



# Taroborah Coal Project

## Environmental Impact Statement

### Section 5 – Matters of National Environmental Significance

Prepared for:  
**Shenhua International Group Pty Ltd**





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## LIST OF ABBREVIATIONS

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AARC	-	AustralAsian Resource Consultants Pty Ltd
AHD	-	Australian Height Datum
BPA	-	Biodiversity Prioritisation Assessment
BVG	-	Broad Vegetation Groups
CAMBA	-	China Australia Migratory Bird Agreement
CPP	-	Coal Processing Plant
cm	-	centimetres
DMC	-	Dense Medium Cyclones
DNRM	-	Department of Natural Resources and Mines
DoE	-	Department of the Environment
EHP	-	Department of Environment and Heritage Protection
EIS	-	Environmental Impact Statement
EP Act	-	<i>Environmental Protection Act 1994</i>
EPBC Act	-	<i>Environment Protection and Biodiversity Conservation Act 1999</i>
EPC	-	Exploration Permit for Coal
GDE	-	Groundwater Dependent Ecosystems
ha	-	Hectare
IQQM	-	Integrated Quantity and Quality Model
JAMBA	-	Japan Australia Migratory Bird Agreement
kL	-	kilolitres
km	-	kilometre
m	-	metre
MDL	-	Mineral Development License
ML/day	-	megalitres per day

MNES	-	Matters of National Environmental Significance
Mt	-	million tonnes
Mtpa	-	Million tonnes per annum
NC Act	-	<i>Nature Conservation Act 1992</i>
PMST	-	Protected Matters Search Tool
QEOP	-	Queensland Environmental Offsets Policy 2014
QR	-	Queensland Rail
RE	-	Regional Ecosystem
REDD	-	Regional Ecosystem Description Database
ROKAMBA	-	Republic of Korea – Australia Migratory Bird Agreement
ROM	-	run of mine
Shenhua	-	Shenhua International Group Pty Ltd
SIGNAL	-	Stream Invertebrate Grade Number – Average Level
SPRAT	-	Species Profile and Threats Database
t	-	tonne
tph	-	tonnes per hour
VM Act	-	<i>Vegetation Management Act 1999</i>
WICET	-	Wiggins Island Coal Export Terminal



## 5.0 MATTERS OF NATIONAL ENVIRONMENTAL SIGNIFICANCE

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### 5.1 INTRODUCTION

The Taraborah Coal Project is located in the Bowen Basin approximately 22 kilometres (km) west of the town of Emerald, Central Queensland, Australia. In terms of local administration, the Project is located entirely within the Central Highlands Regional Council local authority area. Thermal coal exploration activities for the Project were initially conducted within exploration permit for coal (EPC) 1011, and subsequently mineral development license (MDL) 467.

The combined opencut and underground mining operations are expected to produce up to 5.75 million tonnes per annum (Mtpa) of run of mine (ROM) coal and 5.73 Mtpa of product coal for export. The mine life is estimated at approximately 22 years, including a 9 month initial construction period and a 15-month decommissioning period.

The Project Proponent is Shenhua International Group Pty Ltd (Shenhua, ABN 62 118 366 591), a Brisbane-based subsidiary of the Henan Shenhua Group Co Ltd. The Project's mining tenements are held in the name of Shenhua, a coal exploration and development company.

Contact details for the Proponent are as follows:

<b>Proponent:</b>	Shenhua International Group Pty Ltd
<b>Street Address:</b>	Level 9, Suite 7
<b>And Postal Address</b>	320 Adelaide Street Brisbane, QLD 4000
<b>Phone:</b>	(07) 3221 9033
<b>Facsimile:</b>	(07) 3221 9055

Shenhua does not have, nor is aware of, any proceedings against it under either State or Commonwealth law for the protection of the environment or the conservation and sustainable use of natural resources.

Initial exploration activities over the Project's opencut area were undertaken by Resolve Geo Pty Ltd during 2006 (500 metre (m) spacing over the opencut area). Further exploration in the form of drilling and coal sampling (Limit of oxidation at 50 m spacing for the opencut area and 500 m spacing for the underground) were conducted across the Project tenement by IMC Mining Group in 2008 and 2009. The results of these exploration activities have indicated 151 million tonnes (Mt) of Measured Resource, 37 Mt of Indicated Resource, and 14 Mt of Inferred Resource over the target opencut and underground areas of MDL 467.

The following Projects are also being developed or have been developed within a 60 to 70 km radius of the Project site (Department of Natural Resources and Mines (DNRM) 2012):

- Operating coal mines – Minerva, Ensham, Oaky Creek, Gregory and Kestrel;
- Coal projects – Valeria, Wilton and Teresa; and



- Known coal deposit > 40 Mt – Athena.

It is not anticipated that the Project will have a significant impact upon the development and operations of the above coal projects and mines.

The Project is currently progressing through the EIS process to obtain approval for the Project and acquire an Environmental Authority for the proposed thermal coal mine.

A copy of Shenhua's environmental policy and framework are presented in Figure 5.1.

The main alternative to development of the Project is continued use of the land as low-intensity cattle grazing and rain-fed cropping. Since the Project site has already been used for agricultural activities over many years, continued use of the land for these purposes is not anticipated to have any further impacts upon MNES, unless the land areas and / or methods employed for cropping and low-intensity cattle grazing change.

The mine layout plan has been designed to avoid significant MNES impacts, although the opencut mine will create limited areas of permanent disturbance by the eastern haul road and visual amenity bund. Sectors of the Project site that have been disturbed will be progressively rehabilitated and the associated impacts upon MNES will therefore be minimised. The process of longwall underground mining will result in controlled surface subsidence and any residual impacts upon MNES will be addressed via the Queensland and Commonwealth environmental offsets policies.

The consequences of not proceeding with this action are summarised as follows:

- The significant financial returns (based upon current market prices and a continuing global demand for coal) for both the State and Commonwealth Governments that would arise from the Project's coal production would not occur;
- Leaving this thermal coal mine undeveloped would result in a potential loss of Australian coal production, thereby allowing international competitors to supply the thermal coal market instead;
- The economic development and business opportunities associated with this Project at both State and Commonwealth levels would not eventuate;
- Anticipated local employment and financial benefits for the nearest town of Emerald, and other local communities would not transpire; and
- The proposed rail system modifications between Taraborah and Burngrove would not occur, leaving this section of the rail system under-developed.

The following activities and mechanisms have been and will be employed to ensure that both interested and affected parties are effectively consulted on the Project:

- Provision of Project details to interested and affected parties via the Terms of Reference Notice;
- Face-to-face consultation has been undertaken with directly affected landholders;
- Community information session for interested and affected parties held in Emerald attracting



some 100 attendees;

- Specific initiatives included mail distribution of a package containing a project fact sheet and reply-paid questionnaire to potentially affected stakeholders. Additional copies of the information package were delivered personally to business owners, state government offices, local government representatives and general community members;
- Production of a Social Impact Assessment and Social Impact Management Plan for inclusion in the EIS;
- Production of a quarterly Project Newsletter for distribution to interested and affected parties; and
- Liaison with Local and State Government departments to discuss Project details, potential impacts and impact mitigation strategies.

This EIS section has been produced to address MNES which may be impacted by Project activities.



## **Shenhua International Group – Environmental Policy: Taroborah Coal Project**

Shenhua International Group Pty Ltd aims to be a leader in the environmental management of coal mining for the Taroborah Coal Project, by minimising our impact upon the natural environment. Such minimisation will be achieved via appropriate planning, education, training and ongoing land rehabilitation.

The Company will adopt best practices and methods throughout their operations and seek a co-operative relationship with both the local community and regulatory authorities.

In order to achieve this aim, the Company will employ the following:

- Comply with all relevant environmental policies and legislation;
- Strive for continuous improvement in our environmental performance and continually assess and monitor that performance;
- Identify and manage the environmental risks associated with Project operations;
- Train our staff to increase their awareness of the environment and environmental issues that are associated with coal mining operations;
- Progressively rehabilitate areas of land as they become available;
- Design and implement operations to minimise environmental impacts, with a focus on limiting both land clearance and waste generation;
- Actively pursue energy and water efficient modes of operation; and
- Undertake environmental monitoring to ensure that coal mining operations do not result in adverse environmental impacts.

**Figure 5.1 Corporate Environmental Policy**



### 5.1.1 Statutory Context

On the 19<sup>th</sup> January 2012 the Project proposal was referred to the Australian Government Environment Minister (the Minister) at the Commonwealth of the Environment (DoE) for assessment under the EPBC Act.

The EPBC Act prescribes the Commonwealth's role in environmental assessment, biodiversity conservation and management of protected areas. Nine MNES are included in this Act and an assessment is required for any Project activity (termed a controlled action) that has, or is likely to have a significant impact upon any of these matters.

The nine MNES which are protected by Part 3 of the EPBC Act are outlined below:

- World Heritage properties (sections 12 and 15A);
- National Heritage places (sections 15B and 15C);
- Ramsar wetlands of international importance (sections 16 and 17B);
- Listed threatened species and communities (sections 18 and 18A);
- Listed migratory species (sections 20 and 20A);
- Nuclear actions (sections 21 and 22A);
- A water resource, in relation to coal seam gas development and large coal mining development (sections 24D and 24E);
- Commonwealth marine environment (sections 23 and 24A); and
- Great Barrier Reef Marine Park (sections 24B and 24C).

On the 20<sup>th</sup> February 2012 the Taraborah Coal Project was declared a controlled action by the Australian Government Environment Minister under Section 75 of the EPBC Act (Decision Notice Reference: EPBC 2012/6262) for listed threatened species and communities, as well as listed migratory species. Following this, sections 24D and 24E were included as an additional, new MNES. A notice dated the 17<sup>th</sup> November 2013 was provided, stating impacts from large scale coal projects on water resources will also be a controlling provision for the Project. The Part 3 Division 1 controlling provisions of this Act that are relevant to the Project are as follows:

- Sections 18 and 18A (listed threatened species and communities);
- Sections 20 and 20A (listed migratory species); and
- Sections 24D and 24E (water resources).

The State's EIS process (as prescribed by the *Environmental Protection Act 1994* (EP Act)) has been accredited for the assessment under Part 8 Section 87 of the EPBC Act, in accordance with the *Bilateral Agreement between the Commonwealth of Australia and the State of Queensland* (2004). Therefore, this Project will be assessed via the State EIS process.

### 5.1.1.1 Listed Threatened Species

Section 179 of the EPBC Act defines the categories of listed threatened species and ecological communities that are addressed by this Act, these categories are presented in Table 5.1.

**Table 5.1 Categories of threatened species and ecological communities listed under the EPBC Act**

CATEGORIES OF THREATENED SPECIES	
E	Endangered
V	Vulnerable
XW	Extinct in the Wild
EX	Extinct *
CE	Critically Endangered
CD	Conservation Dependant *
CATEGORIES OF ECOLOGICAL COMMUNITIES	
V	Vulnerable*
E	Endangered
CE	Critically Endangered

\*Species listed as 'conservation dependent' and 'extinct' under the EPBC Act and ecological communities listed in the 'vulnerable' category of ecological communities are not MNES and therefore, do not trigger assessment under the EPBC Act.

### 5.1.2 Scope and Purpose

The purpose of this EIS section is to identify and address potential Project impacts upon MNES that were identified in the controlling provisions, since the Project has been determined to be a controlled action by the Commonwealth Minister for the Environment.

The EPBC Act controlling provisions prescribed by the Minister and relevant to this report are 18 and 18A (listed threatened species and communities), 20 and 20A (listed migratory species) and 24D and 24E (water resources).

The following steps were employed to assess the potential impacts that the Project may have upon relevant MNES:

- **Description of the Proposed Action** – as it would impact MNES;
- **Description of the Existing Environment** – identifies all environmental values on the Project site and those which could be impacted by the Project's activities;
- **Description of the Affected Environment** – identifies MNES that are protected under the EPBC Act which have been identified on the Project's site; and
- **Assessment of Relevant Impacts and Mitigation Measures** – potential Project impacts upon MNES are assessed in this section, together with appropriate impact mitigation measures.

## **5.2 DESCRIPTION OF PROPOSED ACTION**

### **5.2.1 Project Location**

The Project is located in the western Bowen Basin coalfields, approximately 22 km west of the town of Emerald, Central Queensland (refer to Figure 5.2 and Figure 5.3 for Project location details). The Project is located entirely within the Central Highlands Regional Council local authority area.

The mining tenement for this Project is MDL 467 which covers a total area of 7,966 hectares (ha), providing the boundary limits for the MNES assessment).

### **5.2.2 Project Description**

The proposed mine includes both opencut and underground mining operations, with run of mine (ROM) coal processed at an on-site Coal Handling and Preparation Plant (CHPP). Product coal will be conveyed to a train load out facility and transported via a rail balloon loop to the Queensland Rail (QR) Central West rail system. The Project is expected to have an operational life of 22 years including periods of construction (12 months) and decommissioning and rehabilitation (15 months). The Project will initially be based solely upon opencut operations south of the Capricorn Highway, until underground operations commence in Year 5.

The opencut mine plan is based upon excavator and truck operations to extract the overburden and interburden to extract the coal fed the CHPP. Opencut overburden and interburden will be hauled to both in and out-of-pit spoil dumps located adjacent to the opencut pit. Topsoil which is stripped prior to mining will be segregated for later use in rehabilitation.

The underground mine will employ longwall mining techniques and is expected to produce up to 5.75 Mtpa of ROM coal when running at full production. Mined coal will be transported via an underground connection to the opencut highwall, with three entries providing man and materials, belt conveyor access and ventilation. From the highwall portal, the underground conveyor will run over a length of 980 m with a lift of 105 m (to the top of the stockpile gantry), operating at a material transport capacity of 4,000 tonnes per hour (tph).

Coal processing will involve crushing, screening and partial washing to separate product coal from waste materials. Waste rejects will be co-disposed of with spoil material in spoil dumps. The CHPP has been sized to handle up to 6.3 Mtpa of ROM coal from both the opencut and underground operations.

Product coal will be transported via the QR Central West and Aurizon Blackwater rail systems to the Wiggins Island Coal Export Terminal (WICET) at Gladstone.

Major elements of the Project have been summarised as follows:

- Opencut mining via truck and excavator methods;
- Underground mining utilising longwall mining techniques;
- Processing of coal (including coal crushing, screening and washing) with waste products being disposed of via in-pit and out-of-pit spoil dumps;
- Site access and haul roads;

- Clean and dirty water management and drainage systems;
- Water storage system (200 kilolitres (kL));
- Mine and potable water treatment systems;
- Mine wastewater dam and CPP water recycle dam;
- Electrical substations;
- Sewage treatment plant;
- Overhead feeder power line and substation;
- In and out-of-pit spoil dumps;
- Radial stacker, train load out facility and balloon loop rail line;
- Offices, workshops and ablutions facilities;
- Opencut and underground ROM pad, coal transfer area and lay-down areas;
- ROM, product and topsoil stockpiles;
- Visual amenity bunds along the rail line;
- Maintenance areas, washdown bays and stores yard;
- Fuel, oil and chemical storages; and
- Explosives magazines.

The Project layout is illustrated in Figure 5.4.





Figure 5.2 Regional Project Location



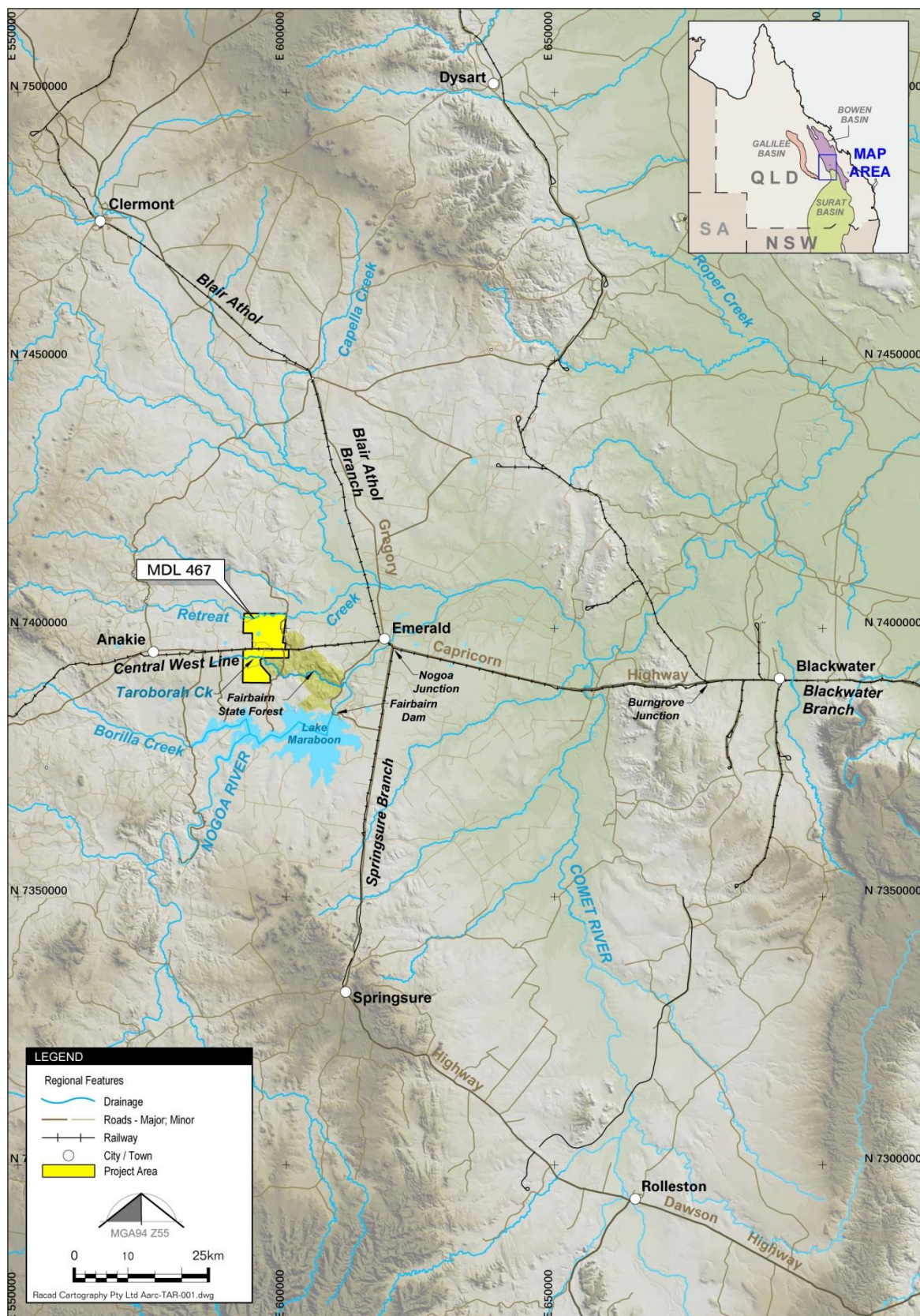


Figure 5.3 Local Project Location



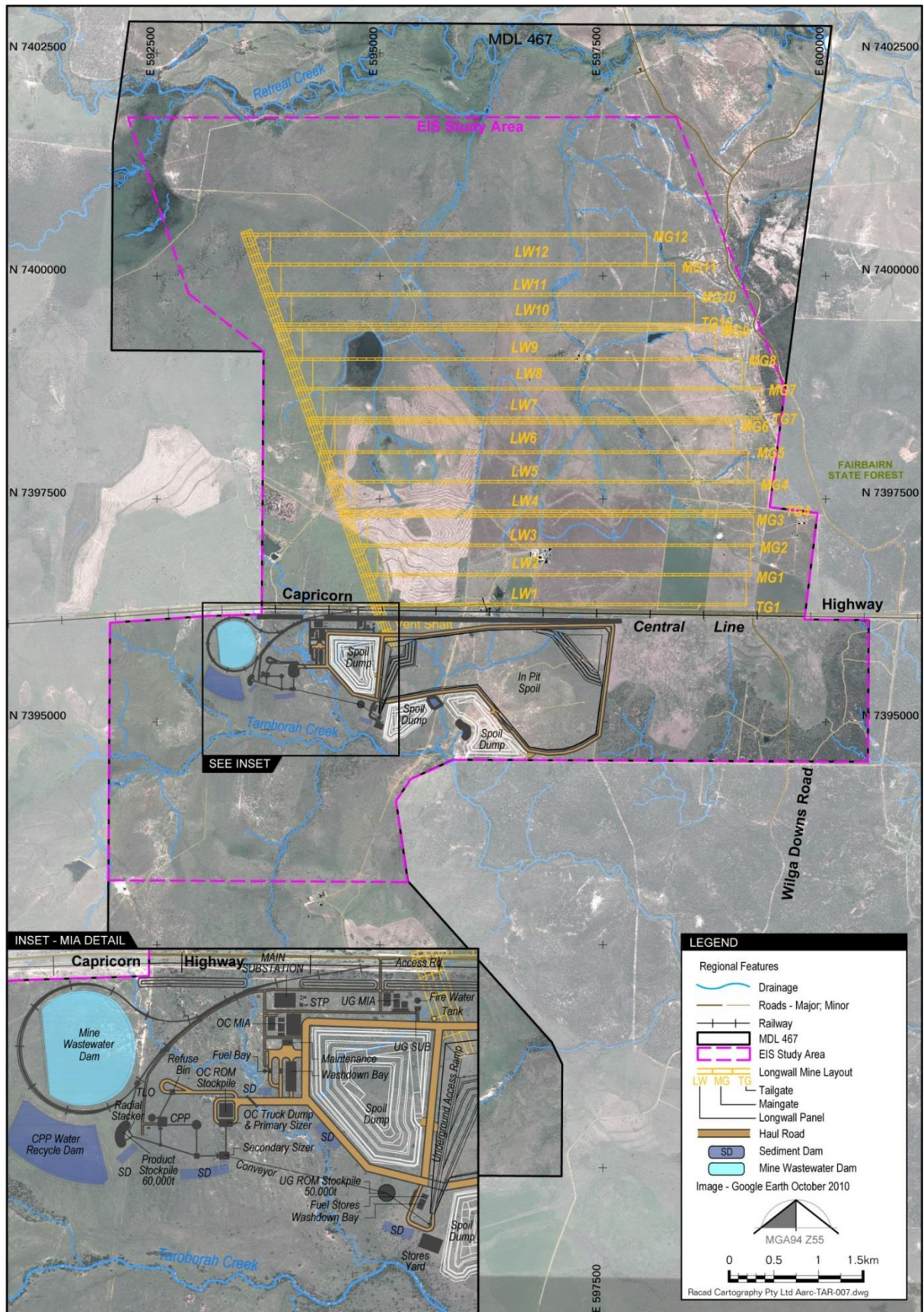


Figure 5.4 Proposed Project Layout

## **Land Disturbance**

Prior to the development of any opencut pits, spoil dumps, processing areas or infrastructure, vegetation and topsoil will be removed from the Project footprint area and stockpiled. The preferred option to dispose of large items of vegetation is to appoint a contractor to clear the area in question and use the timber for milling, wood-chipping, or other economically viable use. Smaller items of vegetation and grasses will be removed with the excavated topsoil and where necessary, soil stockpiles will be seeded, in order to establish vegetation growth, increase water infiltration, encourage microbial activity and prevent erosion. Approximately half of the stockpiled topsoil will be placed on the out-of-pit waste dumps during operational years 2 and 3, with the remainder of this material used for the end of opencut reclamation and MIA area reclamation.

