
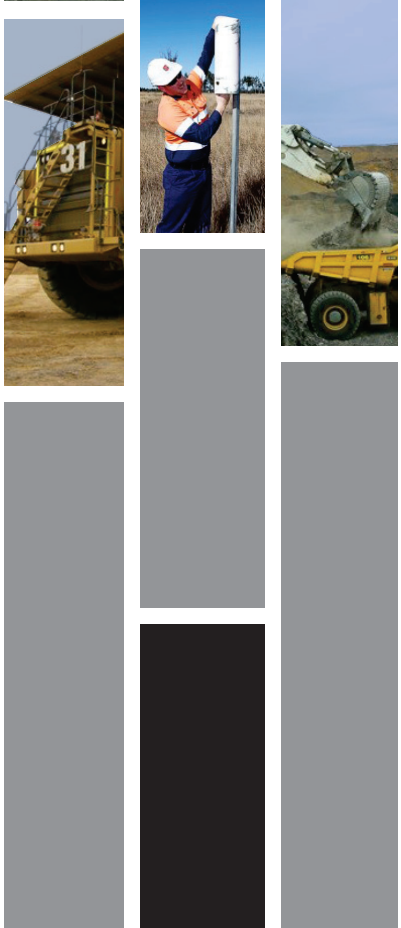

Cameby Downs Mine

Cameby Downs Continued Operations Project

Environmental Values Assessment

APPENDIX D

Terrestrial Flora Assessment

YANCOAL
兖煤澳大利亚有限公司

ecosure

Cameby Downs Continued Operations Project

Flora Assessment
May 2018

Syntech Resources Pty Ltd

ecology / vegetation / wildlife / aquatic ecology / GIS

Executive summary

The Cameby Downs Mine is owned and operated by Syntech Resources Pty Ltd (Syntech) and is managed by Yancoal. Syntech are considering expanding their operation area as part of the Cameby Downs Continued Operations Project (the Project) and an environmental values statement is being prepared to accompany a major Environmental Authority Amendment application.

Ecosure Pty Ltd (Ecosure) were commissioned to undertake a flora assessment for the Project. This flora assessment characterises the flora in the Project area, evaluates potential impacts and presents measures to avoid, mitigate and offset those impacts.

To supplement previous flora surveys undertaken over the last decade, Ecosure completed a flora survey of the Project area and surrounds from the 10-14 October 2016 and 6-14 March 2017. A total of 78 sites were assessed during the survey period, comprising 11 tertiary, 35 quaternary sites and 32 regional ecosystem boundary sites. The assessments were undertaken in accordance with the Queensland Herbarium vegetation survey methods within representative communities within the study area. Potentially occurring threatened species and communities were specifically targeted during the survey work.

As a result of the field verification, previous vegetation mapping for the area was reviewed and refined where necessary. Based on the refined mapping, 11 Regional Ecosystems (RE) occur within the study area, including:

- three Endangered Regional Ecosystems under the *Vegetation Management Act 1999* (VM Act) (RE 11.3.1, RE 11.4.3 and RE 11.4.10)
- two Of Concern Regional Ecosystems under the VM Act (RE11.3.2 and RE 11.3.4)
- six No Concern at Present Regional Ecosystems under the VM Act (RE 11.3.25, RE 11.5.1, RE 11.7.2, RE 11.7.4, RE 11.7.5, RE 11.7.7).

Brigalow Threatened Ecological Community listed under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) is present in the study area, mainly as linear features between former paddocks.

No threatened flora species listed under the *Nature Conservation Act 1992* or EPBC Act were recorded during the past (i.e. Biodiversity Assessment and Monitoring Pty Ltd, 2006; AustralAsian Resource Consultants Pty Ltd, 2013a and 2013b) or present (2016 and 2017) surveys.

A total of 129 flora species were identified during the present survey. Of these, 123 are native (122 least concern and one near threatened) and six are introduced species. Three weeds listed as restricted matter in the *Biosecurity Act 2014* were observed during the field survey, two of which are also listed as Weeds of National Significance.

After consideration of impact avoidance measures, the Project would clear a total of approximately 910 hectares (ha) of remnant vegetation: 36 ha in stage 1, 132 ha in stage 2, 470 ha in stage 3 and 271.5 ha in stage 4. This total includes approximately 20 ha of Endangered RE, approximately 18 ha of Of Concern REs and approximately 871 ha of No Concern at Present REs. Of the total vegetation to be cleared, 2.5 ha of REs are within 5 m of a watercourse. Impacts on connectivity and fragmentation are considered to be significant by the Department of Environment and Heritage Protection Landscape Fragmentation and Connectivity Tool: the post-clearing change at the local scale is 10% (the threshold for a significant impact is 5%). The vegetation clearance impacts would be mitigated over time by progressive rehabilitation of the post-mine landforms.

An environmental offset would be provided for the Project to address significant residual impacts on Matters of State Environmental Significance (i.e. Regulated Vegetation and Connectivity Areas) as determined by the *Queensland Environmental Offsets Policy — Draft Significant Residual Impacts Guideline*. In accordance with the *Queensland Environmental Offsets Policy*, a notice of election for Stage 1 will be provided to the Department of Environment and Heritage Protection no less than three months before residual significant impacts on any Matters of State Environmental Significance. The notice of election would include a description of the:

- offset delivery approach (a land-based proponent-driven offset site(s), direct-benefit offset and/or a financial settlement offset); and
- proposed staging details.

For subsequent stages, a detailed assessment of the impact of each stage of the Project and the offset requirement for each stage would be conducted prior to providing the notice of election to the Department of Environment and Heritage Protection for that stage. The offset would be provided before the commencement of each stage.

Glossary, acronyms and abbreviations

AARC	AustralAsian Resource Consultants Pty Ltd
BAAM	Biodiversity Assessment and Monitoring Pty Ltd
CDCOP	Cameby Downs Continued Operations Project
CE	critically endangered
CSG	coal seam gas
DEHP	Queensland Department of Environment and Heritage Protection
DNRM	Queensland Department of Natural Resources and Mines
E	endangered
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*
ESA	environmentally sensitive area
GDE	groundwater dependent ecosystem
MLA	mining lease application
ML	mining lease
MNES	matters of national environmental significance
MSES	matters of state environmental significance
NC	no concern at present
NC Act	*Nature Conservation Act 1992*
NT	near threatened
OC	of concern
OMP	Offset Management Plan
PPZ	primary protection zone
PWMP	Pest and Weed Management Plan
RE	Regional Ecosystem
V	vulnerable
VM Act	*Vegetation Management Act 1999*

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1 Introduction

The Cameby Downs Mine is owned and operated by Syntech Resources Pty Ltd (Syntech) and is managed by Yancoal Australia Ltd (Yancoal). Syntech Resources has lodged an amendment application to the Cameby Downs Mine Environmental Authority (EA) EPML00900113 in accordance with Section 224 of the Queensland *Environmental Protection Act 1994* (EP Act) to approve the Cameby Downs Continued Operations Project (the Project).

The Cameby Downs Mine is located approximately 360 kilometres (km) west-north-west of Brisbane in the Western Downs Regional Council (WDRC) local government area. The regional location of the Project is shown on Figure 1[1]. The Cameby Downs Mine has been operating for six years, with excavation of overburden commencing in July 2010 and first coal excavated in August of that year. The coal handling and preparation plant was commissioned in November 2010 with first railing of coal occurring in December 2010.

The Project involves a staged extension of operations within Mining Lease (ML) 50233 and into Mining Lease Applications (MLAs) 50258, 50259, 50260 and 50269 and an increase in the run-of-mine coal mining rate from the currently approved 2.8 million tonnes per annum (Mtpa) to 3.5 Mtpa. The Project life would be for approximately 75 years. Figure 2 shows the four proposed stages of mine extension.

Syntech Resources is seeking approval of the Project through a major amendment of the EA in accordance with Chapter 5, Part 7, Section 224 of the EP Act. The EA amendment application was lodged with the Queensland Department of Environment and Heritage Protection (DEHP) on 21 November 2016. DEHP subsequently made its Assessment Level Decision on 30 November 2016 that the proposed amendment is a major EA amendment application. DEHP issued an Information Request on 12 January 2017 to request additional information from Syntech Resources to enable it to make a decision on the application.

Syntech Resources has responded to DEHP's Information Request through an Environmental Values Assessment (EVA). This report supports the EVA to assess the potential environmental impacts associated with the development of the Project in accordance with the DEHP's Information Request.

Syntech has commissioned Ecosure Pty Ltd (Ecosure) to undertake terrestrial flora and fauna field surveys and ecological assessments to address the minimum requirements in the DEHP Information Request for an Amendment Application for an Environmental Authority. This report addresses the terrestrial flora components of the request for information.

[1] All Figures are presented in Appendix 1

1.1 Scope of works

The scope of works for the flora assessment consisted of the following components:

- Conduct a **desktop review** of available literature and previous studies in the vicinity of the study area (see Figure 1), and conduct database searches for threatened flora species. The desktop review includes the following:
  - a review of available regional and site-specific flora data, vegetation mapping, historical aerial photographs and previous flora studies (published and unpublished) of the study area
  - a search of relevant databases for potentially occurring conservation significant flora species listed under the Queensland *Nature Conservation Act 1992* (NC Act)
  - a search of relevant databases for potentially occurring threatened flora and ecological communities listed under the federal *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act)
  - a search of relevant databases for 'Endangered' or 'Of Concern' Regional Ecosystems (REs) under the *Vegetation Management Act 1999* (VM Act).
- Undertake **flora surveys** using appropriate methodology to:
  - target potentially-occurring conservation significant flora species listed under the NC Act or EPBC Act
  - target potentially occurring threatened ecological communities listed under the EPBC Act
  - ground-truth REs (including Endangered' or 'Of Concern' REs under the VM Act).
- Prepare an **assessment report** that provides:
  - a detailed summary of the desktop review findings, including a summary of all relevant previous reports and mapping, as well as the results of the database searches
  - a detailed description (including maps) of the survey methodologies, including timing, duration, survey effort and limitations
  - a list of all terrestrial flora species observed within the study area
  - a description and map(s) of all REs within the study area
  - a description of all Matters of State Environmental Significance (MSES) relevant to the Project area and a description of the potential adverse impacts associated with the Project
  - an assessment of the potential impacts of the Project on terrestrial flora (including conservation significant species and communities)
  - a description of measures to avoid and/or mitigate impacts to terrestrial flora
  - a description of why biodiversity offsets would/would not be required under the *Queensland Environmental* Offset *Policy*, 2014 (DEHP, 2014a).

This report also considers the requirements in the 'Application requirements for activities with impacts to land (ESR/2015/1839)'.

1.2 Study area

The study area is shown on Figure 1 and encompasses the existing ML (outside of the existing approved disturbance boundary) and four MLAs: MLA 50258, MLA 50259, MLA 50260 and MLA 50269.

The existing/approved Cameby Downs Mine was excluded from the study area (Figure 1).

1.3 Previous studies

The flora in the study area has been subject to multiple studies since 2004 as described below.

Biodiversity Assessment and Monitoring Pty Ltd (2006)

Biodiversity Assessment and Monitoring Pty Ltd (BAAM) (2006) undertook flora and fauna surveys for the original Cameby Downs Mine. The area surveyed was equivalent to the current mining lease (ML 50233). The surveys were undertaken in April and May 2004 and January, October and November 2005 (BAAM, 2006).

Quaternary level assessments were used to assist in amending mapping of native vegetation communities and to search for threatened flora species. A total of 41 such assessments were made.

BAAM found no plant species of conservation significance listed under the NC Act or EPBC Act but did map areas of RE 11.4.3 (an 'Endangered' RE under the VM Act), which they equated to the Brigalow (*Acacia harpophylla* dominant and co-dominant) ecological community (Brigalow TEC; listed under the EPBC Act). These areas of RE 11.4.3 are not included in the Remnant Regional Ecosystem Map (DSITI, 2016a).

The surveyed areas (both remnant and regrowth) were found to be relatively free of weeds, which were mostly exotic grasses. The most significant weed species detected were *Bryophyllum daigremontianum* x *Bryophyllum delagoense* (now *B.* x *houghtonii:* hybrid mother-of-millions), *Opuntia stricta* (prickly pear) and *O. tomentosa* (velvety tree pear).

AustralAsian Resource Consultants Pty Ltd (2013a)

AustralAsian Resource Consultants Pty Ltd (AARC) (2013a) undertook flora and fauna surveys for the previously proposed Cameby Downs Mine Expansion Project (which was subsequently discontinued by Syntech). The surveys were undertaken in February, April, June and October 2009. The area surveyed[2] was similar to the study area described in Section 1.2 (surrounding the existing Cameby Downs Mine ML 50233).

Flora assessments were based on 11 secondary transects and an unspecified number of quaternary level sites. In addition, random meander transects were used to search for conservation significant flora species.

This study also did not find any plants of conservation significance listed under the NC Act or EPBC Act, and also confirmed the presence of Brigalow TEC both inside the current mining lease (ML 50233) and to the south-east of the mining lease.

Four weeds of concern were detected; *Bryophyllum delagoense* (mother-of-millions), *Opuntia stricta* (prickly pear), *O. tomentosa* (velvety tree pear) and *Eragrostis curvula* (African lovegrass).

AARC (2013b) also prepared an assessment report for the then Cameby Downs Mine Expansion Project, which was subsequently discontinued.

[2] Vegetation mapping was also provided inside the existing Cameby Downs Mine ML 50233, despite no survey sites. The AARC (2013a) mapping inside the lease was based on BAAM (2006) vegetation mapping.

2 Existing environment

2.1 Regional setting

The study area is situated in the Western Downs Regional Council area in southern Queensland, approximately 16 km east-northeast of Miles. The Project is located within the Barakula subregion of the Brigalow Belt South Bioregion.

2.2 Topography

The majority of the study area is flat and lies within the Condamine-Balonne River Catchment of the Murray Darling Basin. Low rises and hills occur in the northern parts, with an approximately 50 m rise in elevation. Low (2-3 m) lateritic outcrops occur in the far north-western section.

2.3 Soils and geology

Soils are mostly alluvial sandy-clayey loams along watercourses, lateritic podsols or exposed duricrusts in northern sections (landzone 7) and sandy loams (landzone 5). Soils are of limited fertility, with the exception of small areas of clay-rich vertosol soils supporting brigalow (*Acacia harpophylla*) communities on landzone 3 in association with Quaternary alluvial systems close to drainage lines, and on older clay plains on landzone 4.

2.4 Land use

Land use within the study area (surrounding the Cameby Downs Mine), comprises cleared areas under grazing (cattle, horses), and uncleared remnant vegetation. There are substantial areas of woody regrowth where farming has been abandoned.

2.5 Surface hydrology

The majority of the study area drains to the south; however, the northern extent of the study area drains north.

The creeks are ephemeral in the upper reaches, with some more or less permanent pools in the far southern part of the study area. These pools contained water at the time of survey, but there was no flow. The low topography and limited fall in elevation allows for the accumulation of slow-moving surface waters.

An aquatic ecology assessment (including an assessment of aquatic plants) has been prepared for the Project by DPM Envirosciences Pty Ltd (2018).

2.6 Climate

The study area locality has a sub-tropical climate with wet humid summers and typically dry winters. The mean annual rainfall (taken from Miles Post Office station 042023) (BOM 2017) is 648 mm (based on 127 years of data). The highest rainfall occurs between December and February.

The mean maximum temperature is 27.1°C and the mean minimum temperature is 12.2°C (BOM 2017). The coldest month of the year is July and the warmest January. The area is relatively humid all year round with the average relative humidity for 9am being 63%.

2.7 Protected areas

There are no protected areas within the study area or surrounds.

2.8 State forests

Barakula State Forest is located approximately 12 km to the north of the study area (Figure 1). The mine is also approximately 24 km southeast of Gurulmundi State Forest.

2.9 Protected plants and essential habitat

The Protected Plants Flora Survey Trigger map (DEHP 2016a) was referred to prior to conducting the surveys. The study area is not located within an area identified as a High Risk Area in the Protected Flora Survey Trigger map (DEHP 2016a) (Appendix 5).

Essential habitat for conservation significant flora has not been mapped within the study area (Figure 3).

2.10 Regional ecosystem mapping

The vegetation identified during the field survey was assigned to regional ecosystems described for the BBS bioregion in the Regional Ecosystem Description Database (DEHP 2016b).

The REs and areas within the study that were mapped by DSITI (2016a) and then refined by this study are described in Section 4.1.3 and Table 3. DSITI (2016a) mapped nine REs (dominant and/or subdominant) within the study area (Figures 4.1 and 4.2). These comprise:

- one Endangered RE (RE 11.3.1)
- two Of Concern REs (RE 11.3.2, RE 11.3.4)
- six No Concern at Present REs (RE 11.3.25, RE 11.5.1, RE 11.7.2, RE 11.7.4, RE 11.7.5, RE 11.7.7).

2.11 Biodiversity planning assessment

Biodiversity Planning Assessments were developed to provide a consistent approach to assessing and mapping biodiversity values at a landscape scale (EPA, 2012). Areas of remnant vegetation are defined as being of state, regional or local significance based on an assessment of a number of ecological criteria (i.e. size, rarity, condition, habitat for EVNT species). Datasets for the Brigalow Belt (DEHP, 2014b) were interrogated.

The study area lies between two bioregional corridors of state significance (DEHP, 2015), but no mapped corridors occur in the study area (Figure 3).

2.12 Environmentally sensitive areas

The *Eligibility criteria and standard conditions for exploration and mineral development projects*—Version 2 (DEHP 2014c) defines environmentally sensitive areas (ESAs) as Category A, Category B and Category C. Category A and B areas are defined in the EP Regulation 2008, while category C areas are defined in the Environmental Authority (EA) for the proposed Environmentally Relevant Activity (ERA).

Category A, B and C ESAs have a primary protection zone (PPZ) that extends 200 m from the ESA boundary. Additionally, category A and B ESAs have a secondary protection zone that extends a further 100 m from the boundary of the PPZ.

A search of the ESAs mapping tool (DEHP, 2016c) based on ML 50233 and MLAs 50258, 50259, 50260 and 50269 identified a small area of Category B ESA within the southern extent of the study area.

It is recognised that fine-scale mapping by BAAM (2006) and AARC (2013a) identified remnant Brigalow (RE 11.4.3 – listed as 'Endangered') within the study area. However, the Remnant Regional Ecosystem Map (DSITI, 2016a) also does not record the presence of Brigalow RE 11.4.3 in the western part of the study area (Ryall's Road), presumably because the patches are below the threshold width of 100 m mappable at 1:100,000 scale (Neldner et al*.,* 2017) (the patches are 50-80 m wide at their widest).

The ESAs were ground-truthed by Ecosure and are discussed in more detail in Section 5.4.

2.13 Groundwater dependent ecosystems

A groundwater dependent ecosystem (GDE) is one in which the plant and/or animal community is dependent on the availability of groundwater to maintain its structure and function. Desktop mapping of potential GDEs through-out Queensland (DSITI, 2017 and BoM, 2017[3]) indicates that areas of terrestrial vegetation and aquatic ecosystems in the Project area and surrounds may be GDEs (Figure 5). Specifically, the desktop GDE mapping (DSITI, 2017 and BoM, 2017) indicates:

- drainage features in the north of the Project area (mainly Drainage Lines 5 and 6 [and associated minor drainage features] - Figure 5) potentially receive surface expression of groundwater (possibly supporting an aquatic ecosystem) and are potentially associated with subsurface presence of groundwater (possibly supporting terrestrial riparian vegetation - mapped as *'treed vegetation fringing channels on unweathered sandstones'*)
- a patch of terrestrial vegetation in ML 50233 (groundtruthed by Ecosure as RE 11.5.1) is potentially associated with subsurface presence of groundwater (mapped as *'treed non-wetland vegetation on alluvia'*)
- patches of terrestrial vegetation south of ML 50233 are potentially associated with subsurface presence of groundwater (mapped as *'treed non-wetland vegetation on alluvia'*) (Figure 5).

The desktop GDE mapping (DSITI, 2017 and BoM, 2017) of the Project locality is not based on site specific work and has a moderate confidence level in regard to the potential for GDEs along the drainage features and a low confidence level in regard to the patches of terrestrial vegetation inside and south of ML 50233. The accuracy of the GDE desktop mapping sources has been reviewed by AGE (2018), DPM Enviroscienses (2018) and Ecosure and the findings are discussed in Section 4.1.5.

There are no GDEs associated with watercourses, wetlands or springs in the Project area or surrounds based on the desktop review.

2.14 Matters of state environmental significance

MSES (recognised under the EO Regulation) are:

- Regulated vegetation
- Connectivity areas
- Wetlands and watercourses
- Designated precinct in a strategic environmental area
- Protected wildlife habitat
- Protected areas

[3] Note: Bureau of Meteorology (2017) mapping is based on the DSITI (2017) mapping as of June 2017.

- Highly protected zones of State marine parks
- Fish habitat areas
- Waterway providing for fish passage
- Marine plants
- Legally secured offset areas.

Based on a desktop review of the MSES mapping (DEHP 2014d) and Remnant Regional Ecosystem Map (DSITI 2016a), prior to the survey, a small proportion of the study area is mapped as being MSES (Figure 6). These areas are mapped as significant as they coincide with areas containing the following values:

- Regulated vegetation
  - Endangered Regional Ecosystems (namely RE 11.3.1, 11.4.3 – Figure 4.1 and 4.2)
  - Of Concern Regional Ecosystems (namely RE 11.3.2 – Figure 4.1 and 4.2).
- Regulated vegetation (intersecting a watercourse)
  - RE 11.3.25 and RE 11.3.2 (intersecting drainage lines).

2.15 Matters of national environmental significance

The *EPBC Act Protected Matters Search Tool* (PMST) (DoEE, 2016) indicated a number of MNES that are known or could occur in a 20 km search buffer around the study area. These included the following threatened communities and flora species:

- four threatened ecological communities listed under the EPBC Act:
  - Brigalow (*Acacia harpophylla* dominant and co-dominant): endangered community known to occur
  - Coolibah - Black Box Woodlands of the Darling Riverine Plains and the Brigalow Belt South Bioregions: endangered community may occur
  - Natural grasslands on basalt and fine-textured alluvial plains of northern New South Wales and southern Queensland: critically endangered community likely to occur
  - Weeping Myall Woodlands: endangered community likely to occur within area.
- seven threatened plant species:
  - *Acacia handonis*
  - *Cadellia pentastylis*
  - *Calytrix gurulmundensis*
  - *Homopholis belsonii*
  - *Homoranthus decumbens*
  - *Thesium australe*
  - *Westringia parvifolia*.

The full PMST report is provided in Appendix 2. As described in Section 4.1.2, Brigalow (*Acacia harpophylla* dominant and co-dominant) occurs within the study area (represented by RE 11.3.1 and 11.4.3). Section 7.1 describes how impacts on RE 11.3.1 would be avoided and impacts on RE 11.4.3 would be reduced. The area of RE 11.4.3 proposed to be cleared is quantified in Section 5.1. No other threatened ecological communities or threatened flora species listed under the EPBC Act occur in the study area (Sections 4.1.2 and 4.2).

3 Methods

3.1 Assessment team

The flora assessment was undertaken by Dr Alan House (Principal Ecologist), Bob Johnston (Ecologist) and Dr Trevor Meers (Principal Botanist). Alan and Trevor both meet DEHP's protected flora survey guideline requirements (DEHP, 2016d), having at least 5 years' experience in undertaking surveys for protected flora (Appendix 3).

3.2 Taxonomic nomenclature

Scientific names of flora used in this report follow the Queensland Herbarium (Bostock and Holland, 2013).

3.3 Determination of significance level for flora

Federally-listed threatened flora species are those taxa listed as Endangered, Vulnerable or Near Threatened under the EPBC Act. State-listed conservation significant species are listed in the NC Act as Critically Endangered (CE), Endangered (E), Vulnerable (V) or Near Threatened (NT). All other native flora species have been designated as being Special Least Concern or Least Concern consistent with the State terminology.

For mining projects, REs are also classified according to their 'biodiversity status' as Endangered (E), Of Concern (OC), and No Concern at Present (NC).

Collectively, these conservation significant species are referred to herein as Endangered, Vulnerable or Near Threatened (EVNT).

3.4 Desktop assessment

Ecosure completed a desktop assessment of the study area to gain an appreciation of the environmental sensitivities of the site and to direct the planning of the field assessment. The desktop assessment reviewed information from the following sources, databases and reports:

- the Remnant Regional Ecosystem Map (DSITI, 2016a) for the study area to identify vegetation communities that are likely to occur within the site
- previous reports relevant to the survey site, including terrestrial flora and fauna assessments (AARC 2013a, BAAM 2006)
- Regulated Vegetation Management mapping (version 1.5) to identify areas of assessable and non-assessable vegetation (DNRM, 2016a)
- essential habitat (EH) mapping (version 4) to identify known areas of EH for flora (DNRM, 2016b)

- Wildlife Online database provided online by EHP to source flora records for the site (DEHP, 2016e)*
- Protected Matters Searches Tool provided by the Commonwealth's Department of Environment to identify EPBC listed species potentially occurring in the study area (DoEE, 2016)*
- Australian Living Atlas database for locations of flora species recorded within the study area (Atlas of Living Australia, 2016)*
- Biodiversity Planning Assessment (BPA) mapping for the Brigalow Belt (version 1.3, DEHP, 2014b) bioregion
- aerial imagery from Nearmap (2016) and Google Earth (2016: imagery date 23 December 2015)
- relevant guidelines:
    - Methodology for Survey and Mapping of Regional Ecosystems and Vegetation Communities in Queensland (Neldner et al., 2017)
    - Flora Survey Guidelines - Protected Plants (DEHP, 2016d)
- GDE mapping (DSITI, 2016b)
- MSES mapping (DEHP, 2014d)
- State Planning Policy Interactive Mapping System (DILGP, 2017).

*Based on a search area of 20 km from the central coordinates -26.61709 150.36385.A selection of database search results are included in Appendix 2.

3.5 Field assessment

Desktop assessment results were used to plan targeted field surveys. Field assessments aimed to assess representative communities occurring on the site, targeting areas of ecological value, such as the brigalow woodland and riparian habitats. The study area was traversed by foot or by vehicle.

3.5.1 Survey timing

The field assessment was conducted during the late dry season from 10– 14 October 2016 and in late summer (6-14 March 2017) in accordance with State guideline requirements. Conditions at the time of the first survey were warm and dry, with no rain experienced. Maximum temperatures during the survey period ranged from 22.9° - 31.0°C (BOM, 2017). The most significant previous rainfall (approximately 140 mm) at Miles fell 15-21 September 2016. As a result, the major creeks and some drainage depressions within the study area contained water. In March 2017, maximum temperatures ranged from 27.2°C – 35.0°C, and rainfall in the previous month was 58 mm.

Despite the September rainfall, many herbaceous species were not accurately identifiable because of lack of fertile material, especially grasses.

This is relevant only to *Homopholis belsonii*, which is thought to flower between February and May (Sharp & Simon, 2002). However, previous surveys between February and May have not recorded this species suggesting that this species is not likely to occur (Section 1.3).

3.5.2 Survey sites

A total of 46 survey sites were assessed: of these, 10 were tertiary-level assessments, and 35 quaternary (observational) (Neldner et al*.,* 2017). Tertiary sites were chosen to assess all dominant REs. In addition, incidental observations of flora were made across the entire study area, and 32 RE boundary sites were recorded to assist in refining mapped vegetation. Boundary sites record the location from one RE to another and help to map where REs change.

Tertiary assessments recorded the more detailed floristic and structural information at each site and included:

- ground-truthed RE mapping
- structural characteristics of the vegetation (based on life forms, strata, approximate height and percentage cover)
- relative abundance of each species (D=dominant, A= abundant, F = frequent, O = occasional, R = rare)
- groundcover characteristics
- condition of vegetation (based on disturbance present at the site)
- presence and species of weeds including those under the *Biosecurity Act 2014* as restricted matter
- presence, population and characteristics of conservation significant flora
- patch area, connectivity and shape
- geology and soil characteristics
- other notes specific to the site, such as site features (gullies), community characteristics (area of community) or disturbances evident.

