Tree Layer	<p><i>Eucalyptus melanophloia</i> (8-10 m), <i>Corymbia dallachiana</i> (8-11 m), <i>Acacia coriacea</i> var <i>sericophylla</i></p> <p>Average Stem Cover count = 10, PFC = 5% - 15%</p>
Shrub Layer	<i>Acacia tenuissima</i> (1-2 m)
Ground Layer	<i>Triodia pungens</i> , <i>Themeda triandra</i> , <i>Eriachne mucronata</i> , <i>Panicum effusum</i>

6.7.2 Conservation Status

No flora species of conservational significance were identified within RE 10.7.11a. This RE is represented within the Cudmore National Park and Cudmore Resource Reserve. RE 10.7.11 is widespread in eastern parts of the Desert Uplands Bioregion (Bioregion 10). In December 2006, the state-wide remnant extent was greater than 10,000 ha and more than 30% of the pre-clearing area remained. It is not listed under the EPBC Act and classified as 'NCAP' under the DERM Biodiversity Status.

6.8 SILVER-LEAVED IRONBARK OPEN WOODLAND (RE 11.8.4)

6.8.1 Community Description and Location

The Silver-leaved Ironbark Open Woodland (RE 11.8.4) occurs along the eastern portion of the Project site. Potentially 28.5 ha may be disturbed by construction of the access road

Table 15 summarises the REDD, conservation status and dominant flora species within this community.



Table 15 Community Profile – RE 11.8.4

Regional Ecosystem	11.8.4
REDD	11.8.4: <i>Eucalyptus melanophloia</i> and/or <i>E. crebra</i> +/- <i>E. orgadophila</i> +/- <i>Corymbia erythrophloia</i> grassy woodland. <i>Macrozamia moorei</i> is a conspicuous element of the mid layer in the Central Highlands. Localised patches of <i>Corymbia citriodora</i> occur on volcanic plugs such as Minerva Hills. Generally occurs on slopes of steep mountains and hills formed from Cainozoic igneous rocks usually with shallow stony soils and extensive outcropping
Conservation Status	Not Listed (EPBC Act) No concern at Present (DERM Biodiversity Status)
Tree Layer	<i>Eucalyptus melanophloia</i> (9-12 m), <i>Corymbia erythrophloia</i> (8-10 m) and <i>Corymbia dallachiana</i> Average Stem Cover count = 6, PFC = 2 % - 12 %
Shrub Layer	<i>Archidendropsis basaltica</i> (1-2.5 m), <i>Carissa ovata</i> (0.5-1 m), <i>Acacia farnesiana</i> , <i>Atayaya hemigaluca</i>
Ground Layer	<i>Iseilema vaginiflorum</i> , <i>Dichanthium sericeum</i> , <i>Aristida calycina</i> , <i>Eulalia aurea</i> , <i>Chrysopogon fallax</i> . Forbs include <i>Walthergia gracilis</i> , <i>Fimbrostylis dichotoma</i> , <i>Evolvulus alsinoides</i> , <i>Stemodia glabella</i>
Groundcover Observed on Site	Groundcover within this community averaged 50 % grass, 6 % bare ground, 13 % leaf litter and 21 % herbs and forbs.

6.8.2 Conservation Status

No flora species of conservational significance were identified within RE 11.8.4. RE 11.8.4 is protected within Carnarvon National Park, Minerva Hills National Park, Homevale National Park, Kroombit Tops National Park, Peak Range National Park, and Homevale Resource Reserve. In December 2006, the state-wide remnant extent was greater than 10,000 ha and more than 30% of the pre-clearing area remained. It is classified as Least Concern under the VM Act and as No Concern at Present under the DERM Biodiversity Status.

6.9 POPLAR BOX OPEN WOODLAND (RE 10.3.27a)

6.9.1 Community Description and Location

The Poplar Box Open Woodland (RE 10.3.27a) is located in small patches along alluvial plains. Planned infrastructure within this community includes the open cut pit and access road which will involve 174.3 ha of disturbance to the community. As the underground mine area also underlies approximately 685 ha of this community.



The Poplar Box Open Woodland (RE 10.3.27a) community profile is summarised in Table 16.

Table 16 Community Profile – RE 10.3.27a

Regional Ecosystem	10.3.27a
REDD	10.3.27a: <i>Eucalyptus populnea</i> open-woodland to woodland. <i>Eucalyptus populnea</i> dominates the very sparse to sparse canopy (10-22 m tall). A very sparse to sparse small tree layer (3-7 m tall) can be present sometimes dominated by <i>Eremophila mitchellii</i> . <i>Flindersia dissosperma</i> , <i>Alectryon oleifolius</i> subsp. <i>elongatus</i> , <i>Geijera parviflora</i> , <i>Acacia harpophylla</i> , <i>Atalaya hemiglauca</i> and <i>Ventilago viminalis</i> are occasionally present. <i>Carissa ovata</i> commonly dominates the very sparse to sparse shrub layer (0.5-2.5 m tall), <i>Senna artemisioides</i> , <i>Maytenus cunninghamii</i> and <i>Denhamia oleaster</i> occur occasionally in this layer. The ground layer is variable ranging from very sparse to mid-dense. <i>Enteropogon acicularis</i> , <i>Bothriochloa ewartiana</i> , <i>Dichanthium fecundum</i> , <i>Aristida calycina</i> , <i>Themeda triandra</i> , <i>Chloris pectinata</i> , <i>Eriachne mucronata</i> , <i>Eragrostis lacunaria</i> and <i>Paspalidium caespitosum</i> are usually common to subdominant graminoids. Forbs commonly present include <i>Einadia hastata</i> , <i>Cyperus fulvus</i> , <i>Evolvulus alsinoides</i> , <i>Glycine tomentella</i> , <i>Waltheria indica</i> , <i>Zornia muriculata</i> and <i>Rostellularia adscendens</i> . Occurs on alluvial plains
Conservation Status	Not Listed (EPBC Act)Of Concern (DERM Biodiversity Status)
Tree Layer	<u><i>Eucalyptus populnea</i></u> (12-15 m), <i>Atalaya hemiglauca</i> , <i>Geijera parviflora</i> , <i>Archidendropsis basaltica</i> Average Stem Cover count = 9, PFC = 8 % - 20 %
Shrub Layer	<u><i>Eremophila mitchellii</i></u> (2.5–3.5 m), <u><i>Carissa ovata</i></u> (1-1.5 m), <i>Petalostigma pubescens</i> , <i>Ventilago viminalis</i> , <i>Acacia coriacea</i> subsp. <i>sericophylla</i> , <i>Eremophila maculata</i>
Ground Layer	<u><i>Aristida calycina</i></u> , <u><i>Bothriochloa ewartiana</i></u> , <u><i>Themeda triandra</i></u> , <i>Eragrostis lacunaria</i> , <i>Enteropogon ramosus</i> and <i>Pennisetum ciliare</i> , <i>Enteropogon acicularis</i> , <i>Bothriochloa ewartiana</i> , <i>Dichanthium fecundum</i> , <i>Aristida calycina</i> , <i>Themeda triandra</i> , <i>Chloris pectinata</i> , <i>Eriachne mucronata</i> , <i>Paspalidium caespitosum</i> . Forbs commonly associated with moist soil conditions included <i>Fimbristylis dichotoma</i> , <i>Rostellularia adscendens</i> , <i>Einadia nutans</i> subsp. <i>linifolia</i> , <i>Evolvulus alsinoides</i> var. <i>villosicalyx</i>
Groundcover Observed on Site	Average ground cover along each secondary transect consisted of 43 % grass cover, 19 % bare ground, 21 % leaf litter, 9 % herbs and forbs and 8 % stem cover from trees and shrubs.



6.9.2 Conservation Status

No flora species of conservation significance were found within the community. Non-native species which inhabit this community include the common pest pear (*Opuntia stricta*), velvety tree pear (*Opuntia tomentosa*), shrubby stylo (*Stylosanthes scabra*) and buffel grass (*Cenchrus ciliaris*).

RE 10.3.27a is listed as 'Of Concern' under DERM's Biodiversity Status. Threatening processes include increasing salinity due to clearing of recharge areas, clearing for pasture development and woody weed invasion due to high total grazing pressures. RE 10.3.27 is currently protected within the Cudmore National Park and Cudmore Resources Reserve. In December 2006, the state wide remnant extent was greater than 10,000 ha and greater than 30 % of the pre-clearing area remained.

6.10 POPLAR BOX OPEN WOODLAND (RE 10.5.12)

6.10.1 Community Description and Location

The Poplar Box Open Woodland (RE 10.5.12) community occurs along sandy plains across the Project site. Proposed disturbance of 542.2 ha within this community includes the pit water dam, light industrial area, clean water storage, powerlines, and access road. The underground mine workings will underlie 2,480 ha of this community.

The summarised community profile is located in Table 17.

Table 17 Community Profile – RE 10.5.12

Regional Ecosystem	10.5.12
REDD	10.5.12: Open-woodland to woodland of <i>Eucalyptus populnea</i> with sparse ground layer of <i>Triodia pungens</i> and/or tussock grasses. Intermediates between <i>E. populnea</i> and <i>E. brownii</i> occur in some areas such as to the south of Barcaldine. <i>Eucalyptus populnea</i> dominates the very sparse canopy (12-20 m tall). <i>Archidendropsis basaltica</i> and/or <i>Eremophila mitchellii</i> occasionally dominate the very sparse to sparse low tree layer (3-8 m tall) and <i>Lysiphyllum carronii</i> , <i>Acacia excelsa</i> , <i>Ventilago viminalis</i> , <i>Geijera parviflora</i> , <i>Grevillea striata</i> and <i>Acacia coriacea</i> are frequently present. <i>Carissa lanceolata</i> frequently dominates the very sparse to sparse shrub layer (0.4-2.5 m tall) and <i>Erythroxylon australe</i> and <i>Sydrax oleifolius</i> are often present. <i>Olearia subspicata</i> occurs occasionally. <i>Triodia pungens</i> often dominates the very sparse to mid-dense ground layer. <i>Eriachne mucronata</i> , <i>Chrysopogon fallax</i> , <i>Eragrostis lacunaria</i> , <i>Bothriochloa ewartiana</i> , <i>Aristida spp.</i> are frequently present and occasionally dominant graminoids. Forbs often present include <i>Evolvulus alsinoides</i> and <i>Rostellularia adscendens</i> . Occurs on undulating terrain with sandy loam to sandy clay soils on Cainozoic sand plains
Conservation Status	Least Concern (VM Act) No concern at Present (DERM Biodiversity Status)



Tree Layer	<i>Eucalyptus populnea</i> (12-15 m), <i>Eremophila mitchellii</i> (4-8 m), <i>Archidendropsis basaltica</i> , <i>Geijera parviflora</i> , <i>Lysiphyllum carronii</i> Average Stem Cover count = 11, PFC = 12 % - 22 %
Shrub Layer	<i>Carissa ovata</i> (1-1.5 m), <i>Acacia coriacea</i> subsp <i>sericophylla</i> , <i>Ventilago viminalis</i> , <i>Psydrax oleifolia</i> , <i>Erythroxylum australe</i> , <i>Eremophila maculata</i>
Ground Layer	<i>Triodia pungens</i> , <i>Aristida calycina</i> , <i>Themeda triandra</i> , <i>Eragrostis lacunaria</i> , <i>Eragrostis elongate</i> , <i>Aristida inaequiglumis</i> , <i>Perotis rara</i> , <i>Pennisetum ciliare</i>
Groundcover Observed on Site	Groundcover within this community averaged 11 % bare ground, 29 % leaf litter, 44 % grass, 10 % herbs and forbs and 6 % stem cover from trees and shrubs.

6.10.2 Conservation Status

No flora species of conservation significance were found within the community. Non-native species which inhabit this community include the common pest pear (*Opuntia stricta*), velvety tree pear (*Opuntia tomentosa*), stinkgrass (*Eragrostis cilianensis*), red natal grass (*Melinis repens*), shrubby stylo (*Stylosanthes scabra*) and buffel grass (*Cenchrus ciliaris*).

RE 10.5.12 is listed as 'No Concern at Present' under the DERM Biodiversity Status. The Poplar Box Open Woodland community is currently protected within the Cudmore National Park and Cudmore Resources Reserve. The state wide remnant extent was greater than 10,000 ha. More than 30 % of the total state wide pre-clearing area remained in 2006.

6.11 POPLAR BOX OPEN WOODLAND (RE 11.3.2)

6.11.1 Community Description and Location

This RE has been identified using DERM's Regional Ecosystem Mapping tool as occurring within the eastern portion of the Project site, along the proposed railway and roadway corridors. However, due to restrictions associated with site access of the railway corridor, data on this Regional Ecosystem is yet to be collected. Proposed infrastructure plans include a railway line which traverses this community, affecting 4.5 ha.



The REDD, conservation status and dominant species within the Poplar Box Open Woodland (RE 11.3.2) is located in Table 18.

Table 18 Community Profile – RE 11.3.2

Regional Ecosystem	11.3.2
REDD	11.3.2: <i>Eucalyptus populnea</i> woodland to open-woodland. <i>E. melanophloia</i> may be present and locally dominant. There is sometimes a distinct low tree layer dominated by species such as <i>Geijera parviflora</i> , <i>Eremophila mitchellii</i> , <i>Acacia salicina</i> , <i>Acacia pendula</i> , <i>Lysiphyllum spp.</i> , <i>Cassia brewsteri</i> , <i>Callitris glaucophylla</i> and <i>Acacia excelsa</i> . The ground layer is grassy dominated by a range of species depending on soil and management conditions. Species include <i>Bothriochloa decipiens</i> , <i>Enteropogon acicularis</i> , <i>Aristida ramosa</i> and <i>Tripogon loliiformis</i> . Occurs on Cainozoic alluvial plains with variable soil types including texture contrast, deep uniform clays, massive earths and sometimes cracking clays.
Conservation Status	Not Listed (EPBC Act)Of Concern (DERM Biodiversity Status)
Tree Layer	Not assessed
Shrub Layer	Not assessed
Ground Layer	Not assessed

6.11.2 Conservation Status

Data on threatened species within this Regional Ecosystem is yet to be collected.

Weeping Myall (*Acacia pendula*) is known to be associated with this RE, and targeted searches for this species will need to be conducted to ascertain the presence or absence of Weeping Myall Woodlands, which is listed as an Endangered Ecological Community under the EPBC Act.

The Poplar Box Open Woodland (RE 11.3.2) is listed as 'Of Concern' under the VM Act and DERM Biodiversity Status. Areas in which RE 11.3.2 is protected include Carnarvon National Park, Expedition (Limited Depth) National Park, Dipperu National Park (Scientific), Homevale Resource Reserve, Chesterton Range National Park, Homevale National Park, Expedition Resource Reserve, Taunton National Park (Scientific), Tregole National Park, Nuga Nuga National Park, Isla Gorge National Park, Blackdown Tableland National Park, Alton National Park, Dawson River Conservation Park, Narrien Range National Park, Bouldercombe Gorge Resource Reserve, Lake Murphy Conservation Park, Epping Forest National Park (Scientific), Carraba Conservation Park, Homevale Conservation Park, Lake Broadwater Conservation Park, [Highworth Bend Conservation Park], [Lake Broadwater Resource Reserve]. In December 2006, state-wide remnant extent of RE 11.3.2 was greater than 10,000 ha and 10-30 % of the pre-clearing area remained.



6.12 SILVER-LEAVED IRONBARK / POPLAR BOX MIXED WOODLAND (RE 10.5.5a/10.5.12)

6.12.1 Community Description and Location

The Silver-leaved Ironbark/Poplar Box Mixed Woodland consists of a heterogeneous community of REs 10.5.5a and 10.5.12 that have been mapped as a single polygon. This community has a high spatial diversity, and with the 1:25,000 scale to which vegetation has been mapped for the Project site, it is not possible to spatially delineate these vegetation communities into homogenous units. This mixed woodland is located in several pockets within the central and western areas of the site. A significant proportion of this heterogeneous community is to be impacted by Project activities (approximately 990 ha) as it lies underneath the proposed disturbance footprint. Nearly 780 ha are also located above proposed mining works.

Both of these REs are represented as individual communities on the Project site and are detailed above. Conservation Status

Neither of these REs are of conservation significance under Queensland legislation. Other conservation status information is provided within the individual RE details discussed in Sections 6.6 and 6.10.

6.13 WHITE CYPRESS PINE WOODLAND (RE 11.5.5b)

6.13.1 Community Description and Location

The White Cypress Pine (RE 11.5.5b) occurs in one small patch (approximately 3 ha) along the western boundary of site. The underground mine workings will be constructed below this RE with no surface disturbance to take place. This community is considered an outlier for the western portion of the Project site. An outlier is a RE which is spatially within one bioregion but has an RE code from an adjacent bioregion. All vegetation communities located on the Project site MLA are included in bioregion 10, the Desert Uplands; however some communities within the transport corridor to the east of the MLA are located within the Brigalow Belt (bioregion 11). The White Cypress Pine Woodland found on site is unusual as it is physically within the Desert Uplands bioregion yet has characteristics that 'fit' the Brigalow Belt. The Brigalow Belt region effectively 'extends' slightly into adjacent parts of the Desert Uplands bioregion.

The summarised community profile for the White Cypress Pine Woodland (RE 11.5.5b) is located in Table 19.



Table 19 Community Profile – RE 11.5.5b

Regional Ecosystem	11.5.5b
REDD	11.5.5b: <i>Callitris glaucophylla</i> , <i>Eucalyptus melanophloia</i> , <i>Eucalyptus populnea</i> +/- <i>Corymbia tessellaris</i> woodlands. Occurs on undulating plains and rises formed on Cainozoic deposits. Associated soils are usually deep texture contrast soils, with thick, sandy surface horizons overlying yellow, mottled clay subsoil's
Conservation Status	Not Listed (EPBC Act)Least Concern (VM Act) No concern at Present (DERM Biodiversity Status)
Tree Layer	<i>Callitris glaucophylla</i> (8-10 m), <i>Eucalyptus melanophloia</i> (10-13 m) Average Stem Cover count = 30, PFC = 2 % - 25 %
Shrub Layer	<i>Petalostigma banksii</i> (2-4 m), <i>Acacia coriacea</i> (2-3 m), <i>Bursaria incana</i> , <i>Carissa ovata</i> , <i>Stylosanthes scabra</i>
Ground Layer	<i>Panicum decompositum</i> , <i>Aristida latifolia</i> , <i>Aristida bigandulosa</i> , <i>Cheilanthes distans</i> , <i>Dactyloctenium radulans</i> , <i>Digitaria brownii</i> , <i>Enneapogon intermedius</i> , <i>Enneapogon lindleyanus</i> , <i>Heteropogon contortus</i>
Groundcover Observed on Site	Groundcover consisted of tussock grass species, with occasional forbs and bare ground. Average groundcover composition along secondary transects averaged 23 % bare ground, 13 % leaf litter, 8 % forbs and herbs, 52 % tussock grass and 5 % stem cover from Cypress Pine trees.

6.13.2 Conservation Status

No threatened flora species were identified within this community. Non-native species were found within this community, shrubby stylo (*Stylosanthes scabra*), common pest pear (*Opuntia stricta*), red natal grass (*Melinis repens*), feathertop rhodes grass (*Chloris virgata*) and the buffel grass (*Cenchrus ciliaris*).

White Cypress Pine Woodland is not listed as being of conservation significance under Queensland legislation. However, DERM has noted an ongoing threatening process – land clearing for pasture development, as occurring within this community type. Areas within the region which RE 11.5.5 is protected include Alton National Park, Morven National Park and Narrien Range National Park. The total mapped extent of RE 11.5.5 within Queensland as of 2006 was greater than 10,000 ha, with more than 30 % of the pre-clear area remaining.



6.14 GIDGEE OPEN WOODLAND (RE 10.3.4b)

6.14.1 Community Description and Location

This vegetation community is located in one small patch of around 1 ha along Rocky Creek. No disturbance is planned within this community however it does exist above proposed underground workings.

The Gidgee Open Woodland (RE 10.3.4b) community profile is summarised in Table 20.

Table 20 Community Profile – RE 10.3.4b

Regional Ecosystem	10.3.4b
REDD	10.3.4b: Contains palustrine wetland (e.g. in swales). <i>Acacia cambagei</i> low woodland (eastern). <i>Acacia cambagei</i> dominates the sparse canopy (6-12 m tall). <i>Eremophila mitchellii</i> dominates the very sparse shrub layer (1-5m tall). Shrubs (0.25-1.5 m tall) frequently present include <i>Apophyllum anomalum</i> and <i>Carissa lanceolata</i> . The ground layer is very sparse and sometime dominated by graminoids including <i>Paspalidium caespitosum</i> . Other graminoids present include <i>Sporobolus actinocladius</i> , <i>Eragrostis lacunaria</i> , and <i>Enteropogon ramosus</i> . Forbs often present include <i>Brunoniella australis</i> , <i>Sclerolaena</i> spp. and <i>Enchylaena tomentosa</i> . Occurs on alluvial plains (eastern)
Conservation Status	Not Listed (EPBC Act)Of Concern (DERM Biodiversity Status)
Tree Layer	<i>Acacia cambagei</i> (6-9m), <i>Eucalyptus cambageana</i> (9-11 m), <i>Atalaya hemiglaucua</i> , <i>Lysiphyllum carronii</i> Average Stem Cover count = 31, PFC = 3 % - 15 %
Shrub Layer	<i>Eremophila mitchellii</i> (2.5–3.5 m), <i>Eremophila deserti</i> , <i>Maytenus cunninghamii</i> , <i>Apophyllum anomalum</i> , <i>Psydrax oleifolium</i> , <i>Carissa ovata</i>
Ground Layer	<i>Paspalidium caespitosum</i> , <i>Paspalidium distans</i> , <i>Sporobolous caroli</i> , <i>Sporobolous scabridus</i> , <i>Enneapogon robustissimus</i> , <i>Eragrostis lacunaria</i> , <i>Leptochloa decipiens subsp.asthenes</i> , <i>Paspalidium caespitosum</i> . Common forbs include <i>Sclerolaena divericata</i> , <i>Nyssanthes erecta</i> , <i>Salsola kali</i> , <i>Sclerolaena convexula</i> , <i>Capparis lasiantha</i> .
Groundcover Observed on Site	Groundcover within the Gidgee Open Woodland consisted of a very open tussocky grass layer and averaged 45 % bare ground, 9 % leaf litter, 13 % grass, 28 % forbs and 5 % shrub and tree stem cover.



6.14.2 Conservation Status

No flora species of conservation significance were found within the community. One LP Act Class 2 pest species was identified within RE 10.3.4b, the velvety tree pear (*Opuntia tomentosa*).

RE 10.3.4b is listed as 'Of Concern' under the DERM Biodiversity status. Pressures within this community include total grazing pressures, in particular pasture degradation and significant loss of groundcover. The Desert Uplands Biodiversity Assessment suggested management strategies include fire management, habitat protection on other state lands, private lands and reserves and research (Australian Natural Resources Atlas (ANRA), 2009).

The regional extent of Gidgee Open Woodland community protected within parks and reserves is low, and includes the Moorrinya National Park. The remnant area of RE 10.3.4 mapped within Queensland, as of 2006, was greater than 10,000 ha.

6.15 FRINGING RIPARIAN WOODLAND (RE 10.3.12a)

6.15.1 Community Description and Location

This community associated along the floodplains of Sandy Creek. Proposed roadways and a product stockpile will transverse sections of this community, potentially disturbing 97.9 ha.

The Fringing Riparian Woodland (RE 10.3.12a) community profile below in Table 21 provides the REDD description, associated conservation status and dominant flora species.

Table 21 Community Profile – RE 10.3.12a

Regional Ecosystem	10.3.12a
REDD	10.3.12a: <i>Corymbia plena</i> dominates the canopy (18-26m tall) usually with <i>C. dallachiana</i> co dominant. The low tree layer (3-6m tall) is usually very sparse or more commonly there are scattered small trees including <i>Acacia sericophylla</i> , <i>A. torulosa</i> and <i>Melaleuca nervosa</i> . <i>Aristida ingrata</i> usually dominates the very sparse to sparse ground layer. Other graminoids frequently present include <i>Schizachyrium fragile</i> and <i>Eriachne mucronata</i> . Commonly occurring forbs include <i>Lomandra leucocephala</i> , <i>Evolvulus alsinoides</i> , <i>Bonamia media</i> and <i>Chrysocephalum apiculatum</i> . Occurs on sandy alluvial terraces (eastern).
Conservation Status	Not Listed (EPBC Act)Least Concern (VM Act) No Concern at Present (DERM Biodiversity Status)
Tree Layer	<u><i>Corymbia plena</i></u> (18-20 m), <i>Corymbia dallaciana</i> (12-15 m), <i>Corymbia tessellaris</i> Average Stem Cover count = 7, PFC = 2% -10%
Shrub Layer	<u><i>Acacia sericophylla</i></u> , <u><i>Melaleuca nervosa</i></u> , <i>Carissa ovata</i>



Ground Layer	<i>Pennisetum ciliare</i> , <i>Aristida ingrata</i> , <i>Aristida inaequiglumis</i> , <i>Eriachne mucronata</i> , <i>Eragrostis lacunaria</i> . Herbs include <i>Evolvulus alsinoides</i> , <i>Chrysocephalum apiculatum</i> , <i>Cajanus reticulatus</i>
Groundcover Observed on Site	Groundcover within this community averages 13% bare ground, 24% leaf litter, 56% grass, 11% herbs and forbs and 1% shrubs.

6.15.2 Conservation Status

No threatened species have been identified within this community on or adjacent to the Project site. The groundcover was predominantly buffel grass (*Cenchrus ciliaris*).

RE 10.3.12a is listed as Least Concern under the DERM Biodiversity Status and is not included within any EPBC listed Threatened Communities. This community is contained within the Cudmore Resource Reserve. In 2006, the total state wide extent of this RE was greater than 10,000 ha and more than 30% of the original pre-clear area remained.

6.16 FRINGING RIPARIAN WOODLAND (RE 10.3.13a)

6.16.1 Community Description and Location

This community is the predominant community of Well Creek and Sandy Creek. The wetland areas identified within the Queensland Wetland Program's 'Wetland Map Version 2.0' for the Edwinstowe region were ground-truthed and discovered to be within this RE. These wetlands incorporate several small lacustrine wetlands located at the headwaters of Well and Sandy Creek and identified as stock watering dams. Proposed roadways will transverse sections of this community potentially incurring surface disturbance of 146.8 ha, however this does not factor in the impacts of proposed creek diversions on downstream vegetation. Approximately 327 ha of this community exist above proposed underground workings.

The Fringing Riparian Woodland (RE 10.3.13a) community profile below in Table 22 provides the REDD description, associated conservation status and dominant flora species.

Table 22 Community Profile – RE 10.3.13a

Regional Ecosystem	10.3.13a
REDD	10.3.13a: Riverine wetland or fringing riverine wetland. <i>Eucalyptus camaldulensis</i> open-woodland to woodland. <i>Eucalyptus camaldulensis</i> dominates the very sparse to sparse canopy (15-26 m tall). <i>E. coolabah</i> , <i>Casuarina cunninghamiana</i> and <i>Melaleuca leucadendra</i> are frequently present in the canopy. <i>Corymbia tessellaris</i> is occasionally present. <i>Melaleuca spp.</i> are frequently present in the mostly very sparse low tree layer
Conservation Status	Not Listed (EPBC Act)Of Concern (DERM Biodiversity Status)



Tree Layer	<i>Eucalyptus camaldulensis</i> (18-21 m), <i>Melaleuca leucadendra</i> (20-22 m), <i>Corymbia tessellaris</i> Average Stem Cover count = 18, PFC = 5 % - 20 %
Shrub Layer	<i>Acacia holosericea</i> , <i>Petalostigma pubescens</i> , <i>Carissa ovata</i>
Ground Layer	<i>Pennisetum ciliare</i> , <i>Cynodon dactylon</i> , <i>Lomandra longifolia</i>
Groundcover Observed on Site	Groundcover within this community averages 23 % bare ground, 22 % leaf litter, 44 % grass, 5 % herbs and forbs and 1 % shrubs.

6.16.2 Conservation Status

No threatened species have been identified within this community on or adjacent to the Project site. The groundcover composition was predominantly non-native species, including buffel grass (*Cenchrus ciliaris*) and couch grass (*Cynodon dactylon*).

RE 10.3.13a is not listed within any EPBC Threatened Communities but is categorised as 'Of Concern' under DERM Biodiversity Status. This Fringing Riparian Woodland community was in a poor condition on site as a result of weed invasion, including rubber vine (*Cryptostegia grandiflora*), and by high total grazing pressure. Reserves which include RE 10.3.13 are White Mountains National Park, Cudmore National Park, White Mountains Resource Reserve and Cudmore Resource Reserve. In 2006, the total state wide extent of this RE was greater than 10,000 ha and more than 30 % of the original pre-clear area remained.

6.17 FRINGING RIPARIAN WOODLAND (RE 10.3.14)

6.17.1 Community Description and Location

The Fringing Riparian Woodland (RE 10.3.14) occurs along most watercourses on the Project site. Access roads, pit water dam and open cut pit are proposed within this community, potentially affecting 541.2 ha. Underground mining occur below this community over approximately 593 ha. The open cut pit will necessitate an un-sized drain of Little Sandy Creek into larger Sandy Creek

The community profile for the Fringing Riparian Woodland (RE 10.3.14) is summarised in Table 23

Table 23 Community Profile – RE 10.3.14

Regional Ecosystem	10.3.14
REDD	10.3.14: <i>Eucalyptus camaldulensis</i> and/or <i>E. coolabah</i> woodlands and open-woodlands on channels, levees and floodplains. <i>Acacia harpophylla</i> or <i>A. cambagei</i> may be present as clumps or scattered trees. Occurs on channels, levees and flood plains with sandy to clayey soils along larger watercourses
Conservation Status	Not Listed (EPBC Act)Of Concern (DERM Biodiversity Status)



Tree Layer	<i>Eucalyptus camaldulensis</i> (15-18 m), <i>Acacia harpophylla</i> , <i>Acacia cambagei</i> , <i>Corymbia leichhardtii</i> , <i>Corymbia erythrophloia</i> , <i>Corymbia terminalis</i> , <i>Atalaya hemiglauca</i> , <i>Lysiphillum carronii</i> Average Stem Cover count = 15, PFC = 10 % - 25 %
Shrub Layer	<i>Acacia holosericea</i> , <i>Alstonia constricta</i> , <i>Petalostigma pubescens</i> , <i>Carissa ovata</i>
Ground Layer	<i>Bothriochloa ewartiana</i> , <i>Arundinella nepalensis</i> , <i>Leptochloa digitata</i> , <i>Aristida calycina</i> , <i>Eragrostis elongata</i> , <i>Pennisetum ciliare</i> and <i>Themeda triandra</i> . Common forbs include <i>Pterocaulon sphacelatum</i> , <i>Vigna lanceolata</i> , <i>Lomandra longifolia</i>
Groundcover Observed on Site	Secondary transect consisted of 43 % grass cover, 19 % bare ground, 7 % herbs and forbs and 24 % litter and 3 % stem cover from shrubs and trees.

6.17.2 Conservation Status

No flora species of conservation significance were identified during all surveys conducted within the Fringing Riparian Woodland (RE 10.3.14). Several non-native species were identified within this community, including mimosa (*Acacia farnesiana*), red natal grass (*Melinis repens*), feathertop rhodes grass (*Chloris virgata*), buffel grass (*Cenchrus ciliaris*), shrubby stylo (*Stylosanthes scabra*), common pest pear (*Opuntia stricta*), velvety tree pear (*Opuntia tomentosa*) malvastrum (*Malvastrum americanum*), awnless barnyard grass (*Echinochloa colona*), paddy's lucerne (*Sida spinosa*), sida (*Sida rhombifolia*), west-indian gherkin (*Cucumis anguria* var. *anguria*), liquorice weed (*Scoparia dulcis*), hairy pigweed (*Portulaca pilosa*) stinking passionflower (*Passiflora foetida*), coffee bush (*Senna occidentalis*) and purpletop (*Verbena incompta*).