Over the life of the Project, land disturbance to a greater or lesser degree will occur in (but is not limited to) the following areas: mining sectors, CHPP and mine infrastructure, out-of-pit spoil dumps, surface water management dams, workshops, offices, haul roads and tracks. Table 5.2 provides a summary of the anticipated disturbance areas associated with the Project, with a total disturbance area of approximately 2,676 ha.

**Table 5.2 Estimated Project Disturbance Areas**

<b>Disturbance</b>	<b>Area (ha)</b>
Opencut mining including dumps and haul roads	373
Underground (longwall) mining	2,071
CHPP, mine infrastructure and site offices	58
Rail balloon loop, sediment dams, CPP water recycle dam and mine waste water dam	50
Visual amenity bunds	16
<b>Total</b>	<b>2,568</b>

## **Coal mining**

Overburden, interburden and coal will be extracted from the opencut pit using excavators / bulldozers / dump trucks via the following activities:

- Vegetation clearance (predominantly non-remnant grassland), however, where possible, the clearance of native vegetation will be avoided;
- Topsoil stripping and stockpiling;
- Initial removal of overburden from the opencut void and overburden storage in permanent out-of-pit spoil dumps;
- Coal extraction and haulage to the CHPP;

- Following initial development of the opencut void, overburden removed ahead of mining will be disposed of in-pit via backfilling; and
- Progressive rehabilitation of spoil emplacement areas, including the backfilled pit and out-of-pit spoil dumps.

Underground operations conducted north of the Capricorn Highway and within the Project area will adopt a longwall mining approach. No vegetation clearance will be required for the underground operations, since extracted coal will be transported via conveyor through the opencut high wall and to the mine infrastructure area.

A subsidence report has been produced by IMC Mining Group Pty Ltd that identifies the nature and extent of the land subsidence which is expected to arise as a result of underground mining activities.

### ***Coal Processing***

Extracted ROM coal from the opencut will be dumped into a 200 tonne bin feeding the primary sizer, or onto a ROM pad and later pushed by either dozer or front-end loader into the bin. From the primary sizer, coal will be fed into a secondary sizing/screening plant to reduce topsize to 50 mm. Coal from the underground will be stockpiled and then conveyed directly to the secondary sizing/screening plant.

Following sizing, the coal will be scanned and sent either directly to the product stockpile or to the CPP feed stockpile, depending on sulphur and ash content. The CPP circuit is based upon conventional dense medium cyclones (DMCs) and spirals which produce product coal with the required final product specification. The CPP will treat +2.0 mm diameter coal in a DMC circuit, whilst coal with diameters between 2.0 mm and 0.25 mm will be processed via a mid-sized circuit (i.e. spiral system). The finest coal particles (under 0.25 mm in diameter) will eventually pass through the system and be rejected to a tailings thickener, following dewatering via belt-press filters.

Product coal will be temporarily stockpiled before being loaded via conveyor into the train load out facility in order to fill train wagons. Coal will then be transported to the WICET via the QR Central West and Aurizon Blackwater rail systems.

### ***Rehabilitation***

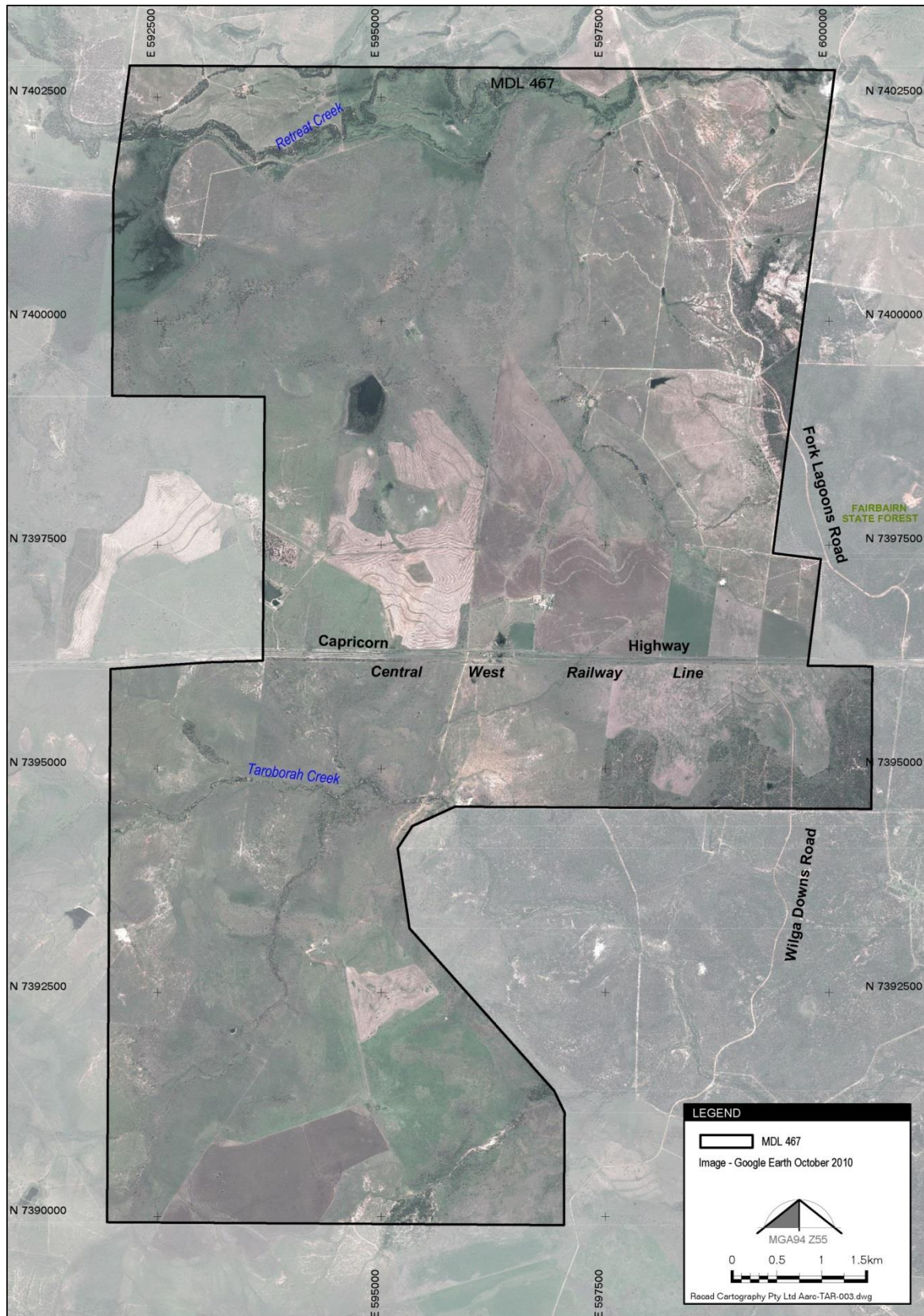
Disturbed areas of the Project site will be progressively rehabilitated via surface contouring, soil ripping, topsoil application and seeding.

All Project infrastructure will be removed from site at the end of mining, unless upon agreement with the landowner to remain.

## **5.3 CURRENT LAND USE**

The dominant land use on the Project site is rain-fed cropping and low-intensity cattle grazing. Extensive areas of cleared land occur on the Project area where the original vegetation has been removed for intermittent cultivation or regular cattle grazing. As indicated in Figure 5.5, the Project site is highly fragmented in terms of vegetation coverage, with patches of native vegetation predominantly occurring in association with the Fairbairn State Forest (which is located immediately adjacent to the east and south of the Project site) and in sporadic patches north of the Capricorn Highway.





**Figure 5.5 Aerial Photograph of Project Site**

## 5.4 DESCRIPTION OF THE EXISTING ENVIRONMENT

### 5.4.1 Flora and Fauna Database Searches

Desktop database searches, literature reviews and information from previous surveys, community records and other sources, were used to develop an understanding of regional flora and fauna species. This information was then reviewed in order to formulate specific field-survey techniques for the identification of threatened flora and fauna species that are potentially present on the Project site. The results of this desktop analysis revealed that many flora and fauna species of national environmental significance have been historically identified within the Project region.

The following databases were searched in order to review historical flora and fauna records within pre-defined Project site buffers (refer to Figure 5.6 for details of the database search areas):

- Wildlife Online Database (Queensland Government, Department of Environment and Heritage Protection (EHP) 2011c);
- EPBC Act Protected Matters Search Tool (PMST) (Australian Government, Department of the Environment (DoE)); and
- Species Profile and Threats Database (SPRAT) (administered by DoE and linked to the PMST).

#### ***Wildlife Online Database (EHP)***

This database was accessed and searched in October 2011 and includes records collected from previous surveys (including Queensland Museum surveys) as well as public records. Note that whilst data screening is conducted by EHP, some species misidentifications are possible.

Since the maximum area that can be conducted for a Wildlife Online database search is 50 km x 50 km, four different search areas were generated (total search area approximately = 100 km x 100 km) in order to encompass a suitable range of regional habitats (refer to Figure 5.6 for the location of each search area). These search areas were clustered around an MDL 467 site centroid (north-east, north-west, south-east and south-west corners) creating a total search area of approximately 10,503 km<sup>2</sup>.

The results of the Wildlife Online database search revealed 43 records (full details provided in Appendix A).

#### ***EPBC Act Protected Matters Search Tool (DoE)***

This database provides general guidance on MNES and other matters protected by the EPBC Act for a nominated area. A regional EPBC Act PMST search was employed for the Project site in September 2011 (prior to the 2012 field surveys) for the purpose of developing specific field-survey techniques for identifying species known to the area (refer to Figure 5 for the location of the PMST search area). The total PMST area for this Project was approximately 10,503 km<sup>2</sup>.

The database search produced a contemporary record of EPBC listed flora and fauna species, including 13 threatened fauna species, six (6) threatened flora species, 11 migratory species and five (5) ecological communities known to the region, in the form of an *EPBC Act Protected Matters Report* (2011a) (refer to Appendix A for details of the outputs from this database search).





Figure 5.6 Database Search Areas



## **5.4.2 Database Search Results Relevant to MNES**

The results of the Project site MNES assessment are presented in this section, based upon the nine MNES categories defined in the EPBC Act.

### **5.4.2.1 World Heritage Properties**

No World Heritage Properties were found to be located within the PMST area as indicated by the *EPBC Act Protected Matters Report* (2011a). The nearest World Heritage Property is the Great Barrier Reef Marine Park, approximately 270 km to the east.

### **5.4.2.2 National Heritage Places**

The *EPBC Act Protected Matters Report* (2011a) did not identify any National Heritage Places located within the PMST area. The nearest National Heritage Place is also the Great Barrier Reef Marine Park.

### **5.4.2.3 Wetlands of International Importance**

No Wetlands of International Importance were identified within the PMST area in the EPBC Act Protected Matters Report. The nearest Ramsar wetland is located approximately 270 km to the north-east of the Project site. This wetland is called the Shoalwater and Corio Bays Area.

### **5.4.2.4 Project Site EPBC Act Listed Threatened Species and Ecological Communities**

Details of the EPBC Act listed threatened species and ecological communities are provided in this section (refer to DoE 2011 for details of the approach to listing EPBC Act threatened species and ecological communities). Note that although listed threatened species and communities may be present regionally and identified from the desktop database searches, they may not be present on the Project site (and therefore may not be impacted by Project activities) if the appropriate habitat is not present on or near the Project site, or is in a suitable condition to support the listed species in question.

In other circumstances, Project impacts are not predicted to be significant if the species or communities concerned are present in low numbers or are fragmented.

#### **EPBC Act Listed Flora**

The *EPBC Act Protected Matters Report* (2011a) identified six (6) threatened flora species that may potentially be found within the Project site. A list of these species, the potential for them to be present on site and availability of suitable habitat are presented in Table 5.3.

#### **EPBC Act Listed Fauna**

Thirteen (13) threatened fauna species were identified within the PMST area from the online EPBC Act search tool. Further details of these EPBC Act listed species were obtained from the SPRAT database. A list of threatened fauna species which may potentially be found within the Project site and availability of suitable habitat are presented in Table 5.4.

**Table 5.3 EPBC Act Listed Flora Species Present in the Project Region**

Scientific Name	Common Name	EPBC Act Status	Likelihood of Occurrence in the Project Area	Comments
<i>Aristida annua</i>	-	Vulnerable	Moderate	This species is restricted to Eucalypt woodland on black clay and basalt soils. It also occurs in the Natural grasslands of the Queensland Central Highlands and the northern Fitzroy Basin threatened ecological community (DoE 2012d). Suitable habitat for this species may occur on the Project site.
<i>Cadellia pentastylis</i>	Ooline	Vulnerable	Low	Occupies dry rainforest, semi-evergreen vine thickets and sclerophyll communities and often occurs as locally dominant or emergent (DoE 2008a). Suitable habitat for this species has not been identified on the Project site. Extensive areas of remnant vegetation within Fairbairn State Forest may provide suitable habitat for this species.
<i>Dichanthium queenslandicum</i>	King Blue-grass	Vulnerable	Moderate	Endemic to Queensland where it occurs on black clay soils around Emerald and more rarely on the Darling Downs. Suitable habitat occurs within the Project site and surrounding area (DoE 2009a).
<i>Dichanthium setosum</i>	-	Vulnerable	Moderate	Occurs in grassy woodland and open forests. Associated with heavy basaltic black soils and stony red-brown hard-setting loam with clay subsoil and is found in moderately disturbed areas such as cleared woodland, grassy roadside remnants, grazed land and highly disturbed pasture (DoE 2008b). Suitable habitat for this species potentially occurs on the Project site and broader region.

Scientific Name	Common Name	EPBC Act Status	Likelihood of Occurrence in the Project Area	Comments
<i>Digitaria porrecta</i>	Finger Panic Grass	Endangered	Moderate	Finger Panic Grass generally occupies grasslands on extensive basaltic plains, as well as undulating woodlands and open forests with an underlying basaltic geology. It usually occurs on dark and fine textured soils with some degree of seasonal cracking. It also persists in disturbed habitats, such as fallow paddocks, stock routes and road verges (DoE 2009b). Surrounding lands are likely to provide suitable habitat for this species.
<i>Marsdenia brevifolia</i>	-	Vulnerable	Low	This plant occurs on serpentine rock outcrops or crumbly black soils derived from serpentine in Eucalypt woodland or in woodlands on granite soils (DoE 2008c).

**Table 5.4 EPBC Act Listed Fauna Species Present in the Project Region**

Scientific Name	Common Name	EPBC Act	Likelihood of occurrence in the Project area	Comments
<b>Birds</b>				
<i>Erythroriorchis radiates</i>	Red Goshawk	Vulnerable	Low	Inhabits undisturbed forest/woodland especially those adjacent to water bodies with large populations of birds. Hunts from a perch in dense foliage. Breeds in large <i>Eucalypt spp.</i> or <i>Melaleuca spp.</i> (Morcombe 2002). Limited habitat occurs on Project Site. Due to the presence of large forest / woodland habitats occurring in association with Lake Maraboon to the south-east of the Project site, it is considered unlikely that the Project would impact on the species if it does occur in the region.
<i>Geophaps scripta scripta</i>	Squatter Pigeon (southern)	Vulnerable	Moderate	This species occurs in dry grassy Eucalypt woodlands and open forests, mostly in sandy sites near permanent water (Curtis et al. 2012). The Project site lacks any permanent watercourses required to support a population in the long-term. The Project site may provide suitable habitat for this species during the wet season.
<i>Neochmia ruficauda ruficauda</i>	Star Finch (eastern), Star Finch (southern)	Endangered	Low	Very rare and nomadic granivore. Sightings have reduced significantly since white settlement. Found in rank vegetation along watercourses and swamps (Morcombe 2002). Suitable habitat occurs in the region. While potential habitat for this species is present, the Project site lacks permanent watercourses. The Project is unlikely to impact the species if it does occur in the region.

Scientific Name	Common Name	EPBC Act	Likelihood of occurrence in the Project area	Comments
<i>Rostratula australis</i>	Australian Painted Snipe	Vulnerable	Moderate	This species inhabits shallow inland wetlands, either permanent or temporary (Marchant and Higgins 1993). It was not observed on the Project site, although suitable ephemeral wetland habitat for this species occurs on the Project site. 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.
<b>Mammals</b>				
<i>Dasyurus hallucatus</i>	Northern Quoll	Endangered	Low	Declined over range, now restricted to isolated populations across the north. Locally common in the Carnarvon range-Bowen area in rocky <i>Eucalyptus spp.</i> woodland. May occur in other woodland and forest types (Menkhorst and Knight 2011). Due to the current high disturbance and fragmentation of the Project site, little suitable habitat is present.
<i>Nyctophilus timoriensis</i> (South-eastern form)	Greater Long-eared Bat, South-eastern Long-eared Bat	Vulnerable	Low	South-eastern form found through inland New South Wales and inland southern Queensland. Roosts in tree hollows or peeling bark. Forages in vegetation below canopy. The Project site provides limited habitat as a result of previous disturbances that have led to a lack of roosting habitat.
<b>Reptiles</b>				
<i>Delma torquata</i>	Collared Delma	Vulnerable	Low	Restricted to south-east Queensland, north-west to Blackdown tableland and inland to Roma. Shelters in leaf litter and beneath logs and rocks. Occurs in rocky areas within dry open forest and Brigalow (Wilson & Swan 2008). As a result of previous clearing and agricultural disturbances, the Project site now contains small fragmented areas of potential habitat for this species.

Scientific Name	Common Name	EPBC Act	Likelihood of occurrence in the Project area	Comments
<i>Denisonia maculata</i>	Ornamental Snake	Vulnerable	Moderate	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). The Project site provides suitable habitat for this species. However, given the low amounts of habitat connectivity and the presence of Lake Maraboon and associated woodlands to the south-east of the Project site, it is highly likely that this species would prefer these habitats.
<i>Egernia rugosa</i>	Yakka Skink	Vulnerable	Moderate	Occurs in south-eastern, central and north-east Queensland. Lives communally in logs, rock crevices, beneath rocks and in burrows. Inhabits dry open forests, woodlands and rocky areas (DERM 2010). Previous activities on the Project site have resulted in extensive disturbance, fragmentation, and a subsequent lack suitable habitat for this species.
<i>Furina dunmalli</i>	Dunmall's Snake	Vulnerable	Moderate	Restricted to central south-eastern Queensland. Inhabits Brigalow but has suffered decline across its range, possibly because of decline in Brigalow habitat. Prey on <i>Egernia striata</i> (Wilson and Swan 2008). Restricted areas of suitable habitat occur in association with watercourses on the Project site.
<i>Lerista allanae</i>	Allan's Lerista, Retro Slider	Endangered	Low	This species' distribution is restricted to the area between Clermont and Capella (Couper & Ingram 1992). It occurs in grass tussocks on heavy-clay soil. There are no recent records despite thorough searches throughout range (Wilson & Swan 2008).

