Adani Mining Pty Ltd

Environment Protection and Biodiversity Conservation Act 1999:

Adani Quarries Environmental Impact Review

CDM Smith

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Adani Quarries Environmental Impact Review

25 July 2013

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Executive Summary

Adani Mining Pty Ltd (Adani) is developing a 60 million tonne per annum (Mtpa) coal mine and rail line (approximately 190 km in length), the Adani Carmichael Coal Mine and Rail Project (the Project). The Project is within the northern Galilee Basin approximately 160 kilometres (km) north-west of Clermont in Central Queensland. An Environmental Impact Statement (EIS) for the Project has been prepared and was submitted for public comment on 11 February 2013. In support of the Project, Adani is proposing to develop and operate a number of quarry sites (the Adani Quarries) to provide material for the construction of mine and rail infrastructure. The development and operation of these quarries were not considered as part of the original referral and as such, were not included in the EIS. Their potential impacts on matters of National Environmental Significance (MNES) have therefore not been assessed and/or considered by the Commonwealth Minister.

The purpose of this review is to identify and assess the potential environmental impacts of the construction and operation of the five selected quarries upon MNES. Although studies for six quarries were originally carried out and are included in this report, Adani are only proceeding with the development of five quarries, these are to be assessed under the EPBC Act. The quarries to be assessed are located within proximity to the proposed rail corridor and include (Figure 1-1):

- North Creek Quarry – Lot 2 SP119925;
- Moray Quarry – 662 PH1491;
- Borrow 7– Lot 3235 PH752;
- Disney Quarry – Lot 4 SP116046; and
- South Back Creek Quarry – Lot 656 SP138788.

The sixth site included in this report (but not assessed under the EPBC Act) is Elgin North Quarry (Lot 637 PH1980).

The Commonwealth Protected Matters Searches listed two MNES as being applicable to the quarry locations and the defined buffer area (**Appendix A**). The MNES identified are:

- Listed threatened species and ecological communities (section 18 & 18A); and
- Listed migratory species (sections 20 & 20A).

A review of potential impacts, which may require Adani to undertake a referral for the two identified MNES, was undertaken using information from the Carmichael Coal Mine and Rail Project EIS, desktop assessments and on-ground flora and fauna surveys. A qualitative risk assessment matrix was used to determine the likelihood and consequence of each particular impact.

It was concluded that the proposed quarry developments are unlikely to significantly impact MNES, within or surrounding the quarry sites.

Section 1 Introduction

1.1 Background

Adani Mining Pty Ltd (Adani) is developing a 60 Mtpa greenfield coal mine and rail line (approximately 190 km in length), the Adani Carmichael Coal Mine and Rail Project (the Project). The Project is within the northern Galilee Basin approximately 160 km north-west of Clermont in Central Queensland. The proposed development will utilise both open cut and underground mining methods. In addition to the mine and supporting infrastructure including processing facilities, water supply infrastructure and accommodation villages are proposed to be developed.

An EIS for the Project has been prepared to meet the impact assessment requirements under both Commonwealth and Queensland legislation. The EIS has been conducted under an accredited bilateral agreement and therefore before the Project can proceed, approval will be required from both the Commonwealth Minister for the Department of Sustainability, Environment, Water, Population and Communities (SEWPaC) and the Queensland Coordinator General. The EIS describes the actions that will be assessed under the EPBC Act.

Adani is proposing to construct and operate a number of quarry sites to be used for the construction of Carmichael Coal Mine and Rail infrastructure and for upgrades to local road infrastructure. The quarry sites are located within a 1485 square kilometre (km^2) area north-west of Clermont. Six sites have been proposed as potential locations for extracting quarry material and include:

- North Creek Quarry (Lot 2 SP119925) – An estimated 603,000 tonnes (t) of low grade construction material is anticipated to be extracted from this quarry. The operational area is approximately 7.64 hectares (ha);
- Moray Quarry (662 PH1491) – An estimated 652,000 t of low grade construction material is anticipated to be extracted from this quarry. The operational area is approximately 91.2 ha;
- Elgin North Quarry (Lot 637 PH1980) – An estimated 1,265,000 t of mid-high grade construction material is anticipated to be extracted from this quarry. The operational area is approximately 15.25 ha;
- Borrow 7 (Lot 3235 PH752) – An estimated 19,930,000 t of high grade construction material is anticipated to be extracted from this quarry. The operational area is approximately 36.17 ha;
- Disney Quarry (Lot 4 SP116046) – An estimated 11,750,000 t of mid grade construction material is anticipated to be extracted from this quarry. The operational area is approximately 181.54 ha; and
- South Back Creek Quarry (Lot 656 SP138788) – An estimated 690,000 t of high grade construction material is anticipated to be extracted from this quarry. The operational area is approximately 55.5 ha.

The quarries will be used for the construction of the Project infrastructure and will be located along the rail corridor (Figure 1-1) (refer to Section 4, for further information on the development, location and size of the quarries). The proposed quarries locations are within the Northern Brigalow Belt bioregion, however extant vegetative conditions vary considerably. The area is

predominantly used for cattle grazing, although four of the sites are presently, or have been previously been, used for local quarry extraction purposes.

1.2 Purpose of EPBC Act Review

The EIS which has been prepared and submitted to SEWPaC and the Queensland Coordinator General was developed to address all relevant Commonwealth and State matters as outlined in the Project Terms of Reference (ToR). The EIS was prepared using the most up to date, engineering and Project description details available at the time of submission. The EIS outlined that a number of quarries would be required to supply construction materials for the development of Project related infrastructure and the upgrading of local roads. The location and details of the quarries was not finalised at the time of the EIS submission and therefore the quarries are required to be included within the submission of the Supplementary EIS (SEIS). These works were not included as part of the original Project and as such, their potential impacts on MNES will now be considered by the Commonwealth Minister in the review of the SEIS.

The purpose of this review is to identify and assess the potential environmental impacts of the construction and operation of five of the six selected quarries upon MNES. The sixth quarry (Elgin North) will not be assessed under the EPBC Act but is included within this review.

The review is aimed at providing SEWPaC with the necessary information to make a determination on the potential impacts of the Adani Quarries on listed threatened species and ecological communities (section 18 & 18A) as well as listed migratory species (sections 20 & 20A). In addition, the review is required to satisfy Adani's due diligence requirements when undertaking work in an area where MNES are identified.

1.3 Commonwealth Legislative Requirements

1.3.1 Environment Protection and Biodiversity Conservation Act 1999

1.3.1.1 Overview

The EPBC Act provides a legal framework to protect and manage MNES including nationally and internationally important flora, fauna, Threatened Ecological Communities (TEC) and heritage places. There are eight MNES listed under the EPBC Act:

- World heritage properties;
- National heritage places;
- Wetlands of international importance (Ramsar wetlands);
- Nationally threatened species and ecological communities;
- Migratory species;
- Commonwealth marine areas;
- Great Barrier Reef Marine Park; and
- Nuclear actions.

The EPBC Act implements obligations under international conventions and treaties, such as protection of migratory species (Migratory Bird Agreement and Bonn Convention) and World Heritage Area values (World Heritage Convention).

The EPBC Act establishes a process and criteria for environmental assessment and approval of proposed actions that have, or are likely to have a significant impact on MNES (DEWHA 2009). The assessment of potential impacts on MNES in this review considered the requirements of the Significant Impact Criteria detailed in EPBC Policy Statement 1.1 – Significant impact guidelines for matters of National Environmental Significance (DEWHA 2009). The EPBC Act is administered by the Commonwealth Minister for SEWPaC.

Under the EPBC Act, any action that is likely to have a significant impact on MNES must be:

- Undertaken in accordance with an approval from the Minister; or
- Approved through a process accredited by the Minister (SEWPaC 2011), such as approval through a bilateral agreement with a State or Territory.

A referral under the EPBC Act is only required where there is the potential for a 'significant impact' to MNES. The threshold test of 'significant impact' was held to mean an impact that is important, notable or of consequence having regard to its context or intensity (*Booth v Bosworth (2001) 114 FCR 39* "the Flying Fox Case"). This EPBC Act Review is to establish whether the development and expansion of the quarries will have a likely significant impact on MNES.

1.3.1.2 Relevance to the Quarry Developments

Of the eight MNES listed under the EPBC Act, two have been identified as being applicable to the six proposed quarries (**Appendix A**). The following are the relevant MNES identified for the quarry developments:

- Listed threatened species and ecological communities (section 18 & 18A) – There are six threatened fauna species which are likely to occur or have the potential to occur (as identified in the SEWPaC Protected Matters Search), within one or all of the quarry sites; and
- Listed migratory species (sections 20 & 20A) – There are nine migratory bird species identified in the SEWPaC Protected Matters Search, which are likely to occur or have the potential to occur within the vicinity of the quarry sites.

1.4 Scope

The quarry sites are located within a 1485 square kilometre (km^2) area north-west of Clermont. Six sites have been proposed as locations for extracting quarry material for use in the construction of Carmichael Coal Mine and Rail infrastructure and local road upgrades (Figure 1-1). The sites have primarily been selected based on their locality, resource quality and quantity and the construction/expansion and operation of the quarries will result in minimal environmental impacts. Five of the sites have been subject to quarrying activities and the sites are partially pre-disturbed.

This review is based on desktop reviews, onsite fauna searches, habitat assessment surveys and field vegetation surveys. Desktop and field surveys have been designed to assess the potential impacts of each quarry development against the relevant Commonwealth matters. The review outlines the proposed actions, the legislative requirements for the works and the potential impact

of the works on MNES. Measures to avoid or reduce potential impacts and recommendations for proceeding are also provided.

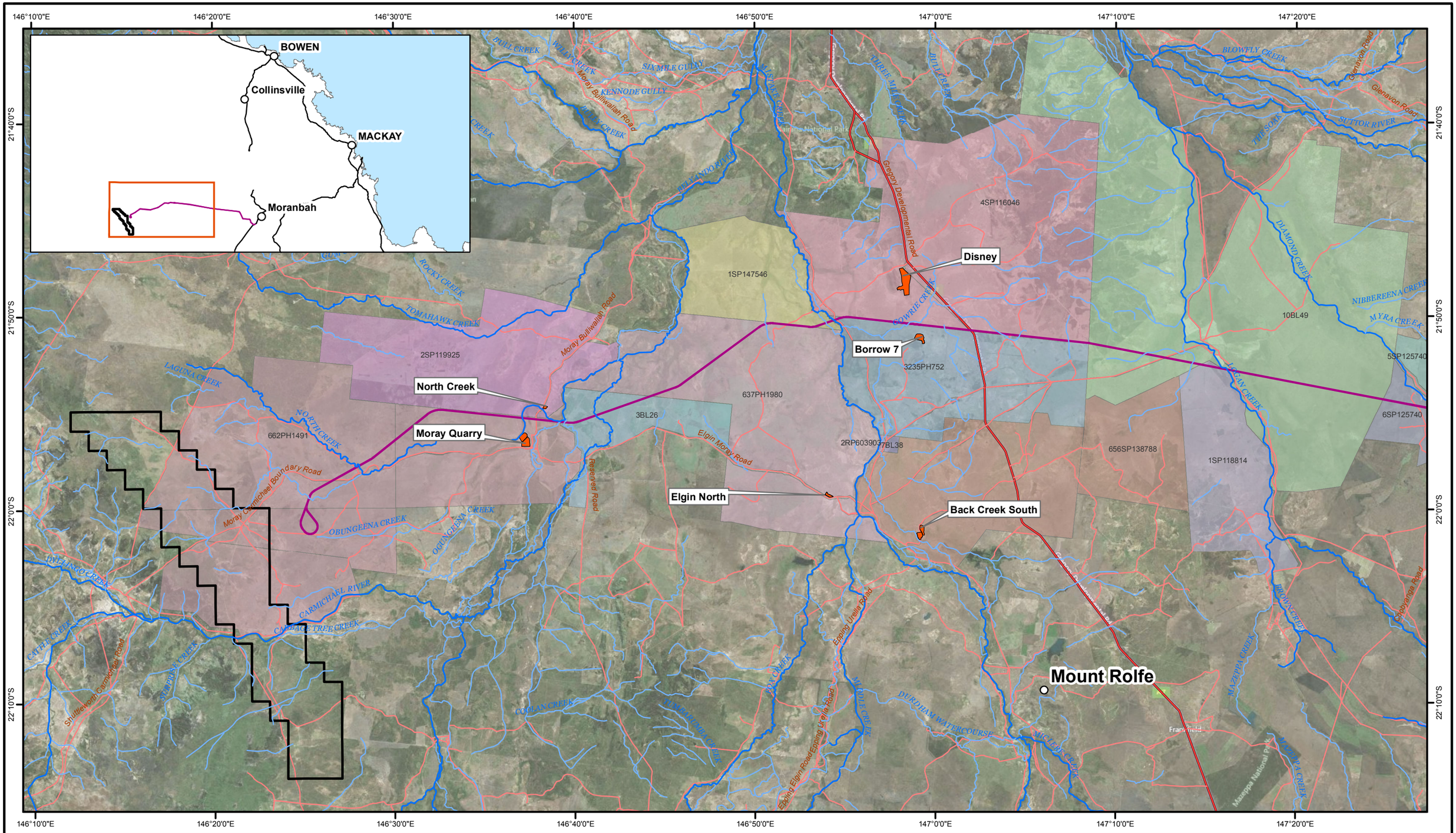
1.5 Report Structure

This EPBC Act Review has been structured into seven distinct sections:

- Introduction – providing a brief background to the Project and Adani Quarries, purpose of the document, legislative overview and document scope;
- Project Need and Alternatives – discusses the proponents requirement for the Adani Quarries and alternatives that have been investigated by the proponent;
- Assessment Methodology – providing an outline of the methodology used to assess MNES across all quarry sites;
- Quarry Sites – provides a site description, discusses the existing environment and details the proposed development;
- Matters of National Environmental Significance – discusses the listed MNES known or likely to occur in proximity to the proposed quarry sites;
- Potential Impacts – provides an assessment of the impacts that may result from each quarry development; and
- Mitigation Measures and Conclusion – identifying the likelihood of significant impacts and provides measures to avoid impacts.

In order to comprehensively address MNES, the EPBC Act Review has been prepared to outline and address all matters and environmental values which would be required as part of any EPBC Act referral to the Commonwealth.

Desktop assessments and on-ground vegetation and fauna assessments have been undertaken at each quarry location. Furthermore, many of the quarries are adjacent to the proposed rail infrastructure corridor assessed as part of the Carmichael Coal Mine and Rail Project EIS and results from the EIS assessments have been considered in this review.



Adani Quarries
Figure 1-1 Quarry Locations

Legend

- Town
- Carmichael Mine - ML 70441
- Quarry Investigation Area
- Railway
- Adani Rail Corridor
- Minor Road
- Major Road
- Major watercourse
- Minor watercourse

0 2.5 5 10
Kilometres

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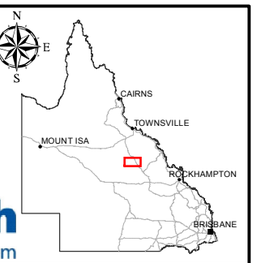
CDM Smith has endeavoured to ensure accuracy and completeness of the data. CDM Smith assumes no legal liability or responsibility for any decisions or actions resulting from the information contained within this map.

Data source:
Adani, 2012;
DERM, 2010;
Base Layer by Bingmaps, 2011.



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Section 2 Project Need and Alternatives

2.1 Need for Quarry Material

Quarry material is used in the building and construction industry as an essential base component for a range of infrastructure. The quarry industry is largely tied to infrastructure development and therefore with major growth in the resource sector the necessity for quarry material has greatly increased over the past few decades. Quarries throughout Queensland help facilitate the development of the States resource sector and are also vital to the construction of local public infrastructure such as roads.

Adani is proposing to develop a 60 million tonne (product) per annum (Mtpa) thermal coal mine. All coal will be railed via a privately owned rail line connecting to the existing Aurizon rail infrastructure near Moranbah, and shipped through coal terminal facilities at the Port of Abbot Point and/or the Port of Hay Point (Dudgeon Point expansion). The Project will operate until 2071 and rehabilitation will continue until 2074.

The development is comprised of two major components:

- The Mine: a greenfield coal mine over EPC1690 and the eastern part of EPC1080, which includes both open cut and underground mining, on mine infrastructure and associated mine processing facilities (the Mine) and offsite infrastructure; and
- The Rail: a greenfield rail line connecting the Mine to the existing Goonyella rail system to provide for export of coal via the Port of Abbot Point and/or the Port of Hay Point (Dudgeon Point expansion).

Adani sees supply from Queensland coal resources as key to meeting its target of generating 20,000 Megawatts (MW) of power from its Indian power plants by 2020. If the Project does not proceed it would likely lead to Adani's demand for coal being met outside of Australia and the benefits of significant economic investment would not be realised.

A key component of the Project is the supply of suitable local quarry material. The Project will require a significant amount of quarry material for upgrade and maintenance works on existing infrastructure and the construction of new infrastructure. Provisional amounts of fill expected to be needed total approximately 34 million tonnes.

Region-wide investigations have identified an acute shortage of appropriate quarry material for construction of a project the size of the Carmichael Coal Mine and Rail development. Existing quarries in the area are primarily historic, small and do not contain appropriate infrastructure to immediately utilise. Although existing quarries will be used, they contain limited supplies of material and are not capable of supplying the different types of materials required. Therefore, the development of new quarries is necessary.

The development of the quarries will provide royalties to the State for the sale of the quarry material, provide jobs through direct employment and support services, and provide necessary material for the construction and upgrading of local infrastructure.

2.2 Alternatives to the Project

2.2.1 Alternatives Considered for the Carmichael Coal Mine and Rail Project

In accordance with the Commonwealth EPBC Act [Schedule 4, Section 2.01(g)], alternatives to the Project were reviewed and discussed as part of the EIS. The EIS noted that Adani had access to EPC 1690 and part of EPC 1080 however, has no other access to coal mining within Australia (GHD 2012c). Therefore, there are currently no other commercially available alternatives for Adani to proceed with a major open cut and underground coal mine.

The Galilee Basin is not currently serviced by any rail infrastructure which would enable export of coal product from the mine, or other resource activities. Adani has also identified opportunities to link the rail to current and proposed rail infrastructure, to minimise the potential environment and social impacts of linear infrastructure within the rural environs while facilitating the export of resources from the Galilee Basin. Transport of coal by rail is the only economically feasible option for transport to the ports for export.

A no action option, that is, that Adani does not develop the Project, would likely lead to Adani's demand for coal being met from outside of Australia. The no action option would see significant capital investment totalling approximately $21.5 billion foregone. Estimates have indicated that $5.9 billion will be spent in the years preceding 2022. The remaining $15.6 billion will be spent over the remaining years of operation (GHD 2012c).

2.2.2 Alternatives Considered for the Quarries

The location of suitable resources is limited due to the constraints imposed by geology, access, land and environmental values. Ideally quarries should be conveniently located to limit heavy truck transport and so reduce end user costs and environmental and infrastructure costs associated with haulage.

As part of the Project development 37 quarry and borrow locations were identified for investigation. Geotechnical investigations undertaken in late 2012 determined the nature of potential resources at each location and in combination with environmental constraints analyses five sites were chosen to proceed with development approval.

In addition to environmental constraints, investigations have identified an acute shortage of appropriate quarry material for construction of a project the size of the Carmichael Coal Mine and Rail development. Existing quarries in the area are primarily historic, small and do not contain appropriate infrastructure to immediately utilise.

Investigations have also considered hauling material from larger existing quarries in the surrounding areas of Clermont, Moranbah, Charters Towers, Townsville and Emerald. However, due to the distance it was determined that haulage costs and the potential impact on the road network would be excessive and this was rejected as an alternative option.

Section 3 Assessment Methodology

The methodology for the terrestrial fauna (CDM Smith) and flora (Saunders Havill) assessment, undertaken as part of this EPBC Act Review, involved the following components:

- Desktop review of previous studies from the Project area and surrounds, and relevant State and Commonwealth databases; and
- Site surveys to assess the presence/absence of conservation significant fauna species and Threatened Ecological Communities (TECs).

Results from both desktop and field assessments are presented in Section 5 - Matters of National Environmental Significance.

3.1 Desktop Review

A desktop review of known and likely terrestrial fauna values was undertaken for the Project area and involved the collation and review of relevant online databases and literature. The desktop review focused on the presence of fauna/flora species and vegetation communities listed as conservation significant (Endangered or Vulnerable) under the EPBC Act. From this information, onsite habitat assessments could focus on the likely habitat features required to support Endangered or Vulnerable fauna previously known from the wider Project area. Database search results are available on request. Information was sourced from the following:

- The Commonwealth's EPBC Act Protected Matters Search (based on a 10 km radius search centred on each quarry site) (accessed 23 May 2013) (**Appendix A**);
- Queensland's Department of Environment and Heritage Protection (EHP) Wildlife Online fauna species database (50 km search radius around the approximate centre of Project area) (accessed 12 December 2012);
- Atlas of Living Australia's online species database;
- Current Regional Ecosystem (RE) mapping and essential habitat mapping for threatened flora and fauna species mapping from EHP (accessed 15 January 2013);
- Mine Technical Report: Terrestrial Ecology Report, Carmichael Coal Mine and Rail Project (GHD 2012a);
- Rail Technical Report: Terrestrial Ecology Report, Carmichael Coal Mine and Rail Project (GHD 2012b); and
- Report for Offsite Infrastructure: Ecological Assessment, Carmichael Coal Mine and Rail Project (GHD 2013a).
- Report for Offsite Infrastructure Project BioCondition Assessment Report, Carmichael Coal Mine and Rail Project (GHD 2013b).

Prior to entering the sites, the following vegetation based information sources were assessed to assist in the final determination of onsite survey methodology:

- Existing vegetation mapping released under the provisions of the Queensland *Vegetation Management Act 1999* (VM Act), including RE descriptions and conservation status;

- Review of the Queensland Herbarium mapping methodology and procedures outlined in Neldner, V.J, Wilson, B.A., Thompson, E.J. and Dillewaard, H.A. (Methodology for Survey and Mapping of REs and Vegetation Communities in Queensland);
- Environmental Database Searches for the EPBC Act;
- Applicable Schedules of the *Nature Conservation (Wildlife) Regulation 1994*;
- Geology (250K), soils and topographical maps;
- Specific Queensland Herbarium searches for records of unknown or specific vegetation species listed to occur in the region; and
- Previous complex Property Map of Assessable Vegetation (PMAV) applications in the locality.

3.2 Site Surveys

3.2.1 Fauna

Three fauna surveys of the proposed quarry areas were carried out over the following dates:

- 29 January-2 February 2013: Weather conditions were relatively fine and hot with maximum daytime temperatures of 43°C experienced. Overnight localised rain was experienced on the evening of 31 January 2013;
- 11-13 March 2013: Fine and warm with temperatures ranging between 15.7°C and 29.7°C; and
- 8-12 July 2013: Fine and mild with temperatures ranging between 7.6°C and 25.9°C (BoM 2013).

The boundaries of the quarry areas surveyed initially were presented by the proponent before the final quarry location had been determined and a much larger area was surveyed as a result. Surveys across the quarry areas focused on detecting fauna species listed as conservation significant (Endangered or Vulnerable) under the EPBC Act including bird species listed as Migratory, however all fauna species encountered were recorded. A full fauna species list of those encountered during all surveys (including site specific species lists) is located in **Appendix B**. No trapping for fauna species was carried out during the site surveys. Disney Quarry site could not be assessed during the final winter (July 2013) survey due to land access restrictions.

Surveys consisted of site traverses by two field staff using the following techniques:

- Rapid habitat value assessment for fauna including evaluation of the presence of features likely to provide value for fauna. This includes noting the presence/absence of features such as tree hollows (shelter/breeding habitat for birds, microbats and arboreal mammals), rocks and fallen woody debris (shelter for small mammals, reptiles and frogs), presence of gilgais, complex vegetation strata, landuse impacts (weed invasion, presence of livestock) and presence of water. Results of the habitat assessment were used to inform habitat mapping for EPBC Act listed threatened fauna considered potentially present in the area;
- Diurnal herpetofauna (i.e. reptiles and frogs) searches included under fallen woody debris, rocks and bark, underneath standing bark, under man-made debris (such as corrugated iron) and under leaf litter. This survey method was ongoing throughout onsite surveys. Where habitat for threatened reptile species listed under the EPBC Act was identified on or near the site (e.g. Ornamental Snake), searches were carried out as per the *Draft Referral guidelines for the nationally listed Brigalow Belt reptiles* (SEWPaC 2011) (i.e. a minimum of 1.5 person hours per hectare of habitat of average complexity);

- Timed 20 minute bird surveys along a meandering transect within and adjacent to quarry sites (minimum three per site), as per the standard outlined by Bird Life Australia. Birds were identified by observation and by call. Where habitat for bird species listed under the EPBC Act was identified, on or near site searches were carried out as per the *Survey guidelines for Australia's threatened birds* (DEWHA 2010). Two threatened bird species which are known from the wider region include the southern subspecies of Black-throated Finch (*Poephila cincta cinta*) and the southern subspecies of Squatter Pigeon (*Geophaps scripta scripta*). The recommended search methods for these species followed was:
    - Black-throated Finch: land-based area searches (10 hrs over several days) and or targeted searches in the vicinity of waterholes (6 hrs over 2 days).
    - Squatter Pigeon: flushing surveys (10 hrs over 3 days).
- In addition, two passive infrared cameras were placed for four days/three nights on waterholes at/near quarry sites considered to have potential for Black-throated Finch to occur;
- Three nights of microbat echolocation call recording at selected suitable sites using an Anabat recorder; and
- Continuous observations of all fauna, including signs of presence (i.e. tree scratches, scats).

3.2.1.1 Koala Surveys

The second targeted survey was carried out on Disney and Moray Quarry sites between 11 and 13 March 2013 after potential evidence of Koala activity (tree scratches) was identified on these sites during the initial survey. Disney Quarry was surveyed during the day (throughout the morning and afternoon), while Moray Quarry was surveyed in the late morning, afternoon and during the night. Surveys were carried out largely in accordance with Queensland's *Nature Conservation (Koala) Conservation Plan 2006 and Management Program 2006-2016* (EPA 2006) as per SEWPaC's 'Interim Koala referral advice for proponents' (2012). Observers divided each site into transects. Two observers equipped with binoculars and Geographic Positioning System (GPS) spaced approximately 15 m apart walked along each transect searching for Koala individuals (within and adjacent to the transect), tree scratches attributable to Koalas and Koala scats. The beginning and end of each transect was marked with a GPS.

The vegetated portion of the Moray Quarry site was of such a size (approximately 50 ha) that the majority of trees in the area were searched. Riparian vegetation located along an anabranch of the Belyando River less than 200 m to the east of the site was also searched as this area was considered to have potential to be a dispersal point for Koalas to Moray Quarry vegetation. A spotlighting survey (approximately 5 hrs total) was also carried out during the early evening to increase the chances of detecting individuals missed during the day, particularly along the Belyando River which was not searched in its entirety during the day. The spotlighting was carried out by two Environmental Scientists both with separate lights. The overall area surveyed for Koala is depicted in Figure 3-1.

The vegetated area within the Disney Quarry site is extensive. The Koala survey area was restricted to the site of the proposed quarry works as they were known at the time (Figure 4-1) and surrounding woodland (Figure 3-1). Overall, an area of approximately 60 ha was thoroughly searched for Koalas using the same techniques detailed above. Spotlighting was not carried out on this site due to logistical considerations.

Further spotlighting and searches were carried out along Back Creek in the vicinity of the quarry area during the July winter survey. The habitat at this site is restricted to a relatively narrow

riparian strip varying in width up to 200 m wide. Approximately 1.75 km of the creekline was searched (approximately 20 ha).

All surveys were carried out under CDM Smith's Scientific Purposes Permit (no. WISP09967511) and Animal Ethics Committee Permit (no. CA2013/01/659).

146°40'0"E
146°50'0"E
147°0'0"E
21°50'0"S
22°0'0"S

Disney
Gregory Developmental Road
Disney
Borrow 7
Gregory Developmental Road
Moray Bulliwallah Road
North Creek
Moray Quarry
Moray Quarry
Moray Carmichael Boundary Road
Moray Bulliwallah Road
Elgin North
Back Creek South

Adani Quarries
Figure 3-1 Koala Survey Areas - March 2013 Survey

Legend

- Minor Road
- Major Road
- Major watercourse
- Minor watercourse
- Spotlighting Transect
- Quarry Investigation Site
- Koala Survey Area

Job: B12849_017-R2_KoalaSurvey
Date: 19/07/2013

0 1,250 2,500 5,000
Metres

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Data source:
Survey by CDM Smith, 2012; Adani, 2012; DERM, 2010;
Base Layer by Bingmaps, 2011.

N W E S
CAIRNS
TOWNSVILLE
MOUNT ISA
ROCKHAMPTON
BRISBANE

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3.2.2 Flora

Following the broad delineation of vegetation communities using historical aerial photography and information obtained in the desktop review (including stereoscopic analysis), a detailed vegetation survey was conducted to locate, describe and map the RE polygons on each site. All data collection was mapped using a Trimble GEO-XT with sub 1 m accuracy.

Table 3-1 below, details the standard survey methods used to describe vegetation type, structure and composition within each study site. Surveys focused on the presence of vegetation communities listed under the EPBC Act. Survey and analysis techniques followed the Methodology for Surveying and Mapping of REs and Vegetation Communities in Queensland (Version 3.1). The EPBC Act Flora Assessment prepared by Saunders Havill is provided in **Appendix C**. A full list and description of the Regional Ecosystems that are currently mapped and/or ground-truthed on the quarry sites is provided in **Appendix D**.

Table 3-1 Standard Flora Survey Methods

Survey Method	Description
Standard Survey Methods	
Secondary	Secondary sites are used for classification and detailed descriptions of REs and vegetation communities. Data collected include all location, environmental and overall structural information as well as a list of all species present and basal area (of woody stems using the Bitterlich stick method), percentage cover and stem density measures of abundance.
Quaternary	Quaternary site data are used primarily as records of field traverses and to verify REs/vegetation mapping. These data are generally collected throughout the field survey and entered on spread sheets or databases. Quaternary sites are collected at regular intervals along a traverse, and/or made where REs/vegetation communities change.
PMAV Transect	PMAV transects are used to accurately define the true boundary of each RE category at the property scale. Data was collated using Qld Herbarium Map Assessment Request Forms. Detailed information on the height and composition of vegetation was recorded at each GPS location with information later analysed to assess the extent of disturbance and accuracy of species canopy mix.
Targeted Flora Survey Methods	
Threatened Flora	The habitat requirements of flora species listed under Government databases as potentially occurring within each study site were considered during on-site surveys. Where potential habitat occurred, targeted searches were conducted to locate the presence of threatened flora.
TECs	Federal Government information detailing the listing advice and composition and classification of TECs was used to determine their presence/absence. Targeted searches, including meandering transects, were conducted within potential TEC habitats on-site to confirm the presence/absence of these communities.

(Saunders Havill 2013)

Section 4 Quarry Sites

4.1 Overview

Five quarry sites are proposed to be developed to provide construction resources for the Carmichael Coal Mine and Rail Project and local infrastructure. Four of the quarries are currently operated on an intermitted basis by Isaac Regional Council (IRC) and will require expansion, while another has had historic quarrying operations (Figure 4-1). The fifth site (Borrow 7) is a greenfield site containing high quality construction rock resources.

This section of the EPBC Act Review provides a brief description of each quarry site, the local geology, resource estimates and the existing environment. The existing environment focuses on those listed species listed within the Protected Matters Search (**Appendix A**) including:

- Listed Threatened Ecological Communities;
- Listed Threatened Species; and
- Listed Migratory Species.

4.2 Development Timeframe

It is anticipated that the five quarries will commence operation to supply quarry material between Quarter 1 2014 and Quarter 3 2014 and continue to supply material during the construction of the Project. During this period, individual quarry utilisation, will vary in relation to the type of material required and the Project construction schedule and progress.

On completion of the Project the quarries will be rehabilitated with the exception of Borrow 7 which will continue operation, albeit at a lower production rate. Elgin North Quarry is not being developed by Adani and has been agreed with IRC that this quarry will be developed by IRC to support the local road upgrades and will remain an IRC asset. Irrespective of the fate of individual quarries, appropriate decommissioning and rehabilitation practices are proposed to be undertaken by the individual quarry owner and operators.

146°40'0"E
146°50'0"E
147°0'0"E
21°50'0"S
22°0'0"S

North Creek
Moray Bulliwallah Road
Disney
Gregory Developmental Road
GOWRIE CREEK
Borrow 7
Moray Bulliwallah Road
BELYANDO RIVER
MISTAKE CREEK
Elgin Pit
Elgin Moray Road
Back Creek
Moray Carmichael Boundary Road
Moray Pit
BELYANDO RIVER
Moray Bulliwallah Road
Moray Carmichael Boundary Road
OGUNGERA CREEK
CARMICHAEL RIVER
FOX CREEK

Adani Quarries
Figure 4-1 General Location of Previous Quarry Activities

Legend

- Minor Road
- Major Road
- Major watercourse
- Minor watercourse
- Quarry investigation site
- Approximate previous quarry activity area

0 1,250 2,500 5,000
Metres

N W E S

DISCLAIMER
CDM Smith has endeavoured to ensure accuracy and completeness of the data. CDM Smith assumes no legal liability or responsibility for any decisions or actions resulting from the information contained within this map.

Data source:
Survey by CDM Smith, 2012; Adani, 2012; DERM, 2010;
Base Layer by Bingmaps, 2011.

CAIRNS
TOWNSVILLE
MOUNT ISA
ROCKHAMPTON
BRISBANE

adani™ CDM Smith cdmsmith.com

Job: G:\Projects\B12849_QuarryInvestigation\mxd\final\067-R2_PreviousQuarryActivities.mxd Date: 31/05/2013

4.3 North Creek Quarry

4.3.1 Site Description

The North Creek Quarry is proposed to be located on Lot 2 SP119925 with direct access to Bulliwallah Road through the existing entrance. The site is approximately 42 km west of the Gregory Development Road, and approximately 135 km north-west of Clermont in the IRC area. Table 4-1 details the lot on which the development is proposed and identifies the use of the lot, and the planning scheme zone under the *Belyando Shire Planning Scheme 2009*.

Table 4-1 North Creek Quarry Site Details

Lot and Plan	Address	Area	Zoning	Current Use(s)	Proposed Use(s)
Lot 2 SP119925 (Leasehold)	1162 Bulliwallah Road, Clermont	47,600ha	Rural	Quarrying and Cattle breeding / fattening	North Creek Quarry over part of lot

The surrounding areas are primarily used for cattle grazing and fattening, however the proposed location of North Creek Quarry is predominately cleared and is subject to intermittent quarry material extraction. The topography of the site is generally flat, but slopes slightly south towards North Creek and east towards the Belyando River (located approximately 1.5 km to the east). Site inspections have confirmed that historical quarrying has occurred in the location of the proposed North Creek Quarry (Plate 4-1) and the area is highly disturbed. There is little native vegetation present on the site. North Creek lies adjacent to the southern edge of the quarry, however the creek bed is shallow at this point and no water was observed during the survey.

Plate 4-1: Proposed Plant Processing and Material Stockpiling Area

Lot 2 SP119925 does not contain any residential dwellings and the closest known dwellings are approximately 4 km directly south of the proposed North Creek Quarry and adjacent to Moray Carmichael Road. These residences will be screened from the quarry operations by vegetation corridors which occur in a general north-south direction.

4.3.2 Existing Environment

4.3.2.1 Flora

EHP RE mapping for the North Creek Quarry site indicates the presence of non-remnant vegetation. A portion of the site towards the southern boundary has been disturbed by previous extractive activities and the remaining area is cleared of vegetation. A small amount of regrowth vegetation was observed on the site.

Pre-clearing vegetation maps identify the site as containing a composite RE community containing 85% Least Concern RE11.3.10, 10% Least Concern RE11.3.5 and 5% Of Concern RE11.3.3. Species observed scattered throughout the proposed quarry site are consistent with elements of each of these regional ecosystem communities (Plate 4-2). No TEC or listed threatened flora species were identified during the surveys.

Plate 4-2: Mapped Non-Remnant Vegetation at the North Creek Quarry Site

4.3.2.2 Fauna

As outlined above there is little native vegetation present on the site to support native species and MNES, the area being largely dominated by Buffel Grass (*Cenchrus ciliaris*). There are no mature trees and only scattered small regrowth on the quarry site. In addition, there is no mapped remnant vegetation for the site. The nearest mapped remnant vegetation is located 800 m to the south. North Creek lies adjacent to the southern edge of the site and comprises a narrow strip of mature riparian canopy trees over a grassy ground layer at this point. The creek bed is shallow and sandy and no standing water was observed during any of the surveys. Total survey time included approximately 3.5 hrs on the site (over several visits) and in the adjacent vegetation

along North Creek itself. This includes 2.5 hrs of bird surveys/general observations and 1 hr of herpetofauna searches. A total of 18 fauna species were recorded although the majority of these were observed in vegetation adjacent to the southern boundary of the site and not on the site itself. There is little habitat value for fauna on the quarry site beyond species common to disturbed grassy habitats. However, several burrows were observed in an artificial soil mound (resulting from quarry activities) that are likely to be that of Rainbow Bee-eater (*Merops ornatus*) (Migratory – EPBC Act) (Plate 4-3), which were common in the wider area during the surveys (Figure 5-1). The species was observed foraging in nearby canopy vegetation along North Creek itself. No other MNES species were observed and there is no suitable habitat on or near the quarry site for other MNES species.

Plate 4-3: North Creek Quarry - Potential Rainbow Bee-eater Burrows Observed During Field Surveys

4.3.3 Development Overview

Geology within the North Creek Quarry area consists primarily of extremely weathered sandstones and other sedimentary rocks with low to moderate strength that are friable and easily ripped. The resources at this quarry are suitable for producing CBR (Californian Bearing Ratio[1]) 15 type materials (low quality fill) as the extracted resource will have a low strength and elevated Atterberg characteristics[2] (Groundwork 2013).

The flora and fauna investigation covered an area of 17.1 ha, while the operational area is proposed to be 7.64 ha. Fauna investigations also extended to the vegetated section of North Creek along the southern boundary of the site. Extraction is likely to start by development of a series of linear rip faces with a small dozer ripping and pushing material to a stockpile which will then be loaded via loader/excavator either straight into a truck or through a screening plant depended upon final determination of material quality. Approximately 603,000 t will be removed at the quarry for the Project construction.

[1] Californian Bearing Ratio penetration test for evaluation of the mechanical strength of subgrades and basecourses. The ratio varies between 1 to 100 with a rating of 100 representing the strongest material. Ratings over 80 represents high quality subgrades.
[2] Higher Atteburg characteristics results in higher water retention capacity and also elevatred material swelling.

4.4 Moray Quarry

4.4.1 Site Description

The Moray Quarry is proposed to be located on Lot 662 PH1491 which connects to Moray Carmichael Road. Table 4-2 details the lot on which the development is proposed and identifies the use for the lot and the planning scheme zone under the *Belyando Shire Planning Scheme 2009.*

Table 4-2 Moray Quarry Site Details

Lot and Plan	Address	Area	Zoning	Current Use(s)	Proposed Use(s)
Lot 662 PH1491 (Leasehold)	5509 Elgin Road, Clermont	120.7 ha	Rural	Pastoral lease – Cattle breeding and fattening	Moray Quarry over part of lot

The site is within the Moray lease held by Adani and is predominantly used for exploration activities with some cattle grazing. It is important to note that the southern area of the site is sparsely vegetated (Plate 4-4).

Plate 4-4: Vegetation Present Onsite at Moray Quarry (Southern Section)

The site lies close to a number of residential buildings and ancillary structures. All known residential buildings close to the lot are located approximately 2.1 km to the west of the proposed quarry. These residences will be screened from the quarry operations [205 m Australian Height Datum (AHD)] by a hill that runs in a general north-south direction.

4.4.2 Existing Environment

4.4.2.1 Flora

EHP RE vegetation mapping indicates the presence of remnant vegetation on the south-east portion of the site. Another portion of the site was observed (during the March flora survey) to have recently undergone some vegetation clearing. EHP pre-clearing vegetation maps identify the site as containing a composite RE community containing 70% Least Concern RE11.3.5, 10 % Endangered RE11.3.1, 10% Of Concern RE11.3.3 and 10% Least Concern RE11.3.10. A larger polygon in the south-east of the site contains a composite RE (80% RE11.3.7 and 20% RE11.3.10) that is Least Concern. RE11.3.1 may be considered as an Endangered TEC under the EPBC Act – Brigalow (*Acacia harpophylla* dominant and co-dominant). No evidence of species consistent with Endangered RE11.3.1 was observed during field surveys.