RE 10.3.14 is listed as Of Concern under the DERM Biodiversity Status but is not within any EPBC listed Threatened Communities. Threatening processes include weed invasion and total grazing pressure. Feral pigs are attracted to these areas, causing major soil disturbance, fouling of water holes and destroying wildlife and habitat. In 2005, the remnant extent of RE 10.3.14 was greater than 10,000 ha. This RE is protected within the Moorrinya National Park, Forest Den National Park, White Mountains National Park, Cudmore National Park, White Mountains Resource Reserve and Cudmore Resource Reserve. ANRA's Biodiversity Assessment of the Desert Uplands highlighted both the invasion of the weed parkinsonia (*Parkinsonia aculeata*) and soil and pasture degradation due to grazing pressures as threatening processes for this RE.

6.18 WEEPING BOTTLEBRUSH HEATH (RE 10.7.7a)

6.18.1 Community Description and Location

The Weeping Bottlebrush Heath (RE 10.7.7a) patchily inhabits the western and central portions of site, along hard setting soils. Planned infrastructure which may disturb this community includes pit water dams, the powerline and access route corridors potentially encompassing 120 ha. This community will overlay approximately 242 ha of underground mine workings.



Table 24 provides a summarised community profile for the Weeping Bottlebrush Heath (RE 10.7.7a).

Table 24 Community Profile – RE 10.7.7a

Regional Ecosystem	RE 10.7.7a and RE 10.7.7b
REDD	<p>10.7.7a: Shrubland dominated by <i>Acacia leptostachya</i>, <i>Calytrix microcoma</i>, <i>Acacia tenuissima</i>, <i>Calytrix microcoma</i>, <i>Melaleuca uncinata</i>, <i>M. tamariscina</i>, <i>Thryptomene parvifolia</i> or <i>Jacksonia rhadinoclona</i>. Different variants of this regional ecosystem are described below. <i>Acacia leptostachya</i> dominates the very sparse to sparse canopy (2-5 m tall). <i>Corymbia spp.</i> and/or <i>Eucalyptus spp.</i> occasionally occur as emergents (8-15 m tall). <i>Calytrix microcoma</i> is sometimes a co dominant in the canopy. <i>Grevillea pteridifolia</i>, <i>Lithomyrtus microphylla</i> and <i>Persoonia falcata</i> are frequently present. <i>Triodia pungens</i> often dominates the ground layer. <i>Scaevola parvifolia</i> occurs occasionally. <i>Acacia tenuissima</i> dominates the very sparse canopy (0.5-2.0 m tall). <i>Corymbia spp.</i> and/or <i>Eucalyptus spp.</i> occasionally occur as emergents (8-15 m tall). <i>Triodia pungens</i>, <i>Eriachne mucronata</i> and <i>Aristida spp.</i> are frequently present and sometimes dominant. <i>Calytrix microcoma</i> dominates the sparse canopy (0.3-1.0 m tall). <i>Triodia spp.</i> dominate the very sparse ground layer. <i>Melaleuca uncinata</i> and <i>M. tamariscina</i> with or without <i>Acacia leptostachya</i> tall open-shrublands on ferricrete. <i>Thryptomene parvifolia</i> dominates the sparse canopy (0.3-1.6 m tall). <i>Calytrix microcoma</i> and <i>Acacia leptostachya</i> are often present. <i>Triodia pungens</i> is usually present and often dominant in the very sparse to sparse ground layer. <i>Schoenus kennyi</i> is occasionally present. <i>Jacksonia rhadinoclona</i> dominates the very sparse canopy (0.5-2.5 m tall). <i>Comesperma pallidum</i> is present and sometimes co dominant. <i>Acacia leptostachya</i>, <i>Persoonia falcata</i>, <i>Lithomyrtus microphylla</i>, <i>Xanthorrhoea johnsonii</i> and <i>Grevillea pteridifolia</i> are present. <i>Triodia mitchellii</i> dominates the very sparse ground layer. Occurs on ferricrete</p> <p>10.7.7b: <i>Melaleuca tamariscina</i> dominates the very sparse canopy (1.5-8 m tall). <i>Petalostigma banksii</i> is often present in the canopy and sometimes co dominant and rarely dominant. <i>Triodia spp.</i> usually dominate the very sparse to sparse ground layer. <i>Stylidium eriorhizum</i>, <i>Eriachne mucronata</i> and <i>Schizachyrium fragile</i> are frequently present</p>
Conservation Status	<p>Not Listed (EPBC Act)Least Concern (VM Act)</p> <p>No concern at Present (DERM Biodiversity Status)</p>
Tree Layer	<p><i>Melaleuca tamariscina</i> (8-10 m), <i>Acacia tenuissima</i>, <i>Persoonia falcata</i>, <i>Grevillea pteridifolia</i>, <i>Jacksonia rhadinoclona</i></p> <p>Average Stem Cover count = 39, PFC = 2 % - 9 %</p>



Shrub Layer	<i>Calytrix microcoma</i> (1–2 m), <i>Acacia leptostachya</i> , <i>Acacia oswaldii</i> , <i>Acacia lazaridis</i> , <i>Comesperma pallidum</i> , <i>Dodonaea viscosa</i> subsp. <i>angustissima</i> , <i>Psdrax foresteri</i>
Ground Layer	<i>Triodia pungens</i> , <i>Eriachne mucronata</i> , <i>Andropogon carcinus</i> var. <i>sericeus</i> , <i>Digitaria ammophila</i> , <i>Mnesithea formosa</i> , <i>Panicum effusum</i> , <i>Scaevola parvifolia</i>
Groundcover Observed on Site	Average groundcover composition along transects was 20 % bare ground, 2 % surface pebbles, 23 % leaf litter, 39 % grass, 7 % herbs and forbs and 9 % stem cover from shrubs and trees.

6.18.2 Conservation Status

No flora species of conservation significance were identified within this community. The Weeping Bottlebrush Heath (RE 10.7.7a) was relatively healthy, with minimal establishment of non-native species, with red natal grass (*Melinis repens*) and shrubby stylo (*Stylosanthes scabra*) being encountered.

RE 10.7.7 is not listed as being threatened under any of the relevant legislation. Areas within the greater region which this RE is protected include the White Mountains National Park, Cudmore Resource Reserve and Cudmore National Park. The state wide extent of this RE was greater than 10,000 ha in December 2006.

6.19 THOZETS BOX WOODLAND (RE 10.7.5)

6.19.1 Community Description and Location

Thozets Box Woodland (RE 10.7.5) occurs along hills with skeletal soils in patchy distributions around the Project site. Disturbance from planned infrastructure includes access roads, powerline and a pit water dam affecting approximately 62.3 ha, with 76 ha above proposed underground mining activities.

Table 25 summarises the Thozets Box Woodland (RE 10.7.5) vegetation community profile.

Table 25 Community Profile – RE 10.7.5

Regional Ecosystem	10.7.5
REDD	10.7.5: <i>Eucalyptus thozetiana</i> woodland. <i>Eucalyptus thozetiana</i> dominates the mostly very sparse and sometimes sparse canopy (8-22 m tall). <i>Eremophila mitchellii</i> is sometimes present as scattered small trees (2.5-6 m tall). <i>Carissa lanceolata</i> and <i>Eremophila deserti</i> are frequently present as scattered shrubs (0.5-2 m tall). <i>Triodia pungens</i> usually dominates the very sparse to sparse ground layer. <i>Enchylaena tomentosa</i> is frequently present. Occurs on scarps with skeletal soils and on pediments below scarps of laterised plateaus with shallow texture contrast soils



Conservation Status	Not Listed (EPBC Act) Of Concern (DERM Biodiversity Status)
Tree Layer	<i>Eucalyptus thozetiana</i> (10-15 m), <i>Acacia shiryleii</i> , <i>Bursaria incana</i> , <i>Archidendropsis basaltica</i> Average Stem Cover count = 11, PFC = 10% - 18%
Shrub Layer	<i>Eremophila mitchellii</i> (2.5–3.5 m), <i>Eremophila latrobei</i> (1-1.5 m), <i>Alphitonia excelsa</i> , <i>Petalostigma pubescens</i> , <i>Capparis canescens</i> , <i>Gossypium australe</i> , <i>Senna artemisioides subsp. artemisioides</i> , <i>Carissa ovata</i>
Ground Layer	<i>Triodia pungens</i> , <i>Triodia mitchellii</i> , <i>Themeda triandra</i> , <i>Pennisetum ciliare</i> , <i>Heteropogon contortus</i> , <i>Enneapogon oblongus</i> , <i>Cleistochloa subjuncea</i> , <i>Aristida caput-medusae</i> . Common forbs include <i>Salsola kali</i> , <i>Enchylaena tomentosa</i>
Groundcover Observed on Site	Groundcover averaged 25 % bare ground, 21 % leaf litter, 10 % surface rock and pebble, 24 % grass tussock, 5 % herbs and 15 % shrub and tree stems.

6.19.2 Conservation Status

No flora species of conservation significance were found within the Thozets Box Open Woodland (RE 10.7.5). One introduced species buffel grass (*Cenchrus ciliaris*) was identified.

RE 10.7.5 is listed as 'Of Concern' under DERM Biodiversity Status. The communities were discovered in good condition despite the presence of *C. ciliaris* as native grass species persist on site (including *Triodia*, *Themeda* and *Enchylaena* spp) and no exotic species were detected within the tree and/or shrub layers. Threatening processes include scalding, groundcover degradation, and high salinity. The soils are shallow with low water holding capacity, low fertility and high salinity. The nature of the soils, often steep slopes and the very sparse ground cover of plants render this ecosystem highly susceptible to erosion. The Desert Uplands Biodiversity Assessment provided by ANRA 2009 recommends protective measures including improved fire management, habitat protection within private land and research.

Areas within the greater region which the Thozets Box Open Woodland is protected include Cudmore National Park, Cudmore Resource Reserve and Moorrinya National Park. In December 2006, the state wide remnant extent was greater than 10,000 ha and more than 30 % of the pre-clearing area remained.

6.20 LANCEWOOD WOODLAND (RE 10.7.3b)

6.20.1 Community Description and Location

The Lancewood Open Woodland (RE 10.7.3b) occurs along skeletal hill slopes and escarpments in large patches along the eastern and western portions of site. Potential disturbance to this community



may occur from the planned pit water dams, access roads and powerline potentially affecting 147.2 ha. This community will overlay approximately 572 ha of underground mining activities.

This community's REDD conservation status and dominant flora species are summarised in Table 26.

Table 26 Community Profile – RE 10.7.3b

Regional Ecosystem	10.7.3b
REDD	10.7.3b: <i>Acacia shirleyi</i> woodland. <i>Acacia shirleyi</i> dominates the sparse canopy (8-18 m tall). <i>Eucalyptus exilipes</i> is occasionally present and sometimes a co-dominant in the canopy in northern areas. <i>Erythroxylon australe</i> occasionally occurs as scattered shrubs in the shrub layer (1-4 m tall). <i>Cleistochloa subjuncea</i> is commonly present and frequently dominates the very sparse to mid-dense ground layer. <i>Triodia pungens</i> is occasionally present and sometimes dominant. <i>Gahnia aspera</i> , <i>Scleria sphacelata</i> and <i>Aristida spp.</i> are occasionally present. Occurs on scarps
Conservation Status	Not Listed (EPBC Act) Least Concern (VM Act) No concern at Present (DERM Biodiversity Status)
Tree Layer	<i>Acacia shirleyi</i> (11-13 m), <i>Eucalyptus melanophloia</i> (9-12 m), <i>Corymbia dallachiana</i> , <i>Corymbia setosa</i> Average Stem Cover count = 66, PFC = 12% - 33%
Shrub Layer	<i>Carissa lanceolata</i> (0.5-1.5 m), <i>Eremophila latrobei</i> (0.5-2 m), <i>Eremophila deserti</i> , <i>Eremophila bignoniiflora</i> , <i>Everistia vacciniifolia</i> , <i>Exocarpus sparteus</i> , <i>Hovea parvicalyx</i> , <i>Muehlenbeckia florulenta</i> , <i>Senna costata</i> , <i>Bursaria incana</i>
Ground Layer	<i>Triodia pungens</i> , <i>Aristida calycina</i> , <i>Aristida caput-medusae</i> , <i>Aristida latifolia</i> , <i>Chrysopogon fallax</i> , <i>Cleistochloa subjuncea</i> , <i>Cymbopogon refractus</i> , <i>Digitaria breviglumis</i> , <i>Eriochloa crebra</i> , <i>Heteropogon contortus</i> , <i>Panicum effusum</i> . Common forbs include <i>Achyranthes aspera</i> , <i>Alternanthera nodiflora</i> , <i>Calogyne pilosa</i> , <i>Enchylaena tomentosa</i>
Groundcover Observed on Site	Average composition of groundcover was 21 % bare ground, 25 % rock and surface pebbles, 3 % forbs and herbs, 34 % leaf litter, 13 % grass and 4 % fallen timber.



6.20.2 Conservation Status

No endangered, vulnerable or near threatened flora species were found within the Lancewood Woodland (RE 10.7.3b). Class 2 listed weeds (under the LP Act) have been identified within this community type - the common pest pear (*Opuntia stricta*) and velvety tree pear (*Opuntia tomentosa*). Additional non-native species identified within RE 10.7.3b include the west-indian gherkin (*Cucumis anguria* var. *anguria*), red natal grass (*Melinis repens*), buffel grass (*Cenchrus ciliaris*) and shrubby stylo (*Stylosanthes scabra*).

RE 10.7.3 is not listed as threatened under state or national legislation. Areas within the region which this RE is protected include White Mountains National Park, Cudmore National Park, Cudmore Resource Reserve, White Mountains Resource Reserve, Dalrymple National Park and Moorrinya National Park. The total mapped area within Queensland of this RE in 2006 was greater than 10,000 ha.

The soils within RE 10.7.3b are shallow with low water holding capacity and low fertility. The nature of the soils and the sparse ground cover of plants cause this ecosystem to be highly susceptible to erosion. Fire management requires consideration of the effect of the expected slow recovery rate of plant cover and the sensitivity to burning of species such as Lancewood.

6.21 LANCEWOOD WOODLAND (RE 10.10.1b)

6.21.1 Community Description and Location

The Lancewood Woodland (Re 10.10.1b) occurs within one patch of approximately 115 ha along the western boundary of site, on a sandstone ridge. No surface disturbance is proposed for this community, however underground workings are planned below this RE.

The community profile for the Lancewood Woodland (RE 10.10.1b) is summarised in Table 27 below.

Table 27 Community Profile – RE 10.10.1b

Regional Ecosystem	10.10.1b
REDD	10.10.1b: <i>Acacia catenulata</i> with or without <i>Acacia shirleyi</i> low woodland to woodland on coarse sandstone. <i>Acacia catenulata</i> dominates the sparse canopy (5-9 m tall). <i>Acacia shirleyi</i> is usually present in the canopy. <i>Erythroxylon australe</i> , <i>Beyeria viscosa</i> and <i>Everistia vacciniifolia</i> are usually present in the very sparse shrub layer (0.5-2.5 m tall). <i>Aristida caput-medusae</i> and <i>Cheilanthes sieberi</i> are commonly present in the very sparse ground layer
Conservation Status	Not Listed (EPBC Act)', NCAP (DERM Biodiversity Status)
Tree Layer	<i>Acacia shirleyi</i> (7-9 m), <i>Callitris glaucophylla</i> , <i>Eucalyptus melanophloia</i> Average Stem Cover count = 17, PFC = 15 % - 20 %
Shrub Layer	<i>Erythroxylon australe</i> , <i>Everistia vacciniifolia</i> , <i>Bursaria incana</i> , <i>Hovea parvicalyx</i>



Ground Layer	<i>Aristida caput-medusae</i> , <i>Aristida latifolia</i> , <i>Cymbopogon bombycinus</i> , <i>Digitaria breviglumis</i> , <i>Eriachne mucronata</i> , <i>Panicum effusum</i>
Groundcover Observed on Site	Groundcover along transects averages 45 % bare ground, 35 % leaf litter, 14 % grasses and 6 % herbs and forbs.

6.21.2 Conservation Status

No threatened species were identified within RE 10.10.1b. One non-native species was identified, the common pest pear (*Opuntia stricta*).

RE 10.10.1b is not listed within any EPBC Threatened Communities and is of 'NCAP' under the DERM Biodiversity Status. Areas which this community is protected include the White Mountains National Park, Cudmore National Park, White Mountains Resource Reserve and Cudmore Resource Reserve. In 2006, the state wide extent of RE 10.10.1b was greater than 10,000 ha.

6.22 QUEENSLAND YELLOWJACKET LOW OPEN WOODLAND (RE 10.5.1c)

6.22.1 Community Description and Location

The Queensland Yellowjacket Low Open Woodland (RE 10.5.1c) occurs along sand plains, within the eastern portion of site. Proposed disturbance plans within this community include the airport, powerline and access road, potentially disturbing 80 ha. Approximately 9 ha occur above proposed underground operations.

Table 28 summarises the community profile for the Queensland Yellowjacket Low Open Woodland (RE 10.5.1c).

Table 28 Community Profile – RE 10.5.1c

Regional Ecosystem	10.5.1c
REDD	10.5.1c: <i>Eucalyptus similis</i> and <i>Corymbia setosa</i> dominate the very sparse canopy (5-10 m tall). The shrub layer is usually very sparse with <i>Lithomyrtus microphylla</i> , <i>Carissa lanceolata</i> , <i>Gastrolobium grandiflorum</i> and <i>Jacksonia ramosissima</i> often present. <i>Triodia pungens</i> usually dominates the very sparse to sparse ground layer. <i>Aristida spp.</i> , <i>Cymbopogon bombycinus</i> , <i>Heteropogon contortus</i> and <i>Themeda triandra</i> are commonly present. Occurs on sand plains
Conservation Status	Not Listed (EPBC Act)Least Concern (VM Act) No concern at Present (DERM Biodiversity Status)
Tree Layer	<i>Eucalyptus similis</i> (6-8m), <i>Corymbia setosa</i> (6-9 m) , <i>Alphitonia excelsa</i> , <i>Acacia coriacea</i> , <i>Persoonia falcata</i> , <i>Brachychiton populneus</i> Average Stem Cover count = 10, PFC = 3 % - 14 %



Shrub Layer	<i>Petalostigma pubescens</i> (1.5–3 m), <i>Carissa ovata</i> (0.5-1 m) <i>Bursaria incana</i> , <i>Terminalia aridicola</i> , <i>Gastrolobium grandiflorum</i> , <i>Acacia holosericea</i> , <i>Acacia leiocalyx</i> , <i>Acacia leptostachya</i> , <i>Breynia oblongifolia</i> , <i>Capparis canescens</i> , <i>Dodonaea lanceolata</i> var. <i>lanceolata</i> , <i>Keraudrenia collina</i>
Ground Layer	<i>Triodia pungens</i> , <i>Heteropogon contortus</i> , <i>Cymbopogon bombycinus</i> , <i>Aristida calycina</i> , <i>Aristida latifolia</i> , <i>Cymbopogon refractus</i> , <i>Digitaria diffusa</i> , <i>Enneapogon polyphyllus</i> , <i>Enneapogon robustissimus</i> , <i>Panicum effusum</i> , <i>Pennisetum ciliare</i> , <i>Schizachyrium fragile</i>
Groundcover Observed on Site	This community consisted of a mid dense grassy ground layer, with exposed patches of bare ground. Average groundcover composition was 24 % bare ground, 43 % grass, 29 % leaf litter, 3 % herbs and forbs and 1 % stem cover from trees.

6.22.2 Conservation Status

No flora species of conservation significance were found within the Queensland Yellowjacket Low Open Woodland (RE 10.5.1c). The common pest pear (*Opuntia stricta*) was identified within this community.

RE 10.5.1 is not listed under any national or state legislation. This RE is protected regionally within the White Mountains National Park, White Mountains Resource Reserve, Cudmore Resource Reserve and Cudmore National Park. In December 2006, remnant extent was greater than 10,000 ha and greater than 30 % of the pre-clearing area remained

The soils in this ecosystem have exceptionally low nutrient status and excessive permeability. The loose sandy top soils are highly susceptible to erosion. Extensive areas have historically been only lightly grazed due to presence of poison heartleaf (*Gastrolobium grandiflorum*) and absence of surface water. Potential threats include wildfires, inappropriate burning regimes and clearing for pasture development intake for Great Artesian Basin aquifers. Sections within this RE are not utilised for light-intensity grazing due to the colonisation of poison heartleaf (*Gastrolobium grandiflorum*).

6.23 RUSTYJACKET OPEN WOODLAND (RE 10.10.4)

6.23.1 Community Description and Location

The Rustyjacket Open Woodland (RE 10.10.4) has been identified using DERM's Regional Ecosystem Mapping tool as occurring in one 296 ha area on the western boundary of the Project site. This area will not be affected by surface disturbance; however, mining activities will occur beneath the surface. Due to restrictions associated with site access in this area, data on this RE is yet to be collected.

The Rustyjacket Open Woodland RE 10.10.4 is summarised in Table 29.

Table 29 Community Profile – RE 10.10.4



Regional Ecosystem	10.10.4
REDD	<i>Corymbia leichhardtii</i> woodland with a ground cover of <i>Triodia</i> spp. Occurs on slopes of rocky hills with sandy to skeletal soils on sandstone ranges. <i>Corymbia leichhardtii</i> dominates the very sparse canopy (9-30m tall). <i>Corymbia lamprophylla</i> and <i>Acacia shirleyi</i> are frequently present and sometimes co dominant in the canopy. <i>Lysicarpus angustifolius</i> is frequently present. <i>Persoonia falcata</i> , <i>Petalostigma pubescens</i> , <i>Acacia leptostachya</i> and <i>Calytrix microcoma</i> are often present in the very sparse shrub layer (0.5-6m tall). <i>Triodia</i> spp. usually dominate the very sparse to sparse ground layer. <i>Lomandra confertifolia</i> is commonly present. Occurs on sandstone ranges.
Conservation Status	Least Concern (VM Act) No Concern at Present (DERM Biodiversity Status)
Tree Layer	<i>Corymbia leichhardtii</i> (9-30m), <i>Corymbia lamprophylla</i> , <i>Acacia shirleyi</i>
Shrub Layer	<i>Persoonia falcata</i> , <i>Petalostigma pubescens</i> , <i>Acacia leptostachya</i> , <i>Calytrix microcoma</i>
Ground Layer	<i>Triodia</i> spp., <i>Lomandra confertifolia</i> .

6.23.2 Conservation Status

No threatened species have been targeted for searches within this community.

The Rustyjacket Open Woodland RE 10.10.4 is not of any conservational significance within Queensland legislation and is not listed within any EPBC Threatened Communities. Reserves in which this RE occurs include White Mountains National Park, Cudmore National Park and Cudmore Resource Reserve. In December 2006, greater than 10,000 ha and over 30% of the pre-clearing area remained.

6.24 NATURAL GRASSLANDS OF THE QUEENSLAND CENTRAL HIGHLANDS AND THE NORTHERN FITZROY BASIN (RE 11.8.11)

6.24.1 Community Description and Location

The Natural Grasslands of the Queensland Central Highlands and the northern Fitzroy Basin (RE 11.8.11) occurs along the eastern portion of the Project; with planned disturbance from proposed railway and access road corridors potentially affecting 22.3 ha.



The REDD, corresponding conservation status and dominant flora species for this community are summarised in Table 30 below.

Table 30 Community Profile – RE11.8.11

Regional Ecosystem	11.8.11
REDD	11.8.11: Grassland dominated by <i>Dichanthium sericeum</i> , <i>Aristida spp.</i> , <i>Astrebla spp.</i> and <i>Panicum decompositum</i> with or without trees such as <i>Eucalyptus orgadophila</i> , <i>E. melanophloia</i> , <i>Corymbia erythrophloia</i> and <i>Acacia salicina</i> , (height 11 +/-3 m). However, dominance and cover may vary with seasonal and other environmental conditions. Frequently occurring and sometimes locally dominant, species include the grasses <i>Aristida lazaridis</i> , <i>A. ramosa</i> , <i>Bothriochloa ewartiana</i> , <i>Dichanthium sericeum</i> , <i>Chrysopogon fallax</i> , <i>Heteropogon contortus</i> , <i>Enneapogon gracilis</i> , <i>Themeda triandra</i> and <i>Tragus australianus</i> and the herbs <i>Brunoniella australis</i> , <i>Evolvulus alsinoides</i> , <i>Galactia tenuiflora</i> and <i>Indigofera linnaei</i> . Isolated emergent trees (tree height 12 +/-4 m - species including <i>Eucalyptus orgadophila</i> , <i>E. melanophloia</i> and <i>Corymbia erythrophloia</i>) or small areas of open-woodland may also be present. Occurs on Cainozoic igneous rocks, particularly fresh basalt, and is generally associated with undulating to gently undulating rises. It usually occurs on the crests and middle and upper slopes (slopes 2-6%), although in places is occasionally present on lower slopes and flat areas (slopes 0-2%). Associated soils are moderately shallow to deep cracking clay soils, dark brown to reddish brown in colour, often self mulching, and with gravel, stone or linear gilgai sometimes present. Surface stone 10-15 cm diameter is present in the south-western remnants.
Conservation Status	Endangered (EPBC Act) Of Concern (DERM Biodiversity Status)
Tree Layer	None observed within this RE
Shrub Layer	None observed within this RE
Ground Layer	<i>Astrebla squarrosa</i> , <i>Sporobolus creber</i> , <i>Dicantheum sericeum</i> , <i>Aristida latifolia</i> , <i>Panicum decompositum</i> , <i>Astrebla pectinata</i> , <i>Iseilema vaginiflorum</i> , <i>Bathriochloa ewartiana</i> . Common forbs include <i>Neptunia gracilis</i> , <i>Streptoglossa adscendens</i> , <i>Polymeria ambigua</i> , <i>Stemodia glabella</i> .

6.24.2 Conservation Status

No threatened species were identified within this community. Identified non-native species include buffel grass (*Cenchrus ciliaris*), caustic weed (*Chamaesyce drummondii*) and paddy's lucerne (*Sida spinosa*).

This vegetation community is listed as "Endangered" under the EPBC Act, and 'Of Concern' under the VM Act and DERM Biodiversity Status. RE 11.8.11 is protected within the Albinia National Park, Peak Range National Park, Carnarvon National Park, Albinia Conservation Park, Albinia Resource Reserve, Minerva Hills National Park. In December 2006, remnant extent was greater than 10,000 ha and 10-30 % of the pre-clearing area remained.

6.25 NON-REMNANT GRASSLAND

6.25.1 Community Description and Location

Non-remnant Grassland is a dominant community throughout the central and western portions of the site, occupying over 10,000 ha (or nearly 30%) of total site area. Approximately 3,000 ha of this Non-remnant Grassland are proposed to be disturbed by both open cut pits, the coal handling and preparation plant, tailings storage facility, access roads, pit water dams, the creek diversion and unsized drain system, and train loading facility. 6,700 ha of this community will overlay proposed underground operations.

The community profile, including dominant species occurring, is summarised in 0 below. During the wet season survey, ground cover was dense, with an average cover of approximately 62 % grass, 5 % bare ground, 13 % herbs and forbs and 20 % litter. Dry season surveys held differing structural composition, with an average of 58 % grass, 32 % bare ground, 3 % herbs and forbs and 6 % leaf litter.



Table 31 Community Profile – Non-remnant Grassland

Regional Ecosystem	Not Classed
REDD	Not Defined
Conservation Status	Not Listed (EPBC Act) NCAP (DERM Biodiversity Status)
Tree Layer	<i>Acacia harpophylla</i> (8-10 m), <i>Eucalyptus cambageana</i> (10-13 m) and <i>Lysiphyllum carronii</i> Average Stem Cover count = 30, PFC = 2% - 25%
Shrub Layer	<i>Eremophila mitchellii</i> (2.5–3.5 m), <i>Carissa ovata</i> (1-1.5 m), <i>Acacia salicina</i> , <i>Eremophila latrobei</i> , <i>Everistia vacciniifolia</i> and <i>Petalostigma pubescens</i>
Ground Layer	<i>Paspalidium caespitosum</i> , <i>Paspalidium distans</i> , <i>Panicum decompositum</i> , <i>Sporobolus actinocladius</i> , <i>Pennisetum ciliare</i> , <i>Aristida latifolia</i> . Common forbs include <i>Sclerolaena divericata</i> and <i>Sida cleisocalyx</i>

6.25.2 Conservation Status

No flora species of conservation significance were identified in this vegetation community during the surveys.

6.26 WEED LOCATION AND ABUNDANCE

The state and regional distribution and abundance of the Class 2 pest weeds that were identified on the Project site (referred to in the above vegetation community assessments - parkinsonia (*Parkinsonia aculeata* – also a Weed of National Significance), prickly pear (*Opuntia stricta*) and the velvet tree pear (*Opuntia tomentosa*)) has been obtained from the following sources:

- Biosecurity Queensland's Annual Pest Distribution Surveys, presented via the DEEDI website predictive maps (<http://www2.dpi.qld.gov.au/extra/asp/IPA-maps/search.asp> viewed on 24/06/11);
- Queensland Herbarium naturalised flora database; and
- Local Government Area Pest Management Plans (PMP).

The distribution and abundance of these weeds across Queensland is presented in Figure 9 to Figure 11 and a summary of the distribution of Class 2 pest weeds that were identified on the Project site is presented in Table 32.



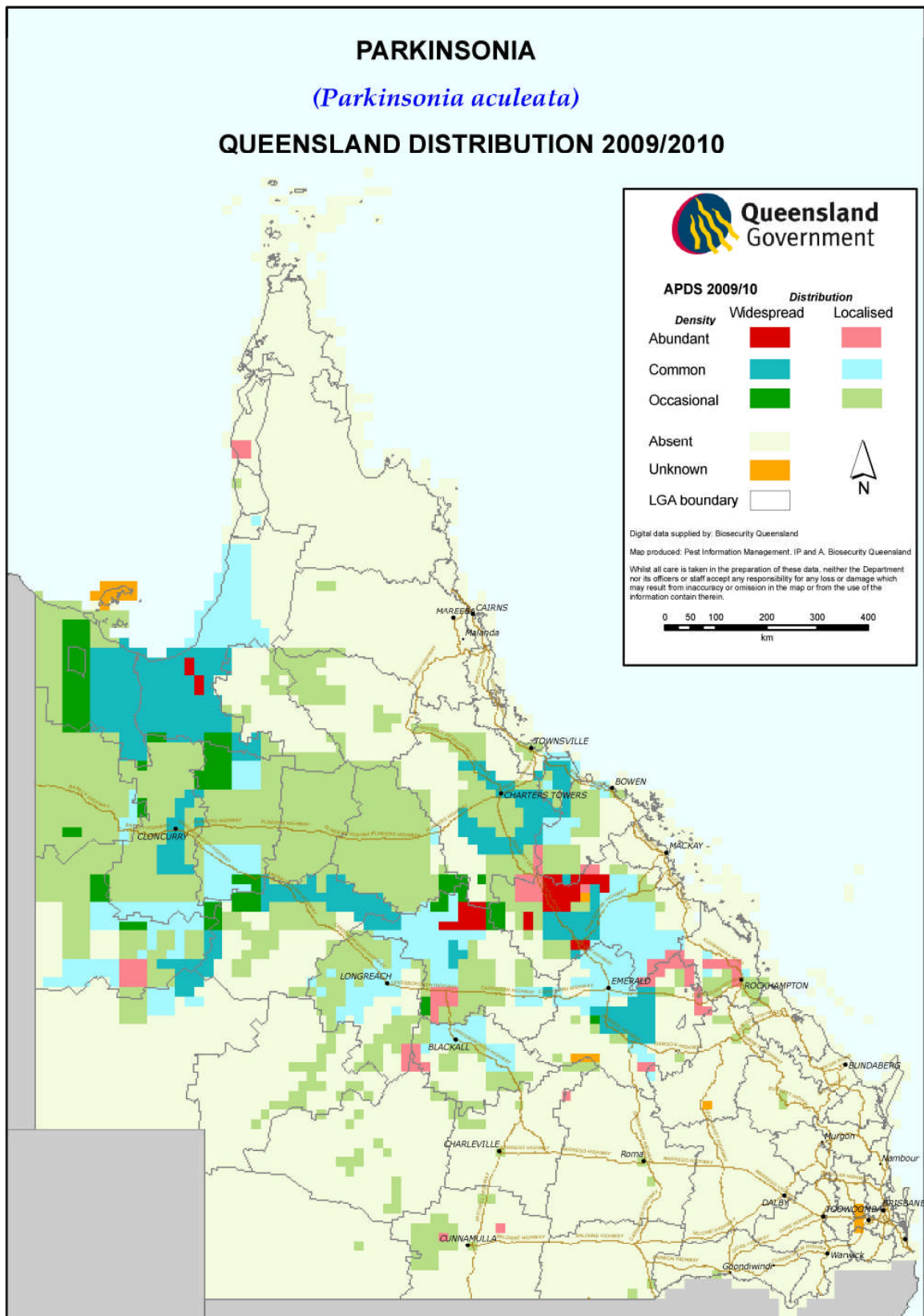
Table 32 Summary of the Distribution and Abundance of Class 2 Pest Weeds

Class 2 Pest Weed	Biosecurity Queensland's Annual Pest Distribution Surveys	Queensland Herbarium Naturalised Flora Database Record	Local Government Area PMPs- Jericho Shire (JS) and Barcaldine Regional Council (BRC) (Jericho Shire)
Parkinsonia (<i>Parkinsonia aculeata</i>)	Localised and occasional	South Kennedy Pastoral District	Listed in both JS and BRC PMPs as a high priority weed
Prickly Pear (<i>Opuntia stricta</i>)	Localised and occasional	South Kennedy Pastoral District	Not Listed in either the JS or BRC PMP
Velvet Tree Pear (<i>Opuntia tomentosa</i>)	Localised and occasional	Mitchell Pastoral District	Not Listed in the JS PMP, but referred to in the BRC PMP

Note: This table refers to data that has been on recorded a large scale and therefore, the proximity of each distribution and abundance record to the Project site is uncertain. The Barcaldine Regional Council Pest Management Plan has not been approved, but a draft copy has been made available to AARC for review.