Scientific Name	Common Name	EPBC Act	Likelihood of occurrence in the Project area	Comments
<i>Paradelma orientalis</i>	Brigalow Scaly-foot	Vulnerable	Low	Restricted to south-east Queensland. Shelters in grass tussocks and leaf litter and beneath logs and sandstone. Occurs on sandstone ridges and in woodlands, Brigalow and vine thickets (Wilson & Swan 2008). Due to high disturbance, fragmentation, and a lack of rocky habitat or fallen debris there is limited suitable habitat for this species on the Project site.
<i>Rheodytes leukops</i>	Fitzroy River Turtle, Fitzroy Tortoise, Fitzroy Turtle	Vulnerable	Low	This species is found in rivers within the Fitzroy Catchment with large deep pools with rocky, gravelly or sandy substrates, connected by shallow riffles. Preferred areas have high water clarity and are often associated with Ribbonweed ( <i>Vallisneria sp.</i> ) beds (Cogger et al. 2000). Suitable habitat for this species does not occur on the Project site.

## Threatened Ecological Communities

The *EPBC Act Protected Matters Report* (2011a) identified five threatened ecological communities that may potentially occur within the Project site (refer to Table 5.5 for details).

**Table 5.5 EPBC Act Protected Matters Report Threatened Ecological Communities**

Description	EPBC Act Status
Brigalow ( <i>Acacia harpophylla</i> dominant and co-dominant)	Endangered
Coolibah-Black Box Woodlands of the Darling Riverine Plains and the Brigalow Belt South Bioregions	Endangered
Natural Grasslands of the Queensland Central Highlands and the northern Fitzroy Basin	Endangered
Semi-evergreen vine thickets of Brigalow Belt (North and South) and Nandewar Bioregions	Endangered
Weeping Myall Woodlands	Endangered

### 5.4.2.5 Fairbairn State Forest EPBC Listed Species and Communities

The Fairbairn State Forest is to the immediate south and east of the Project site and encompasses approximately 10,000 ha of remnant vegetation.

A desktop review has been conducted of threatened species and communities potentially occurring at the Fairbairn State Forest using the EPBC Act Protected Matters search tool. A total of one (1) listed flora species, fifteen (15) listed fauna species and three (3) ecological communities were identified. Table 5.6 summarises threatened species and communities from the database search.

**Table 5.6 EPBC Act Protected Matters Report for the Fairbairn State Forest Area**

Scientific Name	Common Name	EPBC Act
<b>Threatened Flora Species</b>		
<i>Dichanthium queenslandicum</i>	King Blue-grass	Endangered
<b>Threatened Fauna Species</b>		
<i>Erythrorichis radiates</i>	Red Goshawk	Vulnerable
<i>Geophaps scripta scripta</i>	Squatter Pigeon (southern)	Vulnerable
<i>Neochmia ruficauda ruficauda</i>	Star Finch (eastern), Star Finch (southern)	Endangered
<i>Poephila cincta cincta</i>	Black-throated Finch (southern)	Endangered
<i>Rostratula australis</i>	Australian Painted Snipe	Vulnerable





Scientific Name	Common Name	EPBC Act
<i>Dasyurus hallucatus</i>	Northern Quoll	Endangered
<i>Nyctophilus timoriensis</i> (South-eastern form)	Greater Long-eared Bat, South-eastern Long-eared Bat	Vulnerable
<i>Phascolarctos cinereus</i>	Koala (combined populations of Qld, NSW and ACT)	Vulnerable
<i>Delma torquata</i>	Collared Delma	Vulnerable
<i>Denisonia maculata</i>	Ornamental Snake	Vulnerable
<i>Egernia rugosa</i>	Yakka Skink	Vulnerable
<i>Furina dunmalli</i>	Dunmall's Snake	Vulnerable
<i>Lerista allanae</i>	Allan's Lerista, Retro Slider	Endangered
<i>Rheodytes leukops</i>	Fitzroy River Turtle, Fitzroy Tortoise, Fitzroy Turtle	Vulnerable
<i>Bidyanus bidyanus</i>	Silver Perch	Critically Endangered
<b>Threatened Ecological Communities</b>		
Brigalow ( <i>Acacia harpophylla</i> dominant and co-dominant)		Endangered
Natural Grasslands of the Queensland Central Highlands and the northern Fitzroy Basin		Endangered
Weeping Myall Woodlands		Endangered

#### 5.4.2.6 Migratory Species

Migratory species listed under the EPBC Act are those protected under the international agreements to which Australia is a signatory, such as the Japan Australia Migratory Bird Agreement (JAMBA), the China Australia Migratory Bird Agreement (CAMBA), the Republic of Korea – Australia Migratory Bird Agreement (ROKAMBA) and the Bonn Convention on the Conservation of Migratory Species of Wild Animals. Listed species hold a Migratory Terrestrial, Wetland, Marine or Listed Marine species classification. Migratory species are considered as MNES under the EPBC Act.

The *EPBC Act Protected Matters Report* (2011a) identified 11 Migratory and / or Marine species that are likely to be found within the 100 km x 100 km PMST area around the Project site. These species are presented in Table 5.7. A total of nine (9) Migratory and / or Marine species potentially utilising the Fairbairn State Forest are presented in Table 5.8.

**Table 5.7 Regional Migratory Species Potentially Present on the Project Site**

Species		Species Status			
Scientific Name	Common Name	Migratory			Listed
		Marine	Terrestrial	Wetland	Marine
<i>Apus pacificus</i>	Fork-tailed Swift	✓			✓
<i>Ardea alba</i>	Great Egret	✓		✓	✓
<i>Ardea ibis</i>	Cattle Egret	✓		✓	✓
<i>Gallinago hardwichii</i>	Latham's Snipe	✓		✓	✓
<i>Haliaeetus leucogaster</i>	White-bellied Sea-Eagle		✓		✓
<i>Hirundapus caudacutus</i>	White-throated Needletail		✓		✓
<i>Merops ornatus</i>	Rainbow Bee-eater		✓		✓
<i>Monarcha melanopsis</i>	Black-faced Monarch		✓		✓
<i>Myiagra cyanoleuca</i>	Satin Flycatcher		✓		✓
<i>Nettapus coromandelianus albipennis</i>	Australian Cotton Pygmy-goose			✓	✓
<i>Rostratula benghalensis s Lat</i>	Painted Snipe			✓	✓

Source: PMST 2011a

**Table 5.8 Regional Migratory Species Potentially Present at Fairbairn State Forest**

Species		Species Status			
Scientific Name	Common Name	Migratory			Listed
		Marine	Terrestrial	Wetland	Marine
<i>Anseranas semipalmata</i>	Magpie Goose				✓
<i>Apus pacificus</i>	Fork-tailed Swift	✓			✓
<i>Ardea alba</i>	Great Egret	✓		✓	✓
<i>Ardea ibis</i>	Cattle Egret	✓		✓	✓
<i>Gallinago hardwichii</i>	Latham's Snipe	✓		✓	✓

Species		Species Status			
Scientific Name	Common Name	Migratory			Listed
		Marine	Terrestrial	Wetland	Marine
<i>Haliaeetus leucogaster</i>	White-bellied Sea-Eagle		✓		✓
<i>Merops ornatus</i>	Rainbow Bee-eater		✓		✓
<i>Myiagra cyanoleuca</i>	Satin Flycatcher		✓		✓
<i>Pandion haliaetus</i>	Osprey				✓
<i>Rostratula benghalensis</i> Lat	Painted Snipe			✓	✓

Source: PMST 2011a

#### 5.4.2.7 Commonwealth Marine Areas

Results from the *EPBC Act Protected Matters Report* (2011a) reported that no Commonwealth Marine Areas are located within the 100 km x 100 km PMST search area around the Project site.

#### 5.4.2.8 The Great Barrier Reef Marine Park

This Project is not located in the Great Barrier Reef Marine Park and local catchments do not drain immediately into this marine park. The Great Barrier Reef Marine Park is located approximately 270 km to the east.

#### 5.4.2.9 Nuclear Actions

The Project does not propose any nuclear action.

#### 5.4.2.10 Water Resources

Water resources potentially affected by this large scale coal development Project include the underlying groundwater aquifer and downstream surface watercourses.

The Commonwealth Government has established the National Atlas of Groundwater Dependent Ecosystems (GDEs), based on the current knowledge of GDEs across Australia. The atlas shows known GDEs and ecosystems that potentially use groundwater, and is considered the most comprehensive inventory of the location and characteristics of GDEs in Australia. The GDE Atlas was created using remote sensing data, previous mapping and literature reviews.

Data derived from the Bureau of Meteorology (2012) Groundwater Dependent Ecosystems Atlas shows that ecosystems within and surrounding the Project area have a low to moderate potential for groundwater interaction.

#### 5.4.2.11 MNES Summary

A summary of the potential impacts that Project activities may have upon MNES is presented in Table 5.9.



**Table 5.9 Potential Project Impacts upon Matters of National Environmental Significance**

<b>Matters of NES</b>	<b>Relevance to the Project</b>
World Heritage Properties	No World Heritage Properties have been identified within the PMST area around the Project site
National Heritage Places	No National Heritage Places have been identified within the PMST area around the Project site
Wetlands of International Importance (listed under the RAMSAR Convention)	No Wetlands of International Importance have been identified within the PMST area around the Project site
Listed threatened species and ecological communities	A total of five (5) threatened ecological communities, six (6) threatened flora species and 13 threatened fauna species were identified as potentially utilising the Project site
Migratory Species	A total of 11 Migratory and / or Marine species have been identified as potentially inhabiting the Project site
Commonwealth Marine Areas	No Commonwealth Marine Areas have been identified in the vicinity of the Project site
The Great Barrier Reef Marine Park	The Great Barrier Reef Marine Park is not located in proximity to the Project site
Nuclear Actions	No nuclear actions will occur on the Project site
Water Resources	Downstream surface waters and underlying groundwater aquifers may be impacted

## 5.5 FLORA AND FAUNA FIELD SURVEYS

Three separate field surveys were conducted in order to assess the terrestrial and aquatic flora and fauna values associated with the Project area and ground-truth the database search results that had been conducted prior to these site surveys. These terrestrial and aquatic field surveys were conducted over the following time periods:

### Terrestrial Flora Fauna

Survey 1: Nine (9) days from 8 – 16<sup>th</sup> September 2011;

Survey 2: Seven (7) days from 28<sup>th</sup> February – 5<sup>th</sup> March 2012; and

Survey 3: Two (2) days from 7<sup>th</sup> – 8<sup>th</sup> August 2012.

### Aquatic Flora Fauna

Survey 1: Five (5) days from 26<sup>th</sup> – 30<sup>th</sup> September 2011; and

Survey 2: Seven (7) days from 28<sup>th</sup> February – 5<sup>th</sup> March 2012.

### 5.5.1 Survey Methodology

The field methodologies employed to identify the Project's environmental values and assess the likely presence of EPBC Act listed species and communities are summarised in this section. Detailed descriptions of the survey methodologies that were employed on the Project site are provided as separate Appendix reports to the EIS; *Terrestrial Flora and Fauna Assessment* (AARC 2012a) and *Aquatic Ecology Assessment* (AARC 2012b).

Prior to conducting field surveys, Project site aerial photography and satellite imagery was reviewed in order to gain an overall perspective of the dominant land features, drainage lines and vegetation community distributions present or adjacent to the Project site. Detailed Google Earth imagery was also matched with existing Regional Ecosystem (RE) mapping, to further detail likely flora species compositions associated with vegetation communities, indicating potential fauna habitat value.

The terrestrial and aquatic flora and fauna data from historical reports was also condensed into a potential species list, in order to conduct targeted searches of these species during field surveys. This information was considered prior to field surveys, in order to assist MNES species identification during the site surveys.

The Project site was broadly surveyed from four-wheel drive vehicles, however, where terrain / vegetation proved impassable, surveying was conducted on foot. Survey transects facilitated the ground-truthing of representative vegetation types and fauna habitats. Such transects also facilitated targeting of habitats potentially occupied / utilised by EPBC Act listed threatened species.

#### 5.5.1.1 Terrestrial Flora

The baseline field assessment for flora was conducted using standard floristic survey methods in accordance with the Queensland Herbarium *Methodology for Survey and Mapping of Regional Ecosystems and Vegetation Communities in Queensland* (Version 3.1) (Neldner et al. 2005).

An assessment of all potential REs on the Project site was conducted (in order to supplement the



Queensland Herbarium RE mapping) via the following survey methods:

- A number of *Secondary* transects (comprised of a 50 m transect line, with floral assessments conducted 10 m either side of this line) were developed for each vegetation type and a detailed floristic inventory of the dominant and associated woody plants (i.e. trees and shrubs) was undertaken along each transect. Secondary plots were positioned in sectors of vegetation that were 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, to capture any variation in species composition / community structure and to search for threatened species known to occur in the region;
- An assessment of the condition (quality and conservation value) of the vegetation type encountered at each transect was undertaken; and
- Vegetation mapping was conducted via the use of aerial photographs, geological maps and the use of a GPS in association with the findings of the field survey. Vegetation transects were conducted until additional transects yielded no significant additional species or structural variation.

Where suitable habitat for species of conservation significance was identified within the survey area, targeted searches for that species were undertaken, via field methods discussed in the draft *New South Wales Threatened Species Survey and Assessment Guidelines* (New South Wales National Parks and Wildlife Service 2001).

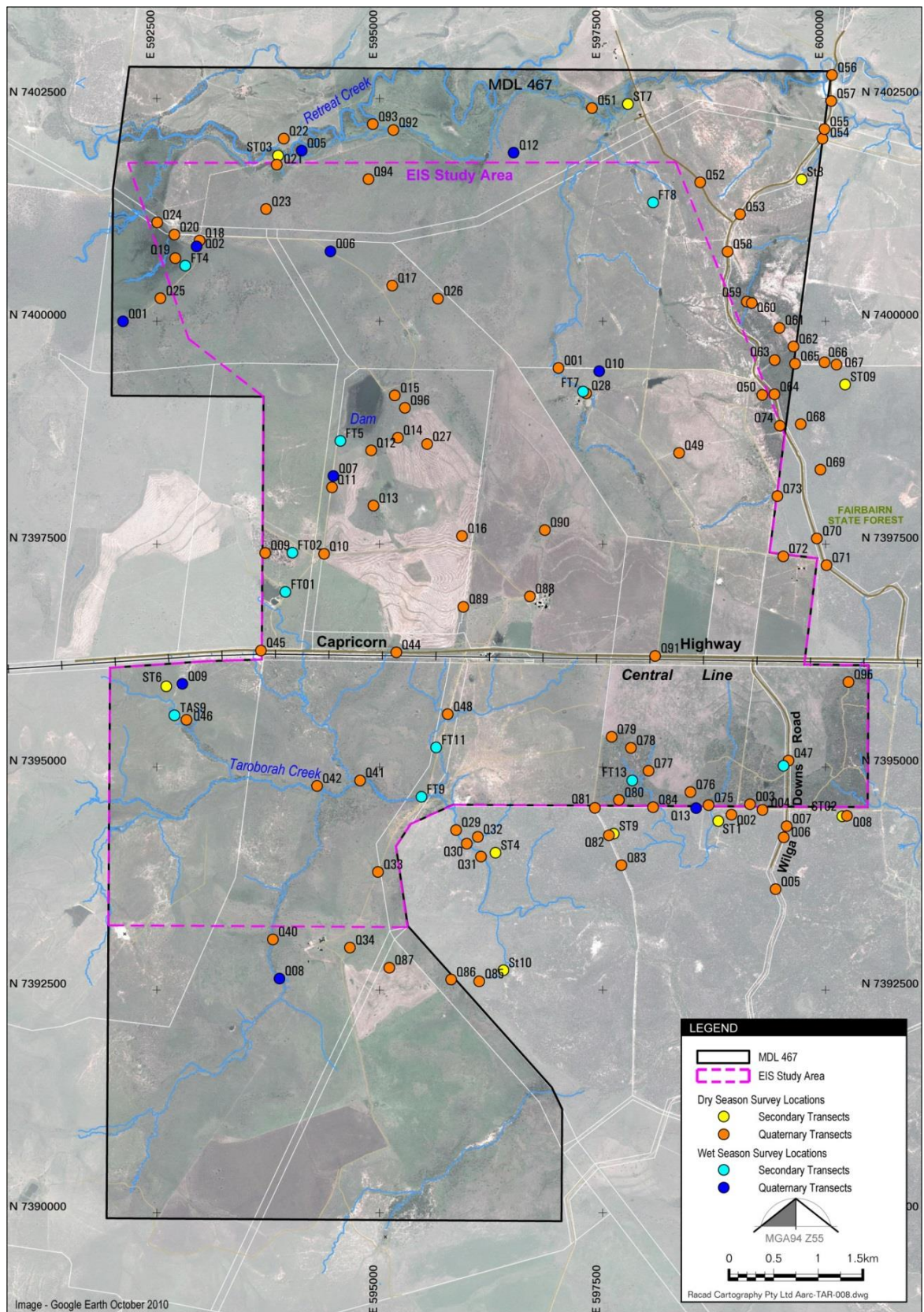
The Random Meander Technique (outlined in the above guidelines) was used in this survey. As the name suggests, this technique involves traversing areas of suitable habitat in no set pattern, whilst searching for the particular plant species. If there was any uncertainty in identifying a plant species, a voucher specimen was collected for species confirmation by the Queensland Herbarium (2005).

Dominant plants representative of each vegetation community were identified using a number of taxonomic keys and other reference material. All REs were described in accordance with the Regional Ecosystem Descriptions Database (REDD (Queensland Herbarium 2011)). The use of the terms 'Remnant' and 'Non-remnant Vegetation' were employed as per the *Vegetation Management Act 1999* (VM Act 1999).

An RE map 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 has the consequence that when Land zone 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.

Flora transects were conducted in each of the vegetation communities found within the survey area. The locations of these transects are presented in Figure 5.7. In addition to the transect study locations, incidental observations of flora species were recorded (with notes on the associated vegetation community) as they were encountered.





### 5.5.1.2 Terrestrial Fauna

The Project site's fauna sampling methodology was based upon survey techniques provided by Department of Environment and Resource Management (DERM) (2009), titled *Recommended Fauna Survey Methodology for Environmental Impact Assessments*. Sampling of vertebrate fauna was conducted primarily along transects established in each of the major fauna habitat types and at changes in vegetation community groups. Secondary sites were established to provide important information on fauna species associated with preferred habitat, as well as increasing the chances of finding species of conservation significance. The inclusion of secondary sites provides a more robust survey methodology and greater survey coverage. The fauna sampling locations that were employed on site are presented in Figure 5.8 with the following survey methods engaged at each location:

- Habitat assessment;
- Pitfall trapping;
- Elliott trapping;
- Ultrasonic bat detection (AnaBat);
- Funnel trapping;
- Spotlighting; and
- Active searching.

Five primary fauna transects were established within the survey area during both the wet season and dry season surveys. AnaBat detectors were set up at four additional sites during the supplementary August 2012 survey. The fauna transect and supplementary AnaBat survey site locations are presented in Figure 5.8. In order to maximise the detection of terrestrial fauna present in each of the different site ecotones, the selection of fauna survey sites was based upon the various habitat values and types which exist within the survey area.

### 5.5.1.3 Aquatic Flora and Fauna

The aquatic flora and fauna assessment took place over five days in September 2011 and seven days in February 2012, each aquatic sampling location was assessed as follows:

- Macroinvertebrate species – the diversity of macroinvertebrates at each location was employed to obtain a Stream Invertebrate Grade Number – Average Level (SIGNAL) score to interpret the health of the water body; and
- Vertebrate species – acquired to assess the diversity of aquatic species present on the Project site.

All fish captured during the survey were identified, their abundances recorded and then released back to their aquatic habitat. Figure 5.9 illustrates the aquatic flora and fauna study locations.