Acacia cambagei (Stinking Wattle) was observed towards the western portion of the site and therefore consistent with the description of Least Concern RE11.3.5 whereas the north and east portion of the site contains regrowth species consistent with the Of Concern RE11.3.3 and Least Concern 11.3.10 (Plate 4-5). No TECs or listed threatened flora species were identified during surveys.

Plate 4-5: Mapped Non-Remnant Vegetation Moray Quarry Site.

4.4.2.2 Fauna

The site is used as a rock quarry for local operations. Standing water is present in several quarry holes. Visual assessments of these pools were undertaken during the March and July 2013 surveys one camera trap was set on a waterhole closest to the remnant woodland on the site for four days/nights (July 2013 only). The waterholes are likely to provide habitat for common frog species, a common watering point for local fauna as well as limited foraging habitat for waterbird species that are common and widespread. Outside of the present quarry area there is grassy eucalypt woodland on a low hill to the south-east with some cattle infrastructure (water troughs and tanks). Under EHP mapping this area is considered as a remnant vegetation community: RE11.3.7/11.3.10. The woodland has been partially cleared in the past and the ground layer was dominated by Buffel Grass although patches of native species were also present.

Total survey time included approximately 13.5 hrs (two staff members) on the quarry site and adjacent vegetation along the Belyando River (over several visits). This includes the following: 5 hrs of dedicated Koala searches; 5 person hrs of spotlighting; 4 person hrs of herpetofauna searches and 4 hrs of bird surveys/general observations and habitat assessment. Search methods within habitat along the adjacent anabranch of the Belyando River (8 person hrs) also comprised searches for Black-throated Finch and were carried out within current SEWPaC guidelines (6 hrs of targeted searches in the vicinity of waterholes). A camera trap was set for four nights during the July winter survey at a waterhole located close to the onsite remnant woodland during initial site investigations. A total of 55 fauna species were recorded on the quarry site (**Appendix B**). The majority of these were observed in or near the remnant vegetation located in the southern portion of the site.

The remnant woodland still contains many large trees likely suitable for Koala (*Phascolarctos cinereus*) (Vulnerable – EPBC Act). Potential evidence of this species presence was observed onsite (tree scratches), however these may also have been created by Lace Monitor (*Varanus Varius*) which can produce similar scratch marks. The nearby presence of a well-vegetated riparian zone along the Belyando River may increase the likelihood of Koala using the site.

The vegetated woodland on the quarry site is dominated by Grey Bloodwood (*Corymbia clarksoniana*) with scattered Ghost Gum (*C. dallachiana*) and Brown's Box (*Eucalyptus brownii*) also occurring. Brown's Box is listed as a secondary feed tree species for Koala in the region (Australian Koala Foundation 2012) and Ghost Gum has been reported in the diet of Koalas (in low levels) to the south of the Project area (Ellis *et al.* 2002). No Koalas were recorded despite a thorough search of the site and no scats attributable to Koala were recorded. Vegetation along the Belyando River was dominated by large Red Gums (*E. tereticornis/camaldulensis*) and Coolabah (*E. coolabah*) which are primary and secondary feed trees for Koalas (respectively). Tree scratches were also recorded in this area however no individuals or scats were observed during the day. No Koalas were recorded during spotlighting although several Brushtail Possums (*Trichosurus vulpecula*) were recorded along the Belyando River.

The grassy woodland on the site provides a limited range of habitat values for fauna. These include:

- Tree hollows that may provide shelter or breeding sites for arboreal mammals (gliders and possums), microbats and birds (owls and parrots);
- Patches of large woody debris provide shelter for a wide range of ground fauna;
- Flowering eucalypts provide seasonal resources for parrots and honeyeaters in particular; and

- A grassy ground layer that provides resources for a range of widespread and common bird species as well as kangaroos.

Due to the relatively sandy substrate this site is also suitable for Squatter Pigeon (Vulnerable – EPBC Act) which is an MNES species. Squatter Pigeon was recorded in two locations (one and two individuals respectively) within the patch of remnant woodland during the March 2013 survey (Figure 5-1).

Vegetation in the remainder of the survey area has been largely cleared outside of the grassy woodland. There are few, scattered trees over a ground layer dominated by Buffel Grass. The north of the quarry area comprises low-relief gilgais with scattered individuals and *Acacia* species including Brigalow. Although subject to cattle disturbance this area may provide suitable (but limited) habitat for Ornamental Snake (*Denisonia maculata*) (Vulnerable – EPBC Act). Apart from this species habitat the remnant vegetation holds few values for fauna with the exception of widespread and common species. The current entrance road and gate to the site lies adjacent to the western edge of the remnant vegetation and is directly accessed from the Moray Carmichael Road. There is no tall vegetation on the western side of the access road.

4.4.3 Development Overview

Moray Quarry is an operational quarry used for local construction and infrastructure developments. Outside of the existing quarry area there is grassy eucalypt woodland on a low hill to the south-east with cattle infrastructure (water troughs and tanks). The woodland has been partially cleared in the past but the site still contains many large trees which may be suitable for Koala.

Geology within the Moray Quarry site consists of extremely weathered sandstones and other sedimentary rocks of low to moderate strength which are friable and relatively easily ripped. Similarly to North Creek Quarry, the site should be capable of producing CBR 15 type materials if processed correctly (Groundwork 2013).

Site equipment and extraction methods for this quarry will be similar to the North Creek Quarry and is likely to start by development of a linear rip faces with the dozer ripping and pushing material to a stockpile. This material will then be loaded via loader/excavator with straight into truck (Groundwork 2013). The quarry is proposed to have multiple access points onto Moray Carmichael Road.

The flora and fauna investigation covered an area of 120.7 ha, while the operational area is proposed to be 91.5 ha. The Project construction requires 652,000 t of material to be extracted from this site, with extraction volumes based on a rippable thickness of six metres (Groundwork 2013).

A small lay down, hardstand and bunded fuel storage will be located in the south-eastern corner of the site. In addition a number of temporary structures including a demountable office, crib room, ablution facilities and a small car park may be erected onsite.

Plate 4-6: Moray Quarry - Remnant Woodland and Potential Koala Habitat

4.5 Elgin North Quarry

4.5.1 Site Description

The Elgin North Quarry is proposed to be located on Lot 637 PH1980 with direct access to Elgin Moray Road through the existing entrance. The site is approximately 18 km west of the Gregory Development Road, and approximately 114 km north-west of Clermont in the IRC area. Table 4-3 details the lot on which the development is proposed and identifies the use of the lot, and the planning scheme zone under the *Belyando Shire Planning Scheme 2009.*

Table 4-3 Elgin North Quarry Site Details

Lot and Plan	Address	Area	Zoning	Current Use(s)	Proposed Use(s)
Lot 637 PH1980 (Leasehold)	Moray Road, Belyando 4721	32,900ha	Rural	Quarrying and Cattle breeding / fattening	Elgin North quarry over part of lot

The surrounding areas are primarily used for cattle grazing and fattening, however, the proposed location of Elgin North Quarry is predominantly cleared and is subject to intermittent quarry extraction. The topography of the site is generally flat except for the small rhyolitic and dacitic outcrop which will be utilised for Elgin North Quarry. Site inspections have confirmed that historical quarrying has occurred in the location of the proposed Elgin North Quarry (Plate 4-7) and the area is highly disturbed.

The property contains a number of residential buildings and ancillary structures. All known residential buildings on the lot are located approximately 2.3 km to the south-east of the proposed quarry. These residences will be screened from the quarry operations by a hill that rises to 220 m AHD and runs in a general north-south direction. The residences are located adjacent to Mistake Creek which is the closest major waterway to Elgin North Quarry (2.2 km).

4.5.2 Existing Environment

4.5.2.1 Flora

The Elgin North Quarry site consists of approximately 8.75 ha of EHP mapped endangered remnant vegetation and 6.5 ha of mapped non-remnant vegetation. RE mapping shows that the mapped endangered RE community contains two regional ecosystems. The remnant polygon is mapped as containing 90% Least Concern RE11.5.3 and 10% Endangered RE11.4.8.

Preliminary investigations and vegetation transects did not identify any species associated with the endangered regional ecosystem community within the remnant area of the site. The dominant canopy species observed throughout the site was identified as *Eucalyptus crebra* (Narrow Leaf Ironbark). Other species observed are identified as *Corymbia clarksoniana* (Long Fruited Bloodwood) and *Corymbia dallachiana* (Ghost Gum). These species are all characteristic of Least Concern Regional Ecosystem 11.5.3. No potential TECs or listed threatened flora species were identified on the site (Plate 4-7).

4.5.2.2 Fauna

Elgin North Quarry has previously been used as a rock quarry for local operations. There is some standing water in existing quarry excavations and a visual assessment of these waterholes was undertaken. The waterholes are likely to provide habitat for common frog species as well as limited foraging habitat for waterbird species that are common and widespread. The area is

sparsely wooded (due to past land management practices) with small, regrowth ironbark species on a mostly rocky substrate. As elsewhere in the area the ground layer is dominated by the introduced Buffel Grass. Total survey time included approximately 5 hrs on the site (over several visits) and a second area to the south. This includes 4 hrs of bird surveys/general observations and 1 hr of herpetofauna searches. A total of 29 fauna species were recorded, mostly south of the quarry site (**Appendix B**). In general, the site has very little value for conservation significant fauna and MNES. Rainbow Bee-eater (Migratory – EPBC Act) was detected during the initial survey period to the south of Elgin North (Figure 5-1).

4.5.3 Development Overview

The geology of the Elgin North Quarry area is comprised by a thin rhyolitic to dacitic flow (maximum thickness of 4.5 m). It is likely that the material will be suitable for producing CBR 45-60 material with localised patches of higher quality material (Groundwork 2013).

Processing of material will occur at the quarry face with an excavator loading into a jaw followed by a suitable secondary and tertiary screening and crushing process. Additional crushing and screening may be required, depending on the type and quantum of the material (Groundwork 2013).

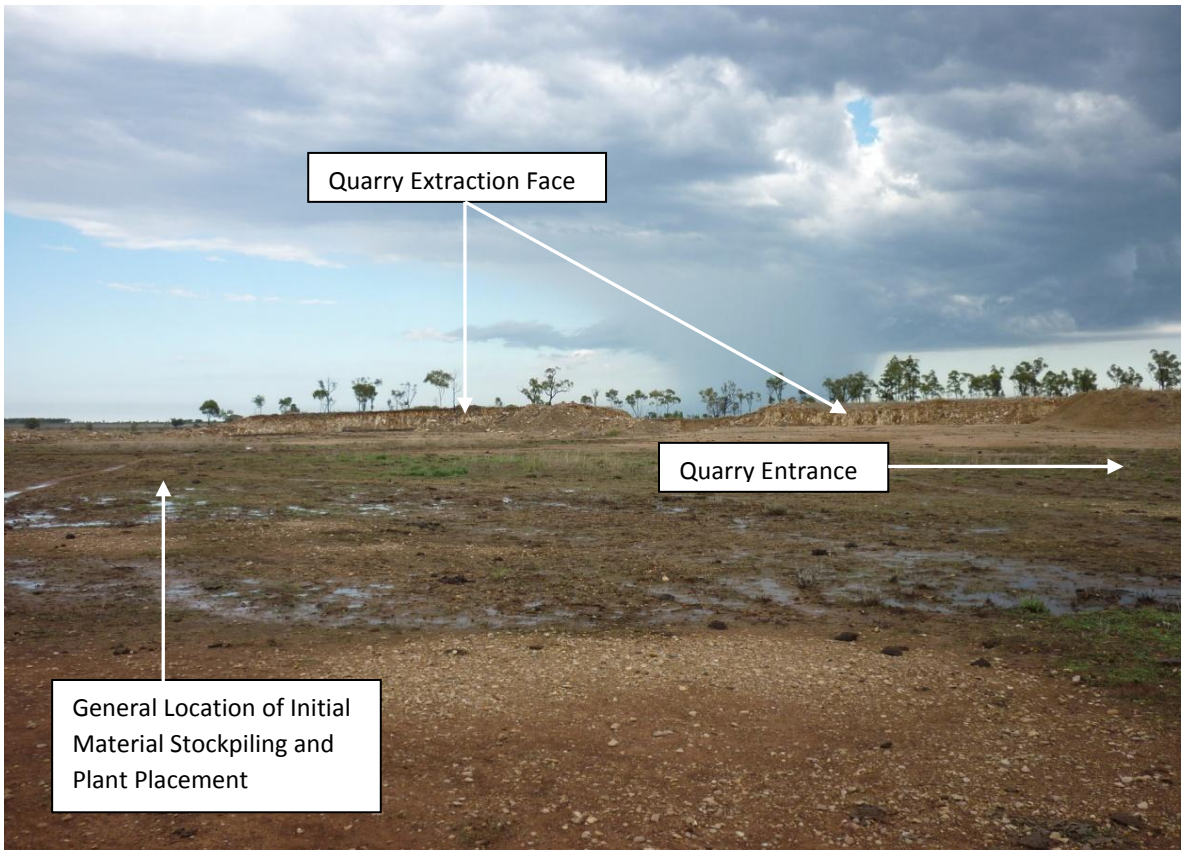


Plate 4-7: Existing Elgin North Quarry Area

The flora and fauna investigation covered an area of 179.1 ha, while the extraction area is proposed to be 15.25 ha. Initial geotechnical investigations indicate a potential extraction in four stages, however there could potentially be more material available at the site and further geotechnical work is being undertaken. A total of 1.265 million tonnes is required from the quarry to support local road upgrades.

4.6 South Back Creek Quarry

4.6.1 Site Description

South Back Creek Quarry is proposed to be located on Lot 656 SP138788 with direct access to Elgin Road through the existing entrance. The site is approximately 10 km west of the Gregory Development Road, and approximately 102 km north-west of Clermont in the IRC area. Table 4-4 details the lot on which the development is proposed and identifies the use of the lot, and the planning scheme zone under the *Belyando Shire Planning Scheme 2009.*

Table 4-4 Back Creek Quarry Site Details

Lot and Plan	Address	Area	Zoning	Current Use(s)	Proposed Use(s)
Lot 656 SP138788 (Leasehold)	Moray Road, Clermont 4721	32,700ha	Rural	Quarrying and Cattle breeding / fattening	Back Creek quarry over part of lot

The surrounding areas are primarily used for cattle grazing and fattening, however the proposed location of South Back Creek Quarry is predominantly cleared and the adjacent area has been subject to intermittent quarry extraction. The topography of the area is predominantly flat, however the site is located on a significant rise that slopes west and south towards Back Creek (an anabranch of Mistake Creek) which runs into Pelican Lagoon (5 km east) (Plate 4-8). Site inspections have confirmed that historical quarrying has occurred in the location of the proposed South Back Creek Quarry (Plate 4-8) and the area is highly disturbed.

The lot contains a number of artificial dams, however no residential dwellings are located on the property. The closest known dwelling houses are located on Lot 637 PH1980 approximately 6.5 km to the west of the proposed quarry. These residences will be screened from the quarry operations by vegetation corridors which occur in a general north-south direction.

4.6.2 Existing Environment

4.6.2.1 Flora

The South Back Creek Quarry site is currently mapped as containing non-remnant vegetation. A portion of the site towards the northern boundary has been disturbed by previous extractive activities and the remaining area is generally cleared of vegetation.

RE mapping identifies the site as containing Least Concern RE11.11.15. Species observed scattered throughout the proposed quarry polygon are consistent with this regional ecosystem community. Species recorded include *Eucalyptus crebra* (Narrow Leaf Ironbark), *Corymbia dallachiana* (Ghost Gum), and *Acacia excelsa* (Ironwood). No TECs or threatened flora species were recorded on the site (Plate 4-8).

Plate 4-8: Mapped Non-Remnant Vegetation at the South Back Creek Quarry

4.6.2.2 Fauna

This site has previously been used for rock quarry operations which are extensive relative to the other sites inspected. The only remaining infrastructure is three large water tanks adjacent to Elgin Road, which bisects the site in a north-south direction. Standing water is present in several quarry holes and a visual assessment of these waterholes was undertaken. The waterholes are likely to provide habitat for common frog species as well as limited foraging habitat for waterbird species that are common and widespread. There is little substantial vegetation with only scattered small trees remaining on the rocky hill itself (Plate 4-8). Small herpetofauna species are likely to use the abundant loose rocky substrate across most of the site for shelter. Otherwise habitat values for fauna are very limited across the quarry site.

Back Creek lies adjacent to the western and southern boundary of the proposed quarry area. Vegetation has been cleared close to the creek except for a riparian strip of varying width (up to 180 m). The vegetation remaining includes some large eucalypts with Brigalow on low-relief gilgai depressions. Standing water in the form of large pools was present throughout the surveys. Although degraded by cattle access this area retains considerable value for fauna given the context of the surrounding landscape and was the focus of much of the survey intensity. There are many tree hollows that may provide shelter/breeding sites for arboreal mammals (gliders and possums), microbats and birds (owls and parrots); patches of large woody debris and deep leaf litter provide shelter for a wide range of ground fauna; flowering eucalypts provide seasonal resources for parrots and honeyeaters in particular; and a patchy lower shrub layer that provides shelter for mid-size ground mammals such as Rufous Bettong (*Aepyprymnus rufescens*).

Total survey time included approximately 13 hrs (two staff members) on the quarry site and adjacent vegetation (approximately 20 ha of riparian vegetation) along Back Creek (over several visits). This includes the following: 2 hrs of dedicated Koala habitat searches; 2 person hrs of spotlighting; 5 person hrs of herpetofauna searches and 3 hrs of bird surveys/general observations and habitat assessment. The remaining 9 person hrs were spent searching the creek habitat and adjacent area for Black-throated Finch (*Poephila cincta cincta*) (Endangered – EPBC

Act) which were carried out within current SEWPaC guidelines (6 hrs of targeted searches in the vicinity of waterholes. This included a 1 hr waterhole watching survey (2 survey staff members), during which waterholes north and south of Elgin Road were monitored during the late afternoon for incoming birds. A camera trap was set for four nights during the July winter survey at a waterhole at which finches were observed to be drinking during initial site investigations. A total of 81 fauna species were recorded in the area, largely along Back Creek (**Appendix B**).

The habitat along Back Creek, while degraded, does provide limited value to MNES species such as Ornamental Snake (*Denisonia maculata*) (Vulnerable – EPBC Act). Squatter Pigeon occurs in the wider area but was not recorded onsite. Given the species requires permanent water it may occur in or near to the site. No signs of Koala were detected (tree scratches or scats) and Black-throated Finch was not observed during the surveys, despite the presence of three other finch species. However, there is suitable habitat and they may potentially occur in the area, although the degraded nature of the surrounding habitat makes this less likely. Two MNES species listed as Migratory (EPBC Act) were observed along Back Creek (but not on the quarry site): Rainbow Bee-eater and Eastern Great Egret (*Ardea modesta*).

4.6.3 Development Overview

The geological structure of the South Back Creek Quarry is similar to the Elgin North Quarry and is described as a rhyolite to dacitic flow with a general thickness of between 10 and 18 m in the main resource. Extraction is likely to be by development of a single bench scenario with bench height increased to 15 m and adjusted as required to match the undulating basement (Groundwork 2013). Material processing will occur at the quarry face (Plate 4-9) with an excavator loading into a jaw crusher followed by a suitable secondary and tertiary screening and crushing process

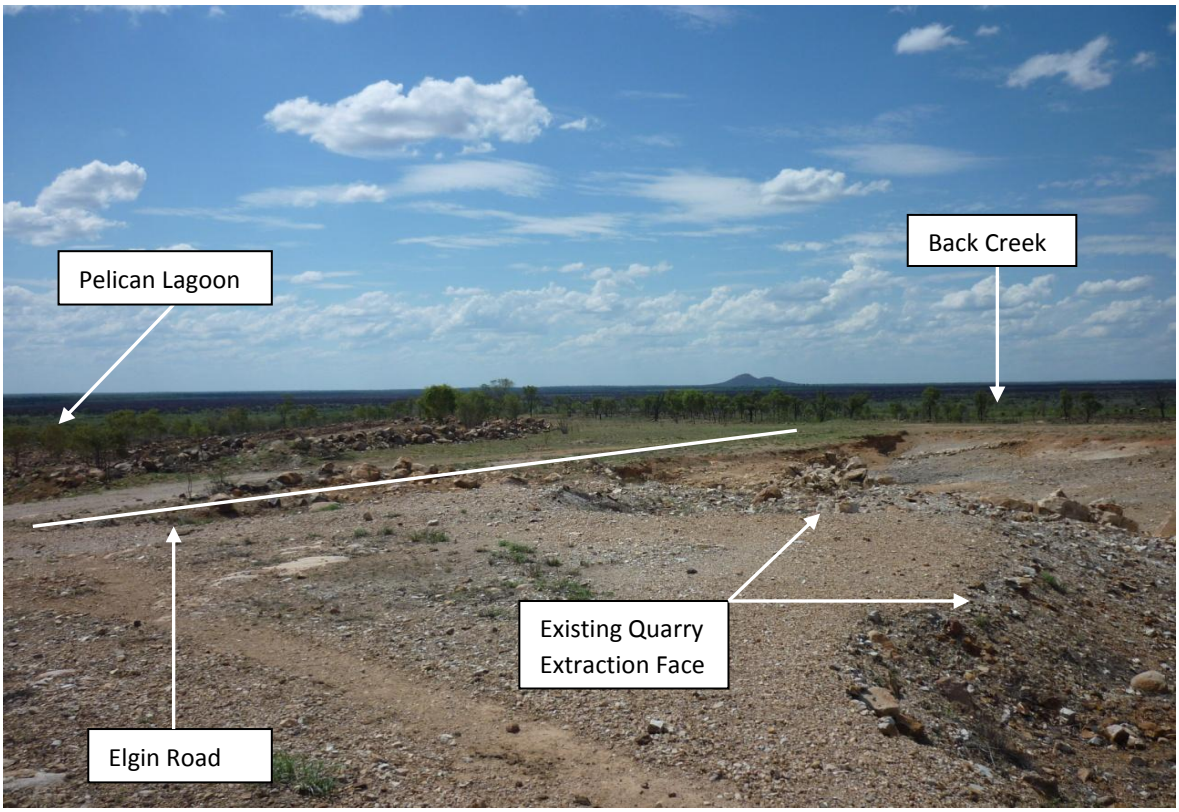


Plate 4-9: View South-East from the Extraction Site

The flora and fauna investigation covered an area of 120 ha, while the operational area is proposed to be 55.5 ha. Geological models indicated that extraction will likely remove 690,000 t.

4.7 Borrow 7

4.7.1 Site Description

Borrow 7 is proposed to be located on Lot 3235 PH752 with access gained via an existing internal property track that connects to Twin Hills Road and the Gregory Development Road. The site is approximately 5 km west of the Gregory Development Road, and approximately 120 km north-west of Clermont in the IRC area. Table 4-5 details the lot on which the development is proposed and identifies the use of the lot and the planning scheme zone under the *Belyando Shire Planning Scheme 2009.*

Table 4-5 Borrow 7 Site Details

Lot and Plan	Address	Area	Zoning	Current Use(s)	Proposed Use(s)
Lot 3235 PH752 (Leasehold)	472 Twin Hills Road, Clermont	20,700 ha	Rural	Cattle breeding and fattening	Borrow 7 over part of lot

The site is within an area primarily used for cattle grazing. This is a large site that is topographically complex and sparsely vegetated. Borrow 7 will be located immediately north of a low depression which is likely to collect surrounding surface water runoff (Plate 4-10). The lot contains residential buildings and ancillary structures approximately 6.7 km south-west of the proposed quarry location. However, the closest residential buildings are approximately 6.5 km to the north-west, located on Lot 4 SP116046.

Plate 4-10: View From Proposed Site of Borrow 7 South

4.7.2 Existing Environment

4.7.2.1 Flora

The Borrow 7 site consists of approximately 29.44 ha of EHP mapped endangered remnant vegetation and 6.73 ha of mapped non-remnant vegetation, however very little extant woody vegetation now remains on the site. Scattered eucalypts and Brigalow are present, however in general the site provides little value for conservation significant flora. The region of mapped endangered vegetation on the site is mapped as a composite RE community containing 90% Of Concern RE11.4.6 and 10% Endangered RE11.4.8.

Four vegetation transects to determine canopy structure, were completed throughout the proposed quarry pit that is mapped as containing endangered remnant vegetation. The results of each transect revealed a canopy structure far less than the minimum 50% cover to be classed as remnant vegetation. Further, the majority of tree species recorded were scattered along the outside edge of the proposed quarry and at the base of the hill. Species include *Corymbia dallachiana* (Ghost Gum), *Acacia harpophylla* (Brigalow), *Grevillea striata* (Beefwood), and *Acacia excelsa* (Ironwood). Therefore, no TECs or threatened flora species were identified within or adjacent to the proposed quarry (Plate 4-11).

Plate 4-11: Typical Vegetation Profile on the Borrow 7 Site

4.7.2.2 Fauna

The initial survey area was relatively large extending 3 km south of the current quarry site (Figure 5-1). This encompasses three low rises (including the current quarry area) and adjacent low-lying clay plains. As stated above, much of this area is currently mapped as containing remnant Brigalow associated woodland but very little extant woody vegetation now remains on the site. Scattered small eucalypts occur on the rocky higher areas with few individuals large enough to have tree hollows. Scattered Brigalow and other *Acacia* species occur over a dense, grassy ground layer (mainly the introduced Buffel Grass) occur in the low-lying areas, largely concentrated around

drainage lines. These areas are likely to provide localised habitat for frogs as well as a general watering point for fauna. In general the site provides little value for fauna apart from widespread and common species that utilise grasslands. This site is accessed by a farm track heading north from the Twin Hills access road through several cleared paddocks.

Total survey time included approximately 6.5 hrs on the site and surrounds (over two visits). This includes 4.5 hrs of bird surveys/general observations and habitat assessment and 2 hrs of herpetofauna searches. A total of 26 fauna species were detected on the quarry site and surrounds (**Appendix B**).

An Ornamental Snake was recorded under fallen timber along a relatively well-vegetated drainage line containing standing water located in the south-east of the survey area (lat: 21.87748; long: 146.97602) approximately 1.5 km south of the proposed quarry site (Figure 5-1). The drainage line travels west from the site through cleared gilgai plains which also provide suitable habitat. The vegetation at the site of the Ornamental Snake comprises tall *Acacia* species including Brigalow with scattered smaller shrub species. The ground layer is still dominated by Buffel Grass however. Ornamental Snake almost exclusively eats frogs and does not require over-storey vegetation where cracking clays are present. An assessment of the low-lying habitat adjacent to and downstream of the quarry site and its suitability for Ornamental Snake was carried out during the winter survey. A shallow drainage line comprising cracking clays was present to the south-east corner of the quarry site. Low-relief gilgais on cracking clays were also present to the north-east of the quarry site. These areas have been heavily impacted by clearing and cattle grazing. However, given the species occurrence nearby it cannot be ruled out as potentially occurring in the area surrounding the quarry site.

No other MNES fauna species were detected and the habitat is unlikely to support other MNES species.

Plate 4-12: Ornamental Snake Record South of Borrow 7 (31 Jan 2013)

4.7.3 Development Overview

Geology at the Borrow 7 is that of a basalt flow or plug. The resource area forms a low rise of approximately 15 m higher than the surrounding plains and is boarded by a thick veneer of basalt soils which are underlain by unweathered basalt. The thickness of the basalt is not known however the main hill area appears to be 20 m thick with potential to be in excess of 50 m (Groundwork 2013).

Processing of material will occur at the quarry face with an excavator loading into a jaw followed by a suitable secondary and tertiary screening and crushing process. Blasting will be required approximately 1–2 events per month during the peak construction period.

The flora and fauna investigations covered an area of 399.5 ha, while the extraction area is proposed to be 36.17 ha. Provisional geological modelling indicates approximately 19.93 million tonnes of material will be removed from the quarry.

4.8 Disney Quarry

4.8.1 Site Description

The Disney Quarry is proposed to be located on Lot 4 SP116046 with an access road directly onto the Gregory Development Road. Table 4-6 details the lot and easement on which the development is proposed and identifies the use for each lot, and the planning scheme zone under the *Belyando Shire Planning Scheme 2009.*

Table 4-6 Disney Quarry Site Details

Lot and Plan	Address	Area	Zoning	Current Use(s)	Proposed Use(s)
Lot 4 SP116046 (Leasehold)	Charters Towers Rd, Belyando 4721	47,600ha	Rural	Cattle breeding and fattening	Disney Quarry

The site is within an area primarily used for cattle grazing, however this is a large and topographically complex site that remains well vegetated over much of its extent. Site inspections have confirmed that historical quarrying has occurred in the location of the proposed Disney Quarry and the area is highly disturbed. The remainder of the lot is predominantly used for cattle grazing and associated agricultural activities.

A telecommunications tower and associated building are located on a rise in the north-east of the site (Plate 4-13) (Lot 1 BL55) however, no activities or infrastructure are proposed on the lot as part of this application.

Plate 4-13: Telecommunication Tower

The property contains a number of residential buildings and ancillary structures. All known residential buildings on the lot are located approximately 2.1 km to the west of the proposed quarry pit. These residences will be screened from the quarry operations (230 m AHD) by a hill that rises to 290 m AHD and runs in a general north-south direction.

4.8.2 Existing Environment

4.8.2.1 Flora

A high rocky hillside running north-south dominates the site with lower rises adjacent to the east and west. Previous quarry activities were evident along the base of the eastern rise, however no quarry is currently in operation at the site. The vegetation is dominated by eucalypt woodland with some patches of *Acacia* forest. The woodland is often sparse in the lower lying areas, which is likely a result of past land management practices.

The site consists of approximately 35.5 ha of mapped Least Concern remnant vegetation and 20.42 ha of mapped non-remnant vegetation. Within this portion of the site species composition is consistent with Least Concern RE11.11.15. Dominant species include *Eucalyptus crebra* (Narrow Leaf Ironbark) and *Corymbia clarksoniana* (Long Fruited Bloodwood) with the occasional *Corymbia dallachiana* (Ghost Gum) present.

The proposed quarry site is located adjacent to a mapped endangered RE running north south along the quarry's western boundary and two smaller vegetation areas running largely east-west and located towards the centre of the proposed quarry area.

The mapped endangered vegetation contains a composition regional ecosystem community including 80% Of Concern RE11.4.6, 10% Endangered RE11.4.8, 5% Endangered RE11.4.9 and 5% Least Concern RE11.3.10. Site investigation of the area identified the following:

- The two smaller mapped endangered vegetation areas contain species associated with the adjacent Least Concern RE11.11.15;

- The large mapped endangered vegetation area running north south contained canopy species dominated by *Eucalyptus brownii* (Reid River Box) throughout the majority of the remnant polygon with a small patch of *Acacia cambagei* (Stinking Wattle) recorded towards the north west portion of the polygon. Two isolated patches of *Acacia harpophylla* (Brigalow) containing no more than ten trees within each patch were recorded throughout the polygon; and
- No TEC associated with *Acacia harpophylla* (Brigalow) or threatened flora species was observed in the survey area (Plate 4-12).

Plate 4-14: Vegetation Associated with the Mapped Endangered Area

4.8.2.2 Fauna

This is a large and topographically complex area that remains relatively well vegetated, although canopy cover varies across the site. A high rocky hillside running north-south dominates the site with lower rises adjacent to the east and west. Former quarry activities were also evident along the base of the low eastern ridgeline. The site is accessed from the Gregory Development Road to the east. The access road passes through low, disturbed regrowth vegetation. The vegetation is dominated by eucalypt woodland with small patches of *Acacia* forest. The woodland within the quarry development area is sparse in the low lying areas and generally dominated by younger regrowth trees, which is a result of past land management practices. A dense grassy, ground layer (mainly Buffel Grass) exists in lower lying areas. Spinifex dominates the ground layer in the rocky areas.

The survey area contains variable habitat values across its extent. Large tree hollows that may provide shelter and breeding sites for arboreal mammals (gliders and possums), microbats and birds (owls and parrots) are patchily distributed throughout. Large woody debris (including man-made timber piles associated with the historic quarry area) are also patchily distributed and these provide shelter for a wide range of ground fauna such as reptiles, rodents and dasyurids.

Flowering eucalypts throughout provide seasonal resources for parrots and honeyeaters in particular. Vegetation with a relatively dense shrub layer is located in the east of the survey area providing additional flowering and insect resources particularly for a range of small forest birds that are uncommon elsewhere. The grassy ground layer in the lower lying areas provides resources for a range of widespread and common bird species as well as kangaroos. Rocky areas on the upper slopes and where Spinifex dominates the ground layer provide abundant shelter sites for ground fauna, particularly reptiles.

Total survey time included approximately 18 hrs on the quarry site and surrounding vegetation (over several visits). However, the site could not be assessed during the winter 2013 survey due to land access restrictions. Total survey time includes the following: 8 hrs of Koala searches; 4 hrs of herpetofauna searches and 6 hrs of bird surveys/general observations and habitat assessment. A total of 46 fauna species were recorded in the area (**Appendix B**).

Potential evidence of Koala activity (tree scratches) was observed on several trees on the site, however these may also have been created by Lace Monitor which can leave similar markings and can be difficult to distinguish. No Koalas or Lace Monitors were recorded during the intensive survey and no scats were found to indicate recent activity. The Koala survey area was dominated by immature Brown's Box and scattered Ghost Gums in lower lying areas along and adjacent to an ephemeral creekline. This vegetation has been subject to substantial disturbance from past grazing and quarry activities with scattered large trees among young regrowth. The canopy vegetation on mid-slope areas is dominated by Narrow-leaved Ironbark (*E. crebra*) and Grey Bloodwood over a relatively dense *Acacia* understorey. Brown's Box is listed as a secondary feed tree species for Koala in the region (Australian Koala Foundation 2012) and Narrow-leaved Ironbark and Ghost Gum have been reported in the diet of Koalas to the south of the Project area (Ellis *et al.* 2002).

The Disney Quarry survey area provides potential habitat not seen elsewhere in the Project area for Yakka Skink (*Egernia rugosa*) (Vulnerable – EPBC Act). There is limited habitat value for Squatter Pigeon and Black-throated Finch on the site. Although the dominant presence of Buffel Grass and lack of nearby permanent water is likely to preclude these species from occurring on a regular basis.

4.8.3 Development Overview

The geology at the Disney Quarry site consists of two main ridgelines. The eastern ridgeline hosting conglomerates and interbedded sandstones and meta-sediments +/- tuffaceous rocks, the western ridgeline is believed to be more granitic in nature (Groundwork 2013).

The flora and fauna investigation covered an area of 594.5 ha, while the operational area is proposed to be 181.54 ha. Extraction on this site is likely to start by development of a series of linear rip faces with the dozer ripping and pushing material to a stockpile which will then be loaded via a loader/excavator straight into a truck or through a screening plant dependent upon the quality of material (Groundwork 2013).

Estimated volumes at Disney Quarry are based on a rippable thickness of five metres, additional volumes of material exist below this, however the feasibility of ripping this material is unknown with additional test work is required to delineate the depth of rippable resources, no blasting will occur at this site (Groundwork 2013). The Project construction requires 11.75 million tonnes of material to be extracted from this site.

Section 5 Matters of National Environmental Significance

5.1 Overview

In accordance with the EPBC Act Protected Matters Search (**Appendix A**), the following are the relevant MNES for the Project:

- Listed threatened species and ecological communities (section 18 & 18A) – There are nine threatened fauna species, two threatened flora species (refer to Table 5-1) and one TEC which are likely to occur or have the potential to occur, within one or all of the quarry sites. A flora survey has confirmed that no listed TEC or conservation significant flora species will be impacted by the quarry developments and these have not been discussed further here. Refer to **Appendix C** for the EPBC Act Flora Assessment.
- Listed migratory species (sections 20 & 20A) – There are nine migratory bird species identified in the SEWPaC Protected Matters Search, which are likely to occur or have the potential occur within the vicinity of the quarry sites.

This section discusses the listed MNES known or likely to occur in proximity to the proposed quarry sites. Potential impacts on MNES associated with the development and operation of the quarries are discussed in Section 6.

5.2 Listed Threatened and Migratory Species

Desktop and field assessments have indicated a potential for six MNES fauna species (as outlined above) to be impacted by the proposed quarry developments. Potential signs of Koala (EPBC Act – Vulnerable (QLD, NSW and ACT)) in the form of tree scratches were recorded on two quarry areas, however it should be noted that these could also have been created by Lace Monitors.

Of the six potential listed species, two listed as vulnerable under the EPBC Act were recorded within the quarry areas or surrounds:

- Squatter Pigeon (EPBC Act – Vulnerable); and
- Ornamental Snake (EPBC Act – Vulnerable).

Conservation significant species sighting locations are identified in Figure 5-1. An additional six species listed as Migratory under the EPBC Act were also recorded:

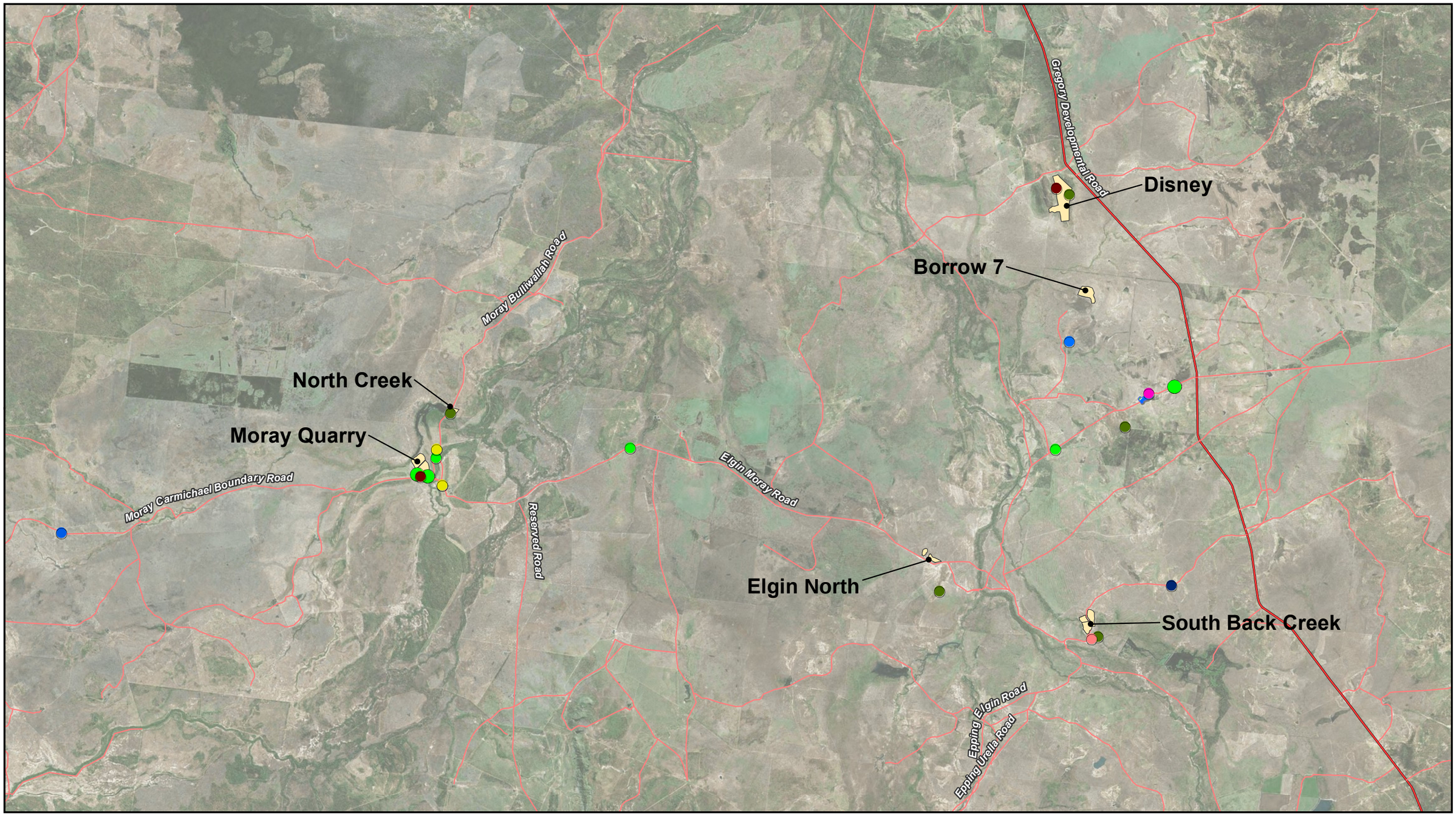
- White-throated Needletail (*Hirundapus caudacutus*);
- White-bellied Sea-eagle (*Haliaeetus leucogaster*);
- Eastern Great Egret (*Ardea modesta*);
- Cattle Egret (*Ardea ibis*);
- Glossy Ibis (*Plegadis falcinellus*); and
- Rainbow Bee-eater (*Merops ornatus*).