Therefore, the Biosecurity Queensland's Annual Pest Distribution Surveys, Queensland Herbarium Naturalised Flora Database Records and Local Government Area PMPs concur with the weed species that have been identified on the Project site. However, the Local Government PMPs do not provide as much information on the location and abundance of *Opuntia* species.

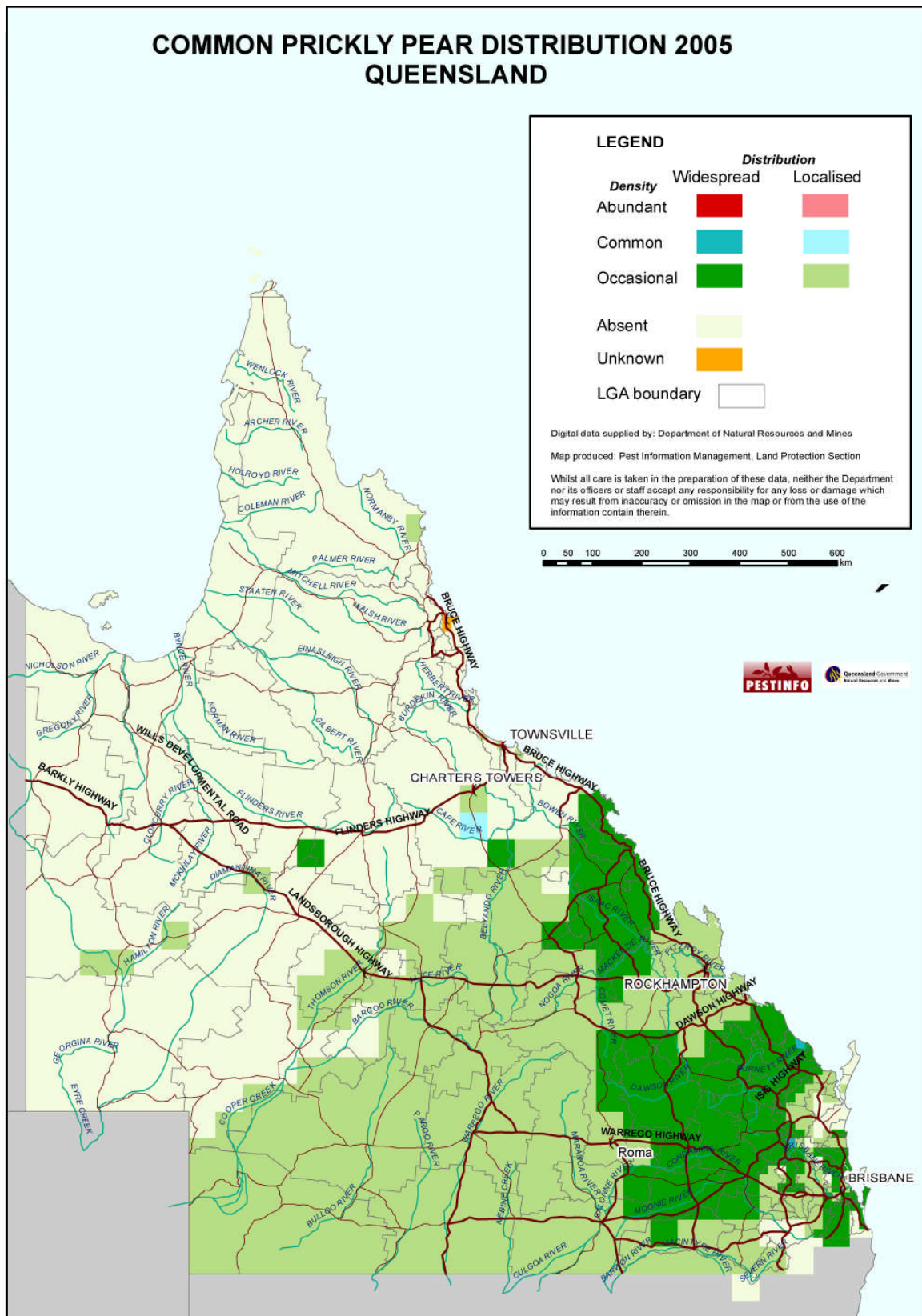
No plant communities of cultural, commercial or recreational significance were identified on the Project site. Similarly, no exotic plant species were recorded on the Project site.



Source: Biosecurity Queensland's Annual Pest Distribution Surveys

Figure 9 Queensland Distribution of Parkinsonia (*Parkinsonia aculeata* - 2009 / 2010)

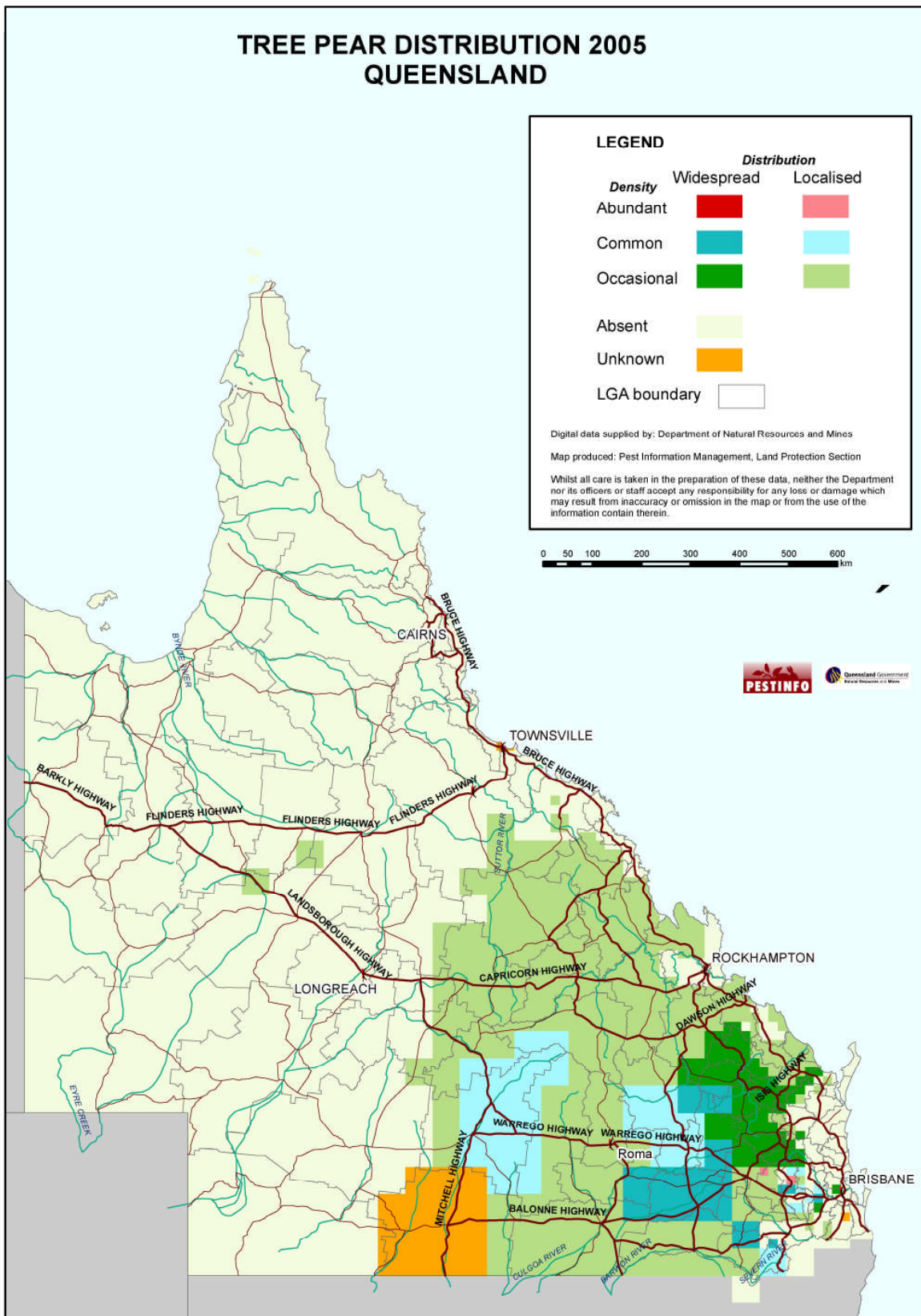




Source: Biosecurity Queensland's Annual Pest Distribution Surveys

Figure 10 Queensland Distribution of the Common Prickly Pear (*Opuntia stricta* - 2005)





Source: Biosecurity Queensland's Annual Pest Distribution Surveys

Figure 11 Queensland Distribution of the Velvety Tree Pear (*Opuntia tomentosa* - 2005)



7.0 FAUNA RESULTS AND DISCUSSION

A total of 163 vertebrate fauna species were identified on the Project site during the surveys. This comprised 92 birds, 35 mammals (four introduced), 26 reptiles and 10 amphibians (one introduced). A complete list of all observed fauna species is provided in Appendix A. Each of the vertebrate groups observed on the Project site are discussed below in Sections 7.1 to 7.5. A summary of species of conservation significance is provided in Section 7.5.

7.1 AMPHIBIANS

Many amphibian species occurring in Australia's drier regions are burrowing species capable of spending several years underground awaiting heavy rain, after which they come to the surface to feed and breed. This behaviour is referred to as aestivation and assists in water preservation and survival during prolonged periods of drought (Withers 1995). Consequently, the vast majority of amphibians from seasonally dry regions only occur in areas where the ground is soft enough to allow digging during wet periods.

Non-burrowing frog species also inhabit drier regions where they adopt different survival strategies, such as sheltering deep in tree hollows or cool rock crevices. However, these species are still typically associated with water sources.

Due to the ephemeral nature of the creeks at the Project site, only stock watering points and two permanent water holes within creeks were observed during the dry season surveys. Conversely the wet season provided a range of varying habitat types for amphibians, and included flowing creeks, black clay floodplains and moist sandy drainage lines. Creeks on the Project site contained a sandy substrate and were soft enough for burrowing frogs. The extent of habitat utilised by amphibians was extended significantly during the observed wet season as a result of extraordinary rainfall events. These events are expected to result in a population increase of many opportunistic amphibian species.

7.1.1 Observed Species

Ten amphibian species were observed on the Project site. The most frequently captured was the ornate burrowing frog (*Platyplectrum ornatus*) (Photo Plate 1); with captures at some trap sites exceeding 50 individuals per night. The green tree frog (*Litoria caerulea*) and desert tree frog (*Litoria rubella*) were frequently seen while spotlighting during the wet season. Four additional *Litoria* species were trapped during the wet season. Other amphibian species observed during the wet season include the spotted marsh frog (*tasmaniensis*), eastern burrowing toadlet (*Uperoleia rugosa*) and the introduced cane toad (*Rhinella marina*).



Photo Plate 1 Ornate Burrowing Frog (*Platyplectrum ornatus*)

7.1.2 Amphibians of Conservation Significance

No amphibians of conservation significance were observed on the Project site during the wet and dry season survey periods despite an extensive trapping effort and favourable conditions, nor have been previously recorded within the region. It is therefore considered highly unlikely that any amphibian species of conservation significance occur on the Project site.

7.2 REPTILES

Australia's environment supports an extremely diverse assemblage of reptile species which exploit a wide array of micro-habitats (e.g. tree hollows, soil cracks) and food sources (e.g. succulent leaves, termites, grasshoppers, birds, and other reptiles) (Pianka 1969a, b). This diversity encompasses species of widely different body sizes (skinks versus monitors), and life history strategies (burrowing blind snakes versus arboreal geckos).

The Project site provides a variety of micro-habitat types suitable for reptile species occurring in the region. These include soil cracks in the grasslands, tree hollows, fallen timber and creek banks and mature overstorey species in riparian woodlands.

7.2.1 Observed Species

A total of 26 reptile species were observed on the Projects Site. Many of these are nocturnal and were observed while spotlighting or captured in pit and funnel traps. Species encountered during the day included a sand goanna (*Varanus gouldii*), central netted dragon (*Ctenophorus nuchalis*) (Photo Plate 2), black headed python (*Aspidites melanocephalus*), eastern blue-tongue (*Tiliqua scincoides*), tommy roundhead dragon (*Diporiphora australis*) and nobbi dragon (*Amphibolurus nobbi*) (Photo Plate 3). Other snake species observed were a spotted python (*Antaresia maculosa*), carpentaria whip snake (*Cryptophis boschmai*) and pale-headed snake (*Holocephalus bitorquatus*). Eight skink species were observed on the Project site with *Ctenotus robustus* and *Ctenotus herbetior* the most abundant. bynoe's gecko (*Heteronotia binoei*) and *Geyhra variegata* were the most frequently encountered gecko species during the surveys. Lower abundances of reptile species during the dry seasons were noted. This is likely due to the dry, cool weather. A complete list of the recorded reptiles is included in Appendix A.



Photo Plate 2 Central Netted Dragon (*Ctenophorus nuchalis*)



Photo Plate 3 Nobbi Dragon (*Amphibolurus nobbi*)

7.2.2 Reptiles of Conservation Significance

No reptiles of conservation significance were recorded on the Project site at the time of the surveys. Species of conservation significance known from the region but not observed at the Project site are discussed in Section 7.5.

7.3 BIRDS

Avian assemblages are generally determined by factors such as food (e.g. fruit, nectar, seeds and insects) and water sources, as well as the mosaic of habitat structures such as grasses, thick understorey and canopy vegetation. Generally, the more food sources available and the more complex the structure of the vegetation, the more diverse the avifauna assemblage will be.

Food sources within the Project site included a variety of grass seeds, nectar, insects and vertebrate prey items. Soft fruiting species suitable for birds do not occur in high densities within the Project site. Habitat complexity is relatively high across the Project site and includes 13 unique vegetation communities.

7.3.1 Observed Species

A total of 92 bird species were recorded within the Project site during the surveys of which 24 are listed as Migratory or Marine under the EPBC Act.

The most commonly observed granivorous bird species observed were the zebra finch (*Taeniopygia guttata*), double-barred finch (*Taeniopygia bichenovii*), peaceful dove (*Geopelia striata*) and galah (*Eolophus roseicapilla*). The range of granivorous birds observed on the Project site is not uncommon within the region.

Many bird species were observed using watercourses located within the Project site. Species using these dams and other bodies of standing water include the straw-necked ibis (*Threskiornis spinicollis*), nankeen night heron (*Nycticorax caledonicus*), great egret (*Ardea alba*), darter (*Anhinga melanogaster*), brolga (*Grus rubicunda*), Australian pelican (*Pelecanus conspicillatus*) and the white-necked heron (*Ardea pacifica*).

Six raptor species were identified during the course of the survey. These were the wedge-tailed eagle (*Aquila audax*), brown falcon (*Falco berigora*), whistling kite (*Haliastur sphenurus*), black-shouldered kite (*Elanus axillaris*), Australian hobby (*Falco longipennis*) and nankeen kestrel (*Falco cenchroides*).

The most common types of birds encountered were insectivorous, and included such species as the Australian magpie (*Gymnorhina tibicen*), the willy wagtail (*Rhipidura leucophrys*), the apostle bird (*Struthidea cinerea*), and the superb fairy-wren (*Malurus cyaneus*). The wide array and abundance observed in these birds is due to the readily available prey, and their ability to colonise all available habitats. An omnivorous bird commonly observed on all vegetation communities within the Project site was the emu (*Dromaius novaehollandiae*) (Photo Plate 4). A complete list of species observed on the Project site during the surveys is provided in Appendix A.



Photo Plate 4 Emu (*Dromaius novaehollandiae*)

7.3.2 Birds of Conservation Significance

The southern squatter pigeon (*Geophaps scripta scripta*) was the only bird species of conservation significance recorded during the survey, with individuals observed within non-remnant grassland habitat (Photo Plate 5). This species is listed as Vulnerable under both the EPBC Act and Schedule 3 of the NCWR.

The ground-dwelling squatter pigeon's range is in tropical, dry sclerophyll woodlands and savannahs of north-eastern Australia (Higgins & Davies 1996). Sightings are generally in the grassy understorey of eucalypt woodland, close to permanent water bodies (Garnett 1992). Nests are located on the ground, sometimes among, or sheltered by vegetation, including short, dry grass, grass tussocks, or bushes (Frith 1982).

The squatter pigeon forages on a wide range of seeds from grasses, legumes, herbs, trees, and shrubs, as well as insects (Higgins & Davies 1996). Drinking occurs every day, usually in the morning (Crome 1976). Breeding is greatly influenced by heavy rainfall, and a clutch of usually two eggs is incubated for a period of 15-17 days (Higgins & Davies 1996).

Threats to this species include overgrazing of habitat by domestic stock and the European Rabbit, trampling of nests by domestic stock, predation by feral cats and foxes, illegal shooting and clearing and fragmentation of grassy woodland habitat for agriculture and development (Department of Environment and Conservation, 2009)

Extensive areas of habitat suitable for the southern squatter pigeon exist on the Project site, and within the local region. Although it is likely some of the available squatter pigeon habitat will be disturbed by mining activities, it is unlikely that there will be a significant impact on the regional population of the species due to the broad extent of habitat in the local region. In addition, if grazing is to be eliminated from site as a result of the establishment of mining activities, suitable habitat for the squatter pigeon could increase in area and condition.



Photo Plate 5 Squatter Pigeons (Southern Subspecies) (*Geophaps scripta scripta*)

Species of conservation significance known from the region which were not detected during the survey are discussed in Appendix F: .

7.3.3 Migratory and Listed Marine Species

Two Migratory species listed under the EPBC Act were observed on the Project site by AARC ecologists during all survey periods. These included the great egret (*Ardea alba*), and the rainbow bee-eater (*Meriops ornatus*). The distribution of these species is widespread throughout eastern Queensland, and the local populations on the Project site are unlikely to constitute an 'ecologically significant proportion' of the total population of the species. Furthermore, the Project site is not at the limit of these species' range, nor are these species considered to be declining within the region. Therefore, it is unlikely the Project will have a significant impact on the regional populations of these species.

Fifteen Marine species listed under the EPBC Act observed on the Project site by AARC ecologists included the rainbow bee-eater (*Meriops ornatus*), Australian pipit (*Anthus novaeseelandiae*), Australian pelican (*Pelecanus conspicillatus*), Australian white ibis (*Threskiornis molucca*), straw necked ibis (*Threskiornis spinicollis*), nankeen kestrel (*Falco cenchroides*), whistling kite (*Haliastur sphenurus*), great egret, intermediate egret (*Ardea intermedia*), nankeen night heron (*Nycticorax caledonicus*), black-faced cuckoo-shrike (*Coracina novaehollandiae*), spotted nightjar (*Eurostopodus argus*), dollar bird (*Eurystomus orientalis*), forest kingfisher (*Todiramphus macleayii*) and sacred kingfisher (*Todiramphus sanctus*). These species are also widespread throughout eastern Queensland and given the availability of similar habitat in the region it is unlikely the Project will have any significant impacts upon them.

7.4 MAMMALS

The morphology of mammal species varies widely from small rodents to larger kangaroos and bats. The ecology of each of these groups is equally variable and they are assessed separately in the following sections.

Small Mammals

Habitats highly suitable for small mammals include areas that provide a plentiful food source and suitable shelter. The highest density of small mammal species is usually associated with:

- Reliable rainfall which is reflected in a reliable source of food; and
- Dense ground vegetation, particularly shrubs and grasses.

The diversity of small mammals is often limited by the lack of a predictable food supply and open ground vegetation. Consequently, small mammal populations can fluctuate dramatically in response to rain which increases seed production and insect abundance. During less favourable periods, small mammal populations can be very low.

Habitats within the Project site ranged from open woodland with adequate groundcover in the form of grasses, to non-remnant grassland with dense groundcover. Other habitat available on the Project site includes riparian woodlands and human structure such as stations and the mine camp.



Medium and Large Mammals

Factors affecting the occurrence of medium-sized mammals are varied. Important factors can include land-clearing, feral animal predation and grazing pressures. Consequently, medium-sized mammals are no longer abundant in most of eastern Australia.

Habitats on the Project site do not include areas of dense native vegetation. Rather, open woodland and non-remnant grasslands are typical of the region, which is likely to be reflected in the medium-sized mammal community.

In contrast, larger mammals such as kangaroos have been much less affected by predation and land clearing activities. In fact, many species have flourished in response to increasing grasslands and their populations are now likely to be above historical levels. Habitat for this group on the Project site commonly occurs throughout the region.

Arboreal Mammals

The majority of arboreal mammals that occur in Australia utilise tree hollows for nesting and shelter. Smith and Lindenmayer (1988) consider that a shortage of nest hollows is likely to limit arboreal mammal populations where the density of hollow bearing trees is less than two to eight trees per ha. Large hollow-bearing trees in the broader area generally occur along creek lines or in small pockets of remnant vegetation and are usually scattered, separated by open areas that would be difficult for arboreal mammals to cross without venturing onto the ground. It is likely that such habitat is too open for many arboreal mammals and very few are known to occur within the broader region.

Bats

The density and diversity of Australian bat species is determined primarily by the availability of suitable nesting and roosting sites. Roosting sites can include locations such as thick foliage, loose exfoliating bark, rock caves or cavities, tree hollows or even fabricated structures such as old buildings and culverts (Churchill 1998).

Consequently, areas with a large number of hollow-bearing trees that occur within remnant vegetation are of high value to many bat species. As bats have a small body size, these hollows can be much smaller in size than required by arboreal mammals. Suitable hollows were present the Project site, including larger senescing trees in the woodlands, particularly in the riparian areas. Habitats such as these appear common within the region.

7.4.1 Observed Species

A total of 35 mammal species were identified within the Project site, including four introduced species.

The most common mammal species to occur on the Project site were the eastern grey kangaroo (*Macropus giganteus*), common wallaroo (*Macropus robustus*), rufous bettong (*Aepyprymnus rufescens*), red kangaroo (*Macropus rufus*) and the introduced European rabbit (*Oryctolagus cuniculus*). Less commonly observed native species were the sugar glider (*Petaurus breviceps*) 200m south of transect 34, stripe-faced dunnart (*Sminthopsis macroura*) at transect 33 (Photo Plate 6), koala (*Phascolarctos cinereus*) (Photo Plate 7) at transect 34 (Figure 7) and echidna (*Tachyglossus aculeatus*) found between transects 8 and 28. Introduced species observed included the feral pig (*Sus scrofa*), feral goat (*Capra hircus*), dingo/wild dog (*Canis lupus dingo*), feral cat (*Felis catus*) and the house mouse (*Mus musculus*). Four of the five introduced mammal species recorded on the Project site (feral pig, dingo/wild dog, feral goat and European rabbit) are classified as 'Class 2' pest's



animal under LP Act. All mammal species recorded on the Project site during the current survey are listed in Appendix A. Fact sheets for pest species are included in Appendix C.



Photo Plate 6 Stripe-faced Dunnart (*Sminthopsis macroura*)



Photo Plate 7 Koala (*Phascolarctos cinereus*)

Eight microbat species have been positively identified from echolocation calls recorded on the Project site including the beccari's free-tailed bat (*Mormopterus beccarii*), the white-striped free-tailed bat (*Tadarida australis*), inland forest bat (*Vespadelus baverstocki*), gould's wattled bat (*Chalinolobus gouldii*), inland free-tailed bat (*Mormopterus* sp. 3), inland broad-nosed bat (*Scotorepens balstoni*), the little broad-nosed bat (*Scotorepens greyii*) and inland / eastern cave bat (*Vespadelus finaysoni* / *V. troughtoni*).

Three microbat species were not positively identified (where there is a probability of confusion with species that have similar calls). However, due to the presence of suitable habitat and comparable calls these microbats have been potentially identified as the troughton's sheath-tailed Bat (*Taphozous troughtoni*), bristle-faced free-tailed bat (*Mormopterus eleryi*), and chocolate wattled bat (*Chalinolobus morio*). Refer to Appendix D for AnaBat™ results.

7.4.2 Mammals of Conservation Significance

No mammals of conservation significance were identified on the Project site.

7.5 OTHER THREATENED SPECIES FROM THE REGION

A total of 51 species have been identified from wildlife database searches (Appendix B) and other scientific literature searches that are tabled in Appendix F. Targeted searches were carried out during field surveys to ensure that these species were searched for. Appendix F details habitat requirements and habitat values of the Project site. The assessment is based on the knowledge and opinion of AARC field ecologists, information obtained from site visits, scientific literature and communications with relevant experts or interest groups.

One threatened species that was not observed on site has been identified within the region during previous surveys. The little pied bat (*Chalinolobus picatus*) was observed approximately 25 km away from site, however this species can travel over 30 km in a night in search of waterholes (Van Dyk & Strahan 2008). The natural range of this species is therefore large enough to suggest its utilisation of the suitable habitat that exists on the Project site.



8.0 SUGGESTED MITIGATION AND REHABILITATION STRATEGIES

8.1 ENVIRONMENTAL VALUES

The Project lies within the upper Burdekin catchment in the Belyando-Suttor sub-catchment. Watercourses on the site flow only in response to recent, heavy local rain events and dry up quickly following the short wet season. Several waterholes, oxbow lakes and dams provide permanent water throughout the year and are generally associated with the Sandy Creek and Lagoon Creek systems flowing south-north through the Project area. Floodplain wetlands and gilgai are present on the site and are generally associated with the Brigalow Woodland community and adjacent non-remnant areas on clay soils. These areas contain significant frog populations and provide important habitat for migratory birds.

Riparian habitat is in good condition across much of the Project site but grazing pressures have caused bank erosion and siltation in some of the more accessible areas. Most stream beds are comprised of highly permeable coarse sands; however some smaller watercourses, where Brigalow or Coolabah dominate, the tree layer grow on less permeable clays where deeper waterholes provide a source of water into the dry season.

Vegetation community specific values include:

- The Fringing Riparian Woodland which provides refuge for fauna by providing water, shade and mature, hollow bearing tree species;
- Fallen timber within the Brigalow Open Woodland and Gidgee Open Woodland has the potential to provide a distinct microhabitat for certain fauna, including the listed Yakka Skink and Brigalow Scaly Foot; and
- The relatively intact patches of Poplar Box Open Woodland, Gidgee Open Woodland, Fringing Riparian Woodland and Thozets Box Open Woodland are listed as 'Of Concern' under DERM's Biodiversity Status and have the potential to contribute to the overall preservation of threatened ecosystems.

8.2 POTENTIAL IMPACTS

Impacts of the Project are expected to be restricted to the local scale. Management strategies implemented at this level would most likely prevent significant impact at the higher regional or state scale.

8.2.1 Flora

Maintaining stands of vegetation across the Project site provides important habitat for a range of fauna species and is important for maintaining high biodiversity levels, carbon sequestration, and aiding the ecosystems ability to maintain an assimilative capacity. Vegetation also assists with the management of anthropogenic activities by providing natural solutions to environmental problems such as soil and bank stabilisation, and reducing the risk of salinity and overland flow.

Edge effects resulting from the proposed works can include the establishment of weeds, alteration to microclimatic conditions (such as greater light intensity, more wind penetration, lower humidity) and a reduction in plant health through loss of photosynthetic potential (as a result of plants being covered by dust generated from vehicle movement on unsealed tracks). In the absence of appropriate control



measures, the project has the potential to cause such edge effects, particularly in relation to the introduction and / or spread of weed species throughout the Project site.

The following potential impacts on flora values may result from the proposed works at the Project site:

- Land clearing and mining activities may reduce the available habitat for native flora species on the Project site;
- A loss of habitat connectivity across the mine infrastructure and pit areas;
- Loss of vegetation communities listed as having a high biodiversity status;
- Increased pressure upon vegetation communities that remain following site development;
- Spread and introduction of weed seeds/propagules on footwear, machinery, vehicles and materials required for mine operation and construction;
- Potential weed invasion from earthworks activities in sensitive areas, particularly along watercourses; and
- Increased incidence of fire due to inappropriate fire regimes or accidental burning as a result of mining activities. An alteration of natural fire regimes for native flora species may disrupt their life cycles, allowing weeds to increase in the area.

Habitat Loss

Table 33 provides a summary of vegetation communities identified on the Project site, the RE conservational status and whether proposed mine infrastructure is planned within each community. Figure 12 below presents the location of the proposed mine infrastructure and vegetation communities that this infrastructure will impact.

Table 33 Vegetation Communities, Associated Conservation Status and Extent of Disturbance from Mine Infrastructure for each Community

VEGETATION COMMUNITY	EPBC STATUS	RE	DERM BIODIVERSITY STATUS	TOTAL AREA ON SITE (HA)	TOTAL CLEARED AREA (PROPOSED) (HA)	PERCENTAGE OF RE TO BE DISTURBED (%)
Brigalow Open Woodland	NL	10.3.3a	NCAP	1,036	234.1	22.6
		10.4.5	OC	71.1	0	0
		10.9.3	E	16.7	0	0
		11.3.5	OC	34.4	5.7	16.6
Silver-leaved Ironbark Open Woodland	NL	10.3.28a	NCAP	559.3	70.8	12.7
		10.5.5a	NCAP	11,870	2,022	17.0
		10.7.11a	NCAP	692.5	63.8	9.2



VEGETATION COMMUNITY	EPBC STATUS	RE	DERM BIODIVERSITY STATUS	TOTAL AREA ON SITE (HA)	TOTAL CLEARED AREA (PROPOSED) (HA)	PERCENTAGE OF RE TO BE DISTURBED (%)
		11.8.4	NCAP	197.7	28.5	14.4
Poplar Box Open Woodland	NL	10.3.27a	OC	894.6	174.3	19.5
		10.5.12	NCAP	4,072	542.2	13.3
		11.3.2	OC	20.1	4.5	22.3
Poplar-Ironbark Mixed Woodland	NL	10.5.5a.	NL	1,763	991.8	56.3
		10.5.12				
White Cypress Pine Woodland	NL	11.5.5b	NCAP	3	0	0
Gidgee Open Woodland	NL	10.3.4	OC	1	0	0
Fringing Riparian Woodland	NL	10.3.12a	NCAP	341.8	97.9	28.6
		10.3.13a	OC	575.4	146.8	25.5
		10.3.14	OC	1,099	541.2	49.2
Weeping Bottlebrush Heath	NL	10.7.7	NCAP	704.3	120.1	17.0
Thozets Box Open Woodland	NL	10.7.5	OC	228.6	62.3	27.2
Lancewood Woodland	NL	10.7.3b	NCAP	2,168	147.2	6.8
		10.10.1b	NCAP	115.9	0	0
Queensland Yellowjacket Low Woodland	NL	10.5.1c	NCAP	1,235	80.1	6.5
Rustyjacket Woodland	NL	10.10.4	NCAP	296.6	0	0
Natural Grasslands of the Queensland Central Highlands and	E	11.8.11	OC	169.7	22.3	13.1



VEGETATION COMMUNITY	EPBC STATUS	RE	DERM BIODIVERSITY STATUS	TOTAL AREA ON SITE (HA)	TOTAL CLEARED AREA (PROPOSED) (HA)	PERCENTAGE OF RE TO BE DISTURBED (%)
the northern Fitzroy Basin						
Non-remnant Grassland	NL	NL	NL	10,200	2,988	29.3
Total Areas				38,365.7	8,343.6	21.7

E = Endangered; OC – Of Concern; NCAP – No Concern at Present; NL – Not Listed

The table above provides an indication of the extent of disturbance that will occur within each RE found on the Project site. Those REs within the proposed footprint that are of conservation significance are discussed below:

The Natural Grasslands of the Central Highlands and northern Fitzroy Basin (RE 11.8.11) is listed as an ‘Endangered Community’ under the EPBC Act and ‘Of Concern’ under the VM Act and DERM’s Biodiversity Status. Around 13% (22 ha) of the area of this RE found on site (predominantly within the transport corridors to the east) will be impacted by surface disturbance from the construction of these corridors. Further impacts may occur as a result of ongoing mining activities.