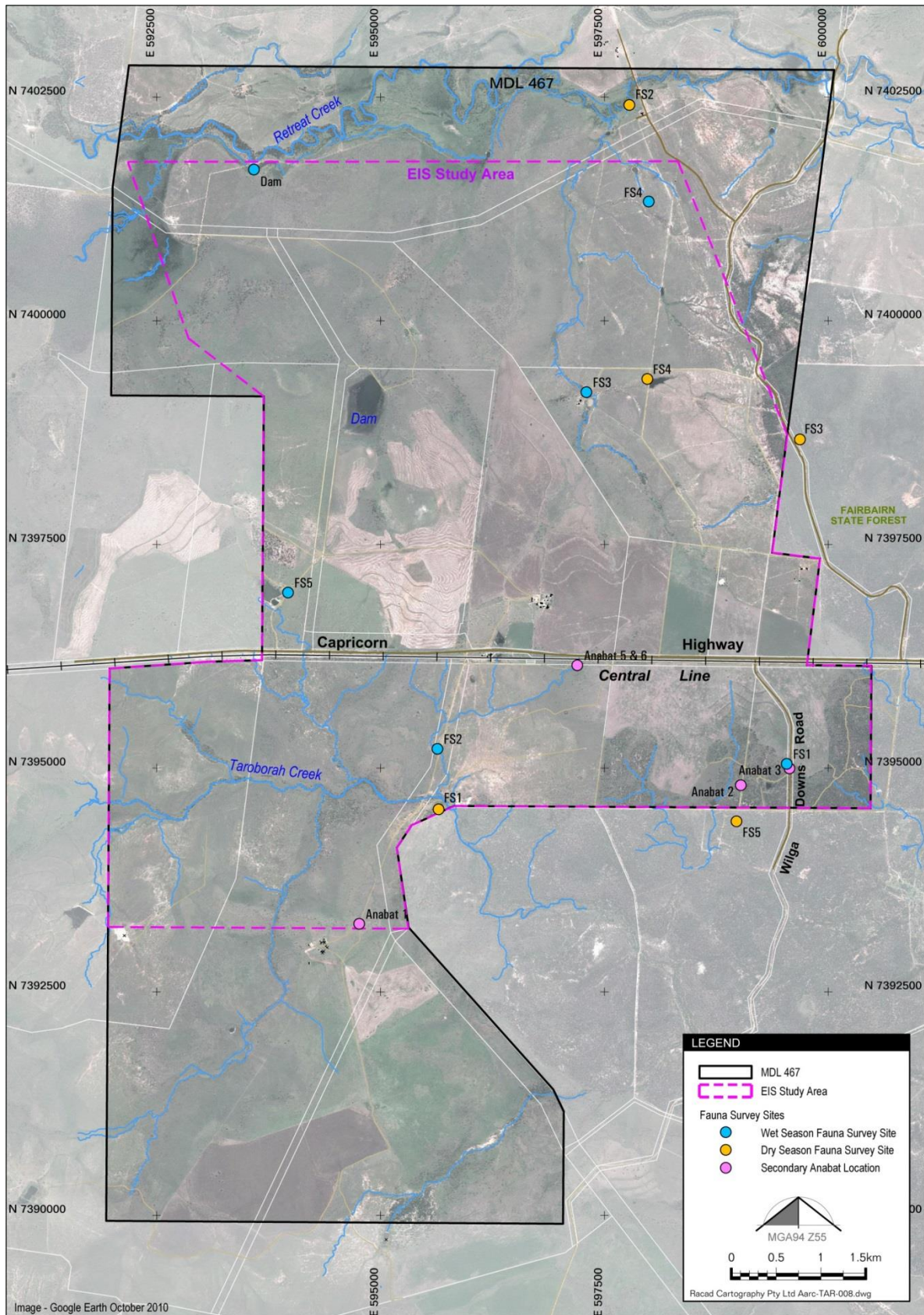
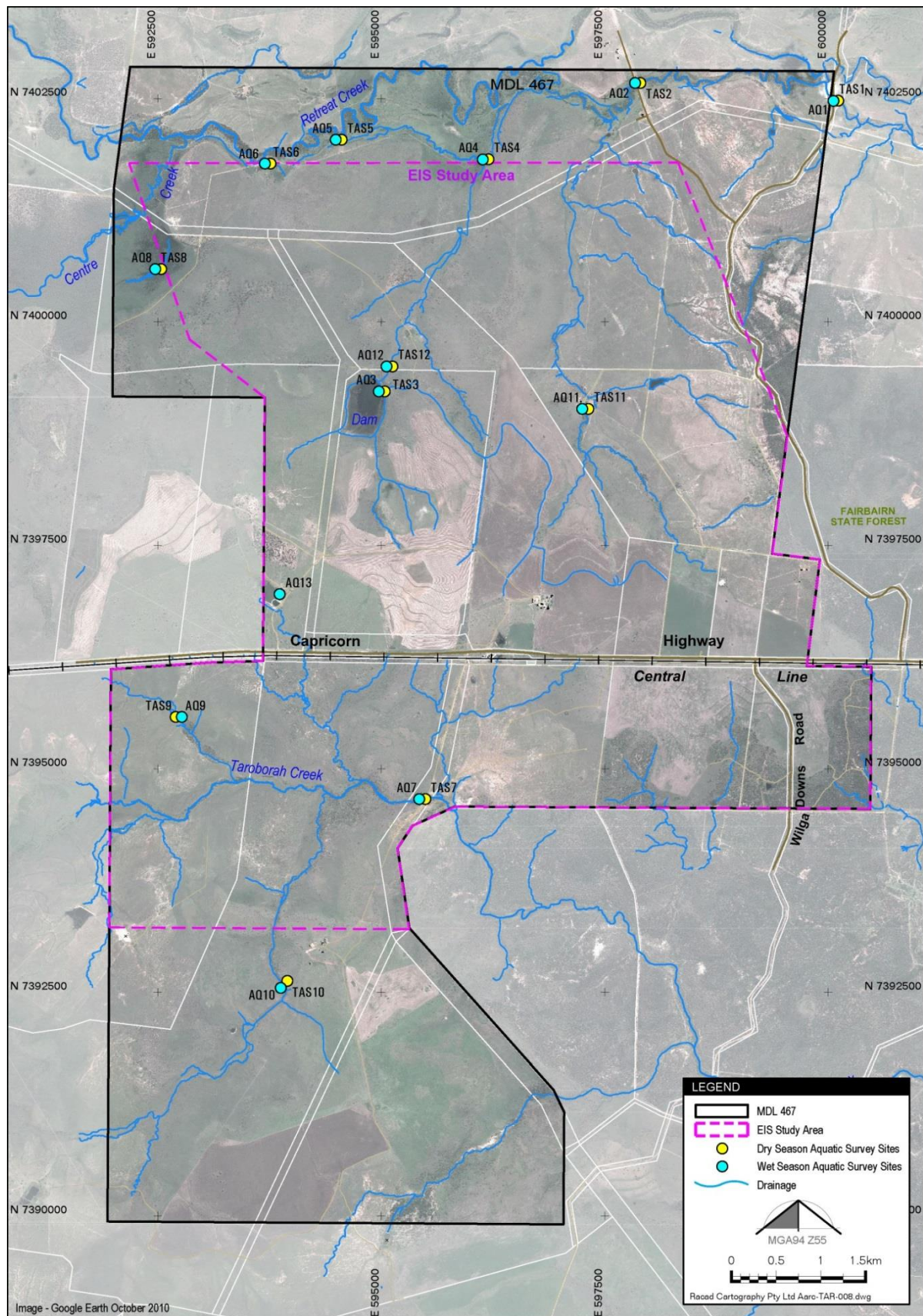


Figure 5.8 Fauna Survey Locations on the Project site





**Figure 5.9 Aquatic Sampling Locations on the Project site**

## 5.5.2 Field Survey Results

During the field surveys, a combined total of 124 fauna species were identified on the Project site, comprising eight reptiles, seven amphibians, 81 birds and 28 mammals. Although most of these species are not listed as threatened under the EPBC Act, one migratory species, listed under the EPBC Act, was observed and is detailed in section 4.8.2.2.

Below is a brief overview of the species observed on the Project site and their relevance as a MNES. A complete list of all species recorded during the field surveys is provided in Appendix C.

### 5.5.2.1 Amphibians

Neither the regional species identified during the desktop database searches, nor the seven amphibian species observed on the Project site, the Greenstripe Frog (*Cyclorana alboguttata*), Spotted Grassfrog (*Limnodynastes tasmaniensis*), Green Tree Frog (*Litoria caerulea*), Broad-palmed Rocket Frog (*Litoria latopalmata*), Ornate Burrowing Frog (*Platyplectrum ornatum*) and Chubby Gungan (*Uperoleia rugosa*) (Cogger 2000) are listed as threatened under the EPBC Act.

### 5.5.2.2 Reptiles

None of the eight reptile species observed on the Project site are listed as threatened under the EPBC Act. These included the Open Litter Rainbow Skink (*Carlia pectoralis*), Robust Striped Skink (*Ctenotus robustus*), Carpentaria Whip Snake (*Cryptophis boschmai*), Black-headed Python (*Aspidites melanocephalus*), Keelback Snake (*Tropidonophis mairii*), *Lerista fragilis*, Iridescent Litter-skink (*Lygisaurus foliorum*) and a gecko that could not be identified to species level (*Gekkonidae* sp.)).

### 5.5.2.3 Birds

None of the 81 bird species observed on the Project site are listed as threatened under the EPBC Act, except for the Cattle Egret (*Ardea ibis*), Latham's Snipe (*Gallinago hardwickii*) and Glossy Ibis (*Plegadis falcinellus*), which are listed as Migratory Marine, Migratory Wetland and Listed Marine under the EPBC Act. The conservation status of each species is presented in Table 5.10 below.

**Table 5.10 EPBC Listed Migratory / Wetland / Listed Marine Species Observed on the Project Site**

EPBC Act Listed Species	Status
Cattle Egret ( <i>Ardea ibis</i> )	Migratory Marine Species / Migratory Wetland Species / Listed Marine Species
Latham's Snipe ( <i>Gallinago hardwickii</i> )	Migratory Wetland Species / Listed Marine Species
Glossy Ibis ( <i>Plegadis falcinellus</i> )	Migratory Marine Species – recorded on site, but not identified by the PMST search

## **Cattle Egret**

The Cattle Egret is listed as a Migratory species and Marine species under the EPBC Act and is protected under the JAMBA and CAMBA international agreements.

The Cattle Egret is a small member of the *Ardeidae* family with a wingspan of about 88 – 91 centimetres (cm) and weight ranging from about 340 – 390 grams (g) (DoE 2012e).

This species is widespread throughout Australia and eastern Queensland, with two major distributions found from north-east Western Australia to the Top End of the Northern Territory and throughout south-east Australia from Bundaberg, inland to Roma, Thargominda, and then down through Inverell, Walgett, Nyngan, Cobar, Ivanhoe, Balranald to Swan Hill, and then west to Pinnaroo and Port Augusta (DoE 2012e).

Cattle Egrets breed in colonies with principal breeding sites being located on the central east coast from Newcastle to Bundaberg, while other breeding colonies have been recorded in northern New South Wales, Western Australia and the Northern Territory. Non-breeding Cattle Egrets may remain at the breeding sites but most migrate elsewhere extending their distribution throughout most of Australia, excluding only the driest areas of central Australia (DoE 2012e).

The Cattle Egret occurs across a diverse range of habitats including tropical and temperate grasslands, wooded lands and terrestrial wetlands, while occasionally also being seen in arid and semi-arid regions. It is commonly associated with farm animals, particularly cattle, and utilises shallow, open and fresh wetlands such as swamps and meadows with low emergent vegetation (DoE 2012e).

This species forages in low-lying grasslands, pastures and croplands and is commonly found foraging in fields containing cattle, where they consume insects and worms disturbed by the trampling of the animals or consuming ticks and other parasites found on the cattle and other livestock.

Fauna surveys on the Project site recorded the presence of the Cattle Egret. While suitable habitat for this species is found across the Project site, it is not considered important habitat due to the widespread distribution of this species and its suitable habitat throughout Australia.

## **Latham's Snipe**

Latham's Snipe is listed as a Migratory Species and Marine Species under the EPBC Act and is protected under the JAMBA and CAMBA international agreements.

Latham's Snipe is a medium-sized wader and the largest snipe in Australia with a weight of 150 g – 230 g and a wingspan of 50 cm – 54 cm (DoE 2013a).

This species is a passage migrant through northern Australia, before travelling south, where it is a non-breeding visitor to south-eastern Australia. Records of the species indicate a distribution from Cape York Peninsula through to south-eastern Australia, including the Adelaide Plains and Eyre Peninsula (DoE 2013a). Inland from the coast, the range extends over the eastern tablelands in south-eastern Queensland, to the west of the Great Dividing Range in New South Wales and most regions of Victoria and Tasmania (DoE 2013a).

As the entire global population of Latham's Snipe migrates to Australia, any estimate of global population size is equivalent to the Australian population. The population is estimated at 25,000 to 100,000 birds, although this number is poorly known and difficult to determine (DoE 2013a).

The habitat of Latham's Snipe while in Australia includes a wide variety of ephemeral and permanent





wetlands up to 2,000 m above sea level, usually in areas with low, dense vegetation (e.g. swamps, flooded grasslands or heathlands) (DoE 2013a).

This species usually forages in areas of mud, either exposed or beneath shallow water, and roosts on the ground at sites that provide some shelter, for example, among tea-tree, under clumps of vegetation or in drainage ditches (DoE 2013a).

Aquatic field surveys recorded the presence of Latham's Snipe on the Project site. Although suitable habitat for this species is found in the large lacustrine dam which exists on the Project site, it is not considered important habitat due to the widespread distribution of this species and the presence of alternative suitable habitat throughout Australia.

### **Glossy Ibis**

The Glossy Ibis is listed as a Migratory Species and a Marine Species under the EPBC Act and is protected under the JAMBA international agreement and the Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention).

The Glossy Ibis, the smallest ibis known in Australia, has a reddish-brown neck and bronze-brown body measuring 55-65 cm, a wingspan of 80 cm – 95 cm and a weight of approximately 500 g – 800 g (DoE 2013b).

This species occupies a global area of approximately 19,400,000 km<sup>2</sup>, including eastern North America, the Caribbean region, Europe, Russia, south of the Sahara in Africa and India, with an estimated 12% of the total population within Australia (DoE 2013b).

The preferred foraging and breeding habitat for this species are freshwater marshes at the edge of lakes and rivers, flood-plains, swamps and areas under irrigation (DoE 2013b). Within Australia, the largest areas of this habitat are in drying Top End grass swamps and Channel Country grass meadows (DoE 2013b).

The species is sometimes recorded in wooded swamps, artificial wetlands and mangroves for breeding purposes, which occurs from mid-spring to the end of summer (DoE 2013b).

Aquatic field surveys on the Project site recorded the presence of the Glossy Ibis. While suitable habitat for this species is found in the large lacustrine dam which exists on the Project site, it is not considered important habitat due to the widespread distribution of this species and alternative suitable habitat throughout Australia.

#### **5.5.2.4 Mammals**

Of the 28 mammalian species recorded on the Project site during field surveys, none were listed as threatened under the EPBC Act.

Although targeted searches were employed for the threatened species that had been identified via database searches and historical surveys, EPBC listed mammal species were not encountered on the Project site.

#### **5.5.2.5 Aquatic Fauna**

During the aquatic ecology assessment conducted in 2011 and 2012, AARC recorded a total of six fish, five amphibian, six reptile, 33 bird and 10 mammal species within the Project site's riparian communities. A total of 47 macro-invertebrate species were also recorded. However, none of these



species were found to be EPBC Act listed aquatic species, except for three birds species – the Cattle Egret (*Ardea ibis*), Latham's Snipe (*Gallinago hardwickii*) and Glossy Ibis (*Plegadis falcinellus*) which are listed as Migratory Marine, Migratory Wetland and Listed Marine species under the EPBC Act.

#### 5.5.2.6 Flora

No terrestrial or aquatic plant species listed under the EPBC Act were identified on the Project site.

#### 5.5.2.7 Threatened Ecological Communities

Thirteen vegetation communities were identified on the Project site during the field surveys (refer to Figure 5.10 for vegetation communities). Seven of these communities were classed as remnant vegetation as defined in the VM Act. In addition, one community (Community 9) was considered to be consistent with Regional Ecosystem 11.4.9 in terms of species composition, but did not satisfy all requirements that define remnant vegetation (i.e. >70% of the height and/or >50% of the cover relative to the undisturbed height and cover of a given RE). 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 following vegetation communities were identified on the Project site:

- Community 1 – River Red Gum Riparian Woodland, RE 11.3.25;
- Community 2 – River Teatree Riparian Woodland, RE 11.3.3a;
- Community 3 – Lancewood Woodland, RE 11.10.3;
- Community 4 – Brigalow Woodland, RE 11.9.1;
- Community 5 – Dawson Gum Open Woodland, RE 11.4.8;
- Community 6 – Silver-leaved Ironbark Open Woodland (non-remnant);
- Community 7 – Silver-leaved Ironbark Open Woodland, RE 11.3.6;
- Community 8 – Poplar Box Open Woodland (non-remnant);
- Community 9 – Belah Low Open Woodland;
- Community 10 – Brigalow / Belah Low Open Woodland, RE 11.4.9;
- Community 11 – Non-remnant Grassland;
- Community 12 – Palustrine Wetland (non-remnant); and
- Community 13 – Lacustrine wetland (non-remnant).

Several areas mapped as Natural Grassland REs (e.g. RE 11.8.11 – '*Dichanthium sericeum* grassland on Cainozoic igneous rocks') are now dominated by buffel grass and, generally, are no longer considered to be representative of the mapped RE. However, for the purpose of this Assessment, an area of EHP-mapped RE 11.8.11 that coincides with the proposed opencut pit and infrastructure area will be considered 'Potential Natural Grassland'. This approach has been adopted to account for



potential impacts to Potential Natural Grassland prior to further ground-truthing to determine its current presence on the Project site. Consequently, this area is classified as Of Concern under the VM Act and EHP Biodiversity Status, and Endangered under the EPBC Act.

Of the ground-truthed vegetation communities, three were found to be consistent with the description of the EPBC Act listed endangered ecological community "Brigalow (*Acacia harpophylla* dominant and co-dominant)", as follows (refer to Figure 5.11 for locations details of these Brigalow vegetation communities):

- Community 4 – Brigalow Woodland, RE 11.9.1;
- Community 5 – Dawson's Gum Open Woodland, RE 11.4.8;
- Community 10 – Brigalow / Belah Open Woodland, RE 11.4.9.

The following provides a description of the three ground-truthed threatened ecological communities. Insufficient truthing of the potential natural grassland area has been undertaken at present to provide an accurate description of this community.