Of the species listed above Rainbow Bee-eater, Squatter Pigeon and potential Koala signs were recorded within a quarry site. The remaining species were recorded opportunistically in the

surrounding area. The potential occurrence of all conservation significant fauna species including those identified from the desktop assessment is provided in Table 5-1.

Species identified in the database searches were subsequently categorised as to their potential to occur in the study areas following onsite habitat assessment. Four categories were used to classify the likelihood of a species being present. Categories were defined as:

1. Known – confirmed during field assessments;
2. Likely – suitable good quality habitat observed during field assessments and desktop records from the area;
3. Potential – possibility of suitable habitat and records of the species occurring within the wider Project area; and
4. Unlikely – no suitable habitat or not known to occur within the local region.



Adani Quarries
Figure 5-1 Conservation Significant Species Locations

Legend

- Minor Road
- Major Road
- Major Watercourse
- Minor Watercourse
- Dam
- Quarry Investigation Area

Surveyed Fauna Species

- Squatter Pigeon
- Potential Koala Scratches
- Ornamental Snake
- Cattle Egret, Eastern Great Egret and Glossy Ibis
- Rainbow Bee-eater
- White-throated Needletail
- White-bellied Sea-eagle
- Eastern Great Egret

0 2,500 5,000
Metres

Data source:
Survey by CDM Smith, 2012; Adani, 2012; DERM, 2010;
Base Layer by Bingmaps, 2011.

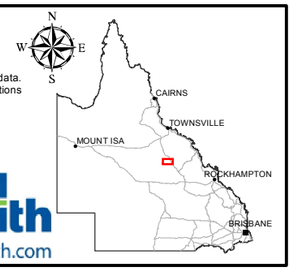


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Table 5-1 Predicted Conservation Significant Species and Potential to Occur on Quarry Sites

Scientific name	Common name	EPBC Act[1]	Preferred habitat	Potential to occur
Endangered or Vulnerable Fauna Species				
Egernia rugosa	Yakka Skink	V	Occurs in a variety of dry sclerophyll woodlands largely in the Brigalow Belt. Constructs burrows in a variety of soil types.	**Potential -** May occur on Disney Quarry as suitable habitat (intact woodland with fallen timber) occurs. However, no survey or database records. EPBC online search only.
Denisonia maculata	Ornamental Snake	V	Prefers seasonally inundated areas on deep cracking clay soils and adjacent habitat. Feeds exclusively on frogs. Rare to absent where Cane Toads are abundant.	**Known -** Individual recorded in southern end of Borrow 7 investigation area. A second individual recorded during the July winter survey on Moray-Carmichael Rd 20 km west of Moray Quarry. Two individuals were recorded by GHD (2013) in the same area during surveys for the Mine Offsite Infrastructure area. Also potential to occur in creekline habitat adjacent to Back Creek. Single WildNet record and EPBC online search.
Furina dunmalli	Dunmall's Snake	V	Rarely encountered. Forests to woodlands, associated with Brigalow scrub.	**Unlikely -** Species at the edge of predicted range in Project area. Habitat generally highly degraded. No survey or database records. EPBC online search only.
Geophaps scripta scripta	Squatter Pigeon (southern)	V	Occurs in dry woodland. Generally on sandy soils close to water.	**Known -** Occurs on Moray Quarry and recorded several times in wider area. May occur on other quarry sites however substrate is generally unsuitable (rocky). May occur in the vicinity of Back Creek where permanent waterholes exist although none observed nearby. Also GHD (2012a;b; 2013) and WildNet records. EPBC online search.
Erythrotriorchis radiatus	Red Goshawk	V	Prefers areas close to the coast featuring extensive open forest and woodland with a mosaic of vegetation types. Nests in tall emergent trees close to water.	**Unlikely -** No survey or database records. EPBC online search only. Landscape throughout Project area is predominantly cleared.
Rostratula australis	Australian Painted Snipe	E, M	Prefers temporary shallow wetlands. Nests in freshly flooded wetlands with low vegetation.	**Unlikely -** Will not occur on quarry sites**.** Potential to occur on wetlands in area but no database records. EPBC online search only.
Poephila cincta cincta	Black-throated Finch (southern)	E	Occurs in grassy open woodlands near water. Prefers areas of intact woodlands.	**Potential -** South Back Creek Quarry site retains narrow riparian strip with permanent water but is degraded by cattle. No records anywhere in the wider survey area despite repeated site visits. Species is relatively sedentary so is likely to have been detected if present. Many records in mine area well to the west by GHD (2012a; 2013) and several WildNet records. EPBC online search.
Neochmia ruficauda ruficauda	Star Finch (eastern)	E	Occurs in grassy flats/woodlands near water.	**Unlikely -** Species present range is much further north. No database records. EPBC online search only.

Scientific name	Common name	EPBC Act[1]	Preferred habitat	Potential to occur
Phascolarctos cinereus	Koala	V	Occurs in a variety of eucalypt woodlands and open forest.	**Potential -** May occur on Disney and Moray Quarries where potential evidence of presence (scratches) observed. Scratches left by Lace Monitor can look similar and the two may be difficult to distinguish. Habitat within remaining sites in relatively poor condition or cleared. Also GHD (2012a) and six WildNet database records within 50 km radius of Project area.
Lasiorhinus krefftii	Northern Hairy-nosed Wombat	E	Occurs in sandy, grassy woodland.	**Unlikely -** Species almost entirely restricted to Epping Forest south of Project area. Single Wildnet record.
Migratory species				
Haliaeetus leucogaster	White-bellied Sea-eagle	M	Occurs in coastal areas including beaches, estuaries and lagoons, but may range well inland on larger rivers. Predominantly feeds on fish.	**Known -** Recorded in habitat close to Belyando River during winter survey. Species forages for fish so is likely to be restricted to the large waterholes in this area. No suitable habitat on quarry sites. No database records. EPBC search only.
Hirundapus caudacutus	White-throated Needletail	M	Aerial foraging species that occur over a variety of landscapes including highly modified environments.	**Known -** White-throated Needletail observed in the area. Species may seasonally occur on the quarry sites.
Apus pacificus	Fork-tailed Swift	M	Aerial foraging species that occur over a variety of landscapes including highly modified environments.	**Likely** - Species may seasonally occur over the area.
Ardea modesta	Eastern Great Egret	M	Eastern Great Egret occurs on a variety of wetlands and intertidal habitats.	**Known -** Several individuals observed on large farm dam and recorded along Back Creek. Unlikely to actually occur on the quarry sites. Three WildNet records. EPBC online search.
Ardea ibis	Cattle Egret	M	Cattle Egret prefers damp grassy areas for feeding, particularly pasture.	**Known -** Observations of species in the area, however unlikely to occur on quarry sites. Potential to occur in paddocks after heavy rains. Single database record. EPBC online search.
Plegadis falcinellus	Glossy Ibis	M	Prefers shallow freshwater habitats. Sometimes occurs in intertidal habitat.	**Known -** Several individuals observed on large farm dam, however unlikely to occur on quarry sites.
Tringa stagnatilis	Marsh Sandpiper	M	May be found in both freshwater and estuarine habitats.	**Potential** - May occur on wetlands in area, however unlikely to occur on quarry sites. Single database record.
Gallinago hardwickii	Latham's Snipe	M	Occurs in generally low numbers in a variety of permanent or ephemeral wetlands across eastern Australia.	**Potential** - May occur on wetlands in area, however unlikely to occur on quarry sites. Single database record. EPBC online search.
Merops ornatus	Rainbow Bee-eater	M	Widespread species that may occur in a variety of habitats. Nests in burrows in sandy banks.	**Known -** Recorded at four quarry sites. Potential nest burrows observed in artificial quarry banks at North Creek Quarry. Common in area at time of survey. Also GHD (2012a;b) and database records.
Rhipidura rufifrons	Rufous Fantail	M	Prefers dense habitats including rainforest, riparian habitats and vine-thicket.	**Potential -** May occur in area, however unlikely to occur on quarry sites where habitat is generally poor. Two database records.

Scientific name	Common name	EPBC Act[1]	Preferred habitat	Potential to occur
Myiagra cyanoleuca	Satin Flycatcher	M	Prefers dense habitats. Generally migrates through coastal forests where it may occur in more open habitats.	**Potential -** May occur in area, however unlikely to occur on quarry sites where habitat is generally poor. Also GHD (2012a) and single database record.
Endangered or Vulnerable flora species				
Acacia ramiflora		V	Occurs in woodland on sandstone hills, often with spinifex.	**Potential -** May occur on Disney as suitable sandstone habitat occurs in higher elevation areas**.** Habitat does not occur on designated quarry area which is low elevation and not sandstone. Three database records from wider area.
Dicanthium queenslandicum	King Blue Grass	V	Occurs on black clay soils around the Emerald district.	**Unlikely -** Project area is outside of known range for the species.

[1] EPBC Act: E = Endangered; V = Vulnerable; M = Migratory.

5.2.1 Conservation Significant Fauna Species Profiles

The following profiles of conservation significant species refers only to those species recorded onsite during the site surveys or considered likely to occur on the quarry sites based on habitat assessments. Habitat mapping is also provided for each species (where applicable for each quarry) in order to provide a guide to the potential ability of habitat within, or adjacent to the quarry site to support the species and to quantify the extent of habitat potentially impacted by Project activities.

The habitat suitability condition score employed is that used by GHD (2013b). The score employs a rating out of 10 of the suitability of specific habitat characteristics (tailored to each species) present on-site as judged during site assessments. This is added to habitat context and connectivity information as detailed in the *Ecological Equivalency Methodology Guideline* (DERM 2011) used for assessing biodiversity offsets in Queensland. These particular measures are applied in fragmented landscapes such as the Project area. Context refers to the percentage of remnant vegetation in the immediate surrounds and connectivity refers to the amount of remnant vegetation connected to the assessment area. A maximum score of 20 is possible. Please refer to **Appendix E** for a table of the condition scores and ecological characteristics used to assess habitat condition for each species.

5.2.1.1 Ornamental Snake (EPBC Act – Vulnerable)

The Ornamental Snake occurs in low-lying areas with deep-cracking clay soils that are subject to seasonal flooding, and adjacent areas of clay and sandy loams. The species is found in woodlands and shrublands in Brigalow, Gidgee (*Acacia cambagei*), Blackwood (*Acacia argyrodendron*) or Coolibah (*Eucalyptus coolabah*)-dominated vegetation communities associated with moist areas, particularly gilgaied landscapes. It also occurs in pure grassland associated with gilgais, and lake margins and wetlands (Melzer 2012). Ornamental Snake shelters in soil cracks and under fallen timber. It is a secretive and nocturnal species and feeds almost entirely on frogs, though lizards may very occasionally be eaten (Ehmann 1992; Wilson and Swan 2008).

Threats to Ornamental Snake include: habitat clearing and fragmentation; altered water quality and hydrology affecting gilgai and wetland habitat; habitat degradation by cattle and exotic weed species; predation by feral species; and consuming Cane Toads. The species is generally not found in areas with high numbers of Cane Toads (Melzer 2012).

Within the surveyed quarry sites preferred habitat for the Ornamental Snake is restricted to the low-lying areas surrounding Borrow 7. The species was recorded 1.5 km south of the quarry site (Figure 5-2a). Potential habitat is present south and west of the Borrow 7 area where a narrow drainage line exists and cleared gilgais are present on cracking clays. Riparian habitat adjacent to South Back Creek Quarry features Brigalow, extensive fallen timber for shelter and low-relief gilgais that may also be suitable for the species (Figure 5-2b). Gilgais which may also be suitable for the species were observed in the northern section of Moray Quarry (Figure 5-2c). All of these areas appear heavily impacted by cattle grazing. However, a second individual was recorded 20 km east of Moray Quarry (Plate 5-1) during the July winter survey in similar habitat i.e. low-relief gilgais in partially cleared regrowth Brigalow.

Plate 5-1: Ornamental Snake Recorded West of Moray Quarry (July 2013)

146°58'30"E
146°59'0"E
146°59'30"E
147°0'0"E
21°50'0"S
21°50'30"S
21°51'0"S
21°51'30"S
21°52'0"S
21°52'30"S
4SP116046
COWRIE CREEK
3235PH752

Figure 5-2a Habitat Suitability Mapping for Ornamental Snake - Borrow 7

Legend

- Property Boundary
- Borrow 7 Quarry Extraction Area
- Quarry Access Road
- Proposed Adani Corridor
- Minor Road
- Minor watercourse

Habitat Suitability

- 1
- 2
- 3

Surveyed Fauna Species

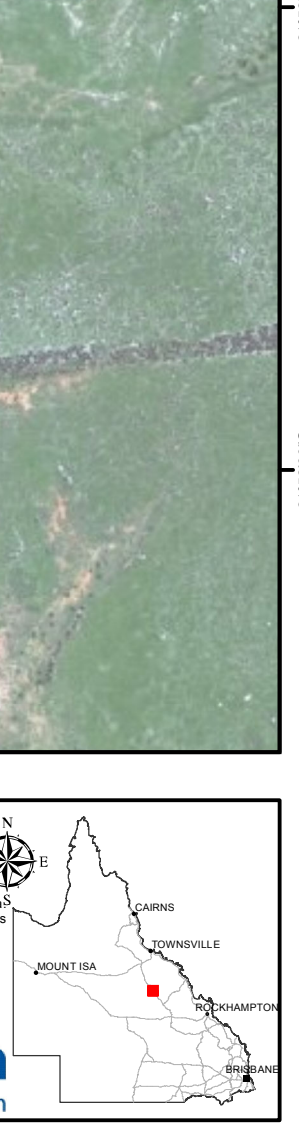
- Ornamental Snake

0 250 500
Metres

N W E S

Data source:
Adani, 2013; EHP; CDM Smith, 2013;
Base Layer by Bingmaps, 2011.

adani™ CDM Smith cdmsmith.com



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146°59'0"E
146°59'30"E
22°1'0"S
22°1'30"S
Elgin Moray Rd
Elgin Moray Rd
Elgin Moray Rd
Rd

Figure 5-2b Habitat Suitability Mapping for Ornamental Snake - South Back Creek Quarry

Legend

- Property Boundary
- South Back Creek Quarry Extraction Area
- Stockpiling & Processing Area
- Minor Road
- Minor Watercourse

Habitat Suitability

- 1
- 3
- 5

0 100 200
Metres

DISCLAIMER
CDM Smith has endeavoured to ensure accuracy and completeness of the data. CDM Smith assumes no legal liability or responsibility for any decisions or actions resulting from the information contained within this map.

Data source:
Adani, 2013; EHP; CDM Smith, 2013;
Base Layer by Bingmaps, 2011.

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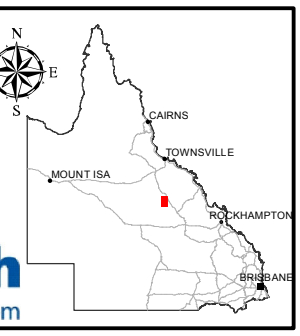

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146°37'0"E
146°37'30"E
21°56'0"S
21°56'30"S
21°57'0"S
Moray Carmichael Boundary Rd
BEEYANDO RIVER

Figure 5-2c Habitat Suitability Mapping for Ornamental Snake - Moray Quarry

Legend

- Property Boundary
- Moray Quarry Extraction Area
- Minor Road
- Minor Watercourse

Habitat Suitability

- 3

0 100 200
Metres

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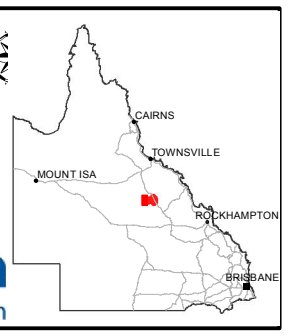

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5.2.1.2 Squatter Pigeon (southern) (EPBC Act – Vulnerable)

The Squatter Pigeon is largely terrestrial, foraging and breeding on the ground (Plate 5-2). The southern subspecies occurs mainly in dry grassy eucalypt woodlands and open forests (Frith 1982; Crome and Shields 1992). It also inhabits Callitris and Acacia woodlands and has been reported utilising open plains in its historical southern range (Frith 1982). Most birds live in sandy sites near permanent water (Blakers *et al.* 1984) and are usually seen in pairs or small groups of up to 20 or more birds.

Squatter Pigeons dust-bathe and are often encountered on dirt tracks and in areas of bare soil denuded of ground cover by livestock (Frith 1982; Higgins and Davies 1996). Although they remain common in heavily grazed country in tropical Queensland they are typically more common in un-grazed land compared to grazed land (Woinarski and Ash 2002; Reis 2012). These birds may occasionally feed in sown grasslands and pastures as they eat mainly seeds, including those of exotic pasture plants, and some insects (Crome and Shields 1992; Higgins and Davies 1996).

Squatter Pigeons were recorded on six occasions, twice in the southern section of the Moray Quarry survey area (1 and 2 individuals respectively), once nearby to the Belyando River anabranch (five individuals) and three other occasions elsewhere along local roads in the wider area (Figure 5-1). GHD (2012a;b; 2013) recorded the species on 42 occasions at several sites during surveys for the Carmichael Coal Mine and Rail EIS. Observations were typically in grassy, open eucalypt woodland habitat. The species may occur anywhere in the wider landscape. Moray Quarry is the quarry considered to have the most suitable Squatter Pigeon habitat due to the presence of sandy substrate as well as the species occurrence there (Figure 5-3a). Grassy woodland habitat within Disney quarry site may also be suitable, although the dominant presence of Buffel Grass makes this less likely (Figure 5-3b). Habitat in the vicinity of Back Creek may also be suitable given the presence of permanent water although the habitat in the area is highly degraded and largely dominated by Buffel Grass (Figure 5-3c). South Back Creek Quarry itself has a rocky substrate which is considered generally unsuitable for this species.

Plate 5-2: Squatter Pigeon Observed During Field Surveys (July 2013)

146°37'0"E
146°37'30"E
21°56'0"S
21°56'30"S
21°57'0"S
Moray Carmichael Boundary Rd
BEYANDO RIVER

Figure 5-3a Habitat Suitability Mapping for Squatter Pigeon - Moray Quarry

Legend

- Property Boundary
- Moray Quarry Extraction Area
- Minor Road
- Minor Watercourse

Surveyed Species

- Squatter Pigeon

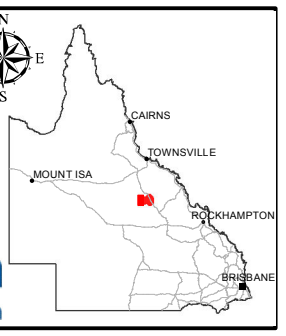
Habitat Suitability

- 7

0 100 200
Metres

N W E S

Data source:
Adani, 2013; EHP; CDM Smith, 2013;
Base Layer by Bingmaps, 2011.



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146°58'0"E
146°58'30"E
146°59'0"E
21°47'30"S
21°48'0"S
21°48'30"S
21°49'0"S

Figure 5-3b Habitat Suitability Mapping for Squatter Pigeon - Disney Quarry

Legend

- Property Boundary
- Disney Quarry Extraction Area
- Quarry Access Road
- Minor Road
- Major Road
- Minor Watercourse

Habitat Suitability

- 3

0 100 200
Metres

Data source:
Adani, 2013; EHP; CDM Smith, 2013;
Base Layer by Bingmaps, 2011.

N
W E
S

CAIRNS
TOWNSVILLE
MOUNT ISA
ROCKHAMPTON
BRISBANE

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146°59'0"E

146°59'30"E

22°1'0"S

22°1'30"S

Elgin Moray Rd

Elgin Moray Rd

Elgin Moray Rd

Rd

Figure 5-3c Habitat Suitability Mapping for Squatter Pigeon - South Back Creek Quarry

Legend

- Property Boundary
- South Back Creek Quarry Quarry Extraction Area
- Stockpiling & Processing Area
- Minor Road
- Minor watercourse

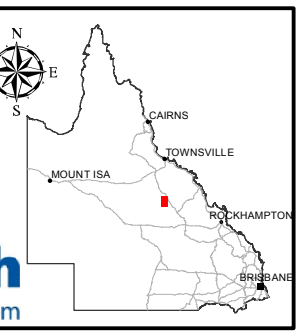
Habitat Suitability

- 1
- 5

0 100 200

Metres

N W E S



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Koala (EPBC Act – Vulnerable)

Koalas have a distinct association with eucalypt woodland and forest habitat types containing suitable food trees (Martin *et al.* 2008). They are not necessarily restricted to bushland or remnant areas and are known to exist and breed within farmland and the urban environment (Dique *et al.* 2004). Similarly, movement is not confined to vegetated corridors, as they also move across cleared rural land and through suburbs (Martin *et al.* 2008). Koalas can utilise a variety of trees, including many non-eucalypts, for feeding, shelter and breeding purposes (Dique *et al.* 2004; Martin *et al.* 2008). Threats to the species include habitat clearing and fragmentation, collisions with vehicles and predation by dogs. Natural threats include disease, drought and periods of extreme heat (TSSC 2012).

Koalas have been well studied south of the Project area near Clermont at Blair Athol Coal Mine and research is ongoing. Koalas in the Blair Athol area live in low densities with average home ranges of 116 ha (Ellis *et al.* 2002). Research on populations further south at Springsure suggest Koalas within the Brigalow Belt North region have shown a significant population decline (TSSC 2012). This is believed to be associated with past drought conditions, as trees suffered die-back and local habitats supported fewer and fewer animals (Gordon, 1990).

A single Koala was detected during ecological surveys for the Carmichael Coal Mine and Rail EIS approximately 50 km south-west of Moray Quarry (GHD 2102a). Remnant vegetation within the Moray Quarry site (Figure 5-4a) has also been mapped as potential habitat for Koala (GHD 2012b). The species may be present in low densities in riverine woodland habitats within the general area, and the species potentially occurs in all habitats with eucalypt trees.

No individuals were observed during the surveys. Tree scratching consistent with Koala were observed at the proposed Moray Quarry and Disney Quarry (Figure 5-4b), however this is not a definitive assessment as scratching may be those of a Lace Monitor and the two can be difficult to distinguish. Fresh evidence of Koala activity in the form of scats was not recorded during either survey. The species may have more potential to occur on Moray Quarry given its proximity to riparian vegetation along an anabranch of the Belyando River which may be considered as suitable habitat.

5.2.1.3 Rainbow Bee-eater (EPBC Act – Migratory)

The Rainbow Bee-eater is a common species that occurs almost anywhere suitable for catching insects. They favour bees and wasps, which they catch mostly in the air from perches, and will also take food from the ground or vegetation, occasionally foraging in water. Rainbow Bee-eaters are widespread in Australia, New Guinea, Indonesia and Micronesia. They have complex migratory patterns with Australian birds moving north to over-winter in New Guinea, some overshooting to Micronesia, while other populations are present in Australia all year. In northern Australia populations are present in coastal or sub-coastal areas where they breed in the riparian areas and move into more open habitat after the breeding season (Higgins 1999). The breeding season extends from August to January (Higgins 1999).

The species was commonly recorded throughout the Project area including at two quarry survey sites – Disney and Back Creek. Potential nest burrows were recorded at North Creek Quarry. Given the species may occur almost anywhere within the Project area no habitat suitability mapping is considered necessary.

146°37'0"E
146°37'30"E
21°56'0"S
21°56'30"S
21°57'0"S
Moray Carmichael Boundary Rd
BEYANDO RIVER

Figure 5-4a Habitat Suitability Mapping for Koala - Moray Quarry

Legend

- Property Boundary
- Moray Quarry Extraction Area
- Minor Road
- Minor watercourse

Habitat Suitability

- 3

0 100 200
Metres

N W E S

Data source:
Adani, 2013; EHP; CDM Smith, 2013;
Base Layer by Bingmaps, 2011.

CAIRNS
TOWNSVILLE
MOUNT ISA
ROCKHAMPTON
BRISBANE

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Job: G:\Projects\B12849_QuarryInvestigation\mxd\final\Habitat_Suitability\Koala\MorayPit.mxd Date: 17/07/2013

146°58'0"E
146°58'30"E
146°59'0"E
21°47'30"S
21°48'0"S
21°48'30"S
21°49'0"S

Figure 5-4b Habitat Suitability Mapping for Koala - Disney Quarry

Legend

- Property Boundary
- Moray Quarry Extraction Area
- Quarry Access Road
- Minor Road
- Major Road
- Minor watercourse

Habitat Suitability

- 3

0 200 400
Metres

N
W E
S

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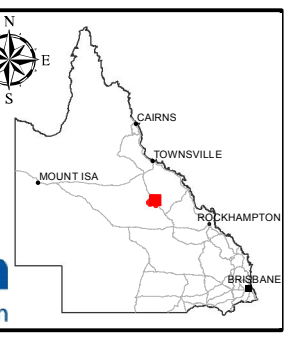

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Section 6 Potential Impacts

Potential impacts associated with MNES have been assessed on the basis of information sourced from previous studies and studies undertaken to specifically assess the impacts of each quarry site, including:

- Flora Surveys – Saunders Havill Group 2013;
- Fauna Surveys – CDM Smith 2013;
- Adani Carmichael Mine and Rail Environmental Impact Statement – GHD 2012;
- Carmichael Coal Mine and Rail Project SEIS: Report for Offsite Infrastructure Ecological Assessment – GHD 2013a; and
- Quarry Management and Development Plan *(draft)* – Groundwork 2013.

Ornamental Snake

An Ornamental Snake (Vulnerable – EPBC Act) was recorded along a partially vegetated drainage line 1.5 km south of the Borrow 7 site. Under the Draft Referral guidelines for the nationally listed Brigalow Belt reptiles (SEWPaC 2011) suitable habitat for the species is considered important if it is 'habitat where the species has been identified during a survey'. Therefore, the habitat south of Borrow 7 is considered important. Subsequent habitat assessment of this area showed that suitable habitat was restricted to this drainage area (Figure 6-1a). Habitat assessment of the area surrounding the quarry site showed suitable, although highly degraded, habitat also exists along a minor drainage line to the south-east of the quarry site and to the north-west where low-relief gilgais occur. Suitable habitat (although again highly degraded) was also identified within riparian habitat along Back Creek adjacent to the South Back Creek Quarry.

Under the guidelines, a referral would be recommended if there is a high risk of a significant impact on Ornamental Snake where there is:

> 'Alteration of water quality or quantity affecting four or more hectares of important gilgai or riparian habitat.'

The drainage line along which the species was recorded is not fully vegetated along its entirety, however suitable habitat for the species (open-forests to woodlands associated with gilgai formations and wetlands) may also be cleared habitat under the guidelines. Habitat assessment restricted the area in which the species was recorded to approximately 4 ha as the surrounding and downstream areas were heavily degraded. This area is isolated from activities associated with the proposed Borrow 7 site by a low rise to the north. However, the drainage line directly south-east of the quarry site and gilgai habitat to the north-west may also be suitable for the species. In addition, habitat adjacent to Back Creek may also be suitable, although the species was not sighted in the area.

Under the guidelines other impacts on the species that may apply to the site and requiring referral or contact with SEWPaC include:

- The fragmentation of important habitat or landscape corridors through the introduction of a barrier to dispersal; and
- Clearing between one and two hectares of important habitat.

Given the relatively small size and site specific nature of activities for the quarry sites it is considered the Project will not fragment important habitat or landscape corridors in the area. Project activities at Moray Quarry may impact 21.7 ha of suitable habitat in the northern section of the site (Figure 5-2b). However, the habitat is of low suitability (largely cleared and subject to cattle grazing impacts) and is unlikely to be considered important habitat. No clearing of important habitat or habitat considered to be suitable for the species is proposed for other quarry sites for the Project as it is understood.

If Adani demonstrate their actions can be managed so as to avoid these impacts, and in particular the alteration of water quality and quantity entering the adjacent drainage line and gilgai areas, then it is considered an EPBC Act referral for the species is not necessary. A detailed erosion and sediment control (ESC) plan and Species Management Plan will be required for the development and it is recommended Adani implement stringent ESC controls to avoid any impact to the drainage line.

Squatter Pigeon

Squatter Pigeon was recorded onsite (Moray Quarry) on two occasions and another four occasions in the wider area during the site surveys. The species has been recorded frequently in the region during previous ecological surveys. The species is likely to be present where suitable habitat occurs throughout the region. The southern subspecies is thought to occur as a continuous interbreeding population and no local population has been identified as important for its' long-term survival or recovery (SEWPaC 2013).

Under the EPBC Act Significant Impact Guidelines 1.1 (DEWHA 2009) an important population is a population that is necessary for a species' long-term survival and recovery, including populations identified in recovery plans and/or:

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

As stated, no local population has been identified as important for the species long-term survival or recovery. The Project area is well within the species known range. Under these definitions it is unlikely that a population in the Project area would be considered an important population.

The species was recorded on Moray Quarry survey site in remnant vegetation that will be partially cleared as a result of the Project (20.26 ha). Remnant vegetation within the Disney Quarry site may also be considered potential habitat for Squatter Pigeon although the species was not observed there and Buffel Grass often dominates the ground layer. It is understood that approximately 96.66 ha of suitable habitat may be potentially impacted for Disney quarry site as a result of the Project activities.

The species is readily observed to forage on or near roads as evidenced during the site surveys. Offsite impacts to this species may include increased roadkill as a result of increased vehicle movements in the area. It is recommended that appropriate speed limits and driver education be applied to this Project to decrease the potential for roadkill of this species (as well as roadkill in general). Given the abundant potential habitat available to this species across the landscape it is considered unlikely the development, expansion or operation of one or all of the quarries will have more than a minor impact on a local population.

Koala

Potential signs of Koala (Vulnerable – EPBC Act) activity, in the form of tree scratches were recorded at Disney Quarry and Moray Quarry. Scratch marks of this species may be difficult to distinguish from the Lace Monitor which is also partially arboreal and as such we have applied the precautionary principle to the potential occurrence of this species. Subsequent surveys found no individuals or evidence of recent usage, although suitable feed tree species occur. A single Koala was recorded within the proposed mine area (EPC 1080) during surveys for the Carmichael Mine and Rail EIS (GHD 2012a). Remnant vegetation within the Moray Quarry site has been mapped as potential habitat for Koala (GHD 2012b). It is understood that approximately 20.26 ha of remnant vegetation will be potentially impacted at Moray Quarry site as a result of the Project activities.

Remnant vegetation within the Disney Quarry site has not been mapped as potential habitat for Koala by GHD (2012b). This may is based on remnant vegetation mapping which is currently incorrect. Vegetation approximately 3 km west of this area has been mapped as potential habitat for Koala (GHD 2012b). Site inspections confirmed this habitat on the quarry is suitable for Koala. It is understood that approximately 119.49 ha of potential habitat may be impacted at the Disney Quarry site as a result of the quarry activities.

As yet no individual has been recorded on these sites. The species is considered more likely to occur on the Moray Quarry site given its' proximity to a vegetated section of the Belyando River which may serve as habitat and a dispersion corridor in the wider area.

Under the EPBC Act Significant Impact Guidelines 1.1 (DEWHA 2009), an important population is a population that is necessary for a species' long-term survival and recovery, including populations identified in recovery plans and/or:

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

There is no important population of Koala identified in the Northern Brigalow Belt and no recovery plan for the species in this area. Given that only a single individual has been observed well to the south-west of the Project area (GHD 2012a) and no evidence of current use was observed in the Project area it is considered highly unlikely that a local population would be necessary for maintaining genetic diversity of the species. The region is well within the species known range.

Under these definitions it is unlikely that a population in the area of the quarry sites would be considered an important population.

Under the interim Koala referral advice for proponents (SEWPaC 2012), habitat that is critical to the survival of the species is currently considered to be areas of forest or woodland that include:

- Primary Koala food trees comprise at least 30% of the overstorey trees;
- Primary Koala food tree species comprise less than 30% of the overstorey trees, but together with secondary food tree species comprise at least 50% of the overstorey trees;
- Primary food tree species are absent but secondary food tree species alone comprise at least 50% of the overstorey trees; and

- Any form of landscape corridor which is essential to the dispersal of Koalas between forest or woodland habitats.

Information on what tree species constitute primary or secondary feed trees from the area is limited at best. Ellis *et al.* (2002) reported that *Eucalyptus populnea* (58.9%), *E. Crebra* (10.6%) and young *Eucalyptus* species (11.6%) formed a significant proportion of Koala diet in the Blair Athol region (approximately 120 km south of the study area). The Australian Koala Foundation lists *E. camaldulensis*, *E. tereticornis* and *E. chloroclada* as primary food tree species in the Central Highlands region (2012).

The Moray Quarry site lies close to vegetated habitat along the Belyando River and North Creek which may function as a dispersal corridor for Koala in the area. The grassy remnant woodland on the site is dominated by *Corymbia clarksoniana* with scattered *C. dallachiana* and *E. brownii.* Ellis *et al.* (2002) reported minor use of *C. Dallachiana* in their study and *E. brownii* is considered a secondary food tree for the species (Australian Koala Foundation 2012). Secondary food tree species do not comprise 50% or more of those present (under current knowledge of the species) and there are no primary food tree species present. Therefore, the site does not contain habitat critical to the survival of the species.

The Disney Quarry site is a large tract of woodland tenuously connected to vegetation to the north and is thereby relatively isolated. There was no water present on the site at the time of the surveys although an ephemeral creekline bisects the site in the vicinity of the proposed works. In the northern section of the site the vegetation is dominated by *E. brownii* (largely small trees) and *C. dallachiana.* This area has been subject to substantial disturbance in the past from clearing for grazing activities and previous quarry activity. In the southern section of the proposed works the vegetation is dominated by *E. crebra* with scattered *Corymbia* species. *E. crebra* is considered a secondary feed tree species in the region (Australian Koala Foundation 2012).

Under the definition above the area may be considered as 'critical to the survival of the species' as secondary food trees likely comprise 50% or more of the overstorey species in these areas. However, no Koalas were observed during any survey, no Koala scats (fresh or otherwise) or other evidence of recent activity were recorded during the second intensive survey and the site is not part of a landscape corridor between habitats. As no 'important population' (as defined under the guidelines) is known to exist on the site or wider area and no individuals have been recorded on the site at all, it is considered unlikely the proposed works will have more than a minor impact on this species, should it occur.

It is recommended that a qualified fauna spotter inspect all tree hollows for arboreal fauna prior to any clearing and for the fauna spotter to be present during clearing operations to prevent potential injury or death to fauna.

Rainbow Bee-eater

The species was commonly recorded during the surveys including within or near quarry sites. Potential nest burrows were observed at North Creek Quarry. The species was also commonly recorded by GHD (2012a;b) and is likely to be common and widespread throughout the wider area.

Under the EPBC Act Significant Impact Guidelines 1.1 (DEWHA 2009) important habitat for a Migratory species is defined as:

- 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.

This is a common and widespread species. The area is not known to support an ecologically significant population either occasionally or periodically and is not known to contain habitat that is of critical importance at particular life-cycle stages. The species is found across mainland Australia and thereby the Project area is not at the limit of the species range. The species is not known to be declining in the region. In addition the majority of the quarry sites are largely cleared already, are based on rocky substrate unsuitable for nesting and relatively small in size.

Under these definitions it is very unlikely that important habitat for Rainbow Bee-eater exists within the any of the quarry sites. It is recommended Adani manage any actions on North Creek Quarry that may disturb potential nest burrows on that site by:

- Where possible carrying out action outside of the breeding season (August-January); and
- Having a fauna spotter inspect potential nest burrows prior to any disturbance, particularly where potential burrows were identified at North Creek quarry site.

6.1.1 Rating of Potential Impacts

Potential impacts resulting from proposed quarry developments have been assessed using the risk matrix presented in Table 6-1. The colour shading refers to the qualitative bands of risk level. The risk assessment tables are structured to show the results of the unmitigated risk profile and are produced by considering both the likelihood and consequence of each particular impact.

For the purpose of this risk assessment, risk levels are defined as follows:

- Extreme – The development/expansion and operation of the quarries will significantly affect MNES and may result in extreme ecological impacts (i.e. loss of populations or communities or > 80% reduction in densities) within the area of the quarry;
- High – The development/expansion and operation of the quarries will significantly affect MNES and may result in high ecological impacts (i.e. 20-80% reduction in population or community densities) within the area of the quarry;
- Medium – The development/expansion and operation of the quarries will affect MNES and may result in moderate ecological impacts (i.e. 2-20% reduction in population or community densities) within the area of the quarry; and
- Low – The development/expansion and operation of the quarries will not significantly impact MNES (i.e. less than 2% reduction to populations or communities) within the area of the quarry.

Table 6-1 Risk Assessment Matrix

Likelihood	Consequence				
	Catastrophic 5	Major 4	Moderate 3	Minor 2	Insignificant 1
Almost Certain 5	Extreme	Extreme	Extreme	High	Medium
Likely 4	Extreme	Extreme	High	Medium	Medium
Possible 3	Extreme	High	High	Medium	Low
Unlikely 2	High	High	Medium	Low	Low
Rare 1	Medium	Medium	Low	Low	Low

Potential impacts to MNES (TECs and/or Endangered or Vulnerable species) resulting from quarry development, expansion and operation, are presented in Table 6-2. Where impacts do not differ between quarry developments, assessments have been made generically across all quarries. However, in the event impacts differ from quarry to quarry individual assessments relating to the specific quarry or quarries have been made.

It is not anticipated that any unknown, unpredictable or irreversible impacts to MNES will arise from the proposed quarries. Nevertheless, a range of mitigation measures are proposed to ensure no impacts are realised. These are discussed in Section 7.

Table 6-2 Impacts on MNES, as a result of Proposed Quarry Developments

Project Phase	Potential Impact Sources	Unmitigated Risk
Site Development	**Introduction of pests and weeds impacting MNES fauna species and adjacent TECs (where they may occur)** Earthworks associated with vegetation clearing and quarry site preparations have the potential to introduce pest and weed species into each prospective quarry area. The introduction of pests and weeds may result in a long term negative impact to TECs and Conservation Significant Fauna.	**Medium**
	Direct impacts to MNES fauna species through vegetation clearing Clearing activities and the operation of heavy machinery will be required to prepare quarry sites. These operations have the potential to adversely impact fauna species (including MNES such as Squatter Pigeon) as a result of direct collision and as a result of excessive noise.	**Low**
	Direct impacts to MNES fauna species through vehicle movements Movement of vehicles throughout the quarry sites has the potential to adversely impact fauna species as a result of direct physical contact and as a result of excessive noise.	**Medium**
Quarry Operations	**Impacts to MNES fauna species as a result air and noise pollution** The operation of the quarry sites will lead to increases in local air and noise pollution and in turn may impact on MNES fauna species.	**Low**

Project Phase	Potential Impact Sources	Unmitigated Risk
	Introduction of pests and weeds impacting MNES fauna and adjacent TECs (where they may occur) Quarry operational activities (e.g. increased vehicle movements, stockpiling and excavations) have the potential to lead to pest and weed species entering the quarry sites. If established, pest and weeds may impact upon conservation significant species and/or TECs.	**Medium**
	Direct impacts to MNES fauna species through vehicle movements Movement of vehicles throughout the site has the potential to adversely impact fauna species (including MNES such as Squatter Pigeon) as a result of direct collision and as a result of excessive noise.	**Medium**
	Alteration of groundwater flow regimes impacting groundwater dependent ecosystems Quarry developments have the potential to impact groundwater aquifers. If Aquifers are intersected, there is the potential to contaminate groundwater and/or alter groundwater flows. Further, any groundwater dependent ecosystems in the vicinity of impacted aquifers may also be adversely impacted.	**Low**
	Impacts to surface water quality and associated terrestrial aquatic systems Run-off during high rainfall events may lead to increased sediment transport into downstream creeks and gilgai habitats. Hazardous material spills may also impact these systems during these events.	**Medium**

Section 7 Mitigation Measures and Conclusion

7.1 Mitigation Measures

Table 7-1 details the planning considerations taken to minimise potential impacts and recommended mitigation measures which should be utilised whilst undertaking the development, expansion and operation of the six quarries to ensure the consequence of all potential impacts is maintained at the lowest practical level.