The Poplar Box Open Woodland (RE 11.3.2) is listed as ‘Of Concern’ under the DERM Biodiversity Status. This RE will lose approximately 20% of its overall area (4.5 ha).

The Poplar Box Open Woodland (RE 10.3.27a) is listed as ‘Of Concern’ under DERM’s Biodiversity Status. The overall condition of these REs on the Project site has been reduced by cattle grazing and weed invasion. Based upon the proposed disturbance footprint, it will lose ~20% of the overall area currently found on site (approximately 175 ha).

The Brigalow Open Woodland (RE 10.4.5 and RE 11.3.5) vegetation communities are listed as ‘Of Concern’ throughout Queensland under the DERM’s Biodiversity Status due to total grazing pressures, in particular pasture degradation and significant loss of groundcover. RE 10.4.5 is outside of the disturbance footprint and will therefore remain intact, however RE 11.3.5 will have nearly 6 hectares impacted or ~16.5% of its total area on site. The Brigalow Open Woodland (RE 10.9.3) is listed as ‘Endangered’ under the DERM Biodiversity Status yet no surface disturbance is proposed for this community.

The Gidgee Open Woodland (RE 10.3.4) is listed as ‘Of Concern’ under the DERM Biodiversity Status. This RE comprises a single hectare of vegetation on the Project site which will not be affected by any surface infrastructure.

The two Fringing Riparian Woodlands listed as ‘Of Concern’ under the DERM Biodiversity Status are both represented within the proposed disturbance footprint. Approximately 150 hectares of RE 10.3.13a and 540 hectares of RE 10.3.14 will be directly impacted as a result of mining construction and operation activities. Importantly, this does not include the impacts caused by proposed creek diversions within the Project site. The direct disturbance constitutes ~25% and ~50% of the total area on site of RE 10.3.13a and 10.3.14 respectively.



The Thozets Box Open Woodland (RE 10.7.5) is listed as 'Of Concern' under DERM's Biodiversity Status. Approximately 60 hectares of this community will be impacted as a result of mining activities, comprising over 25% of its total extent on site.

Pressure Upon Undisturbed Vegetation

Historically, vegetation communities associated with the Project site have been subjected to grazing pressures and widespread clearing for pasture development. The proposed mining activities at Kevin's Corner will potentially create additional pressures upon the local vegetation communities as follows:

- Land clearing – creation of isolated habitat areas with no fauna-migration corridors;
- Dust – increased amounts of air-borne dust and dust deposition can result in a reduction in plant vigour;
- Increased erosion and sediment mobilisation – mining activities may result in locally-enhanced soil erosion and sediment mobilisation, which could impact plant growth and vegetation community structures; and
- Feral animal activity – feral animals may be attracted to the mine site due to the availability of waste food, thereby disturbing local vegetation communities.

In response to these vegetation pressures, a number of mitigation measures have been proposed which are detailed in the next section. These mitigation measures include minimising the clearing of habitat to maintain habitat connectivity. Where vegetation clearing is necessary, fauna migration corridors should be retained (which facilitate movement between fragmented areas), thereby aiding seed dispersal and vegetation development.

Maintaining the integrity of uncleared vegetated land via appropriate erosion and sediment controls, fencing sections of the Fringing Riparian Woodland (RE 10.3.13a & 10.3.14 - thereby excluding grazing within 'Of Concern' communities) and encouraging grazing in areas of Buffel grass infestation, will improve the ability of native vegetation to withstand the increased pressures that are imposed by the Project.

Impact mitigation, monitoring the health of vegetation communities, together with post-construction and post-mining rehabilitation programmes will help to reduce the Project pressures upon local vegetation communities.

These mitigation strategies provide an effective method of supporting habitat resilience whilst breaking the impact of historic pressures, presenting an opportunity for these endemic communities to thrive once rehabilitation commences.

Sensitive or Important Riparian Habitats

Several ecological communities of conservation significance, listed under Queensland and Commonwealth legislation, were observed on the Project site. These included Poplar Box Open Woodland (REs 10.3.27a, and 11.3.2), Gidgee Open Woodland (RE 10.3.4) and Fringing Riparian Woodland (RE 10.3.14).

The Fringing Riparian Woodland community (RE 10.3.14) provides most of the riparian habitat on the Project site in the form of two conservation-significant REs, as follows:



- RE 10.3.13a - found predominately along Well Creek and Sandy Creek, which contain small lacustrine wetlands at their headwaters. This community does not contain any threatened flora or fauna species and is not listed within any EPBC Threatened Communities. However, this RE is listed as 'Of Concern' under the DERM biodiversity status due to weed invasion and total grazing pressure; and
- RE 10.3.14 - occurs along most watercourses on the Project site and although this ecosystem has been listed as 'Of Concern' under the DERM Biodiversity Status (but not within any EPBC listed threatened communities); no flora species of conservation significance were identified within this community. This ecosystem is protected in numerous national parks across Queensland (refer to section 6.17.2 for details) but is considered to be under threat from weed invasion, total grazing pressure and the impact of introduced species such as Feral Pigs.

The species of conservation significance that were observed or considered likely to occur on the Project site (the Squatter Pigeon and Little Pied Bat) are mainly found in grassy woodlands and dry open woodland communities (consistent with Non-remnant Grassland vegetation communities) rather than RE 10.3.13a and 10.3.14 riparian vegetation.

The vegetation associated with the Fringing Riparian Woodland community is not perceived to offer any recreation, scientific, educational and / or historical interest / value. However, this riparian vegetation does offer habitat for various marine / migratory birds that are associated with the Project site, although the presence of these bird species is primarily correlated with water availability, rather than vegetation community structure.

Note that due to its distance from the coast, the Project site does not include any marine littoral or sub-tidal zones.

Impact of Creek Diversion upon Riparian Corridor Vegetation

The proposed mining activities may impact both surface water (refer to EIS Volume 1 Section 11 Surface Water for further details) and groundwater environments as follows:

- Hydrological impacts:
 - Changes in catchment areas – most catchment areas will be reduced in response to the Creek Diversion;
 - Downstream flow volumes – the limited reduction in total catchment area which occurs due to the Creek Diversion will result in a minor reduction in downstream flow volumes;
 - Temporal flow characteristics – no measurable change in flow characteristics anticipated;
 - Flood hydrology – reduction in peak flows in the downstream watercourse (due to a reduction in catchment areas), slight reduction in peak flows (due to changes in hydrograph timing) and slight increases in peak flows (due to a loss of floodplain storage); and
 - Water supply – a reduction in the supply of surface water to riparian vegetation communities as a result of stream diversion will impact this habitat.



- Surface water quality:
 - Construction Phase – sediment mobilisation during construction activities and subsequent impacts upon both surface water and air quality, spillages of fuel and / or chemicals at refuelling / storage / washdown facilities, dust and sediment mobilisation in times of limited water supply and soil erosion / sediment release during significant rain events;
 - Operational Phase – in addition to the potential construction phase impacts, operational impacts include failure of water storages, embankments, pipelines, levees or bunds which may impact downstream water quality and erosion / sediment mobilisation from mining operations; and
 - Increased sediment loading via sediment and topsoil release from stockpiles, cleared areas and during creek diversion, will deposit sediment downstream, thereby affecting the water allocation to other riparian vegetation;
- Flooding levels:
 - Although some limited increases in flood levels are anticipated as a result of mine development, such changes are not anticipated to change the flood risk to existing infrastructure in the area.
- Geomorphic impacts:
 - Erosion – the creek diversion may lead to increased erosion of the creek floor and banks resulting in a reduction in water quality, sediment deposition and impacts upon aquatic ecosystems. Erosion may also occur due to flooding following construction of the diversion channel and as a result of the enhanced catchment area and frequency of flows;
 - Lateral migration of stream channel – migration of stream channels can impact valuable infrastructure, riparian vegetation and local terrestrial ecosystems;
 - Channel flow velocity and stream power- no significant impacts anticipated as a result of the creek diversion;
 - Sedimentation – enhanced as a result of a reduced longitudinal gradient, resulting in a reduced flood capacity, accumulation of sediment at the confluence of the creeks and diversion and excessive sediment deposition downstream of the creek diversion;
 - Enhanced floodplain – riparian habitat, local vegetation and terrestrial flora and fauna could be impacted as a result of changes in the floodplain; and
 - Soil salinity - due to a reduction in surface water flows (stream diversion) and groundwater levels (groundwater abstraction), soil salinity may increase.

- Vegetation Community impacts:
 - Desiccation of drought-sensitive flora species and changes in the structure of local vegetation communities as a result of a reduction in the supply of surface water to local vegetation;
 - Disturbance of local surface water environments and increase in sediment mobilisation and deposition (in addition to the release of sediment and topsoil from stockpiles and cleared areas) can impact local riparian vegetation by causing a decline in water quality and nutrient transfer for vegetation;
 - Hydraulic erosion of drainage lines will destabilise the root structure of riparian vegetation, resulting in the uprooting and / or decline in the density of local vegetation communities; and
 - A reduction in soil pore water can result in an increase in soil salinity and consequently affect vegetation sensitive to soil salt concentrations.

Note that conservation significant riparian REs, rather than specific riparian floral species have been identified on the Project site.

In particular, potential environmental impacts may be experienced by The Silver-leaved Ironbark Open Woodland (RE 10.5.5a) and the Fringing Riparian Woodland (RE 10.3.13a and 10.3.14) as creek diversions may cause significant disturbance to this vegetation. However, with the implementation of adequate erosion, sediment and drainage controls, affected vegetation should be minimised and potential impacts mitigated to ensure the continued survival of these communities within, and downstream of, the Project site.



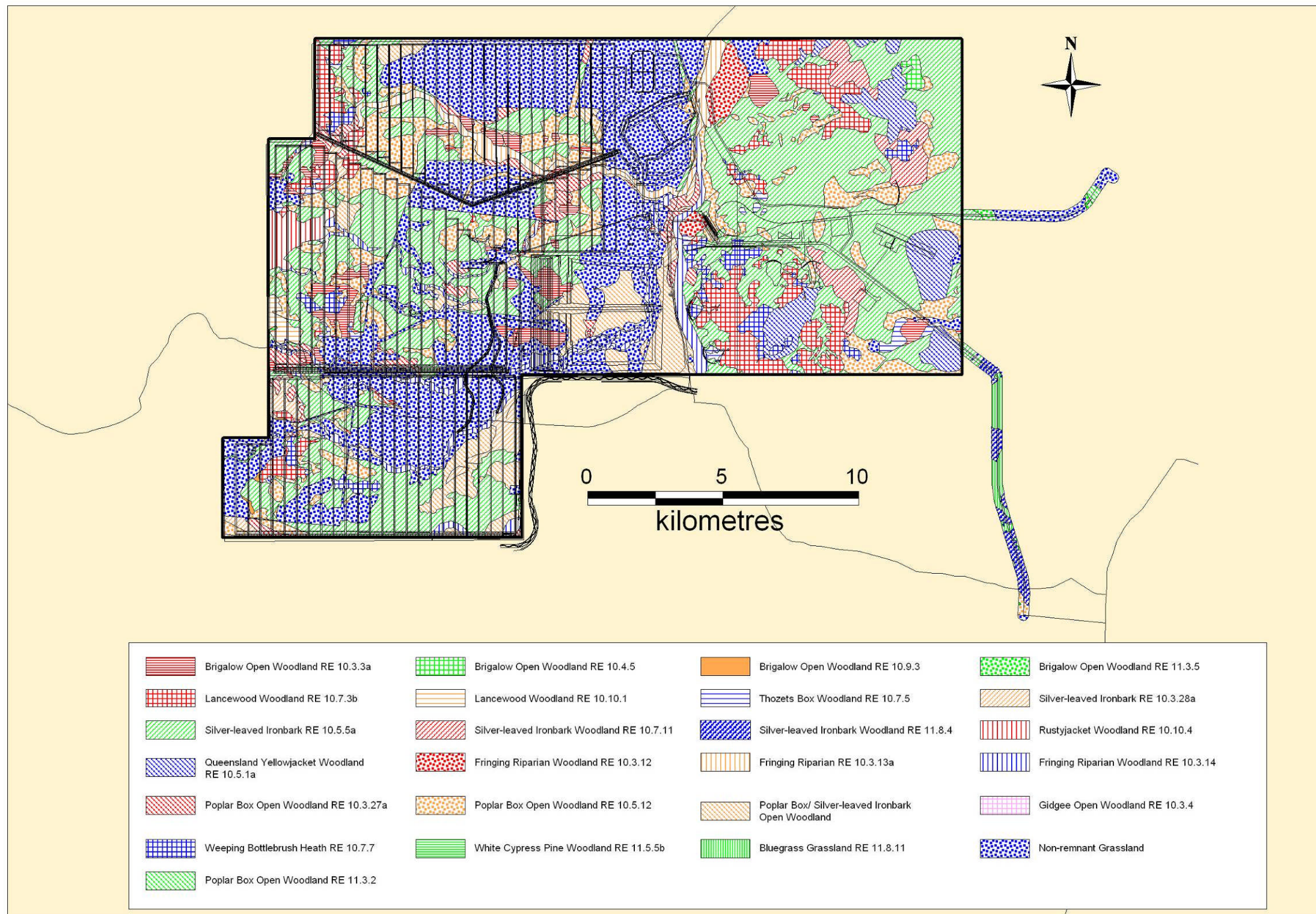


Figure 12 Project Infrastructure and Vegetation Communities

8.2.2 Fauna

The construction of mine infrastructure has the potential to affect fauna populations through habitat loss, population isolation, edge and barrier effects, an increase in mortality from mine activities and increased road traffic. The development of mine infrastructure will involve landscape modification procedures through vegetation clearing, a recognised threatening process that can affect different taxa in different ways.

Habitat connectivity involves the linkages of habitats, species, communities and ecological processes. The smaller and more isolated habitat patches will have fewer species than large patches. Wildlife corridors are systems of linear habitat which, at a minimum, enhance connectivity of wildlife populations and may help them overcome the main consequences of habitat fragmentation. Corridors can support ecological processes at a variety of spatial and temporal scales from daily foraging movements of individuals, to broad-scale genetic gradients across biogeographical regions.

Habitat polygons within the Project site and surrounds are in-tact, with much of the surrounding landscape relatively undisturbed. Habitat within the Project site and surrounding areas holds a high degree of connectivity, with large stands of remnant woodland. Well Creek and Sandy Creek are important linear habitat corridors which traverse the Project site. The riverine habitat on site provides shaded shelter, nesting habitat and a water source for fauna species.

The species that are most vulnerable to a decline in genetic diversity are those which are habitat-specific and those which are low mobility species (where even a small reduction in mobility can reduce genetic continuity within a population, hence reducing the effective population size). Species least vulnerable to a decline in genetic diversity are those which are highly mobile, including birds and larger mammals, although even these species can vary in their response to habitat fragmentation. Low mobility species, such as smaller reptiles and amphibians, utilising the Project site have the potential to become genetically isolated. This occurs when individuals from a population within one fragment are unable to interbreed with individuals from populations in adjoining fragments

The following potential impacts on fauna may result from the proposed works at the Project site:

Negative Impacts

- Land clearing and mining activities will reduce the available breeding and foraging habitat for many native fauna species;
- Increased risk of fauna mortality resulting from vehicle strike and the destruction of tree hollows;
- Disruption of species behaviour, due to interference from the Project activities;
- Increased habitat fragmentation and loss of connectivity across the mine infrastructure and pit areas;
- Creek diversion will reduce the extent of developed riparian habitats and contribute to habitat fragmentation;
- An increase in noise, vibration and dust associated with the construction and operational phases of the Project may lead to the displacement of native species from their current home ranges;



- Changes in flow patterns accompanied with an increased risk of sedimentation in riparian woodlands downstream of the proposed mine site. Higher levels of erosion can lead to a loss of morphological diversity in streams adversely affecting habitat quality that may result in biodiversity loss in affected areas;
- An increase in populations of introduced fauna species that currently utilise the Project site may occur, including the cane toad, feral pig, european rabbit, house mouse and feral goat.
- Vegetation clearing will result in a localised reduction in the amount of roost and nesting sites, microhabitats and potential foraging areas for many fauna species. This would add population pressure (such as competition for roost sites, and food resources) to resident bats and birds in these adjacent areas and may potentially lead to decreased population viability; and

Positive Impacts

- Certain species, including the Southern Squatter Pigeon, may be positively impacted by the rehabilitation process, as mining activities will potentially provide grassland habitat which is not dominated by Buffel Grass.
- Mine-related infrastructure, such as sediment dams, may be accessible to fauna and may be additional water sources, resulting in positive impacts for some fauna species;
- An increase in populations of native fauna species that currently utilise the Project site may occur, including kangaroos.

8.2.3 Potential Impacts on Fauna of Conservational Significance

Two species of conservational significance, the Southern Squatter Pigeon and the Little Pied Bat, were identified within and/or surrounding the Project site. The following points describe direct and indirect potential impacts of the Project on these two species.

Direct impacts

- Loss of roost sites and habitat due to vegetation clearing;
- Loss of existing suitable habitat as a result of clearing activities, for example the foraging areas for bats and birds may be reduced;
- Direct disruption of breeding and weaning behaviour associated with the timing of vegetation clearing as well as via vibrations from blasting activities;
- Direct mortality of individuals from clearing activities (bats);
- Degradation of fauna habitat in the event that there is a spread of weeds and pests, and increased noise, vibration, dust and light.

Effects of blasting, noise, dust, vibration and light

- Artificial lighting can affect both nocturnal and diurnal animals, because it disrupts light induced activity patterns. The effects of artificial lighting vary with different species. Insects attracted to lights can in turn attract bats, reptiles and frogs ready to take advantage of



concentrated prey, however light pollution can lead to negative impacts on mating behaviour in some species (Baker and Richardson 2006); and

- In addition to vibration, noise and dust emissions may increase as a result of construction and operational activities which may discourage the Southern Squatter Pigeon from utilising the immediate area. These impacts may also affect insect abundance, water quality and reproductive behaviour.

Secondary impacts

- Degradation of habitat values in adjacent and remaining habitats;
- Possible restriction of fauna movements within adjacent wildlife corridors;
- Indirect impact to breeding and feeding activities through noise, dust, vibration and light disturbance; and
- Introduction of pests and predators and spread of weed infestations.

8.2.4 Cumulative Impacts

The potential ecological impacts identified above are considered as a consequence of the construction and operation of the Project. The incremental effect of multiple sources of impact (past, present and future) is referred to as 'cumulative impacts' (Contant & Wiggins 1991). These impacts may become exacerbated over time. Consideration of cumulative impacts is necessary so impacts associated with the Project can be assessed with additional regional impacts from external sources.

Potential regional developments that may interact with the construction and operation of the Project include:

- Other mines that may be opened in the future in the region, including the Alpha Coal Project;
- The coal transport corridor for the Project;
- The proposed water supply for the Project, such as construction of the Sunwater pipeline, ongoing water supply and associated clean-water storage facility; and
- Socioeconomic impacts, both positive and negative, on local communities via the change in land use from low intensity farming to mining activities;

Cumulative impacts can pose serious threats to the ongoing health of ecosystems and their associated flora and fauna. Many sources of impact deemed minor in isolation, can become significant when factored together. Examples of such negative cumulative impacts include the ongoing fragmentation of habitat as a result of many small instances of vegetation clearing and the pollution of waterways through diffuse sources. Positive cumulative impacts include the increase in land use value and the voluntary creation of habitat offsets,

8.2.5 Residual Impacts

Residual impacts remain after a Project's environmental management strategies, mitigation measures and rehabilitation methods have been carried out. Residual impacts for the Project include removal of vegetation and associated faunal habitat, of particular importance is the Fringing Riparian Woodland



(RE 10.3.13 and RE 10.3.14) and associated creek diversions. Where there is residual loss or degradation of vegetation, habitat or land use upon completion of mine decommissioning (or as residual impact is identified prior to decommissioning), compensation in the form of further habitat rehabilitation in areas adjacent to the Project site, land rehabilitation, contribution to research or vegetation offsets can be employed.

8.3 MANAGEMENT OF NATIVE FLORA AND FAUNA

Suggested strategies to minimise the impacts on native flora and fauna, and recommendations regarding rehabilitation of the Project site, are outlined below.

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

- Avoid environmental impacts;
- Minimise the impacts;
- Mitigate for impact; and
- Where impact cannot be avoided or minimised, compensation for residual impact by means such as offsets.

Avoidance of Environmental Impact

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

Offsetting Residual Impacts

The presence of the Threatened Ecological Community 'Natural Grasslands of the Central Highlands and northern Fitzroy Basin' (RE 11.8.11) has resulted in the requirement of offsets under the EPBC Act. Although vegetation offsets are not required for areas within the Project's mining lease as determined by the VM Act or the *Sustainable Planning Regulation 2009* it is to be encouraged that any residual negative impacts of the Project be offset based on guidelines provided within the Policy for Vegetation Management Offsets. The requirements for offsets are detailed within Section 3.2, 3.3 and 3.4 of this report.

Vegetation Offsets Management Strategy

A vegetation offsets management strategy report has been produced (refer to EIS Volume 2, Appendix Z for details). This strategy provides an overview of the approach that will be adopted to establish and meet Hancock's obligations as a result of the Project, Environmental offsets have been considered as part of the EIS and in the development of the EMP, where remaining environmental impacts persist.

The main offset policy applicable to the Project is the Federal *Draft Policy Statement: Use of environmental offsets under the Environment Protection and Biodiversity Conservation Act 1999*. Since the Project will require clearance of Threatened Ecological Community vegetation (Natural Grasslands of the Queensland central highlands and the northern Fitzroy basin, RE11.8.11) and potentially impact EPBC listed species (squatter pigeon (*Geophaps scripta scripta*) (southern



subspecies), cattle egret (*Ardea ibis*) and the rainbow bee-eater (*Merops ornatus*), such clearance activities will trigger offset obligations under this policy.

Note that offsets required by the state policies (Queensland Government Environmental Offsets Policy, Queensland Government Policy for Biodiversity Offsets, Policy for Vegetation Management Offsets Version 2.4 (Department of Environment and Resource Management, 2009); and Mitigation and Compensation for Works or Activities Causing Marine Fish Habitat Loss are not required, because offsets requirements will be adequately addressed via the Federal EPBC legislation.

The REs recorded on the Project site which possess a DERM Biodiversity Status of “Endangered” or “Of Concern” and which may be disturbed are as follows:

- Brigalow Open Woodland RE 11.3.5 (5.7 Ha disturbed);
- Fringing Riparian Woodland RE 10.3.13a and 10.3.14 (688.0 ha disturbed);
- Natural Grasslands of the Queensland central highlands and the northern Fitzroy basin RE 11.8.11 (22.3 ha disturbed);
- Poplar Box Open Woodland RE 10.3.27a (174.3 ha disturbed);
- Thozets Box Woodland RE 10.7.5 (62.3 ha disturbed); and
- Poplar Box Open Woodland RE 11.3.2 (4.5 ha disturbed).

However, only RE 11.8.11 (Natural Grasslands of the Queensland central highlands and the northern Fitzroy basin) occurs off the mining lease and therefore, this is the only RE that requires vegetation offsets.

Further work will be required in order to identify suitable off-lease sites that can be used as off-set areas; this work will include the following activities:

- Geospatial desktop analysis to identify potential off-lease sites;
- Field assessment of sites that have been identified via desktop analysis, including large-scale strategic sites;
- Review / confirmation of habitat mapping and acquisition of additional site details;
- Development of rehabilitation strategies to link areas of high ecological value, thereby offsetting fragmentation effects for both project and regional contexts;
- Conduct additional MNES research, in order to mitigate long-term MNES and biodiversity impacts;
- Production of Biodiversity Offset Management Plans; and
- Liaison with regulatory bodies and landowners to secure required off-sets and finalise contractual arrangements.



8.3.1 General Management Strategies

The following general management strategies have been developed for the Project site:

- Areas of native vegetation requiring removal should be clearly delineated to equipment operators and supervisors before any clearance is conducted to ensure disturbance is minimised;
- Clearing of vegetation in Sandy Creek and Well Creek should be minimised to maintain habitat connectivity and provide a movement corridor for small terrestrial fauna species including birds, amphibians, ground-dwelling mammals and arboreal species such as bats and gliders. Whilst this community will be physically fragmented, the actual degree of habitat fragmentation is highly dependent on the mobility of the organism in question (McIntyre and Hobbs 1999). It needs to be considered that disconnected areas may continue to be utilised by some species if kept intact, however minimising fragmentation will allow more species to utilise the remaining strands of vegetation.
- Native vegetation removal should be conducted only after:
 - A fauna spotter/catcher has been organised to oversee clearing operations
 - The areas to be cleared have been clearly delineated and identified to equipment operators and supervisors;
 - Weed control measures such as vehicle wash downs have been implemented to prevent the spread of weed species along riparian corridors;
 - Appropriate erosion and sediment-control structures are in place; and
- To maintain the integrity of vegetated land that is not cleared, appropriate erosion and sediment controls are used to prevent sediment deposition in remaining habitat. Appropriate fire management regimes should also be developed to allow for natural vegetation cycles to continue. Maintenance of retained areas of existing vegetation would provide a source of seed for mine rehabilitation works, particularly when a fire regime is incorporated to allow seed recovery of fire-dependent species;
- Areas of the Project site which have been disturbed by construction activities will be rapidly rehabilitated. The Decommissioning and Rehabilitation report (refer to EIS Section 26) provides details of the proposed rehabilitation methods that will be used on the Project site. The plant species selected for revegetation are also detailed in the Decommissioning and Rehabilitation report;
- Following the cessation of mining activities, a number of sectors of the Project site will be decommissioned and where required, the decommissioned areas rehabilitated. Section 26 of the EIS addresses the following rehabilitation components in detail:
 - Post mining land use – a stable landform including bushland and grazing areas will be developed, in order to return the Project site (wherever possible) to its previous low density cattle grazing use;



- Land classification – Nutrient deficiencies limit the project site’s suitability for both rain-fed broadacre cropping and beef cattle grazing. The post-mining landform will be constructed and rehabilitated to ensure that its land suitability classifications are similar to those of the pre-mining landscape. Note that good quality agricultural land has not been identified within the Kevin’s Corner project boundary;
- Landform design and planning – the final rehabilitated landform will be stable, with most slopes exhibiting an angle of less than 10 degrees to help prevent erosion and aid in groundcover establishment. Creek diversions will have riparian areas including native trees, shrubs and grasses. The potential for water and wind-induced erosion will be minimised and the quality of surface water released from the site will be suitable for release into the environment. The quality of water in residual water bodies will not pose a risk to the environment and the final landform will not be subject to slumping or erosion. It is recommended that recreated landforms are contoured to resemble the original local topography, and be re-contoured as a flat to undulating plain. Flora species which resemble the pre-mine condition of vegetation communities will be selected for use in rehabilitation, where practical;
- Infrastructure planning - will avoid the creation of permanent, shallow water areas, such as septic and other tank overflows that form a permanent seep. These areas attract cane toads that are lethal to most snakes and other fauna species when ingested;
- Vegetation clearance - prior to clearing a particular area, measures will be taken to minimise impacts upon local fauna communities by inspecting the vegetation to be disturbed and identify any fauna that are present. Inspection of vegetation by a qualified fauna spotter / catcher should take place ahead of the clearing front at all times. If vertebrate fauna are present such as mammals, birds or reptiles, the Site Supervisor should be informed to cease work in the area and allow fauna to move on naturally before clearing recommences. The species and location of the fauna should be noted by the qualified spotter and added to existing flora and fauna records;
- Staged and progressive rehabilitation – progressive rehabilitation will be adopted in order to reduce the area of disturbed land which exists at any one time. The experience gained from progressive rehabilitation will be used to refine future rehabilitation programmes;
- Staff induction - a segment of the Staff Induction Program will be allocated to informing staff of the conservation values on the Project site and surrounding areas to increase staff awareness of the species present. This could include photographs, brief descriptions and management requirements of native species; and
- Topsoil management – a Topsoil Management Plan will be developed for the effective management of topsoil characterisation, storage, handling and placement so that the final landform rehabilitation objectives are achieved. Topsoil stripping and handling procedures will be developed, in order to prevent excessive soil deterioration. Refer to EIS Section 28 for details of topsoil stripping, handling, respreading, seed bed preparation, erosion and sediment control;
- Revegetation strategy – revegetation will be conducted following land re-shaping, topsoiling and drainage engineering and in a suitable season. Native species that grow well on the available growth medium will be established via direct seeding.



Suitable seeds will be collected locally where possible. Refer to EIS Section 26 for details of the plant species that are proposed for revegetation of the Project site;

- Weed management – weed control will be attained via the washing down of any at risk equipment which enters and leaves the Project site, scalping weeds off topsoil stockpiles, regular inspections for weeds in rehabilitated areas, spraying existing weed populations and the application of herbicides to the surface of stripped areas and stockpiles;
- Rehabilitation success criteria – success criteria have been developed for the project site and are based upon vegetation, fauna, soil stability and landuse indicators. These criteria are presented in the Environmental Management Plan (EIS Volume 2 Appendix W). The success criteria will be reviewed every three to five years; with stakeholder participation. Developing indicators of rehabilitation success is particularly important, and can include photo points (whereby photos are taken from a fixed point at regular, repeated intervals); transect data such as soil and litter cover, and analysis of invertebrate diversity and abundance (Asher and Bell 1998);
- Rehabilitation monitoring – regular monitoring of the rehabilitation process will be conducted to ensure that the rehabilitation strategies are being achieved. Reference sites will be included in the rehabilitation programme in order to compare the success of rehabilitation with the desired final landform and condition. The monitoring process will include topsoil chemical analysis, assessment of soil erosion rates, comparison of vegetation rates with those of the reference sites, analysis of surface water quality and visual surveillance of rehabilitated areas; and
- Rehabilitation maintenance – rehabilitated areas that require ongoing maintenance in order to achieve and retain the necessary rehabilitation standards, will be identified and addressed. Examples of maintenance work include re-seeding, replanting of tube stock / shrubs / trees, fertiliser application, weed management and implementation of erosion protection measures. Once the rehabilitation and maintenance of a particular area is no longer required, this area will be handed back to the relevant stakeholders.



8.3.2 Management Strategies for Species of Conservational Significance

Squatter Pigeon (Southern Subspecies)

The southern squatter pigeon was recorded during the surveys, with approximately 30 individuals observed in Non-remnant Grassland habitat within the Project site. This species is listed as Vulnerable under both the EPBC Act and Schedule 3 of the NCWR.

Threats to this species include overgrazing of habitat by domestic stock and the European Rabbit, trampling of nests by domestic stock, predation by feral cats and foxes, illegal shooting and clearing and fragmentation of grassy woodland habitat for agriculture and development (Department of Environment and Conservation, 2009)

Mitigation measures for this species may include:

- Care should be taken to ensure no mortality occurs due to vehicle strike. The behavioural characteristics of this pigeon tends to make it vulnerable to such accidents in that it is known to freeze in an attempt to go unnoticed instead of fleeing like the majority of other birds. This species has commonly been observed on tracks and roadways and in areas of vehicle activity. Persons operating vehicles in and adjacent to the Project site should be made aware of the presence of this threatened species and the potential for it to be encountered on vehicle tracks;
- Fauna spotters should conduct a thorough survey of the site prior to any vegetation clearing to determine the location of any squatter pigeon nests. Particular attention should be given to areas of short dry grass, grass tussocks and under bushes and fallen logs. If nests are located, translocation of the eggs/young should be conducted by qualified personnel to a suitable nearby habitat;
- Control of pest species, such as the European Rabbit and Feral Goat in areas known to be foraging habitat; and pests such as the Feral Cat in areas where the Southern Squatter Pigeon is known to flock; and
- Raise awareness of this species through a staff induction program, including photos, descriptions and preferred habitat.