Quaternary assessments were recorded to identify vegetation communities and where changes in the vegetation were observed to assist vegetation mapping interpretation. The following information was recorded at these sites:

- the dominant and characteristic canopy, mid-storey and under-storey species (relative abundance measured as D=dominant, A= abundant, F = frequent, O = occasional, R = rare)
- ground-truthed RE
- condition of vegetation (based on disturbance present at the site)
- presence, population and characteristics of conservation significant flora
- presence of restricted matter environmental weeds

- other notes relevant to the survey site, such as site features (gullies), community characteristics (size of community) or disturbances evident.

Flora species were recorded for each assessment site, as well as whilst traversing the study area. A full species list for each RE is located in Appendix 3. The location of and data collected at survey sites were recorded with a Motion Computing Tablet (model: CFT-003) running ArcPad mobile GIS software and customised data forms (accuracy to approximately 10 m).

An additional field survey was undertaken between 6-14 March 2017 by Senior Ecologist Ben Nottidge (GreenLeaf Ecology), Principal Botanist Trevor Meers (Ecosure) and Ecologist Emily Hatfield (Ecosure) to collect habitat quality data within a portion of the Project area for the purposes of running the DEHP Landscape Fragmentation and Connectivity Tool.

Regional ecosystem mapping, previous survey findings and aerial imagery were used to identify the boundaries of assessment units. The Queensland Herbarium mapping showed areas within the assessment sites as being mosaic REs (mixed heterogeneous polygons consisting of several REs). In these instances, the boundaries of REs were refined in the field so that each assessment unit contained a single RE. All assessment units are less than 50 ha so it was determined that two sampling sites were required for each unit. A total of six sampling sites were assessed.

The following attributes were assessed for each assessment unit:

- site condition
- site context
- species habitat.

Where available, the site condition attributes were measured against the relevant regional ecosystem benchmarks (DSITI, 2016).

3.5.3 Relevant survey guidelines

Flora surveys followed Queensland Herbarium vegetation survey guidelines (Neldner et al. 2017).

The Flora Survey Guidelines – Protected Plants (DEHP, 2016d) are not relevant to this survey as the area is not mapped as high risk, and the development footprint is more than 100 m from the nearest high risk boundary. Notwithstanding, they were generally considered during the targeted searches for conservation significant flora species (Section 3.5.6).

3.5.4 Identification of threatened ecological communities

The potential presence of EPBC Act listed threatened ecological communities in the study area was identified using the SPRAT database (DoEE 2017) and conservation listing advice and by ground-truthing each relevant vegetation patch.

For example, the presence of Brigalow TEC was assessed in accordance with the *Commonwealth Conservation Advice for Brigalow Ecological Community* (Threatened Species Scientific Community [TSSC] 2013) and *Commonwealth Listing Advice on Brigalow* (Acacia harpophylla *dominant and co-dominant)* (TSSC 2001).

3.5.5 Vegetation mapping method

Regional ecosystem boundaries were assessed as described by (Neldner et al. 2017) using the Remnant Regional Ecosystem Map (DSITI, 2016a), the latest aerial imagery (Google Earth 2016) and field assessment results.

Vegetation boundaries were mapped at a 1:10 000 scale where possible from GPS points taken at changes in RE using a mobile mapping device. Where discrepancies between Remnant Regional Ecosystem Mapping (DSITI, 2016a) and ground-truthed vegetation boundaries were detected, new RE distributions were mapped. Field survey locations and ground-truthed RE boundaries are subject to standard (non-differential) GPS device inaccuracies (approximately 10 m).

In some instances, an RE polygon was made up of smaller portions of other vegetation communities which was un-mappable at the scale of the vegetation mapping.

Areas of regrowth were mapped from field data and satellite image interpretation (to distinguish dense and sparse regrowth).

3.5.6 Targeted searches for conservation significant flora species

Table 1 lists conservation significant flora species potentially occurring within the study area, their habitat preferences and an assessment of the likelihood for them to occur within the study area based on habitat availability.

All of the conservation significant flora species listed in Table 1 were surveyed for during months where they are known to be detectable (October and March) with the possible exception of *Homopholis belsonii* (see Section 3.5.1). Targeted searches were undertaken within potential habitat in the study area in formal assessment plots (tertiary and quaternary) and in the course of traversing the site by vehicle and on foot.

Table 1 Targeted searches for conservation significant flora species potentially occurring within the study area.

Species	EPBC Act Status*	NC Act Status*	Source^	Preferred habitat	Likelihood of occurrence in the study area considered prior to the survey work	Months of the year detectable
Acacia handonis	V	V	W, AL, E	Open eucalypt woodland on stony ridges and laterite scarps	Possible, suitable habitat present. Nearest record in Barakula State Forest approx. 20 km from study area	12

Species	EPBC Act Status*	NC Act Status*	Source^	Preferred habitat	Likelihood of occurrence in the study area considered prior to the survey work	Months of the year detectable
Cadellia pentastylis	V	V	W, AL, E	Various vegetation types: semi-evergreen vine thicket, brigalow, poplar box woodland	Possible, suitable habitat present	12
Calytrix gurulmundensis	V	V	W, AL, E	Shallow gravelly soils in low shrubland/stunted woodland	Possible, suitable habitat possibly present but not detected during surveys. Nearest record Gurulmundi State Forest approx. 40 km from study area	12
Cryptandra ciliata	-	NT	W, AL, E	Sandstone ridges and slopes in eucalypt woodland	Possible. Nearest record approx. 23 km from study area	12
Homopholis belsonii	V	E	W, AL, E	Range of soils in a variety of habitats (brigalow, eucalypt woodland)	Possible, suitable habitat present. Nearest record 33 km from study area	Only when flowering usually between February and March
Homoranthus decumbens	E	V	W, AL, E	Shrubland or heath on shallow sandy soils	Possible, suitable habitat present. Nearest record 36 km from study area	12
Rutidosis lanata	-	NT	W, AL	Open eucalypt woodlands on gravelly to sandy loam soils	Possible, suitable habitat present. Nearest record approx. 9 km from study area	Oct-Mar
Thesium australe	V	V	W, AL, E	Damp sites in open woodland or grassland	Possible, suitable habitat present. Nearest record 80 km from study area	Nov-Mar
Westringia parvifolia	V	V	W, AL, E	Mallee woodlands on sandy or stony soils	Unlikely, no suitable habitat present. Nearest record over 200 km from study area	12

* Status under EPBC Act and NC Act: E = Endangered; V = Vulnerable; NT = Near Threatened.
^ Source: W- EHP Wildlife online database, E- EPBC Protected Matters search, AL- Atlas of Living Australia database.

4 Results

4.1 Vegetation communities and regional ecosystems

4.1.1 General description

Regional ecosystems mapped by DSITI (2016a) and ground-truthed REs are shown on Figures 4.1, 4.2, 7.1 and 7.2, respectively. Ground-truthing largely agreed with the Remnant Regional Ecosystem Map (DSITI 2016a), with the notable exceptions:

- ground-truthed presence of RE 11.4.3 along Ryall's Road (Figures 7.1 and 7.2)
- more limited extent of RE 11.3.1 to the south of the study area (Figure 7.2).

These are discussed further in Section 4.1.3.

The most widespread vegetation community in the study area is a complex mixture of open woodlands, dominated by either *Eucalyptus crebra* (narrow-leaved red ironbark) woodland on remnant surfaces (RE 11.5.1 and 11.7.4) or *E. fibrosa* (broad-leaved red ironbark) (RE 11.7.7). Associated with these communities are areas of acacia woodland (*Acacia shirleyi*, RE 11.7.2 and *Acacia harpophylla*, RE 11.3.1), riparian woodland containing Queensland blue gum (*E. tereticornis*, RE 11.3.25) and small areas of *E. populnea* (poplar box) woodland (RE 11.3.2).

No mappable areas of stunted woodland or shrubland (RE 11.7.5) were detected during the surveys (despite being mapped on the Remnant Regional Ecosystem Map [DSITI 2016a]), although *Kunzea opposita* and *Kardomia jucunda* (both of which are found in these communities) were found often in association with *Eucalyptus exserta* (Queensland peppermint).

4.1.1.1 Ironbark woodlands

Ironbark woodlands are present in the study area as REs 11.5.1, 11.7.4 and 11.7.7.

Species commonly occurring (and sometime co-dominant with the eucalypts) in the ironbark communities include *Callitris glaucophylla* and *Allocasuarina luehmannii*, with a number of locally dominant *Acacia* species in a discontinuous mid-canopy/shrub layer (*A. semilunata*, *A. muelleriana*, *A. ixiophylla*, *A. leiocalyx*, *A. conferta*). Ground layers in these woodlands are either sparse (beneath dense *C. glaucophylla*) to moderately dense, with grasses, sedges and mat rushes dominant *(Aristida caput-medusae*, *A. jerichoensis*, *Ancistrachne uncinulata*, *Cymbopogon refractus*, *Cleistochloa subjuncea*, *Chloris divaricata*, *Walwhalleya proluta*, *Lomandra multiflora*, *Laxmannia compacta*, *Gahnia aspera*). *Dodonaea biloba* is also locally common as a prostrate shrub.

In the western part of the study area, RE 11.5.1 (containing *Eucalyptus woollsiana* (syn. *E. microcarpa*)) grades into a distinct community also containing *Casuarina cristata* on clay-rich soil on landzone 4, and is immediately adjacent a community supporting brigalow (RE 11.4.3) (Figure 7.2).

This zone was surveyed and mapped as RE 11.4.10 during the additional field surveys conducted to collect habitat quality data to run the DEHP Landscape Fragmentation and Connectivity Tool. It should be noted that this patch of vegetation was mapped previously by BAAM (2006) and AARC (2013a) as regrowth vegetation, however was confirmed to have regrown sufficiently to meet the criteria to be identified as remnant vegetation during the recent field surveys.

The condition of these communities is generally good, with few weeds. There is evidence of timber-cutting and small-scale clearing within the mapped areas, but grazing impacts are minimal (as there are few palatable native grasses).

4.1.1.2 Riparian fringe communities

Riparian fringe communities are present in the study area as RE 11.3.25.

Communities dominated by *Eucalyptus tereticornis* are confined to the lower reaches of a drainage line in the south of the study area (Figure 7.2). Species co-dominant with *E. tereticornis* include *Casuarina cristata* and *E. populnea*, with *Acacia harpophylla* locally present on creek banks (RE 11.3.1). Mid-storey species include *Eremophila mitchellii* and *Geijera parviflora*. Landzone 3 is restricted to the high creek bank or where RE 11.3.2 occurs, and *Callitris glaucophylla* is common where landzone 5 adjoins abruptly. Ground covers include *Arundinella nepalensis*, *Juncus usitatus*, *Walwhalleya proluta*, *Lomandra longifolia*.

Overall vegetation condition is good. Despite the fact that these sites receive runoff and propagules from the catchment and majority of the study area, the lack of weeds upstream results in these normally weedy environments being relatively weed-free except where *Bryophyllum delagoense* is locally frequent and isolated *Opuntia* spp. are found.

4.1.1.3 *Acacia* communities (except brigalow)

Acacia communities (other than brigalow which is described separately below) are present in the study area as RE 11.7.2.

Areas of RE 11.7.2 are intimately intermixed with other landzone 7 REs (11.7.4, 11.7.7). *Acacia shirleyi* is the dominant *Acacia*, forming dense, monospecific stands with little sub-canopy structure and low species richness. Associated canopy species include occasional *Eucalyptus crebra*, *E. exserta* and *Callitris glaucophylla*, with sparse *Kunzea opposita*, *Aristida caput-medusae* and *Bulbostylis barbata* in the ground layer.

4.1.1.4 Brigalow

Brigalow is present in the study area as REs 11.3.1 and 11.4.3.

Acacia harpophylla communities were found in two areas: associated with the drainage line in the south (RE 11.3.1), and along Ryall's Road (RE 11.4.3) just inside the current mining lease on the western side of the study area (Figures 7.1 and 7.2). Only part of RE 11.4.3 near Ryall's Road would be cleared as a result of the Project (Section 5.1).

These two areas contrast in structure and composition. At the drainage line in the south, *A. harpophylla* is dominant, with only occasional *Casuarina cristata* and *Eucalyptus populnea* in the canopy. There is no mid-canopy and a sparse shrub layer of *Geijera parviflor*a. Ground cover is comprised mostly of *Paspalidium caespitosum*, *Ancistrachne uncinulata* and *Enchylaena tomentosa*. This area is mapped by DSITI (2016a) as RE 11.3.25, but ground-truthing indicates it conforms to RE 11.3.1 on recent alluvial sediments (texture contrast soils with sandy surface layers, not deep cracking clays). There is no micro-relief (i.e. gilgais), and *A. harpophylla* occurs on the high creek banks immediately adjacent to water as well as on the alluvial floodout. This area is largely weed-free: sparse *Opuntia tomentosa* and *Cereus uruguayensis* occur.

Brigalow stands in the ML along Ryall's Road are comprised of co-dominant *A. harpophylla* and *Casuarina cristata* in the canopy, with a discontinuous shrub layer of *Geijera parviflora, Carissa ovata and Eremophila mitchellii.* Ground covers include *Enteropogon ramosus, Enchylaena tomentosa* and *Sclerolaena tetracuspis.* Soils in this area have a higher clay content and have gilgais which are periodically inundated from local surface runoff. There is no clear watercourse close to the area. Although not mapped by DSITI (2016a) as remnant, this community conforms to RE 11.4.3. Mapped boundaries are shown in Figure 7.1 and 7.2.

4.1.1.5 Belah

In addition, an area of RE 11.4.10 was mapped in association with REs 11.4.3 and 11.5.1 close to Ryall's Road (Figure 7.2). This RE is transitional between landzones 4 and 5 and is often a narrow zone (and therefore not large enough to be mapped at 1:100,000 scale). Brigalow (*Acacia harpophylla*) occurs very sparsely in the ground truthed area: instead, the presence of belah (*Casuarina cristata*) is evidence of heavy clay soils. The RE description allows for *A. harpophylla* to be absent.

4.1.1.6 Regrowth vegetation

Areas of regrowth are highly variable in composition, with large areas dominated by *Callitris glaucophylla*, *Allocasuarina luehmannii*, *Grevillea striata* and various *Acacia* species (*A. semilunata and A. shirleyi*). *Eucalyptus* species are also present, representing dominants of the pre-clear REs (e.g. *E. crebra, E, fibrosa, E. populnea*).

Regrowth density is also highly variable and has been mapped (from field data and satellite image interpretation (Queensland Globe imagery dated June 2015, DNRM 2015) into 'sparse' and 'dense' regrowth. Areas of dense regrowth are mainly confined to poor soils on landzone 5 and 7, and are comprised of even-aged stands of *Callitris glaucophylla* and/or *Allocasuarina luehmannii*, with very few associated species and limited ground cover due to shading and intense competition for water.

'Sparse' regrowth comprised of *Grevillea striata* or *Acacia semilunata* with or without *Eucalyptus* species have more diverse structures, with a range of associated shrubs and native grasses (*Aristida caput-medusae* is dominant).

4.1.1.7 Non-remnant predominately cleared land

Cleared land in the study area is largely comprised of improved pastures grazed by cattle, sheep, goats and horses. A range of pasture species is present, including *Cenchrus ciliaris*, *Bothriochloa pertusa* and *Chloris gayana*, with the native grasses *Aristida caput-medusae*, *A. calycina*, *Dichanthium sericeum* and *Bothriochloa decipiens* common. Native shrubs such as *Sclerolaena birchii*, *S. tetracuspis* and *Maireana microphylla* also occur.

4.1.2 Threatened ecological communities listed under the EPBC Act

As described in Section 2.15, the *EPBC Act Protected Matters Search Tool* (DoEE, 2016) indicated the potential presence of four threatened ecological communities in a 20 km search buffer around the study area (Table 2), one of which (brigalow (*Acacia harpophylla* dominant and co-dominant) TEC) was found in this and previous surveys (AARC, 2013b; BAAM, 2006) (Figure 8).

Table 2 Threatened ecological communities occurrence within the study area

Threatened Ecological Community (TEC)	EPBC Act Status	Field survey findings
Brigalow (*Acacia harpophylla* dominant and co-dominant)	E	Approximately 5 ha of RE11.3.1 and 53 ha of RE11.4.3 found in study area. See 4.1.1.4 above for details.
Coolibah - Black Box Woodlands of the Darling Riverine Plains and the Brigalow Belt South Bioregions	E	This community was not observed within the study area.
Natural grasslands on basalt and fine-textured alluvial plains of northern New South Wales and southern Queensland	CE	This community was not observed within the study area.
Weeping Myall Woodlands	E	This community was not observed within the study area.

A number of patches of brigalow regrowth occur in the south eastern part of the study area. These patches are not mapped as remnant by DSITI (2016a) (Figure 4.2), but were mapped as such by AARC (2013a). Of these patches, those surveyed were found to be regrowth (they do not meet the criteria of height and cover of the benchmark for this RE), and Statewide Landcover and Tree Study mapping (DSITI, 2016c) indicates that they are likely to be more than 15 years' old, which is the threshold for inclusion in the Brigalow TEC (TSSC, 2001; 2013). In this report, these patches are included in the calculations for the Brigalow TEC but not for the RE.

The Remnant Regional Ecosystem Map (DSITI, 2016a) also does not record the presence of brigalow RE 11.4.3 in the western part of the study area (Ryall's Road) (Figures 4.1 and 4.2), presumably because the patches are below the threshold width of 100 m mappable at 1:100,000 scale (Neldner et al., 2017) (the patches are 50-80 m wide at their widest). The earlier survey by AARC (2013a) mapped this patch as RE 11.4.3, and the current survey confirmed that it is remnant RE 11.4.3 based on height and cover characteristics.

This area has therefore been included in both Brigalow TEC and RE 11.4.3 calculations. Details of all tertiary sites with photos are given in Appendix 4.

4.1.3 Regional ecosystems

Regional ecosystems ground-truthed as occurring in the study area are listed in Table 3 and mapped in Figures 7.1 and 7.2.

Table 3 Regional ecosystems mapped by DSITI (2016a) and ground-truthed by Ecosure in the study area

RE	BD status	VM Act Class	Short description	Approximate ground-truthed area (ha)	Mapped by DSITI
11.3.1	Endangered	Endangered	*Acacia harpophylla* and/or *Casuarina cristata* open forest on alluvial plains	4.5	Yes
11.3.2	Of concern	Of Concern	*Eucalyptus populnea* woodland on alluvial plains	23	Yes
11.3.4	Of Concern	Of Concern	*Eucalyptus tereticornis* and/or *Eucalyptus* spp. woodland on alluvial plains (this RE only occurs as a sub-dominant RE in a mixed RE polygon)	8	Yes (as sub-dominant)
11.3.25	Of Concern	Least Concern	*Eucalyptus tereticornis* or *E. camaldulensis* woodland fringing drainage lines	22.5	Yes
11.4.3	Endangered	Endangered	*Acacia harpophylla* and/or *Casuarina cristata* shrubby open forest on Cainozoic clay plains	23.5	No
11.4.10	Endangered	Endangered	*Eucalyptus populnea* or *E. woollsiana, Acacia harpophylla, Casuarina cristata* open forest to woodland on margins of Cainozoic clay plains	24	No
11.5.1 (including 11.5.1a)	No concern at present	Least Concern	*Eucalyptus crebra* and/or *E. populnea*, *Callitris glaucophylla*, *Angophora leiocarpa*, *Allocasuarina luehmannii* woodland on Cainozoic sand plains and/or remnant surfaces	294	Yes
11.7.2	No concern at present	Least Concern	*Acacia* spp. woodland on Cainozoic lateritic duricrust. Scarp retreat zone	34	Yes

RE	BD status	VM Act Class	Short description	Approximate ground-truthed area (ha)	Mapped by DSITI
11.7.4	No concern at present	Least Concern	*Eucalyptus decorticans* and/or *Eucalyptus* spp., *Corymbia* spp., *Acacia* spp., *Lysicarpus angustifolius* woodland on Cainozoic lateritic duricrust	237	Yes
11.7.5	No concern at present	Least Concern	Shrubland on natural scalds on deeply weathered coarse-grained sedimentary rocks (this RE occurs only as a sub-dominant RE in a mixed RE polygon)	35	Yes
11.7.7	No concern at present	Least Concern	*Eucalyptus fibrosa* subsp. *nubila* ± *Corymbia spp.* ± *Eucalyptus* spp. woodland on Cainozoic lateritic duricrust	607	Yes
			Total	**1,312.5**	

As described in Section 3.5.5, in some instances, a RE polygon was made up of smaller portions of other vegetation communities which was unmappable at the scale of the vegetation mapping. For example, RE 11.5.1 and its subordinate community 11.5.1a are not distinguished as areas of RE 11.5.1 without *Eucalyptus crebra* (i.e. RE 11.5.1a) as they were too small and intermixed with other communities to be mapped accurately. However, all occurrences of Of Concern or Endangered REs were mapped.

Areas ground-truthed as RE 11.7.4 (dominant) were found to contain *Eucalyptus crebra* but not *E. decorticans*.

RE 11.7.5 was not found during surveys: small areas of shrub-dominated vegetation (either *Kardomia jucunda* or *Kunzea opposita*) which could be mapped as RE 11.7.5 were found in association with a mixed polygon RE ground-truthed as RE 11.7.4/11.7./11.7.5/11/72 (in a 85/5/5/5 % mix), but these were not large enough to be mapped. The area provided in the table is based on the ground-truthed percentage area for RE 11.7.5 for the mixed RE polygon.

RE 11.3.4 was only recorded as part of a mixed polygon RE mapped as RE 11.3.25/11.3.2/11.3.4 (in a 60/30/10% mix). No areas of stand-alone RE 11.3.4 were recorded during the field surveys. The area provided in Table 3 is based on the ground-truthed percentage area of RE 11.3.4 in the mixed RE polygon.

Two additional REs not mapped by DEHP were ground-truthed in the study area (see Section 4.1.1.4 above):

- RE 11.4.3: 23.5 ha mapped along Ryalls Road

- RE 11.4.10: 24 ha mapped between 11.4.3 and 11.5.1 along Ryalls Road.

Both of these REs have an endangered biodiversity status.

4.1.4 Endangered and/or of concern regional ecosystems

Endangered and of concern REs recorded in the study area are listed in Table 4.

Table 4 Endangered and/or of concern regional ecosystems

RE	BD status	VM Act Class	Short description	Approximate ground-truthed area (ha)
11.3.1	Endangered	Endangered	*Acacia harpophylla* and/or *Casuarina cristata* open forest on alluvial plains	4.5
11.3.2	Of concern	Of Concern	*Eucalyptus populnea* woodland on alluvial plains	23
11.3.4	Of Concern	Of Concern	*Eucalyptus tereticornis and/or Eucalyptus spp. woodland on alluvial plains* (this RE only occurs as a sub-dominant RE in a mixed RE polygon)	8
11.3.25	Of Concern	Least Concern	*Eucalyptus tereticornis* or *E. camaldulensis* woodland fringing drainage lines	22.5
11.4.3	Endangered	Endangered	*Acacia harpophylla* and/or *Casuarina cristata* shrubby open forest on Cainozoic clay plains	23.5
11.4.10	Endangered	Endangered	*Eucalyptus populnea* or *E. woollsiana, Acacia harpophylla, Casuarina cristata* open forest to woodland on margins of Cainozoic clay plains	24
			Total	**105.5**

4.1.5 Groundwater dependent ecosystems

The accuracy of the desktop GDE mapping (DSITI, 2017 and BoM, 2017) of the Project locality has been reviewed by AGE (2018), DPM Enviroscіences (2018) and Ecosure, with the following conclusions made in relation to the presence/absence of GDEs based on detailed site surveys and assessments.

Drainage Lines 5 and 6 (and associated minor drainage features) (Figure 5) are not likely to support aquatic or terrestrial GDEs because:

- thin, discontinuous and temporal alluvial aquifers (perched and hydraulically separated from the regional groundwater system) may be associated with these drainage features, however, there is no permanent alluvial aquifers (AGE, 2018)
- the vegetation that occurs along these drainage lines (RE11.7.4 and RE11.7.7) also occurs more widely across the landscape and not restricted to areas where the vegetation could potentially access groundwater
- the aquatic flora and fauna present along these drainage lines are generally well adapted to wetting and drying cycles expected in these ephemeral systems (DPM Enviroscіences, 2018).

The patch of terrestrial vegetation in ML 50233 (mapped as RE 11.5.1) is not likely to be dependent on groundwater because the occurrence of this regional ecosystem is dominated by Ironbark Woodlands and comprises tree species that area more widely located across the landscape and not restricted to areas where the vegetation could potentially access groundwater.

There are no other drainage lines, watercourses, wetlands or springs surrounding the Project in the maximum drawdown zone (including those patches of terrestrial vegetation south of ML 50233) that are likely to support GDEs which are connected to the regional groundwater system and subject to any predicted drawdown impacts by the Project (AGE, 2018).

There are no GDEs associated with watercourses, wetlands or springs in the Project area or surrounds based on the desktop review and site inspections by AGE (2018).

4.1.6 Wetlands associated with regional ecosystems

DPM (2018) ground-truthed the *Queensland Wetlands Mapping 2009* (DEHP, 2016f) for the study area and found no natural lacustrine waterbodies or wetlands as each of the 11 mapped lacustrine waterbodies were either farm dams or mine water dams.

Four REs occurring within the study area are recognised on the Regional Ecosystem Description Database to be generally associated with wetlands (Table 5), however:

- no wetlands were observed in association with RE 11.3.2 and 11.4.3
- RE 11.3.25 and RE 11.3.4 are associated with local drainage lines.

Table 5 REs which are generally associated with wetlands within the study area

RE (dominant)	Short description	Wetland type as per Regional Ecosystem Description Database	Approximate ground-truthed area (ha)
11.3.2	*Eucalyptus populnea* woodland on alluvial plains	Contains palustrine wetland (e.g. in swales)	23
11.3.25	*Eucalyptus tereticornis* or *E. camaldulensis* woodland fringing drainage lines	Riverine wetland or fringing riverine wetland	22.5
11.4.3	*Acacia harpophylla* and/or *Casuarina cristata* shrubby open forest on Cainozoic clay plains	Contains palustrine wetland (e.g. in swales)	23.5
11.3.4	*Eucalyptus tereticornis* and/or *Eucalyptus* spp. woodland on alluvial plains (this RE only occurs as a sub-dominant RE in a mixed RE polygon)	Floodplain (other than floodplain wetlands)	8

4.2 Conservation significant flora species

One conservation significant species listed under the NC Act was detected within the study area during the field survey. Two populations of approximately 10 plants each of *Rutidosis lanata* (near threatened under NC Act) were found in RE 11.5.1 in the south of the study area (Figure 8). Neither of these are located within the Proposed Additional Surface Development Extent.

The desktop assessment identified the potential presence of nine conservation significant flora species listed under either the NC Act or EPBC Act. Table 6 lists these species and survey findings. All of these species, except *Westringia parvifolia*, have the potential to occur within the study area based on available habitat, although they were not found during the past or present studies (AARC, 2013a; AARC, 2013b; BAAM, 2006; Ecosure, 2016, 2018).

Profiles of conservation significant species that may occur within the study area have been included in Appendix 4.

Table 6 Conservation significant flora species potentially occurring within the study area

Species	EPBC Act status*	NC Act status*	Detected in surveys
Acacia handonis	V	V	No
Cadellia pentastylis	V	V	No
Calytrix gurulmundensis	V	V	No
Cryptandra ciliata	-	NT	No
Homopholis belsonii	V	E	No
Homoranthus decumbens	E	V	No
Rutidosis lanata	-	NT	Yes
Thesium australe	V	V	No
Westringia parvifolia	V	V	No

* Status under EPBC Act and NC Act: E = Endangered; V = Vulnerable; NT = Near Threatened.
^ Source: W- EHP Wildlife online database, E- EPBC Protected Matters search, AL- Atlas of Living Australia database.