Table 7-1 Potential Impacts and Proposed Mitigation Measures

Project Phase	Potential Impacts and mitigation measures	Mitigated Risk
Site Design	**Direct impacts to MNES fauna species through vegetation clearing** Design site restriction of the Borrow 7 extraction area and associated infrastructure away from identified Ornamental Snake habitat. Location of extraction areas within pre-disturbed and cleared areas for South Back Creek Quarry, North Creek Quarry and Elgin North Quarry. Minimise clearing at Moray Quarry and Disney Quarry sites wherever possible. Location of access roads away from vegetation and habitat areas at Moray Quarry to reduce impacts from noise and dust. Avoidance of potential TEC in the north-east Disney Quarry investigation area.	**Low**
Site Development	**Introduction of pests and weeds impacting MNES fauna and adjacent TECs (where they may occur)** Weeds and pests will be addressed as part of the environmental management strategies submitted as part of each quarry DA. The strategies will outline methods to minimise potential spread of pests and weeds and also manage pest and weeds should they enter the site. It should be noted however, that all quarry sites assessed have been impacted and are not representative of intact natural systems. The majority of the sites are cleared with a ground layer dominated by Buffel Grass. As such, pest and weeds are already established throughout the sites.	**Low**
	Direct impacts to MNES fauna species through vegetation clearing As quarry sites do not contain intact natural vegetation of significant value and quarry design is largely located out of remnant vegetation it is highly unlikely that clearing activities will impact on MNES. Further, fauna species surveys have indicated that MNES fauna species are absent or sites do not support populations of importance as defined under the SEWPaC Guidelines. An Ornamental snake was recorded along a partially vegetated drainage line south of Borrow 7. The habitat south of Borrow 7 is therefore considered important under SEWPaC guidelines to support species. Suitable habitat was also identified to the south-east and north-west of Borrow 7 and	**Low**

Project Phase	Potential Impacts and mitigation measures	Mitigated Risk
	within riparian habitat adjacent to South Back Creek Quarry. It is recommended that Project activities avoid the rise immediately north of the Ornamental Snake sighting and directly impacting identified habitat adjacent to the quarry site. It has been recommended that Adani manage their actions so as to avoid fragmenting or clearing suitable habitat adjacent to the western and southern edge of the proposed South Back Creek Quarry and implement a Species Management Plan to mitigate impacts to Ornamental Snake and ESC measures to maintain stormwater quality.	
	Direct impacts to MNES fauna species through vehicle movements It is recommended that all site vehicles should adhere to strict vehicle speed limits and site driver education programs be employed to minimise potential impacts on Squatter Pigeon and fauna in general. It is not anticipated that vehicle movements associated with the quarry site developments and expansions will significantly impact MNES fauna species where these approaches are employed. It is also noted that the area does not support significant MNES fauna species populations according to SEWPaC guidelines.	**Low**
Operations	**Impacts to MNES fauna species as a result of air and noise pollution** With the exception of habitat for the Ornamental snake south of Borrow 7 and South Back Creek Quarry, sites assessments of quarries have failed to detect significant fauna populations which would be negatively impacted by noise and/or air pollution. Noise generated as a result of the Project is not anticipated to have a significant negative impact on Ornamental snakes if present at either Borrow 7 or South Back Creek Quarry, as habitat which supports the species will not be directly impacted by the quarry developments. All quarries should also operate in accordance with noise and dust management strategies, which would further minimise any potential impacts.	**Low**
	Introduction of pests and weeds impacting MNES fauna species and adjacent TECs (where they may occur) Weeds and pests will be addressed as part of the environmental management strategies outlined in each quarry DA. The strategies will outline methods to minimise potential spread of pests and weeds and also manage pest and weeds should they enter the site. It should be noted however, that all quarry sites assessed have been impacted and are not representative of intact natural systems. As such, pest and weeds are already established throughout the sites.	**Low**
	Direct impacts to MNES fauna species through vehicle movements It is recommended that all site vehicles should adhere to strict vehicle speed limits and site driver education programs be employed to minimise potential impacts on Squatter	**Low**

Project Phase	Potential Impacts and mitigation measures	Mitigated Risk
	Pigeon and fauna in general. It is not anticipated that vehicle movements associated with the quarry site developments and expansions will significantly impact MNES fauna species where these approaches are employed. It is also noted that the area does not support significant MNES fauna species populations according to SEWPaC guidelines.	
	Alteration of groundwater flow regimes impacting groundwater dependent ecosystems It is not anticipated that any of the quarry developments will impact groundwater or groundwater dependent ecosystems. To date, drilling investigations in at each quarry site have failed to intersect aquifers at depths to which drilling has been undertaken. Resource extraction will not be undertaken to these depths and as such quarries will not directly impact aquifers or any groundwater dependent ecosystems. Water, including groundwater on each quarry site should be managed in accordance with the water management conditions as per individual quarry DAs.	**Low**
	Impacts to surface water quality and associated terrestrial aquatic systems Under the Environmental Management Plan (EMP) for each quarry site there will be a detailed erosion and sediment control system in place to reduce sediment transport into local drainages during high rainfall events. Under the EMP there will also be an immediate response procedure to contain and minimise the effects of a hazardous material spill in the unlikely event one occurs.	**Low**

Section 8 Conclusion and Recommendations

The development and operation of the quarry sites is not anticipated to have significant negative impacts on MNES (TECs and/or Endangered, Vulnerable or Migratory species). Primarily, this is associated with the poor existing environmental conditions at each site making them not suitable to support significant flora and fauna communities. Nonetheless, the following recommendations are proposed. These recommendations relate to specific MNES fauna species identified as occurring at one or more of the proposed quarry sites and have been related to the SEWPaC referral guidelines:

- Avoid any impacts to Borrow 7 and Back Creek drainage, creek and gilgai habitat areas (potential habitat of the Ornamental Snake) through development of an appropriate site water management plan and ESC devices;
- It is recommended that quarrying and associated activities avoid impacts to the rise immediately north of the Ornamental Snake record near Borrow 7;
- Manage actions so as to avoid fragmenting or impacting suitable habitat along the drainage line adjacent to the western and southern edge of the proposed Back Creek Quarry;
- Manage any actions on North Creek Quarry that may disturb potential Rainbow Bee-eater nest burrows on that site by having a fauna spotter inspect burrows prior to any potential disturbance; and
- A qualified fauna spotter should inspect all tree hollows for arboreal fauna at the Disney Quarry and Moray Quarry sites prior to any clearing and for the fauna spotter to be present during clearing operations, including cleared gilgai areas, to prevent potential injury or death to fauna.

Section 9 References

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Glossary

Acronym/Abbreviation	Description
AHD	Australian Height Datum
CBR	Californian Baring Ratio
DA	Development Application
EHP	Department of Environment and Heritage Protection (Qld)
EIS	Environmental Impact Statement
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999* (Cth)
EPC	Exploration Permit for Coal
ESC	Erosion and Sediment Control
EV	Endangered or Vulnerable (EPBC Act)
GPS	Geographic Positioning System
IRC	Isaac Regional Council
km	Kilometres
km^2	Kilometres squared
m	Metres
Mtpa	Million tonnes per annum
MNES	Matters of National Environmental Significance
NC Act	*Nature Conservation Act 1992* (Qld)
PMAV	Property Map of Assessable Vegetation
RE	Regional Ecosystem
SEIS	Supplementary Environmental Impact Statement
SEWPaC	Department of Sustainability, Environment, Water, Populations and Communities (Cth)
TEC	Threatened Ecological Community
ToR	Terms of Reference
VM Act	*Vegetation Management Act 1999* (Qld)

Appendix A - Protected Matters Search

List of EPBC Act Protected Matters Search attachment:

1 – North Creek Quarry:

2 – Moray Quarry;

3 – Elgin Quarry;

4 – Back Creek;

5 – Borrow 7; and

6 – Disney Quarry.

Australian Government

Department of Sustainability, Environment, Water, Population and Communities

EPBC Act Protected Matters Report

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Information on the coverage of this report and qualifications on data supporting this report are contained in the caveat at the end of the report.

Information is available about Environment Assessments and the EPBC Act including significance guidelines, forms and application process details.

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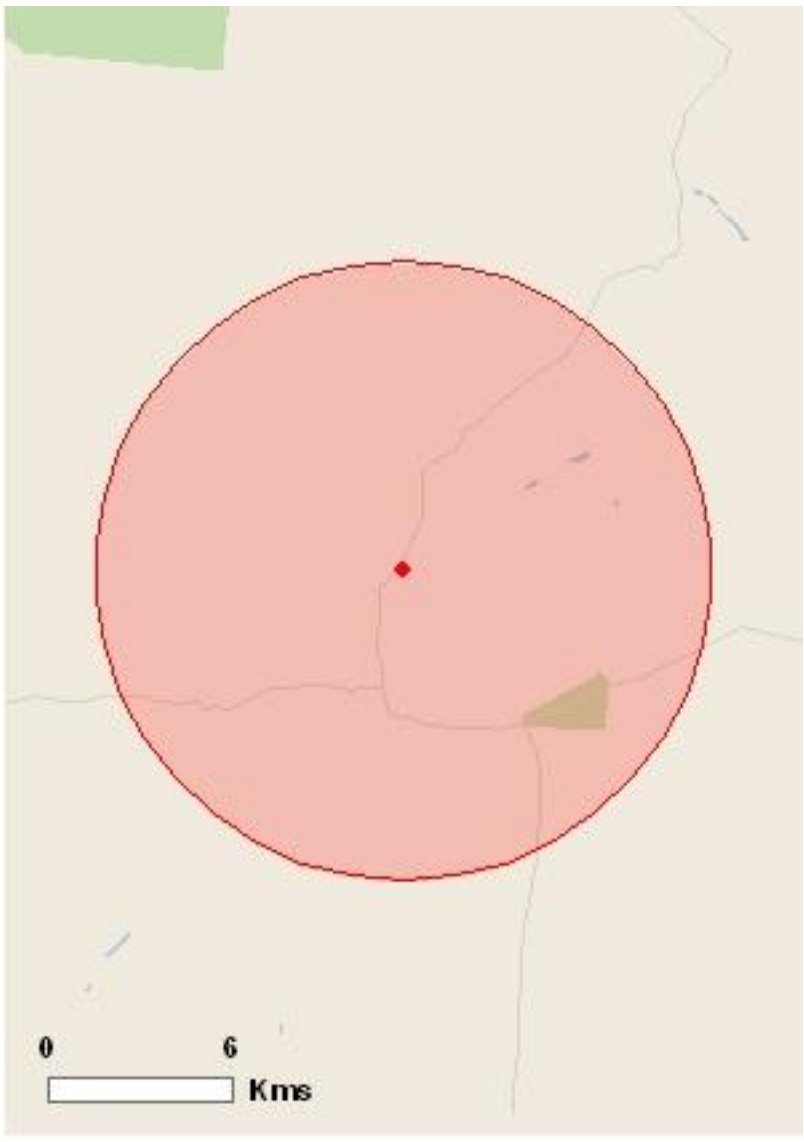

Coordinates

Buffer: 10.0Km

Summary

Matters of National Environmental Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the Administrative Guidelines on Significance.

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance:	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Areas:	None
Listed Threatened Ecological Communities:	1
Listed Threatened Species:	8
Listed Migratory Species:	7

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

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A permit may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

Commonwealth Land:	None
Commonwealth Heritage Places:	None
Listed Marine Species:	7
Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves:	None

Extra Information

This part of the report provides information that may also be relevant to the area you have nominated.

Place on the RNE:	None
State and Territory Reserves:	None
Regional Forest Agreements:	None
Invasive Species:	14
Nationally Important Wetlands:	None
Key Ecological Features (Marine)	None

Details

Matters of National Environmental Significance

Listed Threatened Ecological Communities [Resource Information]

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Name	Status	Type of Presence
Brigalow (Acacia harpophylla dominant and co-dominant)	Endangered	Community likely to occur within area

Listed Threatened Species [Resource Information]

Name	Status	Type of Presence
Birds		
Erythrotriorchis radiatus		
Red Goshawk [942]	Vulnerable	Species or species habitat likely to occur within area
Geophaps scripta scripta		
Squatter Pigeon (southern) [64440]	Vulnerable	Species or species habitat likely to occur within area
Poephila cincta cincta		
Black-throated Finch (southern) [64447]	Endangered	Species or species habitat likely to occur within area
Rostratula australis		
Australian Painted Snipe [77037]	Vulnerable	Species or species habitat may occur within area
Mammals		
Phascolarctos cinereus (combined populations of Qld, NSW and the ACT)		
Koala (combined populations of Queensland, New South Wales and the Australian Capital Territory) [85104]	Vulnerable	Species or species habitat may occur within area
Plants		
Acacia ramiflora		
[7242]	Vulnerable	Species or species habitat may occur within area
Reptiles		
Denisonia maculata		
Ornamental Snake [1193]	Vulnerable	Species or species habitat likely to occur

Name	Status	Type of Presence
		within area
Egernia rugosa		
Yakka Skink [1420]	Vulnerable	Species or species habitat likely to occur within area

Listed Migratory Species [Resource Information]

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
Migratory Marine Birds		
Apus pacificus		
Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Migratory Terrestrial Species		
Haliaeetus leucogaster		
White-bellied Sea-Eagle [943]		Species or species habitat likely to occur within area
Merops ornatus		
Rainbow Bee-eater [670]		Species or species habitat may occur within area
Migratory Wetlands Species		
Ardea alba		
Great Egret, White Egret [59541]		Species or species habitat likely to occur within area
Ardea ibis		
Cattle Egret [59542]		Species or species habitat likely to occur within area
Gallinago hardwickii		
Latham's Snipe, Japanese Snipe [863]		Species or species habitat may occur within area
Rostratula benghalensis (sensu lato)		
Painted Snipe [889]	Vulnerable*	Species or species habitat may occur within area

Other Matters Protected by the EPBC Act

Listed Marine Species [Resource Information]

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
Birds		
Apus pacificus		
Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardea alba		
Great Egret, White Egret [59541]		Species or species habitat likely to occur within area
Ardea ibis		
Cattle Egret [59542]		Species or species habitat likely to occur within area
Gallinago hardwickii		
Latham's Snipe, Japanese Snipe [863]		Species or species habitat may occur within area
Haliaeetus leucogaster		
White-bellied Sea-Eagle [943]		Species or species habitat likely to occur within area

Name	Threatened	Type of Presence
Merops ornatus		
Rainbow Bee-eater [670]		Species or species habitat may occur within area
Rostratula benghalensis (sensu lato)		
Painted Snipe [889]	Vulnerable*	Species or species habitat may occur within area

Extra Information

Invasive Species	[Resource Information]

Weeds reported here are the 20 species of national significance (WoNS), along with other introduced plants that are considered by the States and Territories to pose a particularly significant threat to biodiversity. The following feral animals are reported: Goat, Red Fox, Cat, Rabbit, Pig, Water Buffalo and Cane Toad. Maps from Landscape Health Project, National Land and Water Resouces Audit, 2001.

Name	Status	Type of Presence
Birds		
Columba livia		
Rock Pigeon, Rock Dove, Domestic Pigeon [803]		Species or species habitat likely to occur within area
Passer domesticus		
House Sparrow [405]		Species or species habitat likely to occur within area
Frogs		
Bufo marinus		
Cane Toad [1772]		Species or species habitat likely to occur within area
Rhinella marina		
Cane Toad [83218]		Species or species habitat likely to occur within area
Mammals		
Bos taurus		
Domestic Cattle [16]		Species or species habitat likely to occur within area
Felis catus		
Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
Mus musculus		
House Mouse [120]		Species or species habitat likely to occur within area
Oryctolagus cuniculus		
Rabbit, European Rabbit [128]		Species or species habitat likely to occur within area
Sus scrofa		
Pig [6]		Species or species habitat likely to occur within area
Vulpes vulpes		
Red Fox, Fox [18]		Species or species

Name	Status	Type of Presence
		habitat likely to occur within area
Plants		
Cryptostegia grandiflora		
Rubber Vine, Rubbervine, India Rubber Vine, India Rubbervine, Palay Rubbervine, Purple Allamanda [18913]		Species or species habitat likely to occur within area
Hymenachne amplexicaulis		
Hymenachne, Olive Hymenachne, Water Stargrass, West Indian Grass, West Indian Marsh Grass [31754]		Species or species habitat likely to occur within area
Parkinsonia aculeata		
Parkinsonia, Jerusalem Thorn, Jelly Bean Tree, Horse Bean [12301]		Species or species habitat likely to occur within area
Parthenium hysterophorus		
Parthenium Weed, Bitter Weed, Carrot Grass, False Ragweed [19566]		Species or species habitat likely to occur within area

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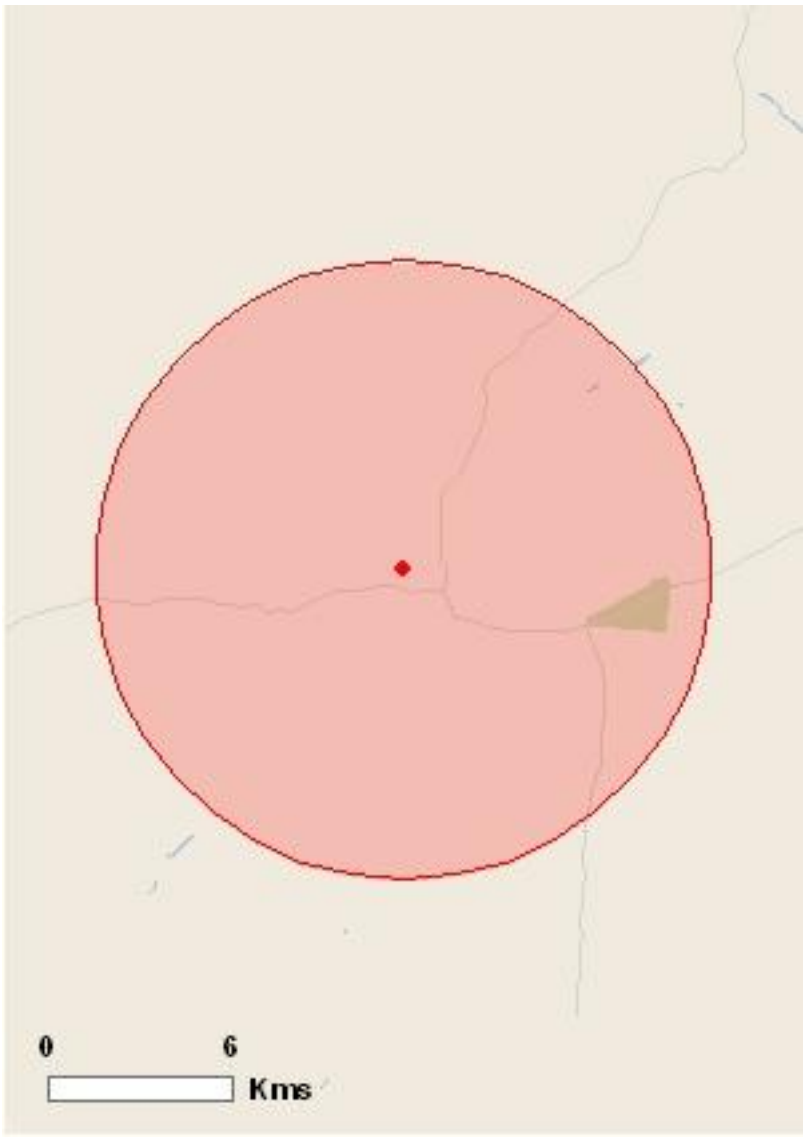

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Coordinates

Buffer: 10.0Km

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World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance:	None
Great Barrier Reef Marine Park:	None
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Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves:	None

Extra Information

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Key Ecological Features (Marine)	None

Details

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Mammals		
Bos taurus		
Domestic Cattle [16]		Species or species habitat likely to occur within area
Felis catus		
Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
Mus musculus		
House Mouse [120]		Species or species habitat likely to occur within area
Oryctolagus cuniculus		
Rabbit, European Rabbit [128]		Species or species habitat likely to occur within area
Sus scrofa		
Pig [6]		Species or species habitat likely to occur within area
Vulpes vulpes		
Red Fox, Fox [18]		Species or species

Name	Status	Type of Presence
		habitat likely to occur within area
Plants		
Cryptostegia grandiflora		
Rubber Vine, Rubbervine, India Rubber Vine, India Rubbervine, Palay Rubbervine, Purple Allamanda [18913]		Species or species habitat likely to occur within area
Hymenachne amplexicaulis		
Hymenachne, Olive Hymenachne, Water Stargrass, West Indian Grass, West Indian Marsh Grass [31754]		Species or species habitat likely to occur within area
Parkinsonia aculeata		
Parkinsonia, Jerusalem Thorn, Jelly Bean Tree, Horse Bean [12301]		Species or species habitat likely to occur within area
Parthenium hysterophorus		
Parthenium Weed, Bitter Weed, Carrot Grass, False Ragweed [19566]		Species or species habitat likely to occur within area

Australian Government

Department of Sustainability, Environment, Water, Population and Communities

EPBC Act Protected Matters Report

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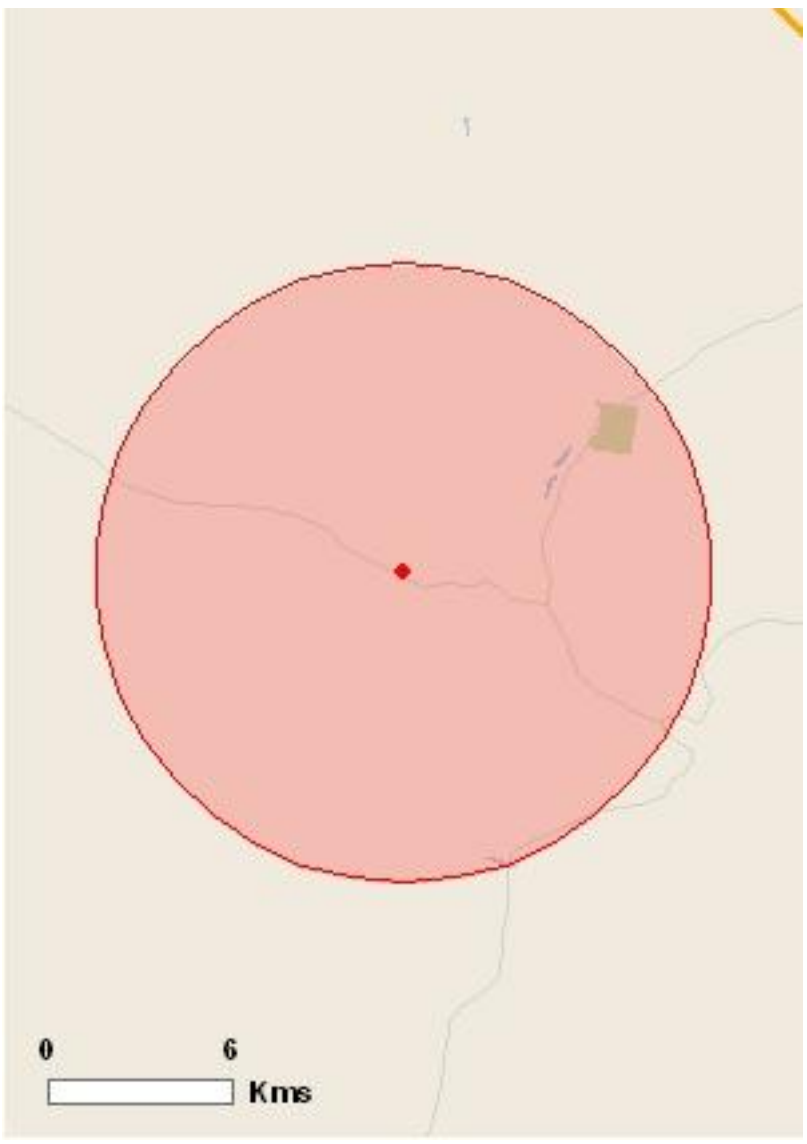
Report created: 23/05/13 15:23:34



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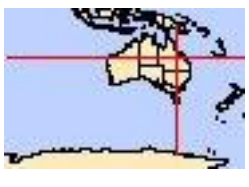
Coordinates

Buffer: 10.0Km



Summary

Matters of National Environmental Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the Administrative Guidelines on Significance.

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance:	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Areas:	None
Listed Threatened Ecological Communities:	1
Listed Threatened Species:	9
Listed Migratory Species:	7

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place and the heritage values of a place on the Register of the National Estate.

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A permit may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

Commonwealth Land:	None
Commonwealth Heritage Places:	None
Listed Marine Species:	7
Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves:	None

Extra Information

This part of the report provides information that may also be relevant to the area you have nominated.

Place on the RNE:	None
State and Territory Reserves:	None
Regional Forest Agreements:	None
Invasive Species:	14
Nationally Important Wetlands:	None
Key Ecological Features (Marine)	None

Details

Matters of National Environmental Significance

Listed Threatened Ecological Communities [Resource Information]

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Name	Status	Type of Presence
Brigalow (Acacia harpophylla dominant and co-dominant)	Endangered	Community known to occur within area

Listed Threatened Species [Resource Information]

Name	Status	Type of Presence
Birds		
Erythrotriorchis radiatus		
Red Goshawk [942]	Vulnerable	Species or species habitat likely to occur within area
Geophaps scripta scripta		
Squatter Pigeon (southern) [64440]	Vulnerable	Species or species habitat likely to occur within area
Neochmia ruficauda ruficauda		
Star Finch (eastern), Star Finch (southern) [26027]	Endangered	Species or species habitat likely to occur within area
Poephila cincta cincta		
Black-throated Finch (southern) [64447]	Endangered	Species or species habitat may occur within area
Rostratula australis		
Australian Painted Snipe [77037]	Vulnerable	Species or species habitat may occur within area
Mammals		
Phascolarctos cinereus (combined populations of Qld, NSW and the ACT)		
Koala (combined populations of Queensland, New South Wales and the Australian Capital Territory) [85104]	Vulnerable	Species or species habitat may occur within area
Reptiles		
Denisonia maculata		
Ornamental Snake [1193]	Vulnerable	Species or species habitat likely to occur within area

Name	Status	Type of Presence
Egernia rugosa		
Yakka Skink [1420]	Vulnerable	Species or species habitat may occur within area
Furina dunmalli		
Dunmall's Snake [59254]	Vulnerable	Species or species habitat may occur within area

Listed Migratory Species [Resource Information]

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
Migratory Marine Birds		
Apus pacificus		
Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Migratory Terrestrial Species		
Haliaeetus leucogaster		
White-bellied Sea-Eagle [943]		Species or species habitat likely to occur within area
Merops ornatus		
Rainbow Bee-eater [670]		Species or species habitat may occur within area
Migratory Wetlands Species		
Ardea alba		
Great Egret, White Egret [59541]		Species or species habitat likely to occur within area
Ardea ibis		
Cattle Egret [59542]		Species or species habitat likely to occur within area
Gallinago hardwickii		
Latham's Snipe, Japanese Snipe [863]		Species or species habitat may occur within area
Rostratula benghalensis (sensu lato)		
Painted Snipe [889]	Vulnerable*	Species or species habitat may occur within area

Other Matters Protected by the EPBC Act

Listed Marine Species [Resource Information]

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
Birds		
Apus pacificus		
Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardea alba		
Great Egret, White Egret [59541]		Species or species habitat likely to occur within area
Ardea ibis		
Cattle Egret [59542]		Species or species habitat likely to occur within area
Gallinago hardwickii		
Latham's Snipe, Japanese Snipe [863]		Species or species habitat may occur within area

Name	Threatened	Type of Presence
Haliaeetus leucogaster		
White-bellied Sea-Eagle [943]		Species or species habitat likely to occur within area
Merops ornatus		
Rainbow Bee-eater [670]		Species or species habitat may occur within area
Rostratula benghalensis (sensu lato)		
Painted Snipe [889]	Vulnerable*	Species or species habitat may occur within area

Extra Information

Invasive Species [Resource Information]

Weeds reported here are the 20 species of national significance (WoNS), along with other introduced plants that are considered by the States and Territories to pose a particularly significant threat to biodiversity. The following feral animals are reported: Goat, Red Fox, Cat, Rabbit, Pig, Water Buffalo and Cane Toad. Maps from Landscape Health Project, National Land and Water Resouces Audit, 2001.

Name	Status	Type of Presence
Birds		
Columba livia		
Rock Pigeon, Rock Dove, Domestic Pigeon [803]		Species or species habitat likely to occur within area
Passer domesticus		
House Sparrow [405]		Species or species habitat likely to occur within area
Frogs		
Bufo marinus		
Cane Toad [1772]		Species or species habitat likely to occur within area
Rhinella marina		
Cane Toad [83218]		Species or species habitat likely to occur within area
Mammals		
Bos taurus		
Domestic Cattle [16]		Species or species habitat likely to occur within area
Felis catus		
Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
Mus musculus		
House Mouse [120]		Species or species habitat likely to occur within area
Oryctolagus cuniculus		
Rabbit, European Rabbit [128]		Species or species habitat likely to occur within area
Sus scrofa		
Pig [6]		Species or species

Name	Status	Type of Presence
		habitat likely to occur within area
[Vulpes vulpes](#) Red Fox, Fox [18]		Species or species habitat likely to occur within area
Plants		
[Cryptostegia grandiflora](#) Rubber Vine, Rubbervine, India Rubber Vine, India Rubbervine, Palay Rubbervine, Purple Allamanda [18913]		Species or species habitat likely to occur within area
[Hymenachne amplexicaulis](#) Hymenachne, Olive Hymenachne, Water Stargrass, West Indian Grass, West Indian Marsh Grass [31754]		Species or species habitat likely to occur within area
[Parkinsonia aculeata](#) Parkinsonia, Jerusalem Thorn, Jelly Bean Tree, Horse Bean [12301]		Species or species habitat likely to occur within area
[Parthenium hysterophorus](#) Parthenium Weed, Bitter Weed, Carrot Grass, False Ragweed [19566]		Species or species habitat likely to occur within area

Australian Government

Department of Sustainability, Environment, Water, Population and Communities

EPBC Act Protected Matters Report

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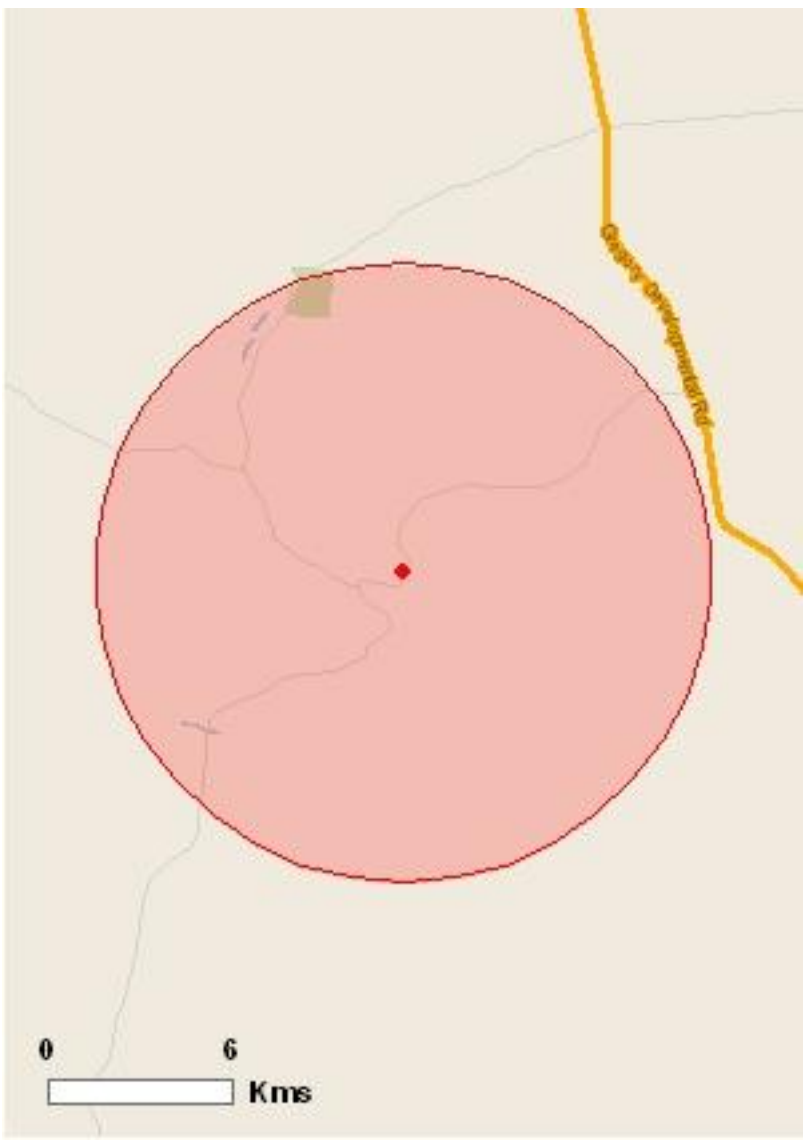

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Coordinates

Buffer: 10.0Km

Summary

Matters of National Environmental Significance

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World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance:	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Areas:	None
Listed Threatened Ecological Communities:	1
Listed Threatened Species:	9
Listed Migratory Species:	7

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

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A permit may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

Commonwealth Land:	None
Commonwealth Heritage Places:	None
Listed Marine Species:	7
Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves:	None

Extra Information

This part of the report provides information that may also be relevant to the area you have nominated.

Place on the RNE:	None
State and Territory Reserves:	None
Regional Forest Agreements:	None
Invasive Species:	14
Nationally Important Wetlands:	None
Key Ecological Features (Marine)	None

Details

Matters of National Environmental Significance

Listed Threatened Ecological Communities [Resource Information]

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Name	Status	Type of Presence
Brigalow (Acacia harpophylla dominant and co-dominant)	Endangered	Community known to occur within area

Listed Threatened Species [Resource Information]

Name	Status	Type of Presence
Birds		
Erythrotriorchis radiatus		
Red Goshawk [942]	Vulnerable	Species or species habitat may occur within area
Geophaps scripta scripta		
Squatter Pigeon (southern) [64440]	Vulnerable	Species or species habitat known to occur within area
Neochmia ruficauda ruficauda		
Star Finch (eastern), Star Finch (southern) [26027]	Endangered	Species or species habitat likely to occur within area
Poephila cincta cincta		
Black-throated Finch (southern) [64447]	Endangered	Species or species habitat may occur within area
Rostratula australis		
Australian Painted Snipe [77037]	Vulnerable	Species or species habitat may occur within area
Mammals		
Phascolarctos cinereus (combined populations of Qld, NSW and the ACT)		
Koala (combined populations of Queensland, New South Wales and the Australian Capital Territory) [85104]	Vulnerable	Species or species habitat may occur within area
Reptiles		
Denisonia maculata		
Ornamental Snake [1193]	Vulnerable	Species or species habitat likely to occur within area

Name	Status	Type of Presence
Egernia rugosa		
Yakka Skink [1420]	Vulnerable	Species or species habitat may occur within area
Furina dunmalli		
Dunmall's Snake [59254]	Vulnerable	Species or species habitat may occur within area

Listed Migratory Species [Resource Information]

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
Migratory Marine Birds		
Apus pacificus		
Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Migratory Terrestrial Species		
Haliaeetus leucogaster		
White-bellied Sea-Eagle [943]		Species or species habitat likely to occur within area
Merops ornatus		
Rainbow Bee-eater [670]		Species or species habitat may occur within area
Migratory Wetlands Species		
Ardea alba		
Great Egret, White Egret [59541]		Species or species habitat likely to occur within area
Ardea ibis		
Cattle Egret [59542]		Species or species habitat likely to occur within area
Gallinago hardwickii		
Latham's Snipe, Japanese Snipe [863]		Species or species habitat may occur within area
Rostratula benghalensis (sensu lato)		
Painted Snipe [889]	Vulnerable*	Species or species habitat may occur within area

Other Matters Protected by the EPBC Act

Listed Marine Species [Resource Information]

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
Birds		
Apus pacificus		
Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardea alba		
Great Egret, White Egret [59541]		Species or species habitat likely to occur within area
Ardea ibis		
Cattle Egret [59542]		Species or species habitat likely to occur within area
Gallinago hardwickii		
Latham's Snipe, Japanese Snipe [863]		Species or species habitat may occur within area

Name	Threatened	Type of Presence
Haliaeetus leucogaster		
White-bellied Sea-Eagle [943]		Species or species habitat likely to occur within area
Merops ornatus		
Rainbow Bee-eater [670]		Species or species habitat may occur within area
Rostratula benghalensis (sensu lato)		
Painted Snipe [889]	Vulnerable*	Species or species habitat may occur within area

Extra Information

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Passer domesticus		
House Sparrow [405]		Species or species habitat likely to occur within area
Frogs		
Bufo marinus		
Cane Toad [1772]		Species or species habitat likely to occur within area
Rhinella marina		
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Bos taurus		
Domestic Cattle [16]		Species or species habitat likely to occur within area
Felis catus		
Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
Mus musculus		
House Mouse [120]		Species or species habitat likely to occur within area
Oryctolagus cuniculus		
Rabbit, European Rabbit [128]		Species or species habitat likely to occur within area
Sus scrofa		
Pig [6]		Species or species

Name	Status	Type of Presence
		habitat likely to occur within area
[Vulpes vulpes](#) Red Fox, Fox [18]		Species or species habitat likely to occur within area
Plants		
[Cryptostegia grandiflora](#) Rubber Vine, Rubbervine, India Rubber Vine, India Rubbervine, Palay Rubbervine, Purple Allamanda [18913]		Species or species habitat likely to occur within area
[Hymenachne amplexicaulis](#) Hymenachne, Olive Hymenachne, Water Stargrass, West Indian Grass, West Indian Marsh Grass [31754]		Species or species habitat likely to occur within area
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Australian Government

Department of Sustainability, Environment, Water, Population and Communities

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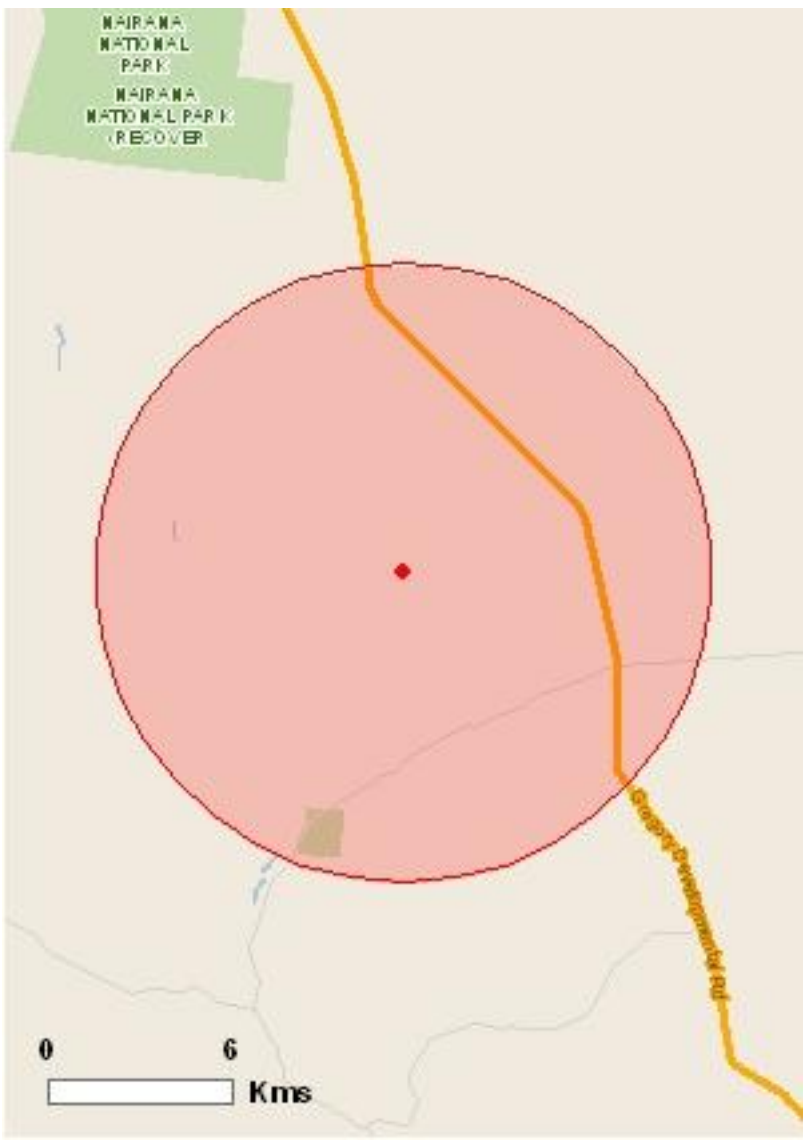

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Coordinates

Buffer: 10.0Km

Summary

Matters of National Environmental Significance

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World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance:	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Areas:	None
Listed Threatened Ecological Communities:	1
Listed Threatened Species:	11
Listed Migratory Species:	7

Other Matters Protected by the EPBC Act

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A permit may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

Commonwealth Land:	None
Commonwealth Heritage Places:	None
Listed Marine Species:	7
Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves:	None

Extra Information

This part of the report provides information that may also be relevant to the area you have nominated.

