Flinders Shire Council

15 Mile Irrigated Agricultural Development Project - Flora and Fauna Assessment

November 2018

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Document Control

15 Mile Irrigated Agricultural Development Project – Flora and Fauna Assessment

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Approval for Issue

Name and position	Signature	Date
Nicholas Baker, Director		12 November 2018

Permits and approvals

Wild Environmental Consultants operate in accordance with the following permits and approvals:

Scientific Use Registration Certificate (*Animal Care and Protection Act 2001*) – Registration Number 600

Scientific Purposes Permit (*Nature Conservation (Administration) Regulation 2006*) – Permit number WISP17791316

Animal Ethics Approval (Animal Ethics Committee) – AEC Application Reference Number CA 2016/08/997

Marine Parks Permit (*Great Barrier Reef Marine Park Regulations 1983* and *Marine Park Regulation 2006*) – G16/38539.1

Wildlife Authority (Rehabilitation Permit) (*Nature Conservation (Administration) Regulation 2017 – WA0002733*

Wildlife Authority (Damage Mitigation Permit) (*Nature Conservation (Administration) Regulation 2017 – WA0005146*

Executive summary

Wild Environmental was commissioned by Flinders Shire Council to conduct a flora and fauna survey of the proposed 15 Mile Irrigated Agricultural Development Project (the Project). The Project is located within the broader Hughenden region, approximately 12 km north north-west of the Hughenden township on the floodplain of the Flinders River.

The flora and fauna surveys conducted and detailed in this report are prepared to support the Impact Assessment Report (IAR) for the Project, which is a declared Coordinated Project under the *State Development and Public Works Organisation Act 1971.* Ecological surveys were conducted during the late dry season of August 2018. Vegetation mapping and flora species surveys were conducted to support an application for a Property Map of Assessable Vegetation in parallel while informing this assessment.

The Vegetation Management Regional Ecosystem Map contained one mixed polygon of 'of concern' regional ecosystem. All surveyed vegetation communities were identified as 'least concern' communities in accordance with the *Vegetation Management Act 1999*.

No listed threatened flora were identified during surveys, however, proposed changes to the regional ecosystem and a review of existing records indicates that the Project site may potentially support Pink Gidgee, a vulnerably listed plant species. Further targeted protected plant surveys would be necessary to confirm whether the species is present or absent.

Fauna survey techniques included diurnal and nocturnal active searches, baited camera trapping, spotlighting, echolocation call detection, and incidental surveys. Field investigations recorded a total of 80 fauna species within the Project site, including 51 birds, 8 reptiles, and 21 mammals.

One fauna species listed under both Commonwealth and State Legislation was identified during the survey. The Squatter Pigeon (*Geophaps scripta scripta*), is listed as vulnerable and was recorded foraging around the wetland on the Project site. One special least concern animal was recorded being the Short-beaked Echidna.

Following the field investigations, and a detailed desktop review, it is considered that the endangered Julia Creek Dunnart (*Sminthopsis douglasi*) has a possible likelihood of occurrence on the site, although this is potentially impacted by the presence of feral cats and other predators recorded on site. Habitat of the Project site consists of low open to open woodlands on alluvial cracking clays of the Mitchell Grass Downs bioregion.

The site is characterised by abandoned river meanders (paleo channels), and some open grassland communities. The modification of one of the oxbow lakes by the installation of a dam wall has resulted in a large amount of standing water, which is providing a permanent wetland environment.

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1. Introduction

1.1 Background

Flinders Shire Council proposes to develop an irrigated high value agricultural development at Lot 168 on SP262319, Old Richmond Road, Hughenden. This 918 ha parcel of land is previously known as '15 mile' reserve (The Project). The Project is located approximately 12 km north north-west of Hughenden and consists of approximately 344 ha of land for high value cropping and 101 ha of farming infrastructure and low value cropping[1]. The remaining 473 ha (approx.) of the Project site will consist of water storage, irrigation and environmental buffers to watercourses, wetlands and regulated vegetation.