4.3 Introduced flora species

The native vegetation in the study area is relatively free of weeds. Significant weed species (weeds of national significance; WONS) or weeds listed as a restricted matter in the *Biosecurity Act 2014* located within the study area are listed in Table 7. *Bryophyllum delagoense* is considered the most invasive species present. Many other weed species are present along roadsides and in grazed or cultivated paddocks within the study area.

Table 7 Significant introduced species in the study area

Species	Common name	WoNS*	Biosecurity Act status^	Occurrence within the study area
Bryophyllum delagoense	mother-of-millions	No	Restricted	Locally common in western parts of ML along Ryall's Road on heavier soils
Cenchrus ciliaris	buffel grass	No	-	Locally common in open woodlands close to improved pastures in eastern part of study area
Cereus uruguayanus	spiny hedge cactus	No	-	Rare occurrences along drainage lines
Megathyrsus maximus	green panic	No	-	Occasional along drainage lines
Opuntia stricta	tree pear	Yes	Prohibited	Occasional in eucalypt woodland; low densities
Opuntia tomentosa	velvety pear	Yes	Prohibited	Scattered throughout study area in open eucalypt woodland and brigalow; low densities

* = weeds of national significance

^ = restricted matter category

4.4 Environmentally sensitive areas

Category B ESAs recorded within the study area include REs with an Endangered biodiversity status (Figure 9):

- Endangered REs
  - 11.4.10 *Eucalyptus populnea* or *E. woollsiana, Acacia harpophylla, Casuarina cristata* open forest to woodland on margins of Cainozoic clay plains
  - 11.4.3 *Acacia harpophylla* and/or *Casuarina cristata* shrubby open forest on Cainozoic clay plains.

4.5 Matters of state environmental significance

The following MSES were found to be present in the study area (Figure 6):

- Regulated vegetation
  - Endangered Regional Ecosystems (namely RE 11.3.1, 11.4.3, 11.4.10)
  - Of Concern Regional Ecosystems (namely RE 11.3.2, RE 11.3.4).
- Regulated vegetation (intersecting a watercourse)
  - Regulated vegetation that intersects a vegetation management watercourse (namely RE 11.3.25, 11.3.2, 11.3.4).
- Connectivity areas (remnant vegetation) (described in Section 6.2).

5 Evaluation of likely adverse impacts

Within this Section, the proposed additional surface development extent shown on Figure 1 is referred to as the Project area.

5.1 Land clearance

Over the life of the Project, a total of approximately 910 ha[4] of remnant vegetation would be cleared, which is approximately 0.33% of affected REs and 0.00003% of all remnant vegetation within 50 km of the Project (Table 8). This area is relatively small compared to the area which has been cleared in the region for cropping and grazing and is not a significant increase in clearing in the region. The relatively high (4.63%) proportion of RE 11.4.10 to be cleared is likely partly due to the under-representation of this RE in state mapping, as it is often found as a narrow zone between brigalow-dominated vegetation (i.e. RE 11.4.3) and REs on coarser soils on landzone 5 (see Section 4.1.1.4). It should be noted that the Project would not result in any change in the area of RE 11.4.10 previously mapped within 50 km of the Project area, as the patch identified during the fieldwork was not previously mapped by any sources as RE 11.4.10.

Table 8 Percentage of REs affected by the Project at regional scale

RE	% clearing (proposed) within 50 km
11.3.2	0.23
11.3.25	0.02
11.3.4	<0.01
11.4.10	4.65
11.4.3	0.07
11.5.1	0.06
11.7.2	0.79
11.7.4	0.32
11.7.7	1.22

[4] Note: all areas of impacted REs within the proposed additional surface development extent have been calculated by Minserve Pty Ltd. Ecosure bears no responsibility for the accuracy of these figures.

Areas proposed to be cleared at each stage of the Project are given for each RE in Table 9.

The stages correlate to the following years of the Project mine life:

Stage 1: Year 1 – Year 24

Stage 2: Year 24 – Year 29

Stage 3: Year 29 – Year 42

Stage 4: Year 42 – end of mine life.

A summary of offset requirements for this clearing is included in Section 8 .

Areas of regrowth (non-remnant vegetation) do not meet the definition of remnant regional ecosystems and are highly variable in composition. For this reason, the areas were mapped into 'sparse' and 'dense' regrowth. Approximately 1,599.5 ha of non-remnant (regrowth vegetation) would be progressively cleared for the Project, comprising 725 ha of dense regrowth and 875 ha of sparse regrowth. Regrowth vegetation that provides habitat for relevant threatened fauna species was characterised as fauna habitat in the Ecosure (2018) *Cameby Downs Mine Continued Operation Project – Terrestrial Fauna Assessment Report*.

Table 9 Areas of REs to be cleared in the Proposed Additional Surface Development Extent

RE	BD status	VM Act Class	Short description	Stage 1 (ha)	Stage 2 (ha)	Stage 3 (ha)	Stage 4 (ha)	Total (ha)
11.3.2	Of Concern	Of Concern	*Eucalyptus populnea* woodland on alluvial plains	0	0	17.5	0	17.5
11.3.4	Of Concern	Of Concern	*Eucalyptus tereticornis and/or Eucalyptus spp. woodland on alluvial plains* (this RE only occurs as a sub-dominant RE in a mixed RE polygon)	0.2*	0	0	0	0.2
11.3.25	Of Concern	Least Concern	*Eucalyptus tereticornis* or *E. camaldulensis* woodland fringing drainage lines	0.2*	0	1	0.5	1.7
11.4.3	Endangered	Endangered	*Acacia harpophylla* and/or *Casuarina cristata* shrubby open forest on Cainozoic clay plains	3	0	0	0	3
11.4.10	Endangered	Endangered	*Eucalyptus populnea* or *E. woollsiana*, *Acacia harpophylla*, *Casuarina cristata* open forest to woodland on margins of Cainozoic clay plains	17	0	0	0	17
11.5.1 (including 11.5.1a)	No Concern at present	Least Concern	*Eucalyptus crebra* and/or *E. populnea*, *Callitris glaucophylla*, *Angophora leiocarpa*, *Allocasuarina luehmannii* woodland on Cainozoic sand plains and/or remnant surfaces	15.5	13.5	23	17	69
11.7.2	No Concern at present	Least Concern	*Acacia* spp. woodland on Cainozoic lateritic duricrust. Scarp retreat zone	0	0	24	6.5	30.5
11.7.4	No Concern at present	Least Concern	*Eucalyptus decorticans* and/or *Eucalyptus* spp., *Corymbia* spp., *Acacia* spp., *Lysicarpus angustifolius* woodland on Cainozoic lateritic duricrust	0	2	122.5	76	200.5
11.7.7	No Concern at present	Least Concern	*Eucalyptus fibrosa* subsp. *nubila* ± *Corymbia* spp. ± *Eucalyptus* spp. woodland on Cainozoic lateritic duricrust	0	116.5	282	171.5	570
			Sub-total (numbers have been rounded)	**36**	**132**	**470**	**271.5**	**910**

* The vegetation patch is 0.4 ha in size comprising 50% RE11.3.25 and 50 % RE11.3.4. As such, 0.2 ha has been assigned to each of RE11.3.25 and RE11.3.4.

5.2 Indirect impacts

5.2.1 Surface water quality

The surface water assessment (supported by site water balance modelling) by WRM Water and Environment (2018) concludes that:

- No uncontrolled spills of mine-affected water from the worked water dams are predicted under normal operating conditions.
- Some overflow of water from sediment dams (designed in accordance with the Best Practice Erosion and Sediment Control guideline [Institute for Environmental Monitoring and Research, 2008]) may occur during wet periods, however it is unlikely that this would have a measurable impact on receiving water quality.
- There is a predicted negligible impact on the downstream water quality through releases from the Project.

Based on the implementation of management strategies (e.g. erosion and sediment controls and land contamination controls), the risks of elevated dissolved solids and other contaminants impacting downstream waters is considered to be low (WRM Water and Environment, 2018).

If no measurable impacts on surface water quality are likely to occur, no adverse impacts are likely to occur on surrounding habitats.

5.2.2 Surface water quantity

During active mining operations, the mine water management system would capture runoff from areas that would have previously flowed to the receiving waters. At the completion of mining, surface runoff from rehabilitated overburden emplacement areas would be released from the site, therefore, the captured catchment areas would reduce. Post-mining, the captured catchment areas would reduce and there is expected to be no measurable change in the catchment.

5.2.3 Groundwater and ecosystems

The Project is unlikely to adversely impact any aquatic or terrestrial GDEs since GDEs are unlikely to occur either within or surrounding the Project area (Section 2). There is a potential for thin, discontinuous and temporal alluvial aquifers to occur (which may be used by localised areas of terrestrial vegetation), however these would consist of a perched groundwater system hydraulically separated from the underlying Walloon Coal Measures by the very low permeability, approximately 15 m thick aquitard overburden sequence that separates the Springbok Sandstone and the upper Walloon Coal Measures (AGE, 2018).

5.2.4 Exotic flora and restricted or prohibited plants

The Project area is relatively weed free (with the exception of introduced pasture grasses in the paddocks) with only scattered weeds throughout. Several of the weeds recorded in the Project area are listed as prohibited or restricted under state legislation as they are highly invasive (Section 4.3). These weeds could potentially be spread by mine machinery, equipment and vehicles and increase their range and density. There is also the possibility that the increase in machinery and vehicles entering the mine would increase the likelihood of introducing a new invasive weed to the area. Weeds compete with native vegetation and can result in changes to community composition.

Syntech would aim to restrict or reduce existing infestations and avoid introducing new weeds to the Project area (see also Section 7.6).

5.2.5 Dust

In general, excessive dust can smother vegetation and lead to loss of plant vigour or disease as it reduces their ability to photosynthesise. Potential dust impacts on vegetation are concentrated near dust sources (e.g. haul roads and areas with active mine landforms). Early in the mine life, much of the surrounding vegetation is within areas proposed to be cleared in later stages of the mine.

The landscape surrounding the Project is extensively cleared. Dust from the Project is unlikely to significantly degrade surrounding habitats given habitats in the locality are already subjected to dust from exposed soils in the cleared landscape and there are no observed impacts on vegetation from dust. It is also likely that seasonal rainfall in the locality would help wash dust from the vegetation and/or encourage new growth.

Measures to reduce dust are detailed in the Air Quality and Greenhouse Gas Assessment prepared by Katestone (2018).

5.2.6 Final landform

The post-mine landform would be progressively rehabilitated. The integrity of the landscape would be maintained by providing safe, stable and non-polluting post-mining landforms.

The water in the final void is predicted to trend towards hypersaline conditions in the long-term (AGE 21017). A long-term hydraulic sink would minimise the potential migration of poor quality groundwater from within the mine pit to other areas (AGE 21017). The final void would be designed to prevent overflow to the downstream watercourses. The final void would be designed to be safe, stable and non-polluting.

5.2.7 Bushfire

Bushfire is an essential component of vegetation dynamics in Australia, but the frequency and intensity must be appropriate to each vegetation type and most accidental wildfires are not likely to be beneficial.

An increase in mine activities and mine vehicles could potentially increase the risk of starting wildfires through hot exhausts, hot works or human error. The Project area is contiguous with large areas of forested country especially to the north, and as such is both prone to wildfire incursion and a potential source of fire.

Bushfire prevention and management measures are described in Section 7.7.

5.3 Cumulative impacts

Cumulative impacts are considered to be the total impact on the environment that would result from the incremental impacts of the Project added to other existing impacts. They include direct and indirect impacts from existing and proposed (but not yet existing) developments in the local area.

The Project is located within a rural area that is predominately used for low intensity cattle grazing on native pasture. Coal mining, coal seam gas exploration and production and power generation are major land uses in the Surat Basin. Coal mines, coal seam gas fields and power stations in the vicinity of the Project, which may contribute to cumulative impacts, include:

- Kogan Creek Coal Mine, approximately 50 km south-east
- Wilkie Creek Coal Mine (currently under care and maintenance), approximately 75 km south-east
- the Bellevue and Berwyndale coal seam gas fields to the south-west of the Project
- the Argyle and Argyle East, Berwyndale South, Talinga, Lauren and Kenya coal seam gas fields to the south of the Project
- the Kogan North and Daandine gas fields to the south-east of the Project
- the Condamine and Darling Downs coal seam gas fired power stations and the Kogan Creek coal fired power station.

In addition, the Cameby Downs Mine tenements share overlapping petroleum tenements which are managed through co-development agreements.

As described in Section 5.1, the native vegetation communities/regional ecosystems to be cleared during the life of the Project, occur more widely in the surrounding landscape (Table 9). The amount of extant remnant vegetation (of each regional ecosystem) within 50 km of the Project is presented in Table 9. The proposed clearance equates to 0.34% of affected REs and 0.00003% of all remnant vegetation within 50 km of the Project (Table 8).

5.4 Environmentally sensitive areas

Category B ESAs recorded within the Project area include REs with an endangered biodiversity status and are listed in Table 10 and shown on Figure 9. Impact avoidance and mitigation measures are detailed in Section 7 and impacts on these REs would be offset as described in Section 8 .

Table 10 Category B and C ESAs in the Project area

RE	BD status	Short description	Clearance with the Project area (ha)
11.4.10	Endangered	*Eucalyptus populnea* or *E. woollsiana*, *Acacia harpophylla*, *Casuarina cristata* open forest to woodland on margins of Cainozoic clay plains	17
11.4.3	Endangered	*Acacia harpophylla* and/or *Casuarina cristata* shrubby open forest on Cainozoic clay plains	3
		Total	**20**

6 Evaluation of likely adverse impacts on matters of state environmental significance

This section provides an evaluation of likely adverse impacts on MSES.

6.1 Regulated vegetation

Regulated Vegetation is a Regional Ecosystem which is (DEHP, 2014d):

- *'Endangered' or 'Of Concern' regional ecosystems;*
- *a regional ecosystems within mapped vegetation management wetlands; and/or*
- *a regional ecosystems within the defined distance of a vegetation management watercourse.*

These components are described below in relation to the Project area.

Endangered' or 'Of Concern' regional ecosystems

Significant residual impact criteria for 'Endangered' or 'Of Concern' regional ecosystems are as follows (DEHP, 2014d):

- *area greater than 5 ha where in a grassland (structural category) regional ecosystem; or*
- *area greater than 2 ha where in a sparse (structural category) regional ecosystem; or*
- *area greater than 0.5 ha where in a dense to mid-dense (structural category) regional ecosystem.*

Clearance of 'Endangered' or 'Of Concern' regional ecosystems is summarised in Table 11. Clearance of more than 0.5 ha of each of these REs is considered to be significant under the Queensland *Environmental Offsets Policy - Significant Residual Impacts Guideline* (DEHP, 2014e).

Table 11 Residual impacts on Endangered and/or Of Concern regional ecosystems

RE	BD status	VM Act Class	Short description	Clearance with the Project area (ha)	Significant Residual impact criteria	Significant Residual impact?
11.3.2	Of concern	Of Concern	*Eucalyptus populnea* woodland on alluvial plains	17.5	0.5	Yes
11.3.4	Of Concern	Of Concern	*Eucalyptus tereticornis* and/or *Eucalyptus* spp. *woodland on alluvial plains* (this RE only occurs as a sub-dominant RE in a mixed RE polygon)	0.2*	0.5	No
11.3.25	Of Concern	Least Concern	*Eucalyptus tereticornis* or *E. camaldulensis* woodland fringing drainage lines	1.6	0.5	Yes
11.4.3	Endangered	Endangered	*Acacia harpophylla* and/or *Casuarina cristata* shrubby open forest on Cainozoic clay plains	3	0.5	Yes
11.4.10	Endangered	Endangered	*Eucalyptus populnea* or *E. woollsiana*, *Acacia harpophylla*, *Casuarina cristata* open forest to woodland on margins of Cainozoic clay plains	17	0.5	Yes
			Total	**38**		

* The vegetation patch is 0.4 ha in size comprising 50% RE11.3.25 and 50 % RE11.3.4, as such, 0.2 ha has been assigned to RE11.3.4.

Regional ecosystems within mapped vegetation management wetlands

The Project would not impact vegetation management wetlands.

Regional ecosystems within the defined distance of a vegetation management watercourse

Significant residual impact criteria for regional ecosystems within the defined distance of a vegetation management watercourse includes any clearing of remnant vegetation within 5 m of the defining bank (DEHP, 2014e). Total areas to be cleared in this zone over the life of the Project are given in Table 12.

Table 12 Areas of REs to be cleared within 5 m of a watercourse

RE	Short description	Area (ha)
11.3.2	*Eucalyptus populnea* woodland on alluvial plains	0.3
11.3.25	*Eucalyptus tereticornis* or *E. camaldulensis* woodland fringing drainage lines	0.8
11.5.1/11.5.1a	*Eucalyptus crebra* and/or *E. populnea*, *Callitris glaucophylla*, *Angophora leiocarpa*, *Allocasuarina luehmannii* woodland on Cainozoic sand plains and/or remnant surfaces	0.05
11.7.4	*Eucalyptus decorticans* and/or *Eucalyptus* spp., *Corymbia* spp., *Acacia* spp., *Lysicarpus angustifolius* woodland on Cainozoic lateritic duricrust	0.7
11.7.7	*Eucalyptus fibrosa* subsp. *nubila* ± *Corymbia spp*. ± *Eucalyptus* spp. woodland on Cainozoic lateritic duricrust	0.7
Total		**2.5**

6.2 Connectivity areas

No state or regional corridors are mapped as occurring within the Project area and the majority of the vegetation to be impacted is located on the edges of large patches of vegetation thereby limiting the impacts on connectivity.

The DEHP *Landscape Fragmentation and Connectivity Tool* indicated that impacts of the Project on landscape connectivity would be 'significant'. The regional extent of core remnant with a 20 km buffer is 36.7%, and the local impact threshold for this extent is set in the *Significant Residual Impact Guideline* (DEHP 2014e) at 5%: the percentage change at the local scale (post-impact) is measured at 10%.

6.3 Protected wildlife habitat

No vulnerable or endangered flora species listed under the NC Act have been recorded in the Project area.

6.4 Other MSES

Designated Precinct in a Strategic Environmental Area

The Project would not impact a Designated Precinct in a Strategic Environmental Area.

Wetlands and Watercourses

Impacts to aquatic values (wetlands and watercourses) are discussed in detail in DPM Envirosciences (2018). In summary, the Project would not result in a significant impact to wetlands or watercourses.

Protected Areas

No protected areas are mapped as occurring within or near the study area therefore no impacts to protected areas are anticipated.

Highly Protected Zones of State Marine Parks

This MSES is not relevant to the Project (DPM Envirosciences, 2018).

Fish Habitat Areas

Impacts to fish habitat are discussed in detail in DPM Envirosciences (2018). In summary, the Project would not result in a significant impact to fish habitat.

Waterways Providing for Fish Passage

Impacts to waterways providing for fish habitat are discussed in detail in the aquatic assessment (DPM Envirosciences, 2018). In summary, the Project would not result in a significant impact to waterways providing for fish habitat.

Marine Plants

This MSES is not relevant to the Project (DPM Envirosciences, 2018).

Legally Secured Offset Areas

This MSES is not relevant to the Project area.

6.5 Summary of significant residual impacts on matters of state environmental significance

The Project would result in residual significant impacts on the following MSES relevant to flora in accordance with the *Significant Residual Impact Guideline* (DEHP, 2014e) (Table 13):

- Endangered' or 'Of Concern' regional ecosystems (i.e. RE 11.3.2, 11.4.3, 11.4.10);

- Regional ecosystems within the defined distance of a vegetation management watercourse (i.e. RE 11.3.2, 11.3.25, 11.3.4, 11.4.3, 11.5.1/11.5.1a, 11.7.4, 11.7.7); and
- Connectivity areas as determined by the DEHP (2016g) *Landscape Fragmentation and Connectivity Tool*.

A complete summary of Potential Impacts on MSES is provided in Table 13.

Table 13 Summary of Potential Impacts on Matters of State Environmental Significance

Matters of State Environmental Significance			Residual Impact Total (ha)	Significant Residual Impacts Likely?
Regulated Vegetation	'Endangered' or 'of concern' regional ecosystems*; or	RE 11.4.3 [A]	3	Yes
		RE 11.4.10	17	Yes
		RE 11.3.2	17.5	Yes
		RE 11.3.4	0.2**	No
	Regional ecosystems within mapped vegetation management wetlands		0	No
	Regional ecosystems within the defined distance of a vegetation management watercourse		2.5	Yes
Connectivity Areas			910	Yes
Wetlands and Watercourses			0	No
Designated Precinct in a Strategic Environmental Area			0	No
Protected Wildlife Habitat*	yakka skink ^^		899.4	Yes
	grey snake		72	Yes
	glossy black-cockatoo		734	No
	short-beaked echidna		2,499.5	No
	koala ^^		899.5^	Yes
Protected Areas			0	No
Highly Protected Zones of State Marine Parks			0	No
Fish Habitat Areas			0	No
Waterways Providing for Fish Passage			0	No
Marine Plants			0	No
Legally Secured Offset Areas			0	No

[A] RE 11.4.3 equates to the Brigalow TEC listed under the EPBC Act.

* The REs and species habitats overlap (i.e. the REs and habitats are not mutually exclusive).

^ Approximately 2.75 ha of riparian vegetation (including RE 11.3.25) which contains primary koala food trees and another 896.75 ha of secondary potential koala habitat.

^^ The yakka skink and koala are also listed under the EPBC Act.

** The vegetation patch is 0.4 ha in size comprising 50% RE11.3.25 and 50 % RE11.3.4, as such, 0.2 ha has been assigned to RE11.3.4.

7 Impact avoidance and mitigation measures

7.1 Refinement of the mine design to avoid land clearance

Syntech has made refinements to the Project layout/design to avoid impacts to REs 11.3.1, 11.4.3 and 11.4.10 (listed as 'Endangered' under the VM Act). These refinements included a re-alignment of the diversion to completely avoid RE 11.3.1 and avoid the majority of RE11.4.3 and 11.4.10, which were to be disturbed by the original Project design.

7.2 Vegetation clearance limits and procedures

No more than 20 ha of endangered vegetation mapped in Figures 4.1 and 4.2 would be cleared by the Project. A total of approximately 910 ha of remnant native vegetation would be cleared for the Project.

Existing surface disturbance procedures at the Cameby Downs Mine would be implemented for all vegetation clearance activities including (Yancoal, 2016a):

- consideration of timing of land clearance
- pre-clearance surveys
- delineation of clearing areas
- areas of vegetation requiring clearing or fragmenting is done in a manner that retains connectivity with surrounding areas of remnant vegetation areas where possible; and
- clearing is only undertaken after appropriate erosion and sediment controls, for the area, have been designed and approved for installation.

7.3 Rehabilitation

As detailed in Section 5.2.5, the post-mine landform would be progressively rehabilitated. The integrity of the landscape would be maintained by providing safe, stable and non-polluting post-mining landforms.

In accordance with the currently approved Rehabilitation Management Plan (Yancoal, 2016b) and existing EA for the Cameby Downs Mine (EPML00900113), the final landform would be rehabilitated to a stable landform with a self-sustaining vegetation cover. The approved final landform would be returned to grazing pasture land however would also include concentrated tree plantings to provide potential wildlife corridors (Yancoal, 2016b). A provisional list of flora species to be planted and the indicative locations for plantings is provided in the Environmental Values Assessment for the Project.

7.4 Water management

The existing water management system would be augmented to incorporate the Project and protect the identified environmental values of the receiving environment. The water management system includes licensed extraction of water resources in accordance with relevant Queensland water related legislation.

As detailed in Sections 5.2.1 and 5.2.2, the Project is not expected to result in a significant impact to the quality or flow of surface or groundwater within the Project locality.

In addition to the above, Syntech would augment the existing groundwater and surface water monitoring networks which have been established at the Cameby Downs Mine. This includes automatic and manual groundwater and surface water level and quality monitoring stations throughout the Project area and surrounds.

7.5 Declared animal prevention and control

Reasonable steps would be taken to keep the Project site free of declared animal pests, in accordance with the requirements of *Biosecurity Act 2014*. Management of animal pests would also be consistent with any pest management plans set by the Western Downs Regional Council.

To protect native fauna within the Project area, employees, contractors or visitors would not be allowed to bring domestic animals, such as cats and dogs, onto the Project site.

7.6 Weed prevention and control

Syntech would aim to contain existing weed infestations and prevent the introduction of new species to the Project area, in order to reduce their potential impact on native vegetation.

This would include the implementation of the following:

- appropriate techniques for controlling weeds of concern in accordance with local management practice and / or agency guidelines, in particular for *Bryophyllum delagoense* and *Opuntia* spp.
- monitoring of treated areas to assess the success of declared weed management
- monitoring of revised Project site to identify any new infestations of weeds
- information on identifying declared weeds
- use of wash-down facilities for earthmoving equipment entering or leaving the Project site.

7.7 Bushfire prevention and management

Syntech would aim to maintain vegetation structure and composition, protect mine assets and safeguard human life through the implementation of bushfire management techniques, including:

- physical protection of assets through clean firebreaks
- active fire suppression of unplanned and potentially destructive fires (to vegetation and built assets)
- pro-active fuel and ecosystem management to sustain ecological fire regimes as much as possible.

7.8 Summary of impact avoidance and mitigation measures related to MSES

Mine design has taken into account the results of surveys to avoid significant ecological features where possible. Significant impacts to MSES would be managed through a combination of pre-clearance surveys active management of weeds, pest animals, and fire; and provision of suitable land-based offsets (Section 8).

8 Environmental offsets

8.1 Summary of offset requirements

A summary of the residual impacts on MSES is provided in Table 14. An environmental offset is required for the Project to address significant residual impacts on Regulated Vegetation, Connectivity Areas and Protected Wildlife. The fauna assessment (Ecosure, 2018) describes the offset strategy for Protected Wildlife (Yakka Skink, Grey Snake and Koala). The offset strategy for Regulated Vegetation and Connectivity Areas is described below.

8.2 Offset strategy

A summary of the residual impacts on MSES is provided in Table 14. An environmental offset is required for the Project to address significant residual impacts on MSES (i.e. Regulated Vegetation and Connectivity Areas) as determined by the *Queensland Environmental Offsets Policy — Draft Significant Residual Impacts Guideline* (DEHP, 2014e).

The environmental offset for MSES would be provided in accordance with the Queensland EO Act and *Queensland Environmental Offsets Policy* (DEHP 2014a) and managed through an Offset Management Plan (OMP). The environmental offset would be:

- staged over time (consistent with the four indicative stages of the Project shown on Figure 2) whereby the initial offsets would be secured for Stage 1 with the balance of offsets in subsequent stages
- a land-based proponent-driven offset site(s), direct-benefit offset and/or a financial settlement offset.

If the offset is to be satisfied through a land-based proponent-driven offset site, the offset would be as follows (DEHP 2014a):

- For Regulated Vegetation:
    - the offset site would contain vegetation of the same broad vegetation group as the impacted regional ecosystem
    - the offset site would contain vegetation of the same regional ecosystem status
    - the offset site would be located within the same bioregion.
- For Connectivity Areas:
    - the offset site would contain an equivalent area of non-remnant ecosystem
    - the offset site would be located within the same subregion.

Table 14 Potential Residual Impacts on Matters of State Environmental Significance

Matters of State Environmental Significance			Stage 1 (ha)	Stage 2 (ha)	Stage 3 (ha)	Stage 4 (ha)	Total (ha)	Significant Residual Impacts likely?
Regulated Vegetation	'Endangered' or 'of concern' regional ecosystems*; or	RE 11.4.3	3	0	0	0	3	Yes
		RE 11.4.10	17	0	0	0	17	Yes
		RE 11.3.2	0	0	17.5	0	17.5	Yes
	Regional ecosystems within the defined distance of a vegetation management watercourse		0	0.5 (RE 11.5.1/1a, 11.7.7)	1.7 (RE 11.3.2, 11.3.25, 11.7.4, 11.7.7)	0.25 (RE 11.3.25, 11.7.4)	2.5	Yes
Connectivity Areas			36	132	470	271.5	910	Yes

* The REs and species habitats overlap (i.e. the REs and habitats are not mutually exclusive).