Place on the RNE:	None
State and Territory Reserves:	None
Regional Forest Agreements:	None
Invasive Species:	12
Nationally Important Wetlands:	None
Key Ecological Features (Marine)	None

Details

Matters of National Environmental Significance

Listed Threatened Ecological Communities [Resource Information]

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

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Listed Threatened Species [Resource Information]

Name	Status	Type of Presence
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Red Goshawk [942]	Vulnerable	Species or species habitat likely to occur within area
Geophaps scripta scripta		
Squatter Pigeon (southern) [64440]	Vulnerable	Species or species habitat known to occur within area
Neochmia ruficauda ruficauda		
Star Finch (eastern), Star Finch (southern) [26027]	Endangered	Species or species habitat likely to occur within area
Poephila cincta cincta		
Black-throated Finch (southern) [64447]	Endangered	Species or species habitat may occur within area
Rostratula australis		
Australian Painted Snipe [77037]	Vulnerable	Species or species habitat may occur within area
Mammals		
Phascolarctos cinereus (combined populations of Qld, NSW and the ACT)		
Koala (combined populations of Queensland, New South Wales and the Australian Capital Territory) [85104]	Vulnerable	Species or species habitat may occur within area
Plants		
Acacia ramiflora		
[7242]	Vulnerable	Species or species habitat likely to occur within area

Name	Status	Type of Presence
Dichanthium queenslandicum		
King Blue-grass [5481]	Endangered	Species or species habitat may occur within area
Reptiles		
Denisonia maculata		
Ornamental Snake [1193]	Vulnerable	Species or species habitat likely to occur within area
Egernia rugosa		
Yakka Skink [1420]	Vulnerable	Species or species habitat may occur within area
Furina dunmalli		
Dunmall's Snake [59254]	Vulnerable	Species or species habitat may occur within area

Listed Migratory Species		[Resource Information]
* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.		
Name	Threatened	Type of Presence
Migratory Marine Birds		
Apus pacificus		
Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Migratory Terrestrial Species		
Haliaeetus leucogaster		
White-bellied Sea-Eagle [943]		Species or species habitat likely to occur within area
Merops ornatus		
Rainbow Bee-eater [670]		Species or species habitat may occur within area
Migratory Wetlands Species		
Ardea alba		
Great Egret, White Egret [59541]		Species or species habitat likely to occur within area
Ardea ibis		
Cattle Egret [59542]		Species or species habitat likely to occur within area
Gallinago hardwickii		
Latham's Snipe, Japanese Snipe [863]		Species or species habitat may occur within area
Rostratula benghalensis (sensu lato)		
Painted Snipe [889]	Vulnerable*	Species or species habitat may occur within area

Other Matters Protected by the EPBC Act

Listed Marine Species		[Resource Information]
* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.		
Name	Threatened	Type of Presence
Birds		
Apus pacificus		
Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardea alba		
Great Egret, White Egret [59541]		Species or species habitat likely to occur within area

Name	Threatened	Type of Presence
Ardea ibis		
Cattle Egret [59542]		Species or species habitat likely to occur within area
Gallinago hardwickii		
Latham's Snipe, Japanese Snipe [863]		Species or species habitat may occur within area
Haliaeetus leucogaster		
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Merops ornatus		
Rainbow Bee-eater [670]		Species or species habitat may occur within area
Rostratula benghalensis (sensu lato)		
Painted Snipe [889]	Vulnerable*	Species or species habitat may occur within area

Extra Information

Invasive Species	[Resource Information]

Weeds reported here are the 20 species of national significance (WoNS), along with other introduced plants that are considered by the States and Territories to pose a particularly significant threat to biodiversity. The following feral animals are reported: Goat, Red Fox, Cat, Rabbit, Pig, Water Buffalo and Cane Toad. Maps from Landscape Health Project, National Land and Water Resouces Audit, 2001.

Name	Status	Type of Presence
Birds		
Columba livia		
Rock Pigeon, Rock Dove, Domestic Pigeon [803]		Species or species habitat likely to occur within area
Passer domesticus		
House Sparrow [405]		Species or species habitat likely to occur within area
Frogs		
Bufo marinus		
Cane Toad [1772]		Species or species habitat likely to occur within area
Rhinella marina		
Cane Toad [83218]		Species or species habitat likely to occur within area
Mammals		
Bos taurus		
Domestic Cattle [16]		Species or species habitat likely to occur within area
Felis catus		
Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
Oryctolagus cuniculus		
Rabbit, European Rabbit [128]		Species or species

Name	Status	Type of Presence
		habitat likely to occur within area
[Sus scrofa](#) Pig [6]		Species or species habitat likely to occur within area
[Vulpes vulpes](#) Red Fox, Fox [18]		Species or species habitat likely to occur within area
Plants		
[Hymenachne amplexicaulis](#) Hymenachne, Olive Hymenachne, Water Stargrass, West Indian Grass, West Indian Marsh Grass [31754]		Species or species habitat likely to occur within area
[Parkinsonia aculeata](#) Parkinsonia, Jerusalem Thorn, Jelly Bean Tree, Horse Bean [12301]		Species or species habitat likely to occur within area
[Parthenium hysterophorus](#) Parthenium Weed, Bitter Weed, Carrot Grass, False Ragweed [19566]		Species or species habitat likely to occur within area

Australian Government

Department of Sustainability, Environment, Water, Population and Communities

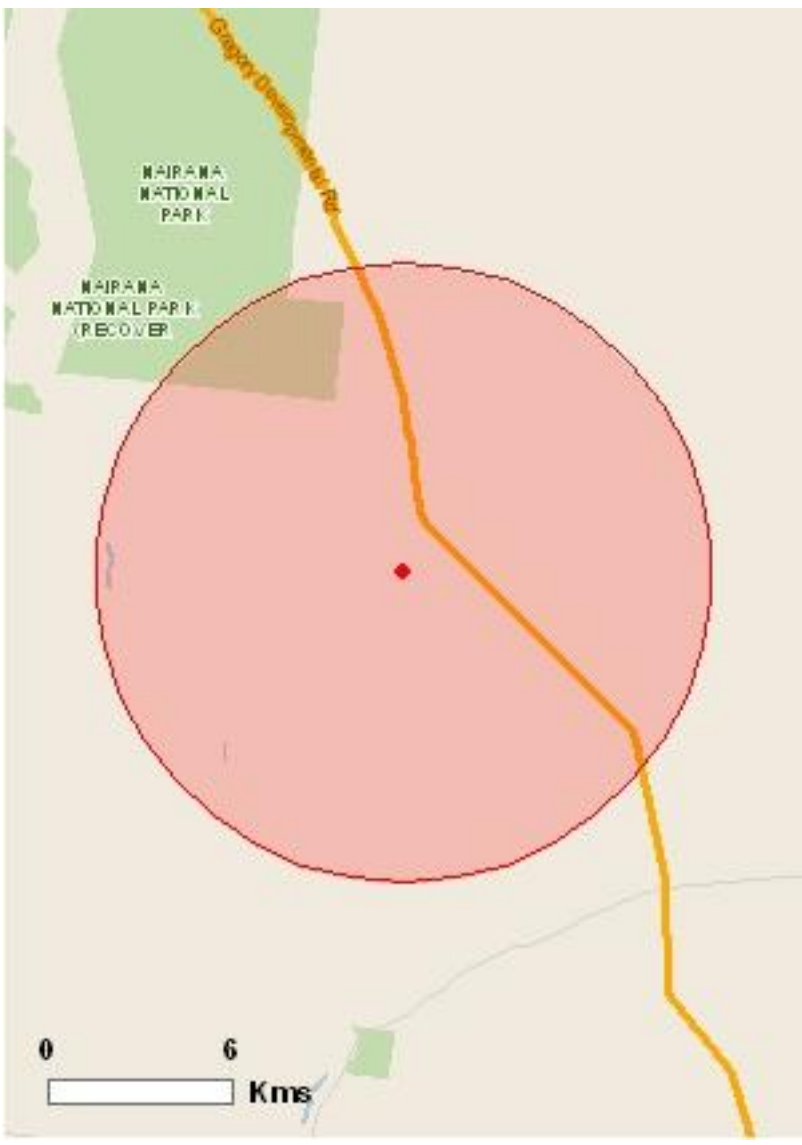
EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected.

Information on the coverage of this report and qualifications on data supporting this report are contained in the caveat at the end of the report.

Information is available about Environment Assessments and the EPBC Act including significance guidelines, forms and application process details.

Report created: 23/05/13 15:19:35



This map may contain data which are ©Commonwealth of Australia (Geoscience Australia), ©PSMA 2010

Coordinates

Buffer: 10.0Km

Summary

Matters of National Environmental Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the Administrative Guidelines on Significance.

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance:	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Areas:	None
Listed Threatened Ecological Communities:	1
Listed Threatened Species:	11
Listed Migratory Species:	7

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place and the heritage values of a place on the Register of the National Estate.

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

A permit may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

Commonwealth Land:	None
Commonwealth Heritage Places:	None
Listed Marine Species:	7
Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves:	None

Extra Information

This part of the report provides information that may also be relevant to the area you have nominated.

Place on the RNE:	None
State and Territory Reserves:	2
Regional Forest Agreements:	None
Invasive Species:	12
Nationally Important Wetlands:	None
Key Ecological Features (Marine)	None

Details

Matters of National Environmental Significance

Listed Threatened Ecological Communities [Resource Information]

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Name	Status	Type of Presence
Brigalow (Acacia harpophylla dominant and co-dominant)	Endangered	Community known to occur within area

Listed Threatened Species [Resource Information]

Name	Status	Type of Presence
Birds		
Erythrotriorchis radiatus		
Red Goshawk [942]	Vulnerable	Species or species habitat likely to occur within area
Geophaps scripta scripta		
Squatter Pigeon (southern) [64440]	Vulnerable	Species or species habitat known to occur within area
Neochmia ruficauda ruficauda		
Star Finch (eastern), Star Finch (southern) [26027]	Endangered	Species or species habitat likely to occur within area
Poephila cincta cincta		
Black-throated Finch (southern) [64447]	Endangered	Species or species habitat likely to occur within area
Rostratula australis		
Australian Painted Snipe [77037]	Vulnerable	Species or species habitat may occur within area
Mammals		
Phascolarctos cinereus (combined populations of Qld, NSW and the ACT)		
Koala (combined populations of Queensland, New South Wales and the Australian Capital Territory) [85104]	Vulnerable	Species or species habitat may occur within area
Plants		
Acacia ramiflora		
[7242]	Vulnerable	Species or species habitat known to occur within area

Name	Status	Type of Presence
Dichanthium queenslandicum		
King Blue-grass [5481]	Endangered	Species or species habitat may occur within area
Reptiles		
Denisonia maculata		
Ornamental Snake [1193]	Vulnerable	Species or species habitat likely to occur within area
Egernia rugosa		
Yakka Skink [1420]	Vulnerable	Species or species habitat may occur within area
Furina dunmalli		
Dunmall's Snake [59254]	Vulnerable	Species or species habitat may occur within area

Listed Migratory Species		[Resource Information]
* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.		
Name	Threatened	Type of Presence
Migratory Marine Birds		
Apus pacificus		
Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Migratory Terrestrial Species		
Haliaeetus leucogaster		
White-bellied Sea-Eagle [943]		Species or species habitat likely to occur within area
Merops ornatus		
Rainbow Bee-eater [670]		Species or species habitat may occur within area
Migratory Wetlands Species		
Ardea alba		
Great Egret, White Egret [59541]		Species or species habitat likely to occur within area
Ardea ibis		
Cattle Egret [59542]		Species or species habitat likely to occur within area
Gallinago hardwickii		
Latham's Snipe, Japanese Snipe [863]		Species or species habitat may occur within area
Rostratula benghalensis (sensu lato)		
Painted Snipe [889]	Vulnerable*	Species or species habitat may occur within area

Other Matters Protected by the EPBC Act

Listed Marine Species		[Resource Information]
* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.		
Name	Threatened	Type of Presence
Birds		
Apus pacificus		
Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardea alba		
Great Egret, White Egret [59541]		Species or species habitat likely to occur within area

Name	Threatened	Type of Presence
Ardea ibis		
Cattle Egret [59542]		Species or species habitat likely to occur within area
Gallinago hardwickii		
Latham's Snipe, Japanese Snipe [863]		Species or species habitat may occur within area
Haliaeetus leucogaster		
White-bellied Sea-Eagle [943]		Species or species habitat likely to occur within area
Merops ornatus		
Rainbow Bee-eater [670]		Species or species habitat may occur within area
Rostratula benghalensis (sensu lato)		
Painted Snipe [889]	Vulnerable*	Species or species habitat may occur within area

Extra Information

State and Territory Reserves	[Resource Information]
Name	State
Nairana	QLD
Nairana (Recovery)	QLD

Invasive Species	[Resource Information]

Weeds reported here are the 20 species of national significance (WoNS), along with other introduced plants that are considered by the States and Territories to pose a particularly significant threat to biodiversity. The following feral animals are reported: Goat, Red Fox, Cat, Rabbit, Pig, Water Buffalo and Cane Toad. Maps from Landscape Health Project, National Land and Water Resouces Audit, 2001.

Name	Status	Type of Presence
Birds		
Columba livia		
Rock Pigeon, Rock Dove, Domestic Pigeon [803]		Species or species habitat likely to occur within area
Passer domesticus		
House Sparrow [405]		Species or species habitat likely to occur within area
Frogs		
Bufo marinus		
Cane Toad [1772]		Species or species habitat likely to occur within area
Rhinella marina		
Cane Toad [83218]		Species or species habitat likely to occur within area
Mammals		
Bos taurus		
Domestic Cattle [16]		Species or species habitat likely to occur within area
Felis catus		
Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur

Name	Status	Type of Presence
		within area
Oryctolagus cuniculus Rabbit, European Rabbit [128]		Species or species habitat likely to occur within area
Sus scrofa Pig [6]		Species or species habitat likely to occur within area
Vulpes vulpes Red Fox, Fox [18]		Species or species habitat likely to occur within area
Plants		
Hymenachne amplexicaulis Hymenachne, Olive Hymenachne, Water Stargrass, West Indian Grass, West Indian Marsh Grass [31754]		Species or species habitat likely to occur within area
Parkinsonia aculeata Parkinsonia, Jerusalem Thorn, Jelly Bean Tree, Horse Bean [12301]		Species or species habitat likely to occur within area
Parthenium hysterophorus Parthenium Weed, Bitter Weed, Carrot Grass, False Ragweed [19566]		Species or species habitat likely to occur within area

Coordinates

-21.80307 146.96877

Caveat

The information presented in this report has been provided by a range of data sources as acknowledged at the end of the report.

This report is designed to assist in identifying the locations of places which may be relevant in determining obligations under the Environment Protection and Biodiversity Conservation Act 1999. It holds mapped locations of World Heritage and Register of National Estate properties, Wetlands of International Importance, Commonwealth and State/Territory reserves, listed threatened, migratory and marine species and listed threatened ecological communities. Mapping of Commonwealth land is not complete at this stage. Maps have been collated from a range of sources at various resolutions.

Not all species listed under the EPBC Act have been mapped (see below) and therefore a report is a general guide only. Where available data supports mapping, the type of presence that can be determined from the data is indicated in general terms. People using this information in making a referral may need to consider the qualifications below and may need to seek and consider other information sources.

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

For species where the distributions are well known, maps are digitised from sources such as recovery plans and detailed habitat studies. Where appropriate, core breeding, foraging and roosting areas are indicated under 'type of presence'. For species whose distributions are less well known, point locations are collated from government wildlife authorities, museums, and non-government organisations; bioclimatic distribution models are generated and these validated by experts. In some cases, the distribution maps are based solely on expert knowledge.

Only selected species covered by the following provisions of the EPBC Act have been mapped:

- migratory and
- marine

The following species and ecological communities have not been mapped and do not appear in reports produced from this database:

- threatened species listed as extinct or considered as vagrants
- some species and ecological communities that have only recently been listed
- some terrestrial species that overfly the Commonwealth marine area
- migratory species that are very widespread, vagrant, or only occur in small numbers

The following groups have been mapped, but may not cover the complete distribution of the species:

- non-threatened seabirds which have only been mapped for recorded breeding sites
- seals which have only been mapped for breeding sites near the Australian continent

Such breeding sites may be important for the protection of the Commonwealth Marine environment.

Acknowledgements

This database has been compiled from a range of data sources. The department acknowledges the following custodians who have contributed valuable data and advice:

-Department of Environment, Climate Change and Water, New South Wales
-Department of Sustainability and Environment, Victoria
-Department of Primary Industries, Parks, Water and Environment, Tasmania
-Department of Environment and Natural Resources, South Australia
-Parks and Wildlife Service NT, NT Dept of Natural Resources, Environment and the Arts
-Environmental and Resource Management, Queensland
-Department of Environment and Conservation, Western Australia
-Department of the Environment, Climate Change, Energy and Water
-Birds Australia
-Australian Bird and Bat Banding Scheme
-Australian National Wildlife Collection
-Natural history museums of Australia
-Museum Victoria
-Australian Museum
-SA Museum
-Queensland Museum
-Online Zoological Collections of Australian Museums
-Queensland Herbarium
-National Herbarium of NSW
-Royal Botanic Gardens and National Herbarium of Victoria
-Tasmanian Herbarium
-State Herbarium of South Australia
-Northern Territory Herbarium
-Western Australian Herbarium
-Australian National Herbarium, Atherton and Canberra
-University of New England
-Ocean Biogeographic Information System
-Australian Government, Department of Defence
-State Forests of NSW
-Geoscience Australia
-CSIRO
-Other groups and individuals

The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Please feel free to provide feedback via the Contact Us page.

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Appendix B - Fauna Survey Results

The table below is a list of fauna species observed at, or surrounding, the Adani Quarries and has been compiled from data collected by CDM Smith in February and April 2013. Unless otherwise noted, this table follows the nomenclature provided by Australian Faunal Directory (SEWPaC 2012) as it provides a single point of reference for all terrestrial vertebrate groups. Alterations due to subsequent taxonomic revision and notable variations in common and/or scientific names of conservation significant species are identified in the report text and as footnotes hereunder.

Site list: Dam refers to large dam located east of Borrow 8 as indicated in Figure 5-1

Status abbreviations – **EPBC Act:** E = Endangered; V = Vulnerable; M = Migratory. **NC Act:** E = Endangered; V = Vulnerable; NT = Near Threatened; S = of Special Least Concern; C = Least Concern; I = Introduced.

Species name	Common name	Conservation status		Site list							
		NC Act	EPBC Act	North Creek	Moray	Elgin North	South Back Creek	Borrow 7	Disney	Dam	Incidental
AMPHIBIANS											
Cyclorana alboguttata	Striped burrowing frog	C									X
Cyclorana novaehollandiae	Eastern snapping-frog	C									X
Litoria caerulea	Green tree frog	C									X
Litoria inermis	Peter's frog	C									X
Litoria latopalmata	Broad-palmed rocketfrog	C									X
Litoria rothii	Roth's tree frog	C									X
Litoria rubella	Desert tree frog	C									X

Species name	Common name	Conservation status		Site list							
		NC Act	EPBC Act	North Creek	Moray	Elgin North	South Back Creek	Borrow 7	Disney	Dam	Incidental
Rhinella marina	Cane toad	I									X
REPTILES											
Emydura macquarii krefftii	Krefft's River Turtle	C									X
Gehyra dubia	Dubious Dtella	C		X			X	X	X		
Heteronotia binoei	Bynoe's Gecko	C					X				
Carlia sp.	Rainbow-skink species	C				X			X		
Cryptoblepharus metallicus	Metallic Snake-eyed Skink	C		X	X	X	X		X		
Morethia boulengeri	South-eastern Morethia Skink	C						X			
Denisonia maculata	Ornamental Snake	V	V					X			X
Pseudonaja textilis	Eastern Brown Snake	C									X
BIRDS											
Dromaius novaehollandiae	Emu	C			X			X			X
Coturnix ypsilophora	Brown Quail	C					X				X
Anseranas semipalmata	Magpie goose	C								X	
Dendrocygna eytoni	Plumed whistling-duck	C								X	

Species name	Common name	Conservation status		Site list							
		NC Act	EPBC Act	North Creek	Moray	Elgin North	South Back Creek	Borrow 7	Disney	Dam	Incidental
Dendrocygna arcuata	Wandering whistling-duck	C								X	
Cygnus atratus	Black swan	C								X	
Chenonetta jubata	Australian wood duck	C								X	X
Nettapus coromandelianus	Cotton pygmy-goose	NT								X	
Anas gracilis	Grey teal	C								X	X
Anas superciliosa	Pacific black duck	C					X	X		X	
Aythya australis	Hardhead	C								X	
Tachybaptus novaehollandiae	Australasian grebe	C					X			X	
Podiceps cristatus	Great crested grebe	C								X	
Phaps chalcoptera	Common Bronzewing	C					X				
Ocyphaps lophotes	Crested pigeon	C			X	X	X		X		X
Geophaps scripta scripta	Squatter pigeon (southern)	V	V		X						X
Geopelia cuneata	Diamond dove	C					X				X
Geopelia striata	Peaceful dove	C			X	X	X	X	X		X
Geopelia humeralis	Bar-shouldered dove	C			X						X

Species name	Common name	Conservation status		Site list							
		NC Act	EPBC Act	North Creek	Moray	Elgin North	South Back Creek	Borrow 7	Disney	Dam	Incidental
Podargus strigoides	Tawny frogmouth	C							X		
Hirundapus caudacutus	White-throated needletail	S	M								X
Anhinga melanogaster	Darter	C								X	
Microcarbo melanoleucos	Little pied cormorant	C					X			X	
Phalacrocorax sulcirostris	Little black cormorant	C			X		X			X	
Pelecanus conspicillatus	Australian pelican	C								X	
Ephippiorhynchus asiaticus	Black-necked stork	C								X	
Ardea pacifica	White-necked heron	C					X			X	X
Ardea modesta	Eastern Great Egret	S	M				X			X	X
Ardea ibis	Cattle Egret	S	M								
Egretta novaehollandiae	White-faced heron	C				X	X			X	
Egretta garzetta	Little Egret	C								X	
Nycticorax caledonicus	Nankeen night heron	C					X				X
Plegadis falcinellus	Glossy ibis	S	M							X	
Threskiornis molucca	Australian white ibis	C								X	

Species name	Common name	Conservation status		Site list							
		NC Act	EPBC Act	North Creek	Moray	Elgin North	South Back Creek	Borrow 7	Disney	Dam	Incidental
Threskiornis spinicollis	Straw-necked ibis	C					X			X	X
Platalea regia	Royal spoonbill	C								X	
Platalea flavipes	Yellow-billed spoonbill	C								X	
Elanus axillaris	Black-shouldered kite	C									X
Hamirostra melanostremon	Black-breasted Buzzard	C			X						
Haliaeetus leucogaster	White-bellied Sea-eagle	S	M								X
Milvus migrans	Black kite	C					X				X
Haliastur sphenurus	Whistling kite	C				X	X	X	X	X	X
Aquila audax	Wedge-tailed eagle	C					X		X		X
Falco cenchroides	Nankeen kestrel	C				X			X		X
Falco berigora	Brown falcon	C									X
Falco longipennis	Australian hobby	C			X						X
Falco subniger	Black Falcon	C					X				
Grus rubicunda	Brolga	C									X
Porphyrio porphyrio	Purple swamphen	C								X	

Species name	Common name	Conservation status		Site list							
		NC Act	EPBC Act	North Creek	Moray	Elgin North	South Back Creek	Borrow 7	Disney	Dam	Incidental
Tribonyx ventralis	Black-tailed native-hen	C				X	X				X
Fulica atra	Eurasian coot	C								X	
Ardeotis australis	Australian bustard	C						X			X
Himantopus himantopus	Black-winged stilt	C			X					X	
Recurvirostra novaehollandiae	Red-necked avocet	C								X	
Elseyornis melanops	Black-fronted dotterel	C			X		X			X	X
Erythrogonys cinctus	Red-kneed dotterel	C									X
Vanellus tricolor	Banded lapwing	C									X
Vanellus miles	Masked lapwing	C			X	X				X	X
Irediparra gallinacea	Comb-crested jacana	C								X	
Calyptorhynchus banksii	Red-tailed black-cockatoo	C							X		
Eolophus roseicapilla	Galah	C			X	X	X	X	X		X
Cacatua galerita	Sulphur-crested cockatoo	C		X	X		X		X		X
Nymphicus hollandicus	Cockatiel	C			X	X	X		X		X
Trichoglossus haematodus	Rainbow lorikeet	C			X				X		X

Species name	Common name	Conservation status		Site list							
		NC Act	EPBC Act	North Creek	Moray	Elgin North	South Back Creek	Borrow 7	Disney	Dam	Incidental
Aprosmictus erythropterus	Red-winged parrot	C		X	X				X		X
Platycercus adscitus	Pale-headed rosella	C		X	X		X	X			X
Melopsittacus undulatus	Budgerigar	C				X			X		X
Centropus phasianinus	Pheasant coucal	C							X		X
Chalcites basalis	Horsfield's bronze-cuckoo	C					X				X
Cuculus pallidus	Pallid Cuckoo	C					X				
Cacomantis flabelliformis	Fan-tailed Cuckoo	C					X				
Tyto javanica	Eastern Barn Owl	C			X		X				X
Dacelo novaeguineae	Laughing kookaburra	C			X			X	X		X
Dacelo leachii	Blue-winged kookaburra	C			X		X				
Todiramphus pyrrhopygia	Red-backed kingfisher	C									X
Todiramphus macleayii	Forest kingfisher	C			X		X				X
Merops ornatus	Rainbow bee-eater	S	M	X		X	X		X		X
Eurystomus orientalis	Dollarbird	C							X		X
Climacteris picumnus	Brown treecreeper	C							X		

Species name	Common name	Conservation status		Site list							
		NC Act	EPBC Act	North Creek	Moray	Elgin North	South Back Creek	Borrow 7	Disney	Dam	Incidental
Ptilonorhynchus maculatus	Spotted bowerbird	C						X			
Malurus melanocephalus	Red-backed fairy-wren	C		X	X	X	X	X	X		X
Malurus lamberti	Variegated Fairy-wren	C			X		X				
Chthonicola sagittata	Speckled Warbler	C					X				
Smicrornis brevirostris	Weebill	C		X	X	X	X	X	X		
Gerygone fusca	Western gerygone	C					X				
Gerygone olivacea	White-throated gerygone	C							X		X
Acanthiza nana	Yellow thornbill	C					X				
Acanthiza chrysorrhoa	Yellow-rumped thornbill	C		X	X		X				X
Pardalotus striatus	Striated pardalote	C		X	X	X	X		X		X
Lichenostomus virescens	Singing honeyeater	C		X	X	X	X		X		X
Lichenostomus penicillatus	White-plumed honeyeater	C		X			X		X		
Manorina flavigula	Yellow-throated miner	C			X	X	X	X	X		X
Acanthagenys rufogularis	Spiny-cheeked honeyeater	C					X				X
Conopophila rufogularis	Rufous-throated honeyeater	C					X				

Species name	Common name	Conservation status		Site list							
		NC Act	EPBC Act	North Creek	Moray	Elgin North	South Back Creek	Borrow 7	Disney	Dam	Incidental
Sugomel niger	Black Honeyeater	C					X				
Lichmera indistincta	Brown honeyeater	C					X		X		
Melithreptus albogularis	White-throated honeyeater	C			X		X		X		
Entomyzon cyanotis	Blue-faced honeyeater	C			X				X		X
Philemon corniculatus	Noisy friarbird	C					X		X		X
Philemon citreogularis	Little friarbird	C			X		X		X		X
Plectorhyncha lanceolata	Striped Honeyeater	C		X			X				
Pomatostomus temporalis	Grey-crowned babbler	C			X						X
Coracina novaehollandiae	Black-faced cuckoo-shrike	C		X	X	X	X	X	X		X
Coracina maxima	Ground cuckoo-shrike	C									X
Lalage sueurii	White-winged triller	C				X	X				
Pachycephala rufiventris	Rufous whistler	C		X	X		X	X	X		X
Colluricincla harmonica	Grey shrike-thrush	C					X		X		X
Artamus leucorynchus	White-breasted woodswallow	C									X
Artamus personatus	Masked woodswallow	C									X

Species name	Common name	Conservation status		Site list							
		NC Act	EPBC Act	North Creek	Moray	Elgin North	South Back Creek	Borrow 7	Disney	Dam	Incidental
Artamus superciliosus	White-browed woodswallow	C									X
Artamus cinereus	Black-faced woodswallow	C				X		X			X
Cracticus torquatus	Grey butcherbird	C			X		X				X
Cracticus nigrogularis	Pied butcherbird	C			X	X	X	X	X		X
Gymnorhina tibicen	Australian magpie	C		X	X	X		X			X
Rhipidura leucophrys	Willie wagtail	C		X	X	X	X		X		X
Rhipidura albiscapa	Grey Fantail	C			X		X				
Corvus orru	Torresian Crow	C			X	X	X				
Corvus coronoides	Australian raven	C			X		X	X	X		X
Myiagra rubecula	Leaden flycatcher	C				X			X		
Myiagra inquieta	Restless flycatcher	C					X				X
Grallina cyanoleuca	Magpie-lark	C			X	X	X		X		X
Struthidea cinerea	Apostlebird	C			X		X				X
Microeca fascinans	Jacky Winter	C		X			X				
Petroica goodenovii	Red-capped Robin	C			X		X				

Species name	Common name	Conservation status		Site list							
		NC Act	EPBC Act	North Creek	Moray	Elgin North	South Back Creek	Borrow 7	Disney	Dam	Incidental
Mirafra javanica	Horsfield's Bushlark	C									X
Cincloramphus mathewsi	Rufous songlark	C						X	X		X
Petrochelidon nigricans	Tree martin	C									X
Dicaeum hirundinaceum	Mistletoebird	C			X	X	X		X		X
Taeniopygia guttata	Zebra finch	C					X	X			
Taeniopygia bichenovii	Double-barred finch	C					X	X	X		X
Neochmia modesta	Plum-headed finch	C					X				X
Anthus novaeseelandiae	Australasian Pipit	C				X		X			X
MAMMALS											
Trichosurus vulpecula	Common brushtail possum	C					X				X
Aepyprymnus rufescens	Rufous bettong	C					X				X
Macropus giganteus	Eastern Grey Kangaroo	C			X			X	X		X
Macropus robustus robustus	Eastern wallaroo	C							X		X
Macropus rufus	Red kangaroo	C			X						X
Saccolaimus flaviventris	Yellow-bellied Sheathtail-bat	C									X

Species name	Common name	Conservation status		Site list							
		NC Act	EPBC Act	North Creek	Moray	Elgin North	South Back Creek	Borrow 7	Disney	Dam	Incidental
Chaerephon jobensis	Northern Freetail-bat	C			X		X				X
Mormopterus beccarii	Beccari's Freetail-bat	C									X
Mormopterus species 2	Eastern Freetail-bat	C									X
Tadarida australis	White-striped Freetail-bat	C			X		X				X
Nyctophilus sp.	Long-eared Bat species	C			X						X
Chalinolobus gouldii	Gould's Wattled Bat	C			X		X				X
Chalinolobus morio	Chocolate Wattled Bat	C					X				
Chalinolobus nigrogriseus	Hoary Wattled Bat	C			X		X				
Scotorepens balstoni	Inland Broad-nosed Bat	C					X				X
Scotorepens greyii/sanborni	Little/Northern Broad-nosed Bat	C			X		X				X
Felis catus	Cat	I			X						
Sus scrofa	Pig	I									X
Total species per quarry site				**18**	**55**	**29**	**81**	**26**	**46**		

Appendix C - EPBC Act Flora Assessment

environmental management

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EPBCA Flora Assessment

Carmichael Coal Project (Rail)
Proposed Quarry Sites

6550
9 April 2013
Adani Mining Pty Ltd

adani™

surveying town planning urban design environmental management landscape architecture

Document Control

Title	EPBCA Flora Assessment – Carmichael Coal Project (Rail) – Proposed Quarry Sites
Address	Moray Carmichael Boundary Road, Clermont
Job Number	**6550**
Client	Adani Mining Pty Ltd

Document Issue

Issue	Date	Prepared By	Checked By
Draft	08.04.2013	David Havill	Ross Marshall
Client Issue	09.04.2013	Dr Andrew Davies	Ross Marshall

Disclaimer

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Reports and/or Plans by Others

Reports and/or plans by others may be included within this PMAV report to support the document.

Table of Contents

Figures

Tables

I. Introduction

The *Environmental Management Division* of the **Saunders Havill Group** was engaged by **Adani Mining Pty Ltd** to review flora values relevant to the *Environment Protection and Biodiversity Conservation Act 1999* (EPBCA) across six proposed quarry locations. The purpose of the quarries is to provide structural material for the Carmichael Coal Project (Rail), a 'significant project' under the *State Development and Public Works Organisation Act 1971* (SDPWO Act).

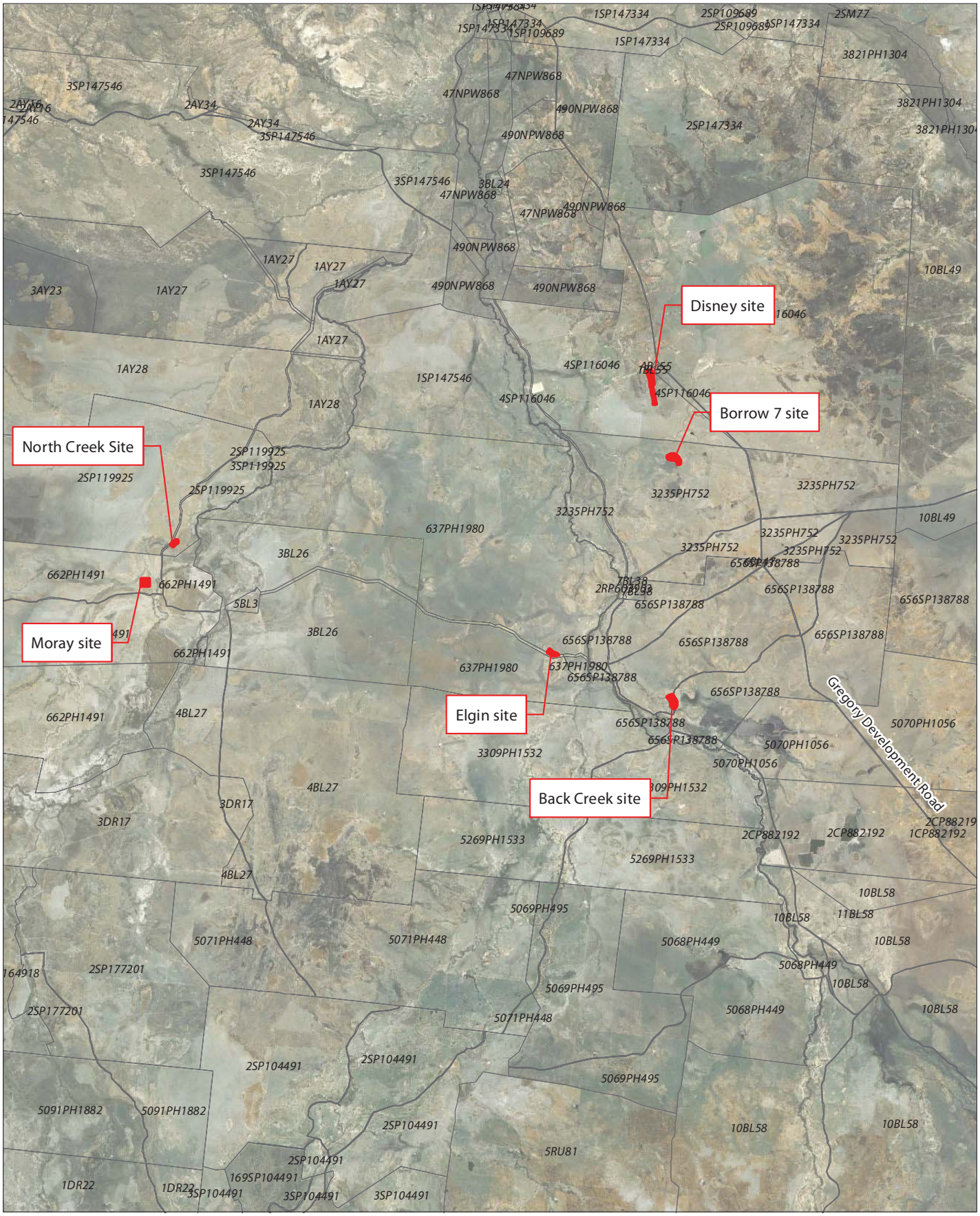
Specifically detailed site assessments were conducted to review the presence / absence of Threatened Ecological Communities (TEC) and the potential presence of listed flora species. The assessment was conducted at six proposed quarry locations as summarised within **Table 1**, below, and **Figure 1**, next page.

Table 1: Quarry Site Summaries

Proposed Quarry	Lot and Plan
Elgin Quarry	Lot 637 on PH1980
Disney Quarry	Lot 4 on SP116046
Borrow 7	Lot 3235 on PH752
Back Creek Quarry	Lot 656 on SP138788
North Creek Quarry	Lot 2 on SP119925
Moray Quarry	Lot 662 on PH1491

I.I. Report Purpose

The purpose of this report is to review site flora values in relation to TECs and listed threatened flora species at the six proposed quarry locations. This report describes the findings of desktop and field assessments in relation to any potential flora related Matters of National Environmental Significance.



Legend

- Quarry Extraction Footprint
- DCDB

Figure 1 *Quarries - Aerial Context*

File ref. *6550 E 01 EPBC Quarry Context A*
Date *9/04/2013*
Project *Carmichael Coal Rail Project*

0 1 2 4 6 8 10 km

Scale (A4): 1:400,000 [GDA 1994 MGA Z55]

N

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Layer Sources DCDB (DRNM 2013) RE v6.1 (DEHP 2012) Quarry Location (Adani Mining Pty Ltd 2013)

2. Methodology

Detailed site assessments were conducted to accurately map and define vegetation into categories as defined by the **Queensland Herbarium**. The applied methodology was designed to ensure an accurate delineation of the separate vegetation polygons. The following steps were undertaken:

1. Desktop Research
    - Existing environmental studies undertaken on the surrounding lots by **Saunders Havill Group**
    - Regional Ecosystem species lists
    - Soil maps
2. Review of Historical Aerial Photography
3. Vegetation Survey
4. GPS Mapping of Vegetation Communities

2.1. Desktop Research

Prior to entering the sites, the following vegetation based information sources were assessed to assist in the final determination of on-site survey methodology:

- Existing vegetation mapping released under the provisions of the *Vegetation Management Act 1999* and Regional Ecosystem descriptions.
- Review of the **Queensland Herbarium** mapping methodology and procedures outlined in Neldner, V.J, Wilson, B.A., Thompson, E.J. and Dillewaard, H.A. (*Methodology for Survey and Mapping of Regional Ecosystems and Vegetation Communities in Queensland*).
- Environmental Database Searches for the *Environmental Protection and Biodiversity Conservation Act 1999*.
- Applicable Schedules of the *Nature Conservation (Wildlife) Regulation 1994*.
- Geology (250K), soils and Topographical Maps.
- Specific **Queensland Herbarium** searches for records of unknown or specific vegetation species listed to occur in the region.
- Previous complex PMAV applications in the locality.