On 24 August 2018, the project was declared a coordinated project under the *State Development and Public Works Organisation Act 1971*, for which an impact assessment report (IAR) is required.

Wild Environmental was engaged by Flinders Shire Council to conduct flora and fauna surveys on the proposed development land. The purpose of the survey was to ground truth vegetation communities, regional ecosystems, vegetation status and conduct fauna surveys. Wild Environmental conducted field surveys over seven (7) full days between the 27th of August and the 1st September.

1.2 Objectives

The objectives of this Flora and Fauna Assessment are to:

- Identify, map and describe existing vegetation communities using currently accepted methods and subsequent analysis of data to identify and describe the distribution of regulated vegetation within the Project site;
- Identify and describe the presence of, and habitat suitable for, any threatened flora and fauna species, populations, ecological communities, listed migratory species, which are known or likely to occur within the Project site;
- Identify the importance of the Project site to any listed conservation significant species such as wildlife corridors.

For the purposes of this assessment, conservation significant flora or fauna refers to flora and fauna relevantly scheduled in State and Commonwealth legislations as rare, vulnerable, endangered, or migratory, or otherwise listed with a conservation status deemed important.

[1] GHD 2018, *Flinders Shire Council 15 Mile Irrigated Agricultural Development Project Initial Advice Statement, GHD, Townsville*

1.3 Scope

The scope of this report includes a desktop and field survey assessment to identify:

- Regional ecosystems and their relevant status (least concern, of concern, or endangered) under the *Vegetation Management Act 1999*;
- Flora and fauna species listed as critically endangered, endangered, or vulnerable under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act);
- Flora and fauna species listed as migratory and/ or marine under the EPBC Act;
- Flora and fauna species listed as endangered, vulnerable, or near threatened or special least concern under the *Nature Conservation Act 1992*;
- Threatened ecological communities (TECs) that are protected under the EPBC Act; and
- Matters of National Environmental Significance (MNES), Matters of State Environmental Significance (MSES), and/ or the potential habitat suitability for MNES / MSES located in or around the Project.

1.4 Project Site Description

The Project site and therefore the relevant study area for this assessment is detailed in Table 1.

Table 1: Site Information

Address	Old Richmond Road, Hughenden
Lot/Plan	Lot 168 on Plan SP262319
Total Area (ha)	918
Client	Flinders Shire Council
Local Government Area	Flinders Shire
Current Zoning	Rural
Current Land Use	Grazing of native pastures
Proposed Land Use	Irrigated High Value Agriculture

1.4.1 Climate

The Project site is located in the arid dry tropics of central North Queensland, with temperatures ranging from 9.7°C in winter to the mean maximum temperature of 38.1°C in summer[2]. Rainfall in the area is highly variable

[2] Bureau of Meteorology. (2018). *Climate statistics for Australian locations.* Available: http://www.bom.gov.au/jsp/ncc/cdio/weatherData/av?p_nccObsCode=139&p_display_type=dataFile&p_stn_num=030024 Last accessed 19/09/2018.

with most of the rainfall being received between the months of November to March, with flash events occurring in October.

1.4.2 Bioregion

There are thirteen bioregions defined for Queensland. The Project is situated within the Mitchell Grass Downs. The subregions include Central Downs associated with the mudstone geology and Flinders associated with the Quaternary period alluvium, of which the site is bordering both.

1.4.3 Geology

The Project is located within the Carpentaria Basin and bound by the Great Dividing Range to the east and Euroka Arch to the south. The surface geology of the Project site and surveyed vegetation communities is a patchwork of

- The Flinders Floodplain Alluvium comprised of Quaternary clays, sands and gravels; and
- The Ranmoor Member comprised of Albian mudstone, in part carbonaceous and calcareous siltstone.

1.4.4 Land zone

The Project area land zone has been derived from both geological mapping and field observations. The Project area is located in Land Zone 3 – recent Quaternary alluvial systems, including closed depressions, paleo-estuarine deposits currently under freshwater influence, inland lakes and associated wave-built lunette[3]. Land zone definitions follow those defined in Wilson and Taylor (2012) and listed on the Queensland Government web site.