It is likely that land-based offsets meeting these requirements would be able to be located for the matters requiring offsetting (Table 14). The MSES proposed to be impacted by the Project (Table 14) occur more widely in the surrounding locality, including on land held by Syntech Resources. Syntech Resources would investigate the potential for these properties to be used as offsets for the impacts associated with the Project.

In accordance with the *Queensland Environmental Offsets Policy* (DEHP 2014a), a notice of election for Stage 1 would be provided to DEHP no less than 3 months before residual significant impacts on MSES. The notice of election would include a description of the:

- offset delivery approach (a land-based proponent-driven offset site(s), direct-benefit offset and/or a financial settlement offset); and
- proposed staging details.

As described in the *Queensland Environmental Offsets Policy, General Guide* (DEHP, 2017a):

> *Under the Offsets Act the identification of the intended offset delivery approach can occur before or after the relevant offset condition, or conditions, have been imposed.*

If a land-based proponent-driven offset site is proposed for the regulated vegetation, it is intended that a habitat quality assessment would be undertaken in accordance with the *Guide to Determining Terrestrial Habitat Quality* (DEHP, 2017b). However, it is also noted that a rapid assessment process is available whereby a site habitat quality score of 7 can be assumed (DEHP, 2017b). It is also noted that the maximum offset quantum for regulated vegetation is up to four times the area of impact (DEHP 2014a).

For subsequent stages, a detailed assessment of the impact of each stage of the Project and the offset requirement for each stage would be conducted prior to providing the notice of election to DEHP for that stage. The offset would be provided before the commencement of each stage.

Conclusion

The Project is located in an area that has had a long history of agricultural use, and more recently mining. This has resulted in substantial clearing of vegetation, leading to fragmentation and loss of connectivity at the local scale. However, the area is also adjacent to large tracts of native vegetation, so at a regional scale the proposed impacts are limited.

The Project proposes to clear a total of approximately 910 ha of remnant vegetation: 36 ha in stage 1, 132 ha in stage 2, 470 ha in stage 3 and 271.5 ha in stage 4. This total includes approximately 20 ha of Endangered REs, approximately 18 ha of Of Concern REs and approximately 871 ha of No Concern at Present REs. Of the total vegetation to be cleared, 2.5 ha of REs are within 5 m of a watercourse. Impacts on connectivity and fragmentation are considered to be significant by the Landscape Fragmentation and Connectivity Tool: the post-clearing change at the local scale is 10% (the threshold for a significant impact is 5%).

An environmental offset is required for the Project to address significant residual impacts on MSES (i.e. Regulated Vegetation and Connectivity Areas) as determined by the *Queensland Environmental Offsets Policy — Draft Significant Residual Impacts Guideline*. In accordance with the *Queensland Environmental Offsets Policy*, a notice of election for Stage 1 would be provided to DEHP no less than three months before residual significant impacts on MSES. The notice of election would include a description of the:

- offset delivery approach (a land-based proponent-driven offset site(s), direct-benefit offset and/or a financial settlement offset); and
- proposed staging details.

For subsequent stages, a detailed assessment of the impact of each stage of the Project and the offset requirement for each stage would be conducted prior to providing the notice of election to DEHP for that stage. The offset would be provided before the commencement of each stage.

References

AARC (2013a) Cameby Downs Expansion Project: Terrestrial flora and Fauna Assessment. AustralAsian Resource Consultants, Brisbane.

AARC (2013b) Cameby Downs Expansion Project: Assessment of Matters of National Environmental Significance. AustralAsian Resource Consultants, Brisbane.

Australasian Groundwater and Environmental Consultants (2018) Cameby Downs Continued Operations Project Groundwater Impact Assessment.

Atlas of Living Australia (2016). Atlas of Living Australia. http://www.ala.org.au/.

BAAM (2006) Flora and fauna assessment report, Cameby Downs Coal Project. Report prepared for AustralAsian Resource Consultants. Biodiversity Assessment and Mapping, Cleveland. Report prepared for AustralAsian Resource Consultants.

BOM (2016) Groundwater Dependent Ecosystems Atlas. Accessed November 2016 from: http://www.bom.gov.au/water/groundwater/gde/. November 2016 Bureau of Meteorology, Canberra.

BOM (2017) Climate Data Online. Accessed from: http://www.bom.gov.au/climate/data/index.shtml. Bureau of Meteorology, Canberra.

Bostock, P.D. and Holland, A.E. (2013) Census of the Queensland Flora 2013, Queensland Herbarium, Environmental Protection Agency, Brisbane, https://data.qld.gov.au/dataset/census-of-the-queensland-flora-2013.

DEHP (2014a) Queensland Environmental Offsets Policy Version 1.1. Department of Environment and Heritage Protection, Queensland.

DEHP (2014b) Biodiversity Planning Assessment - Brigalow Belt., Accessed from: https://data.qld.gov.au/dataset/biodiversity-planning-assessment-series. Department of Environment and Heritage Protection, Queensland.

DEHP (2014c) Code of environmental compliance for exploration and mineral development projects - EM586. Accessed from: http://ehp.qld.gov.au/licences-permits/compliance-codes/mining.html. Department of Environment and Heritage Protection, Queensland.

DEHP (2014d) Method for mapping matters of state environmental significance for use in land use planning and development assessment Version 4. Accessed from: http://www.ehp.qld.gov.au/land/natural-resource/method-mapping-mses.html. Department of Environment and Heritage Protection, Queensland.

DEHP (2014e) Queensland Environmental Offsets Policy - Significant Residual Impact Guideline. Department of Environment and Heritage Protection, Queensland.

DEHP (2015) Statewide Corridors mapping. Queensland Government, Department of Environment and Heritage Protection, Queensland.

DEHP (2016a) Protected Plants Flora Survey Trigger Mapping. Queensland Government, Department of Environment and Heritage Protection, Queensland.

DEHP (2016b) Regional Ecosystem Descriptions. July 2016, Accessed from

http://www.ehp.qld.gov.au/ecosystems/biodiversity/regional-ecosystems/index.php. Queensland Department of Environment and Heritage Protection, Queensland.

DEHP (2016c) Environmentally Sensitive Areas mapping. Department of Environment and Heritage Protection, Queensland.

DEHP (2016d) Flora survey guidelines- protected plants Version 2.0, Department of Environment and Heritage Protection, Queensland, https://www.ehp.qld.gov.au/licences-permits/plants-animals/documents/flora-survey-guidelines.pdf. Department of Environment and Heritage Protection, Queensland.

DEHP (2016e) Wildlife Online. Accessed from http://www.ehp.qld.gov.au/wildlife/wildlife-online/. Queensland Government, Department of Environment and Heritage Protection, Queensland.

DEHP (2016f) Queensland Wetland Mapping version 4.0. Queensland Government, Department of Environment and Heritage Protection, Queensland.

DEHP (2016g) Landscape Fragmentation and Connectivity Tool. Queensland Government, Department of Environment and Heritage Protection, Queensland.

DEHP (2017a) Queensland Environmental Offsets Policy, General Guide v1.2. Queensland Government, Department of Environment and Heritage Protection, Queensland.

DEHP (2017b) Guide to determining terrestrial habitat quality. A toolkit for assessing land based offsets under the Queensland Environmental Offsets Policy v1.2. Queensland Government, Department of Environment and Heritage Protection, Queensland.

DILGP (2017) State Planning Policy Interactive Mapping System. Accessed from: http://www.dilgp.qld.gov.au/planning/state-planning-instruments/spp-interactive-mapping-system.html. Department of Infrastructure, Local Government and Planning, Queensland.

DNRM (2015) Queensland Globe, Imagery date June 2015. Queensland Government, Department of Natural Resources and Mines, Queensland.

DNRM (2016a) Regulated Vegetation Management mapping (version 1.5). Accessed from https://www.dnrm.qld.gov.au/qld/environment/land/vegetation/vegetation-map-request-form July 2016. Department of Natural Resources and Mines, Queensland.

DNRM (2016b) Essential habitat (EH) mapping (version 4). Accessed from: https://environment.ehp.qld.gov.au/report-request/environment/ July 2016. Department of Natural Resources and Mines, Queensland.

DoEE (2016) EPBC Act Protected Matters Search Tool. Accessed from http://www.environment.gov.au/topics/about-us/legislation/environment-protection-and-biodiversity-conservation-act-1999/protected. Department of the Energy and Environment, Canberra.

DoEE (2017) Species profile and threats database. Accessed from: http://www.environment.gov.au/cgi-bin/sprat/public/sprat.pl. Department of Energy and Environment, Canberra.

DPM Envirosciences Pty Ltd (2018) Aquatic Ecology Assessment of the Cameby Downs Continued Operations Project. Prepared for: Syntech Resources Pty Ltd C/- Yancoal

Australia Ltd.

DSEWPaC (2012) Offsets Assessment Guide. Department of Sustainability, Environment, Water, Population and Communities, Canberra.

DSITI (2016a) Regional Ecosystem Mapping Version 9.0, Department of Science, Information Technology and Innovation, Brisbane.

DSITI (2016b) Mapping data – Queensland Groundwater Dependent Ecosystems and Potential GDE Aquifer Mapping. Department of Science, Information Technology and Innovation, Brisbane.

DSITI (2016c) Statewide Landcover and Tree Study Mapping. Queensland Government, Department of Environment and Heritage Protection, Queensland.

Ecosure (2018) *Cameby Downs Mine Continued Operation Project – Terrestrial Fauna Assessment Report*. Ecosure, Brisbane.

EPA (2002) Biodiversity Assessment and Mapping Methodology Version 2.1. Environmental Protection Agency, Queensland.

Google Earth (2016) Accessed July 2016. Google Pty Ltd.

Katestone Environmental (2018) Cameby Downs Continued Operations Project Air Quality and Greenhouse Gas Assessment.

Institute for Environmental Monitoring and Research (2008) Best Practice Erosion and Sediment Control Guideline.

Luminous Energy (2016) Columboola Solar Farm. Development Application for Material Change of Use at Kerwicks Road, Columboola. Lots 70 & 71 on Plan BWR159, Planning Report November 2016. Luminous Energy Pty Ltd, Brisbane.

Nearmap (2016) Accessed from http://maps.au.nearmap.com/. Nearmap Pty Ltd.

Neldner, V.J., Wilson, B.A., Dillewaard, H.A., Ryan, T.S. and Butler, D.W. (2017) Methodology for Survey and Mapping of Regional Ecosystems and Vegetation Communities in Queensland. Version 4.0. Updated May 2017. Queensland Herbarium, Queensland Department of Science, Information Technology and Innovation, Brisbane.

Sharp, D. & Simon, B.K. (2002) AusGrass: Grasses of Australia. Australian Biological Resources Study: EPA, Brisbane.

TSSC (2001) Commonwealth Listing Advice on Brigalow (Acacia harpophylla dominant and co-dominant).

TSSC (2013) Commonwealth Conservation Advice for Brigalow Ecological Community.

WRM Water and Environment (2018) Cameby Downs Continued Operations Project Surface Water Assessment.

Yancoal (2016a) Cameby Downs Continued Operations Project: Section 226 Consideration Report.

Yancoal (2016b) Cameby Downs Mine Rehabilitation Management Plan.

Appendix 1 Figures

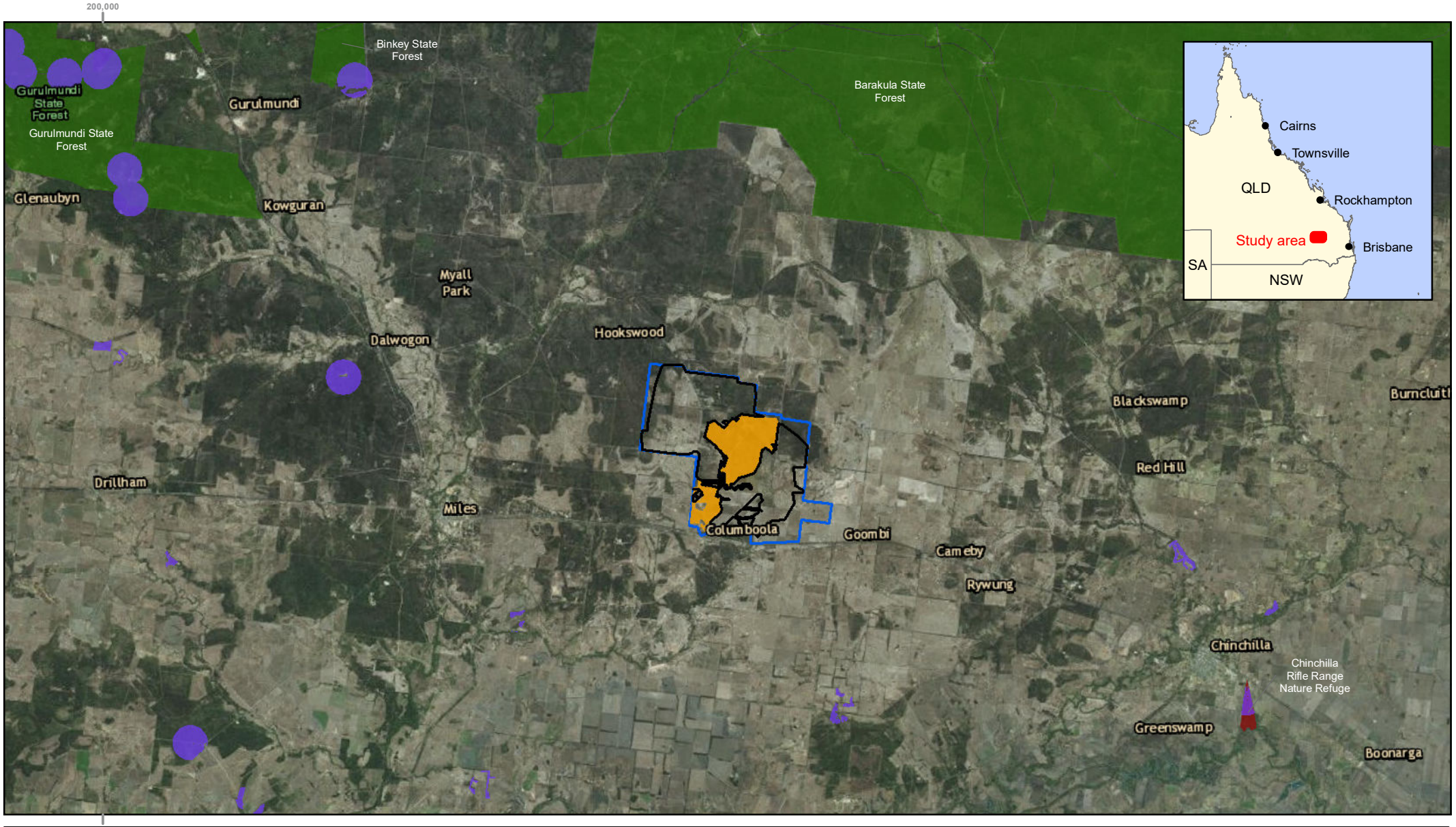

Figure 1: Site location

Syntech
Flora survey report
Cameby Downs Continued Operations Project

- Indicative extent of additional surface development
- Existing/approved extent of operations
- Ecology survey study area
- Essential habitat
- Nature reserve
- Protected area

ecosure

Job number: PR1851
Revision: 9
Author: DB
Date: 29/08/2017

0 1.5 3 6
Kilometers

GDA 1994 MGA Zone 56
Projection: Transverse Mercator
Datum: GDA 1994
Units: Meter

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Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community, Mine data:
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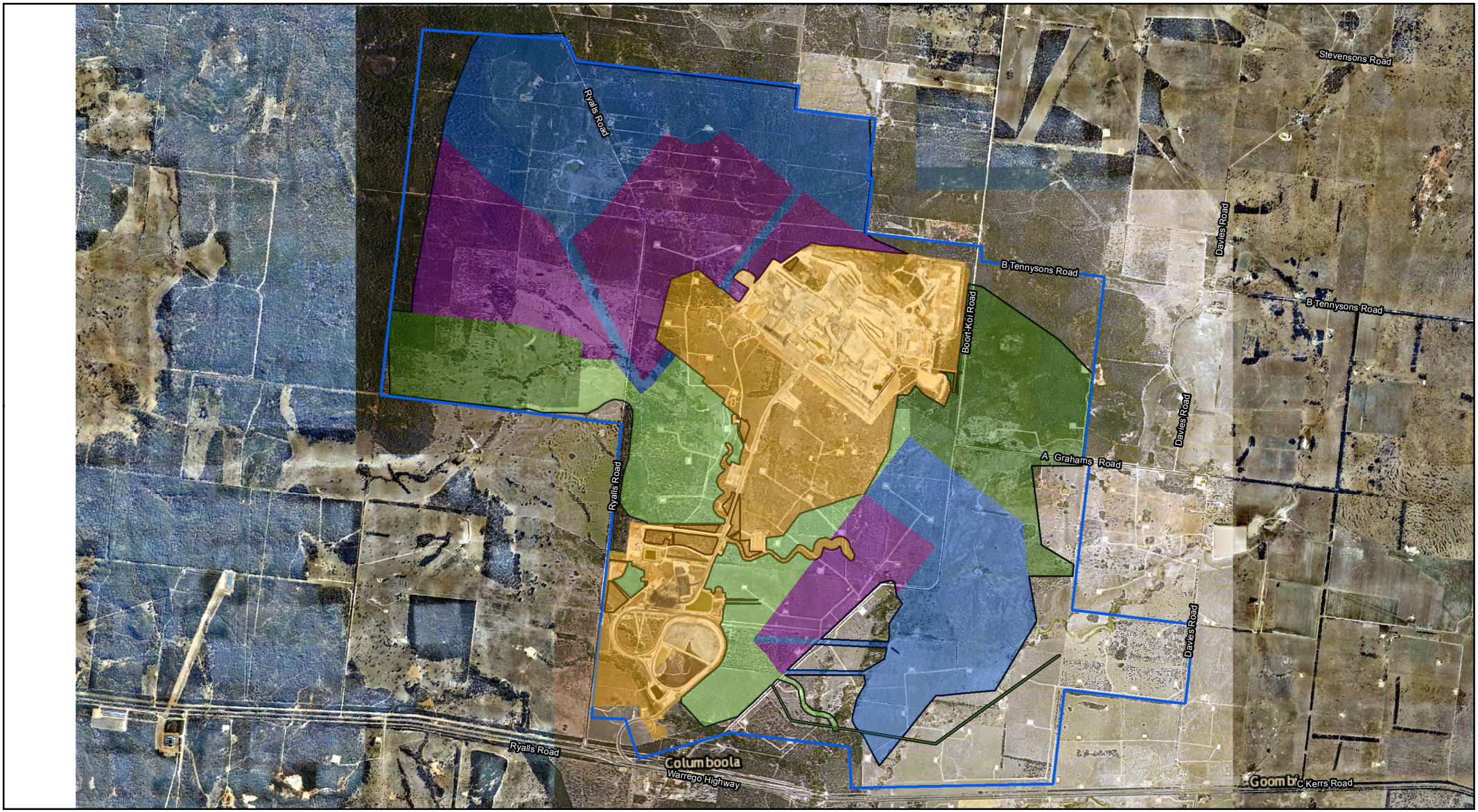

Figure 2: Mine development stages

Syntech
Flora survey report
Cameby Downs Continued Operations Project

- Ecology survey study area
- Indicative extent of additional surface development
- Existing/approved extent of operations
- Stage 1
- Stage 2
- Stage 3
- Stage 4

ecosure

Job number: PR1851
Revision: 11
Author: DB, KF
Date: 5/06/2018

0 0.5 1 2
Kilometers

GDA 1994 MGA Zone 56
Projection: Transverse Mercator
Datum: GDA 1994
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PR1851_MP2_FL_MineStages
A4

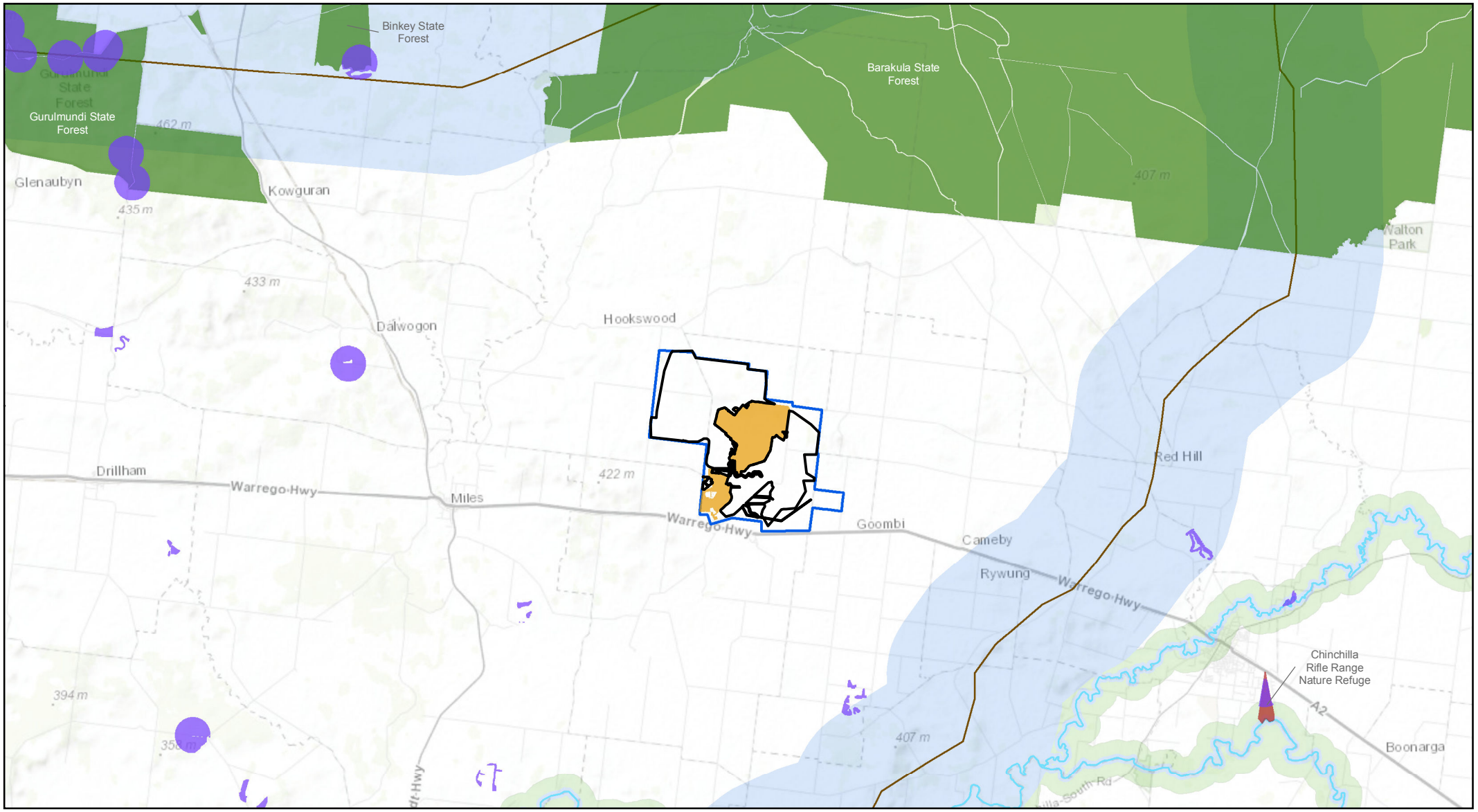

Figure 3: Regional environmental values including state and regional corridors, essential habitat and protected areas

Syntech
Flora survey report
Cameby Downs Continued Operations Project

- Indicative extent of additional surface development
- Existing/approved extent of operations
- Ecology survey study area
- Essential habitat
- Nature reserve
- Protected area

Wildlife corridors
- Riparian corridor
- Terrestrial corridor
- State significance
- Regional significance

ecosure

Job number: PR1851
Revision: 9
Author: DB
Date: 14/05/2018

0 1.5 3 6
Kilometers

GDA 1994 MGA Zone 56
Projection: Transverse Mercator
Datum: GDA 1994
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Sources: Esri, USGS, NOAA, Mine data:
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PR1851_MP3_FL_Corridors
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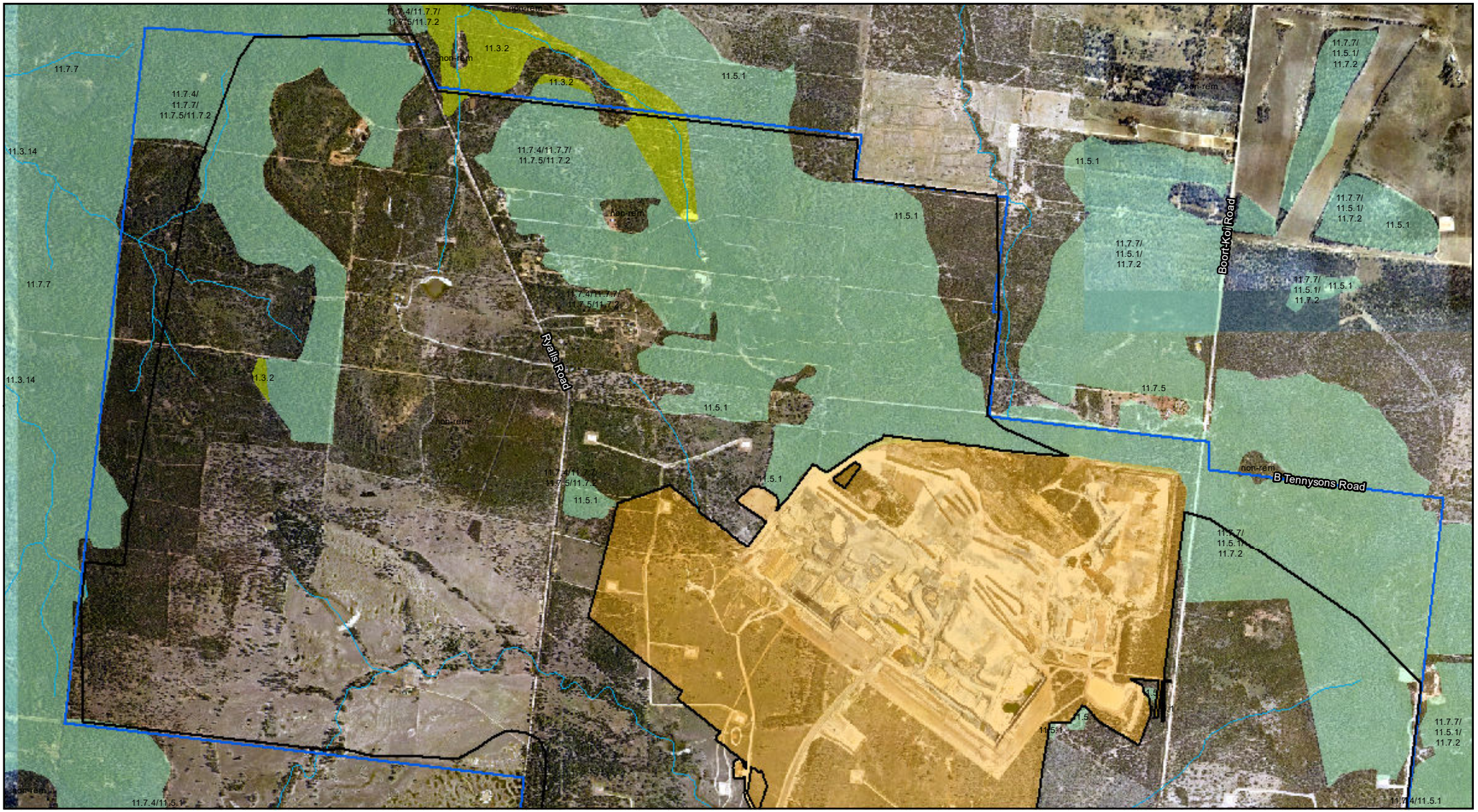