2.2. Vegetation Survey Methodology

Following the broad delineation of vegetation communities using historical aerial photography and information obtained in the desktop review (including stereoscopic analysis), a detailed vegetation survey was conducted to locate, describe and map the Regional Ecosystem polygons located on each site.

All data collection was mapped using a Trimble GEO-XT with sub 1 m accuracy.

2.1. General and Targeted Survey Methods

Table 2, below, details the standard survey methods used to describe vegetation type, structure and composition within each study site. Survey and analysis techniques followed the *Methodology for Surveying and Mapping of Regional Ecosystems and Vegetation Communities in Queensland (Version 3.1)*.

Table 2: Standard Flora Survey Methods

Survey Method	Description
Standard Survey Methods	
Secondary	Secondary sites are used for classification and detailed descriptions of REs and vegetation communities. Data collected include all location, environmental and overall structural information as well as a list of all species present and basal area (of woody stems using the Bitterlich stick method), percentage cover and stem density measures of abundance.
Quaternary	Quaternary site data are used primarily as records of field traverses and to verify REs/vegetation mapping. These data are generally collected throughout the field survey and entered on spread sheets or databases. Quaternary sites are collected at regular intervals along a traverse, and/or made where REs/vegetation communities change.
PMAV Transect	PMAV transects are used to accurately define the true boundary of each Regional Ecosystem category at the property scale. Data was collated using *Qld Herbarium Map Assessment Request Forms*. Detailed information on the height and composition of vegetation was recorded at each GPS location with information later analysed to assess the extent of disturbance and accuracy of species canopy mix.
Targeted Flora Survey Methods	
Threatened Flora	The habitat requirements of flora species listed under Government databases as potentially occurring within each study site were considered during on-site surveys. Where potential habitat occurred, targeted searches were conducted to locate the presence of threatened flora.
TECs	Federal Government information detailing the listing advice and composition and classification of TECs was used to determine their presence/absence. Targeted searches, including meandering transects, were conducted within potential TEC habitats on-site to confirm the presence/absence of these communities.

3. Potential Flora MNES – Summary

The *Department of Sustainability, Environment, Water, Population and Communities* (SEWPaC) EPBCA Online Protected Matters Search Tool database (SEWPaC 2011a) was reviewed using a search within a 10 km radius of each proposed quarry location.

The EPBCA Online Protected Matters Search Tool, whilst based on some species records, relies on modelling of suitable habitats and is largely predictive. The following communities and threatened species were identified as potentially occurring within the landscape surrounding the 6 quarry sites (**Figure1**):

- Threatened Ecological Community – Brigalow (*Acacia harpophylla* dominant and co-dominant)
- Listed Threatened Species – *Acacia ramiflora*
- Listed Threatened Species – *Dichanthium queenslandicum* (King Blue Grass)

3.1. Threatened Ecological Communities - Brigalow

The Federal Government provides listing advice regarding Brigalow TECs. The advice identifies a number of State mapped vegetation communities that potentially contain Brigalow as relevant to the EPBCA. Within the study area, these REs usually form part of composite Regional Ecosystems. REs potentially containing 'Brigalow' TECs and within the vicinity of the quarries (Endangered RE 11.4.8 and Endangered RE 11.4.9) are described in **Table 3**, next page.

3.1.1 Threshold Conditions

Brigalow TECs protected under the EPBCA are listed and characterised by the presence of *Acacia harpophylla* as one of the three most abundant tree species in the community (Butler 2007). Brigalow is usually dominant in the tree layer or co-dominant with other tree species such as *Casuarina cristata* (Belah), other species of *Acacia*, or species of *Eucalyptus*. Occasionally Belah or species of *Acacia* or *Eucalyptus* may be more common than *A. harpophylla* within the broad matrix of Brigalow vegetation.

Butler (2007) considers that a community containing *A. harpophylla* can be excluded from the list of Brigalow TECs if it meets any one of the following three criteria:

- Vegetation has been comprehensively cleared (not thinned) within the past 15 years;
- Vegetation in which exotic perennial plants have more than 50% cover, assessed in a minimum area of 0.5ha (100 m by 50 m); and/or
- Individual patches of 'Brigalow' that are smaller than 0.5 ha.

Table 3: Possible Brigalow Regional Ecosystems

RE 11.4.8 – Endangered	
Description	Woodland to open-forest dominated by *Eucalyptus cambageana* and *Acacia harpophylla* or, sometimes in the north, *A. argyrodendron*. *E. thozetiana* is sometimes present on shallower soils. There is a moderately dense low tree layer (5 m high) layer dominated by species such as *Eremophila mitchellii* and a low shrub layer (2 m high) dominated by species such as *Carissa ovata* and *Geijera parviflora*. Occurs on level to gently undulating plains formed from Cainozoic deposits. Associated soils are usually deep texture contrast with thin loamy or sandy surface horizons overlying strongly alkaline clay subsoils. Surface or subsurface gravel is common. (BVG1M: 25a). Major vegetation communities include: 11.4.8a: Palustrine wetland (e.g. vegetated swamp). Gilgai and small depressions on clay plains usually associated *with Acacia harpophylla* ecosystems. Generally support a range of sedges, grasses and, when wet, aquatic species. (BVG1M: 34d)
RE 11.4.9 – Endangered	
Description	Open-forest, occasionally woodland, dominated by *Acacia harpophylla* usually with a low tree mid-storey of *Terminalia oblongata* and *Eremophila mitchellii*. *Casuarina cristata* sometimes replaces *Acacia harpophylla* in the overstorey and *Lysiphyllum cunninghamii* sometimes co-dominates. Other low tree or shrub species such as *Alectryon diversifolius*, *Carissa ovata*, *Pittosporum spinescens*, *Ehretia membranifolia*, *Geijera parviflora* and *Flindersia dissosperma* may occur in the mid-storey or low shrub layer. *Acacia harpophylla* trees have been recorded as 11- 17 m high, the mid-storey layer 2- 8 m high and the low shrub layer 1-2 m high. Occurs on level to gently undulating Cainozoic plains, including weathered basalt. Associated soils are predominantly moderately deep to deep cracking clays that may be brown, red-brown or grey-brown, and with much surface gravel in some areas. (BVG1M: 25a). Major vegetation communities include: 11.4.9a: *Acacia harpophylla*, *Lysiphyllum carronii* +/- *Casuarina cristata* open-forest to woodland. (BVG1M: 25a). 11.4.9b: *Acacia harpophylla*, *Eucalyptus thozetiana* (sometimes *E. cambageana*) open-forest to woodland. (BVG1M: 25a).

3.2. Threatened Flora

3.2.1 Acacia ramiflora

Habit

Acacia ramiflora, Family Mimosaceae, is a slender shrub to 3 m high with pendulous, hairless branchlets. Phyllodes are incurved, 8 – 12 cm long, 3 – 8 mm wide, narrowed towards the base, acute to gradually or abruptly narrowing to a sharp terminal point to 2 mm long, hairless, with three indistinct to slightly raised main nerves.

Inflorescence

Flowers are in globular heads 4.5 – 5 mm in diameter on hairless stalks 3 – 5 mm long.

Seed pods

Pods are linear, alternately raised over and slightly constricted between the seeds, to 9 cm long and 8 mm wide (Cowan & Maslin, 2001). Flowering specimens have been collected in February, specimens with young fruit in July and August (Pedley, 1978).

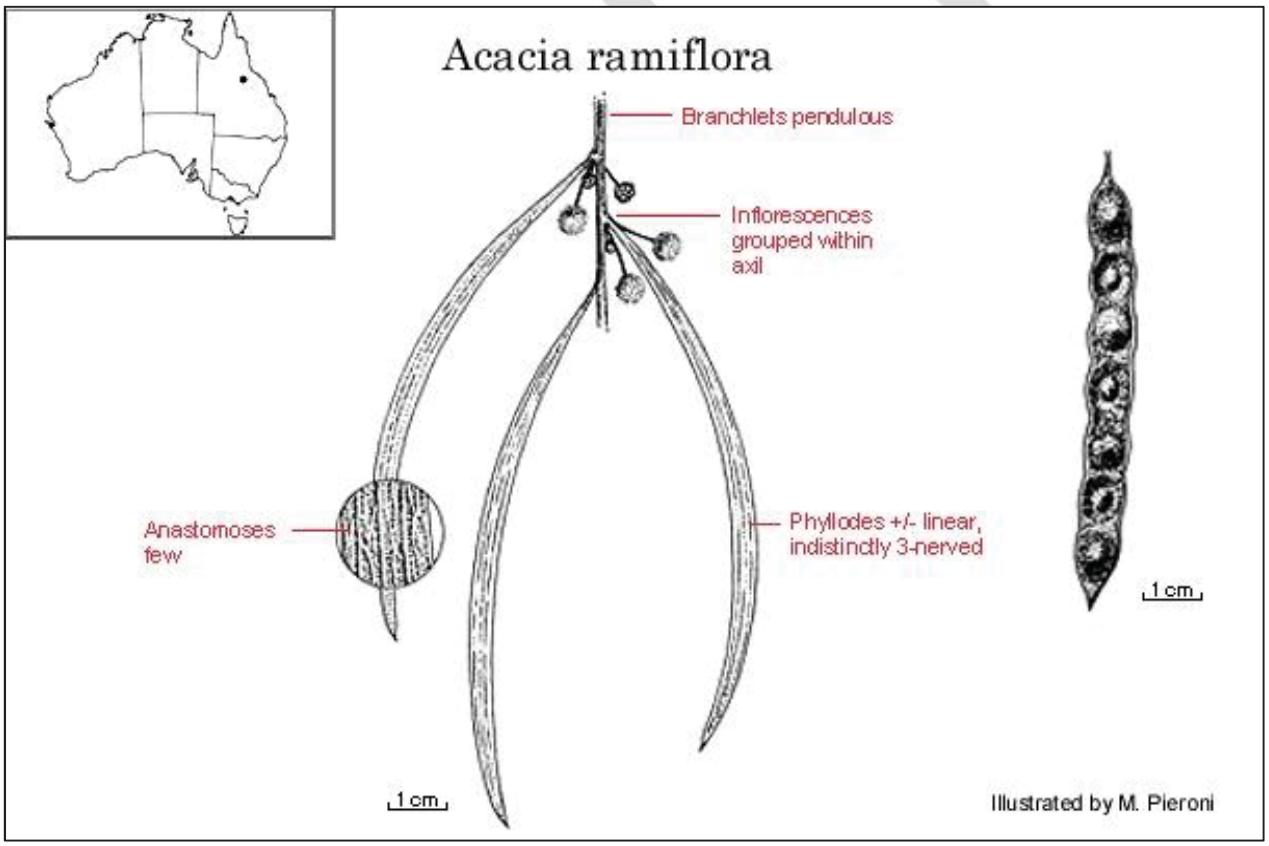


Illustration: **Acacia ramiflora**

3.2.2 Dichanthium queenslandicum (King Blue Grass)

Habit

Perennial. Culms erect, 40 – 80 cm tall, 4 – 5 -noded. Mid-culm nodes bearded. Leaf-sheaths hairy. Ligule a fringed membrane, a ciliolate membrane, 1 – 1.5 mm long. Leaf-blades 9 – 18 cm long, 3 – 5 mm wide. Leaf-blade surface indumented.

Inflorescence

Inflorescence solid or subdigitate, a rame, with ramose branches. Rhachis fragile at the nodes.

Spikelets

Spikelets sessile, 1 in the cluster. Companion spikelets pedicelled, 1 in the cluster. Companion spikelets developed, male, 6 mm long. Fertile spikelets 2 - flowered, the lower floret barren (rarely male), the upper fertile, comprising 1 basal sterile florets, comprising 1 fertile floret(s), without rachilla extension, linear or lanceolate or oblong, dorsally compressed, 7.5 – 8.5 mm long.

Glumes

Dissimilar, firmer than fertile lemma. Lower glume oblong, coriaceous, without keels, winged on margins, 11 -nerved. Upper glume lanceolate, coriaceous, keeled, 1-keeled, 3 -nerved.

Florets

Basal sterile florets 1, barren, without significant palea. Lemma of lower sterile floret hyaline. Fertile lemma 3 mm long, without keel, 1 -nerved. Lemma apex entire, awned, 1 -awned. Median (principal) awn apical, 20 mm long overall, with a twisted column. Palea absent. Anthers 2. Grain 4 mm long.

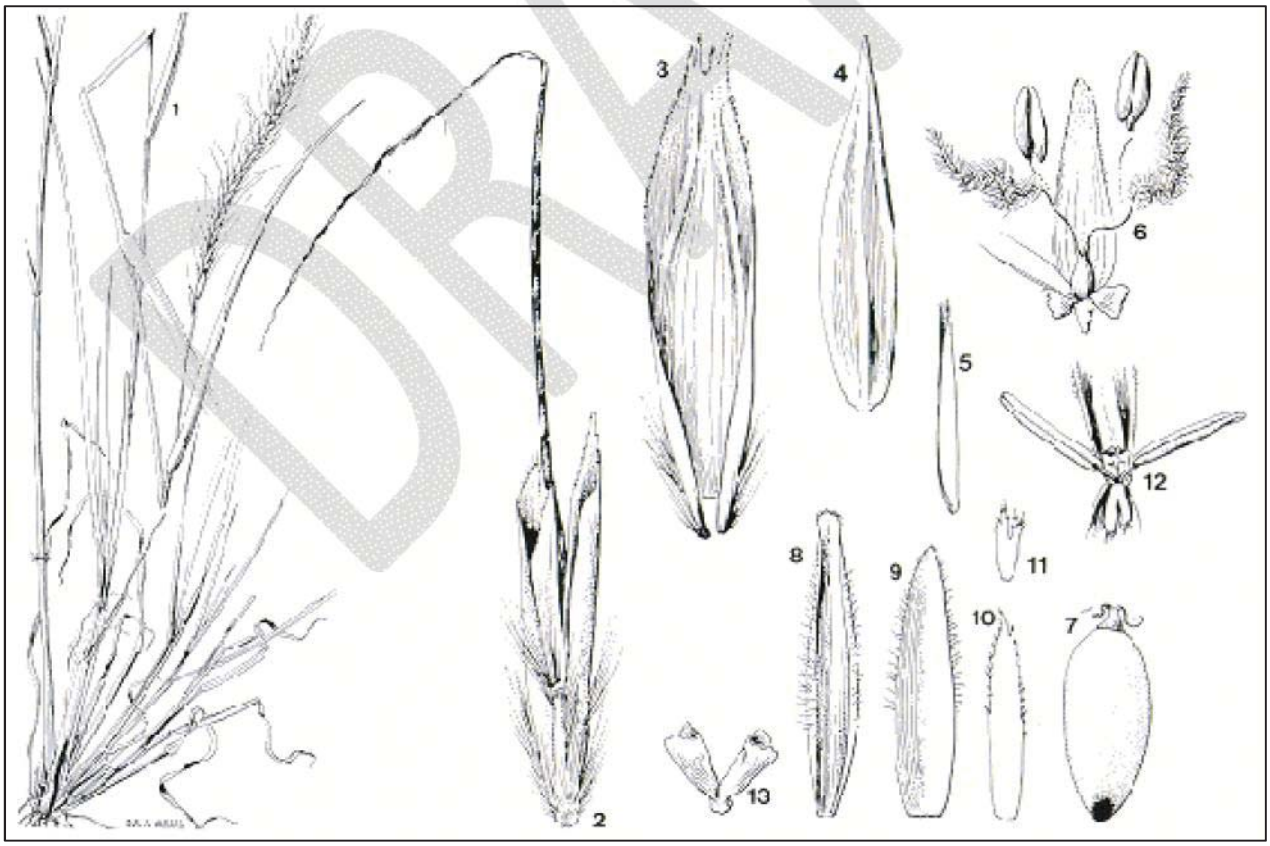


Illustration: **Dichanthium queenslandicum**

4. Elgin Quarry

Field Survey Summary

1	**No** listed threatened flora were observed on-site
2	Species consistent with Brigalow TEC were **not** observed on-site

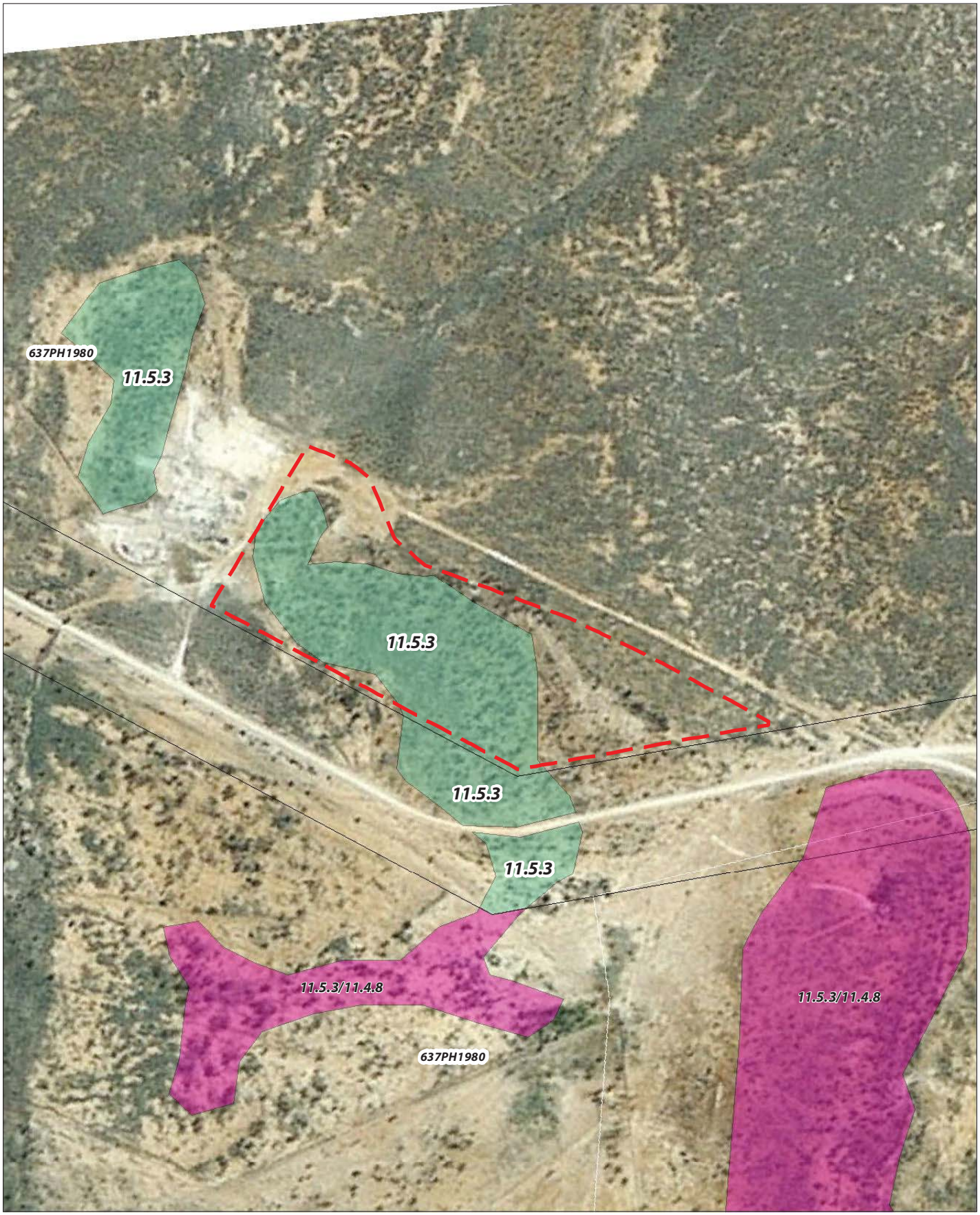
Elgin Quarry is located on Lot 637 on PH1980 and the proposed quarry footprint is approximately 15.25ha, encompassing approximately 8.75ha of mapped Endangered remnant vegetation and 6.5 ha of non-remnant vegetation (see **Appendix A**). The proposed quarry site is located adjacent to an existing quarry and contains characteristics of Land Zone 5. Land Zone 4 characteristics were observed outside of the remnant polygon within the adjacent cleared paddocks.

The *Vegetation Management Act 1999* (VMA) Regional Ecosystem Mapping Version 6.1 overlays the site with a composite Endangered community containing two REs; 90% Least Concern RE 11.5.3 and 10% Endangered RE 11.4.8 (**Appendix A**). Preliminary investigations and vegetation transects did not identify any species associated with Endangered RE 11.4.8 within areas mapped as endangered remnant polygons nor characteristics of Land Zone 4 (see **Figure 2** Elgin Quarry Proposed PMAV and imagery, below, for on-ground proofing of site vegetation).

The dominant canopy species observed on-site was *Eucalyptus crebra* (Narrow Leaf Ironbark). Other species present included *Corymbia clarksoniana* (Long Fruited Bloodwood) and *Corymbia dallachiana* (Ghost Gum). These species are all characteristic of Least Concern RE 11.5.3. Therefore, no potential TEC was identified within the remnant vegetation (please see **Appendix B** for a full species list).

Preliminary results indicate that vegetation on-site is remnant due to both height and canopy structure.

Photo: Vegetation on the Proposed Elgin Quarry Site Described as RE11.5.3



Legend

Quarry Extraction Footprint

PMAV Regional Ecosystem Amendments

- Remnant vegetation containing Endangered REs
- Remnant vegetation containing Of Concern REs
- Remnant vegetation that is a Least Concern RE

Figure 2 *Lot 637 on BH1980 Quarry*

File ref. *6550 E 02 EPBC 637PH1980 Quarry A*
Date *9/04/2013*
Project *Carmichael Coal Rail Project*

0 50 100 200 300 400 *m*

N

Scale (A4): 1:8,000 *[GDA 1994 MGA Z55]*

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Layer Sources *DCDB (DRNM 2013) RE v6.1 (DEHP 2012) Quarry Location (Adani Mining Pty Ltd 2013)*

5. Disney Quarry

Field Survey Summary

1	**No** listed threatened flora were observed on-site
2	Vegetation structure consistent with Brigalow TEC was **not** observed on-site

Disney Quarry is located on Lot 4 on SP116046 and the proposed quarry footprint is approximately 56.57 ha, encompassing approximately 35.5 ha of mapped Least Concern Remnant vegetation and 20.42 ha of non-remnant vegetation (see **Appendix C**). An existing and disused quarry is located within the northern portion of the proposed quarry footprint.

Species composition within the mapped remnant polygon is consistent with Least Concern RE 11.11.15. Dominant species on-site included *Eucalyptus crebra* (Narrow Leaf Ironbark) and *Corymbia clarksoniana* (Long Fruited Bloodwood) with the occasional *Corymbia dallachiana* (Ghost Gum) (please see **Appendix D** for a full species list).

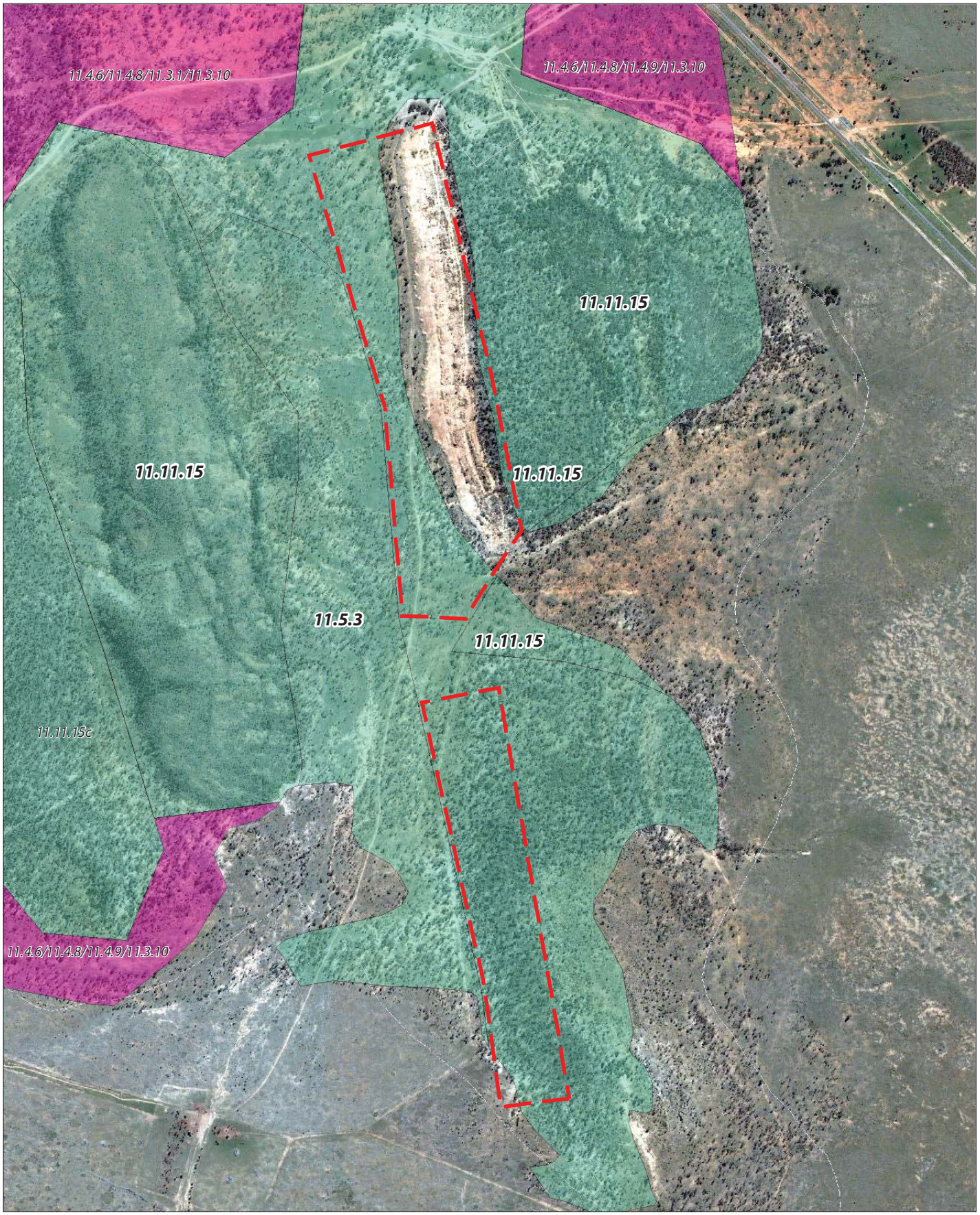
The proposed quarry is located adjacent to mapped Endangered RE polygons; one along its western boundary and two relatively small polygons of the same composition between the two proposed quarry pits. The mapped Endangered polygons consist of 80% Of Concern RE 11.4.6, 10% Endangered RE 11.4.8, 5% Endangered RE 11.4.9 and 5% Least Concern RE 11.3.10 (**Appendix C**). The following observations and technical data were recorded throughout respective polygons.

- The two small central Endangered polygons contain evidence of species associated with adjacent Least Concern RE 11.11.15. No evidence of Land Zone 4 was observed within these polygons.
- The relatively large Endangered polygon to the West of the proposed quarry site contained canopy species dominated by *Eucalyptus brownii* (Reid River Box) with one small patch of *Acacia cambagei* (Stinking Wattle) recorded in its North-West portion. Two isolated patches of *Acacia harpophylla* (Brigalow) containing no more than ten trees within each were recorded within the polygon.
- No clay deposits consistent with Land Zone 4 were observed throughout the western polygon. Some sediments and small rocks were observed on the soil surface.
- The broader landscape including the Least Concern vegetation community associated with the proposed quarry site contained evidence of metamorphosed rock folding more consistent with Land Zone 11.

Please see **Figure 3** Disney Quarry Proposed PMAV and imagery, next page, for on-ground proofing of site vegetation.

Photo: Existing and Proposed Disney Quarry Site

Photo: Mapped Endangered RE Adjacent to the Proposed Disney Quarry Site



Legend

Quarry Extraction Footprint

DCDB

PMAV Regional Ecosystem Amendments

Remnant vegetation containing Endangered REs

Remnant vegetation containing Of Concern REs

Remnant vegetation that is a Least Concern RE

Figure 3 *Lot 4 on SP116046 Quarry*

File ref. *6550 E 03 EPBC 4SP116046 Quarry A*
Date *9/04/2013*
Project *Carmichael Coal Rail Project*

0 50 100 200 300 400 500 *m*

Scale (A4): 1:14,000 [GDA 1994 MGA Z55]

N

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Layer Sources DCDB (DRNM 2013) RE v6.1 (DEHP 2012) Quarry Location (Adani Mining Pty Ltd 2013)

6. Borrow 7

Field Survey Summary

1	**No** listed threatened flora were observed on-site
2	Vegetation structure consistent with Brigalow TEC was **not** observed on-site

Borrow 7 is located on Lot 3235 on PH752 and the proposed quarry footprint is approximately 36.17 ha, encompassing approximately 29.44 ha of mapped Endangered Remnant vegetation and 6.73 ha of non-remnant vegetation (see **Appendix E**). The Endangered polygon that overlays the site is mapped as a composite Regional Ecosystem comprised of 90% Of Concern RE 11.4.6 and 10% Endangered RE 11.4.8.

Four vegetation transects to determine canopy structure were completed throughout the proposed quarry footprint mapped as containing Endangered remnant vegetation. Each transect revealed that canopy cover was less than that required for the vegetation to be categorised as remnant. Therefore no TECs were identified within the proposed quarry site.

In addition, no characteristics of Land Zone 4 were observed within the proposed quarry footprint where exposed and crumbling basalt is the predominant surface structure. Land Zone 4 characteristics were observed directly South-West of the quarry site although this portion of the polygon has been cleared of all vegetation values and is dominated by exotic *Pennisetum ciliare* (Buffel Grass).

The majority of observed trees were scattered along the outside edge of the proposed quarry footprint at the base of the hill. Species included *Corymbia dallachiana* (Ghost Gum), *Acacia harpophylla* (Brigalow), *Grevillea striata* (Beefwood), and *Acacia excelsa* (Ironwood) (please see **Appendix F** for a full species list).

Please see **Figure 4** Borrow 7 Proposed PMAV and imagery, below, for on-ground proofing of site vegetation.

Photo: Borrow 7 Quarry Site with Vegetation Proposed as Non-remnant

Legend

Quarry Extraction Footprint

DCDB

PMAV Regional Ecosystem Amendments

Remnant vegetation containing Endangered REs

Remnant vegetation containing Of Concern REs

Remnant vegetation that is a Least Concern RE

Figure 4 *Lot 3235 on PH752 Quarry*

File ref. *6550 E 04 EPBC 3235PH752 Quarry A*
Date *9/04/2013*
Project *Carmichael Coal Rail Project*

0 50 100 200 300 400 *m*

Scale (A4): 1:12,000 [GDA 1994 MGA Z55]

N

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Layer Sources DCDB (DRNM 2013) RE v6.1 (DEHP 2012) Quarry Location (Adani Mining Pty Ltd 2013)

7. Back Creek Quarry

Field Survey Summary

1	**No** listed threatened flora were observed on-site
2	Vegetation structure consistent with Brigalow TEC was **not** observed on-site

Back Creek Quarry is located on Lot 656 on SP138788 and the proposed quarry footprint is approximately 37.58 ha. The site is mapped as containing non-remnant vegetation (**Figure 5 & Appendix G**). A portion of the site towards the northern boundary has previously undergone extraction works and the surrounding area has likewise largely been cleared of vegetation values.

Pre-clear mapping overlays the site with Least Concern Regional Ecosystem 11.11.15. Species observed scattered throughout the proposed quarry site, such as *Eucalyptus crebra* (Narrow Leaf Ironbark), *Corymbia dallachiana* (Ghost Gum), and *Acacia excelsa* (Ironwood), are consistent with this Regional Ecosystem community (please see **Appendix H** for a full species list).

Land Zone characteristics within the proposed quarry site are consistent with Land Zone 11.

Photo: Mapped Non-remnant Vegetation at the Proposed Back Creek Quarry Site

Legend

Quarry Extraction Footprint

DCDB

Regional Ecosystem v6.1

Remnant vegetation containing Endangered REs

Remnant vegetation containing Of Concern REs

Remnant vegetation that is a Least Concern RE

Figure 5 *Lot 656 on SP138788 Quarry*

File ref. *6550 E 05 EPBC 656SP138788 Quarry A*
Date *9/04/2013*
Project *Carmichael Coal Rail Project*

0 50 100 200 300 400 *m*

Scale (A4): 1:12,000 [GDA 1994 MGA Z55]

N

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Layer Sources DCDB (DRNM 2013) RE v6.1 (DEHP 2012) Quarry Location (Adani Mining Pty Ltd 2013)

8. North Creek Quarry

Field Survey Summary

1	**No** listed threatened flora were observed on-site
2	Vegetation structure consistent with Brigalow TEC was **not** observed on-site

North Creek Quarry is located on Lot 2 on SP119925 and the proposed quarry footprint is approximately 14.45 ha. The site is mapped as containing non-remnant vegetation (**Figure 6 & Appendix I**). A portion of the site towards the southern boundary has previously undergone extraction works and the surrounding area has likewise been mostly cleared of vegetation values. Some regrowth shrubs were observed throughout the site.

Pre-clear mapping overlays the site with a composite Regional Ecosystem community comprised of 85% Least Concern RE 11.3.10., 10% Least Concern RE 11.3.5 and 5% Of Concern RE 11.3.3. Species observed scattered throughout the proposed quarry site are consistent with elements of each of these regional ecosystem communities (please see **Appendix J** for a full species list).

The site was highly disturbed and included soil piles of unknown origin.

Photo: Mapped Non-remnant Vegetation at the Proposed North Creek Quarry Site

Legend

Quarry Extraction Footprint

DCDB

Regional Ecosystem v6.1

Remnant vegetation containing Endangered REs

Remnant vegetation containing Of Concern REs

Remnant vegetation that is a Least Concern RE

Figure 6 *Lot 2 on SP119925 Quarry*

File ref. *6550 E 06 EPBC 2SP119925 Quarry A*
Date *9/04/2013*
Project *Carmichael Coal Rail Project*

0 50 100 200 300 400 *m*

Scale (A4): 1:12,000 [GDA 1994 MGA Z55]

N

adani™

saunders havill group

Layer Sources DCDB (DRNM 2013) RE v6.1 (DEHP 2012) Quarry Location (Adani Mining Pty Ltd 2013)

9. Moray Quarry

Field Survey Summary

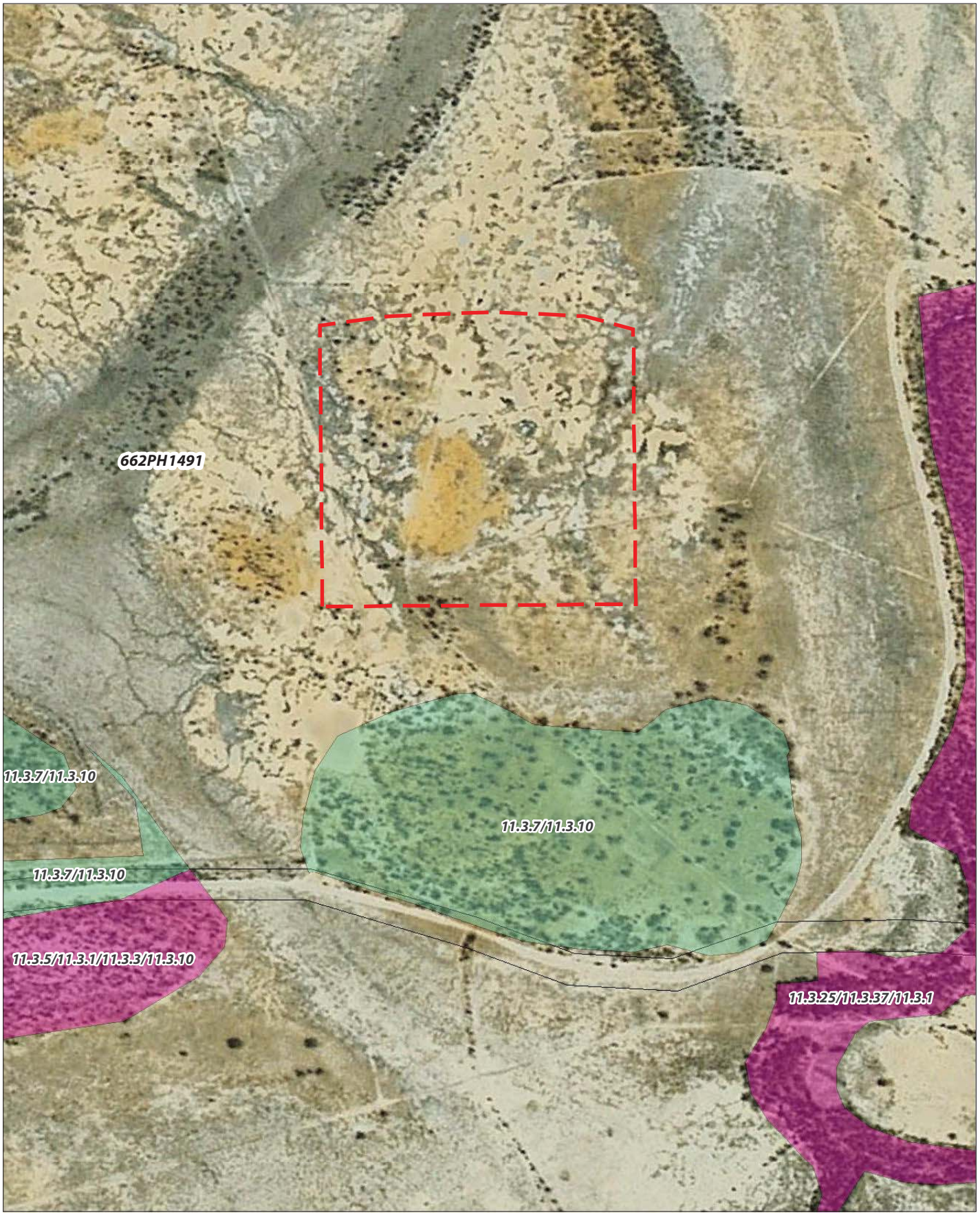
1	**No** listed threatened flora were observed on-site
2	Vegetation structure consistent with Brigalow TEC was **not** observed on-site

Moray Quarry is located on Lot 662 on PH1491 and the proposed quarry footprint is approximately 30.91 ha. The site is mapped as containing non-remnant vegetation (**Figure 7 & Appendix K**). A portion of the site has recently undergone some vegetation clearing as part of ongoing agricultural practices associated with cattle production.

Pre-clear mapping overlays the site with a composite Regional Ecosystem community comprised of 70% Least Concern RE 11.3.5., 10 % Endangered RE 11.3.1, 10% Of Concern RE 11.3.3 and 10% Least Concern RE 11.3.10. The site was highly disturbed and no evidence of species consistent with Endangered RE11.3.1 was observed.

Acacia cambagei (Stinking Wattle) consistent with the description of Least Concern RE 11.3.5 was observed in the western portion of the proposed quarry site. Vegetation towards the North and East contained regrowth species consistent with Of Concern RE 11.3.3 and Least Concern RE 11.3.10 (please see **Appendix L** for a full species list). Due to recent disturbances, no definitive line work for each of the communities could be determined.