1.4.5 Soil

Soils of the Project area have been mapped at 1:250,000 and the study area is as a single soil landscape group. Soils within the study area are those of very dark grey to dark brown sand to sandy loam over massive to structured yellowish brown clay.

[33] Wilson, P.R. and Taylor, P.M. 2012 *Land Zones of Queensland*. Queensland Herbarium, Queensland Department of Science, Information Technology, Innovation and the Arts, Brisbane. 79 pp.

Figure 1: Locality Map

2. Legislative considerations

The Project is a declared coordinated project under the *State Development and Public Works Organisation Act 1971* for which an Impact Assessment Report (IAR) is required. The following legislative instruments relevantly pertain to the protection and management of native flora and fauna in Queensland.

2.1 Vegetation Management Act 1999

The VM Act establishes a framework for the protection of Queensland's native vegetation. Areas shown on the Regulated Vegetation Map as Category X are not regulated under the VM Act, however, areas shown as a Category A, B, C or R are subject to regulation. The latter vegetation categories can only be cleared in accordance with an exemption, self-assessable vegetation clearing code, area management plan or development approval in accordance with the *Planning Act 2016*.

The VM Act also protects 'essential habitat' vegetation where listed threatened species have been known to occur. Regulated Vegetation Management Mapping shows vegetation categories used to determine clearing requirements. The Project site is mapped as Category B vegetation which is listed as least concern.

2.2 Nature Conservation Act 1992

The Queensland *Nature Conservation Act 1992* (NC Act), is administered by the Department of Environment and Science (DES) and is the principal legislation for the conservation and management of the State's native flora and fauna. The primary objective of the NC Act is the conservation of biodiversity, namely the preservation of Endangered, Vulnerable and Near Threatened species of flora and fauna, as listed under the *Nature Conservation (Wildlife) Regulation 2006*. The NC Act classifies and protects significant areas (Protected Areas) and protects threatened plant and animal species. The *Nature Conservation (Wildlife) Regulation 2006* (NCWR) lists plant and animal species presumed extinct, endangered, vulnerable, near threatened, least concern, international or prohibited.

In Queensland all native plants are considered 'protected plants' under the *Nature Conservation Act 1992.* Proposals to clear protected plants may require a permit from under the *Nature Conservation (Wildlife Management) Regulation 2006*. Permits are required for clearing, protected plants in an area identified as high risk on the flora survey trigger map, unless an exemption applies.

If a protected plant is identified by survey to be cleared as part of the proposed works, a clearing permit must be sought from the Department of Environment and Science. Under the amended NC Act, a Protected Plant that is in the wild must not be 'taken', which includes being cleared, unless taking is under:

- A conservation plan applicable to the plant;
- A license, permit or other authority under a regulation; or

- An exemption under a regulation.

2.3 Environmental Protection and Biodiversity Conservation Act 1999

The EPBC Act is the national environmental law which legislates the protection and management of the environment, especially MNES. Under Part 3 of the EPBC Act, a person must not take an action that has or is likely to have a significant impact on a MNES unless that person can rely on an exemption, or obtains an approval from the Commonwealth Minister. The EPBC Act is administered by the Commonwealth Department of the Environment and Energy (DoEE).

The EPBC Act is designed to provide for the conservation of biodiversity through the protection of threatened species and ecological communities, migratory, marine, and other protected species listed under the EPBC Act.

2.4 Planning Act 2016

Under Schedule 10 of the *Planning Regulation 2017*, the clearing of native vegetation is prohibited development unless it is for a relevant purpose under section 22A of the VM Act, exempt clearing work, or accepted development.