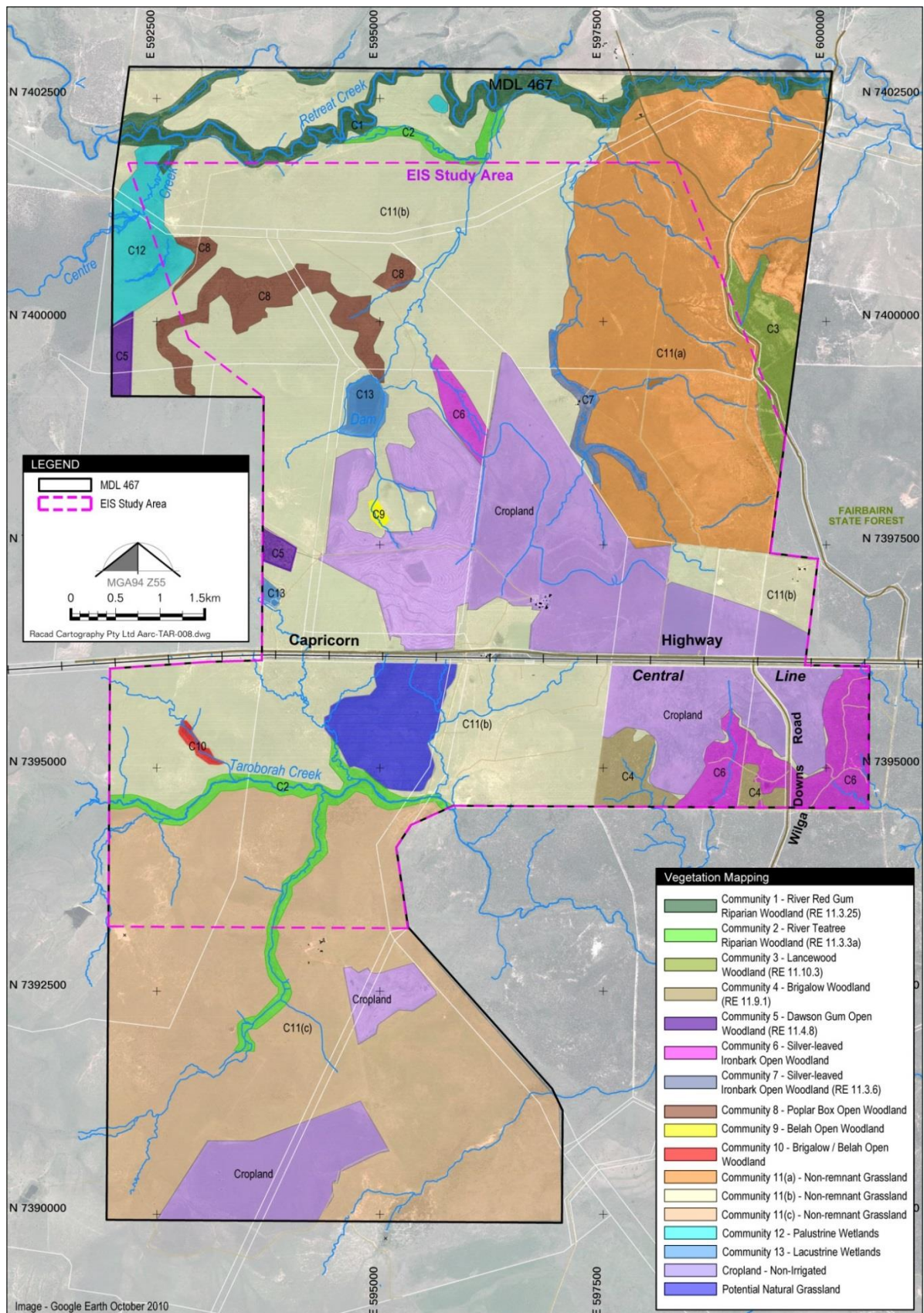


Figure 5.10 Vegetation Communities Associated with the Project Site



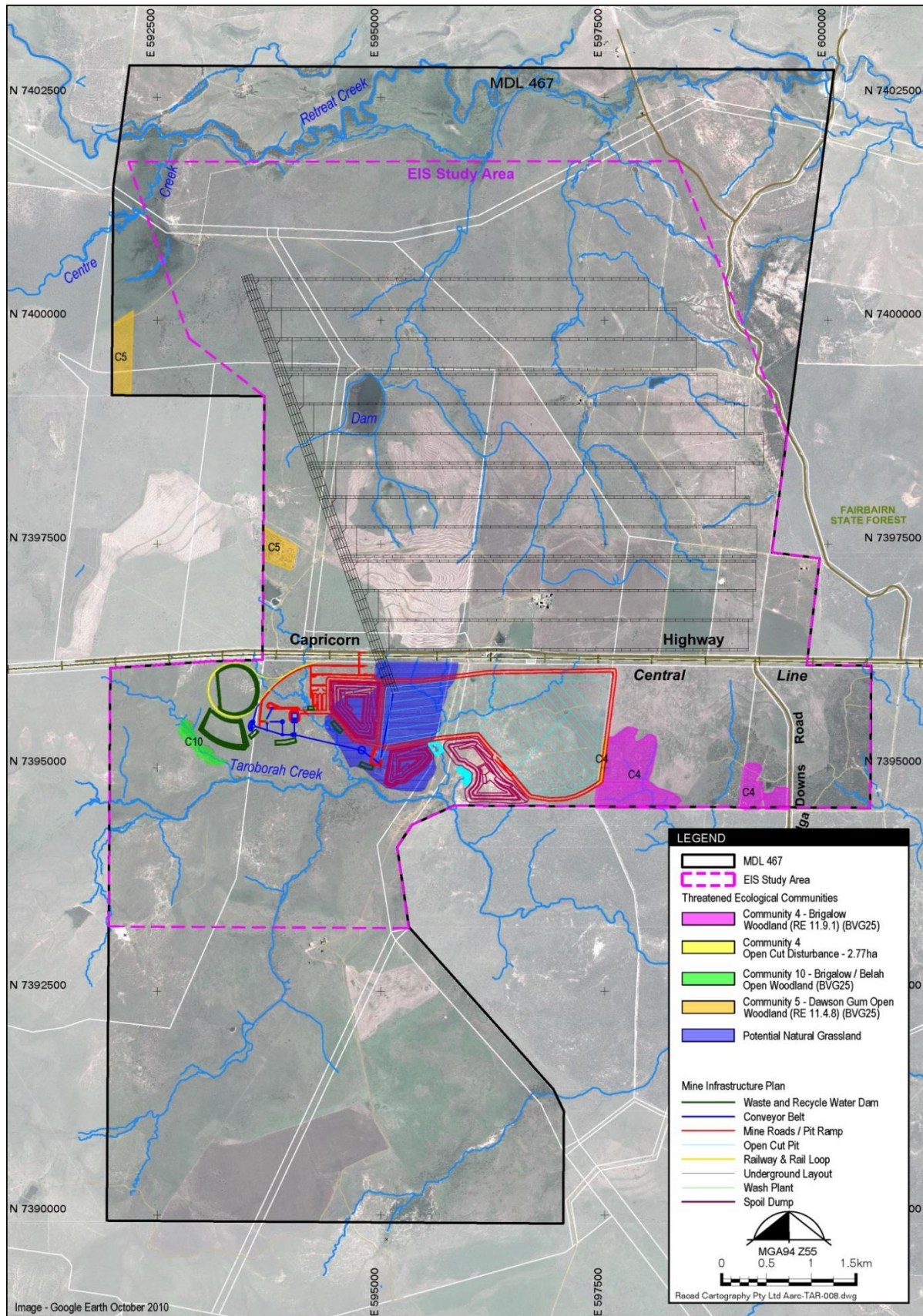


Figure 5.11 Location of Endangered Ecological Communities on the Project Site

## Community 4 – Brigalow Woodland

Brigalow (*Acacia harpophylla*) Woodland (Photo Plate 5.1) occurs in the south-east of the Project site, adjacent to Fairbairn State Forest and is comprised of two contiguous but distinct vegetation communities: Community 4 – Brigalow Woodland (RE 11.9.1) and Community 3 – Lancewood Woodland (RE 11.10.3).

These two communities occur in distinct stands but are interspersed within the patch and as such, definite boundaries between the two communities are extremely difficult to determine from aerial images. In general Lancewood Woodland occupies more surface area than Brigalow Woodland and is particularly dominant to the east of Wilga Downs Road.

### Woody Species

This community is described as Brigalow open forest to 15 m with associated emergents to a height of 20 m. Brigalow forms a low canopy layer, while the emergent canopy is typically dominated by Dawson Gum and associated with Silver-leaved Ironbark (*Eucalyptus melanophloia*). However, Silver-leaved Ironbark replaces Dawson Gum as the dominant emergent species in some areas.

False Sandalwood (*Eremophila mitchellii*) and Wilga exhibit a co-dominant distribution throughout the mid-storey of this community. Other commonly occurring mid-storey species include Erythroxylum (*Erythroxylum australe*), Currant bush (*Carissa ovata*) and Yellowwood (*Terminalia oblongata* subsp. *oblongata*). Red Ash (*Alphitonia excelsa*), Whitewood (*Atalaya hemiglauca*), Holly Bush (*Alectryon diversifolius*) and Sticky Hop-bush (*Dodonaea viscosa* subsp. *spathulata*) occur occasionally throughout the community.

### Groundcover

The ground layer is dominated by the non-native Buffel Grass (*Pennisetum ciliare*). Associated grasses include Red Natal Grass (*Melinis repens*), Queensland Bluegrass (*Dichanthium sericeum* subsp. *sericeum*), and Black Speargrass (*Heteropogon contortus*). Occasional grasses and herbs present include Slender Chloris (*Chloris divaricate* var. *divaricate*), Feathertop Wiregrass (*Aristida latifolia*), Purple Lovegrass (*Eragrostis lacunaria*), Woodland Lovegrass (*Eragrostis sororia*), Prickly Chaff Flower (*Achyranthes aspera*), and Flannel Weed (*Sida cordifolia*).

### Conservation Status

Species composition is consistent with RE 11.9.1 and is listed under the EPBC Act, described as “Brigalow (*Acacia harpophylla* dominant and co-dominant)”.

No flora species of conservation significance were recorded within the Brigalow Woodland.





**Photo Plate 5.1    Brigalow (*Acacia harpophylla*) Woodland**

### **Community 5 – Dawson Gum Open Woodland**

Dawson Gum (*Eucalyptus cambageana*) tall open woodland (Photo Plate 5.2) occurs in two small, separate patches in the west of the Project site.

#### *Woody Species*

This community consists of open woodland dominated by Dawson Gum with an associated to occasional presence of Brigalow. The low shrub layer is dominated by Currant Bush.

#### *Groundcover*

The ground layer is dominated by Buffel Grass, while spiked sida (*Sida hackettiana*) occurs commonly. Although this community is dominated by exotic Buffel Grass, it also contains a high diversity of native grasses and sedges. Occasional native groundcover species include *Bothriochloa decipiens* var. *decipiens*, Kangaroo Grass (*Themeda triandra*), Barbed Wire Grass (*Cymbopogon refractus*), Sticky Sedge (*Cyperus fulvus*) and Common Fringe-sedge (*Fimbristylis dichotoma*). Introduced and occasional groundcover species present include Sabi grass (*Urochloa mosambicensis*), Purpletop Chloris (*Chloris inflata*) and Red Natal Grass.

### Conservation Status

Species composition in this community is consistent with RE 11.4.8 and is listed under the EPBC Act, described as “Brigalow (*Acacia harpophylla* dominant and co-dominant)”. No flora species of conservation significance were recorded within the Dawson Gum Open Woodland.



**Photo Plate 5.2 Dawson Gum (*Eucalyptus cambageana*) Open Woodland**

### Community 10 – Brigalow / Belah Low Open Woodland

This Brigalow / Belah Low Open Woodland community (Photo Plate 5.3) is located in the south-west portion of the Project site and occurs in association with a tributary to Taraborah Creek. This community also occurs in a highly disturbed state along drainage lines associated with Retreat Creek and Taraborah Creek.

#### Woody Species

The canopy of this community ranges from 6 to 8 m in height and is co-dominated by Brigalow and Belah with the occasional occurrence of Coolabah. The sub-canopy exhibits a co-dominant composition of Red Bauhinia and Yellowwood to a height of 6 m.

The shrub layer has developed to a height of 4 m and is dominated by Currant Bush. Associated species include False Sandalwood and Holly Bush, while occasional species include Erythroxylum and Wilga.



### Groundcover

The ground layer has developed to a height of 1.5 m and is dominated by exotic Buffel Grass, while Awnless Barnyard Grass (*Echinochloa colona*) exhibits a sub-dominant presence. Occasional native species present within this community include Black Speargrass and *Senna sophora* var. (40Mile Scrub J.R.Clarkson+ 6908).

### Conservation Status

Species composition in this community is consistent with RE 11.4.9 and is listed under the EPBC Act, described as “Brigalow (*Acacia harpophylla* dominant and co-dominant)”.

No flora species of conservation significance were recorded within the Brigalow / Belah Low Open Woodland.



**Photo Plate 5.3 Brigalow (*A. harpophylla*) / Belah (*C. cristata*) Low Open Woodland**

### **5.5.3 Water Resources**

#### **5.5.3.1 Surface Water**

There are several eastward flowing ephemeral drainage features within the region, including:

- Retreat Creek;
- Taraborah Creek;
- St Helens Creek; and
- Kettle Creek.

Retreat Creek crosses the Project area along the northern boundary, while Taraborah Creek runs east-west across the Project area, to the south of the Capricorn Highway. Retreat Creek continues in generally an east-northeast direction to eventually join Kettle Creek and Theresa Creek before flowing into the Nogoa River downstream of Emerald. Taraborah Creek joins St Helens Creek 3 km southeast of the site before flowing into the Nogoa River downstream of Lake Maraboon.

Lake Maraboon, Queensland's second largest lake is located approximately 5 km south of the Project boundary. The lake was created following construction of the Fairburn Dam in 1972 and currently provides water to about 300 irrigators within the Emerald Region. Lake Maraboon discharges to the Nogoa River with flow maintained to supply a consistent flow to the downstream irrigators.

#### **5.5.3.2 Groundwater**

The following geological units form groundwater systems within and surrounding the Project site:

- Quaternary alluvium, located primarily along Taraborah Creek, Retreat Creek and Kettle Creek;
- Tertiary basalt, and to a lesser extent Tertiary sands and gravels; and
- Permian Aldebaran Sandstone.

##### **Permian Aldebaran Sandstone**

The Permian Aldebaran Sandstone appears on the 1:250,000 published basement geology map as the predominant sub-surface geological unit within the Project area. The Aldebaran Sandstone was extensively drilled during exploration, and the geological distribution and structure of this formation is well defined within the Taraborah Mine geological model.

Geologically the region has undergone extensive periods of deformation, resulting in disconnection of the coal seams from stratigraphy east of the Project site. This can therefore be considered as representing a regional boundary to groundwater flow.

Observations during recent drilling of groundwater monitoring bores, together with exploration drilling results, have shown groundwater to be present throughout a number of different horizons within the Aldebaran Sandstone including:

- Pebbly coarse-grained sandstone unit directly overlying A Seam;



- A and B coal seams; and
- Shallower, predominantly fine-grained, sandstones.

Bore census results show that the Permian Aldebaran Sandstone is the most commonly used groundwater system within the Project site. However, regionally only six of the 22 landholder bores identified within 10 km of the Project area target the Aldebaran Sandstone. This indicates that landholder water usage is likely to be supplemented by surface water capture and mains water supply (i.e. for domestic water use).

The western flow direction in the central Project site indicates that recharge may be occurring via rainfall percolation from mapped sub-crops of the Aldebaran Sandstone, shown on the 1:250,000 surface geology map. The southward flow direction in the northern Project area does not originate from any mapped sub-crop areas and could indicate recharge from either of the following two sources:

- Downward percolation from Quaternary alluvium associated with Retreat Creek; or
- Graben related fault leakage from the western fault zone.

### **Tertiary Basalt and Sediments**

Bore census results show that Tertiary basalts are predominantly used by landholders located to the west of the Project area, where the basalts are typically described as being fresh and vesicular. The basalt is not heavily used within the Project area, with only one landholder bore identified during the bore census.

Groundwater within basalt typically occurs within fractured and vesicular horizons. It is expected that the amount of flow within the basalts is dependent on the extent and intensity of the fractures. Drilling has shown groundwater to also be present within Tertiary clays, sands, and gravels, with measured yields generally lower than that of the basalts. The presence of thick impermeable Tertiary clays throughout the Project area suggests the Tertiary units are likely to be confined and hydraulically disconnected from the underlying Aldebaran Sandstone.

Discharge from Tertiary sediments is likely to occur as lateral flow down gradient of the Project site. Leakage to underlying units may also occur where impermeable Tertiary clays are absent in the geological profile.

### **Quaternary Alluvium**

Bore census results show that the Quaternary alluvium is used by landholders located to the north of the Project area, within the present day floodplains of Retreat and Kettle Creeks.

Alluvium within the Project site has limited groundwater potential, as drilling shows it is typically thin (<30 m) and has limited lateral extent. No users of alluvium aquifers were identified within the Project area during the bore census.

Groundwater levels measured in monitoring and landholder bores throughout the Project site show that the water table is shallow and generally less than 10 m below ground level. Water table contours for the alluvium could not be inferred due to the scarcity of monitoring bores within it; however, the water table in the alluvium is expected to reflect topography, with groundwater flow being towards drainage features and watercourses

## 5.6 SIGNIFICANT IMPACT CRITERIA

### 5.6.1 EPBC Act Listed Flora and Fauna Species

This section identifies potential Project impacts upon specific MNES that have been identified, or have the potential to be found, on the Project site as detailed in section 4.0 (threatened species, ecological communities and migratory species). Where applicable, relevant guidelines and species recovery plans have been utilised to assist mitigation measures associated with the MNES in question.

These species and communities have been assessed against the significant impact criteria defined by the *Significant Impact Guidelines: 1.1 Matters of National Environmental Significance* (Department of Environment, Water, Heritage and Arts (DEWHA) 2009), in order to assess the potential extent and significance of these impacts.

The *Significant Impact Guidelines: 1.1 Matters of National Environmental Significance* (DEWHA 2009) identifies the significant impact criteria for vulnerable species listed under the EPBC Act. It is determined that an action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:

- *Lead to a long-term decrease in the size of an important population of a species;*
- *Reduce the area of occupancy of an important population;*
- *Fragment an existing important population into two or more populations;*
- *Adversely affect habitat critical to the survival of a species;*
- *Disrupt the breeding cycle of an important population;*
- *Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline;*
- *Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat;*
- *Introduce disease that may cause the species to decline, or*
- *Interfere substantially with the recovery of the species.*

#### 5.6.1.1 Important Populations

For a species to be considered as part of an important population, the population must be necessary for a species long-term survival and recovery (DEWHA 2009). This may include populations identified in recovery plans or that are:

- *Key source populations either for breeding or dispersal;*
- *Populations that are necessary for maintaining genetic diversity; and/or*
- *Populations that are near the limit of the species range.*



#### 5.6.1.2 Suitable Habitat

Since EPBC listed reptiles are probably at greatest risk of being impacted by habitat disturbance due to their limited ability to avoid vegetation disturbance, the assessment of habitat suitability and importance should focus on these species (Brigalow Belt Reptiles Workshop (2010)).

Suitable habitats for the listed Brigalow Belt reptiles occur in a wide variety of remnant and non-remnant vegetation, predominantly eucalypt or acacia-dominated forests to woodlands and grassland communities. These species are typically found sheltering in microhabitats where moisture is retained at or just below the soil surface. Microhabitats include, but are not limited to (DoE 2011b):

- *Loose, friable topsoils;*
- *Cracks in alluvial clay soils;*
- *Live or decaying plant material, such as tussock bases, rotting logs or tree bases; and*
- *Debris situated at the soil surface, such as coarse woody debris, leaf litter, rocks or artificial debris.*

#### 5.6.1.3 Important Habitat

Suitable habitat for any one of the listed Brigalow Belt reptiles is considered important if it is (DoE 2011b):

- *Habitat where the species has been identified during a survey;*
- *Near the limit of the species' known range;*
- *Large patches of contiguous, suitable habitat and viable landscape corridors (necessary for the purposes of breeding, dispersal or maintaining the genetic diversity of the species over successive generations); or*
- *A habitat type where the species is identified during a survey, but which was previously thought not to support the species*

### 5.6.2 Endangered Ecological Communities

The significance of Project impacts upon areas of EPBC Act listed threatened ecological communities has been determined via the *Significant Impact Guidelines: 1.1 Matters of National Environmental Significance* (DEWHA 2009).

An action is likely to have a significant impact on a critically endangered or endangered ecological community if there is a real chance or possibility that it will:

- *Reduce the extent of an ecological community;*
- *Fragment or increase fragmentation of an ecological community, for example by clearing vegetation for roads or transmission lines;*
- *Adversely affect habitat critical to the survival of an ecological community;*
- *Modify or destroy abiotic (non-living) factors (such as water, nutrients, or soil) necessary for*



*an ecological community's survival, including reduction of groundwater levels, or substantial alteration of surface water drainage patterns;*

- *Cause a substantial change in the species composition of an occurrence of an ecological community, including causing a decline or loss of functionally important species, for example through regular burning or flora or fauna harvesting;*
- *Cause a substantial reduction in the quality or integrity of an occurrence of an ecological community, including, but not limited to:*
  - *Assisting invasive species, that are harmful to the listed ecological community, to become established, or*
  - *Causing regular mobilisation of fertilisers, herbicides or other chemicals or pollutants into the ecological community which kill or inhibit the growth of species in the ecological community, or*
- *Interfere with the recovery of an ecological community.*

#### **5.6.2.1 Habitat Critical to the Survival of an Ecological Community**

Habitat critical to the survival of a species or ecological community refers to areas that are necessary:

- *For activities such as foraging, breeding, roosting, or dispersal*
- *For the long-term maintenance of the species or ecological community (including the maintenance of species essential to the survival of the species or ecological community, such as pollinators)*
- *To maintain genetic diversity and long term evolutionary development, or*
- *For the reintroduction of populations or recovery of the species or ecological community.*

#### **5.6.3 Listed Migratory Species**

An action is likely to have a significant impact on a migratory species if there is a real chance or possibility that it will (DEWHA 2009):

- *Substantially modify (including by fragmenting, altering fire regimes, altering nutrient cycles or altering hydrological cycles), destroy or isolate an area of important habitat for a migratory species;*
- *Result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for the migratory species, or*
- *Seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion\* of the population of a migratory species.*

*\* An 'ecologically significant proportion' of the population varies with the species (each circumstance will need to be evaluated). Some factors that should be considered include the species' population status, genetic distinctiveness and species specific behavioural patterns (for example, site fidelity and dispersal rates) (DEWHA 2009).*

### 5.6.3.1 Important Habitat for Migratory Species

An area of 'important habitat' for a migratory species is (DEWHA 2009):

- *Habitat utilised by a migratory species occasionally or periodically within a region that supports an ecologically significant proportion of the population of the species; and/or*
- *Habitat that is of critical importance to the species at particular life-cycle stages; and/or*
- *Habitat utilised by a migratory species which is at the limit of the species range; and/or*
- *Habitat within an area where the species is declining.*

### 5.6.4 EPBC Act Water Resources

The significance of Project impacts upon water resources in relation to the EPBC Act has been determined via the *Draft Significant Impact Guidelines: Coal seam gas and large coal mining developments—impacts on water resources* (DSEWPC 2013).

An action is likely to have a significant impact on a water resource if there is a real chance or possibility that it will directly or indirectly result in:

- *A substantial change to the hydrology of a water resource; or*
- *A substantial change in water quality of a water resource.*

Where an action is likely to have a significant impact on a water resource, consideration should also be given to substantial changes to ecosystem function and integrity. Changes to a water resource may be caused by watercourse diversions, water discharges, impoundments, subsidence, post-action voids or other landscape modifications as well as mining or drilling.

#### 5.6.4.1 Hydrology of a Water Resource

A change in hydrology is a change in the groundwater and / or surface water characteristics or processes through changes in the quantity (and timing of changes in quantity) of water in a water resource, in the hydrological characteristics, or in the integrity of hydrological connections.

For the purpose of this criterion, a 'substantial change' is a change that is of sufficient scale or intensity as to reduce the current or future utility of the water resource for any purpose, or would create a material risk (i.e. greater than 'low risk') of such reduction in utility occurring. Utility includes its potential value for any purpose including for the environment.