Figure 4.1: Mapped remnant regional ecosystems in the north of the study area

Syntech

Flora survey report

Cameby Downs Continued Operations Project

- Indicative extent of additional surface development
- Ecology survey study
- Existing/approved extent of operations

Remnant vegetation (DSITI, version 9)

- Of concern - dominant
- Not of concern

ecosure

Job number: PR1851
Revision: 10
Author: DB
Date: 11/05/2018

0 0.25 0.5 1
Kilometers

GDA 1994 MGA Zone 56
Projection: Transverse Mercator
Datum: GDA 1994
Units: Meter

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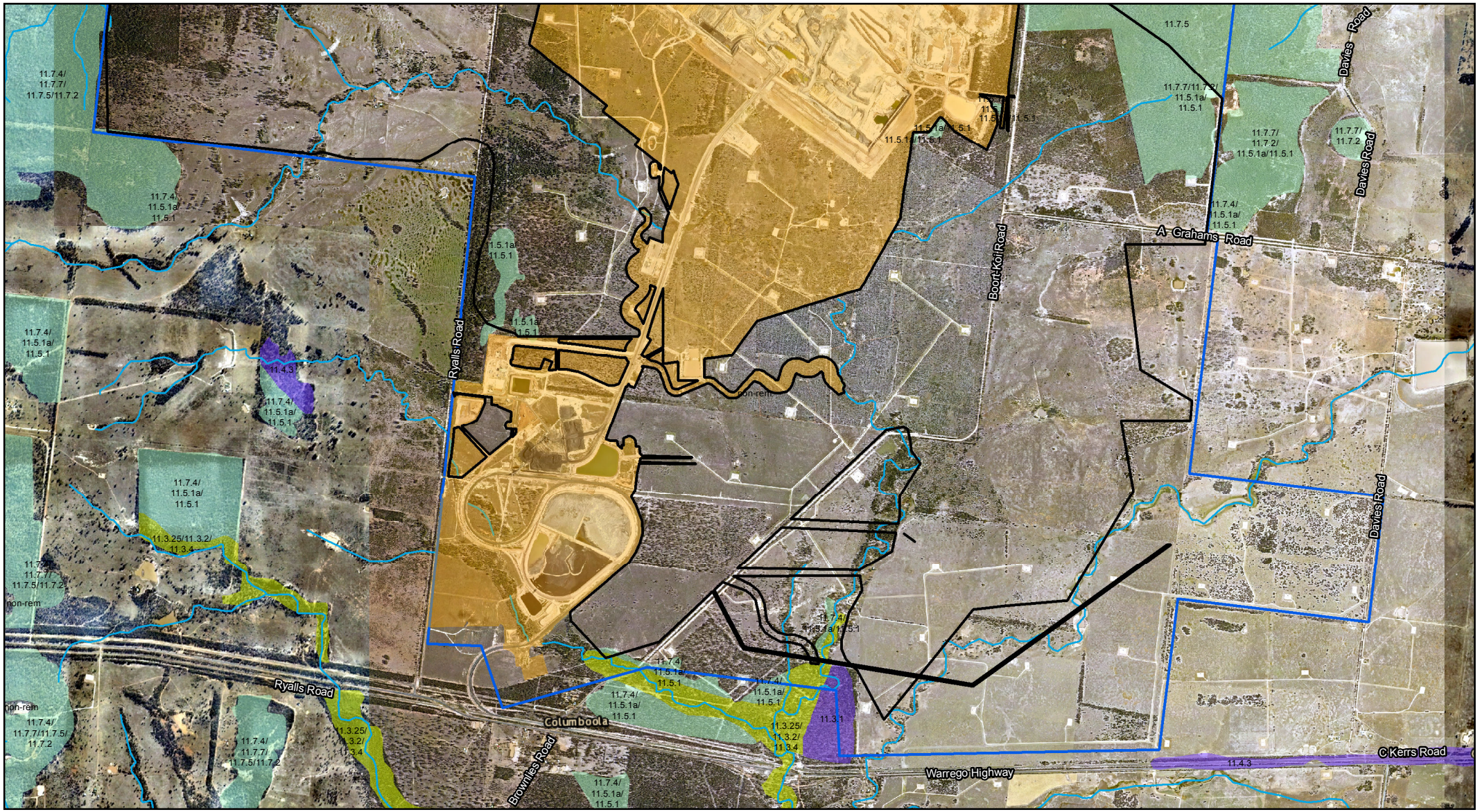

Figure 4.2: Mapped remnant regional ecosystems in the south of the study area

Syntech
Flora survey report
Cameby Downs Continued Operations Project

Indicative extent of additional surface development
Existing/approved extent of operations
Ecology survey study area

Remnant vegetation (DSITI, version 10)
Endangered - dominant
Of concern - dominant
Not of concern

ecosure

Job number: PR1851
Revision: 10
Author: DB
Date: 14/05/2018

0 0.25 0.5 1
Kilometers

GDA 1994 MGA Zone 56
Projection: Transverse Mercator
Datum: GDA 1994
Units: Meter

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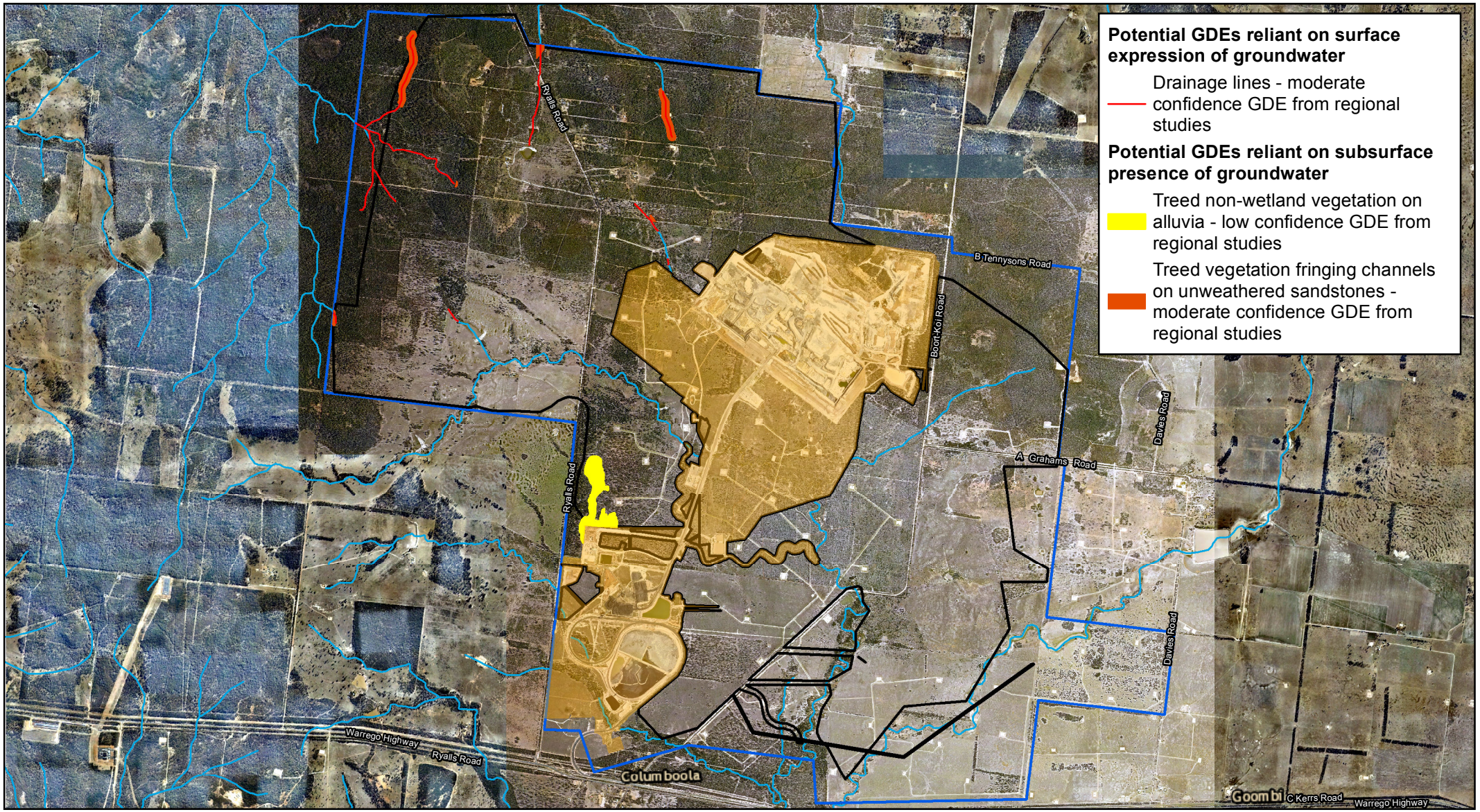

Figure 5: Mapped groundwater dependant ecosystems

Syntech
Flora survey report
Cameby Downs Continued Operations Project

Existing/approved extent of operations
Indicative extent of additional surface development
Ecology survey study area

ecosure

Job number: PR1851
Revision: 10
Author: DB
Date: 14/05/2018

0 0.5 1 2 Kilometers

GDA 1994 MGA Zone 56
Projection: Transverse Mercator
Datum: GDA 1994
Units: Meter

Data Sources: © State of Queensland (Department of Natural Resources and Mine), 2017; © Ecosure Pty Ltd, 2017; Syntech 2017, Image:Nearmap 2016 , Groundwater dependent ecosystems: Australian Government CSIRO 2017 at:http://www.data.gov.au/dataset/075cdc0a-382e-4040-9a70-fcd85a2da5d5/resource/7856feaa-d6c3-4d66-ba40-c29500d2d557.
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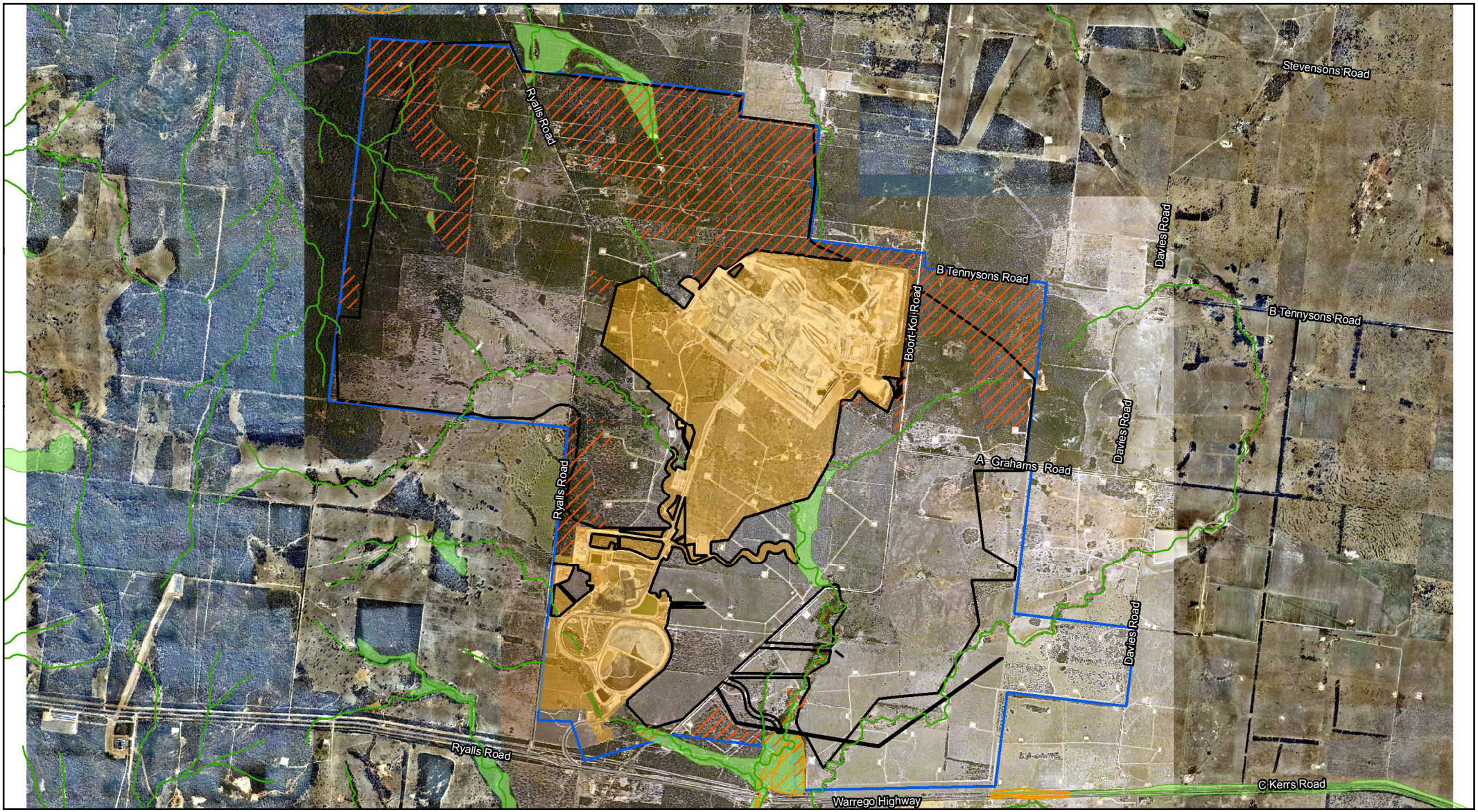

Figure 6: Matters of state environmental significance mapped by the state

Syntech
Flora survey report
Cameby Downs Continued Operations Project

- Ecology survey study area
- Existing/approved extent of operations
- Indicative extent of additional surface development

Matters of state environmental significance

- Regulated vegetation (intersecting a watercourse)
- Wildlife habitat
- Regulated vegetation
- Connectivity areas within study area

ecosure

Job number: PR1851
Revision: 9
Author: DB
Date: 14/05/2018

0 0.5 1 2
Kilometers

GDA 1994 MGA Zone 56
Projection: Transverse Mercator
Datum: GDA 1994
Units: Meter

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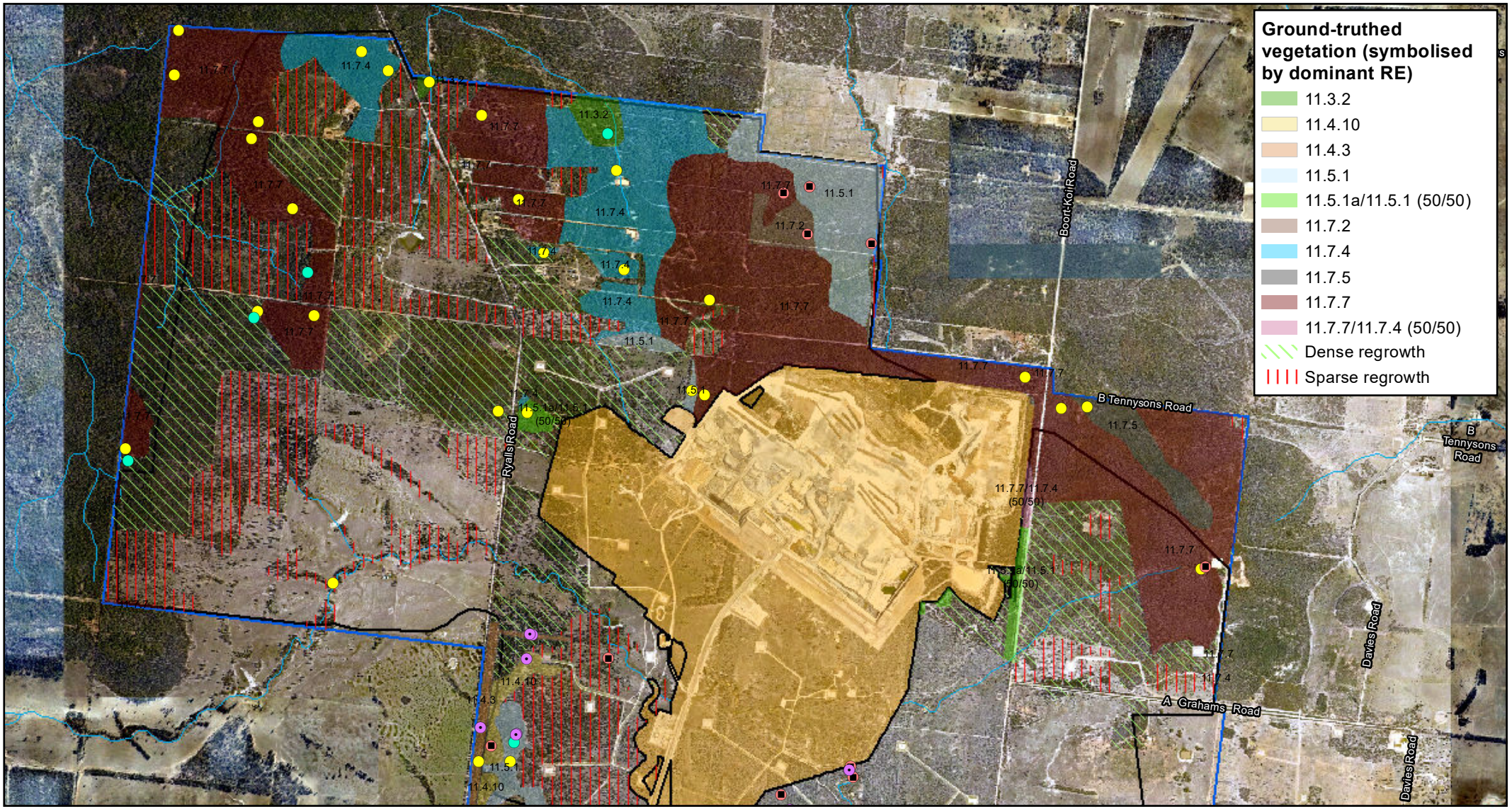

Figure 7.1: Ground-truthed vegetation communities in the north of the study area

Syntech
Flora survey report
Cameby Downs Continued Operations Project

Indicative extent of additional surface development
Ecology survey study area
Existing/approved extent of operations

Flora survey locations
Tertiary
Observational

Other survey locations
Terrestrial habitat quality sites
Preliminary sites

ecosure

Job number: PR1851
Revision: 10
Author: DB
Date: 11/05/2018

0 0.25 0.5 1
Kilometers

GDA 1994 MGA Zone 56
Projection: Transverse Mercator
Datum: GDA 1994
Units: Meter

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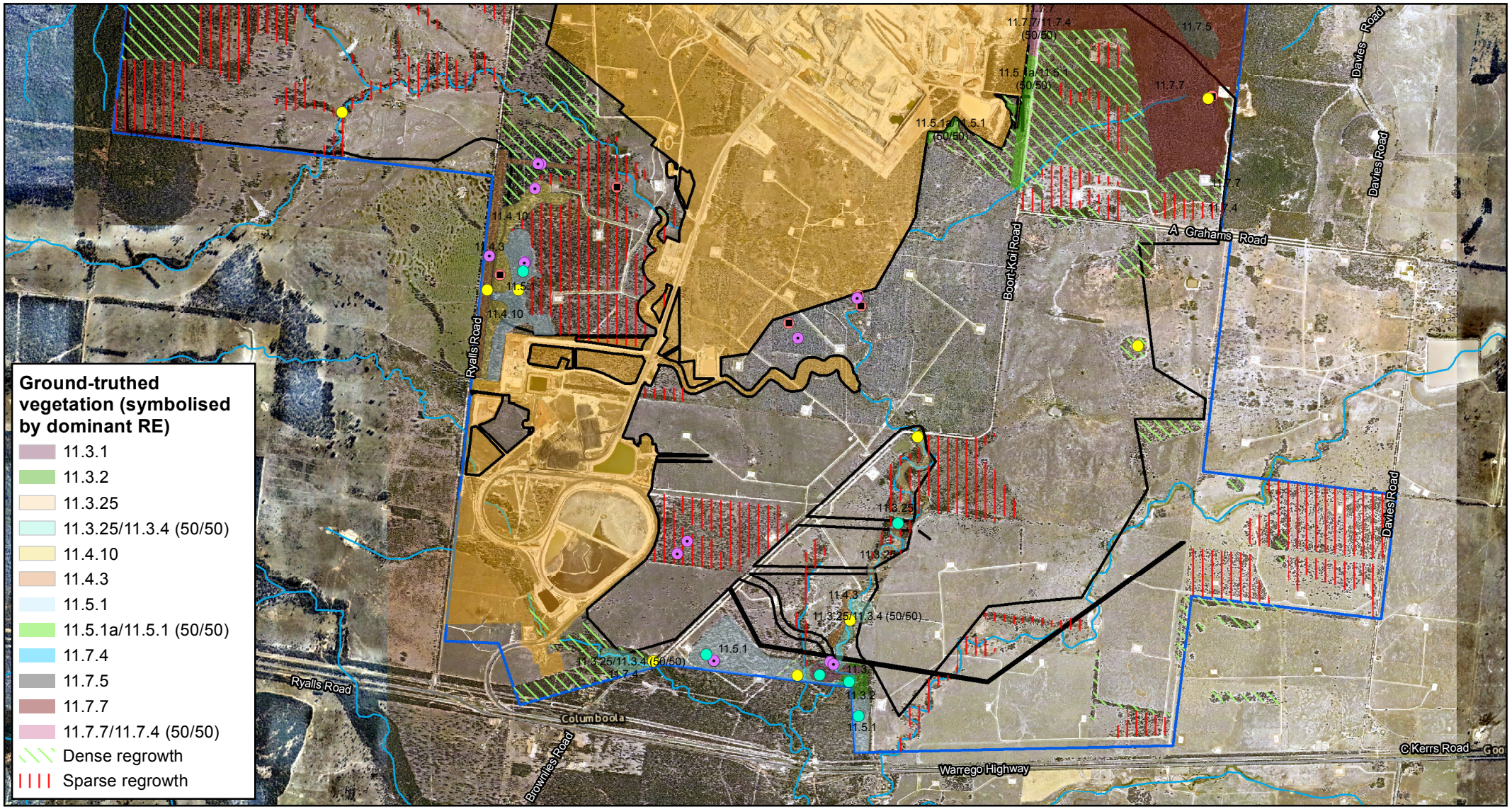

Figure 7.2: Ground-truthed vegetation communities in the south of the study area

Syntech
Flora survey report
Cameby Downs Continued Operations Project

Ecology survey study area
Indicative extent of additional surface development
Existing/approved extent of operations

Flora survey locations
Observational
Tertiary

Other survey locations
Terrestrial habitat quality sites
Preliminary sites

ecosure

Job number: PR1851
Revision: 10
Author: DB
Date: 14/05/2018

0 0.25 0.5 1
Kilometers

GDA 1994 MGA Zone 56
Projection: Transverse Mercator
Datum: GDA 1994
Units: Meter

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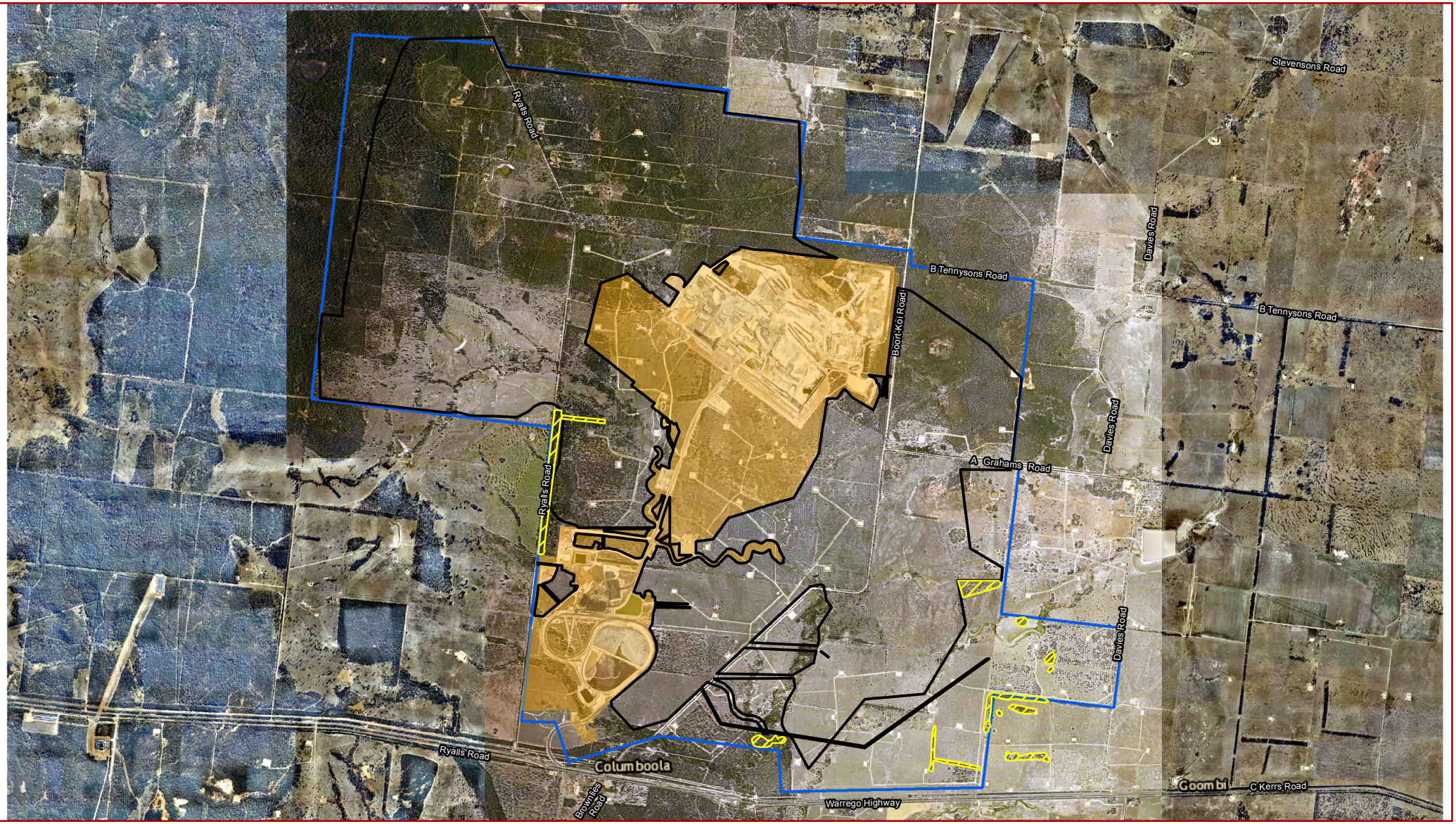

Figure 8: Threatened ecological communities

Syntech
Flora survey report
Cameby Downs Continued Operations Project

- Indicative extent of additional surface development
- Ecology survey study area
- Existing/approved extent of operations
- Brigalow threatened ecological community (Endangered under the EPBC Act)

ecosure

Job number: PR1851
Revision: 10
Author: DB
Date: 14/05/2018

0 0.5 1 2
Kilometers

GDA 1994 MGA Zone 56
Projection: Transverse Mercator
Datum: GDA 1994
Units: Meter

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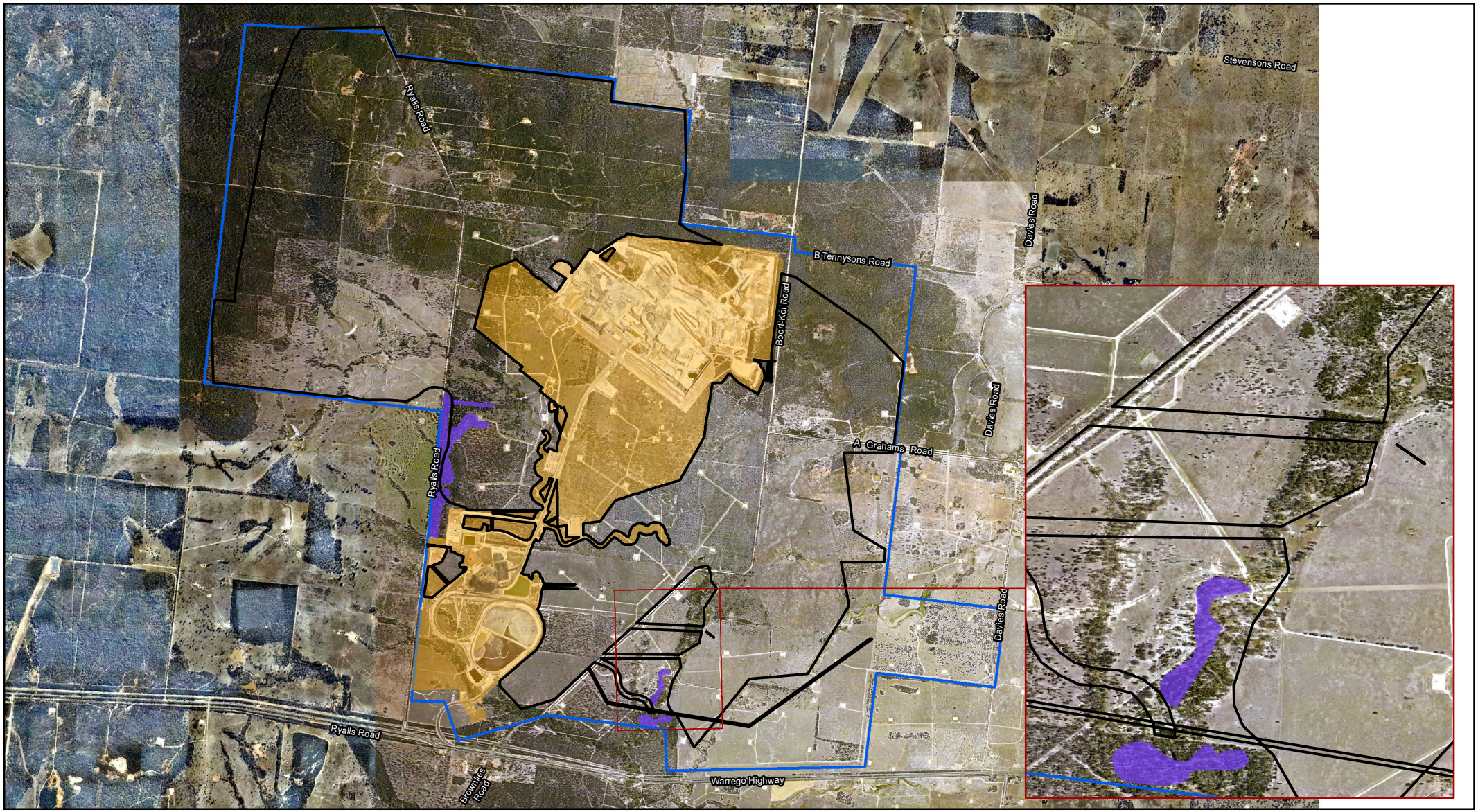

Figure 9: Ground-truthed environmentally sensitive areas

Syntech

Flora survey report
Cameby Downs Continued Operations Project

Ecology survey study area

Indicative extent of additional surface development

Existing/approved extent of operations

Environmentally sensitive areas

Category B

ecosure

Job number: PR1851
Revision: 10
Author: DB
Date: 14/05/2018

0 0.5 1 2
Kilometers

GCS GDA 1994
Datum: GDA 1994
Units: Degree

Data Sources: © State of Queensland (Department of Natural Resources and Mine), 2017; © Ecosure Pty Ltd, 2017; Syntech 2017, Image:Nearmap 2016
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Appendix 2 Database search results - PMST and Wildlife Online

Australian Government

Department of the Environment

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.