Little Pied Bat (Chalinolobus picatus)

The identification of the Little Pied Bat in habitat adjacent to the Project site, coupled with the existence of suitable habitat on site, suggests that mitigation strategies should be employed for this species during construction and mining activities.

The Little Pied Bat is listed as Near Threatened under Schedule 5 of the *Nature Conservation Wildlife Regulation 2006*. They have been negatively impacted by habitat loss and fragmentation. Disturbance to roost sites via vegetation clearing also has the potential to affect threatened bat species including the Little Pied Bat. Mitigation strategies developed by the Australasian Bat Society (Australasian Bat Society Inc. 2010) should be employed during vegetation clearing and includes:

- A survey of trees prior to clearing to identify and flag potential roost hollows;



- Staggered clearing effort to retain hollow trees for 2-3 days after initial clearing to disturb bats and encourage dispersal;
- Careful removal of hollow trees to allow fauna spotter/catcher to relocate trapped individuals; and
- After clearing operations have occurred, the salvaging of felled trees containing good hollows for placement off site.

A more detailed description of these strategies is available from the Australasian Bat Society Newsletter Archive (Australasian Bat Society Inc., 2010 - www.batcall.csu.edu.au/abs/absmain.htm) and includes further mitigation methods such as artificial habitat creation and ongoing monitoring programs.

8.4 MANAGEMENT OF INTRODUCED FLORA AND FAUNA

8.4.1 Weed Management Strategies

Weeds pose a significant threat to Australia's natural ecosystems. Extensive invasions can change the floristic structure of vegetation and upset the ecological balance in affected communities as they compete for space and resources with native species. Controlling declared pests and protecting ecosystems from 'threatening processes' such as the invasion of noxious weeds is a legal obligation. Prevention and early detection of weed outbreaks are the most cost effective strategies for dealing with weeds as eradication of large infestations can be difficult and often requires greater resources.

Mined lands are prone to weed invasion, particularly where soils have been disturbed, along transport routes and surrounding infrastructure areas. The risks posed by weeds in mining areas include the introduction of new species, the spread of weeds to adjacent areas and increases in weed abundance in disturbed areas. Weeds can also diminish rehabilitation efforts by outcompeting species selected for revegetation and reduce overall land productivity.

A number of weed management strategies are recommended to minimise the potential of future weed infestations. These should be adopted for all stages of mine activity including construction, operation and rehabilitation:

- The present location of weeds will be highlighted and a comprehensive weed spraying program implemented prior to the commencement of works. Declared weed species will be treated as per the relevant Department of Employment, Economic Development and Innovation (DEEDI) fact sheet for each particular species;
- Monitoring in the form of annual observations by site personnel for weeds of management concern shall be undertaken. These should be conducted following significant rain events in the wet season particularly in disturbed areas, roadsides, riparian zones and wash down facilities;
- Wash down facilities shall be constructed at access points for vehicles arriving and departing from the Project site. These facilities should be bunded and located away from drainage lines to minimise the risk of weed spread;



- All vehicles entering the Project site and leaving properties known to contain declared weeds shall be thoroughly washed down before entering clean areas; ensuring wheels, wheel arches and the undercarriage are free of mud and plant material;
- Radiators, grills and vehicle interiors shall be cleaned for accumulated seed and plant material;
- All materials shall be certified as weed free prior to acceptance on-site;
- Soil and fill material from weed affected areas will not be transported to clean sites. Minimising soil disturbance will limit the ability of weeds to become established;
- If weeds of management concern are identified, they shall be managed in accordance with local best management practice from the Jericho Shire Pest Management Plan and/or the DEEDI Pest Fact sheets;
- Observations and monitoring of treated areas to assess the success of declared weed eradication shall be undertaken;
- To promote the awareness of weed management issues, weed management shall be included in the Site Induction Program for the Project; and
- A site specific weed management plan shall be prepared (WMP).

8.4.2 Management Strategies for Introduced Fauna Species

Eight introduced pest fauna species were recorded by AARC during the field surveys (Table 34).

Table 34 Introduced Pest Fauna Species

LP Act Status	Common Name	Scientific Name
2	feral goat	<i>Capra hircus</i>
2	feral dog	<i>Canis lupus familiaris</i>
2	Dingo	<i>Canis lupus dingo</i>
2	feral cat	<i>Felis catus</i>
2	european rabbit	<i>Oryctolagus cuniculus</i>
2	feral pig	<i>Sus scrofa</i>
Not Declared	house mouse	<i>Mus musculus</i>
Not Declared	cane toad	<i>Rhinella marina</i>

Feral Pig (*Sus scrofa*)

The feral pig is one of the most widespread and damaging pest animals in Queensland. They favour environments with permanent water bodies and have the potential to cause widespread ecological damage by spreading weeds and disease and spoiling riparian areas. They are listed as Class 2 pests under LP Act. Feral pigs were observed by stock watering dams located in non-remnant grasslands and in watercourses on the Project site. Control methods may include, trapping, fencing and possible poisoning carried out by external contractors.

European Rabbit (*Oryctolagus cuniculus*)

European rabbits are a major agricultural and environmental pest in Australia. They compete for food with native animals, are a leading cause of soil loss and can cause the silting up of aquatic ecosystems. European rabbits are listed as a Class 2 Pest under Queensland's LP Act. Favourable habitat conditions and food availability are likely reasons behind their prevalence throughout the Project site where they were observed in abundance.

Under the LP Act, land managers must take reasonable steps to control numbers of Class 2 Pests on their land. It is recommended that a pest management plan be developed to control pest fauna on the Project site.



Feral Goat (*Capra hircus*)

Feral goats are widespread throughout Australia with approximately 10% living in Queensland (DEEDI, 2007). They are a declared Class 2 Pest under the LP Act and landholders are required to take actions to control their numbers. Some of the environmental impacts caused by feral goat populations include overgrazing, increased soils erosion and land degradation. Their selective feeding can alter the floristic composition of plant communities and lead to reduced species diversity as preferred plants can be lost from communities in relatively short periods.

Fact sheets outlining the ecology and control methods of the species described above are attached in Appendix C.

House Mouse (*Mus musculus*)

House mice are introduced pests that are now distributed throughout Australia. They are often found in areas of long grass, crops, sheds and houses. During favourable conditions their numbers can rapidly increase to plague proportions where they can cause serious damage to crops and houses. Although not declared under Queensland legislation, control of this species is recommended.

Cane toad (*Rhinella marina*)

Cane toads were introduced into Australia in 1935 and have expanded their territory ever since. They produce highly toxic venom capable of killing most domestic and native animals if ingested. Cane toads eat a wide variety of insects and frogs as well as small reptiles and mammals. This species is not a declared animal under Queensland legislation and there is no legal requirement to control them.

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Appendix A: Flora and Fauna Species List



Flora Species List

Scientific Name	Common Name	Queensland Yellowjacket Low Open Woodland	Brigalow Open Woodland	Silver-leaved Ironbark Woodland	Poplar Box Woodland	White Cypress Pine Woodland	IB/Poplar Woodland	Gidgee Open Woodland	Fringing Riparian Woodland	Non-remnant Grassland	Melaleuca Heathland	Lancewood Woodland	Thozets Box Woodland	Natural Grasslands of the Queensland Central Highlands and the northern Fitzroy Basin
<i>Abutilon fraseri</i> subsp. <i>fraseri</i>	Dwarf Lantern Flower									X				
<i>Abutilon malvifolium</i>	Bastard Marshmallow													X
<i>Abutilon oxycarpum</i>	Straggly Lantern-bush				X					X				
<i>Acacia acradenia</i>	Ampwey						X							
<i>Acacia bidwillii</i>	Corkwood Wattle			X										
<i>Acacia cambagei</i>	Gidgee		X		X			X	X	X				
<i>Acacia colei</i> var. <i>colei</i>	Cole's Wattle			X										
<i>Acacia conferta</i>	Crowded-leaf Wattle								X					
<i>Acacia coriacea</i> subsp. <i>sericophylla</i>	Desert Oak	X		X	X	X	X		X	X	X			
<i>Acacia excelsa</i>	Ironwood						X			X	X			
<i>Acacia farnesiana</i> *	Mimosa Bush			X					X					X
<i>Acacia harpophylla</i>	Brigalow		X		X			X	X	X			X	
<i>Acacia holosericea</i>	Soap Bush	X		X		X			X					
<i>Acacia lazaridis</i>	Lazarides Wattle	X		X							X			
<i>Acacia leiocalyx</i>	Black Wattle	X		X										



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<i>Acacia leptostachya</i>	Townsville Wattle	X					X				X			
<i>Acacia oswaldii</i>	Milijee								X	X	X			
<i>Acacia salicina</i>	Sally Wattle		X											
<i>Acacia shirleyi</i>	Lancewood	X				X						X	X	
<i>Acacia sp.</i>	Wattle			X	X					X	X			
<i>Acacia sparsiflora</i>	Currawang			X										
<i>Acacia tenuissima</i>	Narrow-leaved Wattle			X										
<i>Acanthospermum hispidum</i>	Star Burr		X	X					X					
<i>Achyranthes aspera</i>	Chaff Flower		X		X		X		X	X		X		X
<i>Aeschynomene brevifolia</i>	Pea				X				X					
<i>Aeschynomene indica</i>	Budda Pea		X	X					X	X				
<i>Alectryon oleifolius subsp. elongatus</i>	Rosewood			X	X		X							
<i>Allocasuarina torulosa</i>	Rose She-oak		X											
<i>Alloteropsis semialata</i>	Cockatoo Grass								X					
<i>Alphitonia excelsa</i>	Red Ash	X		X	X		X		X		X	X	X	
<i>Alstonia constricta</i>	Bitter Bark						X		X					
<i>Alternanthera angustifolia</i>	Narrow-leaved Joyweed								X					

Scientific Name	Common Name	Queensland Yellowjacket Low Open Woodland	Brigalow Open Woodland	Silver-leaved Ironbark Woodland	Poplar Box Woodland	White Cypress Pine Woodland	IB/Poplar Woodland	Gidgee Open Woodland	Fringing Riparian Woodland	Non-remnant Grassland	Melaleuca Heathland	Lancewood Woodland	Thozets Box Woodland	Natural Grasslands of the Queensland Central Highlands and the northern Fitzroy Basin
<i>Alternanthera denticulata</i>	Lesser Joyweed		X	X	X	X			X	X				X
<i>Alternanthera denticulata</i> var. <i>micrantha</i>	Lesser Joyweed			X										
<i>Alternanthera nana</i>	Hairy Joyweed								X					
<i>Alternanthera nodiflora</i>	Common Joyweed				X							X		
<i>Alternanthera pungens</i>	Khacki Weed									X				
<i>Alternanthera</i> sp (Mt Isa R.L. Specht+49)	Joyweed			X										
<i>Ammannia multiflora</i>	Jerry-jerry								X					
<i>Amyema quandang</i>	Grey Mistletoe								X					
<i>Andropogon caricinus</i> var. <i>sericeus</i>	Greybeard Grass										X			
<i>Apophyllum anomalum</i>	Broom Brush		X		X	X		X	X	X				
<i>Archidendropsis basaltica</i>	Dead Finish		X	X	X		X		X	X			X	
<i>Aristida bigandulosa</i>	Dark Wiregrass			X	X	X	X		X	X				
<i>Aristida calycina</i>	Dark Wiregrass	X	X	X	X		X		X	X		X		
<i>Aristida caput-medusae</i>	Many-headed Wiregrass		X									X	X	
<i>Aristida holathera</i> var. <i>holathera</i>	Erect Kerosene Grass								X	X				



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<i>Aristida inaequiglumis</i>	Feathertop Three-awn	X		X	X	X	X		X	X	X			
<i>Aristida jerichoensis</i>	Jericho Wiregrass									X				
<i>Aristida latifolia</i>	Feather Top Wiregrass	X	X	X		X	X		X	X		X		X
<i>Aristida leptopoda</i>	White Speargrass			X										X
<i>Aristida sp.</i>	Wiregrass	X			X	X	X			X		X	X	
<i>Arundinella nepalensis</i>	Reed Grass			X					X					
<i>Asteraceae sp.</i>						X								X
<i>Astrebla elymoides</i>	Hoop Mitchell Grass													X
<i>Astrebla pectinata</i>	Barley Mitchell Grass													X
<i>Astrebla squarrosa</i>	Bull Mitchell Grass													X
<i>Atalaya hemiglauca</i>	Whitewood		X	X	X			X	X	X		X	X	X
<i>Arundinella nepalensis</i>	Reedgrass			X			X		X					
<i>Basilicum polystachyon</i>	Musk-basil					X					X			
<i>Bergia trimera</i>	Small Water-fire									X				
<i>Bertya oleifolia</i>							X							
<i>Boerhavia dominii</i>	Tar-vine		X											
<i>Boerhavia sp.</i>							X		X					



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<i>Bonamia media</i>	Common Bonamia		X											
<i>Bothriochloa bladhii</i>	Forest Bluegrass									X				
<i>Bothriochloa ewartiana</i>	Desert Bluegrass			X	X				X	X				X
<i>Brachyachne convergens</i>	Native Couch								X	X				
<i>Brachychiton populneus</i>	Kurrajong	X		X		X	X		X	X	X	X		
<i>Brachychiton rupestris</i>	Queensland Bottletree			X										
<i>Brachyscome ciliaris</i> var. <i>lanuginosa</i>	Variable Daisy									X				
<i>Brunoniella australis</i>	Blue Trumpet			X										X
<i>Breynia oblongifolia</i>	Coffee Bush	X	X	X	X									
<i>Bulbine bulbosa</i>	Bulbine Lilly		X	X					X					
<i>Bulbostylis barbata</i>	Dainty Sedge									X				
<i>Bursaria incana</i>	Prickly Pine	X		X		X						X	X	
<i>Bursaria tenuifolia</i>	Mock Orange			X										
<i>Cajanus reticulatus</i>	Furry Rattlepod								X					
<i>Callitris glaucophylla</i>	White Cypress Pine					X						X		
<i>Calogyne pilosa</i>							X		X		X	X		
<i>Calotis cuneata</i> var. <i>cuneata</i>	Mountain Burr Daisy													X



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<i>Calotis lappulacea</i>	Yellow Burr Daisy			X						X				X
<i>Calotis multicaulis</i>	Wolly-headed Burr-daisy			X			X		X	X				
<i>Calotis squamigera</i>	Burr-daisy								X					
<i>Calytrix microcoma</i>	Desert Star Flower	X				X					X			
<i>Camptacra barbata</i>	Daisy													X
<i>Canthium attenuatum</i>	Australian Native Myrtle			X	X									
<i>Canavalia papuana</i>	Jack Bean			X			X							
<i>Capparis canescens</i>	Wild Orange	X	X							X			X	
<i>Capparis lasiantha</i>	Wait-a-While		X		X		X	X	X	X			X	
<i>Capparis shanesiana</i>							X							
<i>Carissa ovata</i>	Currant Bush	X	X	X	X	X	X	X	X	X		X	X	X
<i>Cassytha filiformis</i>	Dodder Laurel								X			X		
<i>Centipeda minima</i>	Spreading Sneezeweed				X				X					
<i>Chamaecrista absus var absus</i>	Tropical Sensitive Pea			X	X		X							X
<i>Chamaesyce australis</i>	Hairy Caustic Weed									X				
<i>Chamaesyce drummondii</i>	Caustic Weed		X	X					X	X				X
<i>Chamaesyce dallachyana</i>	Wedge Sandmat			X			X			X				



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<i>Chamaesyce hirta</i>	Asthma Plant											X		
<i>Cheilanthes distans</i>	Rock Fern		X	X		X				X	X			
<i>Chenopodium carinatum</i>	Green Crumbweed				X		X		X					
<i>Chloris divaricata</i>	Slender Chloris		X	X			X		X	X		X		
<i>Chloris pectinata</i>	Windmill Grass		X				X							X
<i>Chloris sp.</i>										X		X		X
<i>Chloris virgata*</i>	Feathertop Rhodes Grass					X			X	X				
<i>Chrysopogon fallax</i>	Golden Beard Grass			X						X		X		
<i>Chrysocephalum apiculatum</i>	Yellow Buttons			X					X	X	X	X		X
<i>Cleistochloa subjuncea</i>	Sandstone Panic											X	X	
<i>Clerodendrum floribundum</i>	Lolly Bush								X					
<i>Comesperma pallidum</i>	Match Sticks			X			X				X			
<i>Corymbia brachycarpa</i>	Desert Bloodwood						X							
<i>Corymbia dallachiana</i>	Dallachy's Gum	X		X	X	X	X		X	X		X		X
<i>Corymbia erythrophloia</i>	Variable-barked Bloodwood			X	X									X
<i>Corymbia lamprophylla</i>	Shiny-leaved Bloodwood						X							



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<i>Corymbia leichhardtii</i>	Rustyjacket								X					
<i>Corymbia setosa</i>	Rough-leaved Bloodwood	X									X	X		
<i>Corymbia terminalis</i>	Western Bloodwood								X					
<i>Crinum flaccidum</i>	Murray Lily									X				
<i>Crinum uniflorum</i>	One-flowered Lily										X			
<i>Crinum sp.</i>	Lily			X			X		X	X				
<i>Crotalaria incana subsp incana*</i>	Woolly Rattlepod													
<i>Crotalaria medicaginea</i>	Trefoil Rattlepod			X						X				
<i>Crotalaria montana</i>	Rattlepod								X					
<i>Crotalaria montana var angustifolia</i>	Rattlepod			X										X
<i>Crotalaria verrucosa</i>	Blue Rattlepod								X					
<i>Cucumis anguria var. anguria*</i>	West-indian Gherkin								X			X		
<i>Cullen cinereum</i>	Annual Verbena			X										
<i>Cyanthillium conereum</i>	Veronica			X	X		X							
<i>Cymbidium canaliculatum</i>	Black Tree Orchid			X	X		X							
<i>Cymbopogon bombycinus</i>	Silky Oil Grass	X		X			X		X			X		
<i>Cymbopogon refractus</i>	Barb Wire	X		X	X							X		



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	Grass													
<i>Cynodon dactylon</i> *	Couch Grass								X					
<i>Cyperus alterniflorus</i>	Tall Sedge						X		X					
<i>Cyperus sp.</i>	Sedge		X	X	X							X		X
<i>Cyperus bifax</i>	Downs Nutgrass									X				
<i>Cyperus concinnus</i>	Trim Flat-sedge			X	X					X				X
<i>Cyperus dactyloides</i>	Sedge								X					
<i>Cyperus difformis</i>	Dirty Dora			X	X				X					X
<i>Cyperus ditrichiae var. brevibracteatus</i>	Sedge									X				
<i>Cyperus exaltatus</i>	Giant Sedge								X					
<i>Cyperus fulvus</i>	Sticky Sedge		X							X				
<i>Cyperus gilesii</i>	Giles Sedge			X				X						
<i>Cyperus iria</i>	Variable Sedge								X					
<i>Cyperus rigidellus</i>	Flat Sedge		X						X	X				
<i>Dactyloctenium radulans</i>	Button Grass		X		X	X			X	X				
<i>Daucus glochidiatus</i>	Australian Carrot													X
<i>Desmodium campylocaulon</i>	Creeping Tick-trefoil			X										X
<i>Desmodium filiforme</i>	Narrow Necklace Pea				X	X								



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<i>Desmodium rhytidophyllum</i>	Hairy Trefoil													
<i>Dianella longifolia</i>	Blue Lily			X			X		X					
<i>Dichanthium fecundum</i>	Curly Bluegrass				X					X				
<i>Dichanthium sericeum subsp sericeum</i>	Bluegrass		X	X	X		X							X
<i>Digitaria ammophila</i>	Silky Umbrella Grass			X	X				X	X	X			
<i>Digitaria bicornis</i>	Hairy Finger Grass		X						X					
<i>Digitaria breviglumis</i>	Short-glumed Umbrella Grass		X	X								X		
<i>Digitaria brownii</i>	Cotton Panic Grass			X	X	X								
<i>Digitaria ciliaris</i>	Summer Grass								X					
<i>Digitaria diffusa</i>	Open Summer Grass	X			X		X							
<i>Digitaria divaricatissima</i>	Umbrella Grass			X						X				X
<i>Digitaria longiflora</i>	Indian Crabgrass		X											
<i>Dipteracanthus australasicus subsp. australasicus</i>	Creeping Blue Trumpet			X	X				X					
<i>Diospyros humilis</i>	Queensland Ebony	X												



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<i>Dodonaea sp.</i>										X				
<i>Dodonaea filifolia</i>	Hopbush	X												
<i>Dodonaea lanceolata</i> <i>var. lanceolata</i>	Hopbush	X		X					X		X			
<i>Dodonaea stenophylla</i>	Narrow-leaved Hopbush	X		X							X			
<i>Dodonaea viscosa</i> <i>subsp. angustissima</i>	Sticky Hopbush			X			X				X			
<i>Echinochloa colona</i> *	Awnless Barnyard Grass							X	X	X				
<i>Ehretia membranifolia</i>	Peach Bush			X	X		X							
<i>Einadia nutans</i>	Climbing Saltbush		X			X	X							
<i>Einadia nutans subsp. linifolia</i>	Climbing Saltbush		X		X	X								
<i>Einadia sp.</i>	Saltbush		X							X				
<i>Eleocharis philippensis</i>	Spikerush								X					
<i>Elytrophorus spicatus</i>	Spikegrass		X	X				X						
<i>Enchylaena tomentosa</i>	Ruby Saltbush		X	X					X	X		X	X	X
<i>Enneapogon intermedius</i>	Tall Bottlewasher		X			X								
<i>Enneapogon lindleyanus</i>	Conetop Nineawn					X	X			X				
<i>Enneapogon oblongus</i>	Purple-head Nineawn	X			X		X			X			X	



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<i>Enneapogon polyhyllus</i>	Limestone Bottlewasher	X	X	X		X	X	X		X				
<i>Enneapogon nigricans</i>	Blackheads				X									
<i>Enneapogon robustissimus</i>	Nineawn Grass	X	X	X				X						
<i>Enneapogon virens</i>	Nineawn Grass						X		X					
<i>Enteropogon acicularis</i>	Curly Windmill Grass								X					
<i>Enteropogon paucispiceus</i>	Windmill Grass								X					
<i>Enteropogon ramosus</i>	Twirly Windmill Grass		X		X	X			X	X				
<i>Eragrostis cilianensis</i> *	Stinkgrass				X									
<i>Eragrostis dielsii</i>	Mulka					X				X				
<i>Eragrostis elongata</i>	Clustered Lovegrass		X	X	X				X	X				
<i>Eragrostis lacunaria</i>	Purple Lovegrass		X	X	X			X	X	X		X		
<i>Eragrostis molybdea</i>	Granite Lovegrass									X				
<i>Eragrostis parviflora</i>	Weeping Lovegrass		X	X					X	X				
<i>Eragrostis sororia</i>	Lovegrass								X	X				
<i>Eragrostis sp.</i>	Lovegrass		X	X	X	X	X					X		
<i>Eragrostis speciosa</i>	Handsome Lovegrass			X		X			X	X		X		



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<i>Eremophila bignoniiflora</i>	Creek Wilga		X	X	X	X		X		X		X		X
<i>Eremophila deserti</i>	Ellangowan Poison Bush		X	X	X			X		X		X		
<i>Eremophila latrobei</i>	Crimson Turkey Bush		X		X							X	X	
<i>Eremophila longifolia</i>	Dogwood		X		X					X				
<i>Eremophila maculata</i>	Fuchsia Bush				X	X		X	X	X				
<i>Eremophila mitchellii</i>	False Sandalwood		X	X				X	X	X			X	
<i>Eriachne aristidea</i>	Three-arm Wanderrie Grass			X										X
<i>Eriachne armitii</i>	Longawn Wanderrie Grass					X								
<i>Eriachne mucronata</i>	Mountain Wanderrie Grass			X					X			X		
<i>Eriachne obtusa</i>	Northern Wanderrie Grass				X					X				
<i>Eriochloa crebra</i>	Spring Grass			X						X		X		X
<i>Eriochloa pseudoacrotricha</i>	Early Spring Grass		X						X	X				
<i>Erythrina vespertilio</i>	Bat's Wing Coral Tree			X	X	X	X							
<i>Erythroxylum australe</i>	Cocaine Bush		X	X	X					X	X			
<i>Eucalyptus brownii</i>	Reid River Box				X									



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<i>Eucalyptus camaldulensis</i>	River Red Gum								X					
<i>Eucalyptus cambageana</i>	Dawson Gum			X				X	X			X		
<i>Eucalyptus coolabah</i>	Coolabah				X				X	X				
<i>Eucalyptus melanophloia</i>	Silver-leaved Ironbark			X		X	X	X	X	X	X	X		X
<i>Eucalyptus populnea</i>	Poplar Box		X	X	X		X		X	X		X		
<i>Eucalyptus similis</i>	Queensland Yellowjacket	X												
<i>Eucalyptus tessellaris</i>	Moreton Bay Ash		X			X	X		X					
<i>Eucalyptus thozetiana</i>	Thozet's Box											X	X	
<i>Eulalia aurea</i>	Silky Browntop			X					X					
<i>Euchiton</i> sp. (Hughenden C.E. Hubbard+ 7639)	Cudweed		X	X										X
<i>Euphorbia tannensis</i> subsp. <i>eremophila</i>	Desert Spurge								X					
<i>Everistia vacciniifolia</i>	Small-leaved Canthium		X									X		
<i>Evolvulus alsinoides</i>	Tropical Speedwell		X	X	X	X	X			X	X	X		X
<i>Evolvulus alsinoides</i> var. <i>villosicalyx</i>	Tropical Speedwell				X					X				
<i>Exocarpos cupressiformis</i>	Native Cherry						X							



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<i>Exocarpus sparteus</i>	Broom Ballart	X		X							X	X		
<i>Fimbristylis dicotoma</i>	Common Finger Rush			X	X				X	X				X
<i>Fimbristylis littoralis</i>	Grass-like Fimbristylis								X					
<i>Fimbristylis neilsonii</i>	Fringerush													
<i>Fimbristylis microcarya</i>	Fringerush								X					
<i>Flaveria australasica</i>	Speedy Weed		X											
<i>Flinderisa dissosperma</i>	Leopardwood		X	X	X		X							
<i>Flueggea leucopyrus</i>	Bushweed				X	X								
<i>Fuirena incrassata</i>	Sedge								X					
<i>Galactia tenuiflora</i>	Milkpea			X										
<i>Gastrolobium grandiflorum</i>	Poison Heartleaf Bush	X			X		X		X	X				
<i>Glinus lotoides</i>	Lotus Sweetjuice								X	X				
<i>Glycine clandestina var sericea</i>	Twining Glycine													X
<i>Glycine sp.</i>	Glycine								X					X
<i>Glycine tabacina</i>	Variable Glycine									X				X
<i>Glycine tomentella</i>	Woolly Glycine			X	X		X		X		X			
<i>Gomphrena celosides</i>	Gomphrena			X	X				X	X				X
<i>Goodenia byrnesii</i>	Goodenia			X					X					



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<i>Gossypium australe</i>	Rose Cottonbush								X				X	
<i>Grevillea glauca</i>	Bushman's Clothes Pegs	X		X			X							
<i>Grevillea parrallela</i>	Silver Oak	X					X		X	X				
<i>Grevillea pteridiflora</i>	Golden Parrot Tree	X			X		X		X	X	X	X		
<i>Grevillea striata</i>	Beefwood			X	X					X				
<i>Grewia latifolia</i>	Dysentery Plant			X										
<i>Grewia retusifolia</i>	Emu Berry	X	X	X	X		X		X	X	X	X		
<i>Hakea chordophylla</i>	Bull Oak			X			X		X					
<i>Heliotropium indicum*</i>	Heliotrope									X				
<i>Heteropogon contortus</i>	Black Speargrass	X	X	X	X	X	X		X	X		X	X	
<i>Heteropogon triticeus</i>	Giant Speargrass			X			X			X				
<i>Hibiscus brachysiphonius</i>	Low Hibiscus			X										
<i>Hibiscus burtonii</i>	Burton's Hibiscus			X					X	X				
<i>Hibiscus meraukensis</i>	Merauke Hibiscus								X	X				X
<i>Hibiscus sp.</i>	Hibiscus			X			X		X					
<i>Hibiscus sturtii</i>	Sturt's Hibiscus		X							X				
<i>Hovea parvicalyx</i>	Bush Pea											X		

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<i>Hybanthus enneaspermus</i>	Blue Spadeflower			X	X					X				
<i>Imperata cylindrica</i> *	Blady Grass			X					X					
<i>Indigofera australis</i>	Australian Indigo									X				
<i>Indigofera colutea</i>	Sticky Indigo				X		X		X					
<i>Indigofera haplophylla</i>	Indigo					X			X					
<i>Indigofera hirsuta</i>	Hairy Indigo									X				
<i>Indigofera linifolia</i>	Round-pod Indigo			X					X					X
<i>Indigofera pratensis</i>	Forest Indigo			X			X		X					
<i>Indigofera linnaei</i>	Birdsville Indigo			X										X
<i>Iphigenia indica</i>	Lily			X			X							
<i>Ipomea brownii</i>	Morning Glory			X										
<i>Ipomoea lonchophylla</i>	Cowvine													X
<i>Ipomoea plebeia</i>	Bellvine								X					
<i>Ipomoea polymorpha</i>	Common Morning Glory													
<i>Ipomoea sp.</i>									X					
<i>Isleilema sp.</i>	Flinders Grass													X
<i>Iseilema vaginiflorum</i>	Red Flinders Grass			X						X				X
<i>Jacksonia sp.</i>					X						X			



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<i>Jasminum didymum</i>	Native Jasmine								X					
<i>Jasminum didymum subsp. lineare</i>	Native Jasmine													
<i>Juncus aridicola</i>	Rush								X					
<i>Juncus usitatus</i>	Common Rush								X					
<i>Keraudrenia collina</i>		X												
<i>Leptochloa decipiens subsp. asthenes</i>	Slender Canegrass							X		X				
<i>Leptochloa digitata</i>	Umbrella Cane Grass									X		X		
<i>Leptochloa fusca</i>	Brown Beetle Grass								X					
<i>Leptosema chapmanii</i>	Dwarf Dogwood										X			
<i>Lomandra leucophala</i>	Woolly Matrush					X	X			X				
<i>Lomandra longifolia</i>	Long-leaved Matrush								X					
<i>Ludwigia octovalvis</i>	Willow Primrose		X			X								
<i>Lysiana subfalcata</i>	Mistletoe		X						X					
<i>Lysicarpus angustifolius</i>	Budgeroo			X			X				X	X		
<i>Lysiphyllum carronii</i>	Red Bauhinia		X		X			X	X	X				X
<i>Malvastrum americanum*</i>	Spiked Malvastrum			X					X	X				X

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<i>Malvastrum coromandelianum</i> subsp. <i>coromandelianum</i>	Prickly Malvastrum						X							
<i>Marsdenia microlepis</i>	Northern Milkvine	X			X									
<i>Marsdenia viridiflora</i> subsp. <i>viridiflora</i>	Native Pear			X										
<i>Marsdenia</i> sp.		X									X	X		
<i>Marsilea drummondii</i>	Nardoo		X		X		X		X	X				X
<i>Maytenus cunninghamii</i>	Yellowberry Bush		X	X	X		X	X						
<i>Melaleuca chisholmii</i>	Bottlebrush								X					
<i>Melaleuca nervosa</i>	Bottlebrush	X												
<i>Melaleuca tamariscina</i>	Weeping Bottlebrush			X		X					X	X		
<i>Melaleuca viminalis</i>	Red Bottlebrush													
<i>Melaleuca viridiflora</i>	Broad-leaved Teatree				X									
<i>Melhania oblongifolia</i>	Velvet Hibiscus				X				X					
<i>Melinis repens</i> *	Red Natal Grass		X	X	X	X	X	X	X	X	X	X		X
<i>Minuria integerrima</i>	Smooth Minuria					X				X				
<i>Mnesithea formosa</i>	Silkytop Grass										X			
<i>Monochoria cyanea</i>	Monochoria		X			X								