Such changes may be observed, for example, in substantial changes to:

- *Flow regimes (volume, timing, duration and frequency of water flows);*
- *Recharge rates;*
- *Aquifer pressure or pressure relationships between aquifers;*
- *Groundwater table levels;*

- *Groundwater/surface water interactions;*
- *River/floodplain connectivity;*
- *Inter-aquifer connectivity; or*
- *Coastal processes including changes to sediment movement or accretion, water circulation patterns, permanent alterations in tidal patterns, or substantial changes to water flows or water quality in estuaries*

Substantial structural damage (e.g. large scale subsidence) is likely to have a significant impact on a water resource.

#### **5.6.4.2 Changes to Water Quality**

A substantial change in water quality would be sufficient to create a risk that, as a result of the action, the ability to achieve relevant local or regional water quality objectives would be materially compromised, and as a result:

- *Create risks to human or animal health or to the condition of the natural environment;*
- *Substantially reduce the amount of water available for human consumptive uses or for other uses, including environmental uses, which are dependent on water of the appropriate quality;*
- *Cause persistent organic chemicals, heavy metals, salt or other potentially harmful substances to accumulate in the environment; or*
- *Where local water quality is superior to local or regional water quality objectives, then the proposed action may still have a significant impact if there is a significant worsening of local water quality as a result of the development. Alternatively, there may be a significant impact if water of high quality is released into an ecosystem which is adapted to a lower quality of water.*

## **5.7 PROJECT IMPACTS**

### **5.7.1 EPBC Act Listed Threatened Species**

Components of these guidelines that were used to conduct Project impact assessments are presented in the following sections and the likely MNES Project impacts presented in Table 5.11 for threatened species, ecological communities and migratory species observed and potentially present on the Project site.

Since no field survey can identify all flora and fauna that are present on the Project site, the potential presence of MNES on site has also been considered, in terms of the availability of suitable / significant habitat on site and species distribution patterns.

A summary of potential Project impacts upon EPBC Act listed threatened ecological communities, flora and fauna species which have either been identified on the Project site or regionally via the PMST, is also presented in Table 5.11.

**Table 5.11 Significant Project Impacts upon EPBC Act Listed Threatened Ecological Communities, Flora and Fauna Found Regionally and on the Project Site**

Name	EPBC Act Status	Likely to be Significantly Affected	Comment
<b><i>Threatened Ecological Communities</i></b>			
Brigalow ( <i>Acacia harpophylla</i> dominant and co-dominant)	Endangered	Yes	<p>Only a relatively small area of fragmented vegetation is to be removed and / or disturbed (comprising 2.76 ha disturbance of a total 112.3 ha occurrence Project wide).</p> <p>Project impacts upon these communities are deemed to be significant in accordance with the <i>Significant Impact Criteria for Endangered Ecological Communities</i> (DEWHA 2009), since this action will reduce the extent of the Brigalow ecological community, although only marginally.</p> <p>Environmental offsets are proposed for this community and are discussed in Section 5.9.</p>
Coolibah – Black Box Woodlands of the Darling Riverine plains and the Brigalow Belt South Bioregions	Endangered	No	Not recorded within the Project site, but present within the PMST area.
Natural grasslands of the Queensland Central Highlands and the northern Fitzroy Basin.	Endangered	Yes	Not recorded in surveys within the Project site, but present within the PMST area. However, upon request from EHP, areas of EHP mapped possible Natural Grassland potentially affected by the Project have been included in environmental offset calculations.
Semi-evergreen vine thickets of the Brigalow Belt (North and South) and Nandewar Bioregions	Endangered	No	Not recorded within the Project site, but present within the PMST area.
Weeping Myall Woodlands	Endangered	No	Not recorded within the Project site, but present within the PMST area.



Name	EPBC Act Status	Likely to be Significantly Affected	Comment
<b>Flora</b>			
<i>Aristida annua</i>	Vulnerable	No	Not recorded within the Project area. No important habitat observed. Records indicate that this species is mainly found to the south of Emerald.
<i>Cadellia pentastylis</i> Ooline	Vulnerable	No	Not recorded within the Project area. No important habitat observed. Records indicate that this species is mainly found to the east and south of Emerald.
<i>Dichanthium queenslandicum</i> King Blue-grass	Vulnerable	No	Not recorded within the Project area. No important habitat observed and suitable habitat is limited on the Project site. This species has been identified to the north and south of Emerald.
<i>Digitaria porrecta</i> Finger Panic Grass	Vulnerable	No	Not recorded within the Project area. No important habitat has been observed on the Project site and suitable habitat is limited. Records indicate that this species is mainly found to the south of Emerald.
<i>Marsdenia brevifolia</i>	Vulnerable	No	Not recorded within the Project area. No important habitat observed on the Project site. This species has been identified to the east and south of Emerald.
<b>Fauna</b>			
<i>Apus pacificus</i> Fork-tailed Swift	Migratory	No	Not recorded within the Project area. No important habitat observed on the Project site. Although one record of this species occurs near the Project site, this bird is mainly found along the coast of Queensland.

Name	EPBC Act Status	Likely to be Significantly Affected	Comment
<i>Ardea alba</i> Great Egret	Migratory	No	Not recorded within the Project area. No important habitat observed on the Project site.  This bird is found throughout Queensland and its distribution is not limited.
<i>Ardea ibis</i> Cattle Egret	Migratory	No	Although this species was observed on the Project site, it was not deemed likely to be subject to significance impacts as defined in the Significant Impact Criteria for listed migratory species.  Important habitat was not observed on the Project site and the Project is unlikely to affect an ecologically significant portion of the species due to the wide distribution of the Cattle Egret and the high availability of suitable habitat off site.
<i>Erythrorhynchus radiatus</i> Red Goshawk	Vulnerable	No	Not recorded within the Project area and no important habitat was observed on site.  Note that the Project site lies outside the known range for this species.
<i>Gallinago hardwickii</i> Latham's Snipe	Migratory	No	Recorded within the Project region, but not the Project area. No important habitat was observed on site and suitable site habitat is limited.  Since the region contains an abundance of suitable habitat, the Project is not likely to have an impact upon this species.
<i>Geophaps scripta scripta</i> Squatter Pigeon	Vulnerable	No	Not recorded within the Project area and no important habitat was observed on site.  The main range of this species lies to the south east of Emerald.
<i>Haliaeetus leucogaster</i> White-bellied Sea Eagle	Migratory	No	Not recorded within the Project area and no important habitat observed on site with suitable habitat limited.  The Project site lies outside the main range of this species, although sightings have been recorded to the south and west of Emerald.

Name	EPBC Act Status	Likely to be Significantly Affected	Comment
<i>Hiraundapus caudacutus</i> White-throated Needletail	Migratory	No	Not recorded within the Project area. No important or suitable habitat has been observed on the Project site. This species is mainly found to the south east of Emerald.
<i>Merops ornatus</i> Rainbow Bee-eater	Migratory	No	Not recorded within the Project area. No important or suitable habitat has been observed on the Project site. However, regional records of this species exist.
<i>Myiagra cyanoleuca</i> Satin Flycatcher	Migratory	No	Not recorded within the Project area. No suitable or important habitat has been observed on the Project site. Although this species has been recorded to the south and east of Emerald, the main range of this species occurs along coastal regions.
<i>Neochmia ruficauda ruficauda</i> Star Finch	Endangered	No	Not recorded within the Project area. No suitable or important habitat observed on the Project site. No records of this species exist within the Project region.
<i>Rostratula australis</i> Australian Painted Snipe	Vulnerable/Migratory	No	Not recorded within the Project area. No suitable or important habitat observed on the Project site. However, records of this species do exist within the Project region.
<i>Dasyurus hallucatus</i> Northern Quoll	Endangered	No	Not recorded within the Project area and no important habitat was observed on site. However, this species has been recorded within the region.
<i>Nyctophilus timoriensis</i> Greater Long-eared Bat, South-eastern Long-eared Bat (South-eastern form)	Vulnerable	No	Not recorded within the Project area. No important habitat observed. Limited occurrences of this species have been identified south of Emerald.

Name	EPBC Act Status	Likely to be Significantly Affected	Comment
<i>Delma torquata</i> Collared Delma	Vulnerable	No	Not recorded within the Project area, but identified within the Project region. No important habitat was observed on the Project site and suitable habitat on site was found to be limited. All of the records for this species lie to the south east of Emerald.
<i>Denison maculata</i> Ornamental Snake	Vulnerable	No	Not recorded within the Project area, but identified within the Project region. No important habitat observed. Most of the location records for this species occur to the north and east of Emerald. Considered low risk of significant impact.
<i>Egernia rugosa</i> Yakka Skink	Vulnerable	No	Not recorded within the Project area, but identified within the Project region. No important habitat was observed on site. Habitat disturbance as a result of Project activities is considered to be minimal, due to the limited area of disturbance proposed. Most of the location records for this species occur to the east and south east of Emerald. Considered low risk of significant impact.
<i>Furina dunmalli</i> Dunmall's Snake	Vulnerable	No	Not recorded within the Project area and no important habitat was observed on site. Suitable habitat on site was found to be limited. This species range lies mainly to the south east of Emerald.

Name	EPBC Act Status	Likely to be Significantly Affected	Comment
<i>Lerista allanae</i> Allan's Lerista	Endangered	No	Not recorded within the Project area and no important habitat was observed on site, suitable site habitat was limited.  Habitat disturbance as a result of Project activities is considered to be minimal, due to the limited area of disturbance proposed.  A limited number of specimens have been identified to the north west of Emerald.
<i>Paradelma orientalis</i> Brigalow Scaly-foot	Vulnerable	No	Not recorded within the Project area, however limited suitable habitat exists on site.  Habitat disturbance as a result of Project activities is considered to be minimal, due to the limited area of disturbance proposed.  Records indicate that this species range is located to the south and east of Emerald.
<i>Rheodytes leukops</i> Fitzroy River Turtle	Vulnerable	No	Not recorded within the Project area and no important habitat observed on site.  Records indicate that this species range is located to the east of Emerald, mainly on the Fitzroy River.



#### 5.7.1.1 Indirect Impacts on MNES

Edge effects resulting from the proposed works can include the introduction and 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 impacts in relation to edge effects, predominantly in relation to the introduction and / or spread of weed species throughout the Project site.

A change in population dynamics may occur through the isolation of habitats, although it is not expected to be significant as the Project site has little remnant vegetation to be cleared. Species most susceptible to a decline are low mobility species. Species such as amphibians and smaller reptiles may become genetically isolated.

Habitat fragmentation and isolation of populations where vegetation clearance has the potential to impact on intact linear strips of remnant vegetation usually would be a considerable indirect impact on local population. In the case of this Project, remnant vegetation patches have already been subject to isolation from previous pastoral clearing. The linear patch along Retreat Creek will not be cleared as part of the Project.

An alteration of ecological processes, such as changed frequencies and extent, has the potential to indirectly impact on listed flora, reptiles and mammals, as these species are considered to be of low mobility. The Squatter Pigeon (*Geophaps scripta scripta*) may also be indirectly impacted by changed fire regimes, as this species spends most of its time and nests in the ground.

The Project site and surrounding areas may encounter an increase in pest fauna and flora species (including the Cane Toad (*Bufo marinus*), European Rabbit (*Oryctolagus cuniculus*), Feral Pig (*Sus scrofa*) and Feral Cat (*Felis catus*)) due to the increased availability of food sources which will occur once the Project site is operational. Applicable pest fauna and flora management and mitigation measures will be implemented during the life of the Project.

Notable species which occur in the *Protected Matters Search Tool 2011* for the Fairbairn State Forest, but within the desktop review for the Project site include the Koala (*Phascolarctos cinereus*) and the Silver Perch (*Bidyanus bidyanus*).

The Koala is classed as Vulnerable. Koalas have been studied near Springsure and Blair Athol (both in Brigalow Belt North bioregion). Koalas in this region typically occur in low densities and have large home ranges. The most recent estimates were provided to the National Koala Abundance Workshop (2009) for Springsure. At four sites at Springsure, the densities of Koala numbers declined from an estimated average of 0.155 to 0.01 Koalas / ha (a decline of >90%) between in 1992 and 2009 (TSSC, 2012). With respect to the Significant Impact Guidelines (DEWHA, 2009), it is not considered the Project site or Fairbairn State Forest is defined as part of an 'important population' (of an EPBC Act listed vulnerable species). Regional mapping shows the area 'may' hold koala habitat (as opposed to 'likely' or 'known' to occur). Potential threats to the Koala include habitat loss and fragmentation, mortality from dog bites and vehicle strikes, declines in isolated populations caused by disease (i.e. Chlamydia) and Myrtle Rust, which is a fungal pest of *Myrtaceae spp.* As adjacent habitat to the Fairbairn State Forest is non-remnant, no fragmentation of additional viable habitat is proposed. A potential for an increase in Dingo/Feral Dog (*Canis lupus dingo*) populations exists due to additional anthropogenic activity and food sources from the Project. An indirect impact from the Project, if not managed, may be the potential increase in wounds to the Koala.

The Silver Perch was listed as Critically Endangered in December 2013. Once very common throughout the warmer waters of the Murray-Darling, this species' natural river numbers have dropped significantly in recent years. It congregates along rapids and weirs. Factors causing decline in this species are an increased egg mortality rate due to lack of moving water, predation by introduced fish species, such as Mosquito fish (*Gambusia holbrooki*) and construction of dams and weirs to impede fish movement. Given the Project is downstream of Fairbairn State Forest, the potential for indirect negative impacts on the Silver Perch as a result of the Project is unlikely.

## **5.7.2 EPBC Act Listed Migratory Species**

Potential Project impacts upon EPBC Act listed migratory species are addressed in this section. A summary of definitions for significant impact criteria and important habitat for these migratory species are presented in the following sections, together with an assessment of Project impacts for the three migratory species in question.

### **5.7.2.1 Cattle Egret**

Given the vast distribution of this species throughout Australia and the presence of a significant wetland (i.e. Lake Maraboon) to the south of the Project site, the Project is not expected to have a significant impact on the Cattle Egret.

In addition, the very nature of Migratory birds allows for the species to utilise various habitats throughout vast distances, therefore significant impacts as determined by review of the *Significant Impact Guidelines: 1.1 Matters of National Environmental Significance* (DEWHA 2009) are not expected to affect Migratory species.

### **5.7.2.2 Latham's Snipe**

This species covers a wide distribution range, including both coastal and inland habitats across eastern Australia. Project impacts upon this migratory species are not expected to be significant since the Project site occurs outside this bird's main distribution range and a wide variety of alternative habitat is available to this species.

Since Latham's Snipe is migratory, it can utilise the various habitats that exist along eastern Australia. Utilising the *Significant Impact Guidelines: 1.1 Matters of National Environmental Significance* (DEWHA 2009) it has been determined that Project activities are not expected to affect this Migratory species. The freshwater wetland habitat preferred by this species will not be significantly impacted by Project activities.

### **5.7.2.3 Glossy Ibis**

Glossy Ibis habitat occurs across eastern, northern and western sectors of Australia; therefore, any disturbance to Project site habitat should not have a significant impact upon this species, even though local records for the Glossy Ibis exist.

Since the Glossy Ibis is a migratory bird, its habitat is not limited to specific locations, therefore, significant Project impacts are not expected to affect this species, as determined by the *Significant Impact Guidelines: 1.1 Matters of National Environmental Significance* (DEWHA 2009).

### 5.7.3 EPBC Act Listed Threatened Communities

#### 5.7.3.1 Brigalow (*Acacia harpophylla* Dominant and Co-Dominant)

The Brigalow threatened ecological community (*Acacia harpophylla* dominant and co-dominant) is listed as Endangered under the EPBC Act.

Brigalow is the commonly accepted name for the species *Acacia harpophylla* and the vegetation in which this species is dominant or co-dominant (DoE 2012f). The Brigalow ecological community occurs on flat to undulating Cainozoic clay plains and bedded fine-grained sedimentary rocks.

This community is associated with clay field-texture soils which are relatively fertile and have a high salt content (DoE 2012f).

The listed Brigalow ecological community is currently threatened by tree clearing, fire, grazing pressure and weed invasion (DoE 2012f). In addition, Brigalow seeds are relatively rare in natural landscapes and the production of viable seed requires cross-pollination between trees, such seeds remain viable for less than 12 months (DoE 2012f).

Brigalow occurs on the Project site in the form of the following three vegetation communities:

- Community 4 – Brigalow Woodland (RE 11.9.1);
- Community 5 – Dawson's Gum Open Woodland (RE 11.4.8); and
- Community 10 – Brigalow/Belah Open Woodland (RE 11.4.9).

Refer to Figure 5.11 for details of the proposed Project layout and potential Project impacts upon EPBC Act listed ecological communities.

The Brigalow vegetation communities located south of the Capricorn Highway will be the only vegetation subject to land clearing, with the vegetation located north of the highway being subject to land subsidence as a result of the underground operations. A land subsidence assessment has been conducted by IMC (2013) in order to identify the extent of land subsidence that is anticipated to occur across the northern sector of the Project site.

The areas of EPBC Act listed threatened ecological communities impacted by Project activities have been summarised as follows:

#### **Brigalow Woodland**

Of the 256,000 ha of remnant Brigalow community in the Brigalow Belt North Bioregion, approximately 72.6 ha is located within the Taraborah MDL 467 area and it is proposed that 2.76 ha (3.8 %) is to be removed in order to construct the eastern opencut pit haul road which is estimated to be in operation by 2018.

#### **Dawson's Gum Open Woodland**

This vegetation community covers 31.2 ha of the Project site and is located in the north-west portion of the Project Site, adjacent to the MDL 467 boundary. The Dawson's Gum Open Woodland is not located in any of the proposed disturbance areas and is considered unlikely to be impacted by the Project.



### Brigalow / Belah Open Woodland

This vegetation occurs in association with a drainage line of Taroborah Creek and was observed to be in a highly disturbed state. The Brigalow / Belah Open Woodland accounts for 8.5 ha of the Project Site but will not be disturbed by Project activities.

A summary of Brigalow vegetation area and proposed disturbance / removal is presented in Table 5.12.

**Table 5.12 Brigalow Vegetation and Proposed Disturbance Areas**

Vegetation Community		Total Area on Project Site (ha)	Total Disturbance Area on Project Site (ha)
4	Brigalow Woodland	72.6	2.76
5	Dawson Gum Open Woodland	31.2	0
10	Brigalow / Belah Low Open Woodland	8.5	0
Total		112.3	2.76

#### 5.7.3.2 Brigalow Indirect Impacts

Weed invasion associated with edge effects along the interface between retained Brigalow communities and the Project disturbance area is an indirect impact which will need to be managed. Continuous livestock grazing and pasture management can prevent or slow the natural regeneration of Brigalow regrowth. This area equates to approximately 8.5 ha of Brigalow / Belah Low Open Woodland, classed as RE 11.4.9.

#### 5.7.3.3 Natural Grasslands of the Queensland Central Highlands and the Northern Fitzroy Basin

The PMST identified that the endangered ecological community 'Natural Grasslands of the Queensland Central Highlands and the northern Fitzroy Basin' may occur on the Project site. While field surveys identified a grassland community on the Project site, it was classified as a Non-remnant Grassland community due to the dominant presence of Buffel grass and high abundance of other exotic groundcover species (e.g. Rhodes Grass, Parthenium and Parkinsonia).

Following discussion with EHP, however, further surveys during the wet season have been requested to provide additional evidence of the characteristics of this grassland community. Consequently, an area of the Potential Natural Grassland endangered ecological community that coincides with the opencut and mine surface facilities has been included in this assessment to ensure the potential impacts are accounted for, prior to further clarification of the status of Potential Natural Grassland on the Project site.

The principal threats to the Natural Grassland ecological community include agricultural pressures (grazing, pasture and cropping), invasive species, and resource and infrastructure activities (DoE 2008).



Further details of Project impacts to, and environmental offsets for, this potential endangered ecological community are provided in Section 5.9.

## **5.7.4 Water Resource Impacts**

The influence of the Project on the groundwater and surface water is summarised below, and a report specifically addressing the *IESC Information Guidelines for Proposals Relating to the Development of Coal Seam Gas and Large Coal Mines where there is a Significant Impact on Water Resources* provided in Appendix 26.

### **5.7.4.1 Water Supply**

All of the water required for the Project will be supplied from local aquifers. Over time, the necessary abstraction of groundwater to permit mining operations to be safely undertaken will result in groundwater drawdown. There will be no need to take water from overland flow, since the volumes of groundwater abstracted will be more than sufficient to supply the mine's water requirements. During particular phases of the mine life, groundwater abstraction rates will actually exceed the Project's water demand. Both construction and operational phases of the Project will use groundwater as their main supply of water. The large dam which is located in the central west of the Project site also offers an additional water supply if required. The *Water Resource (Fitzroy Basin) Plan 2011* applies to this Project and manages the taking of overland flow water and groundwater. Details of the proposed rates of groundwater abstraction and possible overland flow capture by existing structures will be used by the Department of Natural Resources and Mines in order to develop and approve a licence or permit to take water under the *Water Act 2000*.

Water requirements on the mine site will vary over the life of the operation. Water use will mainly comprise dust suppression and in the coal preparation process. Climatic factors will also play a significant role in water requirements for dust suppression and will be assessed on a year to year basis. Operational water needs will be preferentially sourced from the on-site storages (dirty and clean water) that are fed from surface and groundwater flows reporting to the opencut pit and underground mine. A 200 kL water storage tank and Potable Water Treatment Plant for the generation of potable water on site will be installed as part of the Project as well as a separate 200 kL storage tank of untreated clean water for fire-fighting purposes.