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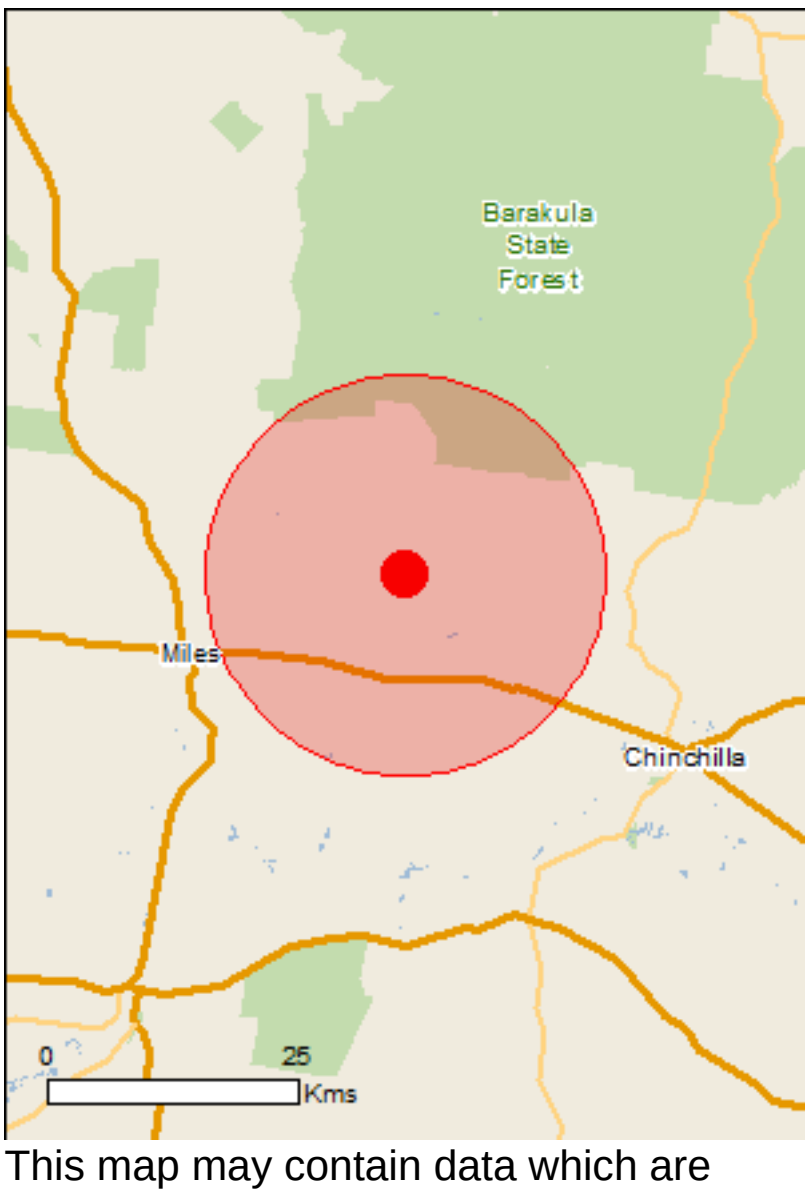

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Coordinates

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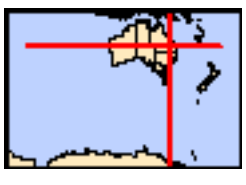

Summary

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:	4
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	4
Listed Threatened Species:	25
Listed Migratory Species:	10

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. Information on the new heritage laws can be found at http://www.environment.gov.au/heritage

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:	14
Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Commonwealth Reserves Marine:	None

Extra Information

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

State and Territory Reserves:	None
Regional Forest Agreements:	None
Invasive Species:	25
Nationally Important Wetlands:	None
Key Ecological Features (Marine)	None

Details

Matters of National Environmental Significance

Wetlands of International Importance (Ramsar) [Resource Information]

Name	Proximity
Banrock station wetland complex	1200 - 1300km
Narran lake nature reserve	400 - 500km upstream
Riverland	1100 - 1200km
The coorong, and lakes alexandrina and albert wetland	1400 - 1500km

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
Coolibah - Black Box Woodlands of the Darling Riverine Plains and the Brigalow Belt South Bioregions	Endangered	Community may occur within area
Natural grasslands on basalt and fine-textured alluvial plains of northern New South Wales and southern Queensland	Critically Endangered	Community likely to occur within area
Weeping Myall Woodlands	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 known to occur within area
Geophaps scripta scripta Squatter Pigeon (southern) [64440]	Vulnerable	Species or species habitat likely to occur within area
Grantiella picta Painted Honeyeater [470]	Vulnerable	Species or species habitat known to occur within area
Lathamus discolor Swift Parrot [744]	Critically Endangered	Species or species habitat may 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]	Endangered	Species or species habitat may occur within area
Fish		
Maccullochella peelii Murray Cod [66633]	Vulnerable	Species or species habitat may occur within area

Name	Status	Type of Presence
Mammals		
Chalinolobus dwyeri Large-eared Pied Bat, Large Pied Bat [183]	Vulnerable	Species or species habitat likely to occur within area
Dasyurus hallucatus Northern Quoll [331]	Endangered	Species or species habitat may occur within area
Nyctophilus corbeni Corben's Long-eared Bat, South-eastern Long-eared Bat [83395]	Vulnerable	Species or species habitat likely to occur within area
Petauroides volans Greater Glider [254]	Vulnerable	Species or species habitat may occur within area
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
Pteropus poliocephalus Grey-headed Flying-fox [186]	Vulnerable	Foraging, feeding or related behaviour may occur within area
Plants		
Acacia handonis Hando's Wattle, Percy Grant Wattle [14928]	Vulnerable	Species or species habitat likely to occur within area
Cadellia pentastylis Ooline [9828]	Vulnerable	Species or species habitat likely to occur within area
Calytrix gurulmundensis [24241]	Vulnerable	Species or species habitat likely to occur within area
Homopholis belsonii Belson's Panic [2406]	Vulnerable	Species or species habitat may occur within area
Homoranthus decumbens a shrub [55186]	Endangered	Species or species habitat known to occur within area
Thesium australe Austral Toadflax, Toadflax [15202]	Vulnerable	Species or species habitat may occur within area
Westringia parvifolia [4822]	Vulnerable	Species or species habitat likely to occur within area
Reptiles		
Anomalopus mackayi Five-clawed Worm-skink, Long-legged Worm-skink [25934]	Vulnerable	Species or species habitat may occur within area
Delma torquata Collared Delma [1656]	Vulnerable	Species or species habitat may occur within area
Denisonia maculata Ornamental Snake [1193]	Vulnerable	Species or species habitat may occur within area
Egernia rugosa Yakka Skink [1420]	Vulnerable	Species or species habitat known to occur within area
Furina dunmalli Dunmall's Snake [59254]	Vulnerable	Species or species

Name	Status	Type of Presence
		habitat known 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		
Cuculus optatus Oriental Cuckoo, Horsfield's Cuckoo [86651]		Species or species habitat may occur within area
Hirundapus caudacutus White-throated Needletail [682]		Species or species habitat may occur within area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area
Motacilla flava Yellow Wagtail [644]		Species or species habitat may occur within area
Myiagra cyanoleuca Satin Flycatcher [612]		Species or species habitat may occur within area
Rhipidura rufifrons Rufous Fantail [592]		Species or species habitat may occur within area
Migratory Wetlands Species		
Ardea alba Great Egret, White Egret [59541]		Breeding known to occur within area
Ardea ibis Cattle Egret [59542]		Species or species habitat may occur within area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		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		
Anseranas semipalmata Magpie Goose [978]		Species or species habitat may occur within area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardea alba Great Egret, White Egret [59541]		Breeding known to occur within area

Name	Threatened	Type of Presence
Ardea ibis Cattle Egret [59542]		Species or species habitat may occur within area
Cuculus saturatus Oriental Cuckoo, Himalayan Cuckoo [710]		Species or species habitat may 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
Hirundapus caudacutus White-throated Needletail [682]		Species or species habitat may occur within area
Lathamus discolor Swift Parrot [744]	Critically Endangered	Species or species habitat may occur within area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area
Motacilla flava Yellow Wagtail [644]		Species or species habitat may occur within area
Myiagra cyanoleuca Satin Flycatcher [612]		Species or species habitat may occur within area
Rhipidura rufifrons Rufous Fantail [592]		Species or species habitat may occur within area
Rostratula benghalensis (sensu lato) Painted Snipe [889]	Endangered*	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		
Acridotheres tristis Common Myna, Indian Myna [387]		Species or species habitat likely to occur within area

Name	Status	Type of Presence
Columba livia Rock Pigeon, Rock Dove, Domestic Pigeon [803]		Species or species habitat likely to occur within area
Lonchura punctulata Nutmeg Mannikin [399]		Species or species habitat likely to occur within area
Passer domesticus House Sparrow [405]		Species or species habitat likely to occur within area
Streptopelia chinensis Spotted Turtle-Dove [780]		Species or species habitat likely to occur within area
Sturnus vulgaris Common Starling [389]		Species or species habitat likely to occur within area
Frogs		
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
Canis lupus familiaris Domestic Dog [82654]		Species or species habitat likely to occur within area
Equus caballus Horse [5]		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
Lepus capensis Brown Hare [127]		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
Rattus rattus Black Rat, Ship Rat [84]		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		
Cylindropuntia spp. Prickly Pears [85131]		Species or species habitat likely to occur within area
Hymenachne amplexicaulis Hymenachne, Olive Hymenachne, Water Stargrass,		Species or species

Name	Status	Type of Presence
West Indian Grass, West Indian Marsh Grass [31754]		habitat likely to occur within area
Lycium ferocissimum African Boxthorn, Boxthorn [19235]		Species or species habitat likely to occur within area
Opuntia spp. Prickly Pears [82753]		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
Salix spp. except S.babylonica, S.x calodendron & S.x reichardtii Willows except Weeping Willow, Pussy Willow and Sterile Pussy Willow [68497]		Species or species habitat likely to occur within area
Salvinia molesta Salvinia, Giant Salvinia, Aquarium Watermoss, Kariba Weed [13665]		Species or species habitat likely to occur within area

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 and National Heritage properties, Wetlands of International and National 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.

Coordinates

-26.59553 150.37677

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:

-Office of Environment and Heritage, New South Wales
-Department of Environment and Primary Industries, Victoria
-Department of Primary Industries, Parks, Water and Environment, Tasmania
-Department of Environment, Water and Natural Resources, South Australia
-Parks and Wildlife Commission NT, Northern Territory Government
-Department of Environmental and Heritage Protection, Queensland
-Department of Parks and Wildlife, Western Australia
-Environment and Planning Directorate, ACT
-Birdlife Australia
-Australian Bird and Bat Banding Scheme
-Australian National Wildlife Collection
-Natural history museums of Australia
-Museum Victoria
-Australian Museum
-South Australian 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
Forestry Corporation, 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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Queensland Government

Wildlife Online Extract

Search Criteria: Species List for a Specified Point
Species: Plants (including other non-animals such as fungi and protists)
Type: All
Status: All
Records: All
Date: All
Latitude: -26.6266
Longitude: 150.3591
Distance: 20
Email: ahouse@ecosure.com.au
Date submitted: Wednesday 06 Sep 2017 10:40:41
Date extracted: Wednesday 06 Sep 2017 10:50:02

The number of records retrieved = 318

Disclaimer

As the DSITIA is still in a process of collating and vetting data, it is possible the information given is not complete. The information provided should only be used for the project for which it was requested and it should be appropriately acknowledged as being derived from Wildlife Online when it is used.

The State of Queensland does not invite reliance upon, nor accept responsibility for this information. Persons should satisfy themselves through independent means as to the accuracy and completeness of this information.

No statements, representations or warranties are made about the accuracy or completeness of this information. The State of Queensland disclaims all responsibility for this information and all liability (including without limitation, liability in negligence) for all expenses, losses, damages and costs you may incur as a result of the information being inaccurate or incomplete in any way for any reason.

Kingdom	Class	Family	Scientific Name	Common Name	I	Q	A	Records
fungi	club fungi	Basidiomycota	*Geastrum fornicatum*			C		1/1
plants	conifers	Cupressaceae	*Callitris glaucophylla*	white cypress pine		C		1
plants	conifers	Cupressaceae	*Callitris endlicheri*	black cypress pine		C		1
plants	ferns	Marsileaceae	*Marsilea drummondii*	common nardoo		C		1/1
plants	ferns	Ophioglossaceae	*Ophioglossum reticulatum*			C		1/1
plants	ferns	Ophioglossaceae	*Ophioglossum gramineum*			C		1/1
plants	higher dicots	Acanthaceae	*Brunoniella australis*	blue trumpet		C		1
plants	higher dicots	Acanthaceae	*Pseuderanthemum variabile*	pastel flower		C		2/1
plants	higher dicots	Aizoaceae	*Tetragonia tetragonoides*	New Zealand spinach		C		1/1
plants	higher dicots	Amaranthaceae	*Gomphrena celosioides*	gomphrena weed	Y			1
plants	higher dicots	Amaranthaceae	*Alternanthera denticulata*	lesser joyweed		C		2
plants	higher dicots	Apiaceae	*Actinotus gibbonsii*	dwarf flannel flower		C		1/1
plants	higher dicots	Apiaceae	*Platysace ericoides*	heath platysace		C		1/1
plants	higher dicots	Apocynaceae	*Vincetoxicum ovatum*			C		1/1
plants	higher dicots	Apocynaceae	*Marsdenia viridiflora subsp. viridiflora*			C		1/1
plants	higher dicots	Apocynaceae	*Marsdenia pleiadenia*			C		1/1
plants	higher dicots	Apocynaceae	*Cynanchum viminale subsp. brunonianum*			C		1/1
plants	higher dicots	Araliaceae	*Trachymene ochracea*	white parsnip		C		2/2
plants	higher dicots	Asteraceae	*Brachyscome microcarpa subsp. darlingensis*			C		1/1
plants	higher dicots	Asteraceae	*Cassinia laevis*			C		1/1
plants	higher dicots	Asteraceae	*Cirsium vulgare*	spear thistle	Y			1
plants	higher dicots	Asteraceae	*Olearia ramulosa*			C		1/1
plants	higher dicots	Asteraceae	*Rutidosis lanata*			NT		14/14
plants	higher dicots	Asteraceae	*Sigesbeckia fugax*			C		1/1
plants	higher dicots	Asteraceae	*Sonchus oleraceus*	common sowthistle	Y			2/1
plants	higher dicots	Asteraceae	*Calotis cuneifolia*	burr daisy		C		1/1
plants	higher dicots	Asteraceae	*Flaveria trinervia*		Y			1/1
plants	higher dicots	Asteraceae	*Arctotheca calendula*	Cape weed	Y			2/2
plants	higher dicots	Asteraceae	*Leptorhynchos baileyi*			C		1/1
plants	higher dicots	Asteraceae	*Rutidosis murchisonii*			C		7/7
plants	higher dicots	Asteraceae	*Solenogyne bellioides*			C		1/1
plants	higher dicots	Asteraceae	*Brachyscome dalbyensis*			C		1/1
plants	higher dicots	Asteraceae	*Leiocarpa panaetioides*			C		1/1
plants	higher dicots	Asteraceae	*Ozothamnus diotophyllus*			C		8/8
plants	higher dicots	Asteraceae	*Chrysocephalum apiculatum*	yellow buttons		C		1/1
plants	higher dicots	Asteraceae	*Olearia canescens subsp. discolor*			C		1/1
plants	higher dicots	Asteraceae	*Coronidium oxylepis subsp. lanatum*			C		1/1
plants	higher dicots	Asteraceae	*Leiocarpa semicalva subsp. tenuifolia*			C		2/2
plants	higher dicots	Asteraceae	*Senecio pinnatifolius var. pinnatifolius*			C		1/1
plants	higher dicots	Byttneriaceae	*Commersonia pedleyi*			C		3/3
plants	higher dicots	Byttneriaceae	*Seringia corollata*			C		1/1
plants	higher dicots	Cactaceae	*Opuntia tomentosa*	velvety tree pear	Y			1
plants	higher dicots	Cactaceae	*Opuntia*		Y			1
plants	higher dicots	Caesalpiniaceae	*Labichea digitata*			C		5/5
plants	higher dicots	Caesalpiniaceae	*Petalostylis labicheoides*			C		1/1
plants	higher dicots	Caesalpiniaceae	*Senna surattensis*			C		1/1

Kingdom	Class	Family	Scientific Name	Common Name	I	Q	A	Records
plants	higher dicots	Campanulaceae	*Lobelia andrewsii*			C		1/1
plants	higher dicots	Campanulaceae	*Lobelia stenophylla*			C		2/1
plants	higher dicots	Capparaceae	*Apophyllum anomalum*	broom bush		C		1/1
plants	higher dicots	Capparaceae	*Capparis lasiantha*	nipan		C		3/3
plants	higher dicots	Caryophyllaceae	*Spergularia brevifolia*			C		1/1
plants	higher dicots	Casuarinaceae	*Allocasuarina luehmannii*	bull oak		C		2/1
plants	higher dicots	Casuarinaceae	*Casuarina cristata*	belah		C		5/1
plants	higher dicots	Celastraceae	*Denhamia bilocularis*			C		1/1
plants	higher dicots	Chenopodiaceae	*Dysphania rhadinostachya subsp. inflata*			C		2/2
plants	higher dicots	Chenopodiaceae	*Sclerolaena muricata*			C		1/1
plants	higher dicots	Chenopodiaceae	*Dysphania glomulifera subsp. glomulifera*			C		1/1
plants	higher dicots	Chenopodiaceae	*Dysphania valida*			C		1/1
plants	higher dicots	Chenopodiaceae	*Enchylaena tomentosa*			C		1
plants	higher dicots	Chenopodiaceae	*Einadia hastata*			C		1
plants	higher dicots	Crassulaceae	*Bryophyllum delagoense*		Y			4/4
plants	higher dicots	Cucurbitaceae	*Cucumis myriocarpus*		Y			1
plants	higher dicots	Ericaceae	*Leucopogon biflorus*			C		2/2
plants	higher dicots	Ericaceae	*Leucopogon mitchellii*			C		2/2
plants	higher dicots	Euphorbiaceae	*Acalypha eremorum*	soft acalypha		C		1/1
plants	higher dicots	Euphorbiaceae	*Croton phebalioides*	narrow-leaved croton		C		1/1
plants	higher dicots	Euphorbiaceae	*Monotaxis macrophylla*			C		3/3
plants	higher dicots	Euphorbiaceae	*Euphorbia hyssopifolia*		Y			1/1
plants	higher dicots	Euphorbiaceae	*Croton insularis*	Queensland cascarilla		C		1/1
plants	higher dicots	Euphorbiaceae	*Euphorbia hirta*		Y			2/2
plants	higher dicots	Euphorbiaceae	*Euphorbia drummondii*			C		2/2
plants	higher dicots	Fabaceae	*Zornia*			C		2/2
plants	higher dicots	Fabaceae	*Crotalaria mitchellii subsp. mitchellii*			C		1/1
plants	higher dicots	Fabaceae	*Hovea longipes*	brush hovea		C		1/1
plants	higher dicots	Fabaceae	*Mirbelia pungens*			C		1/1
plants	higher dicots	Fabaceae	*Bossiaea concolor*			C		1/1
plants	higher dicots	Fabaceae	*Crotalaria brevis*			C		1/1
plants	higher dicots	Fabaceae	*Desmodium varians*	slender tick trefoil		C		1/1
plants	higher dicots	Fabaceae	*Dillwynia retorta*			C		1/1
plants	higher dicots	Fabaceae	*Mirbelia aotoides*			C		1/1
plants	higher dicots	Fabaceae	*Zornia dyctiocarpa*			C		3/3
plants	higher dicots	Fabaceae	*Chorizema parviflorum*	eastern flame pea		C		1/1
plants	higher dicots	Fabaceae	*Hardenbergia violacea*			C		1/1
plants	higher dicots	Fabaceae	*Tephrosia dietrichiae*			C		1/1
plants	higher dicots	Fabaceae	*Vicia sativa subsp. nigra*		Y			1/1
plants	higher dicots	Fabaceae	*Glycine clandestina var. sericea*			C		1/1
plants	higher dicots	Fabaceae	*Zornia muriculata subsp. muriculata*			C		1/1
plants	higher dicots	Fabaceae	*Cullen patens*	bullamon lucerne		C		1/1
plants	higher dicots	Geraniaceae	*Geranium solanderi var. solanderi*	native geranium		C		1/1
plants	higher dicots	Goodeniaceae	*Goodenia glabra*			C		1/1
plants	higher dicots	Goodeniaceae	*Scaevola spinescens*	prickly fan flower		C		1/1
plants	higher dicots	Goodeniaceae	*Goodenia disperma*			C		2/2

Kingdom	Class	Family	Scientific Name	Common Name	I	Q	A	Records
plants	higher dicots	Goodeniaceae	*Goodenia gracilis*			C		1
plants	higher dicots	Goodeniaceae	*Brunonia australis*	blue pincushion		C		1/1
plants	higher dicots	Goodeniaceae	*Goodenia*			C		1/1
plants	higher dicots	Goodeniaceae	*Goodenia delicata*			C		2/2
plants	higher dicots	Haloragaceae	*Haloragis heterophylla*	rough raspweed		C		1/1
plants	higher dicots	Haloragaceae	*Gonocarpus urceolatus*			C		7/7
plants	higher dicots	Lamiaceae	*Teucrium puberulum*			C		1/1
plants	higher dicots	Lamiaceae	*Prostanthera sp. (Baking Board V.Hando 135)*			C		2/2
plants	higher dicots	Lamiaceae	*Teucrium sp. (Pittsworth A.R.Bean 18338)*			C		1/1
plants	higher dicots	Lamiaceae	*Prostanthera lithospermoides*			C		1/1
plants	higher dicots	Lamiaceae	*Plectranthus parviflorus*			C		1
plants	higher dicots	Lamiaceae	*Prostanthera ringens*			C		1/1
plants	higher dicots	Lamiaceae	*Westringia cheelii*			C		3/3
plants	higher dicots	Lamiaceae	*Prostanthera cryptandroides subsp. euphrasioides*			C		3/3
plants	higher dicots	Lentibulariaceae	*Utricularia stellaris*			C		1/1
plants	higher dicots	Loranthaceae	*Amyema congener subsp. rotundifolia*			C		1/1
plants	higher dicots	Loranthaceae	*Amyema quandang var. bancroftii*	broad-leaved grey mistletoe		C		1/1
plants	higher dicots	Loranthaceae	*Lysiana exocarpi subsp. tenuis*			C		1/1
plants	higher dicots	Loranthaceae	*Dendrophthoe glabrescens*			C		2/2
plants	higher dicots	Lythraceae	*Ammannia multiflora*	jerry-jerry		C		2
plants	higher dicots	Lythraceae	*Rotala mexicana*			C		1
plants	higher dicots	Malvaceae	*Pavonia hastata*	pink pavonia	Y			1/1
plants	higher dicots	Malvaceae	*Sida corrugata*			C		1/1
plants	higher dicots	Malvaceae	*Hibiscus sturtii*			C		1/1
plants	higher dicots	Malvaceae	*Abutilon oxycarpum*			C		1
plants	higher dicots	Malvaceae	*Sida sp. (Musselbrook M.B.Thomas+ MRS437)*			C		2/2
plants	higher dicots	Meliaceae	*Owenia acidula*	emu apple		C		2/1
plants	higher dicots	Mimosaceae	*Acacia burrowii*			C		4/4
plants	higher dicots	Mimosaceae	*Acacia caroleae*			C		1/1
plants	higher dicots	Mimosaceae	*Acacia conferta*			C		4/4
plants	higher dicots	Mimosaceae	*Acacia shirleyi*	lancewood		C		1/1
plants	higher dicots	Mimosaceae	*Acacia triptera*			C		4/4
plants	higher dicots	Mimosaceae	*Acacia everistii*			C		1/1
plants	higher dicots	Mimosaceae	*Acacia hakeoides*	hakea wattle		C		1/1
plants	higher dicots	Mimosaceae	*Acacia johnsonii*			C		1/1
plants	higher dicots	Mimosaceae	*Acacia leiocalyx*			C		1
plants	higher dicots	Mimosaceae	*Acacia melvillei*			C		3/3
plants	higher dicots	Mimosaceae	*Acacia burbidgeae*			C		2/2
plants	higher dicots	Mimosaceae	*Acacia flexifolia*			C		1/1
plants	higher dicots	Mimosaceae	*Acacia ixiophylla*			C		6/6
plants	higher dicots	Mimosaceae	*Acacia juncifolia*			C		2/2
plants	higher dicots	Mimosaceae	*Acacia neriifolia*	pechey wattle		C		2/2
plants	higher dicots	Mimosaceae	*Acacia semilunata*	crescent-leaved wattle		C		6/5
plants	higher dicots	Mimosaceae	*Acacia harpophylla*	brigalow		C		3
plants	higher dicots	Mimosaceae	*Acacia microsperma*	bowyakka		C		1/1
plants	higher dicots	Mimosaceae	*Acacia omalophylla*			C		2/2