Applications for development approvals can only be granted if the clearing is for a relevant purpose as prescribed under the VM Act, relevant purposes include:

1. A project is declared to be a coordinated project under the *State Development and Public Works Organisation Act 1971*, section 26;
2. The necessary control of non-native plants or declared pests;
3. Ensuring public safety;
4. Establishing a necessary fence, firebreak, road or vehicular track, or constructing necessary built infrastructure, and the clearing for the relevant infrastructure cannot reasonably be avoided or minimised;
5. A natural and ordinary consequence of other assessable development for which a development approval was given under the repealed Integrated Planning Act 1997, or a development application was made under that Act, before 16 May 2003;
6. Fodder harvesting;
7. Thinning of thickened vegetation;
8. Clearing of encroachment;
9. An extractive industry;

10. A special Indigenous purpose under the Cape York Peninsula Heritage Act 2007;
11. Necessary environmental clearing; and
12. Irrigated and non-irrigated high-value agriculture clearing.

3. Methodology

3.1 Overview

A combination of desktop and field-based assessments were undertaken to assess the flora and fauna values of the Project site. Survey methods primarily comprised of generic fauna survey methods aimed at techniques to identify the majority of fauna and habitat types present on the site in order to develop an inventory of species and consider the likelihood of occurrence for species of conservation significance. The survey methods did not include targeted species-specific surveys for species listed under the EPBC Act or NC Act.

Survey methods included (but were not limited to) camera trapping, vegetation surveys (quaternary and tertiary), and habitat observations.

3.2 Desktop assessment

A review of existing reports, aerial and satellite imagery, and database searches of flora and fauna records was conducted for the Project and surrounding area. Desktop searches were conducted using 5 - 10 km buffers.

The key desktop assessment resources assessed included:

- Department of the Environment's Protected Matters Search Tool;
- Regulated Vegetation Management Map and Vegetation Management Regional Ecosystem map;
- Queensland Government Wildlife Online Database extract;
- Occurrence records from Atlas of Living Australia;
- General mapping and spatial data;
- Essential Habitat Mapping; and
- Aerial imagery from Google Earth and Qld Globe.

3.3 Field Survey

Field surveys of the Project site were conducted between 27 August 2018 and 1 September 2018 and were considered to be representative of the late dry season for the region. Field conditions were dry and mild with temperatures ranging between 8 and 32.9 °C. The Project site has several drainage features which are characteristic of paleo channels and would be intermittently wet, seasonal wetlands. These channels were mostly dry at the time of the survey with the exception of the main water storage facility.

3.4 Flora survey

Vegetation surveys were conducted with due consideration given to Version 4 of the Queensland Herbariums *Methodology for Survey and Mapping of Regional Ecosystems and Vegetation Communities in Queensland*[4]. The method includes all detail relevant to the assessment of regional ecosystems in the field and required to delineate more concise regional ecosystem mapping polygon in areas currently mapped as a mosaic.

3.4.1 Site Selection

Sites were chosen using a combination of desktop assessment and during field traverses, where changes in vegetation communities occurred or where patches of vegetation communities were obvious. Sites were selected if they were considered representative of the on-ground vegetation communities of contiguous vegetation patches. At least one observation site was located in each regional ecosystem.

3.4.2 Survey Method

Field data at each vegetation survey site was recorded in accordance with the Queensland Herbariums *Methodology for Survey and Mapping of Regional Ecosystems and Vegetation Communities in Queensland* for quaternary and tertiary methods.

Field survey methodology involved sampling in the form of transects of 500 m^2 (10 m x 50 m or 20 m X 25 m) for Quaternary sites, located in each mapped regional ecosystem. A tertiary survey site was completed along a 1,000 m^2 transect in areas that had been ground truthed as Category B 'Remnant vegetation'.

A total of 38 sites were recorded throughout the Project site and are mapped in detail in Figure 4. Data collected at each survey site was designed to capture regional ecosystems on site, and structural formation to be used for numerical data analyses if need be.

Survey effort consisted of 48 man-hours over six (6) consecutive days on site to survey the Project site. During the field survey, the area was traversed by vehicle and on foot.