### **5.7.4.2 Surface Water**

The Project site will be subjected to two different types of disturbance. In the north of the site, underground mining will cause subsidence of the land surface, whilst in the south of the site, vegetation clearance, pit excavation and infrastructure development will impact local surface water courses and overland flows. The catchment size south of the Project site will be modified by infrastructure development. No significant changes in catchment area are anticipated for the land in the north of the Project site. Catchment characteristics will be modified by land subsidence (increased undulation in topography), infrastructure development (modifications in catchment runoff characteristics) and pit development (removal of land surface).

No significant changes to the direction or quantity of runoff in the local catchment north of the Project site are anticipated, however, development of the opencut pit and out-of-pit spoil dumps in the south of the Project site will alter surface water drainage lines, with some lines removed entirely and other lines redirected. However, the majority of the current surface water drainage patterns disturbed in the opencut area will be returned upon final rehabilitation of the site.

Limited stream bed and bank scouring and erosion are anticipated in the early stages of land surface





subsidence, however, in time the surface water courses which have been impacted by subsidence will, via sediment deposition, repair the initial bed and bank scouring and erosion effects.

Since most of the Project site flooding is modelled to occur along Taroborah Creek and no infrastructure will be developed within the modelled flood plain, development of the Project will not have a significant impact upon flooding in the south of the Project site.

Note that no Wild Rivers declarations exist on or near the Project site and therefore, no preservation; special floodplain management or sub-artesian management areas apply to this Project.

#### **5.7.4.3 Groundwater Drawdown**

A three-dimensional numerical simulation of groundwater flow for the Project was undertaken as part of the technical studies, in order to estimate groundwater seepage into the opencut pit and underground mine. The modelling was also used to predict the zone of depressurisation in alluvial and other aquifers, and predict changes in the groundwater regime. The predictive model was run over the life of the mine (21 years) and indicates that:

- The proposed mine has a predicted average inflow rate of 2.6 megalitres per day (ML/day) of groundwater, which peaks at 5.7 ML/day around Year 19;
- Groundwater level drawdown within the alluvium could extend up to 3.5 km east of the MDL boundary, although no known current users of alluvium will be impacted;
- Groundwater level drawdown within the Tertiary basalt could extend up to 3 km south of the MDL boundary, although the drawdown on the two known bores to be effected would be 1 m or less;
- Following mine closure, groundwater levels will recover to 194 m Australian Height Datum (AHD) and 190 m AHD for the western and eastern pit voids, respectively, with both pit lake levels well below the pit crest; and
- Based on model results and findings from a series of bore census investigations conducted in the Project area, seven active private bores could report declines in groundwater levels of over 2 m as a result of the proposed mine.

#### **5.7.4.4 Groundwater Drawdown Impacts on Flora and Fauna**

Land subsidence may impact on any of the seven remnant vegetation communities located above the underground mining footprint. Surface cracking occurs as a result of tensile strain on the ground surface from subsidence. Direct impacts on these communities may include destabilising root systems, increasing land elevation angles and changing surface-soil drainage patterns. Tension cracking may occur throughout the subsidence impact area. It is expected that any cracks will be less than 5 m deep and a maximum width of 0.2 to 0.3 m in the worst case scenario.

Alteration to the groundwater regime by dewatering may cause variations to terrestrial habitat and fluctuations to surface water flows and aquatic habitat availability.

Groundwater drawdown impacts to surface watercourses may cause a loss of habitat for species and an alteration/degradation of water quality. Subsidence due to groundwater drawdown and long wall mining often leads to the formation of shallow depressions within the beds of watercourses. Although it is considered likely that such depressions will fill with sediment within a few wet seasons, the watercourse may experience increases in flow velocity and erosion in the interim if the watercourse



runs tangentially to the line of subsidence. The drainage profile may experience subtle changes as a result of subsidence. The predicted minor changes in topography may result in additional ponded areas. While most areas of ponding would be shallow and dry quickly after rainfall events, some ponded areas may provide additional habitat for Cane Toads (*Bufo marinus*). Significant areas of artificial long-term ponding also have the potential to cause changes in vegetation type or remnant status. While the majority of the area to be impacted by subsidence consists of non-remnant grasslands and croplands, some areas of remnant vegetation may be impacted by subsidence-induced ponding. In the event that subsidence leads to the creation of ponded areas of significant depth (i.e. 1 m or greater) there could be significant impacts on remnant vegetation. If not mitigated in a timely matter, such changes in hydrological regime can cause dieback of terrestrial flora species resulting in the loss of remnant vegetation and/or a shift in community composition to wetland species.

One large dam located in the north-west region of the Project site may be impacted by groundwater drawdown, which may affect native flora and fauna species, as well as any stock which may utilise the dam as a drinking water source. Potential impacts on the dam may change to the extent and depth of the water body. Groundwater drawdown below a surface water body may result in the loss of water to near-surface groundwater flows. The severity of impacts on the dam will depend on the depth of the coal seam to be extracted below the dam and depth of groundwater drawdown. Long wall mining can cause a surface water body to lose flow permanently where the coal seam occurs less than 100 – 120 m below the surface. Where a coal seam occurs greater than 150 m below the surface water body, the loss of water may be temporary, unless the area is affected by severe geological disturbance (e.g. strong faulting). Given that, within the region of the dam, the target coal seam occurs approximately 140 – 150 m below the surface and there is no evidence of significant faulting from the exploration surveys that have been conducted to date, long wall mining will likely not have permanent impacts on the hydrology of the dam.

#### **5.7.4.5 Groundwater Drawdown Impacts on Groundwater Dependant Ecosystems**

Based on the available mapped extent of GDEs from the national GDE Atlas and the predicted zone of drawdown within the unconfined stratigraphy, a few, minor zones of low to moderate potential for groundwater interaction could be impacted by the proposed mine. The GDE Atlas presents mapped locations of potential GDEs based on remote sensing, previous mapping and literature reviews. Therefore, ground-based assessments are required in order to confirm the presence of GDEs.

Ecological field investigations discovered only one creek, which flows northward towards Retreat Creek, that is fed by a local spring. The main threatening processes for this spring fed creek are aquifer draw down (due primarily to uncapped bores, but also to mining activities), excavation of springs, pest flora and fauna establishment and stock damage.

However, since groundwater levels in the vicinity of Retreat Creek have been recorded approximately six metres below ground level, only deep-rooted vegetation (such as the Eucalypt trees which form the dominant canopy) may potentially depend on groundwater resources.

A groundwater reduction of approximately 5 m has been modelled around Retreat Creek, while a 30 m reduction has been modelled around Taroborah Creek. Although existing measured groundwater levels along Retreat Creek are 6 – 10 m below ground level, and no shallow groundwater was encountered in the alluvial material along Taroborah Creek, the predicted drawdown may result in impacts to vegetation that utilise groundwater, such as deep-rooted Eucalypt species associated with RE 11.3.25, 11.3.3a or 11.3.6. Vegetation lacking deep-roots (i.e. shrubs and groundcover species) is not anticipated to be impacted by operational groundwater drawdown. The maximum extent of groundwater drawdown extends up to approximately 3.5 km beyond the Project



site, predominantly to the east (AGE 2014). Within this extent of drawdown, vegetation communities or flora species that depend to some degree on access to sub-surface groundwater may be impacted if the groundwater level falls lower than the root zone.

### 5.7.5 Cumulative Impacts

The potential ecological impacts identified 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; Council on Environmental Quality 1978). These impacts may become exacerbated over time. Consideration of cumulative impacts is necessary so that impacts associated with the Project can be assessed with additional regional impacts from external sources. External mining operations established in the future may potentially interact with the construction and operation of the Project.

According to the Coal Plan 2030 (Coal Plan), Queensland has large reserves of coal, with Central Queensland identified as a world-ranked producer and exporter of black coal and a major centre for mineral processing (Mining and Safety, 2011) (DIP, 2010). The Bowen Basin produces coal, gold, silver, limestone, coal seam gas, magnetite and gemstones. A number of coal projects are currently under investigation or development in the Bowen Basin and in particular the Central Highlands Regional Council LGA.

Information provided by EHP (2014) indicates approximately 41 mines are located in the Fitzroy Basin and the *Central Queensland Mineral and Energy Development Project Lists* provided by DNRM (2013a) indicates six operating coal mines, one coal mine in care and maintenance and five advanced coal projects within approximately a 100 km radius from the Project site. Operating coal mines and advanced coal projects located within this study area are summarised in Table 5.13 below.

**Table 5.13 Current and Proposed Coal Projects in the Region**

Company	Project Name	Proposed Start Date	Distance to the Project
<b>Operating Mines</b>			
Rio Tinto Coal Australia	Blair Athol Mine	care and maintenance	90 km north west
Rio Tinto Coal Australia	Clermont Mine	operating	85 km north
Ensham Resources	Ensham Mine	operating	60 km east
Xstrata Coal	Oaky Creek	operating	75 km north east
Sojitz Coal Mining Pty Ltd	Minerva Mine	operating	50 km south
Rio Tinto Coal Australia	Kestrel Mine	operating	50 km north east
BHP Billiton Mitsubishi Alliance Australia	Gregory Crinum Mine	operating	65 km north east
<b>Proposed Mines</b>			
Aquila Resources	Washpool Opencut	2015	90 km east



Company	Project Name	Proposed Start Date	Distance to the Project
Blackwater Coal Pty Ltd	Minyango Underground	2016	100 km east
Bandanna Energy Ltd	Springsure Creek Underground	2014	75 km south east
New Emerald Coal Pty Ltd	Teresa Underground	2016	25 km to the north east
Bandanna Energy Ltd	Accturus Opencut and Underground	On hold	90 km south east

#### 5.7.5.1 Brigalow Threatened Ecological Community Cumulative Impacts

The Project proposes to clear a minimal area of the Brigalow threatened ecological community, with a total of up to 2.76 ha. Within Queensland, approximately 65% of remnant Brigalow threatened ecological community occurs within protected areas. Therefore, there is little risk of extinction of this community; however there is the potential for a number of Projects within the Bowen Basin to have a cumulative impact. A potential for cumulative impact to the Brigalow threatened ecological community occurs as:

- Clearing from multiple Projects will reduce the existing remnant area within the Brigalow Belt Bioregion;
- Clearing has the potential to increase fragmentation and edge effects by creating smaller patches which may be less sustainable to flora and fauna that utilise this community. Species endemic to the Brigalow community (such as the Ornamental Snake (*Denisonia maculata*) and Dunmall's Snake (*Furina dunmalli*)) may be particularly affected by habitat clearing and fragmentation; and
- Drawdown of groundwater levels may modify factors necessary for the Brigalow threatened ecological communities persistence in the surrounding landscape.

#### 5.7.5.2 Water Resources Cumulative Impacts

The greatest potential for any impact to groundwater is in the vicinity of shallow alluvial aquifers, mostly found near major creeks and rivers. The nearest advanced coal resource is the Teresa Coal Project, approximately 25 km to the north. This project has a worst-case scenario model drawdown extent of 2.5 km to the north and west of the project boundary and 10 km to the south and southeast of the project boundary (GHD, 2013). Groundwater drawdown for the Taraborah Project is modelled to be up to 3.5 km outside of the Project boundary. Given the two Project boundaries are approximately 19 km apart, it is unlikely that the Teresa Coal Project and the Taraborah Coal Project will have a cumulative impact on the groundwater aquifer.

The Project is unlikely to have significant cumulative impact on the ecological integrity of Taraborah Creek or Retreat Creek. Both of these waterways are ephemeral, flow in an easterly direction and ultimately flow into the Nogoa River, downstream of Fairbairn Dam or Lake Maraboon. The Project does not propose water to be dammed, extracted or diverted from these watercourses, and only minimal overland flow that drains to these waterways during the wet season will be temporarily captured in ponds created by subsidence. No operating mines exist upstream of the Project site within



the Fitzroy Basin. Therefore the cumulative impacts of discharges from multiple sources are not considered to pose a risk to the local receiving environment. No Coal Seam Gas (CSG) projects are located in near proximity to the Project.

#### **5.7.5.3 Uncontrolled Releases**

While the Taraborah Project is not anticipated to cause impacts to the receiving environment, the potential exists for the Project to contribute to catchment-wide downstream cumulative impacts resulting from uncontrolled discharges of mine affected water. The potential impacts associated with the release of mine affected waters include:

- Toxicity related to the release of sulphate, salinity, acid or alkaline solutions, metals or metalloids;
- Changes in the bioavailability of metals caused by changes to pH of receiving waters, impacting flora and fauna;
- Detrimental impacts to the structure and function of ecosystems; and
- Impacts to the suitability of water for drinking, stock water, or irrigation.

While it is inevitable that all developments will contribute to cumulative impacts to some extent, the degree and severity of this contribution is dependent on a number of factors, including:

- Quality and quantity of mine discharge water;
- Time of release;
- Weather conditions at the time of release;
- Existing quality and flow of the receiving catchments. For example, it has been noted that northern sub-catchments such as Isaac/Connors typically has naturally higher EC than the Nogoia sub-catchment (DERM 2009);
- The number and type of other developments in the area; and
- Whether the release coincides with releases from other mines.

#### **Fitzroy Basin Cumulative Impacts**

A study conducted by the Department of Environment and Resource Management (DERM) in 2009 investigated the cumulative impacts of mining activities on water quality in the Fitzroy River Basin. The study concluded that the limits and conditions imposed on coal mines were inconsistent and not necessarily effective in protecting downstream environmental values, and insufficient data are available to provide a quantitative assessment of the cumulative impacts of mine water discharges (DERM 2009).

It is considered that salinity presents the most significant risk to water quality in the Fitzroy Basin due to discharges from coal mines. As part of the study, a risk assessment was conducted using electrical conductivity, discharge data (i.e. duration, frequency, volume, water quality and receiving waters) and geographic location within the basin. The matrix shown in Table 5.14 was used to determine the risk rating for each mine.





**Table 5.14 Cumulative Risk Assessment Matrix for Mine Discharges in the Fitzroy Basin**

Frequency/Volume (ML/year)			EC (µS/cm)			
			Very Low	Low	Medium	High
			<720	<1,250	<2,500	>2,500
Very Low	Zero/small	<100	Very Low	Low	Low	Medium
Low	Few releases, infrequent	<1,000	Low	Low	Medium	Medium
Medium	Frequent	<10,000	Low	Medium	Medium	High
High	Continuous, some dry weather	<100,000	Medium	Medium	High	Very High
Very High	Continuous, months	>100,000	Medium	High	Very High	Very High

Source: DERM 2009

The assessment found that the greatest contributors to potential downstream cumulative impacts on water quality were:

- Coppabella (Peabody Energy);
- North Goonyella (Peabody Energy);
- Goonyella Riverside (BHP Billiton Mitsubishi Alliance);
- Millennium (Peabody Energy);
- Peak Downs (BHP Coal Pty Ltd); and
- Ensham (Ensham Resources Pty Limited).

The results of the risk assessment are illustrated in Figure 5.12. With the exception of Ensham (located in the Nogoa sub-catchment), these mines are located in the Isaac-Connors sub-catchment. An additional six mines in the northern sub-catchments were found to present a medium cumulative risk. Most mines in the southern sub-catchments (i.e. Dawson, Nogoa and Mackenzie), however, presented only a low cumulative risk to water quality impacts based on EC. Coal mine development in the northern sub-catchments of the Fitzroy Basin is considered to pose a greater risk of downstream cumulative impacts than mines in the southern sub-catchments, in which the Taraborah Project is located.

Three main recommendations were proposed based on the conclusions of the study:

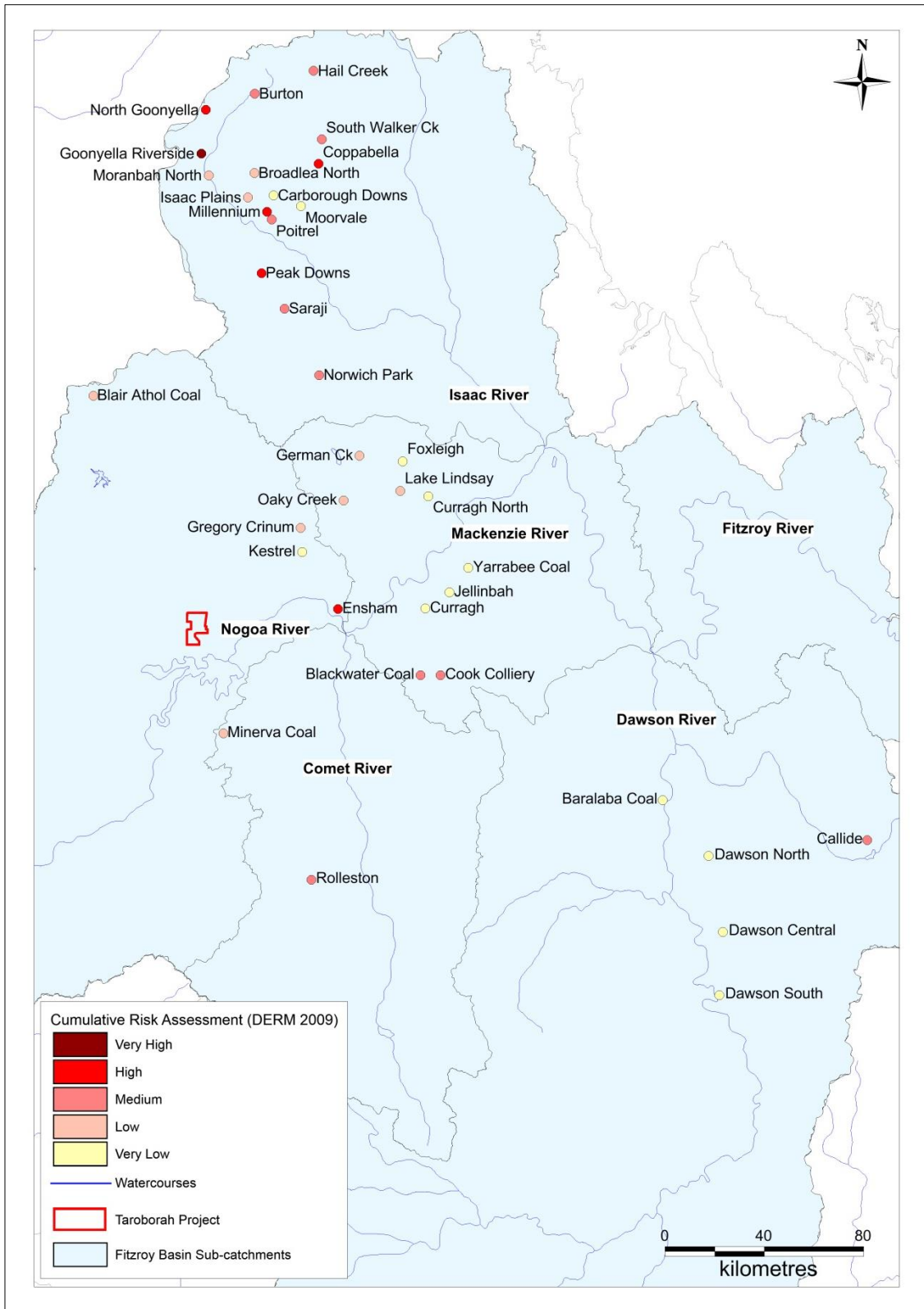
1. Development of appropriate standardised environmental authority conditions relating to mine water discharges;
2. Development of locally-relevant water quality guidelines; and

### 3. Development of a cumulative impact assessment model for the region.

These recommendations have culminated in the establishment of an Integrated Quantity and Quality Model (IQQM) for the Fitzroy Basin, the Model Water Conditions for Coal Mines in the Fitzroy Basin and Environmental Values and Water Quality Objectives at localised sub-basin scales across the Fitzroy River Basin. The IQQM simulates stream flows, releases, in-stream infrastructure and diversions, and was used to inform the Water Resource Plan development process.

It is anticipated that the Model Water Conditions will be applied to the Taraborah Project, located in the lower Fitzroy Basin (Zone 3). The Model Water Conditions were developed specifically for improving water management in relation to coal mines in the Fitzroy Basin, particularly in terms of improving the cumulative impact of multiple mine discharges, and achieving consistency in Environmental Authority conditions between mining developments. The model conditions consider the spatial location of a project within the catchment when determining appropriate trigger levels and contaminant limits applicable to its mine discharges.

Using the risk matrix provided above, the Taraborah Project is anticipated to have a low risk of cumulative impacts to the receiving environment, within the context of the Fitzroy Basin. The Project will have a 'very low' volume of <100 ML/year and a 'medium' EC of <2,500  $\mu\text{S}/\text{cm}$ , resulting in a risk rating of 'low'.