Photo: Mapped Non-remnant Vegetation at the Proposed Moray Quarry Site



Legend

Quarry Extraction Footprint

DCDB

Regional Ecosystem v6.1

Remnant vegetation containing Endangered REs

Remnant vegetation containing Of Concern REs

Remnant vegetation that is a Least Concern RE

Figure 7 *Lot 662 on PH1491 Quarry*

File ref. *6550 E 07 EPBC 662PH1491 Quarry A*
Date *9/04/2013*
Project *Carmichael Coal Rail Project*

0 50 100 200 300 400 *m*

Scale (A4): 1:10,000 [GDA 1994 MGA Z55]

N

adani™

saunders havill group

Layer Sources DCDB (DRNM 2013) RE v6.1 (DEHP 2012) Quarry Location (Adani Mining Pty Ltd 2013)

10. Appendices

Appendix A

Elgin Quarry Regional Ecosysyem Mapping

Appendix B

Elgin Quarry Flora Species List

Appendix C

Disney Quarry Regional Ecosysyem Mapping

Appendix D

Disney Quarry Flora Species List

Appendix E

Borrow 7 Regional Ecosysyem Mapping

Appendix F

Borrow 7 Flora Species List

Appendix G

Back Creek Quarry Regional Ecosysyem Mapping

Appendix H

Back Creek Quarry Flora Species List

Appendix I

North Creek Quarry Regional Ecosysyem Mapping

Appendix J

North Creek Quarry Flora Species List

Appendix K

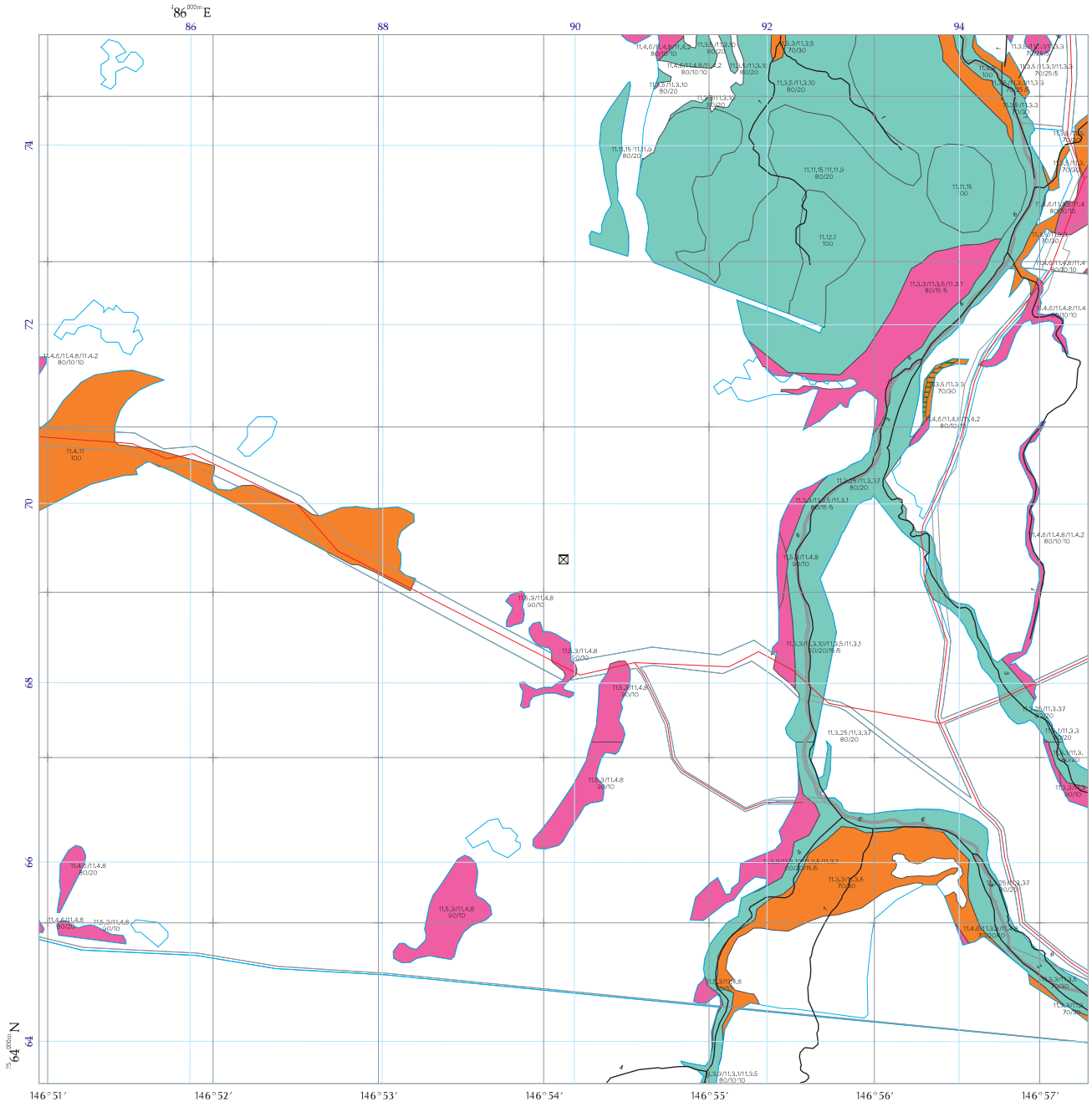
Moray Quarry Regional Ecosysyem Mapping

Appendix L

Moray Quarry Flora Species List

Appendix A

Elgin Quarry Regional Ecosystem Mapping



Vegetation Management Act Regional Ecosystem and Remnant Map-Version 6.1

Based on 2006 Landsat TM imagery

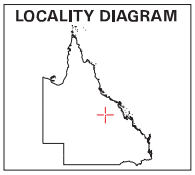
Requested By: ANDREWDAVIES@SAUNDERSHAVILL.COM
Date: 05 Mar 13 Time: 15.24.46

Centered on Coordinate:
Latitude: -21.98 Longitude: 146.902 (decimal degrees)
Bioregion: Brigalow Belt

- Remnant vegetation containing endangered regional ecosystems
- Remnant vegetation containing of concern regional ecosystems
- Remnant vegetation that is a least concern regional ecosystem
- Remnant vegetation under Section 20AH of the VMA
- Non-remnant
- Plantation Forest
- Dam or Reservoir
- Remnant Vegetation
- PMAV Category X area
- Great Barrier Reef Wetlands
- Vegetation Management Act Essential Habitat
  For further information on VMA Essential Habitat, please see the attached VMA Essential Habitat map.
- Subject Lot
- Watercourse (Stream order shown as black number against stream where available)
- Bioregion boundary
- Roads
  © Pitney Bowes Software 2012
- National Park, Conservation Area State Forest and other reserves
- Cadastral line
  Property boundaries shown are provided as a locational aid only.
- Towns
- Coordinate entered

Queensland Government

LOCALITY DIAGRAM



0 500 1000 1500 2000 2500m

A remnant map covers areas not covered by a regional ecosystem map.

Defined map areas are labelled with the regional ecosystem (RE) code along with the percentage breakdown if more than one RE occurs within the area. Detailed definitions of regional ecosystems are available from www.derm.qld.gov.au/REDD. Defined map areas smaller than 5ha may not be labelled.

Regional ecosystem linework has been compiled at a scale of 1:100 000, except in designated areas where a compilation scale of 1:50 000 is available. Linework should be used as a guide only. The positional accuracy of RE data mapped at a scale of 1:100 000 is +/-100 metres. The extent of remnant regional ecosystems as of 2006, depicted on this map is based on rectified 2006 Landsat TM imagery (supplied by the Statewide Landcover and Trees Study (SLATS), Queensland Government).

Some watercourse lines are derived from GeoScience Australia 1:250 000 mapping.

Disclaimer:
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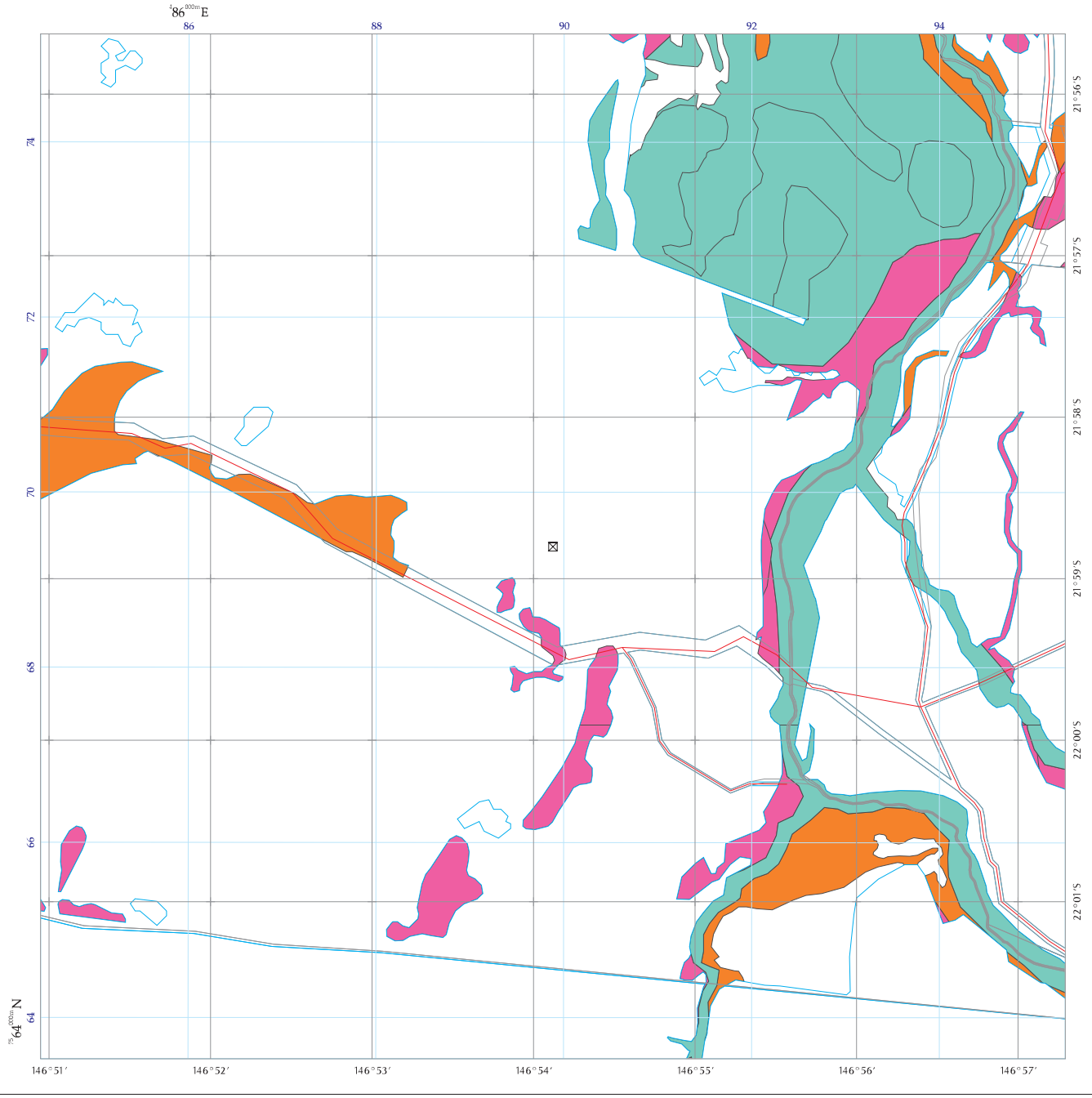
All datasets are updated as they become available to provide the most current information as of the date shown on this map.

Additional information is required for the purposes of land clearing or assessment of a regional ecosystem map or PMAV applications. For further information go to the web site: www.derm.qld.gov.au/vegetation or contact the Department of Natural Resources and Mines.

Digital regional ecosystem data is available in shapefile format, for Lot on Plans from www.derm.qld.gov.au/REDATA or from DNRM for larger areas.

Horizontal Datum: Geocentric Datum of Australia 1994 (GDA94)



Vegetation Management Act Essential Habitat Map Version 3.1

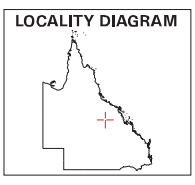
- Remnant vegetation containing endangered regional ecosystems
- Remnant vegetation containing of concern regional ecosystems
- Remnant vegetation that is a least concern regional ecosystem
- Remnant vegetation under Section 20AH of the VMA
- Non-remnant
- Plantation Forest
- Dam or Reservoir
- Remnant Vegetation
- PMAV Category X area
- Vegetation Management Act Essential Habitat
- Vegetation Management Act Essential Habitat Species Records
- Subject Lot
- Roads
  © Pitney Bowes Software 2012
- National Park, Conservation Area State Forest and other reserves
- Cadastral line
  Property boundaries shown are provided as a locational aid only.
- Towns
- ⊠ Coordinate entered

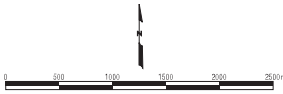
Requested By: ANDREWDAVIES@SAUNDERSHAVILL.COM
Date: 05 Mar 13 Time: 15.24.48

Centered on Coordinate:
Latitude: -21.98 Longitude: 146.902 (decimal degrees)

Queensland Government

LOCALITY DIAGRAM





Labels for the Vegetation Management Act Essential Habitat are centred on the subject lot (1.1km surrounding and including a Lot on Plan). Labels correlate to the label field in the attached essential habitat database.

Regional ecosystem linework has been compiled at a scale of 1:100 000, except in designated areas where a compilation scale of 1:50 000 is available. Linework should be used as a guide only. The positional accuracy of RE data mapped at a scale of 1:100 000 is +/-100 metres. The extent of remnant regional ecosystems as of 2006, depicted on this map is based on rectified 2006 Landsat TM imagery (supplied by SLATS, Queensland Government).

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Digital regional ecosystem data is available in shapefile format, for Lot on Plans from www.derm.qld.gov.au/REDATA or from DNRM for larger areas.

Horizontal Datum: Geocentric Datum of Australia 1994 (GDA94)

Appendix B

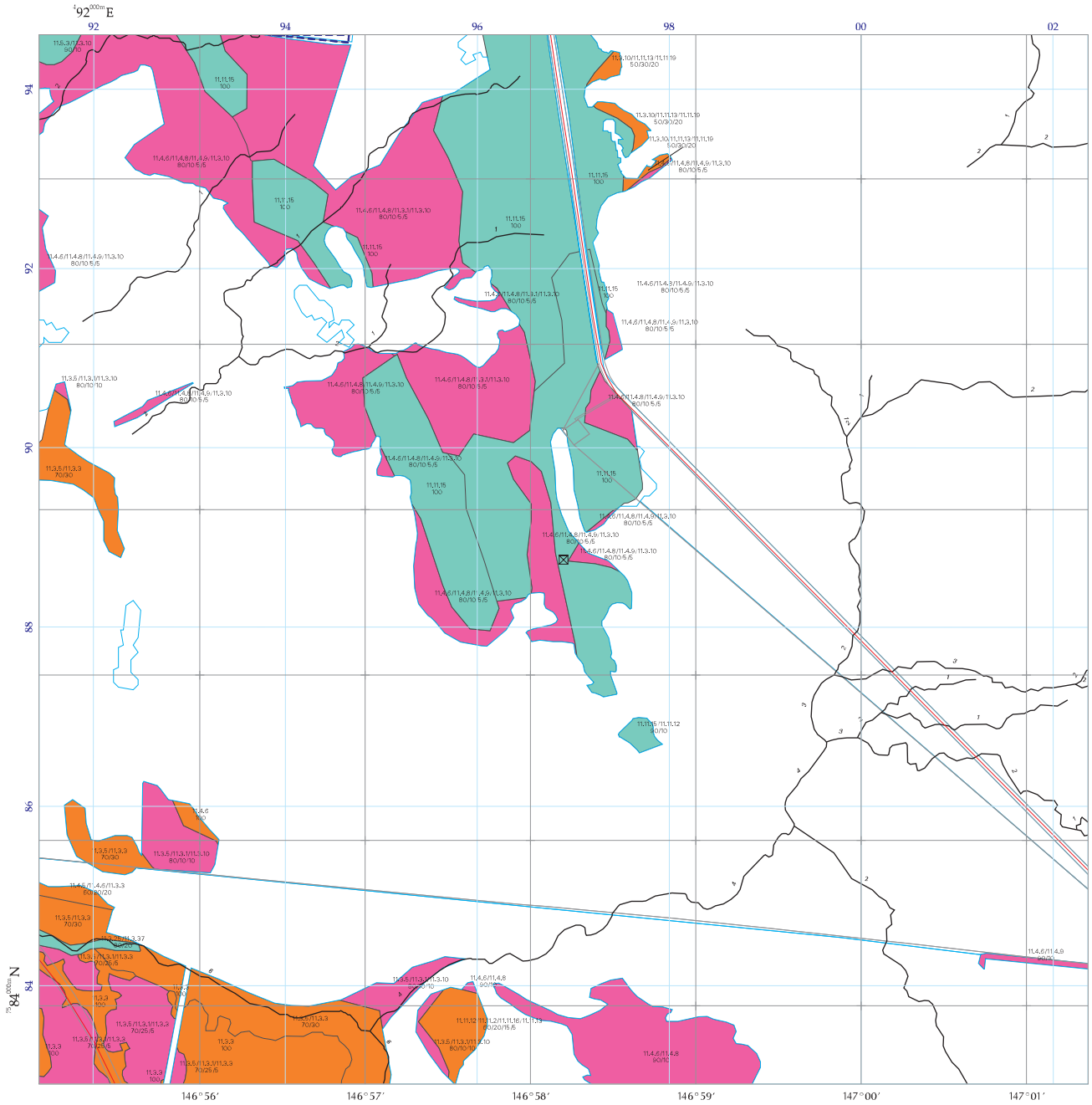
Elgin Quarry Flora Species List

Elgin Quarry Flora Species List

Scientific name	Common name
Aristida latifolia	Feathertop
Atalaya hemiglauca	Whitewood
Carissa ovata	Current Bush
Corymbia dallachiana	Ghost Gum
Dactyloctenium radulans	Button Grass
Eragrostis sororia	Woodland Lovegrass
Eriocereus martinii	Harrisia Cactus
Eucalyptus brownii	Reid River Box
Eucalyptus crebra	Narrow Leaf Ironbark
Indigofera linifolia	Narrow Leaved Indigo
Pennisetum ciliare	Buffel Grass
Sida cordifolia	Flannel Weed
Themeda triandra	Kangaroo Grass
Tragus australianus	Small Burrgrass

Appendix C

Disney Quarry Regional Ecosystem Mapping



Vegetation Management Act Regional Ecosystem and Remnant Map-Version 6.1

Based on 2006 Landsat TM imagery

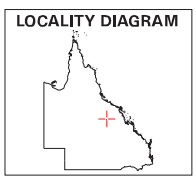
Requested By: ANDREWDAVIES@SAUNDERSHAVILL.COM
Date: 05 Mar 13 Time: 15.12.38

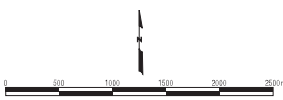
Centered on Coordinate:
Latitude: -21.805 Longitude: 146.97 (decimal degrees)
Bioregion: Brigalow Belt

- Remnant vegetation containing endangered regional ecosystems
- Remnant vegetation containing of concern regional ecosystems
- Remnant vegetation that is a least concern regional ecosystem
- Remnant vegetation under Section 20AH of the VMA
- Non-remnant
- Plantation Forest
- Dam or Reservoir
- Remnant Vegetation
- PMAV Category X area
- Great Barrier Reef Wetlands
- Vegetation Management Act Essential Habitat
  For further information on VMA Essential Habitat, please see the attached VMA Essential Habitat map.
- Subject Lot
- Watercourse (Stream order shown as black number against stream where available)
- Bioregion boundary
- Roads
  © Pitney Bowes Software 2012
- National Park, Conservation Area State Forest and other reserves
- Cadastral line
  Property boundaries shown are provided as a locational aid only.
- Towns
- Coordinate entered

Queensland Government

LOCALITY DIAGRAM





A remnant map covers areas not covered by a regional ecosystem map.

Defined map areas are labelled with the regional ecosystem (RE) code along with the percentage breakdown if more than one RE occurs within the area. Detailed definitions of regional ecosystems are available from www.derm.qld.gov.au/REDD. Defined map areas smaller than 5ha may not be labelled.

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Some watercourse lines are derived from GeoScience Australia 1:250 000 mapping.

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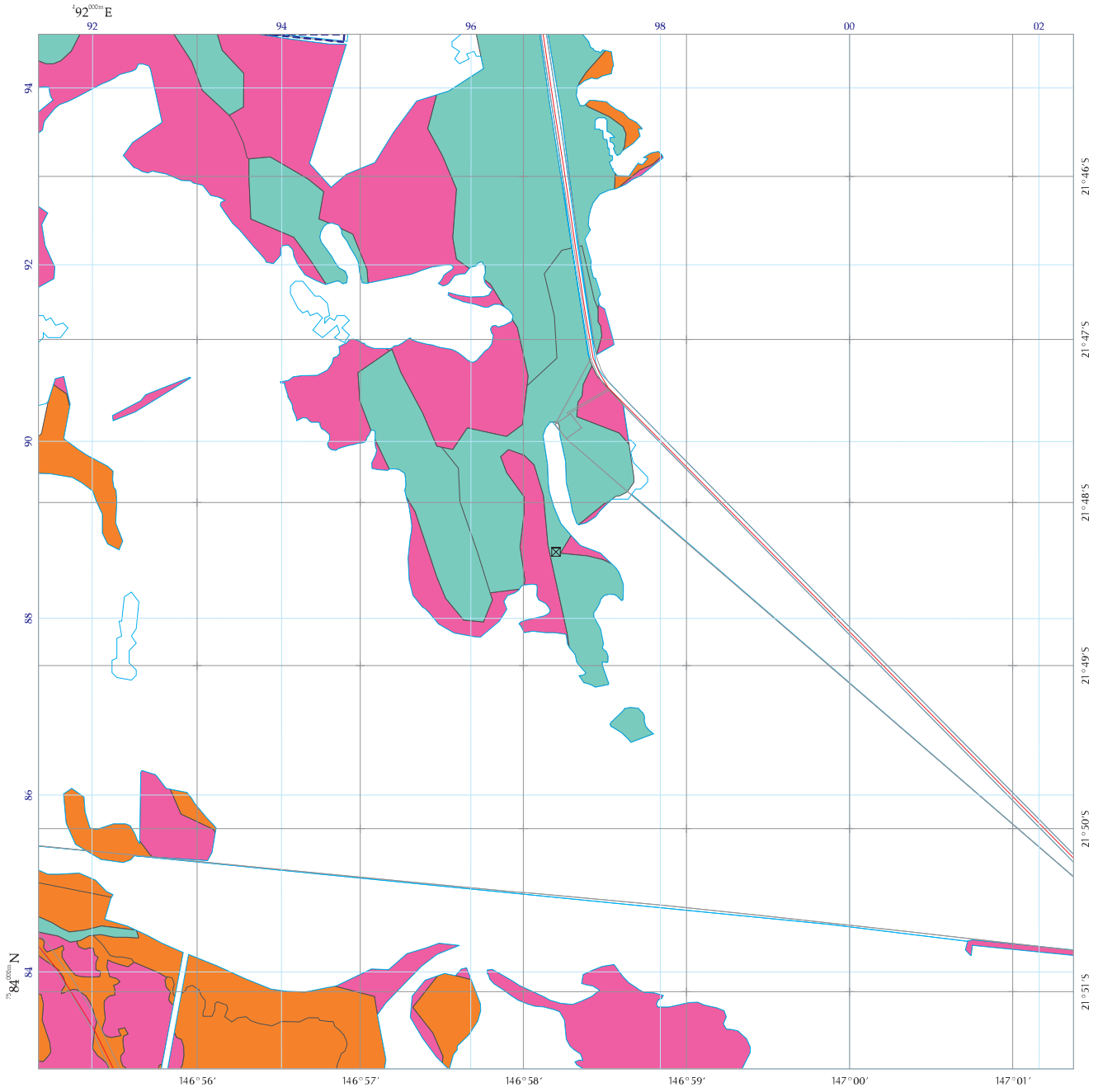
Horizontal Datum: Geocentric Datum of Australia 1994 (GDA94)



Vegetation Management Act Essential Habitat Map Version 3.1

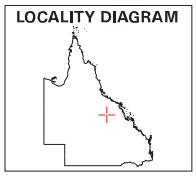
- Remnant vegetation containing endangered regional ecosystems
- Remnant vegetation containing of concern regional ecosystems
- Remnant vegetation that is a least concern regional ecosystem
- Remnant vegetation under Section 20AH of the VMA
- Non-remnant
- Plantation Forest
- Dam or Reservoir
- Remnant Vegetation
- PMAV Category X area
- Vegetation Management Act Essential Habitat
- Vegetation Management Act Essential Habitat Species Records
- Subject Lot
- Roads
  © Pitney Bowes Software 2012
- National Park, Conservation Area State Forest and other reserves
- Cadastral line
  Property boundaries shown are provided as a locational aid only.
- Towns
- Coordinate entered

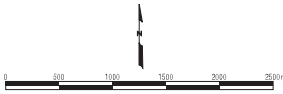
Requested By: ANDREWDAVIES@SAUNDERSHAVILL.COM
Date: 05 Mar 13 Time: 15.12.41

Centered on Coordinate:
Latitude: -21.805 Longitude: 146.97 (decimal degrees)

Queensland Government

LOCALITY DIAGRAM





Labels for the Vegetation Management Act Essential Habitat are centred on the subject lot (1.1km surrounding and including a Lot on Plan). Labels correlate to the label field in the attached essential habitat database.

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All datasets are updated as they become available to provide the most current information as of the date shown on this map.

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Digital regional ecosystem data is available in shapefile format, for Lot on Plans from www.derm.qld.gov.au/REDATA or from DNRM for larger areas.

Horizontal Datum: Geocentric Datum of Australia 1994 (GDA94)

Appendix D

Disney Quarry Flora Species List

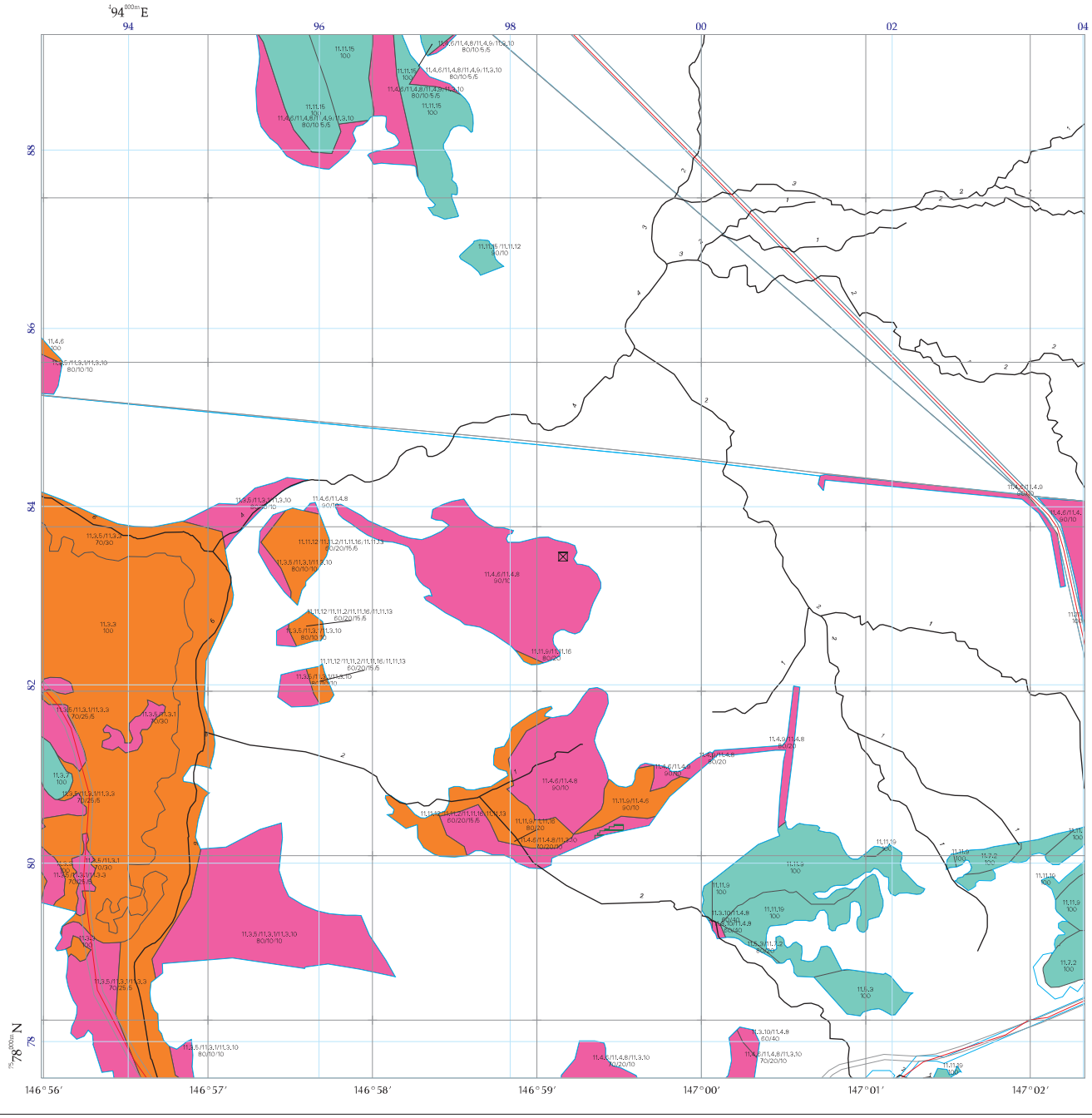
Disney Quarry Flora Species List

Scientific name	Common name
Acacia cambagei	Stinking Wattle
Acacia decora	Pretty Wattle
Acacia excelsa	Soap Tree
Acacia harpophylla	Brigalow
Acacia salicina	Sally Wattle
Alphitonia excelsa	Soap Tree
Archidendropsis basaltica	Dead Finish
Aristida latifolia	Feathertop Wiregrass
Atalaya hemiglauca	Whitewood
Breynia oblongifolia	Coffee Bush
Calotis sp.	Daisy Burr
Carissa ovata	Currant Bush
Cassia brewsteri	Leichhardt Bean
Chrysocephalum apiculatum	Yellow Buttons
Chrysopogon fallax	Golden Beard Grass
Citrus glauca	Limebush
Corymbia clarksoniana	Long Fruited Bloodwood
Corymbia dallachiana	Ghost Gum
Corymbia erythrophloia	Variable Barked Bloodwood
Corymbia setosa	Rough-leaved Bloodwood
Dodonaea filifolia	Hop Bush
Erythroxylum australe	Dogwood
Eucalyptus brownii	Reid River Box
Eucalyptus crebra	Narrow Leaf Ironbark
Grevillea decora	Grevillea
Grevillea pteridifolia	Grevillea
Grewia retusifolia	Dogs Balls
Heteropogon contortus	Black Speargrass
Hovea longipes	Brush Hovea
Lysiphyllum carronii	Bauhinia
Melaleuca nervosa	Paperbark
Melinis repens	Red Natal Grass
Owenia acidula	Emu Apple
Panicum decompositum	Umbrella Grass
Parthenium hysterophorus	Parthenium Weed
Pennisetum ciliare	Buffel Grass
Petalostigma pubescens	Quinine Bush
Pogonolobus reticulatus	Pogonolobus
Sida cordifolia	Flannel Weed
Terminalia oblongata	Yellowwood

Scientific name	Common name
Themeda triandra	Kangaroo Grass
Tragus australianus	Small Burrgrass
Triodia mitchellii	Buck Spinifex

Appendix E

Borrow 7 Regional Ecosystem Mapping



Vegetation Management Act Regional Ecosystem and Remnant Map-Version 6.1

Based on 2006 Landsat TM imagery

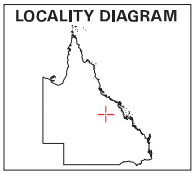
Requested By: ANDREWDAVIES@SAUNDERSHAVILL.COM
Date: 05 Mar 13 Time: 15.25.23

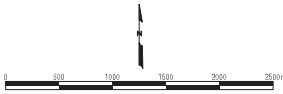
Centered on Coordinate:
Latitude: -21.853 Longitude: 146.986 (decimal degrees)
Bioregion: Brigalow Belt

- Remnant vegetation containing endangered regional ecosystems
- Remnant vegetation containing of concern regional ecosystems
- Remnant vegetation that is a least concern regional ecosystem
- Remnant vegetation under Section 20AH of the VMA
- Non-remnant
- Plantation Forest
- Dam or Reservoir
- Remnant Vegetation
- PMAV Category X area
- Great Barrier Reef Wetlands
- Vegetation Management Act Essential Habitat
  For further information on VMA Essential Habitat, please see the attached VMA Essential Habitat map.
- Subject Lot
- Watercourse (Stream order shown as black number against stream where available)
- Bioregion boundary
- Roads
  © Pitney Bowes Software 2012
- National Park, Conservation Area State Forest and other reserves
- Cadastral line
  Property boundaries shown are provided as a locational aid only.
- Towns
- Coordinate entered

Queensland Government

LOCALITY DIAGRAM





A remnant map covers areas not covered by a regional ecosystem map.

Defined map areas are labelled with the regional ecosystem (RE) code along with the percentage breakdown if more than one RE occurs within the area. Detailed definitions of regional ecosystems are available from www.derm.qld.gov.au/REDD. Defined map areas smaller than 5ha may not be labelled.

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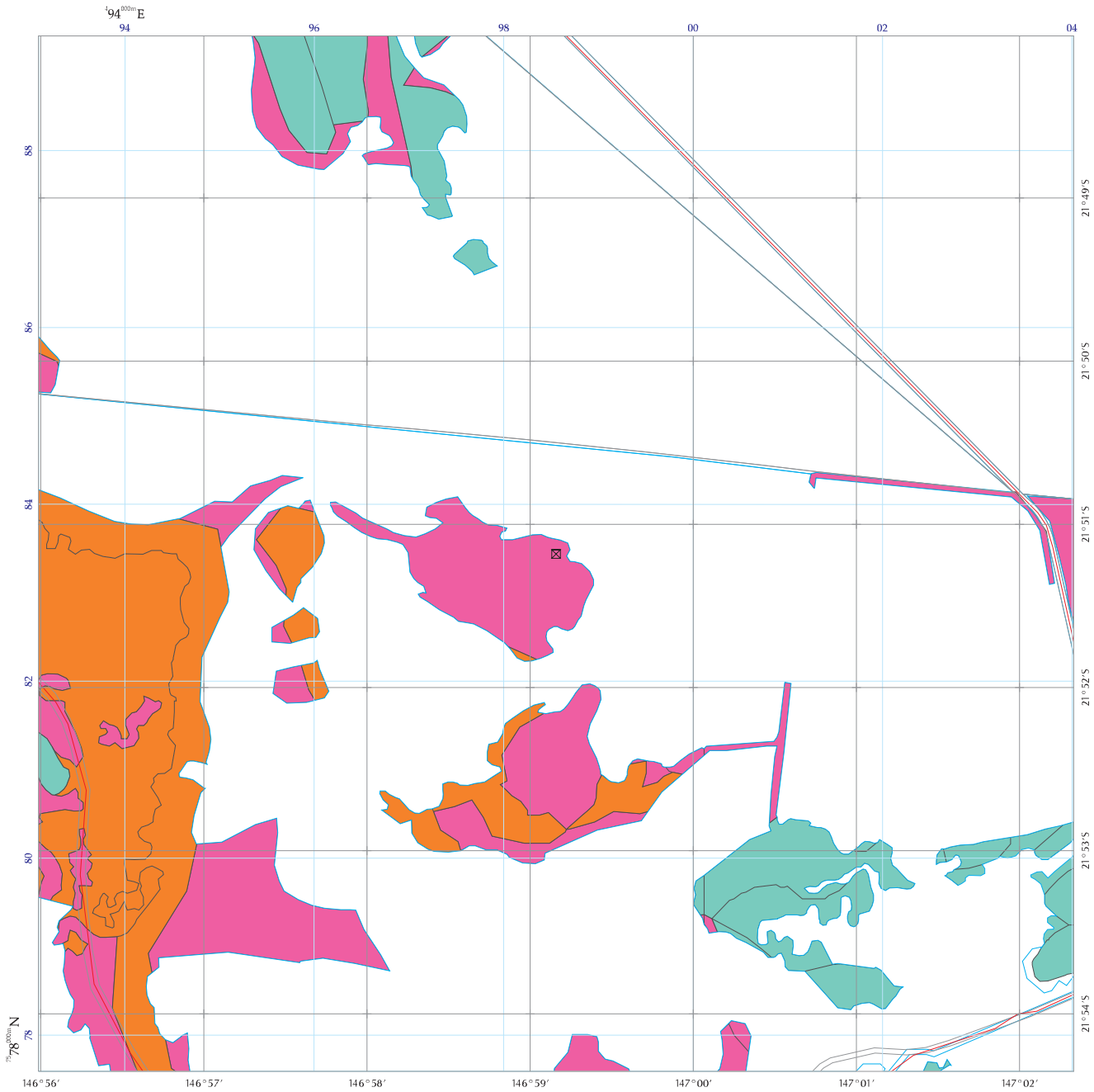
Digital regional ecosystem data is available in shapefile format, for Lot on Plans from www.derm.qld.gov.au/REDATA or from DNRM for larger areas.