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<i>Muehlenbeckia florulenta</i>	Lignum											X		
<i>Murdannia graminea</i>	Grass Lily				X									
<i>Najas tenuifolia</i>	Waternymph								X					
<i>Neptunia gracilis</i>	Low Sensitive Plant			X			X		X					X
<i>Neptunia sp.</i>									X					
<i>Nicotiana megalosiphon</i>	Native Tobacco									X				
<i>Nymphoides crenata</i>	Wavy Marshwort		X											
<i>Nyssanthes erecta</i>	Barbed Wire Weed		X					X	X					
<i>Oldenlandia mitrasacmoides subsp. trachymenoides</i>	Sweet Basil									X	X			
<i>Olearia subspicata</i>	Spiked Daisy-bush								X					
<i>Opuntia stricta*</i>	Common Pest Pear	X	X	X	X	X	X		X	X		X		
<i>Opuntia tomentosa*</i>	Velvety Tree Pear		X		X		X	X		X		X		
<i>Owenia acidula</i>	Emu Apple				X				X					
<i>Oxalis chnoodes</i>	Plains Wood-sorrel			X	X									
<i>Pandorea panadorana</i>	Wonga Wonga Vine			X	X		X		X					
<i>Panicum sp</i>		X		X			X							
<i>Panicum decompsitum</i>	Native Millet		X	X		X	X		X	X				X



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<i>Panicum effusum</i>	Hairy Panic	X	X	X	X				X	X	X	X		
<i>Parkinsonia aculeata</i>	Parkinsonia					X			X	X				
<i>Paspalidium caespitosum</i>	Brigalow Grass		X					X	X					
<i>Paspalidium distans</i>	Spreading Panicgrass		X											
<i>Paspalidium jubiflorum</i>	Warrego Summer Grass													X
<i>Passiflora foetida</i> *	Stinking Passionflower								X					
<i>Pennisetum ciliare</i> *	Buffel Grass	X	X	X	X	X	X	X	X	X		X	X	X
<i>Peripleura hispidula</i>	Fuzzweed									X		X		
<i>Peripleura obovata</i>	Tall Fuzzweed							X	X					
<i>Perotis rara</i>	Comet Grass		X	X	X				X	X				
<i>Persicaria attenuata</i>	Slender Knotweed								X	X				
<i>Persicaria decipiens</i>	Slender Knotweed								X					
<i>Persoonia falcata</i>	Geebung	X			X		X				X	X		
<i>Petalostigma banksii</i>	Smooth-leaved Quinine Tree			X	X	X	X		X			X		
<i>Petalostigma pubescens</i>	Quinine Bush	X	X	X	X	X	X		X	X	X	X	X	
<i>Phebalium glandulosum</i> subsp. <i>glandulosum</i>	Desert Phebalium											X		



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<i>Phragmites australis</i>	Common Reed								X	X				
<i>Phyllanthus fuernrohrii</i>	Phyllanthus		X	X	X	X	X							
<i>Phyllanthus lacunarius</i>	Caraweenaclover								X					
<i>Phyllanthus maderaspatensis</i>	Spurge	X			X				X					X
<i>Phyllanthus virgatus</i>	Spurge		X		X	X			X	X				
<i>Plantago cunninghamii</i>	Sago Weed		X											X
<i>Plectranthus parviflorus</i>	Cockspur Flower				X	X								
<i>Plumbago zeylanica</i>	Plumbago													
<i>Poaceae sp.</i>			X			X	X	X		X		X		
<i>Polycarpaea corymbosa</i>	Four-leaf Allseed				X	X								
<i>Polygala linariifolia</i>	Native Milkwort				X									
<i>Polygonum plebeium</i>	Small Knotweed									X				
<i>Polymeria ambigua</i>	Morning Glory			X										X
<i>Portulaca oleraceae</i>	Pigweed		X	X					X	X				X
<i>Portulaca pilosa*</i>	Hairy Pigweed								X	X				
<i>Potamogeton sp.</i>									X					
<i>Psoralea sp.</i>							X		X					
<i>Psydrax forsteri</i>											X	X		



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<i>Psydrax oleifolia</i>	Canthium	X	X	X	X	X	X	X	X		X	X		
<i>Pterocaulon redolens</i>	Fruit Salad Plant						X		X					
<i>Pterocaulon serrulatum</i>	Ragweed				X	X			X					
<i>Pterocaulon sphacelatum</i>	Fruit Salad Plant		X						X					
<i>Pterocaulon sp.</i>				X		X			X		X			
<i>Ptilotus macrocephalus</i>	Tall Mulla Mulla			X										
<i>Ptilotus polystachyus</i>	Longtails								X					
<i>Ptilotus sp.</i>	Bottlebrush									X		X		
<i>Rutidosis leucantha</i>	Button Wrinklewort						X							
<i>Rhodanthe sp.</i>						X								
<i>Rhynchosia minima</i>	Rhynchosia		X	X					X	X				X
<i>Rostellularia adscendens</i>	Pinktongues		X	X										X
<i>Rostellularia adscendens var. clementii</i>	Pinktongues			X										
<i>Rotala mexicana</i>	Rotala		X			X								
<i>Salsola kali</i>	Soft Roly-poly		X	X	X			X		X			X	
<i>Santalum lanceolatum</i>	Sandalwood	X	X	X	X		X		X	X	X			
<i>Sarga plumosum</i>	Plume Sorghum								X					
<i>Sauropus rigens</i>	Brush				X									



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	Sauropus													
<i>Schizachyrium fragile</i>	Firegrass	X		X		X					X	X		
<i>Schoenoplectus dissachanthus</i>			X											
<i>Schoenoplectus litoralis</i>	Clubrush								X					
<i>Scleria sphacelata</i>	Razor Grass								X					
<i>Sclerolaena divaricata</i>	Tangled Copperburr		X					X						
<i>Sclerolaena lanicuspis</i>	Woolly Copperburr								X	X				
<i>Sclerolaena bicornis</i>	Goathead Burr									X				
<i>Sclerolaena convexula</i>	Tall Copperburr			X				X	X	X				
<i>Sclerolaena decurrens</i>	Copperburr									X				
<i>Sclerolaena muricata var muricata</i>	Grey Roly Poly		X											X
<i>Sclerolaena sp.</i>				X								X		
<i>Scoparia dulcis</i> *	Licorice Weed								X					
<i>Senna artemisioides subsp. artemisioides</i>	Silver Senna												X	
<i>Senna costata</i>	Sicklepod	X		X	X	X	X					X		
<i>Senna occidentalis</i> *	Coffee Bush								X					
<i>Senna planticola</i>	Ant Bush								X					
<i>Sesbania brachycarpa</i>	Purple Sesbania			X										



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<i>Sesbania sp.</i>			X							X				
<i>Setaria surgens</i>	Annual Pigeon Grass			X		X			X			X		
<i>Sida atherophora</i>	Sida-retusa						X							
<i>Sida cleisocalyx</i>	Sponge Sida		X						X	X				
<i>Sida cordifolia</i>	Flannel Weed	X	X	X	X		X		X	X				
<i>Sida fibulifera</i>	Pin Sida	X		X	X					X				
<i>Sida hackettiana</i>	Spiked Sida								X	X				
<i>Sida laevis</i>	Sida													X
<i>Sida rhombifolia*</i>	Sida-retusa					X	X		X	X				
<i>Sida rohlenae</i>	Shrub Sida						X		X	X				
<i>Sida spinosa*</i>	Paddy's Lucrene		X	X					X					X
<i>Sida subspicata</i>	Spiked Sida		X	X	X	X	X		X	X		X		
<i>Sida trichopoda</i>	High Sida			X										
<i>Sida sp.</i>	Sida-retusa	X										X		
<i>Solanum chippendalei</i>	Chippendale's Tomato											X		
<i>Solanum esuriale</i>	Quena				X		X			X				X
<i>Solanum galbinum</i>		X				X				X				
<i>Solanum nigrum*</i>	Blackberry Nightshade			X										
<i>Solanum parvifolium</i>	Small-leaved Nightshade								X					



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<i>Sorghum x alnum</i>	Columbus Grass								X					
<i>Spermacoce brachystema</i>	Blue Heads		X						X					X
<i>Sporobolus actinocladus</i>	Australian Dropseed		X						X	X	X			
<i>Sporobolus caroli</i>	Fairy Grass		X		X			X	X	X				X
<i>Sporobolus creber</i>	Slender Rat's Tail Grass													X
<i>Sporobolus disjunctus</i>	Dropweed						X	X		X				
<i>Sporobolus scabridus</i>	Rapsy Dropseed							X		X				
<i>Stackhousia intermedia</i>	Stackhousia										X			
<i>Stemodia glabella</i>	Bluerod			X										X
<i>Streptoglossa adscendens</i>	Desert Daisy			X										X
<i>Stylosanthes hamata*</i>	Caribbean Stylo									X				
<i>Stylosanthes scabra*</i>	Shrubby Stylo	X		X	X	X	X		X	X	X	X		
<i>Tephrosia brachyodon var longifolia</i>	Narrow Leaf Tephrosia													X
<i>Terminalia aridicola ssp. aridicola</i>	Arid Peach	X												
<i>Terminalia oblongata</i>	Yellow-wood				X					X				
<i>Themeda triandra</i>	Kangaroo Grass	X	X	X	X	X	X		X	X	X	X	X	X
<i>Thryptomene parviflora</i>	Myrtle Turkey Bush										X			



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<i>Thyriodolepis xerophila</i>						X								
<i>Thysanotus banksii</i>	Mallee Fringe-lily						X				X			
<i>Thysanotus tuberosus subsp. tuberosus</i>	Common Fringe-lily		X											X
<i>Tragus australianus</i>	Sock Grass								X	X				X
<i>Trianthema triquetra</i>	Red Spinach			X		X			X	X		X		
<i>Trichodesma zeylanicum</i>	Camel Bush								X					
<i>Triodia marginata</i>	Spinifex				X				X					
<i>Triodia mitchellii</i>	Buck Spinifex		X	X	X	X	X	X			X	X	X	
<i>Triodia pугens</i>	Soft Spinifex	X		X	X		X		X	X	X	X	X	
<i>Tripogon loliiformis</i>	Five-minute Grass		X	X				X						
<i>Triraphis mollis</i>	Purple Needlegrass									X				
<i>Urochloa gilesii</i>	Hairy Edged Armgrass									X				
<i>Urochloa mosambicensis</i>	Sabi Grass													
<i>Ventilago viminalis</i>	Vine Tree			X	X		X	X		X				
<i>Verbena incompta*</i>	Purpletop		X						X					
<i>Verbena litoralis car litoralis*</i>	Verbena			X										
<i>Verbesina encelioides*</i>	Golden Crownbeard									X				
<i>Vigna lanceolata</i>	Maloga Bean			X			X		X					



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<i>Vittadinia pustulata</i>	Fuzzweed			X	X		X							X
<i>Wahlenbergia gracilis</i>	Slender Bluebell		X	X	X					X		X		
<i>Wahlenbergia stricta</i>	Tall Bluebell			X					X	X				
<i>Waltheria indica</i>	Waltheria													
<i>Xanthium strumarium</i>	Noogoora Burr				X				X	X				
<i>Zornia adenophora</i>	Zornia		X	X										X
<i>Zornia muriculata</i>	Zornia		X	X					X	X				X
<i>Zornia muriculata subsp. angustata</i>	Upright Zornia									X				
<i>Zornia prostrata</i>	Zornia Vine			X	X				X	X				

Fauna Species Observed on and adjacent to the Project site

Family	Scientific Name	Common Name	Status	Survey point
Mammals				
Bovidae	<i>Capra hircus</i> *	Feral Goat	LC	
Canidae	<i>Canis lupus</i>	Dingo / Wild Dog	LC	
Dasyuridae	<i>Sminthopsis macroura</i>	Stripe-faced Dunnart	LC	
Felidae	<i>Felis catus</i>	Feral Cat	LC	
Leporidae	<i>Oryctolagus cuniculus</i> *	European Rabbit	LC	
Phalangeridae	<i>Trichosurus vulpecula</i>	Common Brushtail Possum	LC	
Macropodidae	<i>Lagorchestes conspicillatus</i>	Spectacled Hare Wallaby	LC	
Macropodidae	<i>Macropus giganteus</i>	Eastern Grey Kangaroo	LC	
Macropodidae	<i>Macropus robustus robustus</i>	Euro	LC	
Macropodidae	<i>Macropus rufogriseus</i>	Red-necked Wallaby	LC	
Macropodidae	<i>Macropus rufus</i>	Red Kangaroo	LC	
Macropodidae	<i>Wallabia bicolor</i>	Swamp Wallaby	LC	
Muridae	<i>Mus musculus</i> *	House Mouse	LC	
Muridae	<i>Pseudomys delicalutus</i>	Delicate Mouse	LC	
Petauridae	<i>Petaurus breviceps</i>	Sugar Glider	LC	
Phascolarctidae	<i>Phascolarctos cinereus</i>	Koala	LC	
Potoroidae	<i>Aepyprymnus rufescens</i>	Rufous Bettong	LC	
Suidae	<i>Sus scrofa</i> *	Feral Pig	LC	
Tachyglossidae	<i>Tachyglossus aculeatus</i>	Short-beaked Echidna	LC	
Pteropodidae	<i>Pteropus scapulatus</i>	Little Red Flying Fox	LC	
Emballonuridae	<i>Saccolaimus flaviventris</i>	Yellow-bellied Sheath-tailed Bat	LC	
Emballonuridae	<i>Taphozous troughtoni</i>	Troughton's Sheath-tailed Bat	LC	
Molossidae	<i>Chaerephon jobensis</i>	Northern Free-tailed Bat	LC	
Molossidae	<i>Mormopterus beccarii</i>	Beccari's Free-tailed Bat	LC	



Family	Scientific Name	Common Name	Status	Survey point
Molossidae	<i>Mormopterus eleryi</i>	Bristle-faced Free-tailed Bat	LC	
Molossidae	<i>Mormopterus ridei</i> / sp. 3	Inland Free-tailed Bat	LC	
Molossidae	<i>Austronomus australis</i>	White-striped Free-tailed Bat	LC	
Vespertilionidae	<i>Chalinolobus gouldii</i>	Gould's Wattled Bat	LC	
Vespertilionidae	<i>Chalinolobus morio</i>	Chocolate Wattled Bat	LC	
Vespertilionidae	<i>Nyctophilus species</i>	Unknown Long-eared Bat	LC	
Vespertilionidae	<i>Scotorepens balstoni</i>	Inland Broad-nosed Bat	LC	
Vespertilionidae	<i>Scotorepens greyii</i>	Little Broad-nosed Bat	LC	
Vespertilionidae	<i>Vespadelus baverstocki</i>	Inland Forest Bat	LC	
Vespertilionidae	<i>Vespadelus finlaysoni</i>	Inland Cave Bat	LC	
Vespertilionidae	<i>Vespadelus troughtoni</i>	Eastern Cave Bat	LC	
Amphibians				
Bufonidae	<i>Rhinella marina</i> *	Cane Toad		
Hylidae	<i>Litoria alboguttata</i>	Striped Burrowing frog	LC	
Hylidae	<i>Litoria caerulea</i>	Green Tree Frog	LC	
Hylidae	<i>Litoria fallax</i>	Dwarf Tree Frog	LC	
Hylidae	<i>Litoria inermis</i>	Floodplain Frog	LC	
Hylidae	<i>Litoria latopalmata</i>	Broad-palmed Frog	LC	
Hylidae	<i>Litoria rubella</i>	Desert Tree Frog	LC	
Limnodynastidae	<i>Platyplectrum ornatus</i>	Ornate Burrowing Frog	LC	
Limnodynastidae	<i>Limnodynastes tasmaniensis</i>	Spotted Marsh Frog	LC	
Myobatrachidae	<i>Uperoleia rugosa</i>	Eastern Burrowing Toadlet	LC	
Reptiles				
Agamidae	<i>Chlamydosaurus kingii</i>	Frilled Neck Lizard	LC	
Agamidae	<i>Ctenophorus nuchalis</i>	Central Netted Dragon	LC	
Agamidae	<i>Pogogna barbata</i>	Common Bearded Dragon	LC	



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Agamidae	<i>Diporiphora australis</i>	Tommy Roundhead Dragon	LC	
Agamidae	<i>Amphibolurus nobbi</i>	Nobbi Dragon	LC	
Elapidae	<i>Cryptophis boschmai</i>	Carpentaria Whip Snake	LC	
Elapidae	<i>Demansia psammophis</i>	Yellow-faced Whipsnake	LC	
Elapidae	<i>Holocephalus bitorquatus</i>	Pale-headed Snake	LC	
Elapidae	<i>Pseudonaja textilis</i>	Eastern Brown Snake	LC	
Gekkonidae	<i>Diplodactylus steindachneri</i>	Box Pattern Gecko	LC	
Gekkonidae	<i>Diplodactylus tessellatus</i>	Tesselated Gecko	LC	
Gekkonidae	<i>Gehyra dubia</i>		LC	
Gekkonidae	<i>Gehyra variegata</i>		LC	
Gekkonidae	<i>Hemidactylus frenatus</i>	Asian House Gecko	LC	
Gekkonidae	<i>Heteronotia binoei</i>	Bynoe's Gecko	LC	
Pygopodidae	<i>Lialis burtonis</i>	Burton's Snake-lizard	LC	
Pythonidae	<i>Antaresia maculosa</i>	Spotted Python	LC	
Pythonidae	<i>Aspidites melanocephalus</i>	Black-headed Python	LC	
Scincidae	<i>Carlia munda</i>		LC	
Scincidae	<i>Carlia pectoralis pectoralis</i>	Rainbow Skink	LC	
Scincidae	<i>Cryptoblepharus sp.</i>	Skink	LC	
Scincidae	<i>Ctenotus herbetior</i>		LC	
Scincidae	<i>Ctenotus pantherinus</i>	Leopard Skink	LC	
Scincidae	<i>Ctenotus robustus</i>		LC	
Scincidae	<i>Menetia greyii</i>		LC	
Scincidae	<i>Morethia taeniopleura</i>	Fire-tailed Skink	LC	
Scincidae	<i>Tiliqua scincoides</i>	Eastern Blue-tongue	LC	
Varanidae	<i>Varanus gouldii</i>	Sand Goanna	LC	
Birds				



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Acanthizidae	<i>Smicrornis brevirostris</i>	Weebill	LC	
Accipitridae	<i>Aquila audax</i>	Wedge-tailed Eagle	LC	
Accipitridae	<i>Elanus axillaris</i>	Black Shouldered Kite	LC	
Accipitridae	<i>Haliastur sphenurus</i>	Whistling Kite	Marine	
Alcedinidae	<i>Alcedo azurea</i>	Azure Kingfisher	LC	
Anatidae	<i>Anas gracilis</i>	Grey Teal	LC	
Anatidae	<i>Anas supecciliosa</i>	Pacific Black Duck	LC	
Anatidae	<i>Chenonetta jubata</i>	Australian Wood Duck	LC	
Anhingidae	<i>Anhinga melanogaster</i>	Darter	LC	
Ardeidae	<i>Ardea alba</i>	Great Egret	M/M	
Ardeidae	<i>Ardea intermedia</i>	Intermediate Egret	Marine	
Ardeidae	<i>Ardea novaehollandiae</i>	White-faced Heron	LC	
Ardeidae	<i>Ardea pacifica</i>	White Necked Heron	LC	
Ardeidae	<i>Nycticorax caledonicus</i>	Nankeen Night Heron	Marine	
Artamidae	<i>Artamus cinereus</i>	Black-faced Woodswallow	LC	
Artamidae	<i>Artamus cyanopterus</i>	Dusky Woodswallow	LC	
Artamidae	<i>Artamus leucorhynchus</i>	White-breasted Woodswallow	LC	
Artamidae	<i>Cracticus nigrogularis</i>	Pied Butcherbird	LC	
Artamidae	<i>Cracticus torquatus</i>	Grey Butcherbird	LC	
Artamidae	<i>Gymnorhina tibicen</i>	Australian Magpie	LC	
Burhinidae	<i>Burhinus grallarius</i>	Bush Stone-curlew	LC	
Cacatuidae	<i>Cacatua galerita</i>	Sulphur-crested Cockatoo	LC	
Cacatuidae	<i>Calyptorhynchus banksii</i>	Red-tailed Black Cockatoo	LC	
Cacatuidae	<i>Eolophus roseicapilla</i>	Galah	LC	
Cacatuidae	<i>Nymphicus hollandicus</i>	Cockatiel	LC	
Campephagidae	<i>Coracina novaehollandiae</i>	Black-faced Cuckoo-shrike	Marine	



Family	Scientific Name	Common Name	Status	Survey point
Campephagidae	<i>Lalage tricolor</i>	White-winged Triller	LC	
Caprimulgidae	<i>Eurostopodus argus</i>	Spotted Nightjar	Marine	
Casuaridae	<i>Dromaius novaehollandiae</i>	Emu	LC	
Charadriidae	<i>Elseyornis melanops</i>	Black-fronted Dotteral	LC	
Charadriidae	<i>Vanellus tricolor</i>	Banded Lapwing	LC	
Charadriidae	<i>Vanellus miles</i>	Maksed Lapwing	LC	
Climacteridae	<i>Climacteris affinis</i>	White -browed Treecreeper	LC	
Climacteridae	<i>Climacteris picumnus</i>	Brown Treecreeper	LC	
Columbidae	<i>Geopelia cuneata</i>	Diamond Dove	LC	
Columbidae	<i>Geopelia striata</i>	Peaceful Dove	LC	
Columbidae	<i>Geophaps scripta scripta</i>	Southern Squatter Pigeon	V (NCWR, EPBC)	
Columbidae	<i>Ocyphaps lophotes</i>	Crested Pigeon	LC	
Columbidae	<i>Phaps chalcoptera</i>	Common Bronzewing	LC	
Corcoracidae	<i>Corcorax melanorhamphos</i>	White-winged Chough	LC	
Corcoracidae	<i>Struthidae cinerea</i>	Apostlebird	LC	
Corcoracidae	<i>Eurystomus orientalis</i>	Dollabird	Marine	
Corvidae	<i>Corvus coronoides</i>	Australian Raven	LC	
Corvidae	<i>Corvus orru</i>	Toreesian Crow	LC	
Cuculidae	<i>Centropus phasianinus</i>	Pheasant Coucal	LC	
Estrildidae	<i>Neochmia modesta</i>	Plum-headed Finch	LC	
Estrilididae	<i>Taeniopygia bichenovii</i>	Double-barred Finch	LC	
Estrilididae	<i>Taeniopygia guttata</i>	Zebra Finch	LC	
Falconidae	<i>Falco berigora</i>	Brown Falcon	LC	
Falconidae	<i>Falco cenchroides</i>	Nankeen Kestrel	Marine	
Falconidae	<i>Falco longipennis</i>	Australian Hobby	LC	
Gruidae	<i>Grus rubicunda</i>	Brolga	LC	



Family	Scientific Name	Common Name	Status	Survey point
Halcyonidae	<i>Dacelo novaeguineae</i>	Laughing Kookaburra	LC	
Halcyonidae	<i>Todiramphus macleayii</i>	Forest Kingfisher	Marine	
Halcyonidae	<i>Todiramphus sanctus</i>	Sacred Kingfisher	Marine	
Hirundinidae	<i>Petrochelidon nigricans</i>	Tree Martin	LC	
Maluridae	<i>Malurus cyaneus</i>	Superb Fairy Wren	LC	
Maluridae	<i>Malurus lamberti</i>	Variiegated Fairy Wren	LC	
Maluridae	<i>Malurus melanocephalus</i>	Red-backed Fairy Wren	LC	
Meliphagidae	<i>Entomyzon cyanotis</i>	Blue-faced Honeyeater	LC	
Meliphagidae	<i>Lichenostomus penicillatus</i>	White-plumed Honeyeater	LC	
Meliphagidae	<i>Lichenostomus virescens</i>	Singing Honeyeater	LC	
Meliphagidae	<i>Manorina melanocephala</i>	Noisy Miner	LC	
Meliphagidae	<i>Melithreptus albigularis</i>	White-throated Honeyeater	LC	
Meliphagidae	<i>Philemon corniculatus</i>	Noisy Friarbird	LC	
Meropidae	<i>Merops ornatus</i>	Rainbow Bee Eater	M/M	
Monarchidae	<i>Grallina cyanoleuca</i>	Peewee	LC	
Monarchidae	<i>Myiagra rubecula</i>	Leaden Flycatcher	LC	
Motacillidae	<i>Anthus novaeseelandiae</i>	Australian Pipit	Marine	
Neosittidae	<i>Daphoenositta chrysoptera</i>	Varied Sittella	LC	
Otididae	<i>Ardeotis australis</i>	Australian Bustard	LC	
Pachycephalidae	<i>Pachycephala rufiventris</i>	Rufous Whistler	LC	
Pachycephalidae	<i>Pachycephala pectoralis</i>	Golden Whistler	LC	
Pardalotidae	<i>Pardalotus striatus</i>	Striated Pardalote	LC	
Pardalotidae	<i>Acanthiza chrysorrhea</i>	Yellow-rumped Thornbill	LC	
Pelicanidae	<i>Pelecanus conspicillatus</i>	Australian Pelican	Marine	
Petroicidae	<i>Melanodryas cucullata</i>	Hooded Robin	LC	
Petroicidae	<i>Microeca fascinan</i>	Jacky Winter	LC	



Family	Scientific Name	Common Name	Status	Survey point
Petroicidae	<i>Petroica goodenovii</i>	Red-capped Robin	LC	
Phalacrocoracidae	<i>Phalacrocorax sulcirostris</i>	Little Black Cormorant	LC	
Phasianidae	<i>Coturnix ypsilophora</i>	Brown Quail	LC	
Podargidae	<i>Podargus strigoides</i>	Tawny Frogmouth	LC	
Pomatostomidae	<i>Pomatostomus temporalis</i>	Grey Crowned Babbler	LC	
Psittacidae	<i>Aprosmictus erythropterus</i>	Red-winged Parrot	LC	
Psittacidae	<i>Melopsittacus undulatus</i>	Budgerigar	LC	
Psittacidae	<i>Platyercus adscitus</i>	Pale-headed Rosella	LC	
Psittacidae	<i>Trichoglossus chlorolepidotus</i>	Scaly-breasted Lorikeet	LC	
Psittacidae	<i>Trichoglossus haematodus</i>	Rainbow Lorikeet	LC	
Ptilonorhynchidae	<i>Ptilonorhynchus maculatus</i>	Spotted Bowerbird	LC	
Rhipiduridae	<i>Rhipidura fuliginosa</i>	Grey Fantail	LC	
Rhipiduridae	<i>Rhipidura leucophrys</i>	Willy Wagtail	LC	
Strigidae	<i>Ninox novaeseelandiae</i>	Southern Boobook	LC	
Threskiornithidae	<i>Platalea flavipes</i>	Yellow-billed Spoonbill	LC	
Threskiornithidae	<i>Threskiornis molucca</i>	Australian White Ibis	Marine	
Threskiornithidae	<i>Threskiornis spinicollis</i>	Straw-necked Ibis	Marine	

Nature Conservation (Wildlife) Regulation:
LC = Least Concern; NT = Near Threatened;

Environmental Protection and Biodiversity Conservation Act:
V = Vulnerable M/M = Migratory / Marine; M = Migratory; V = Vulnerable



Appendix B: Database Search Results



Appendix C: DEEDI Pest Fact Sheets



Appendix D: AnaBat™ Analysis Summary



Appendix E: Queensland Herbarium Results



Appendix F: Threatened Species Not Observed on the Project site



Family	Scientific Name	Common Name	Conservation Status		Habitat	Likelihood of Presence on the Project site
			EPBC	NC Act		
Zamiaceae	<i>Macrozamia platyrhachis</i>	-	Endangered	Endangered	Restricted to the Blackdown Tableland / Planet Downs area of the Dawson Range in central Queensland, in eucalypt woodland or open forest on sandy soil. Seeds become ripe in March to April (Department of the Environment, 2009)	Unlikely
Blennaceae	<i>Blechnum ambiguum</i>	-	Not Listed	Near Threatened	Common on wet rocks, usually found in open forest, especially common in sandstone areas (PlantNet, 2009)	Unlikely
Apocynaceae	<i>Marsdenia brevifolia</i>	-	Vulnerable	Vulnerable	Occurs on serpentine rock outcrops or crumbly black soils derived from serpentine in eucalypt woodland. Flowering occurs from November to February, fruiting from February to June (Department of the Environment, 2009)	Low Potential
Apocynaceae	<i>Cerbera dumicola</i>	-	Not Listed	Near Threatened	Found near Howard Point, Middle Percy Island, 55 km NE of Arthur Point, Shoalwater Bay (APNI, 2009).	Unlikely
Asteraceae	<i>Rutidosia glandulosa</i>	-	Not Listed	Near Threatened	Leichhardt District, Blackdown Tableland, 32 km SE of Blackwater, along a sandy creek (APNI, 2009)	Low Potential



Family	Scientific Name	Common Name	Conservation Status		Habitat	Likelihood of Presence on the Project site
			EPBC	NC Act		
Asteraceae	<i>Trioncinia retroflexa</i>	-	Not Listed	Endangered	Occurs in soils are moderately shallow to deep cracking clay soils, dark brown to reddish brown in colour, often self mulching, and with gravel, stone or linear gilgai sometimes present (Department of the Environment, 2009)	High Potential
Brassicaceae	<i>Lepidium hyssopifolium</i>	Basalt Peppercross	Endangered	Not Listed	Basalt Peppercross can be found on a variety of soils, growing in association with many vegetation types, including eucalypt woodland with grassy ground cover, low open casuarina woodland with a grassy ground cover and tussock grass, flowering in summer (APNI, 2009)	Unlikely
Campanulaceae	<i>Wahlenbergia islensis</i>	-	Not Listed	Near Threatened	Leichhardt region; near Isla George (APNI, 2009)	Low Potential
Celastraceae	<i>Apatophyllum flavovirens</i>	-	Not Listed	Endangered	Leichhardt District: Bull Creek Gorge, 15 km W of 'Castlevalle', W of Springsure (APNI, 2009)	Low Potential
Celastraceae	<i>Apatophyllum teretifolium</i>	-	Not Listed	Near Threatened	Leichhardt District: Lonesome National Park, NNE of Injune (APNI, 2009)	Low Potential



Family	Scientific Name	Common Name	Conservation Status		Habitat	Likelihood of Presence on the Project site
			EPBC	NC Act		
Ericaceae	<i>Leucopogon cuspidatus</i>	Beard Heath	Vulnerable	Not Listed	<i>Leucopogon cuspidatus</i> collections have been made from open forest, woodland and heath on rocky slopes with granitic or serpentinite substrates, flowering from July to October (Department of the Environment, 2009)	Low Potential
Ericaceae	<i>Leucopogon grandiflorus</i>	Whorl-leaved Heath	Not Listed	Near Threatened	Found at Leichhardt District - Carnarvon Creek (APNI, 2009)	Low Potential
Eriocaulaceae	<i>Eriocaulon carsonii</i>	Salt Pipewort	Endangered	Endangered	The salt pipewort is found in aquatic environments, on permanent spring-fed wetlands with a groundwater source from the GAB. All populations occur in relatively flat landscapes except for one which is found in a spring-fed area on the side of a gentle range (DERM, 2007)	Unlikely



Family	Scientific Name	Common Name	Conservation Status		Habitat	Likelihood of Presence on the Project site
			EPBC	NC Act		
Euphorbiaceae	<i>Bertya opposens</i>	-	Vulnerable	Not listed	Flowering is generally believed to occur between July and August, although timing is more dependent on the individual site characteristics. The two coastal populations, because of their different climatic and seasonal variations, normally flower in October-November, but can flower as late as February (Department of the Environment, 2009)	Unlikely
Euphorbiaceae	<i>Shonia carinata</i>	-	Not Listed	Vulnerable	Located within the Maranoa District: Summit of Junction Ridge, N of Marlong Arch, Mt Moffatt National Park (APNI, 2009)	Low Potential
Euphorbiaceae	<i>Bertya pedicellata</i>	-	Not Listed	Near Threatened	Grows in heath or open eucalypt forest with heath understorey on skeletal sandy loam soils derived from rhyolite on steep rocky slopes, rock pavements and in mountain gorges; located near Rockhampton (Department of the Environment, 2009)	Low Potential