Kingdom	Class	Family	Scientific Name	Common Name	I	Q	A	Records
plants	higher dicots	Mimosaceae	*Acacia sparsiflora*			C		2/2
plants	higher dicots	Mimosaceae	*Acacia spectabilis*	pilliga wattle		C		5/5
plants	higher dicots	Mimosaceae	*Acacia tenuinervis*			C		4/4
plants	higher dicots	Mimosaceae	*Acacia longispicata*			C		1
plants	higher dicots	Mimosaceae	*Acacia blakei subsp. blakei*			C		1/1
plants	higher dicots	Mimosaceae	*Acacia crassa subsp. crassa*			C		1/1
plants	higher dicots	Mimosaceae	*Acacia excelsa subsp. excelsa*			C		1/1
plants	higher dicots	Mimosaceae	*Acacia julifera subsp. julifera*			C		1/1
plants	higher dicots	Mimosaceae	*Acacia leiocalyx subsp. leiocalyx*			C		3/3
plants	higher dicots	Mimosaceae	*Prosopis glandulosa var. glandulosa*		Y			2/2
plants	higher dicots	Mimosaceae	*Acacia pendula*	myall		C		1/1
plants	higher dicots	Mimosaceae	*Acacia falcata*	sickle wattle		C		1/1
plants	higher dicots	Mimosaceae	*Acacia debilis*			C		1/1
plants	higher dicots	Mimosaceae	*Acacia aprepta*	Miles mulga		C		7/7
plants	higher dicots	Mimosaceae	*Acacia decora*	pretty wattle		C		1
plants	higher dicots	Mimosaceae	*Acacia deanei*			C		2/2
plants	higher dicots	Mimosaceae	*Acacia macradenia*	zig-zag wattle		C		1/1
plants	higher dicots	Molluginaceae	*Glinus oppositifolius*			C		1/1
plants	higher dicots	Molluginaceae	*Glinus lotoides*	hairy carpet weed		C		1/1
plants	higher dicots	Myrsinaceae	*Lysimachia arvensis*		Y			1/1
plants	higher dicots	Myrtaceae	*Eucalyptus panda*			C		2/2
plants	higher dicots	Myrtaceae	*Kardomia jucunda*			C		3/3
plants	higher dicots	Myrtaceae	*Melaleuca decora*			C		1
plants	higher dicots	Myrtaceae	*Melaleuca nodosa*			C		1/1
plants	higher dicots	Myrtaceae	*Angophora costata*			C		1
plants	higher dicots	Myrtaceae	*Eucalyptus crebra*	narrow-leaved red ironbark		C		3/1
plants	higher dicots	Myrtaceae	*Eucalyptus elegans*			C		5/5
plants	higher dicots	Myrtaceae	*Eucalyptus exserta*	Queensland peppermint		C		5/5
plants	higher dicots	Myrtaceae	*Melaleuca quercina*			C		1/1
plants	higher dicots	Myrtaceae	*Eucalyptus populnea*	poplar box		C		3/1
plants	higher dicots	Myrtaceae	*Eucalyptus tenuipes*	narrow-leaved white mahogany		C		2/1
plants	higher dicots	Myrtaceae	*Harmogia densifolia*			C		1/1
plants	higher dicots	Myrtaceae	*Melaleuca bracteata*			C		1
plants	higher dicots	Myrtaceae	*Angophora floribunda*	rough-barked apple		C		1/1
plants	higher dicots	Myrtaceae	*Melaleuca lanceolata*			C		2/2
plants	higher dicots	Myrtaceae	*Melaleuca pallescens*			C		3/3
plants	higher dicots	Myrtaceae	*Micromyrtus albicans*			C		1/1
plants	higher dicots	Myrtaceae	*Micromyrtus sessilis*			C		2/2
plants	higher dicots	Myrtaceae	*Eucalyptus microcarpa*	inland grey box		C		1
plants	higher dicots	Myrtaceae	*Eucalyptus woollsiana*			C		1/1
plants	higher dicots	Myrtaceae	*Eucalyptus chloroclada*	Baradine red gum		C		2/2
plants	higher dicots	Myrtaceae	*Melaleuca squamophloia*			C		6/6
plants	higher dicots	Myrtaceae	*Eucalyptus tereticornis*			C		1
plants	higher dicots	Myrtaceae	*Eucalyptus longirostrata*			C		1
plants	higher dicots	Myrtaceae	*Lysicarpus angustifolius*	budgeroo		C		1/1
plants	higher dicots	Myrtaceae	*Leptospermum polygalifolium*	tantoon		C		3/3

Kingdom	Class	Family	Scientific Name	Common Name	I	Q	A	Records
plants	higher dicots	Myrtaceae	*Eucalyptus fibrosa subsp. fibrosa*			C		1/1
plants	higher dicots	Myrtaceae	*Eucalyptus fibrosa subsp. nubilis*			C		3/2
plants	higher dicots	Myrtaceae	*Corymbia trachyphloia subsp. trachyphloia*			C		2/2
plants	higher dicots	Myrtaceae	*Eucalyptus tereticornis subsp. tereticornis*			C		1/1
plants	higher dicots	Oleaceae	*Notelaea microcarpa*			C		1/1
plants	higher dicots	Oleaceae	*Jasminum didymum subsp. racemosum*			C		1/1
plants	higher dicots	Oleaceae	*Jasminum simplicifolium subsp. australiense*			C		1/1
plants	higher dicots	Onagraceae	*Oenothera lindheimeri*		Y			1/1
plants	higher dicots	Onagraceae	*Ludwigia octovalvis*	willow primrose		C		1/1
plants	higher dicots	Oxalidaceae	*Oxalis*			C		1/1
plants	higher dicots	Oxalidaceae	*Oxalis radicosa*			C		1/1
plants	higher dicots	Phyllanthaceae	*Phyllanthus virgatus*			C		1/1
plants	higher dicots	Phyllanthaceae	*Sauropus hirtellus*			C		2/2
plants	higher dicots	Phyllanthaceae	*Phyllanthus*			C		1/1
plants	higher dicots	Phyllanthaceae	*Phyllanthus gunnii*			C		1/1
plants	higher dicots	Plantaginaceae	*Gratiola pedunculata*			C		1
plants	higher dicots	Plantaginaceae	*Linaria maroccana*		Y			2/2
plants	higher dicots	Plantaginaceae	*Misopates orontium*	lesser snapdragon	Y			1/1
plants	higher dicots	Polygalaceae	*Polygala triflora*			C		1/1
plants	higher dicots	Portulacaceae	*Portulaca australis*			C		1/1
plants	higher dicots	Proteaceae	*Hakea purpurea*			C		3/3
plants	higher dicots	Rhamnaceae	*Cryptandra armata*			C		3/3
plants	higher dicots	Rubiaceae	*Psydrax oleifolia*			C		1
plants	higher dicots	Rubiaceae	*Diodia teres*		Y			3/3
plants	higher dicots	Rubiaceae	*Everistia vacciniifolia forma vacciniifolia*			C		1/1
plants	higher dicots	Rubiaceae	*Psydrax odorata forma subnitida*			C		1/1
plants	higher dicots	Rubiaceae	*Dentella repens*	dentella		C		1/1
plants	higher dicots	Rutaceae	*Phebalium nottii*	pink phebalium		C		2/2
plants	higher dicots	Rutaceae	*Boronia bipinnata*	rock boronia		C		1/1
plants	higher dicots	Rutaceae	*Geijera parviflora*	wilga		C		4/1
plants	higher dicots	Rutaceae	*Philotheca difformis subsp. difformis*			C		2/2
plants	higher dicots	Rutaceae	*Zieria aspalathoides subsp. aspalathoides*			C		1/1
plants	higher dicots	Rutaceae	*Boronia occidentalis*			C		3/3
plants	higher dicots	Santalaceae	*Santalum lanceolatum*			C		1/1
plants	higher dicots	Sapindaceae	*Dodonaea heteromorpha*			C		1/1
plants	higher dicots	Sapindaceae	*Dodonaea peduncularis*			C		3/3
plants	higher dicots	Sapindaceae	*Dodonaea viscosa subsp. cuneata*			C		1
plants	higher dicots	Sapindaceae	*Dodonaea viscosa subsp. spatulata*			C		2/2
plants	higher dicots	Sapindaceae	*Dodonaea vestita*			C		1/1
plants	higher dicots	Sapindaceae	*Dodonaea macrossanii*			C		2/2
plants	higher dicots	Sapindaceae	*Dodonaea biloba*			C		9/9
plants	higher dicots	Scrophulariaceae	*Myoporum acuminatum*	coastal boobialla		C		1/1
plants	higher dicots	Scrophulariaceae	*Eremophila debilis*	winter apple		C		2
plants	higher dicots	Scrophulariaceae	*Eremophila deserti*			C		1/1
plants	higher dicots	Solanaceae	*Solanum parvifolium*			C		1
plants	higher dicots	Solanaceae	*Solanum ellipticum*	potato bush		C		1/1

Kingdom	Class	Family	Scientific Name	Common Name	I	Q	A	Records
plants	higher dicots	Solanaceae	*Solanum tetrathecum*			C		1/1
plants	higher dicots	Solanaceae	*Solanum ferocissimum*			C		2/2
plants	higher dicots	Solanaceae	*Solanum parvifolium subsp. parvifolium*			C		2/2
plants	higher dicots	Solanaceae	*Solanum nemophilum*			C		2/2
plants	higher dicots	Sparrmanniaceae	*Corchorus trilocularis*			C		1/1
plants	higher dicots	Thymelaeaceae	*Pimelea neoanglica*	poison pimelea		C		1/1
plants	higher dicots	Verbenaceae	*Glandularia aristigera*		Y			1/1
plants	higher dicots	Viscaceae	*Viscum articulatum*	flat mistletoe		C		1/1
plants	higher dicots	Zygophyllaceae	*Zygophyllum apiculatum*	gall weed		C		1
plants	lower dicots	Linderniaceae	*Lindernia alsinoides*			C		1/1
plants	lower dicots	Linderniaceae	*Lindernia sp. (Bribie Island S.T.Blake 7089)*			C		2/2
plants	lower dicots	Phrymaceae	*Glossostigma diandrum*			C		1/1
plants	lower dicots	Phrymaceae	*Peplidium foecundum*			C		1/1
plants	lower dicots	Ranunculaceae	*Clematis*			C		1/1
plants	monocots	Alismataceae	*Damasonium minus*	starfruit		C		1
plants	monocots	Aponogetonaceae	*Aponogeton queenslandicus*			C		1/1
plants	monocots	Commelinaceae	*Commelina diffusa*	wandering jew		C		1
plants	monocots	Cyperaceae	*Eleocharis*			C		1/1
plants	monocots	Cyperaceae	*Cyperus iria*			C		2/1
plants	monocots	Cyperaceae	*Cyperus fulvus*			C		1/1
plants	monocots	Cyperaceae	*Cyperus procerus*			C		2/1
plants	monocots	Cyperaceae	*Cyperus difformis*	rice sedge		C		1
plants	monocots	Cyperaceae	*Cyperus flaccidus*			C		1
plants	monocots	Cyperaceae	*Cyperus isabellinus*			C		1/1
plants	monocots	Cyperaceae	*Eleocharis blakeana*			C		1
plants	monocots	Cyperaceae	*Bulbostylis pyriformis*			C		1/1
plants	monocots	Cyperaceae	*Fimbristylis littoralis*			C		1/1
plants	monocots	Cyperaceae	*Fimbristylis microcarya*			C		1/1
plants	monocots	Cyperaceae	*Eleocharis philippinensis*			C		1/1
plants	monocots	Cyperaceae	*Fimbristylis bisumbellata*			C		1/1
plants	monocots	Cyperaceae	*Eleocharis cylindrostachys*			C		1/1
plants	monocots	Cyperaceae	*Cyperus betchei subsp. betchei*			C		2/1
plants	monocots	Hemerocallidaceae	*Dianella brevipedunculata x D.revoluta var. revoluta*			C		1/1
plants	monocots	Hemerocallidaceae	*Dianella brevipedunculata*			C		1/1
plants	monocots	Hemerocallidaceae	*Dianella revoluta var. revoluta*			C		2/2
plants	monocots	Hydrocharitaceae	*Blyxa aubertii*			C		1
plants	monocots	Iridaceae	*Sisyrinchium sp. (Peregian P.R.Sharpe 4970)*	scourweed	Y			1/1
plants	monocots	Juncaceae	*Juncus psammophilus*			C		2/2
plants	monocots	Juncaceae	*Juncus prismatocarpus*	branching rush		C		1/1
plants	monocots	Juncaceae	*Juncus aridicola*	tussock rush		C		1/1
plants	monocots	Juncaceae	*Juncus usitatus*			C		1/1
plants	monocots	Juncaginaceae	*Cycnogeton dubius*			C		1/1
plants	monocots	Poaceae	*Leersia hexandra*	swamp rice grass		C		2/1
plants	monocots	Poaceae	*Aristida echinata*			C		2/2
plants	monocots	Poaceae	*Cenchrus ciliaris*		Y			1/1

Kingdom	Class	Family	Scientific Name	Common Name	I	Q	A	Records
plants	monocots	Poaceae	*Cenchrus spinifex*		Y			1/1
plants	monocots	Poaceae	*Paspalum urvillei*	vasey grass	Y			1/1
plants	monocots	Poaceae	*Sporobolus creber*			C		4/4
plants	monocots	Poaceae	*Chrysopogon fallax*			C		2/2
plants	monocots	Poaceae	*Digitaria diminuta*			C		1/1
plants	monocots	Poaceae	*Echinochloa colona*	awnless barnyard grass	Y			1
plants	monocots	Poaceae	*Eragrostis curvula*		Y			1/1
plants	monocots	Poaceae	*Eragrostis sororia*			C		1
plants	monocots	Poaceae	*Eriachne mucronata*			C		1/1
plants	monocots	Poaceae	*Setaria parviflora*	slender pigeon grass	Y			1/1
plants	monocots	Poaceae	*Chrysopogon filipes*			C		1/1
plants	monocots	Poaceae	*Eragrostis elongata*			C		1/1
plants	monocots	Poaceae	*Homopholis belsonii*			E	V	1/1
plants	monocots	Poaceae	*Panicum larcomianum*			C		1/1
plants	monocots	Poaceae	*Paspalidium distans*	shotgrass		C		1/1
plants	monocots	Poaceae	*Paspalidium gracile*	slender panic		C		1
plants	monocots	Poaceae	*Eragrostis lacunaria*	purple lovegrass		C		1/1
plants	monocots	Poaceae	*Tripogon loliiformis*	five minute grass		C		1/1
plants	monocots	Poaceae	*Aristida caput-medusae*			C		1/1
plants	monocots	Poaceae	*Cleistochloa subjuncea*			C		2/2
plants	monocots	Poaceae	*Enteropogon acicularis*	curly windmill grass		C		1/1
plants	monocots	Poaceae	*Eragrostis trichophora*		Y			1/1
plants	monocots	Poaceae	*Sporobolus pyramidalis*		Y			1/1
plants	monocots	Poaceae	*Thyridolepis xerophila*			C		2/2
plants	monocots	Poaceae	*Urochloa mosambicensis*	sabi grass	Y			1/1
plants	monocots	Poaceae	*Paspalidium albovillosum*			C		3/3
plants	monocots	Poaceae	*Walwhalleya subxerophila*			C		3/3
plants	monocots	Poaceae	*Diplachne fusca var. fusca*			C		1/1
plants	monocots	Poaceae	*Eragrostis longipedicellata*			C		1/1
plants	monocots	Poaceae	*Digitaria eriantha cv. Pangola*		Y			1/1
plants	monocots	Poaceae	*Aristida calycina var. calycina*			C		1/1
plants	monocots	Poaceae	*Aristida calycina var. praealta*			C		1/1
plants	monocots	Poaceae	*Bothriochloa bladhii subsp. bladhii*			C		1/1
plants	monocots	Poaceae	*Calyptochloa gracillima subsp. gracillima*			C		5/5
plants	monocots	Poaceae	*Dimorphochloa sp. (Miles E.J.Thompson EJT888)*			C		1/1
plants	monocots	Poaceae	*Eriachne mucronata forma (Alpha C.E.Hubbard 7882)*			C		1/1
plants	monocots	Poaceae	*Aristida obscura*			C		1/1
plants	monocots	Poaceae	*Eriochloa crebra*	spring grass		C		1/1
plants	monocots	Poaceae	*Aristida ramosa*	purple wiregrass		C		1/1
plants	monocots	Poaceae	*Melinis repens*	red natal grass	Y			1/1
plants	monocots	Poaceae	*Aristida*			C		1/1
plants	monocots	Potamogetonaceae	*Potamogeton tricarinatus*	floating pondweed		C		3/2
plants	quillworts	Isoetaceae	*Isoetes muelleri*	quillwort		C		2/1

CODES

I - Y indicates that the taxon is introduced to Queensland and has naturalised.

Q - Indicates the Queensland conservation status of each taxon under the *Nature Conservation Act 1992.* The codes are Extinct in the Wild (PE), Endangered (E), Vulnerable (V), Near Threatened (NT), Least Concern (C) or Not Protected ( ).

A - Indicates the Australian conservation status of each taxon under the *Environment Protection and Biodiversity Conservation Act 1999.* The values of EPBC are Conservation Dependent (CD), Critically Endangered (CE), Endangered (E), Extinct (EX), Extinct in the Wild (XW) and Vulnerable (V).

Records – The first number indicates the total number of records of the taxon for the record option selected (i.e. All, Confirmed or Specimens).
This number is output as 99999 if it equals or exceeds this value. The second number located after the / indicates the number of specimen records for the taxon.
This number is output as 999 if it equals or exceeds this value.

Appendix 3 Curricula vitae

Alan House

Ecology Team Leader (Brisbane)/ Principal Ecologist

Alan has over 35 years experience as an ecological scientist in both research and consulting, and has worked in UK, Indonesia and Australia (mainly in Queensland and New South Wales). He has specialised in forest ecology, biodiversity in agricultural landscapes, landscape ecology, plant population genetics, conservation management planning, botanical surveys, ecological impacts of climate change, and invertebrate ecology.

He is an experienced project and team leader, leading teams for Queensland Department of Primary Industries, CSIRO Ecosystem Sciences, AECOM and now Ecosure. He has also supervised 10 PhD students and 4 honours students, and has published over 40 peer-reviewed papers, 2 book chapters, and edited 4 books. His technical skills are in vegetation ecology, field botany, landscape ecology, conservation management and flora and fauna impact assessments. His consulting experience includes work on the Brisbane Airport Parallel Runway Project, and research on mud-nesting wasp hazards to aircraft at Brisbane Airport. He has also worked on Commonwealth land for Department of Defence projects at Wide Bay Training Area.

Alan is currently Ecosure's Ecology Product Manager and an Adjunct Associate Professor in the School of Geography, Planning and Environmental Management, University of Queensland.

Alan has experience in:

- ecological survey and impact assessment
- threatened species ecology and management
- ecological research
- team leadership
- project management.

Qualifications

Bachelor of Science (Botany), University of Southampton, 1975

PhD, Australian National University, 1986

Professional memberships & associations

Ecological Society of Australia

British Ecological Society

Areas of expertise

Forest ecology

Biodiversity in agricultural landscapes

Landscape ecology

Plant population genetics

Conservation management planning

Botanical surveys

Ecological impacts of climate change

Invertebrate ecology

Project experience

Date	Project	Client	Project Position	Role
Department of Defence				
2011	Rare plant surveys Wide Bay Training Area	Dept. of Defence	Flora team lead	Surveys for rare plants in potential impact sites for infrastructure development
Mining, Energy & Natural Resources				
2014	Gladstone New Fuels Development Project	Queensland Energy Resources	Flora team leader	Flora surveys for EVNT species and threatened ecological communities; RE ground-truthing and re-mapping for mine expansion
2013-14	Meteor Downs Supplementary Surveys and Offset Planning	U & D Mining	Project manager, flora team lead	Flora surveys for EVNT species and threatened ecological communities and offset planning for new open cut coal mine
2014	Rehabilitation, management & revegetation of BBBQ Habitat Area	Queensland Alumina Limited	Flora surveys, fire management planning	Surveys of vegetation communities and habitat, fire management strategy planning
2013	Surat Basin Springs survey	Australia Pacific Liquid Natural Gas (on behalf of APLNG, Gladstone Liquid Natural Gas, Queensland Gas Company and Arrow Energy)	Team ecologist	Flora surveys of natural springs in the Surat Basin gas field. Species compositions and targeted searches for EVNT species, aquatic macroinvertebrate sampling. Surveys and analysis
2010, 2012, 2013	Arrow Bowen Pipeline	Arrow Energy	Flora team leader	Flora surveys for ABP. Regional ecosystem ground-truthing; EVNT species targeted searches; watercourse crossing assessments; fauna habitat assessments
2013	Arrow Surat Pipeline	Arrow Energy	Flora team leader	Flora surveys for ASP. Targeted searches for EVNT species (*Cycas megacarpa*) and enumeration of individuals within ROW
2010	Arrow Surat Pipeline	Arrow Energy	Flora team leader	Survey of Arrow offset property; weed surveys and weed management planning, cycad mapping and offset planning. Surveys and reporting
2012-13	Rolleston Mine Expansion	AECOM (for Xstrata Coal)	Flora report reviewer	Review and re-write of flora report for EIS; general impact and mitigation statements; EVNT species impact and mitigation recommendations
2012	Moranbah Gas Field grassland surveys	Arrow Energy	Flora team leader	Assessments of grassland composition and condition. Surveys, analysis and reporting (including advice on need for EPBC referral)
2012	Condabri Gas Field ecological surveys	Origin Energy	Flora team leader	Property-scale ecological assessments; regional ecosystem ground-truthing; targeted EVNT and Type A species surveys. Surveys, analysis and reporting
2012	Condabri Gas Field pre-clear surveys	Origin Energy	Ecology team leader	Pre-clear assessments and field mapping/marking of EVNT species, declared plants, Type A plants and fauna habitat. Surveys
2011	Gas well site surveys	Westside Corporation	Flora team leader	Surveys of proposed gas well infrastructure sites in Bowen Basin. Regional ecosystem ground-truthing, EVNT species surveys; declared plants. Surveys, analysis and reporting
2011	Bowen Basin coal rail duplication	QR National	Ecology team leader	Scoping study for coal rail duplication, Bowen Basin-Abbot Point – ecological considerations

Date	Project	Client	Project Position	Role
2010	Purari High Voltage Powerline	Origin Energy	Ecology team member	Scoping study of alternative routes for high voltage powerline from Cape York to Townsville. Consideration of MNES and major environmental constraints
Government				
2014	Vegetation Surveys, Habitat tree assessment & Next box Management	Roads and Maritime Services, NSW	Field team lead, flora team lead	Surveys for threatened plant species, fauna habitat and vegetation community mapping
2013	Pro-active weed mapping	Brisbane City Council	Survey team leader	Systematic mapping of weed species in 180 ha of Mt Coot-tha Forest Park. Surveys and reporting
2013	Gateway Upgrade North	Dept Transport and Main Roads	Project director	Ecological assessments of proposed 8-lane upgrade to Gateway Motorway, Nudgee to Deagon. Regional ecosystem ground-truthing, targeted EVNT searches, estimates of least concern plants for offset calculations; fauna use and habitat condition; koala activity. Surveys and reporting
2012	Vegetation condition assessments, Palm Beach	Gold Coast City Council	Flora team leader	Surveys of vegetation condition in headlands and foredunes, Palm Beach. Surveys, analysis and reporting
2012	Vegetation condition assessments, Pimpama River	Gold Coast City Council (Alluvium Consulting)	Flora team leader	Surveys of vegetation condition in established monitoring sites in Pimpama River and Hotham Creek catchments. Surveys, analysis and reporting
2011	Gateway Upgrade North	Dept Transport and Main Roads	Flora team leader	Ecological assessments of proposed route for Gateway Motorway upgrade, Nudgee to Deagon. Regional ecosystem ground-truthing, EVNT species searches; fauna habitat assessments. Surveys and reporting
2010	Transport Network Reconstruction Program	Dept Transport and Main Roads	Ecology team leader	Ecological assessments of proposed road and bridge reconstruction works, Lockyer Valley. Reports and management recommendations
Airports				
2014	Brisbane Airport mud wasp ecology	Brisbane Airport Corporation	Ecology team leader	Literature review and preliminary investigations of mud wasp hazard
2011	Brisbane Airport Parallel Runway	Brisbane Airport Corporation	Flora team leader	Ecological assessments and management recommendations for conversion of *Casuarina* plantations to bird habitat. Surveys and reporting
Other relevant consulting experience				
2003-2011	Various research projects	CSIRO Sustainable; Ecosystems and Ecosystem Sciences for: Grain & Graze Program, Land & Water Australia, Condamine Alliance, Queensland Murray Darling Committee, Dept. of Sustainability, Environment, Water, Population and Communities	Ecology team leader	Projects included: responses of biodiversity to isolation and fragmentation in agricultural landscapes; impacts of clearing patterns and extent on ecological function in mulga landscapes; contribution of the farmed matrix to biodiversity conservation in mixed farming landscapes; estimating the real costs of conservation in agricultural landscapes; ecological consequences of predicted climate change on south-eastern Australian forest landscapes
1993-2003	Various research projects	Queensland Dept. Primary Industries	Senior forest ecologist	Projects included: long-term forest fire experiments; paired catchment studies; biodiversity responses to forestry management; aquatic ecology in forest plantations; criteria and indicators of sustainable forest management

Training

- Generic Coal Board induction (GIQ) Standard 11
- Senior First Aid and CPR
- Basic Firefighting
- 4WD (SRODRV001B, SRODRV002B as part of SRO40206)
- Light vehicle training (RIIVEH201D)
- Biocondition v2.1

Licences

- Construction Card

Publications (recent)

Butler, S., McAlpine, C., Fensham, R. & **House A.** 2013. Climate and exotic pasture area in landscape determines invasion of forest fragments by two invasive grasses. Journal of Applied Ecology 51, 114-123.

Robertson, O.J., McAlpine, C., **House, A.** & Maron, M. 2013. Influence of interspecific competition and landscape structure on spatial homogenization of avian assemblages. *PLoS ONE* 8(5): e65299. doi:10.1371/journal.pone.0065299.

House, A.P.N., Hilbert, D.W., Ferrier, S., Martin, T.G., Harwood, T., Williams, K.J., Fletcher, C.S., Murphy, H. and Gobbett, D. 2012. *The implications of climate change for biodiversity conservation and the National Reserve System: sclerophyll forests of south-eastern Australia*. CSIRO Climate Adaptation Flagship Working Paper No. 13A. www.csiro.au/resources/CAF-working-papers

Smajgl, A, **House, A.P.N.** & Butler, J.R.A. 2011. Implications of ecological data constraints for integrated policy and livelihoods modelling: an example from East Kalimantan, Indonesia. Ecological Modelling 222, 888- 896.

Smith, F.P., Prober, S.M., **House, A.P.N.** & McIntyre, S. 2011. Maximizing native biodiversity in Australian agricultural landscapes - the 10:20:40:30 guidelines. Agriculture, Ecosystems & Environment 166, 35-45.

Firn, J., **House, A.P.N.** & Buckley, Y.M. 2010. Alternative states models provide an effective framework for invasive species control and restoration of native communities. Journal of Applied Ecology 47, 96-105.

Bradley, M., **House, A.P.N**., Robertson, M. & Wild, C. 2010. Vegetation succession and recovery of ecological values in the southern Queensland Brigalow Belt. Ecological Management & Restoration 11, 113-118.