**Figure 5.12 Cumulative Risk Assessment of Major Operational Mines in the Fitzroy Basin**

## 5.8 MITIGATION MEASURES

### 5.8.1 General Mitigation Measures

Strategies to minimise potential Project impacts upon the Brigalow communities are outlined below:

- The Brigalow community present on the Project site is generally well represented throughout the region. However, efforts to minimise the proposed disturbance footprint and retain tracts of vegetation where possible should still be undertaken, in recognition of the intrinsic value of native vegetation and the fauna habitat that they provide;
- A portion of the Brigalow community south of the rail line is not predicted to be impacted by the Project. This area and any others of Brigalow vegetation on the Project site not requiring vegetation clearance should be managed so that they are free from anthropogenic disturbances and allowed to contribute to the production of viable seed for the benefit of current and future communities;
- Periodic monitoring of isolated fragments of vegetation should be undertaken, in order to ensure that species richness does not decline throughout the life of the Project;
- Areas within MDL 467, but outside the mine plan could be set aside for regrowth of native vegetation, thereby supporting the local Brigalow community;
- Brigalow vegetation removal should be conducted only after:
  - The areas to be cleared have been obviously delineated and identified to equipment operators and supervisors; and
  - Appropriate erosion and sediment control structures are in place.
- It is recommended that the methodologies for the rehabilitation / re-vegetation works for the Project consider the most appropriate species for the landscape elements suitable for the regeneration of the Brigalow community;
- A weed monitoring program should be developed for declared pest species Parthenium, Fireweed, Parkinsonia and Lantana to ensure they do not become established and spread across the Project site;
- A segment of the Staff Induction Program should be allocated to informing staff of the conservation values on the Project areas to increase staff awareness of the Brigalow community present. This could include photographs, brief descriptions and management requirements of the Brigalow community; and
- A rehabilitation strategy should be developed for the Project areas. This strategy should embody the concepts and recommendations presented above and include provisions for monitoring of rehabilitation progress over the life of the operation.

Long term studies in Queensland have shown that Brigalow communities are highly resilient to disturbance due to their suckering ability (DoE 2012f). This suckering ability allows root stock to grow much more rapidly than their seed counterparts and enables remnants to survive in cleared pasture lands (DoE 2012f). However, it should be noted, Brigalow seeds have no dormancy, lack hard coats



and germinate quickly in suitable conditions (DoE 2012f),

Studies suggest in a period of 50 years the root stocks of the Brigalow can develop into mature communities indistinguishable from uncleared communities (DoE 2012f), illustrating that the progressive rehabilitation of the Project site should allow the re-generation of the Brigalow community to its pre-disturbance state.

### **5.8.2 Mitigation for Migratory birds**

Although Project impacts upon the three migratory bird species in question are not anticipated to be significant, the following general impact mitigation measures can be employed:

- The proposed site disturbance footprint should be minimised in order to retain the intrinsic value of local native vegetation and associated fauna habitat;
- Prior to disturbance, the vegetation in question should be inspected to identify any fauna that may be present, thereby minimising Project impacts upon local fauna communities. If fauna is present, it should be given the opportunity to move on naturally before clearing occurs. Staff or contractors involved in land clearing should be made aware of the possible presence of migratory species;
- A component of the Staff Induction Programme should be allocated to informing staff of the Project's conservation values, thereby increasing staff awareness of the potential presence of these species;
- Photographs, brief descriptions and management requirements should be acquired / developed for any migratory species that are encountered on the Project site; and
- Post mining rehabilitation should include the restoration of any wetland habitat capable of supporting the Cattle Egret, Latham's Snipe and Glossy Ibis, that may have been impacted by Project activities.

### **5.8.3 Mitigation for Water Resources**

The impacts associated with the degradation of aquatic habitats that will be realised onsite will be managed by engineering and construction management solutions, which will be documented within the site Water Management Plan and will include erosion and sediment control requirements to be implemented and monitored throughout all phases of the Project.

To limit the degradation of downstream aquatic habitat, mitigation and management will focus on limiting sediment transport from exposed areas, minimising the risk of increased erosion and managing potential mobilisation or introduction of pollutants. Controlling site runoff from all areas disturbed during construction and minimising bank disturbance will be important in limiting the degradation of habitats downstream of the construction area. Mitigation measures include (but are not limited to):

- Clearing of vegetation is not to be undertaken during overland flow events;
- Construction activities that affect stormwater flow paths to commence only after suitable stormwater management infrastructure has been established;
- Installation and maintenance standards for sediment fences and other sediment control



devices, in particular for areas near earthworks, watercourses and key stormwater flow paths;

- Location of all soil or mulch stockpiles away from watercourses and key stormwater flow paths to limit potential for transport of these substances into the watercourses via runoff;
- Stabilisation of disturbed areas to be undertaken as soon as practicable after disturbance. If appropriate, clearing of vegetation to be undertaken in a staged manner as construction progresses, minimising the disturbance footprint at all times. Revegetation applicable areas to be undertaken as soon as practicable, using native flora appropriate for local conditions;
- Emergency response protocols and procedures for implementation in the event of a contaminant spill or leak to be clearly articulated in the site Water Management Plan. Contaminated materials are to be removed from site by a licenced waste collector and transport company, and disposed of at a licenced facility.
- Spill kits to be located at regular intervals across the construction phase footprint to allow for timely response to uncontained spills. All staff to be familiar with their use;
- Requirement for the use of vehicles and machinery in good working order to limit potential for hydrocarbon leaks;
- All waste management measures, including appropriate storage locations and disposal procedures for domestic and construction waste to be clearly articulated;
- Regular water quality monitoring of nearby resources to confirm adequacy of management and mitigation measures. Monitoring requirements, water quality targets, corrective actions and reporting requirements to be clearly articulated in a Water Monitoring Plan, embedded within the Water Management Plan. The design of the Mine Infrastructure Area will incorporate stormwater management infrastructure and mechanisms to manage runoff. Stormwater management mechanisms and monitoring requirements will be incorporated in the Water Management Plan; and
- A comprehensive groundwater monitoring network has been established within the Project site, with all sites equipped with data loggers. In order to monitor potential impacts from the mine and establish baseline groundwater data on natural variations, it is recommended that:
  - The groundwater levels within the monitoring bore network be manually checked and the data downloaded on a three monthly (quarterly) basis over a 24-month period;
  - Surface water (i.e. Retreat Creek) and groundwater quality samples be collected and analysed on a three monthly basis; and
  - Ongoing monitoring and annual reporting of groundwater data, in order to identify any departures from the baseline trends that could trigger further investigation and re-assessment of management and impact mitigation measures.

## **5.9 ENVIRONMENTAL OFFSETS**

The Project was declared a controlled action under Section 75 of the EPBC Act due to anticipated impacts upon the following MNES:

- Listed threatened species and communities (sections 18 and 18A) – identified on site as the



endangered ecological communities of Brigalow (*Acacia harpophylla* dominant and co-dominant) and Potential Natural Grassland (Natural Grasslands of the Queensland Central Highlands and the northern Fitzroy Basin); and

- Listed migratory species (sections 20 and 20A) – identified on site as Cattle Egret, Latham's Snipe and the Glossy Ibis.

Ground-truthed RE assessments and seasonal surveys conducted by qualified and experienced ecologists have identified particular on-site MNES that will be impacted by Project activities. Such residual (post rehabilitation) impacts were found to be significant following assessment via the *Significant Impact Guidelines: 1.1 Matters of National Environmental Significance* (DEWHA 2009) refer to Section 5.0 of this chapter of the EIS for details of the impact assessment results.

The *EPBC Environmental Offset Policy* (DoE 2012a) therefore applies to the Project, since some impact upon the Brigalow (*Acacia harpophylla* dominant and co-dominant) and Natural Grassland (Natural Grasslands of the Queensland Central Highlands and the northern Fitzroy Basin) threatened ecological communities will occur, even after all reasonable measures have been taken to avoid and mitigate impacts upon the protected matter.

Significant Project impacts upon EPBC Act listed migratory species are considered to be unlikely and therefore, their habitat does not require offsetting.

An initial offset strategy has been developed in consideration of the requirements of the Commonwealth *EPBC Environmental Offset Policy 2012* (DoE 2012a) and the *Queensland Environmental Offset Policy*<sup>1</sup> – Version 1 (EHP 2014). In addition, the Australian Government guide *How to Use the Offsets Assessment Guide* (DoE 2012c) will be referenced when offsets are to be calculated.

### 5.9.1 Mapping Potential Environmental Offset Locations

A desktop assessment was undertaken in order to locate potential environmental offset locations within the Brigalow Belt Bioregion. Ideally, offsets will be located on properties accessible by Shenhuo, outside of the resource area and away from significant mine development areas in order to avoid the potential for future offset disturbance.

Broad Vegetation Groups (BVG) were employed to identify off-site habitats which are similar in value and ecological structure to those REs which will be impacted on the Project site and would prove suitable as offset areas.

This assessment was undertaken via analysis and combination of the following GIS data sets, in order to generate BVGs (refer to **Error! Reference source not found.** for potential offset supply for each BVG):

- RE mapping version 8.0;
- Pre-clear (vegetation present before European clearing) mapping;
- Mining leases, protected areas and nature refuges, to remove conflicting land uses;

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<sup>1</sup> The *Queensland Environmental Offset Policy 2014* came into effect on the 1 July 2014 and applies to where significant residual impacts remain from activities requiring an Environmental Authority.

- Areas identified as Class A Agricultural Land in the Agricultural Land Audit, to ensure areas most suitable for agriculture are excluded in identification of potential offset supply. Class A Agricultural Land is land that is considered suitable for most agricultural uses, with few limitations; and
- Regulated Vegetation Management Map, with Category A and R land removed. Category B (remnant), C (high value regrowth) and X (unregulated) vegetation is available for use as environmental offsets.

### 5.9.2 Calculating Environmental Offsets

The *EPBC Act Offset Policy* (DoE 2012g) requires the offset site to meet, as a minimum, the quality of the habitat at the impact site. Where a proposed offset site has a lower habitat quality than that of the impact site, the offset must be managed over a defined period of time so that its habitat quality is improved to meet the quality of habitat originally impacted.

Since the offsets required under the *Queensland Environmental Offset Policy* (EHP 2014) will contribute toward those required under the EPBC Act, it is proposed that State environmental offsets will be calculated first by applying the habitat quality analysis in accordance with EHP's *Guide to Determining Terrestrial Habitat Quality* which forms part of the *Queensland Environmental Offset Policy* (EHP 2014). The *Offset Assessment Guide* (DoE 2012b) provided under the *EPBC Act Offset Policy* (DoE 2012a), will then be employed to ensure offset requirements have been met for EPBC Act purposes.

The following areas of MNES threatened ecological communities will be impacted by Project:

- Community 4 – Brigalow Woodland (RE 11.9.1) – disturbance area = 2.76 ha; and
- Potential Natural Grassland (RE 11.8.1) – disturbance area = 149.43 ha.

The quality of each threatened ecological community disturbed by the Project will be determined via the habitat quality indicators provided in the *Guide to Determining Terrestrial Habitat Quality*, in conjunction with the *EPBC Act Offset Policy* (2012a) *Offset Assessment Guide* (DoE 2012c). These guidelines take into account the site condition, site context and species stocking rates as required.

The following ecological characteristics of the threatened ecological communities Brigalow (*Acacia harpophylla* dominant and co-dominant) and Potential Natural Grassland (Natural Grasslands of the Queensland Central Highlands and the northern Fitzroy Basin) will be defined in accordance with the *EPBC Act Offset Policy* (DoE 2012a):

- Vegetation condition and structure;
- Diversity of habitat species present;
- Number of relevant habitat features;
- The importance of the site in relation to the overall occurrence of the community;
- Threats which occur on or near the site;
- Presence of species on the site;



- Density of species known to utilise the site; and
- Role of the site population(s) in regards to the overall community population.

Habitat Quality assessments will be determined using the Queensland Government's assessment framework which is yet to be released. The assessments will be conducted on both the impact site and offset area in order to ensure that the environmental offset site will deliver a 'conservation outcome'.

Data from the site-based assessment will also be used in conjunction with the *Offset Assessment Guide* (DoE 2012c) 'impact calculator' to ensure the proposed environmental offset is adequate, in accordance with the *EPBC Act Offset Policy* (2012a).

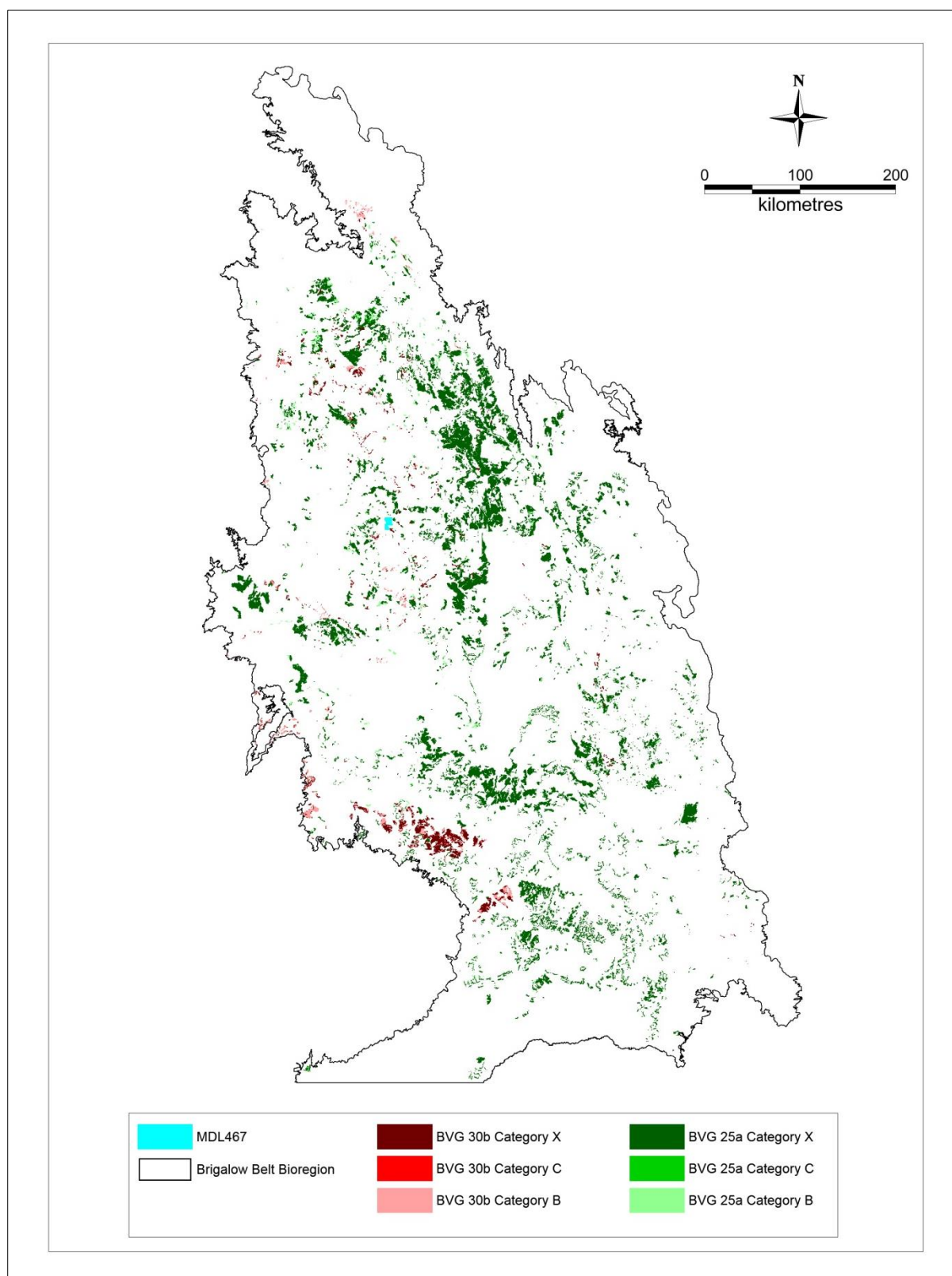
### 5.9.3 Available Offsets

An assessment of the various local ecological communities that could be employed for offsetting has been conducted within the Brigalow Belt Bioregion, and excludes land classified as Class A Agricultural Land as identified by the Agricultural Land Audit). BVG25a provides equivalent ecosystems to the Brigalow community and BVG30b provides equivalent ecosystems to the Potential Natural Grassland ecological community that will be impacted by the Project. Figure 5.13 indicates the potential offset supply areas within the Bioregion for BVGs 25a and 30b.

Table 5.15 identifies the area of relevant EPBC listed community that will be impacted by the Project and the anticipated area of suitable environmental offset sectors that are available.

**Table 5.15 Required Offsets and Potentially Available Offsets within the Brigalow Belt Bioregion.**

Required Offset	Description	TEC Area to be Offset	BVG Area Available
BVG 25a	Brigalow ( <i>Acacia harpophylla</i> dominant and co-dominant)	11.04 ha	1,625,900 ha
BVG 30b	Natural Grasslands of the Queensland Central Highlands and the northern Fitzroy Basin	597.72 ha	219,688 ha



**Figure 5.13 Potential Land Available for Offset within Brigalow Belt Bioregion**

#### 5.9.4 Securing Offsets

All direct offset sites will be secured using one of the following mechanisms:

- An environmental offset protection area in accordance with the *Environmental Offsets Act 2014*;
- An area of high nature conservation value in accordance with the VM Act 1999, secured for the purposes of an offset;
- A nature refuge under the *Nature Conservation Act 1992* (NC Act 1992), secured for the purposes of an offset;
- A protected area under the NC Act 1992, secured for the purposes of an offset; or
- Covered by a statutory covenant for environmental purposes under the *Land Act 1994* or *Land Title Act 1994*.

These mechanisms ensure offset protection and assist in the implementation of offset management strategies.

Note that the mechanisms adopted to secure offsets will ultimately depend upon the options that are available and agreed to by the relevant parties.

#### 5.9.5 Management of Offsets

Offset management plans will be prepared to provide information on the ecological threats for each offset site and the associated actions that will be required in order to manage these threats. Each management plan will contain an estimate of the costs of offset management, reporting and monitoring program that will be required until the desired management outcomes are achieved.

Offset management actions recommended could include:

- Management of grazing;
- Weed management;
- Feral pest management; and
- Management of fire.

The duration of the active management period will be influenced by the condition of vegetation, type of habitat and vegetation on site, as well as existing management issues.

#### 5.9.6 Monitoring and Reporting

The following offset monitoring and reporting actions will be required in order to generate a record of ecological community comparability over the term of the offset and overall progress for returning the offset to remnant vegetation status:

- Provision of regular Project offset monitoring and management reports to the regulator,

- Biannual photo point monitoring conducted every two years; and
- Habitat Quality assessments conducted at the same locations as the photo point monitoring.

## 5.10 CONCLUSION

The following MNES conclusions have been developed for this Project:

- A variety of EPBC Act listed ecological communities, flora and fauna have been recorded in the Project region, however, only four threatened ecological communities and three migratory bird species were actually identified on the Project site;
- Of the nine MNES identified in the EPBC Act, only threatened ecological communities and water resources will be impacted by Project activities. No EPBC Act listed flora or fauna species were identified on the Project site, apart from migratory birds;
- Historically, the Project site has experienced extensive clearing for agricultural purposes. Large areas of vegetation have been removed for low-intensity cattle grazing and cropping, leaving remnant vegetation fragmented;
- The EPBC Act listed threatened ecological communities which will be impacted by Project activities are:
  - Community 4 – Brigalow Woodland (RE 11.9.1) – estimated disturbance area = 2.76 ha; and
  - Potential Natural Grassland (RE 11.8.11) – estimated disturbance area = 145.13 ha.

Note that relatively small areas of these communities will be impacted, compared with the area of each community that occurs within the Project region. In addition, the environmental values associated with these communities are of limited conservation value due to extensive clearing, grazing pressure and cropping;

- Although no EPBC Act listed flora and fauna have been identified on the Project site, in the event that EPBC Act listed species are encountered on site during Project development and operations, impact mitigation options have been developed for such species;
- Though EPBC Act listed migratory bird species have been identified on the Projects site Cattle Egret (*Ardea ibis*), Latham's Snipe (*Gallinago hardwickii*) and Glossy Ibis (*Plegadis falcinellus*), no significant Project impacts are anticipated, since the Project site does not represent important habitat for these avian species. In addition, these birds are mobile and would thrive in suitable habitat which exists outside the Project area. However, a number of impact mitigation strategies are outlined, in order to minimise Project impacts upon EPBC Act listed migratory species which may visit the site;
- Local groundwater will be impacted as a result of Project activities in terms of limited groundwater drawdown (<10 m) within 3 km outside MDL 467 and will begin recharge at the end of mine life;
- A number of Project impact mitigation measures have been outlined in order to minimise impacts upon EPBC Act listed threatened ecological communities and groundwater;

- Up to 1,625,900 ha of BVG25a and 219,688 ha of BVG30b is available within the Brigalow Belt Bioregion for consideration as potential offset areas;
- Environmental offsets will be developed in further detail following submission of the EIS;
- Management plans will be used to actively manage the offset area(s) in terms of livestock grazing, weed, pest and fire management;
- Offset monitoring and photography will be conducted and the results of offset community development reported to the regulator; and
- Overall, impacts to MNES as a consequence of Project operations are manageable if appropriate precautions, as detailed throughout Section 5.0, are carried out during mine planning and operations.