Family	Scientific Name	Common Name	Conservation Status		Habitat	Likelihood of Presence on the Project site
			EPBC	NC Act		
Fabaceae	<i>Daviesia discolor</i>	-	Vulnerable	Vulnerable	Occurs on sandy soil derived from sandstone and on lateric clay, at altitudes of 600 to 900 m, in open eucalypt forest dominated by <i>Eucalyptus shaerocarpa</i> and <i>Eucalyptus nigra</i> . Flowering occurs from August to October (Department of the Environment, 2009)	Unlikely
Fabaceae	<i>Daviesia quoquoversus</i>	-	Not Listed	Vulnerable	Located in the Leichhardt district, Blackdown Tableland, 25 km from Mimosa Creek (APNI, 2009)	Low Potential
Fabaceae	<i>Desmodium macrocarpum</i>	Large-podded Trefoil	Not Listed	Near Threatened	Located in clay soils and skeletal soils (ANRA, 2009)	Moderate Potential
Fabaceae	<i>Zornia pallida</i>	-	Not Listed	Near Threatened	Rare in Queensland, no information about this species (APNI, 2009; North Australian Land Manager, 2009)	Potential
Haloragaceae	<i>Haloragis exalata</i> subsp. <i>velutina</i>	Tall Velvet Sea-berry	Vulnerable	Vulnerable	Often occurs in damp places near watercourses and in woodland on steep, rocky slopes. Flowering from January to April (Department of the Environment, 2009)	Low Potential



Family	Scientific Name	Common Name	Conservation Status		Habitat	Likelihood of Presence on the Project site
			EPBC	NC Act		
Lamiaceae	<i>Plectranthus blakei</i>	-	Not Listed	Near Threatened	Located in the Leichhardt district, in the Blackdown Tableland Park APNI, 2009)	Low Potential
Longaniaceae	<i>Logania diffusa</i>	-	Vulnerable	Vulnerable	This species occurs on the top of the plateau escarpment in heathland in the Blackdown Tableland and in open forest with shallow, sandy, often stony soil overlying sandstone. Flowering occurs in March to September, fruiting in January (Department of the Environment, 2009)	Low Potential
Loranthaceae	<i>Lysiana filifolia</i>	-	Not Listed	Near Threatened	Only known to parasitise she-oaks growing in open woodland communities, recorded flowering and fruiting from June to August (Lokkers et al., 2005)	Unlikely
Mimosaceae	<i>Acacia grandifolia</i>	-	Vulnerable	Not Listed	Known only from 2 localities in the Burnett District, Qld, occurring as open stands among sandstone outcrops in sand or in shallow, stony soils derived from basalt. Flowers in September (Wattle, 2001)	Unlikely
Mimosaceae	<i>Acacia tenuinervis</i>	-	Not Listed	Near Threatened	Grows in Brigalow scrub or eucalypt woodland, in ironstone gravel. Flowers August to September (Wattle, 2001)	Low Potential



Family	Scientific Name	Common Name	Conservation Status		Habitat	Likelihood of Presence on the Project site
			EPBC	NC Act		
Mimosaceae	<i>Acacia arbiana</i>	-	Not Listed	Near Threatened	Confined to the summits of Ropers and Scotts Peak and perhaps other peaks of the Peak Range, E of Clermont, Qld. Recorded from trachyte outcrops in heath-like vegetation. Flowers July to August (Wattle, 2001)	Unlikely
Mimosaceae	<i>Acacia spania</i>	Western Rosewood	Not Listed	Near Threatened	Known only from two localities near Emerald, Qld, where it occurs as relatively pure stands in shallow red soil surrounded by open eucalypt woodland. Flowers in August (Wattle, 2001)	Low Potential
Mimosaceae	<i>Acacia hockingsii</i>	-	Not Listed	Vulnerable	Restricted to the Isla Gorge area, Qld. Grows in shallow soil over sandstone in eucalypt woodland (Wattle, 2001)	Unlikely
Mimosaceae	<i>Acacia islana</i>	-	Not Listed	Vulnerable	Restricted to the Isla Gorge area (50 km SSW of Theodore), Qld. Grows in Eucalyptus woodland on shallow, stony soil over sandstone (Wattle, 2001)	Unlikely

Family	Scientific Name	Common Name	Conservation Status		Habitat	Likelihood of Presence on the Project site
			EPBC	NC Act		
Mimosaceae	<i>Acacia storyi</i>	-	Not Listed	Near Threatened	Occurs on the Blackdown Tableland and adjacent, lower land on W side, Qld. Grows on sandstone plateaux, in open forest. Flowers April to August and fruits August , September and December (Wattle, 2001)	Unlikely
Mimosaceae	<i>Acacia pubicosta</i>	-	Not Listed	Near Threatened	Restricted to the Biggenden area, south-eastern Qld. Confined to rocky slopes (Wattle, 2001)	Unlikely
Mimosaceae	<i>Acacia gittinsii</i>	-	Not Listed	Near Threatened	Confined to the Blackdown Tableland S of Blackwater, Qld. Grows on sandstone in Eucalyptus woodland; it is common in places in wetter areas (Wattle, 2001)	Unlikely
Mimosaceae	<i>Acacia tingoorensis</i>	Tingoora Wattle	Not Listed	Vulnerable	Restricted to a small area near Kingaroy in the Burnett District, south-eastern Qld; grows in deep red loam or shallow loamy and sandy soils, in eucalypt woodland or forest; forms dense stands on roadsides. Flowers August to September (Wattle, 2001)	Unlikely

Family	Scientific Name	Common Name	Conservation Status		Habitat	Likelihood of Presence on the Project site
			EPBC	NC Act		
Mimosaceae	<i>Acacia pubifolia</i>	Wyberba Wattle	Vulnerable	Vulnerable	Grows on rocky granite hillsides, in sandy, stony or loam soil in eucalypt-scrub woodland or <i>Eucalyptus - Callitris</i> forest. Flowers September to November (Wattle, 2001)	Unlikely
Mimosaceae	<i>Acacia ramiflora</i>	-	Vulnerable	Not Listed	Poorly known and inadequately collected species in the Torrens Creek- Pentland area; also near headwaters of Gilbert R., Qld. Grows on sandstone hills (Wattle, 2001). This species occurs within the Burdekin, Desert Channels, Northern Gulf and Wet Tropics (Queensland) Natural Resource Management Regions (EPBC, 2008)	Low Potential
Myrtaceae	<i>Baeckea trapeza</i>	-	Not Listed	Vulnerable	Located along Two Mile Creek in the Blackdown Tableland (APNI, 2009)	Unlikely
Myrtaceae	<i>Corymbia clandestina</i>	-	Vulnerable	Vulnerable	This species is known from two localities, north-west and south-west of Clermont, Queensland. It grows on hillsides as a minor component of woodland dominated by <i>Eucalyptus crebra</i> , with skeletal brown clay-loam or red gravels (EPBC, 2008)	Low Potential



Family	Scientific Name	Common Name	Conservation Status		Habitat	Likelihood of Presence on the Project site
			EPBC	NC Act		
Myrtaceae	<i>Ochrosperma obovatum</i>	-	Not Listed	Vulnerable	Inhabits the Burnett District, 6 km ESE of Brovinia (APNI, 2009)	Unlikely
Myrtaceae	<i>Melaleuca pearsonii</i>	-	Not Listed	Near Threatened	On exposed plateaus in closed heath to open shrubland (APNI, 2009)	Low Potential
Myrtaceae	<i>Sannantha brachypoda</i>	-	Not Listed	Near Threatened	Grows in a wide range of habitats, including Melaleuca dominated open forest and Eucalypt forest (PlantNet, 2009)	Low Potential
Myrtaceae	<i>Homoranthus zeteticorum</i>	-	Not Listed	Near Threatened	Located in Salvator Rosa National Park in Queensland (APNI, 2009)	Unlikely
Myrtaceae	<i>Eucalyptus pachycalyx</i> subsp. <i>waajensis</i>	Pumpkin Gum	Not Listed	Endangered	Common in hills west of Herberton and north of Mount Garnet and at Mt Mulligan in N Qld, a small occurrence near Waaje in the Barakula area. Flowering period February (Brooker and Kleinig, 2004)	Unlikely
Myrtaceae	<i>Eucalyptus sicilifolia</i>	-	Not Listed	Vulnerable	Very restricted, known only from Little St Peter Montain and Mt Zamia Environmental Park, near Springsure, Flowering period from July to September (Brooker and Kleinig, 2004)	Unlikely



Family	Scientific Name	Common Name	Conservation Status		Habitat	Likelihood of Presence on the Project site
			EPBC	NC Act		
Myrtaceae	<i>Eucalyptus decolor</i>	-	Not Listed	Near Threatened	Known only from the Many Peaks Range S of Gladstone and ranges south of Biggenden; flowering from December to March (Brooker and Kleinig, 2004)	Unlikely
Myrtaceae	<i>Melaleuca groveana</i>	Grove's Paperbark	Not Listed	Near Threatened	Grows in heath, often in exposed sites	Unlikely
Myrtaceae	<i>Homoranthus decumbens</i>	-	Vulnerable	Vulnerable	This species grows in shrub land on shallow sandy soils containing lateritic pebbles and on sandstone cliff edges in the Blackdown National Park (Department of the Environment, 2009)	Unlikely
Myrtaceae	<i>Homoranthus decasetus</i>	-	Not Listed	Near Threatened	Inhabits the Isla Gorge in the Leichhardt district (APNI, 2009)	Low Potential
Myrtaceae	<i>Eucalyptus raveretiana</i>	Black Ironbox	Vulnerable	Vulnerable	Occurs in riparian woodlands on alluvial flats along riverbanks on sandy and / or alluvial soils, between Rockhampton, Charters Towers and the lower Burdekin. Recorded flowering from December to January, fruiting February to April (Brooker and Kleinig, 2004)	Unlikely



Family	Scientific Name	Common Name	Conservation Status		Habitat	Likelihood of Presence on the Project site
			EPBC	NC Act		
Myrtaceae	<i>Corymbia scabrida</i>	Rough-leaved Yellowjacket	Not Listed	Near Threatened	Restricted distribution to the west of Springsure in central Qld, flowering period October (Brooker and Kleinig, 2004).	Unlikely
Picrodendraceae	<i>Pseudanthus pauciflora subsp. arenicola</i>	-	Not Listed	Near Threatened	Grows in health land, accompanied by <i>Banksia</i> spp. and <i>Leptospermum</i> spp. and in Eucalypt woodlands (personal communication with Queensland Herbarium, June 2009)	Moderate Potential
Rhamnaceae	<i>Polianthion minutiflorum</i>	-	Vulnerable	Vulnerable	Grows in forest and woodland on sandstone slopes and gullies with skeletal soil. It is known from five areas in east Queensland, from Redcliffe Vale, about 110 km west of Mackay, south to Kingaroy	Low Potential
Rutaceae	<i>Boronia eriantha</i>	Round-leaflet Sandstone Boronia	Not Listed	Near Threatened	Located in soils which are shallow with low water-holding capacity and low fertility, shrub layers and ground cover tend to be sparse (APNI, 2009)	Low Potential



Family	Scientific Name	Common Name	Conservation Status		Habitat	Likelihood of Presence on the Project site
			EPBC	NC Act		
Santalaceae	<i>Thesium australe</i>	Austral Toadflax	Vulnerable	Vulnerable	Occurs in grassland or grassy woodland and is often found in damp sites in association with <i>Themeda triandra</i> (DEC, 2009)	Low Potential
Solanaceae	<i>Solanum adenophorum</i>	-	Not Listed	Endangered	A relatively rare species recorded from scattered localities in Qld in the Dingo-Nebo-Clermont area near Rockhampton (APNI, 2009)	Moderate Potential
Surianaceae	<i>Cadellia pentastylis</i>	Ooline	Vulnerable	Vulnerable	Occurs on the western edge of the NSW north-west slopes, from Mt Black Jack near Gunnadah to west of Tenterfield, and extends into Queensland to Carnarvon Range and Callide Valley, south-west of Rockhampton. The distribution of this species overlaps with the following EPBC Act-listed threatened ecological communities of Brigalow (Department of the Environment, 2009)	Unlikely
Areaceae	<i>Livistona fulva</i>	-	Not Listed	Near Threatened	Blackdown Tableland in open Eucalypt forest (PASCOA, 2009)	Unlikely



Family	Scientific Name	Common Name	Conservation Status		Habitat	Likelihood of Presence on the Project site
			EPBC	NC Act		
Arecaceae	<i>Livinstona nitida</i>	-	Not Listed	Near Threatened	Open eucalypt forest, stream banks and on rocky escarpments in the Carnarvon and Isla Gorge area of central Queensland (PASCOA, 2009)	Low Potential
Cyperaceae	<i>Cyperus clarus</i>	-	Not Listed	Vulnerable	Grows in grassland or open woodland, on heavy soils derived from basalt (PlantNet, 2009)	Unlikely
Cyperaceae	<i>Eleocharis blakeana</i>	-	Not Listed	Near Threatened	Grows in ephemerally wet situations, such as gilgais, often associated with <i>Acacia harpophylla</i> and <i>Casuarina cristata</i> woodland and on clayey soil (PlantNet, 2009)	Moderate Potential
Juncaginaceae	<i>Maundia triglochinooides</i>	-	Not Listed	Vulnerable	Flowering occurs during warmer months. Grows in swamps, creeks or shallow freshwater 30 - 60 cm deep on heavy clay, low nutrients (DEC, 2009)	Unlikely
Orchidaceae	<i>Gastrodia crebriflora</i>	-	Not Listed	Vulnerable	A ground orchid inhabiting the Blackdown Tableland (APNI, 2009)	Unlikely
Orchidaceae	<i>Pterostylis woollsii</i>	Long Tail Greenhood	Not Listed	Near Threatened	Grows in dry open granite forests (PlantNet, 2009)	Unlikely



Family	Scientific Name	Common Name	Conservation Status		Habitat	Likelihood of Presence on the Project site
			EPBC	NC Act		
Orchidaceae	<i>Diuris parvipetala</i>	Slender Purple Donkey Orchid	Not Listed	Vulnerable	Found in near Carnarvon Gorge in central Queensland and in south-eastern Queensland, from Brigooda near Murgon, south to the New South Wales border. It grows in shallow, brown, basalt loam soils (DERM, 2009)	Unlikely
Orchidaceae	<i>Phaius australis</i>	Lesser Swamp-orchid	Endangered	Endangered	Inhabits swampy grassland or swampy forest including rainforest, eucalypt or paperbark forest, mostly in coastal areas (Department of the Environment, 2009)	Unlikely
Orchidaceae	<i>Genoplesium validum</i>	-	Not Listed	Near Threatened	Located within creeks along the Blackdown Tableland (APNI, 2009)	Low Potential
Poaceae	<i>Arthraxon hispidus</i>	Hairy-joint Grass	Vulnerable	Vulnerable	Found along the edges of rainforests, creeks and swamps. Flowering between March to July and summer to autumn (Department of the Environment, 2009)	Low Potential
Poaceae	<i>Digitaria porrecta</i>	Finger Panic Grass	Endangered	Near Threatened	Occurs in grasslands on extensive basaltic plains, and in undulating woodlands and open forests with an underlying basaltic geology. Seeding period from March to April (Department of the Environment, 2009)	Unlikely



Family	Scientific Name	Common Name	Conservation Status		Habitat	Likelihood of Presence on the Project site
			EPBC	NC Act		
Poaceae	<i>Dichanthium queenslandicum</i>	King Blue-grass	Vulnerable	Vulnerable	Endemic to Queensland where it occurs mostly on black clay soils around Emerald and more rarely on the Darling Downs. Flowers November to January (Department of the Environment, 2009)	Low Potential
Poaceae	<i>Dichanthium setosum</i>	Bluegrass	Vulnerable	Near Threatened	<i>Dichanthium setosum</i> is associated with heavy basaltic black soils and stony red-brown hard setting loam with clay subsoil and is found in moderately disturbed areas. Flowering period November to June (Ausgrass, 2002)	Unlikely

Threatened Fauna Known from the Region Not Observed on the Project site

Scientific Name	Common Name	Conservation Status		Habitat	Notes / Likelihood of Presence on Project site
		EPBC Act	NC Act		
<i>Acanthophis antarcticus</i>	Common Death Adder	Not Listed	Near Threatened	Inhabits grasslands, woodlands, and rocky ranges (Wilson 2005). Lies concealed under leaf litter, or half buried under soil or sand (Tyler and Knight 2009)	Due to the abundance of similar habitat type surrounding the Project site, if the species was present in the region, the Project is unlikely to impact on the species / Moderate Potential



Scientific Name	Common Name	Conservation Status		Habitat	Notes / Likelihood of Presence on Project site
		EPBC Act	NC Act		
<i>Accipiter novaehollandiae</i>	Grey Goshawk	Migratory	Near Threatened	Rainforests, gallery forests, tall mangroves, and closed forests, woodlands, river edge forest (Simpson and Day 2010)	Due to the abundance of similar habitat type surrounding the Project and migratory nature of the species, it is considered unlikely that, if it were present in the region, the Grey Goshawk would be impacted by the Project / Low Potential
<i>Adelotus brevis</i>	Tusked Frog	Not Listed	Vulnerable	The Tusked Frog inhabits rainforest, wet sclerophyll country (Tyler and Knight 2009) and flooded grasslands (Robinson 1999). It is found coastal of the Great Dividing Range from central-eastern Queensland to southern New South Wales	Some suitable habitat may occur on the Project site, however it is likely that the Project is west of the species preferred range. Due to the abundance of similar habitat type surrounding the Project site, if the species was present in the region, it is unlikely there would be an impact to the species / Low Potential
<i>Aerodramus terraereginae</i>	Australian Swiftlet	Not Listed	Near Threatened	This species occurs in tropical north-east Queensland from the Cape York Peninsula south as far as the Eungella Range near Mackay and inland to Chillagoe. It is mainly found near the coast including a number of offshore islands (Simpson and Day 2010)	The known range for this species is not near the Project site. The Wildlife Online results showed only two records of the species in the Central Highlands area. It is therefore considered unlikely that the species would be impacted by the Project / Unlikely



Scientific Name	Common Name	Conservation Status		Habitat	Notes / Likelihood of Presence on Project site
		EPBC Act	NC Act		
<i>Amytornis striatus</i>	Striated Grasswren	Not Listed	Near Threatened	The Striated Grasswren prefers spinifex clumps on sand dunes, mallee woodlands, or on rocky ranges in central west Queensland (Simpson and Day 2010, ABRIS 2009)	Due to the abundance of similar habitat type surrounding the Project, if the species was present in the region, it is considered unlikely that the Project would impact on the species / Unlikely
<i>Anthochaera phrygia</i>	Regent Honeyeater	Endangered	Endangered	Regent Honeyeaters mostly occur in dry box-ironbark eucalypt woodland and dry sclerophyll forest associations. They sometimes use native pine <i>Callitris</i> spp. woodlands, usually where mixed with <i>Eucalyptus</i> spp. (Department of the Environment, Water, Heritage and the Arts 2009)	Some suitable habitat occurs on the Project site, however the range of this species is further south, if the species was present; it is considered unlikely that the Project would impact on the species / Unlikely
<i>Bettongia tropica</i>	Northern Bettong	Endangered	Endangered	This species is now restricted to four areas of the north-eastern tropical rainforest zone, although has formerly been identified in the Rockhampton area by a single specimen (Menkhorst and Knight 2001). Their distribution appears to be limited by the availability of hypogeous fungi (truffles) and potentially <i>Alloteropsis semialata</i> and <i>Hypoxix</i> spp., all of which are critical food resources (Johnson & McIlwee 1997)	As this species has not been identified within the Central Highlands region since 1884 (Pope 1996), it is considered unlikely that there would be any extant populations in the area, and therefore there are not considered to be any impacts possible by the Project on the species / Unlikely
<i>Chalinolobus dwyeri</i>	Large-eared Pied Bat	Vulnerable	Vulnerable	Dry and wet eucalypt forests, and roosts in caves and mines (Menkhorst and Knight 2001)	Suitable habitat for this species exists, but distribution of the Large-eared Pied Bat is east of the Project site / Unlikely



Scientific Name	Common Name	Conservation Status		Habitat	Notes / Likelihood of Presence on Project site
		EPBC Act	NC Act		
<i>Climacteris erythrops</i>	Red-browed Treecreeper	Not Listed	Near Threatened	The Red-browed Treecreeper favours the tall, smooth-barked trees of wet eucalypt forests, and rainforest margins (Simpson and Day 2010)	Suitable habitat for this species does not exist on the Project site and its distribution is within south-east Queensland, therefore it is considered unlikely that the species would inhabit or access the Project / Unlikely
<i>Ctenotus capricorni</i>	Skink	Not Listed	Near Threatened	This skink species prefers sandy areas supporting Spinifex, often in association with shrub and woodland communities (Cogger 2000). Known range is throughout most of Queensland	Some suitable habitat may occur on the Project site however given the species large range and the availability of similar habitat in the region it is unlikely the Project will adversely affect it / Moderate Potential
<i>Cyclorana verrucosa</i>	Rough Collared Frog	Not Listed	Near Threatened	Found around temporary ponds, ditches, claypans and creeks in wooded or open country, following summer rains (Robinson 1999)	Whilst suitable habitat for the species occurs within the Project site, it is outside of the normal range for the species (northern New South Wales up to south-east Queensland), and it is considered unlikely that there would be a population of the species within the Project area / Unlikely



Scientific Name	Common Name	Conservation Status		Habitat	Notes / Likelihood of Presence on Project site
		EPBC Act	NC Act		
<i>Dasyurus geoffroii geoffroii</i>	Western Quoll	Vulnerable	Extinct in the wild	The last specimens of the Western Quoll in Queensland were collected between 1884 and 1907. The species disappeared from central Australia around the 1940s–1950s. The species is now known only from Western Australia (Department of the Environment, Water, Heritage and the Arts 2009)	The available data indicates that the species is no longer extant within Queensland. It is therefore considered that the Project will not impact on the species / Unlikely
<i>Dasyurus hallucatus</i>	Northern Quoll	Endangered	Not Listed	The Northern Quoll is found in savannahs and rocky eucalypt woodlands, mostly within 200 km of the coast (Menkhorst and Knight 2004)	Despite targeted trapping and extensive spotlighting activities within the Project site, this species was not detected. It is considered unlikely that the species is found within the Project site / Unlikely
<i>Dasyurus maculatus maculatus</i>	Spotted-tailed Quoll (southern subspecies)	Endangered	Vulnerable	The Spotted-tailed Quoll is found in many habitats, including rainforest, wet and dry sclerophyll forest, coastal heath and scrub. Dens in tree hollows, hollow logs, and rock crevices (Menkhorst and Knight 2004)	Despite targeted trapping and extensive spotlighting activities within the Project site, this species was not detected. It is considered unlikely that the species is found within the Project site / Unlikely



Scientific Name	Common Name	Conservation Status		Habitat	Notes / Likelihood of Presence on Project site
		EPBC Act	NC Act		
<i>Delma torquata</i>	Collared Delma	Vulnerable	Vulnerable	The Collared Delma favours open rocky terrain, although has been recorded in woodland and Brigalow sites (Wilson 2005). It can be found within disturbed habitats (Cogger 2000) and known populations are concentrated around south-east Queensland, with disjunct populations recorded near the Project site	Despite targeted trapping active searching activities within the Project site, this species was not detected. Given the availability of similar habitat in the region it is unlikely the Project will have an adverse impact on the species if it does utilise the area / Moderate Potential
<i>Denisonia maculata</i>	Ornamental Snake	Vulnerable	Vulnerable	This species occurs in Brigalow woodlands growing on clay and sandy soils, riverside woodland, and open forest growing on natural levees (Shine 1983), showing a preference for moist areas (Wilson and Knowles 1988)	This species was not trapped or observed despite targeted efforts across the Project site. Given the availability of similar habitat in the region it is unlikely the Project will have an adverse impact on the species if it does utilise the area / Moderate Potential
<i>Egernia rugosa</i>	Yakka Skink	Vulnerable	Vulnerable	Usually found in open dry sclerophyll forest or woodland. Fallen timber and ground litter provide cover along with dense ground vegetation (Cogger 2000)	This species was not trapped or observed despite targeted efforts across the Project site. Given the availability of similar habitat in the region it is unlikely the Project will have an adverse impact on the species if it does utilise the area / Moderate Potential



Scientific Name	Common Name	Conservation Status		Habitat	Notes / Likelihood of Presence on Project site
		EPBC Act	NC Act		
<i>Ephippiorhynchus asiaticus</i>	Black-necked Stork	Not Listed	Near Threatened	The Black-necked Stork prefers open, freshwater environs, including the margins of billabongs and swamps, shallow floodwaters over grasslands, wet heathlands, watercourse pools, sewage farms, dams and adjacent grasslands, and savannah woodlands (Morcombe 2002)	Given the availability of similar habitat in the region it is unlikely the Project will have an adverse impact on the species if it does utilise the area / Moderate Potential
<i>Erythrotriochis radiatus</i>	Red Goshawk	Vulnerable	Endangered	The Red Goshawk is typically found over wooded and forested land with a mosaic of vegetation types in tropical and warm temperate climates in coastal and subcoastal areas (Marchant and Higgins 1993)	While the Project site offers a mosaic of vegetation types, this species is generally found closer to the coast in areas with permanent water. The Project will not disturb its favoured habitat and is unlikely have any adverse impacts on this species / Low Potential
<i>Falco hypoleucos</i>	Grey Falcon	Migratory	Near Threatened	The Grey Falcon is found over much of arid and semi-arid Australia, usually observed in lightly timbered country, especially stony plains and lightly timbered acacia shrublands (Morcombe 2002). Little else is known of the species or its movements	Given the availability of similar habitat in the region, and the migratory status of the bird, it is unlikely the Project will have an adverse impact on the species if it does utilise the area / Low Potential



Scientific Name	Common Name	Conservation Status		Habitat	Notes / Likelihood of Presence on Project site
		EPBC Act	NC Act		
<i>Furina barnardi</i>	Yellow-naped Snake	Not Listed	Near Threatened	The Yellow-naped snake inhabits open forests, where it shelters under fallen timber and litter (Cogger 2000)	Despite active searches in areas of likely habitat, this species was not observed. Given the availability of similar habitat in the region it is unlikely the Project will have an adverse impact on the species if it does utilise the area / Moderate Potential
<i>Furina dunmalli</i>	Dunmall's Snake	Vulnerable	Vulnerable	This species is commonly found in the Brigalow Belt Region, including Belah, Brigalow and Cypress Pine communities	Extensive habitat searching and trapping for reptiles was undertaken, and no evidence of this species was detected during the survey. It is considered unlikely this species inhabits the Project site / Moderate Potential
<i>Grantiella picta</i>	Painted Honeyeater	Not Listed	Near Threatened	This species is found in forests, woodlands, dry scrublands, often with abundant mistletoe (Simpson and Day 2010)	Despite targeted bird surveys in areas of likely habitat, this species was not identified within the Project site. Given the availability of similar habitat in the region, it is unlikely the Project will have an adverse impact on the species if it does utilise the area / Low Potential
<i>Hermiaspis daemellii</i>	Grey Snake	Not Listed	Near Threatened	This species favours cracking soil areas of the Brigalow Belt (Wilson 2005), in dry sclerophyll forests and woodlands (Cogger 2000)	Despite active searches in areas of likely habitat, this species was not observed. Given the availability of similar habitat in the region it is unlikely the Project will have an adverse impact on the species if it does utilise the area / Moderate Potential



Scientific Name	Common Name	Conservation Status		Habitat	Notes / Likelihood of Presence on Project site
		EPBC Act	NC Act		
<i>Kerivoula papuensis</i>	Gold-tipped Bat	Not Listed	Near Threatened	The Gold-tipped Bat inhabits rainforests, and occasionally wet and dry sclerophyll forests, and is usually noted in dense vegetation close to creek lines (Menkhorst and Knight 2001)	Despite AnaBat™ recordings within riparian habitat over a range of conditions, this species was not identified within the Project area. This species is generally inhabits the coastline / Unlikely
<i>Lasiorhinus krefftii</i>	Northern Hairy-nosed Wombat	Endangered	Endangered	The last known colony of Northern Hairy-nosed Wombats is now restricted to 300 ha in Epping Forest National Park in central Queensland. The Northern Hairy-nosed Wombat occurs along an ancient water course in the park where the soil is sandy and dry (DEWHA, 2009)	Despite active searches in areas of likely habitat, this species was not observed. This species is only known to inhabit one centralised location / Unlikely
<i>Lathamus discolor</i>	Swift Parrot	Endangered	Endangered	The Swift Parrot inhabits forests and woodlands with flowering trees (Morcombe 2002). It breeds only in Tasmania, and migrates to mainland Australia in autumn (Higgins 1999). It has been recorded in the Central Highlands region 3 times	This species has not been seen during any of the field surveys conducted by AARC to date. Migratory birds vary their habitat use in response to variations in climatic conditions and the subsequent spatial and temporal patterns of food productivity. It is therefore considered that, even if the species was observed within the Project area, it would be only transiently during migration, and the Project would not have any impact on breeding populations or habitats / Unlikely



Scientific Name	Common Name	Conservation Status		Habitat	Notes / Likelihood of Presence on Project site
		EPBC Act	NC Act		
<i>Lerista allanae</i>	Allan's Lerista	Endangered	Endangered	Allan's Lerista is endemic to black soils of the Brigalow Belt at Clermont, Logan Downs Station, and Retro Station, with the most recent specimen being collected in 1960 (Wilson 2005). It is possible that cultivation and grazing have led to their decline	Despite active searches in areas of likely habitat, this species was not observed. This species is poorly known, there have not been any recent sightings of the species, and the area is currently grazed by cattle. It is therefore considered unlikely that the species is present in the Project area / Unlikely
<i>Lewinia pectoralis</i>	Lewin's Rail	Not Listed	Near Threatened	This species inhabits swamps, lakes, tidal creeks, salt marshes, lush wet pasture, or paperbark and other swamp woodlands (Simpson and Day 2010)	Suitable habitat occurs on the Project site however given the species range (majority of eastern and southern coast of Australia) and the availability of similar habitat in the region it is unlikely the Project will adversely affect it / Unlikely
<i>Lophoictinia isura</i>	Square-tailed Kite	Migratory	Near Threatened	This species is found in a range of habitats including woodlands dominated by Eucalypts and Pandanus, gallery forests, and heaths (Simpson and Day 2010). Appears to occupy large hunting ranges of more than 100 km ² (DECC 2005).	Suitable habitat occurs on the Project site however given the mobility of the species, the availability of similar habitat in the region and large hunting ranges of individual birds, it is unlikely the Project will adversely affect the Square-tailed Kite population / Unlikely



Scientific Name	Common Name	Conservation Status		Habitat	Notes / Likelihood of Presence on Project site
		EPBC Act	NC Act		
<i>Macroderma gigas</i>	Ghost Bat	Not Listed	Vulnerable	The Ghost Bat requires undisturbed roost caves or mineshafts, which are usually complex systems with multiple openings (Menkhorst and Knight 2001)	Roosting habitat required by the species is not present within the Project area. Therefore it is considered unlikely that the species would frequent the Project site, and there will be no impact from the Project on the species / Low Potential
<i>Macronectes giganteus</i>	Southern Giant-petrel	Endangered	Endangered	This species is marine, over open seas and inshore waters. It favours the edge of the continental shelf and edge of ice-packs (Morcombe 2002)	The habitat required by the species is not present within the Project area. Therefore it is considered unlikely that the species would frequent the Project site, and there will be no impact from the Project on the species / Unlikely
<i>Melithreptus gularis</i>	Black-chinned Honeyeater	Not Listed	Near Threatened	The Black-chinned Honeyeater is often found in the upper levels of open forest and woodland dominated by box and ironbark eucalypts, also in riparian areas (Australian Museum, 2006)	Some suitable habitat may occur on the Project site however given the species range (widespread throughout both Queensland and Australia) and the availability of similar habitat in the region it is unlikely the Project will adversely affect it / Moderate Potential
<i>Neochmia phaeton</i> and <i>Neochmia phaeton phaeton</i>	Crimson Finch	Vulnerable	Endangered	The Crimson Finch is found in waterside vegetation including Pandanus, Cane grass, Paperbarks, and lush grasses (Simpson and Day 2010)	Riparian habitats similar to those occurring on the Project site are commonly represented in the wider area. It is considered unlikely that mining activities would result in adverse impacts on this species / Unlikely