Bowen, M.E., McAlpine, C. A., Seabrook, L.M., **House, A.P.N.** & Smith, G.C. 2009. The age and amount of regrowth forest in fragmented brigalow landscapes are both important for woodland dependent birds. Biological Conservation 142, 3051-3059.

House, A.P.N., MacLeod, N.D., Cullen, B., Whitbread, A.M., Brown, S.D. & McIvor, J.G. 2008. Integrating production and natural resource management on mixed farms in eastern Australia: the cost of conservation in agricultural landscapes. Agriculture, Ecosystems & Environment 127, 153-165.

MacLeod, N.D., **House, A.P.N.**, McIvor, J.G. & Brown, S.D. 2007. Challenges for profitably integrating high-level biodiversity goals into contemporary commercial grazing and mixed farming enterprises. Paper presented at 'Balancing Conservation and Production – Case Studies from the Real World', University of Tasmania, Launceston, 26-28 June 2007.

House, A.P.N., Schellhorn, N.A., Brown, S.D. & Bianchi, F.J.J.A. 2007. Landscape configuration, vegetation condition and ecosystem services in cotton agro-ecosystems in southern Queensland, Australia. Pp. 86-87 in: R.G.H. Bunce, R.H.G. Jongman, L. Hojas & S. Weel (eds) '25 years of Landscape Ecology: Scientific Principles in Practice'. Proceedings of 7th International Association of Landscape Ecology World Congress, Wageningen, The Netherlands, 8-12 July 2007.

Attwood, S.J., Maron, M., **House, A.P.N.** & Zammit, C. 2007. Arthropod assemblage responses to agricultural intensification in heterogeneous landscapes – local testing of global patterns. Pp. 377-378 in: R.G.H. Bunce, R.H.G. Jongman, L. Hojas & S. Weel (eds) '25 years of Landscape Ecology: Scientific Principles in Practice'. Proceedings of 7th International Association of Landscape Ecology World Congress, Wageningen, The Netherlands, 8-12 July 2007.

Bowen, M.E., McAlpine, C.A., **House, A.** & Smith, G.C. 2007. Ecological values of regrowth vegetation for conserving and restoring bird communities in highly fragmented landscapes: a brigalow case study from sub-tropical Australia. Pp. 1077-1078 in: R.G.H. Bunce, R.H.G. Jongman, L. Hojas & S. Weel (eds) '25 years of Landscape Ecology: Scientific Principles in Practice'. Proceedings of 7th International Association of Landscape Ecology World Congress, Wageningen, The Netherlands, 8-12 July 2007.

Curriculum Vitaé of Dr Trevor Meers

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PROFESSIONAL SUMMARY

A passionate ecologist with over 10 years' experience in ecology and land rehabilitation, as well as undertaking 'hands on' restoration activities. As Senior Ecologist with AMEC prepared rehabilitation plans for major gas and petroleum projects, and undertook and managed ecological surveys, monitoring and soil surveys. On behalf of Greening Australia monitored and managed environmental offset projects. Managed the rehabilitation program at the Rio Tinto Alcan Gove mine site and was accountable for a range of rehabilitation, research, ecological monitoring and survey projects. Equipped with a PhD from the University of Melbourne, researching the rehabilitation of former pine (*Pinus radiata*) plantations in north east Victoria (with a focus on how land use change influenced vegetation composition), and a published author for several papers including international scientific journals. Key strengths include:

- Strong technical skills in ecological survey, research, soil-sampling, monitoring design
- Quality control to ensure large and complex projects are delivered on time
- Maintains an eye for detail
- Data management and analysis
- Excellent report writing
- Accepts direction and adaptable
- Works well in a team environment
- Mentoring others

EDUCATION

PhD (awarded 2007): School of Forest and Ecosystem Science, University of Melbourne, Creswick, Victoria

Thesis title: "The role of plant functional traits in determining the response of vegetation to land use change on the Delatite Peninsula, Victoria"

Honours (2002): School of Ecology and Environment, Deakin University, Victoria

Thesis title: "Vegetation responses to burning and post-fire grazing: Implications for the planning of ecological fire regimes for Ecological Vegetation Classes at Reef Hills Regional Park, Victoria".

Bachelor of Applied Science (Natural Resource Management) (2000), School of Ecology and Environment, Deakin University, Victoria

EMPLOYMENT HISTORY

July 2012 to May 2014 AMEC Australia East Senior Ecologist

AMEC is one of the world's leading engineering, project management and consultancy firms with offices in over 40 countries and over 29,000 employees. The Brisbane Office services the oil and gas and mining sectors and provides environmental, land access, stakeholder management and engineering solutions.

Position Profile: Senior Ecologist in the Soils and Rehabilitation Group within the Environment Team. Led pre-clearance ecological surveys and monitoring, included mentoring and training of junior ecologists, ensuring health and safety requirements were met, quality control, data management, and communication with project managers and clients.

Key Achievements

Prepared rehabilitation and monitoring plans for major oil and gas projects for clients including QGC, Australia Pacific LNG and Central Petroleum. These plans were developed to ensure State and Commonwealth approval conditions were met, and with incorporation of client feedback, received timely regulatory approval. Representative projects included:

- Rehabilitation, Remediation, Recovery and Monitoring Plan for QGC Gas Fields
- Rehabilitation, Remediation, Recovery and Monitoring Plan for Australia Pacific LNG Gas Fields
- Rehabilitation Plan and Rehabilitation Monitoring Program, and preclearance ecological surveys for Central Petroleum South Georgina Seismic Exploration Program (Simpson Desert, Queensland, with approx. 1000km of seismic survey lines)
- *Cycas megacarpa* translocation plan for QGC
- Weed survey for Sunwater, Woleebee Creek to Glebe Weir Pipeline (120 km pipeline)
- Mainline Pipeline, Eastern High Pressure Gas Network and Western High Pressure Gas Network (Australia Pacific LNG), Rehabilitation Plans and Monitoring Programs
- Western High Pressure Gas Pipeline soil survey
- Preclearance and ecological surveys for Australia Pacific LNG Gas Fields and Pipelines (Roma to Chinchilla area, Queensland)
- Environmental Scouting for Australia Pacific LNG gas fields
- Set up and undertook photo monitoring and translocation monitoring for the Australia Pacific LNG Mainline Pipeline
- Vegetation assessments for Energex powerlines in SE Queensland
- Various offset surveys and preparation of offset management plans in SE Queensland

Sept 2010- June 2012 Greening Australia Queensland Senior Environmental Consultant

Greening Australia is a not-for-profit organisation, passionate about protecting and restoring the health, diversity and productivity of our unique Australian landscapes. Employed in the Consultancy Group, which is responsible for offset management and provision of environmental consultancy services.

Position Profile: The role involved management and monitoring of Greening Australia's environmental offsets on behalf of clients. Also included hands on restoration activities such as seed collection for major projects such as the Caloundra South urban development, and secondment to Unidel (now AMEC Australia East).

Key Achievements

Responsible for undertaking management, monitoring and reporting for vegetation offset projects across south east Queensland. Clients included Ergon Energy, Queensland Rail and RSL Care. Included an assessment of the development of regrowth vegetation towards remnant status and providing recommendations for weed control, fire management, and erosion control. Key risks to these sites were identified and managed to ensure that these sites will meet offset objectives.

Oct 2006 – Sept 2010: Matrixplus Consulting, Consultant-Environment (2006-2008) and Senior Consultant-Environment (2008-2010)

Matrixplus Consulting (now MET Serve) is a small Brisbane based consultancy firm providing environmental management services to the mining and energy sectors.

Position Profile: This role involved providing rehabilitation services to the mining sector, including 'hands on' rehabilitation, ecological survey and monitoring, project management and EIS preparation.

Key Achievements

This role involved management of the rehabilitation program at the Rio Tinto Alcan Gove mine site (Northern Territory). It commenced as a graduate role in late 2006, working in a small team (project manager and two personnel). Initially this role involved managing and undertaking rehabilitation activities on the mine site including soil handling and preparation, seed collection, direct seeding and tree planting. During this time, strong client relationships were built to create trust and a strong foundation for ensuring environmental risks were identified and managed. In 2008 this role was handed over, and then involved the management of environmental monitoring and research projects, including pre-clearance flora and fauna surveys, development of translocation program for an endangered plant species, rehabilitation monitoring and the development of completion criteria. A greater level of project management was undertaken in 2009, including training of a graduate, demonstrating adaptability in resourcing and prioritising with a reduced project budget. In 2010, took on sole responsibility for managing this project, with an annual budget of over $500,000. During this period demonstrated adaptability to changing budgets, mine production, personnel, and weather to ensure over 130ha of mined land was rehabilitated annually.

In addition to this role a range of EIS studies and reports were undertaken and managed. Examples include:

- Wilkie Creek Coal Mine Expansion EIS – Soil and Land Capability Study (Darling Downs). This study was completed on time and within budget, and included training a graduate in standard soil survey techniques. The study identified soils with limitations including sodicity, dispersability, and extreme pH, and provided recommendations for management.
- Flora survey for Lagoon Creek Resources (Gulf Country). This involved survey of vegetation communities in a remote and poorly described area of Queensland, and the set up of monitoring sites to assess future impacts.
- Pisolite Hills (Cape Alumina) Draft EIS – Rehabilitation and Decommissioning section. Included development of novel rehabilitation techniques to meet client requirements that were based on a modification of existing techniques used successfully at the Gove mine site.

Employment before and during graduate study

2002: Deakin University – part time tutoring and research

2001: Country Fire Authority Victoria – research assistant (3 month project investigating fire behaviour)

1996-1997: Kuranga Native Nursery – nurseryman, included plant propagation, weed management, stock and site maintenance.

1995: Healesville Wildlife Sanctuary, Revegetation Department – Gardening Apprenticeship (Trade Certificate in Horticulture), included weed management, revegetation and habitat restoration.

1993-1995: City of Melbourne, Parks and Gardens – Gardening Apprenticeship.

WORKPLACE TRAINING, ACCREDITATION AND MEMBERSHIPS

- Department of Environment (Commonwealth) approved ecologist (flora and fauna) for Australia Pacific LNG since 13 September 2012
- Australian Chemical Distributors Control Licence, 2014
- Santos Light Vehicle Operation and 4WD Operation and Recovery, 2013
- Senior First Aid, refreshed 2013
- BioCondition Monitoring Training, Queensland Herbarium, 2011
- Construction White Card (Queensland)
- Class C Queensland Manual Drivers Licence
- Member of Barung Landcare Association

- Member of Southern Queensland Land Rehabilitation Group

SCHOLARHIPS AND ACADEMIC AWARDS

- 2006: Post-submission Postgraduate Publication Award
- 2003-2006: Australian Postgraduate Award and Department of Sustainability and Environment studentship
- 2005: Mary Sloane Travelling Scholarship: Awarded to present results at the XVII International Botanical Congress, Vienna, Austria (17-23 July 2005).
- 2001: Kate England Award for commitment, high personal achievement and potential to pursue course ideals (School of Ecology and Environment, Deakin University)
- 2005: Top of class in subject 'Field Botany'
- 1999: Membership of Golden Key Honour Society for results in top 15% of field in the first year of undergraduate study

PUBLICATIONS AND PRESENTATIONS

Meers T. L., Bell, T.L., Enright, N.J. and Kasel, S (2012) "**Deforestation strongly affects soil seed banks in eucalypt forests: Generalisations in functional traits and implications for restoration**." *Forest Ecology and Management* 266: 94–107.

Meers T. L., Bell, T.L., Enright, N.J. and Kasel, S (2010) "**Do generalisations of global trade-offs in plant design apply to an Australian sclerophyllous flora**?" *Australian Journal of Botany*. 58: 257-270.

Meers T.L. Kasel S, Bell T. L. and Enright N. (2010) "**Conversion of native forest to exotic *Pinus radiata* plantation: Response of understorey vegetation using a plant functional trait approach**." *Forest Ecology and Management.* 259: 399-409.

Meers T. L., Bell T.L., Enright N.J. and Kasel S (2008) "**Role of plant functional traits in determining composition of abandoned grazing lands in north-eastern Victoria, Australia**." *Journal of Vegetation Science.* 19: 515-524.

Meers T., Dunbar C., Stokes C. and Unger C. (2008) "**The discovery of a critically endangered plant: Lessons learnt at Rio Tinto Alcan Gove Mine."** Proceedings of SDO8 Solutions through Collaboration. Darwin, 15-18 September 2008, Minerals Council of Australia.

Meers T, and Adams R. (2006) "**Changes in vegetation structure and floristics under a power-line easement and implications for vegetation management**." *The Victorian Naturalist* 123: 29-37.

Meers T. L. (2005) "**The role of soil seed banks in the re-establishment of native vegetation on a former pine plantation**." Proceedings of the Fifth Australian Workshop on Native Seed Biology, Brisbane, 21-23 June 2004. Australian Centre for Mining Environmental Research, Kenmore, Queensland.

Kasel S., Meers T. (2004) "**Restoration of former pine sites in Australia: revegetation techniques, pine wildling control and the importance of land use history**." Proceedings of the 16th International Conference, Society for Ecological Restoration, Victoria, Canada. 24-26 August 2004.

Meers T., Adams R. (2003) "**The impact of grazing by Eastern Grey Kangaroos (*Macropus giganteus*) on vegetation recovery after fire at Reef Hills Regional Park, Victoria**." *Ecological Management and Restoration* 4: 126-132.

PERSONAL INTERESTS

Bushwalking and hiking, Gardening

Appendix 4 Species list and tertiary site assessment summaries

	11.3.1	11.3.2	11.3.25	11.4.3	11.5.1	11.5.1a	11.7.2	11.7.4	11.7.7	non-rem
Acacia conferta						x		x	x	
Acacia decora		x	x							
Acacia harpophylla	x			x						x
Acacia ixiophylla								x		
Acacia leiocalyx		x	x		x			x	x	x
Acacia muelleriana									x	
Acacia salicina		x								
Acacia semilunata		x							x	
Acacia shirleyi						x	x	x	x	
Acacia spectabilis								x		
Allocasuarina luehmannii		x			x			x	x	x
Alphitonia excelsa			x			x		x	x	
Alstonia constricta					x		x		x	
Amyema linophylla								x		
Ancistrachne uncinulata	x								x	
Angophora leiocarpa								x		
Aristida calycina					x			x	x	
Aristida caput-medusae		x	x		x	x	x	x	x	x
Aristida jerichoensis					x	x		x		
Aristida sp.								x		
Arundinella nepalensis			x							
Bothriochloa bladhii		x	x							
Bothriochloa decipiens					x			x		
Brunoniella australis	x									
Bryophyllum delagoense		x			x					
Bulbostylis barbata							x			
Callitris glaucophylla		x	x		x	x	x	x	x	x
Calotis sp.					x					
Calyptochloa gracilis	x	x								
Capparis lasiantha	x	x								
Carissa ovata	x	x		x						

	11.3.1	11.3.2	11.3.25	11.4.3	11.5.1	11.5.1a	11.7.2	11.7.4	11.7.7	non-rem
Casuarina cristata	x	x	x	x	x					
Casuarina cunninghamii		x	x							
Cenchrus ciliaris		x						x		
*Cereus uruguayensis**	x	x								
Cheilanthes sieberi		x			x			x	x	
Chloris divaricata	x	x						x	x	x
Chrysocephalum apiculatum		x			x		x			
Chrysopogon fallax					x					
Citrus glauca	x	x			x					
Cleistochloa subjuncea		x							x	
Corymbia citriodora									x	
Corymbia clarksoniana								x		
Corymbia intermedia						x		x	x	
Cyanthillium cinereum		x								
Cymbopogon refractus	x	x			x			x		x
Cynodon dactylon			x							
Cyperus gracilis					x			x		
Daviesia ulicifolia								x		
Dianella longifolia		x			x			x	x	
Digitaria sp.		x		x						x
Diplachne fusca						x				
Dodonaea biloba		x			x			x	x	
Dodonaea peduncularis					x			x	x	
Dodonaea triangularis										
Dodonaea viscosa		x						x	x	
Einadia hastata				x						
Eleocharis pusilla										x
Emilia sonchifolia									x	
Enchylaena tomentosa	x	x			x					
Enteropogon ramosus				x	x		x	x		
Enteropogon unispiceus	x				x					
Entolasia stricta									x	
Eragrostis brownii					x					
Eragrostis longipedicellata									x	
Eremochloa bimaculata									x	
Eremophila deserti		x			x	x		x		

	11.3.1	11.3.2	11.3.25	11.4.3	11.5.1	11.5.1a	11.7.2	11.7.4	11.7.7	non-rem
Eremophila mitchellii		x	x	x	x					x
Eriachne mucronata								x		
Eucalyptus chloroclada								x		
Eucalyptus crebra		x			x	x	x	x	x	x
Eucalyptus exserta							x	x		
Eucalyptus fibrosa ssp. *nubila*								x	x	
Eucalyptus microcarpa										x
Eucalyptus populnea	x	x	x		x	x		x		x
Eucalyptus populnea x crebra		x								
Eucalyptus tenuipes								x		
Eucalyptus tereticornis		x	x							
Evolvulus alsinoides									x	
Gahnia aspera		x			x			x	x	x
Geijera parviflora	x	x	x	x	x	x			x	x
*Glandularia aristigera**		x								
Goodenia bellidifolia		x			x			x	x	
Goodenia disperma		x			x			x	x	
Jasminum didymum						x	x			
Juncus usitatus		x								
Kardomia jucunda							x			
Kunzea opposita								x		
*Lantana montevidensis**				x						
Laxmannia compacta		x			x			x	x	
Leucopogon mitchellii		x						x		
Lomandra confertiflora		x			x				x	
Lomandra longifolia		x								
Lomandra multiflora					x	x		x	x	
Lysicarpus angustifolius								x		
Melaleuca styphelioides								x		x
*Melinis repens**								x		
Murdannia graminea								x		
Myoporum debile							x	x		
*Opuntia stricta**		x		x				x	x	
*Opuntia tomentosa**	x	x			x			x		
Oxalis sp.									x	
Ozothamnus diosmifolius								x	x	

	11.3.1	11.3.2	11.3.25	11.4.3	11.5.1	11.5.1a	11.7.2	11.7.4	11.7.7	non-rem
Ozothamnus diotophyllus							x	x		
Parsonsia eucalyptophylla	x	x								
Paspalidium caespitosum	x	x			x					
Paspalidium sp.		x								
Petalostigma pubescens									x	
Prostanthera cryptandroides ssp. *euphrasioides*									x	
Psydrax odorata/oleifolium					x			x		
Rostellularia adscendens		x				x	x			
Rutidosis lanata					x				x	
Scleria sphacelata									x	
Sclerolaena tetracuspis				x						
Senecio brigalowensis		x			x				x	
Sida corrugata	x									
Sida filiformis		x			x				x	
*Sida rhombifolia**	x								x	
Solanum ferocissimum				x					x	
Solanum nemophilum									x	
Stackhousia muricata					x		x			
Tetragonia tetragonioides	x	x		x						
Thyridolepis mitchelliana								x	x	
Thysanotus tuberosus					x					
Velleia spathulata		x						x	x	
Wahlenbergia gracilis		x			x					
Walwhalleya proluta		x	x		x			x	x	x
Zygophyllum apiculatum				x						

* = introduced species

Site number	D1	Date: 10/10/2016
Latitude/Longitude	-26.667889	150.3506
Survey type	Tertiary	
Site description	Open eucalypt woodland	
Site condition	Average	
DSITI mapped regional ecosystem	11.5.1	
Surveyed regional ecosystem	non-remnant	
BD status	-	
VM status	-	
Dominant species	*Eucalyptus crebra, Callitris glaucophylla, Laxmannia gracilis*	

North

East

South

West

Site number	D2	Date: 11/10/2016
Latitude/Longitude	-26.614903	150.302265
Survey type	Tertiary	
Site description	Open eucalypt woodland	
Site condition	Excellent	
DSITI mapped regional ecosystem	11.7.4/11.7.7/11.7.5/11.7.2	
Surveyed regional ecosystem	11.7.4	
BD status	No concern at present	
VM status	Least concern	
Dominant species	*Callitris glaucophylla, Allocasuarina luehmannii, Acacia leiocalyx, Aristida caput-medusae, Laxmannia compacta*	

North

East

South

West

Site number	D3	Date: 11/10/2016
Latitude/Longitude	-26.600523	150.31826
Survey type	Tertiary	
Site description	Open acacia/eucalypt woodland	
Site condition	Good	
DSITI mapped regional ecosystem	11.7.4/11.7.7/11.7.5/11.7.2	
Surveyed regional ecosystem	11.7.2/11.7.7	
BD status	No concern at present	
VM status	Least concern	
Dominant species	*Acacia shirleyi, Eucalyptus fibrosa, Callitris glaucophylla, Aristida caput-medusae*	

North

East

South

West

Site number	D4	Date: 11/10/2016
Latitude/Longitude	-26.60393	150.313458
Survey type	Tertiary	
Site description	open eucalypt woodland	
Site condition	Good	
DSITI mapped regional ecosystem	11.3.2	
Surveyed regional ecosystem	11.7.7	
BD status	No concern at present	
VM status	Least concern	
Dominant species	*Eucalyptus fibrosa, Callitris glaucophylla, Acacia semilunata, Ancistrachne uncinulata, Gahnia aspera*	

North

East

South

West

Site number	D5	Date: 12/10/2016
Latitude/Longitude	-26.590158	150.34455
Survey type	Tertiary	
Site description	Open eucalypt woodland	
Site condition	Average	
DSITI mapped regional ecosystem	11.3.2	
Surveyed regional ecosystem	11.3.2	
BD status	Of concern	
VM status	Of concern	
Dominant species	*Eucalyptus populnea, Eucalyptus crebra, Callitris glaucophylla, Aristida caput-medusae, Cleistochloa subjuncea*	

North

East

South

West

Site number	D6	Date: 12/10/2016
Latitude/Longitude	-26.669695	150.360451
Survey type	Tertiary	
Site description	Brigalow woodland	
Site condition	Good	
DSITI mapped regional ecosystem	non-remnant	
Surveyed regional ecosystem	11.3.1	
BD status	Endangered	
VM status	Endangered	
Dominant species	*Acacia harpophylla, Casuarina cristata, Geijera parviflora, Paspalidium caespitosum, Chloris divaricata*	

North

East

South

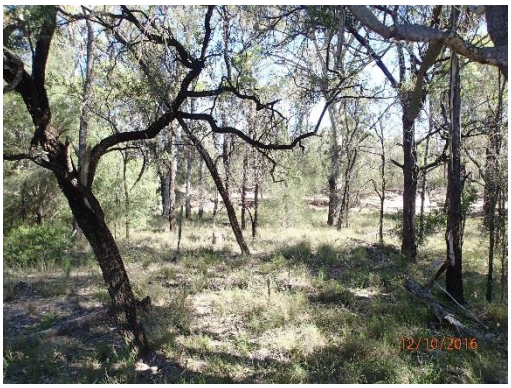
West

Site number	D7	Date: 12/10/2016
Latitude/Longitude	-26.670262	150.363016
Survey type	Tertiary	
Site description	Open eucalypt woodland	
Site condition	Average	
DSITI mapped regional ecosystem	11.3.1	
Surveyed regional ecosystem	11.3.2	
BD status	Of concern	
VM status	Of concern	
Dominant species	*Eucalyptus populnea, Eucalyptus crebra, Eremophila mitchellii, Aristida caput-medusae, Paspalidium caespitosum*	

North

East

South



West

Site number	D8	Date: 13/10/2016
Latitude/Longitude	-26.672972	150.363761
Survey type	Tertiary	
Site description	Open eucalypt woodland	
Site condition	Good	
DSITI mapped regional ecosystem	11.3.1	
Surveyed regional ecosystem	11.5.1	
BD status	No concern at present	
VM status	Least concern	
Dominant species	*Eucalyptus crebra, Allocasuarina luehmannii, Paspalidium caespitosum*	

North

East

South

West

Site number	D9	Date: 14/10/2016
Latitude/Longitude	-26.657909	150.367546
Survey type	Tertiary	
Site description	Open eucalypt woodland	
Site condition	Good	
DSITI mapped regional ecosystem	non-remnant	
Surveyed regional ecosystem	11.3.2/11.3.25	
BD status	Of concern	
VM status	Of concern	
Dominant species	*Casuarina cunninghamii, Eucalyptus tereticornis, Geijera parviflora, Chloris divaricata, Aristida caput-medusae*	

North

East

South

West

Site number	D10	Date: 14/10/2016
Latitude/Longitude	-26.667889	150.3506
Survey type	Tertiary	
Site description	Open eucalypt woodland	
Site condition	Average	
DSITI mapped regional ecosystem	non-remnant	
Surveyed regional ecosystem	11.7.4/11.5.1	
BD status	No concern at present	
VM status	Least concern	
Dominant species	*Eucalyptus crebra, Allocasuarina luehmannii, Aristida caput-medusae*	

North

East

South

West

Site number	D11	Date: 11/10/2016
Latitude/Longitude	-26.636389	150.332334
Survey type	Tertiary	
Site description	Brigalow woodland	
Site condition	Excellent	
DSITI mapped regional ecosystem	Non-remnant	
Surveyed regional ecosystem	11.4.3	
BD status	Endangered	
VM status	Endangered	
Dominant species	*Acacia harpophylla, Casuarina cristata, Eremophila mitchellii, Sclerolaena tetracuspis, Enteropogon ramosus*	

North

East

South

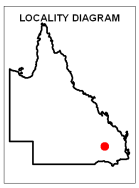
West

Appendix 5
Protected Plant Survey Trigger Area Map

Protected Plants Flora Survey Trigger Map

Legend

- Coordinates
- High risk area
- Cadastral line
  Property boundaries shown are provided as a locational aid only
- Freeways / motorways / highways
- Secondary roads / streets



N

0 490 980 1,470 1,960 2,450 m

This product is projected into:
GDA 1994 Queensland Albers

This map shows areas where particular provisions of the Nature Conservation Act 1992 apply to the clearing of protected plants.

This map is produced at a scale relevant to the size of the area selected and should be printed as A4 size in portrait orientation.

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Protected Plants Flora Survey Trigger Map

Legend

- Coordinates
- High risk area
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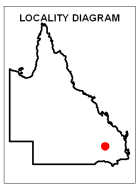

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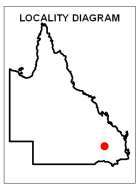

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Revision history

Revision No.	Revision date	Details	Prepared by	Reviewed by	Approved by
00	18/11/2016	Cameby Downs Continued Operations Project – First Draft Flora Survey Report	Alan House, Principal Ecologist	Carissa Free, Senior Ecologist	Beth Kramer, Senior Environmental Scientist
01	27/2/2017	Cameby Downs Continued Operations Project – Second Draft Flora Survey Report	Alan House, Principal Ecologist Carissa Free, Senior Ecologist	Phil Bracks, Regional Manager	
02	24/05/17	Cameby Downs Continued Operations Project – Final Draft Flora Assessment Report	Deanna Bayliss, Senior Ecologist	Alan House, Principal Ecologist	Beth Kramer, Senior Environmental Scientist
03	12/06/2017	Cameby Downs Continued Operations Project – Final Flora Assessment Report	Alan House, Principal Ecologist	Beth Kramer, Senior Environmental Scientist	
04	29/08/2017	Cameby Downs Continued Operations Project – Final Flora Assessment Report	Alan House, Principal Ecologist		
05	06/09/2017	Minor amendments to text and maps	Alan House, Principal Ecologist	Beth Kramer, Senior Environmental Scientist	
06	07/09/2017	Minor amendments to text and maps	Alan House, Principal Ecologist	Beth Kramer, Senior Environmental Scientist	
07	23/02/2018	Minor amendments	Dr Natalie Toon, Senior Environmental Scientist	Dave Fleming, SEQ Team Leader / Senior Ecologist	
08	11/5/2018	Minor amendments – area calculations		Dave Fleming, Manager – SEQ	

Distribution list

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1	11/5/2018	Electronic	Syntech Resources	Daniel Jones
2	11/5/2018	Electronic	Ecosure	Administration

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