Horizontal Datum: Geocentric Datum of Australia 1994 (GDA94)



Vegetation Management Act Essential Habitat Map Version 3.1

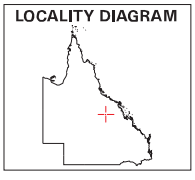
- Remnant vegetation containing endangered regional ecosystems
- Remnant vegetation containing of concern regional ecosystems
- Remnant vegetation that is a least concern regional ecosystem
- Remnant vegetation under Section 20AH of the VMA
- Non-remnant
- Plantation Forest
- Dam or Reservoir
- Remnant Vegetation
- PMAV Category X area
- Vegetation Management Act Essential Habitat
- Vegetation Management Act Essential Habitat Species Records
- Subject Lot
- Roads
  © Pitney Bowes Software 2012
- National Park, Conservation Area State Forest and other reserves
- Cadastral line
  Property boundaries shown are provided as a locational aid only.
- Towns
- Coordinate entered

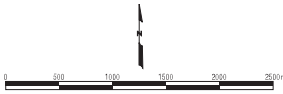
Requested By: ANDREWDAVIES@SAUNDERSHAVILL.COM
Date: 05 Mar 13 Time: 15.25.26

Centered on Coordinate:
Latitude: -21.853 Longitude: 146.986 (decimal degrees)

Queensland Government

LOCALITY DIAGRAM





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Horizontal Datum: Geocentric Datum of Australia 1994 (GDA94)

Appendix F

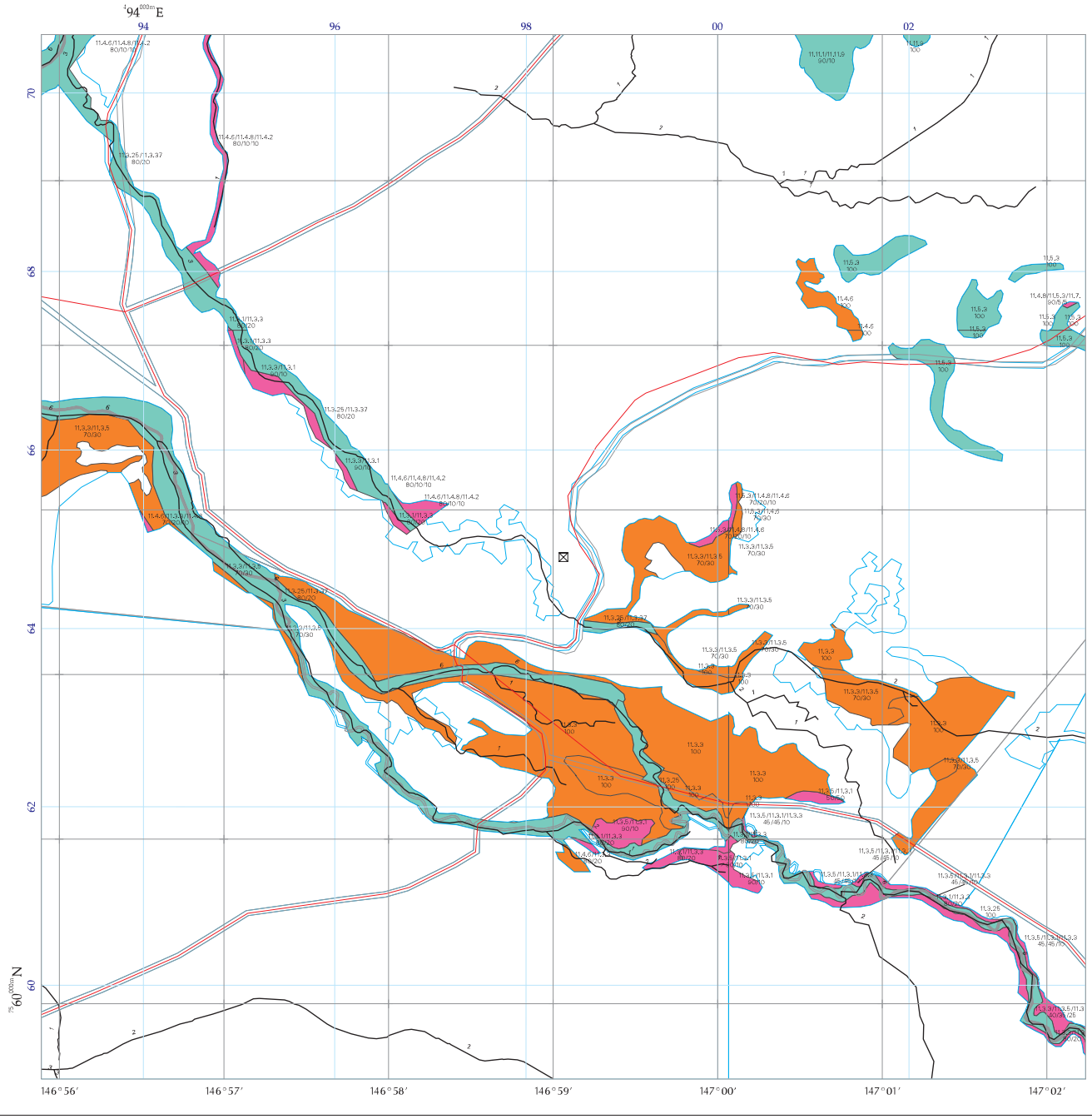
Borrow 7 Flora Species List

Borrow 7 Flora Species List

Scientific name	Common name
Acacia cambagei	Stinking wattle
Acacia excelsa	Ironwood
Acacia famesiana	Mimosa Bush
Acacia harpophylla	Brigalow
Apophyllum anomalum	Warrior Bush
Archidendropsis basaltica	Dead Finish
Aristida latifolia	Feathertop Wire Grass
Atalaya hemiglauca	Whitewood
Atriplex muelleri	Saltbush
Capparis lasiantha	Wait-a-while
Carissa ovata	Currant Bush
Corymbia clarksoniana	Clarkson's Bloodwood
Corymbia dallachiana	Ghost Gum
Enchylaena tomentosa	Ruby Saltbush
Eragrostis sororia	Woodland Lovegrass
Eremophila mitchellii	False Sandalwood
Eremophila sp.	Eremophila
Eriocereus martinii	Harrisia Cactus
Eucalyptus brownii	Reid River Box
Eucalyptus crebra	Narrow-leaved Ironbark
Flindersia dissosperma	Leopardwood
Grevillea striata	Beefwood
Heteropogon contortus	Black Spear Grass
Lysiphyllum carronii	Red Bauhinia
Melinis repens	Red Natal Grass
Owenia acidula	Emu Apple
Pennisetum ciliare	Buffel Grass
Petalostigma pubescens	Quinine Bush
Planchonia careya	Cocky Apple
Salsola kali	Soft Roly Poly
Sclerolaena birchii	Galvanised Burr
Sida cordifolia	Flannel Weed
Themeda triandra	Kangaroo Grass
Tragus australianus	Small Burrgrass

Appendix G

Back Creek Quarry Regional Ecosystem Mapping



Vegetation Management Act Regional Ecosystem and Remnant Map-Version 6.1

Based on 2006 Landsat TM imagery

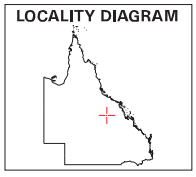
Requested By: ANDREWDAVIES@SAUNDERSHAVILL.COM
Date: 06 Mar 13 Time: 11.43.21

Centered on Coordinate:
Latitude: -22.0214 Longitude: 146.9844 (decimal degrees)
Bioregion: Brigalow Belt

- Remnant vegetation containing endangered regional ecosystems
- Remnant vegetation containing of concern regional ecosystems
- Remnant vegetation that is a least concern regional ecosystem
- Remnant vegetation under Section 20AH of the VMA
- Non-remnant
- Plantation Forest
- Dam or Reservoir
- Remnant Vegetation
- PMAV Category X area
- Great Barrier Reef Wetlands
- Vegetation Management Act Essential Habitat
  For further information on VMA Essential Habitat, please see the attached VMA Essential Habitat map.
- Subject Lot
- Watercourse (Stream order shown as black number against stream where available)
- Bioregion boundary
- Roads
  © Pitney Bowes Software 2012
- National Park, Conservation Area State Forest and other reserves
- Cadastral line
  Property boundaries shown are provided as a locational aid only.
- Towns
- Coordinate entered

Queensland Government

LOCALITY DIAGRAM



0 500 1000 1500 2000 2500m

A remnant map covers areas not covered by a regional ecosystem map.

Defined map areas are labelled with the regional ecosystem (RE) code along with the percentage breakdown if more than one RE occurs within the area. Detailed definitions of regional ecosystems are available from www.derm.qld.gov.au/REDD. Defined map areas smaller than 5ha may not be labelled.

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Some watercourse lines are derived from GeoScience Australia 1:250 000 mapping.

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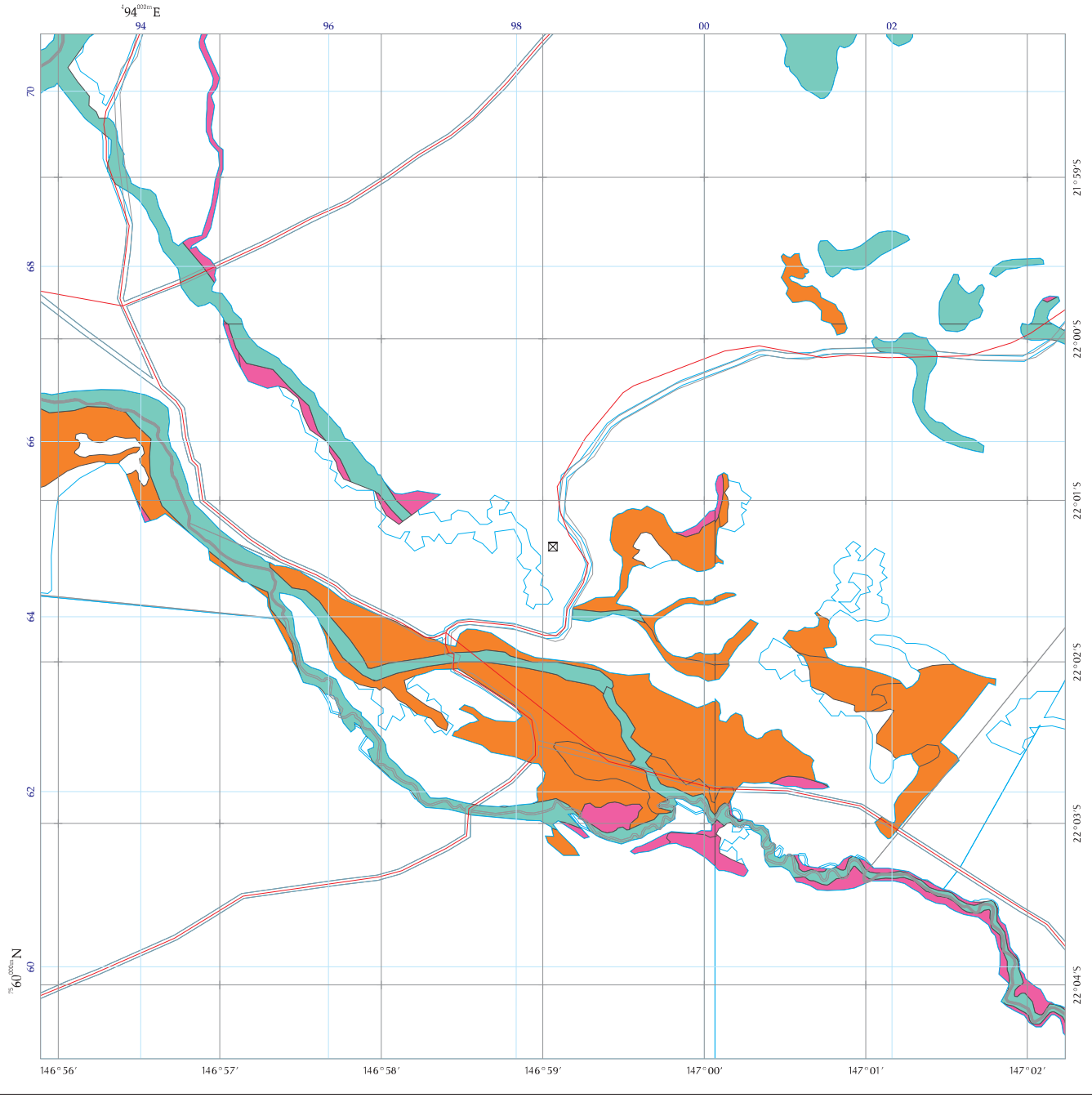
Horizontal Datum: Geocentric Datum of Australia 1994 (GDA94)



Vegetation Management Act Essential Habitat Map Version 3.1

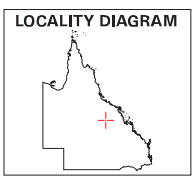
- Remnant vegetation containing endangered regional ecosystems
- Remnant vegetation containing of concern regional ecosystems
- Remnant vegetation that is a least concern regional ecosystem
- Remnant vegetation under Section 20AH of the VMA
- Non-remnant
- Plantation Forest
- Dam or Reservoir
- Remnant Vegetation
- PMAV Category X area
- Vegetation Management Act Essential Habitat
- Vegetation Management Act Essential Habitat Species Records
- Subject Lot
- Roads
  © Pitney Bowes Software 2012
- National Park, Conservation Area State Forest and other reserves
- Cadastral line
  Property boundaries shown are provided as a locational aid only.
- Towns
- ⊠ Coordinate entered

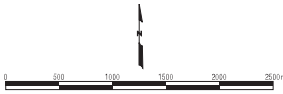
Requested By: ANDREWDAVIES@SAUNDERSHAVILL.COM
Date: 06 Mar 13 Time: 11.43.23

Centered on Coordinate:
Latitude: -22.0214 Longitude: 146.9844 (decimal degrees)

Queensland Government

LOCALITY DIAGRAM





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Horizontal Datum: Geocentric Datum of Australia 1994 (GDA94)

Appendix H

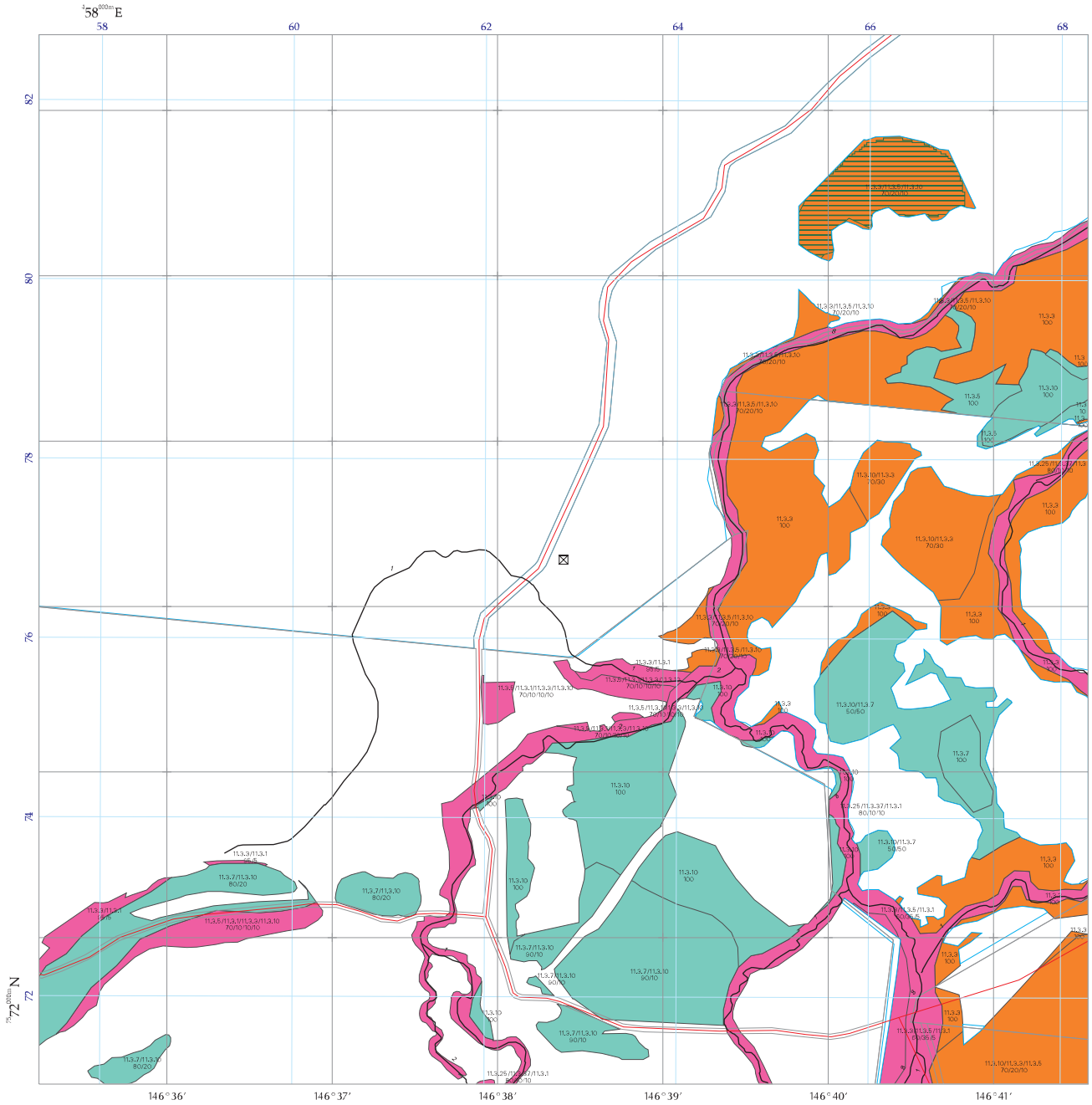
Back Creek Quarry Flora Species List

Back Creek Quarry Flora Species List

Scientific name	Common name
Acacia excelsa	Ironwood
Asclepias curassavica	Butterfly Weed
Corymbia dallachiana	Ghost Gum
Eucalyptus crebra	Narrow-leaved Ironbark
Flindersia dissosperma	Scrub Leopardwood
Heteropogon contortus	Black Spear Grass
Pennisetum ciliare	Buffel Grass
Ventilago viminalis	Vine Tree

Appendix I

North Creek Quarry Regional Ecosystem Mapping



Vegetation Management Act Regional Ecosystem and Remnant Map-Version 6.1

Based on 2006 Landsat TM imagery

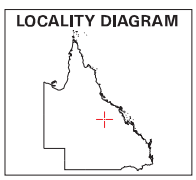
Requested By: ANDREWDAVIES@SAUNDERSHAVILL.COM
Date: 09 Apr 13 Time: 13.36.29

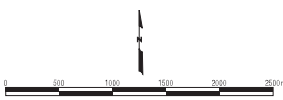
Centered on Coordinate:
Latitude: -21.9119 Longitude: 146.64 (decimal degrees)
Bioregion: Brigalow Belt

- Remnant vegetation containing endangered regional ecosystems
- Remnant vegetation containing of concern regional ecosystems
- Remnant vegetation that is a least concern regional ecosystem
- Remnant vegetation under Section 20AH of the VMA
- Non-remnant
- Plantation Forest
- Dam or Reservoir
- Remnant Vegetation
- PMAV Category X area
- Great Barrier Reef Wetlands
- Vegetation Management Act Essential Habitat
  For further information on VMA Essential Habitat, please see the attached VMA Essential Habitat map.
- Subject Lot
- Watercourse (Stream order shown as black number against stream where available)
- Bioregion boundary
- Roads
  © Pitney Bowes Software 2012
- National Park, Conservation Area State Forest and other reserves
- Cadastral line
  Property boundaries shown are provided as a locational aid only.
- Towns
- Coordinate entered

Queensland Government

LOCALITY DIAGRAM





A remnant map covers areas not covered by a regional ecosystem map.

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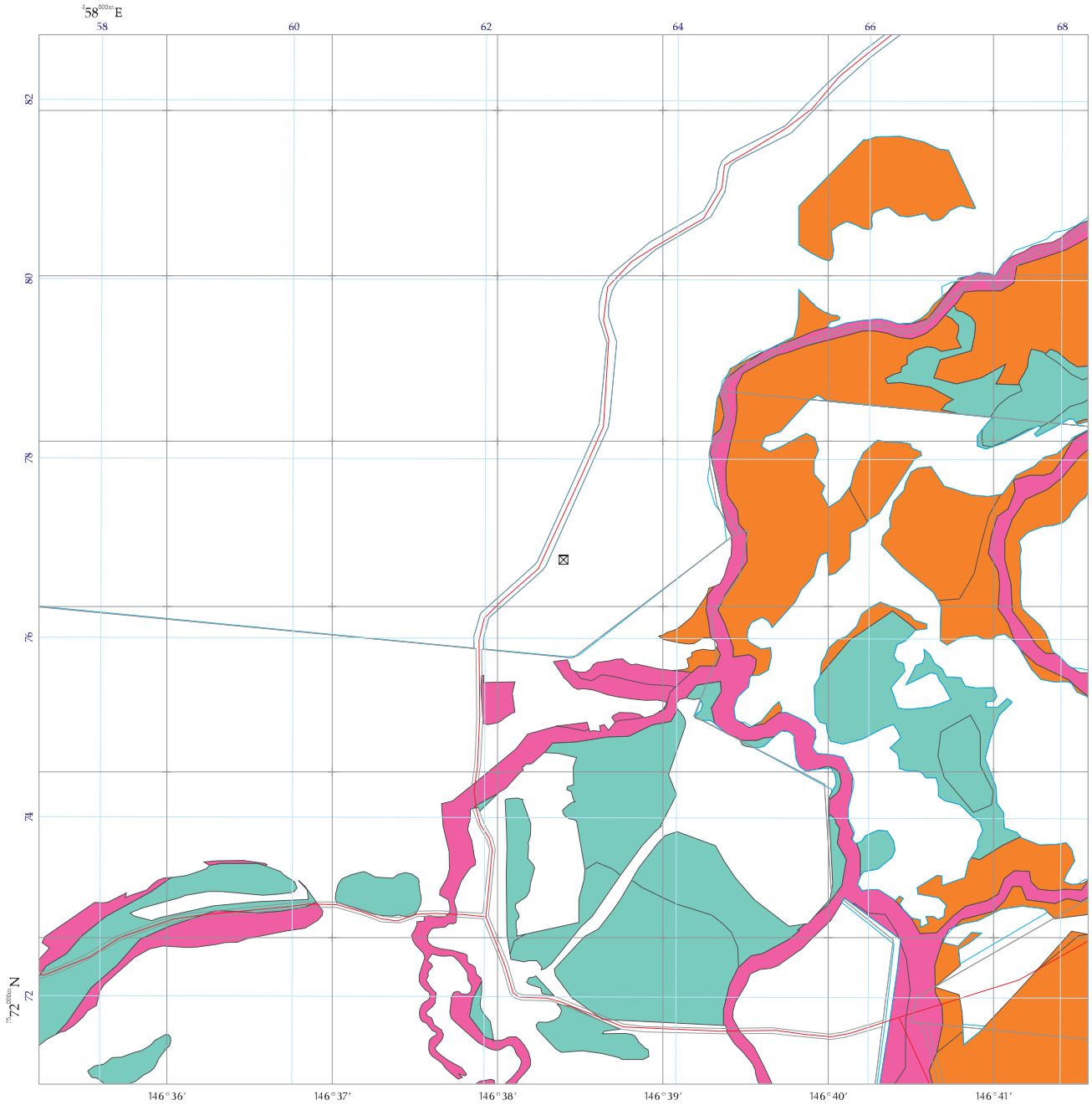
Horizontal Datum: Geocentric Datum of Australia 1994 (GDA94)



Vegetation Management Act Essential Habitat Map Version 3.1

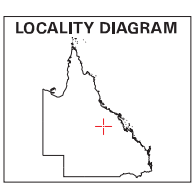
- Remnant vegetation containing endangered regional ecosystems
- Remnant vegetation containing of concern regional ecosystems
- Remnant vegetation that is a least concern regional ecosystem
- Remnant vegetation under Section 20AH of the VMA
- Non-remnant
- Plantation Forest
- Dam or Reservoir
- Remnant Vegetation
- PMAV Category X area
- Vegetation Management Act Essential Habitat
- Vegetation Management Act Essential Habitat Species Records
- Subject Lot
- Roads
  © Pitney Bowes Software 2012
- National Park, Conservation Area State Forest and other reserves
- Cadastral line
  Property boundaries shown are provided as a locational aid only.
- Towns
- ⊠ Coordinate entered

Requested By: ANDREWDAVIES@SAUNDERSHAVILL.COM
Date: 09 Apr 13 Time: 13.36.31

Centered on Coordinate:
Latitude: -21.9119 Longitude: 146.64 (decimal degrees)

Queensland Government

LOCALITY DIAGRAM



0 500 1000 1500 2000 2500m

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Horizontal Datum: Geocentric Datum of Australia 1994 (GDA94)

Appendix J

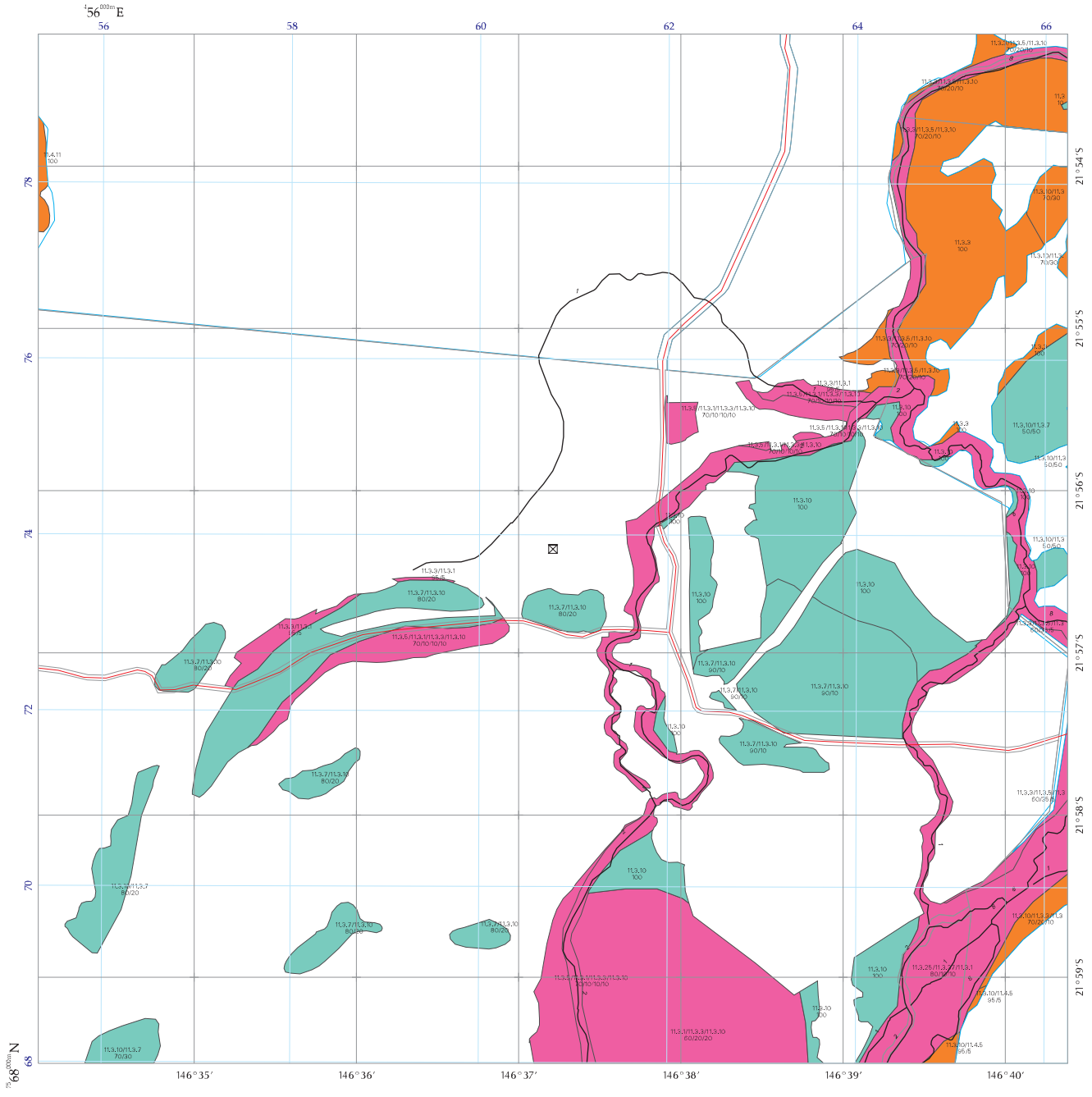
North Creek Quarry Flora Species List

North Creek Quarry Flora Species List

Scientific name	Common name
Carissa ovata	Currant Bush
Chloris gayana	Rhodes Grass
Erythroxylum australe	Dogwood
Eucalyptus coolabah	Coolabah
Lysiphyllum Carronii	Red Bauhinia
Owenia acidula	Emu Apple
Pennisetum ciliare	Buffel Grass

Appendix K

Moray Quarry Regional Ecosystem Mapping



Vegetation Management Act Regional Ecosystem and Remnant Map-Version 6.1

Based on 2006 Landsat TM imagery

Requested By: ANDREWDAVIES@SAUNDERSHAVILL.COM
Date: 06 Mar 13 Time: 11.39.43

Centered on Coordinate:
Latitude: -21.9393 Longitude: 146.6202 (decimal degrees)
Bioregion: Brigalow Belt

- Remnant vegetation containing endangered regional ecosystems
- Remnant vegetation containing of concern regional ecosystems
- Remnant vegetation that is a least concern regional ecosystem
- Remnant vegetation under Section 20AH of the VMA
- Non-remnant
- Plantation Forest
- Dam or Reservoir
- Remnant Vegetation
- PMAV Category X area
- Great Barrier Reef Wetlands
- Vegetation Management Act Essential Habitat
  For further information on VMA Essential Habitat, please see the attached VMA Essential Habitat map.
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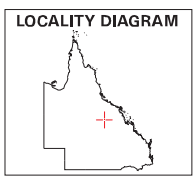
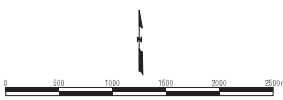
- Bioregion boundary
- Roads
  © Pitney Bowes Software 2012
- National Park, Conservation Area State Forest and other reserves
- Cadastral line
  Property boundaries shown are provided as a locational aid only.
- Towns
- Coordinate entered

Queensland Government

LOCALITY DIAGRAM





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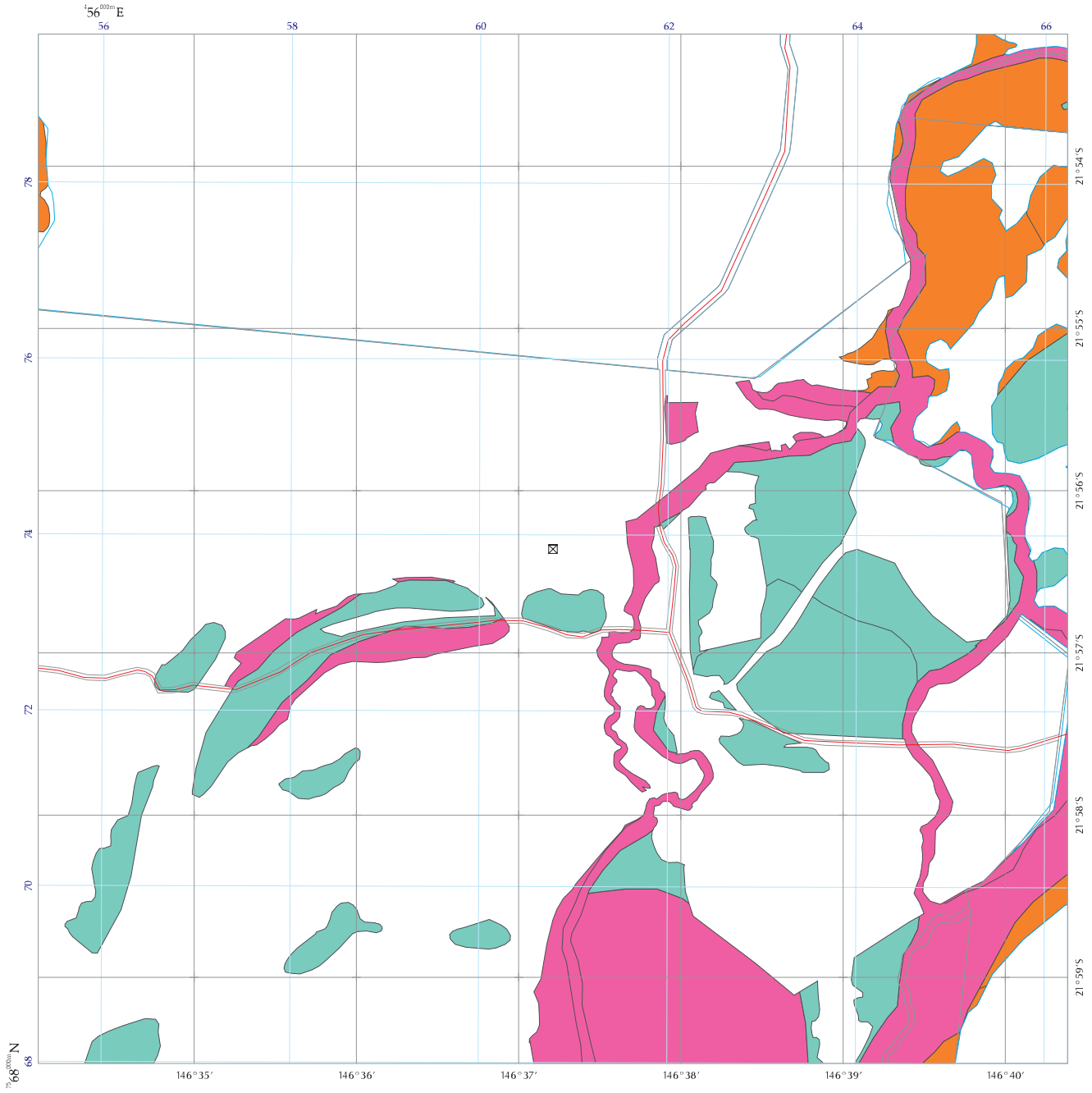
Horizontal Datum: Geocentric Datum of Australia 1994 (GDA94)



Vegetation Management Act Essential Habitat Map Version 3.1

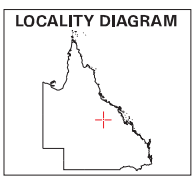
- Remnant vegetation containing endangered regional ecosystems
- Remnant vegetation containing of concern regional ecosystems
- Remnant vegetation that is a least concern regional ecosystem
- Remnant vegetation under Section 20AH of the VMA
- Non-remnant
- Plantation Forest
- Dam or Reservoir
- Remnant Vegetation
- PMAV Category X area
- Vegetation Management Act Essential Habitat
- Vegetation Management Act Essential Habitat Species Records
- Subject Lot
- Roads
  © Pitney Bowes Software 2012
- National Park, Conservation Area State Forest and other reserves
- Cadastral line
  Property boundaries shown are provided as a locational aid only.
- Towns
- Coordinate entered

Requested By: ANDREWDAVIES@SAUNDERSHAVILL.COM
Date: 06 Mar 13 Time: 11.39.45

Centered on Coordinate:
Latitude: -21.9393 Longitude: 146.6202 (decimal degrees)

Queensland Government

LOCALITY DIAGRAM



0 500 1000 1500 2000 2500m

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Horizontal Datum: Geocentric Datum of Australia 1994 (GDA94)

Appendix L

Moray Quarry Flora Species List

Moray Quarry Flora Species List

Scientific name	Common name
Acacia cambagei	Stinking Wattle
Astrebla squarrosa	Bull Mitchell
Atalaya hemiglauca	Whitewood
Bothriochloa bladhii	Forest Bluegrass
Carissa ovata	Currant Bush
Chloris gayana	Rhodes Grass
Flindersia dissosperma	Scrub Leopardwood
Pennisetum ciliare	Buffel Grass

Appendix D - Regional Ecosystem Descriptions of Quarry Areas

List and descriptions of Regional Ecosystems listed as occurring on quarry sites under current EHP mapping. Actual occurrence on quarry sites as observed during March 2013 site surveys (SaundersHavilll 2013) noted under 'occurrence notes'.

Qld's **Vegetation Management Act** status abbreviations**:** E = Endangered; OC = Of Concern; LC = Least Concern.

Regional Ecosystem	VM Act Status	Description	Occurrence notes
11.3.3	OC	Eucalyptus coolabah woodland to open-woodland with a grassy understorey. A mid layer is often absent but scattered tree or shrub species. Occurs on Cainozoic alluvial plains or levees with clay or sometimes texture contrast soils.	Back Creek - mapped as occurring adjacent to the east of quarry. Unconfirmed.
11.3.5	OC	Acacia cambagei +/- A. harpophylla low woodland or open-forest sometimes clumped, on Cainozoic alluvial plains. Associated soils are often texture contrast with sandy surfaces.	Back Creek - mapped as occurring adjacent to the east of quarry. Unconfirmed.
11.3.7	LC	Corymbia clarksoniana, C. tessellaris and C. dallachiana tall woodland to open-woodland (12-17m high). There is usually a low open-woodland tree layer. Occurs on levees and plains formed from Quaternary alluvial deposits. Soils are usually deep uniform sands with minor areas of sandy red earths.	Moray Pit – mapped as occurring in southern portion of site. Unconfirmed.
11.3.10	LC	Eucalyptus brownii grassy woodland. Occurs on Cainozoic alluvial plains.	Disney – does not occur on site Moray Pit – mapped as occurring in southern portion of site. Unconfirmed.
11.3.25	OC	Eucalyptus camaldulensis or E. tereticornis open-forest to woodland. Variety of other tree species present. An open to sparse, tall shrub layer is frequently present. Low shrubs are present, but rarely form a conspicuous layer. The ground layer is open to sparse. Occurs on fringing levees and banks of major rivers and drainage lines of alluvial plains throughout the region. Soils are very deep, alluvial, grey and brown cracking clays with or without some texture contrast.	Mapped as occurring adjacent to the south-east of Back Creek quarry. Unconfirmed.
11.3.37	OC	Eucalyptus coolabah with Eucalyptus camaldulensis form a distinct but discontinuous woodland to low woodland canopy layer. Occurs on fringing stream channels, usually braided. Soils are bed loads of clay or silt with cobbles and boulders in some areas.	Mapped as occurring adjacent to the south-east of Back Creek quarry. Unconfirmed.

11.4.6	OC	Acacia cambagei dominates the tree canopy (10-13m high). There is a sparse to open low tree layer. Occurs on gently undulating plains formed from Cainozoic sediments. Associated soils are texture contrast with thin sandy or loamy surface horizons and strongly alkaline clay subsoils.	Disney – does not occur on site Borrow 7 – does not occur on site
11.4.8	E	Woodland to open-forest dominated by Eucalyptus cambageana and Acacia harpophylla. There is a moderately dense low tree layer. Occurs on level to gently undulating plains formed from Cainozoic deposits. Associated soils are usually deep texture contrast with thin loamy or sandy surface horizons overlying strongly alkaline clay subsoils.	Elgin Pit – does not occur on site Disney – does not occur on site Borrow 7 – does not occur on site
11.4.9	E	Open-forest, occasionally woodland, dominated by Acacia harpophylla usually with a low tree mid-storey of Terminalia oblongata and Eremophila mitchellii. Occurs on level to gently undulating Cainozoic plains, including weathered basalt. Associated soils are predominantly moderately deep to deep cracking clays that may be brown, red-brown or grey-brown, and with much surface gravel in some areas.	Disney – does not occur on site
11.5.3	LC	Eucalyptus populnea +/- E. melanophloia +/- Corymbia clarksoniana +/- C. dallachiana and occasionally E. cambageana or E. brownii dominate the tree layer. There is generally a distinctive low tree layer. Occurs on flat to gently undulating plains formed from Cainozoic sediments. Associated soils are generally deep texture contrast with thick sandy surface horizons with some deep red earths.	Elgin Pit – confirmed as present Disney – confirmed as present
11.11.15	LC	Eucalyptus crebra +/- Corymbia erythrophloia +/- E. populnea +/- E. melanophloia +/- C. tessellaris +/- C. clarksoniana woodland often with a shrubby layer. Occurs on undulating rises and low hills, often with distinct strike pattern formed on moderately to strongly deformed and metamorphosed sediments and interbedded volcanics and Permian sediments.	Disney – confirmed as present

Appendix E - Habitat Condition Scores for EPBC Act Listed Species (GHD 2013b)

Condition Score	Ecological characteristics used to assess habitat condition for each species
Ornamental snake (*Denisonia maculata*)	
1 - 2	Remnant status - Non-remnant, regrowth - immature, structural complexity - low, grazing intensity - high (evidence of trampling, dung deposition), cracking clay soils - present
3 - 4	Remnant status - non-remnant, regrowth - advanced, structural complexity - low, grazing intensity - high, cracking clay soils - present
5 - 6	Remnant status - remnant (RE), structural complexity - low-moderate, grazing intensity - moderate - high, cracking clay soils - present
7 - 8	Remnant status - remnant (RE), structural complexity - moderate, grazing intensity - moderate, cracking clay soils - present
9 - 10	Remnant status - remnant (RE),vegetation, structural complexity - moderate-high, grazing intensity - low, cracking clay soils - present
Black-throated finch (southern) (*Poephila cincta cincta*)	
1 - 2	Buffel grass - dense, native grasses absent, grazing intensity - high
3 - 4	Buffel grass - moderate, native grasses absent, grazing intensity - high
5 - 6	Buffel grass - low - moderate, native grasses - moderate, grazing intensity - moderate
7 - 8	Buffel grass - low, native grasses - moderate, grazing intensity - low-moderate
9 - 10	Buffel grass - absent, native grasses - abundant and diverse, grazing intensity – low
Squatter pigeon (southern) (*Geophaps scripta scripta*)	
1 - 2	Buffel grass - dense, native grasses absent, grazing intensity - high, erosion - high
3 - 4	Buffel grass - moderate, native grasses absent, grazing intensity - high, erosion - high
5 - 6	Buffel grass - low/moderate, native grasses - moderate, grazing intensity – moderate, erosion - moderate
7 - 8	Buffel grass - low, native grasses - moderate, grazing intensity - low/moderate, erosion - low
9 - 10	Buffel grass - absent, native grasses - abundant and diverse, grazing intensity - low, erosion absent
Yakka skink (*Egernia rugosa*)	
1 - 2	Structural complexity - low, large logs - absent, ground cover - absent, grazing intensity - high, erosion - high, burrows - absent
3 - 4	Structural complexity - low/moderate, large logs - low abundance, ground cover -low abundance, grazing intensity - moderate/high, erosion - moderate/high, burrows - absent

Condition Score	Ecological characteristics used to assess habitat condition for each species
5 - 6	Structural complexity - moderate, large logs - moderate abundance, ground cover - moderate abundance, grazing intensity – low/moderate, erosion - moderate, burrows - absent
7 - 8	Structural complexity - moderate/high, large logs - moderate/high abundance, ground cover - moderate/high abundance, grazing intensity - low, erosion – low, burrows - present
9 - 10	Structural complexity - high, large logs - high abundance, ground cover - high abundance, grazing intensity - low, erosion - low, burrows - abundant
Koala (*Phascolarctos cinereus*)	
1 - 2	*E. tereticornis, E. camaldulensis* - sparse, understorey density - high, scratches/pellets - absent
3 - 4	*E. tereticornis, E. camaldulensis* - sub-dominant, understorey density - moderate, scratches/pellets - absent
5 - 6	*E. tereticornis, E. camaldulensis* - sub-dominant, understorey density - low/moderate, scratches/pellets - low abundance/old
7 - 8	*E. tereticornis, E. camaldulensis* – dominant, understorey density - low, scratches/pellets – moderate abundance/old
9 - 10	*E. tereticornis, E. camaldulensis* - dominant, understorey density - low, scratches/pellets - high abundance/recent

Appendix F - Disclaimer and Limitations

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