Scientific Name	Common Name	Conservation Status		Habitat	Notes / Likelihood of Presence on Project site
		EPBC Act	NC Act		
<i>Neochmia ruficauda ruficauda</i>	Star Finch	Endangered (Eastern and Southern)	Endangered (Eastern)	This species occupies grassland or grassy woodland near water (Simpson and Day 2010)	Grassland and grassy woodland habitats similar to those occurring on the Project site are commonly represented in the wider area. It is considered unlikely that mining activities would result in adverse impacts on this species as a whole / Moderate Potential
<i>Neophema pulchella</i>	Turquoise Parrot	Not Listed	Near Threatened	The Turquoise Parrot inhabits woodland and open grassland, both natural and partly cleared (Simpson and Day 2010)	Grassland and grassy woodland habitats similar to those occurring on the Project site are commonly represented in the wider area. It is considered unlikely that mining activities would result in adverse impacts on this species as a whole / Unlikely
<i>Nettapus coromandelianus</i>	Cotton Pygmy-goose	Migratory	Near Threatened	This species is found in coastal wetlands, preferring deep permanent pools and swamps with abundant aquatic grasses (Simpson and Day 2010)	Wetland habitats similar to those occurring on the Project site are commonly represented in the wider area. Despite targeted bird surveying in areas of likely habitat, this species was not observed. It is considered unlikely that mining activities would result in adverse impacts on this species as a whole / Moderate Potential



Scientific Name	Common Name	Conservation Status		Habitat	Notes / Likelihood of Presence on Project site
		EPBC Act	NC Act		
<i>Ninox strenua</i>	Powerful Owl	Not Listed	Vulnerable	The Powerful Owl inhabits eucalypt forests, preferring the tall wet forests of ranges. They can also be found marginally in lower or drier forest that holds prey and large hollows (Simpson and Day 2010). The Powerful Owl requires large tracts of forest or woodland habitat but can occur in fragmented landscapes as well. Pairs of Powerful Owls are believed to have high fidelity to a small number of hollow-bearing nest trees and will defend a large home range of 400-1450 ha (DECC 2005)	Habitats similar to those occurring on the Project site are commonly represented in the wider area. This species was not observed. It is considered unlikely that mining activities would result in adverse impacts on this species as a whole / Unlikely
<i>Nyctophilus timoriensis</i> (South eastern form)	Greater Long-eared Bat, South-eastern Long-eared Bat	Vulnerable	Vulnerable	Found in a range of dry woodland and shrubland communities in arid and semi-arid areas (Menkhorst and Knight 2001). It roosts in tree hollows, crevices, and under loose bark	Habitats similar to those occurring on the Project site are commonly represented in the wider area. AnaBat™ recordings over a range of seasons and in a range of likely habitats did not detect any presence or potential presence of the species. It is considered unlikely that mining activities would result in adverse impacts on this species as a whole / Low Potential



Scientific Name	Common Name	Conservation Status		Habitat	Notes / Likelihood of Presence on Project site
		EPBC Act	NC Act		
<i>Onychogalea fraenata</i>	Bridled Nailtail Wallaby	Endangered	Endangered	The Bridled Nailtail Wallaby is confined to acacia-dominated woodland and shrubland in Taunton Scientific Reserve near Dingo, and Idalia National Park (Menkhorst and Knight 2001)	This species has shown up in the database searches as the search included the entire Central Highlands region. However, due to the known restricted range of the species, there is not considered to be any impacts of the Project to the wallaby populations in either National Park / Unlikely
<i>Paradelma orientalis</i>	Brigalow Scaly-foot	Vulnerable	Vulnerable	The Brigalow Scaly-foot inhabits the Brigalow Belt region on sandstone ridges, dry forests and woodlands (Wilson 2005).	The Project site was searched extensively for reptiles and the Brigalow Scaly-foot was not detected. If the species inhabits the Project site the availability of similar habitat in the surrounding region makes it unlikely the Project will adversely affect it / Moderate Potential
<i>Pedionomus torquatus</i>	Plains-wanderer	Vulnerable	Vulnerable	The Plains-wanderer inhabits natural open grasslands, treeless with patches of open ground, may be lightly grazed. Avoids country where grass is too tall or dense, or too sparse, low, or heavily grazed. Infrequent records of it being in low shrublands (Simpson and Day 2010)	This species was not detected during any of the AARC surveys within the Project site. Due to the grazing activities already undertaken on the Project site, the potential for the species to inhabit the area is considered low. If, however, the site was suitable for the species, there is habitat of similar disturbance in the region / Low Potential



Scientific Name	Common Name	Conservation Status		Habitat	Notes / Likelihood of Presence on Project site
		EPBC Act	NC Act		
<i>Phaethon rubricauda</i>	Red-tailed Tropicbird	Not Listed	Vulnerable	This species is recorded from tropical and subtropical seas, and is pelagic, often far from land (Simpson and Day 2010). A single record of the species from the Central Highlands region showed up in database searches	As the Project site is not coastal, it is considered highly unlikely that the species would utilise the site. There is not considered to be any risk to the species from the Project / Unlikely
<i>Podargus ocellatus plumiferus</i>	Plumed Frogmouth	Not Listed	Vulnerable	This race is found in patches of subtropical lowland rainforest (Simpson and Day 2010)	This habitat type is not found within the Project site, therefore it is considered unlikely that there would be any impact to the species from the Project / Unlikely
<i>Poephila cincta cincta</i>	Black-throated Finch (Southern subspecies)	Endangered	Endangered	The southern subspecies inhabits open woodland, scrubby plains, Pandanus flats with deep cover of grasses, never far from water	Due to the abundance of similar habitat types surrounding the Project site, the Project is unlikely to have impact on the species / Unlikely
<i>Psephotus pulcherrimus</i>	Paradise Parrot	Extinct	Extinct in the wild	Records of the Paradise Parrot indicate it favoured open grassy woodlands and scrubby grasslands on broad river valleys and plains where termite mounds are common (Morcombe 2002). Formally found near Duaringa, unconfirmed reports have been investigated and are currently thought to be incorrect (Olsen 2007)	Current data indicates that the species is extinct. Whilst habitat that the species would favour is found within the Project area, there is no information to suggest that the species is extant / Unlikely



Scientific Name	Common Name	Conservation Status		Habitat	Notes / Likelihood of Presence on Project site
		EPBC Act	NC Act		
<i>Rheodytes leukops</i>	Fitzroy River Turtle	Vulnerable	Vulnerable	This species is known only from the Fitzroy River and its tributaries (Cogger 2000). Requires rivers systems with fast-flowing, permanently water	The Project site is not part of the Fitzroy River drainage area. Additionally, the Project site does not offer any areas of the species preferred habitat (permanent fast-flowing water), therefore it is considered unlikely that the species would inhabit the Project site / Unlikely
<i>Rostratula australis</i>	Australian Painted Snipe	Vulnerable	Vulnerable	This species inhabits shallow inland wetlands, either permanent or temporary (Marchant and Higgins 1993)	Due to the abundance of similar habitat type surrounding the Project site, if the species is present in the region, the Project is unlikely to impact on the species / Low Potential
<i>Sminthopsis douglasi</i>	Julia Creek Dunnart	Endangered	Endangered	This species is restricted to the Mitchell Grass Downs country of northwest Queensland. It gets its name from the fact that until recently, all known individuals had been found within a short radius of Julia Creek and Richmond. During dry conditions, especially when ground cover is sparse, the Dunnart may shelter in cracks in the ground. After rain it likes the protection of low plant communities.	No suitable habitat exists for this species within or adjacent to the Project site / Unlikely



Scientific Name	Common Name	Conservation Status		Habitat	Notes / Likelihood of Presence on Project site
		EPBC Act	NC Act		
<i>Stictonetta naevosa</i>	Freckled Duck	Not Listed	Near Threatened	The Freckled Duck breeds in densely vegetated freshwater lakes, creeks, swamps, and floodwaters with thickest of <i>Melaleuca</i> spp., <i>Casuarina</i> spp., <i>Leptospermum</i> spp., or Cane grass and <i>Lignum</i> . After breeding, they move out to open waters (Morcombe 2002)	Habitat suitable for the species exists within the Project area; however no individuals of the species were noted during any of the surveys conducted by AARC. Due to the abundance of similar habitat type surrounding the Project site, if the species was present in the region, the Project is unlikely to impact on the species / Moderate Potential
<i>Strophurus taenicauda</i>	Golden-tailed Gecko	Not Listed	Near Threatened	This species is endemic to the southern Brigalow Belt in dry sclerophyll forests featuring a mix of Ironbark Eucalypts, Cypress Pine, and Brigalow (Wilson 2005)	The Project site has been searched extensively for reptile species, and no Golden-tailed Geckoes were observed / Low Potential
<i>Tadorna radjah</i>	Radjah Shelduck	Migratory / Marine	Near Threatened	During the dry season the bird flocks to pools and congregates on coastal waters, mangrove-lined river channels, tidal mudflats and beaches, or will remain inland on permanent lagoons and pools along major rivers and where deeper swamps remain on river floodplains. In the wet season the birds move from littoral habitat to the shallow margins of wetlands (Simpson and Day 2010)	Due to the migratory habits of the species, even though some habitat exists within the Project area, it is considered unlikely that the species would be impacted by the Project activities, as birds would relocate to similar habitat within the wider region / Moderate Potential



Scientific Name	Common Name	Conservation Status		Habitat	Notes / Likelihood of Presence on Project site
		EPBC Act	NC Act		
<i>Turnix melangaster</i>	Black-breasted Button-quail	Vulnerable	Vulnerable	This species is usually found in low-canopy, closed rainforest or monsoon forests vine thickets, and drier shrubby scrubs such as Brigalow thickets, where there is a deep leaf-litter (Simpson and Day 2010)	Patches of habitat suitable for the species exists within the Project area; however no individuals of the species were noted during any of the surveys conducted by AARC. Due to the abundance of similar habitat type surrounding the Project site, if the species was present in the region, the Project is unlikely to impact on the species / Unlikely



Appendix G: Migratory Birds of the Alpha Region



Scientific Name	Common Name	Status	Habitat	Timing	Observed on the Project site
<i>Anas supecillosa</i>	Pacific Black Duck	Migratory	Has a wide range throughout Australia and frequents all types of standing water.	Will visit the Project site during wet season when standing pools of water are common. As water availability decreases this species will move on.	Y
<i>Anthus novaeseelandiae</i>	Australian Pipit	Marine/ Migratory	Common in open country throughout much of Australia	Common throughout the year	Y
<i>Aquila audax</i>	Wedge-tailed Eagle	Migratory	Mixed eucalypt woodland	Common throughout the year	Y
<i>Ardea alba</i>	Great Egret	Marine/ Migratory	Wetlands, flooded pastures, dams, estuarine mudflats, mangroves, common, widespread	Most common in the wet season	Y
<i>Ardea intermedia</i>	Intermediate Egret	Marine/ Migratory	Wetlands, flooded fields	Most common in the wet season	Y
<i>Chenonetta jubata</i>	Wood Duck	Migratory	Grassland, open woodland, wetlands, floodplains, dams	More common in the wet season, may be found in large dams and other permanent water sources throughout the year.	Y



Scientific Name	Common Name	Status	Habitat	Timing	Observed on the Project site
<i>Anas gracilis</i>	Grey Teal	Migratory	Sheltered watered areas, timbered pools and river systems are favoured habitat (Birds in Backyards).	Very mobile during dry periods, possibly present on the Project site for most of the year.	Y
<i>Coracina novaehollandiae</i>	Black-faced Cuckoo-shrike	Marine/ Migratory	Most wooded habitat.	Partially nomadic, some northward migration (Birds in Backyards, 2010)	Y
<i>Elanus axillaris</i>	Black-shouldered Kite	Migratory	Open woodland, grassland, roadsides	Nomadic, populations may condense around mouse plagues	Y
<i>Euseyornis melanops</i>	Black-fronted Dotterel	Migratory	Shallow wetlands, lakes, rivers	Generally resident although occasionally travelling to favourable feeding areas.	Y
<i>Eurystomus orientalis</i>	Dollarbird	Marine / Migratory	Woodlands, inland watercourses, open country with scattered trees	The Dollarbird arrives in northern and eastern Australia in September each year to breed. In March or April the birds return to New Guinea (Birds in Backyards, 2010)	Y
<i>Falco berigora</i>	Brown Falcon	Migratory	Prefers grassland, often with scattered trees or perches	May move throughout the year to areas where conditions are favourable	Y
<i>Falco cenchroides</i>	Nankeen Kestrel	Marine/ Migratory	Lightly wooded areas	Some birds are partially migratory, others disperse in response to the availability of food and some are largely resident.	Y
<i>Falco longipennis</i>	Australian Hobby	Migratory	Woodland	Possibly on the Project site throughout the year depending on conditions	Y



Scientific Name	Common Name	Status	Habitat	Timing	Observed on the Project site
<i>Grus rubicunda</i>	Brolga	Migratory	Grassland, open wetlands	Partly migratory, some northward migration outside of breeding season (Feb to May) (Birds in Backyards, 2010)	Y
<i>Haliastur sphenurus</i>	Whistling Kite	Marine/ Migratory	Woodlands, open country and wetlands	Partially migratory, generally resident in northern Australia	Y
<i>Merops ornatus</i>	Rainbow Bee Eater	Migratory	Non-remnant grassland, commonly found during the summer in un-forested areas in most of southern Australia	Migrates north during the winter into northern Australia, New Guinea, and some of the southern islands of Indonesia.	Y
<i>Nycticorax caledonicus</i>	Nankeen Night Heron	Marine/ Migratory	Vegetated wetlands, riparian areas, swamps, floodplains	Nomadic in response to rainfall	Y
<i>Pelecanus conspicillatus</i>	Australian Pelican	Marine/ Migratory	Wetlands, dams	Wet season	Y
<i>Threskiornis molucca</i>	White Ibis	Marine/ Migratory	Wetlands, grassland	Nomadic, moves to areas with favourable conditions	Y
<i>Todiramphus macleayii</i>	Forest Kingfisher	Marine / Migratory	Open sclerophyll forest with a patchy or sparse understorey. They favour watercourse vegetation and the margins of swamps and billabongs	Likely to inhabit Project site year-round	Y
<i>Todiramphus sanctus</i>	Sacred Kingfisher	Marine/ Migratory	Woodland, tall open forest	Likely found on the Project site throughout the year	Y



Scientific Name	Common Name	Status	Habitat	Timing	Observed on the Project site
<i>Petrochelidon nigricans</i>	Tree Martin	Migratory	Open woodlands and watercourses	Seasonal movement northward in winter months. Likely to be found on the Project site throughout the year.	Y
<i>Vanellus miles</i>	Masked Lapwing	Migratory	Non-remnant grassland / Brigalow creek	Likely found on the Project site throughout the year	Y
<i>Vanellus tricolor</i>	Banded Lapwing	Migratory	Non-remnant grassland	Likely found on the Project site throughout the year	Y
<i>Accipiter cirrocephalus</i>	Collared Sparrowhawk	Migratory	Widespread in arid areas and wet habitat	Generally resident and partly migratory but movements are not well known	N
<i>Accipiter novaehollandiae</i>	Grey Goshawk	Migratory, Rare NC Act	Mature, tall forests with overhead canopy and open understory	Limited habitat is available on the Project site	N
<i>Anthochaera phrygia</i>	Regent Honeyeater	Migratory, Endangered (NCWR & EPBC)	Prefers Eucalypt forest and woodlands	Strongly nomadic, mostly confined to NSW and VIC	N
<i>Apus pacificus</i>	Fork-tailed Swift	Marine	Found in varied habitat, rainforest to semi-desert.	A summer migrant found in Australia from October to April.	N
<i>Ardeola ibis</i>	Cattle Egret	Marine/ Migratory	Wet pastures with tall grass, open wetlands and margins.	Partial migrant, most likely found on the Project site in the wet season.	N
<i>Cacomantis variolosus</i>	Pallid Cuckoo	Marine	Open country, tends to avoid dense, closed vegetation.	Common in northern Australia, likely found on the Project site throughout the year.	N



Scientific Name	Common Name	Status	Habitat	Timing	Observed on the Project site
<i>Chalcites basalis</i>	Horsfield's Bronze-cuckoo	Marine	Open forests, woodland, roadsides.	Partial migrant, breeds in south-eastern Australia during winter and spring. Resident in northern Australia (Birds in Backyards, 2010)	N
<i>Chrysococcyx lucidus</i>	Shining Bronze-cuckoo	Marine	Wet dense rainforest, eucalypt forest, woodlands.	Summer migrant (Birds in Backyards, 2010).	N
<i>Erythrotriorchis radiates</i>	Red Goshawk	Migratory, Endangered NCWR, Vulnerable EPBC	Woodland or forest with a mosaic of vegetation.	Generally occurs over eastern QLD and northern Australia, possibly found on the Project site in the wet season (DERM, 2010)	N
<i>Falco hypoleucos</i>	Grey Falcon	Migratory, Rare NC Act	Shrubland, grassland and wooded watercourses in arid and semi-arid regions. Also occurs near wetlands where surface water attracts prey. (DECC 2005)	Mostly nomadic, possibly resident in moist inland areas. Inland birds may overwinter in Northern Australia (SAAL NRM, 2007).	N
<i>Gallinago hardwickii</i>	Latham's Snipe, Japanese Snipe	Marine/ Migratory	Low vegetation around wetlands in shallows, sedges, reeds, heaths, salt marsh and irrigated crops.	Migrates to Australia in September, most leave Queensland by mid-April (Birds in Backyards, 2010).	N
<i>Haliaeetus leucogaster</i>	White-bellied Sea-Eagle	Marine/ Migratory	Inhabits seasonally flooded swamps, lagoons and floodplains.	Possibly present on site during the wet season.	N



Scientific Name	Common Name	Status	Habitat	Timing	Observed on the Project site
<i>Hirundapus caudacutus</i>	White-throated Needletail	Marine/ Migratory	Habitat includes high open spaces above almost any habitat.	Migrates to Australia in early October, returning to Asia in March, mostly departed by April.	N
<i>Lathamus discolor</i>	Swift Parrot	Marine, Endangered NC Act and EPBC	Forests and woodlands with flowering trees.	Breeds in Tasmania and migrates north in winter, most commonly into VIC and NSW. Less frequently into central Queensland.	N
<i>Lophoictinia isura</i>	Square-tailed Kite	Migratory, Rare NC Act	Open wooded areas throughout mainland Australia. Also found along inland timbered watercourses	Possibly on the Project site throughout the year depending on conditions	N
<i>Nettapus pulchellus</i>	Cotton Pygmy-goose	Migratory, Rare NC Act	Lakes, lagoon, swamps and dams, particularly with abundant aquatic vegetation.	Suitable habitat may occur on the Project site during the wet season	N
<i>Numenius minutus</i>	Little Curlew, Little Whimbrel	Marine/ Migratory	Found in dry open grasslands in wet season.	Suitable habitat is likely available during the wet season.	N
<i>Oxyura australis</i>	Radjah Shelduck	Migratory, Marine, Rare NC Act	More common further north in Cape York and Northern Territory, occupies wetlands and estuaries in monsoon regions.	Inhabits coastal areas during dry season, unlikely to travel as far as the Project site during the wet season.	N
<i>Rostratula benghalensis</i>	Painted Snipe	Marine/ Migratory Vulnerable NCWR & EPBC	Well vegetated shallow inland wetlands	Can be resident or nomadic, may appear on the Project site in good wet seasons.	N



Scientific Name	Common Name	Status	Habitat	Timing	Observed on the Project site
<i>Scythrops novaehollandiae</i>	Channel-billed Cuckoo	Marine	Rainforest, monsoon forest, eucalypt forest and woodlands, river-edge thickets, swamp woodlands.	Migrates to Australia from August, leaves by March.	N



Appendix H: Secondary and Quaternary Flora Transect Pro-formas



AARC FLORA SURVEY PROFORMA Secondary Transect

Project	
Date	
Recorder	
Site No.	
GPS Coordinates	
Site Photo No.	

Locality	
Site Context	
RE	
General Notes	

Altitude	Erosion Pattern	Slope (°)	Aspect

Soil Description	
Geology	
Additional Soil Notes	

Disturbance Severity (1 = minor 2 = moderate 3 = severe)	
Storm Damage	
Road Works	
Fire	
Clearing	
Grazing	
Weeds	
Other	



Height (m)	Emergent	T1	T2	T3	S1	S2	Ground

Stem Cover (Bitterlich Method)	
---------------------------------------	--

Species Stem Cover (50x10m) – count all woody stems	
Emergent	
T1	
T2	
T3	
S1	
S2	
S3	

Additional Notes (sketch if required)

Crown Cover Calc.	0m	5m	10m	15m	20m	25m	30m	35m	40m	45m



D = Dominant, CD = Co-Dominant, A = Associated, O = Occasional

Dominance (D, CD, A, O or ✓)							Species	Sample #	Photo #	Q1	Q2	Q3	Q4	Q5
E	T1	T2	T3	S1	S2	G								
							Bare							
							Litter							
							Rock							



Dominance (D, CD, A, O or ✓)							Species	Sample #	Photo #	Q1	Q2	Q3	Q4	Q5
E	T1	T2	T3	S1	S2	G								



AARC FLORA SURVEY PROFORMA Quaternary Transect

Project	
Date	
Recorder	
Site No.	
GPS Coordinates	
Site Photo No.	
RE	
Notes	

Dominance (D, CD, O, A)	Species	Sample No.	Photo No.



Appendix I: Fauna Trapsite Descriptions



Transect 1 (Photo Plate 8) was located at a riparian site along Sandy Creek; the dominant vegetation consisted of Silver-leaved Ironbark (*Eucalyptus melanophloia*), Moreton Bay Ash (*Eucalyptus tessellaris*) and Dallachy's Gum (*Corymbia dallachiana*) trees. This site was established in the initial dry season survey and replicated in the wet season. Trapping at this site involved a pitfall line, Elliott traps and funnel traps.



Photo Plate 8 Fauna Transect 1

Transect 2 (Photo Plate 9) was located in Non-remnant Grassland where the dominant vegetation was Buffel Grass (*Pennisetum ciliare*) and occasional wattle (*Acacia* sp.) regrowth. This site was surveyed during the dry season. Trapping at this site involved a pitfall line, Elliott traps and funnel traps.



Photo Plate 9 Fauna Transect 2

Transect 3 was located in a Brigalow (*Acacia harpophylla*) Open Woodland with a dense understory of shrubs. This site was surveyed during the dry season. Trapping at this site involved a pitfall line, Elliott traps and funnels traps.

Transect 4 was located in a co-dominant Brigalow (*Acacia harpophylla*) and Dawson Gum (*Eucalyptus cambageana*) Woodland with moderate amounts of shrubs and grasses. This site was surveyed during a dry season survey. Trapping at this site involved a pitfall line and Elliott traps.

Transect 5 (Photo Plate 10) was located within a Silver-leaved Ironbark (*Eucalyptus melanophloia*) Woodland with a Quinine Tree (*Petalostigma pubescens*) dominated understory and sparse groundcover. This site was surveyed in the dry season. Trapping at this site involved a pitfall line and Elliott traps.



Photo Plate 10 Fauna Transect 5

Transect 6 (Photo Plate 11) was located in a White Cypress Pine (*Callitris glaucophylla*) Woodland, with a low density of shrubs and groundcover. This site was replicated in the dry and wet season. Trapping at this site involved a pitfall line, funnel traps, cage traps and Elliott traps.



Photo Plate 11 Fauna Transect 6

Transect 7 (Photo Plate 12) was located in a riparian site with a mixed canopy of Bauhinia (*Lysiphyllum carronii*), River Red Gum (*Eucalyptus camaldulensis*), Poplar Box (*Eucalyptus populnea*) and Brigalow (*Acacia harpophylla*), and was surveyed in the dry season and replicated in the wet season. Trapping at this site included a funnel traps, Elliott traps and cage traps.



Photo Plate 12 Fauna Transect 7

Transect 8 (Photo Plate 13) was located within a Silver-leaved Ironbark (*Eucalyptus melanophloia*) Woodland, with a shrubby understorey of Currant Bush (*Carissa ovata*) and moderate grass layer. It was established and surveyed in the dry season. Trapping at this site involved a pitfall line, Elliott traps and funnel traps.



Photo Plate 13 Fauna Transect 8

Transect 9 (Photo Plate 14) was located in a Riparian Woodland with an overstorey dominated by Brigalow (*Acacia arpophylla*) and associated Poplar Box (*Eucalyptus populnea*). This transect was established and surveyed in the wet season. Trapping at this site involved a pitfall line, Elliott traps and funnel traps.



Photo Plate 14 Fauna Transect 9

Transect 10 (Photo Plate 15) was located in a Silver-leaved Ironbark (*Eucalyptus melanophloia*) Open Woodland. Traps were located in close proximity to fallen timber in which a number of hollows had formed. This transect was established and surveyed in the wet season. Trapping at this site involved a pitfall line, Elliott traps and funnel traps.



Photo Plate 15 Fauna Transect 10

Transect 11 (Photo Plate 16) was located in a Silver-leaved Ironbark (*Eucalyptus melanophloia*) Dominated Woodland. Associated species include Poplar Box (*Eucalyptus populnea*) and a shrub layer dominated by the Quinine Tree (*Petalostigma pubescens*). This transect was established and surveyed in the wet season. Trapping at this site involved a pitfall line, funnel, Elliott and cage traps.



Photo Plate 16 Fauna Transect 11

Transect 12 (Photo Plate 17) was located in a Silver-leaved Ironbark (*Eucalyptus melanophloia*) Open Woodland with areas of large fallen timber. This transect was established and surveyed in the wet season. This transect consisted of cage and funnel traps.



Photo Plate 17 Fauna Transect 12

Transect 13 was located in a Weeping Bottlebrush (*Melaleuca tamariscina*) Heathland. This transect was established and surveyed in the wet season. This transect consisted of Elliott traps and cage traps.

Transect 14 (Photo Plate 18) was established and surveyed in the wet season in non-remnant grassland dominated by Buffel grass (*Pennisetum ciliare*). Trapping at this site involved a pitfall line, funnel traps and Elliott traps.



Photo Plate 18 Fauna Transect 14

Transect 15 (Photo Plate 19) was located in a Weeping Bottlebrush (*Melaleuca tamariscina*) Heathland. This transect was established and surveyed in the dry season and consisted of a pitfall line, funnel traps, Elliott traps and cage traps.



Photo Plate 19 Fauna Transect 15

Transect 16 (Photo Plate 20) was established in a Poplar Box (*Eucalyptus populnea*) Woodland on an undulating plain. Dry season trapping included a pitfall line, Elliott traps, funnel traps and cage traps.



Photo Plate 20 Fauna Transect 16

Transect 17 (Photo Plate 21) was established upslope on skeletal soils in a Lancewood (*Acacia shirleyi*) Woodland. This transect was established and surveyed in the dry season and included Elliott traps, cage traps and funnel traps.



Photo Plate 21 Fauna Transect 17

Transect 18 (Photo Plate 22) was established in a Queensland Yellowjacket (*Eucalyptus similis*) Open Woodland. This transect included Elliott traps, funnel traps and cage traps.



Photo Plate 22 Fauna Transect 18

Transect 19 (Photo Plate 23) was established in a sandy riparian creek line, which has been listed by DERM as an endangered regional ecosystem. Tree species included River Red Gum (*Eucalyptus camaldulensis*), Poplar Box (*Eucalyptus populnea*), White Cypress Pine (*Callitris glaucophylla*) and Brigalow (*Acacia harpophylla*), with a dense grass layer. Trapping entailed a pitfall line, cage traps, funnel traps, Elliott traps and AnaBat™.



Photo Plate 23 Fauna Transect 19

Transect 20 (Photo Plate 24) was located on a sandy flat plain, with Silver-leaved Ironbark (*Eucalyptus melanophloia*), Lancewood (*Acacia shirleyi*) and Rough-leaved Bloodwood (*Corymbia setosa*) Open Woodland, with a shrubby understory. Trapping included a pitfall line, funnel traps, Elliott traps, cage traps and an AnaBat™.



Photo Plate 24 Fauna Transect 20

Transect 21 (Photo Plate 25) was located in a narrow riparian creek. Substrate was a mix of sand and rock. Trapping included a pitfall line, Elliott traps, cage traps and funnels.



Photo Plate 25 Fauna Transect 21

Transect 22 (Photo Plate 26) was located directly adjacent to a permanent lagoon. Large River Red Gum (*Eucalyptus camaldulensis*) trees were fringing the water body. Trapping efforts included Elliott traps, funnel traps, cage traps and two AnaBat™ devices.



Photo Plate 26 Fauna Transect 22

Transect 23 (Photo Plate 27) was located in a Brigalow (*Acacia harpophylla*) Open Woodland with a moderate density of fallen timber and hollow logs. A fire had occurred recently in the adjacent Non-remnant grassland community. Trapping efforts included a pitfall line, Elliott traps, funnel traps and cage traps.



Photo Plate 27 Fauna Transect 23

Transect 24 (Photo Plate 28) was located in a narrow riparian area, with Poplar Box (*Eucalyptus populnea*), Brigalow (*Acacia harpophylla*) and False Sandalwood (*Eremophila mitchelli*). This area is used as a stock watering hole. Trapping efforts included a pitfall line, Elliott traps, cage traps and funnel traps.



Photo Plate 28 Fauna Transect 24

Transect 25 (Photo Plate 29) was located in a low open woodland of Rough-leaved Bloodwood (*Corymbia setosa*) and Bottlebrush (*Melaleuca nervosa*) on undulating hills. Fallen timber and grass tussocks were present. Trapping included Elliott traps, cage traps and funnel traps.



Photo Plate 29 Fauna Transect 25

Transect 26 (Photo Plate 30) was located within a fringing riparian area, with a dense grass and shrub layer. No hollows were present in the Rustyjacket (*Corymbia leichhardtii*) trees. Trapping included a pitfall line, Elliott traps, cage traps, funnel traps and an AnaBat™.



Photo Plate 30 Fauna Transect 26

Transect 27 (Photo Plate 31) was established in a large River Red Gum (*Eucalyptus camaldulensis*) riparian area along Splitter Creek. Trapping efforts included a pitfall line, Elliott traps, funnel traps, cage traps and AnaBat™.



Photo Plate 31 Fauna Transect 27

Transect 28 (Photo Plate 32) was located in a Brigalow (*Acacia harpophylla*) and River Red Gum (*Eucalyptus camaldulensis*) riparian area, with a dense grass layer on creek banks. Trapping included a pitfall line, cage traps, funnel traps and Elliott traps.



Photo Plate 32 Fauna Transect 28

Transect 29 (Photo Plate 33) was located along a riparian area with surrounding fallen timber and tree hollows. Trapping efforts included a pitfall line, funnel traps, cage traps, Elliott traps and an AnaBat™.



Photo Plate 33 Fauna Transect 29

Transect 30 (Photo Plate 34) was located in a dense woodland of Thozets Box (*Eucalyptus thozetiana*) with a shrubby understory of False Sandalwood (*Eremophila mitchelli*). Trapping efforts included Elliott traps, funnel traps, cage traps and an AnaBat™.



Photo Plate 34 Fauna Transect 30

Transect 31 (Photo Plate 35) was located in a sandy plain with an open woodland dominated by Silver-leaved Ironbark (*Eucalyptus melanophloia*) and a dense grass later of Soft Spinifex (*Triodia pungens*) and Buck Spinifex (*Triodia mitchelli*). Trapping included a pitfall line, cage traps, funnel traps, Elliott traps and an AnaBat™.



Photo Plate 35 Fauna Transect 31

Transect 32 was located along Well Creek, in a section with multiple channels and a wide floodplain. Faunal habitat included tree hollows, fallen timber and a densely grassed understory. Trapping efforts included a pitfall line, Elliott traps, funnel traps, cage traps and an AnaBat™.

Transect 33 (Photo Plate 36) was located in a Lancewood (*Acacia shirleyi*) Woodland with a high density of fallen timber and tussock grass species. Trapping included Elliott traps, funnel traps, cage traps and an AnaBat™.



Photo Plate 36 Fauna Transect 33

Transect 34 (Photo Plate 37) was located in a small River Red Gum (*Eucalyptus camaldulensis*) drainage line within a Carbeen Moreton Bay Ash (*Corymbia tessellaris*) floodplain. The trapping regime included a pitfall line, Elliott traps, funnel traps, cage traps and an AnaBat™.



Photo Plate 37 Fauna Transect 34

Transect 35 (Photo Plate 38) was located on a sandy plain inhabited by Poplar Box (*Eucalyptus populnea*) in an open woodland. Fallen timber and small tree hollows were present. Trapping included Elliott traps, cage traps and funnel traps.



Photo Plate 38 Fauna Transect 35

Transect 36 (Photo Plate 39) was established with a Weeping Bottlebrush (*Melaleuca tamariscina*) Heathland, with pisolitic, pebbly substrate. This site included Elliott traps, funnel traps, cage traps and an AnaBat™.



Photo Plate 39 Fauna Transect 36