3.5 Plant Identification

The majority of plant species were identified in the field. Small samples were collected for unknown taxa and identified later using standard keys from local and regional flora publications where necessary. Nomenclature within this report follows that of the Queensland Herbarium as it was current in August 2018.

[4] 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. 124 pp.

3.6 Fauna Survey

Terrestrial fauna surveys were undertaken using a mix of survey techniques including:

- Remote motion sensor baited camera traps;
- Spotlighting;
- Scat, track, and sign search;
- Diurnal active searches for reptiles;
- Diurnal bird surveys using active search techniques;
- Microbat echolocation call detection; and
- Opportunistic observations during other survey works.

3.6.1 Diurnal bird surveys

Diurnal bird surveys were conducted by active searches. A total of 11 bird surveys were conducted, in predetermined locations on the Project site. During each survey, ecologists moved along a meandering transects running across the Project site. Ecologists conducted non-intrusive active area searches of the Project site so as to provide a direct census of diurnal bird species occurrence and abundance. This method requires highly skilled observers with substantial experience in bird observation, species identification (both visual and auditory) and knowledge of Australian bird distribution and migration patterns.

Bird surveys were conducted in the early morning. Whilst traversing the Project site, birds were opportunistically identified where possible by sight and call.

3.6.2 Active Diurnal Searches and Destructive Searches

During general traversing of the site, opportunistic active diurnal searches were conducted, in multiple locations on the Project site. Ecologists conducted destructive searches of potential reptile habitat by turning rocks and logs, investigating hollow logs, raking through the leaf litter, looking under bark and inspecting crevices. These searches were conducted in the morning (reptiles most active) and in the afternoon.

3.6.3 Bat echolocation call detection

Two types of bat detectors were used for the survey. Two SM2Bat+ Song Meters were deployed in the for three (3) nights, and subsequently moved to new locations for two (2) more nights. The SM2Bat+ Song Meters were deployed (recording from 1800 – 0630) several metres above the ground in trees, and orientated upwards towards gaps in the canopy (Figure 2). Targeted survey areas included habitat with obvious hollow bearing trees and open canopy structure.

In addition, an Anabat Bat Detector was used as a secondary detection method. Whilst conducting the spotlight surveys, the observer held the Anabat Bat Detector.

3.6.4 Camera trapping

Motion sensor cameras were deployed within the Project site to monitor and detect presence of fauna.

A total of 11 bait stations paired with 11 motion sensor cameras were deployed within the survey area. Camera traps were placed in strategic sites within the Project site which were likely to exhibit high animal traffic, such as water sources and trails or tracks which appeared to be in constant use. Each camera trap was enhanced by the use of bait stations. Cameras were attached to trees, positioned facing the bait station. Baits included a mixture of creamed honey, peanut butter, and rolled oats as per the relevant survey guidelines and baits were placed in PVC containers secured with steel mesh to increase the longevity of the bait (Figure 3). Camera traps were left on the project site for six days and five nights.

Figure 2: Song meter placement in tree

Figure 3: Camera trap bait station in high fauna traffic area

3.6.5 Spotlight survey

Spotlight surveys were conducted using a combination of walking meanders and slow vehicle-based movement along tracks. Spotlighting was conducted for 1.5 hour periods over three nights. Spotlighting effort covered approximately nine (9) person hours using two (2) observers with handheld spotlights, torches, and head torches.

Spotlight surveys were aimed at identifying nocturnal and arboreal species and fauna were identified by direct sighting and via calls. Each observer used a 15-Watt LED handheld spotlight and walked slowly and methodically through the survey site.

3.6.6 Track, scat, and sign search

During active searches, tracks, scats, animal remains, movement pathways, tree scratches and other traces of animal activity and presence were observed. Trees were closely inspected for scratch marks, nests and hollows to determine their value as habitat. Hollows were also inspected with a bore scope to determine their potential value as habitat where able to be reached.

3.6.7 Opportunistic observations

Opportunistic observations of terrestrial fauna were also recorded as were observations outside of the Project site while moving between survey locations, if it was considered that they were relevant to the Project Site.

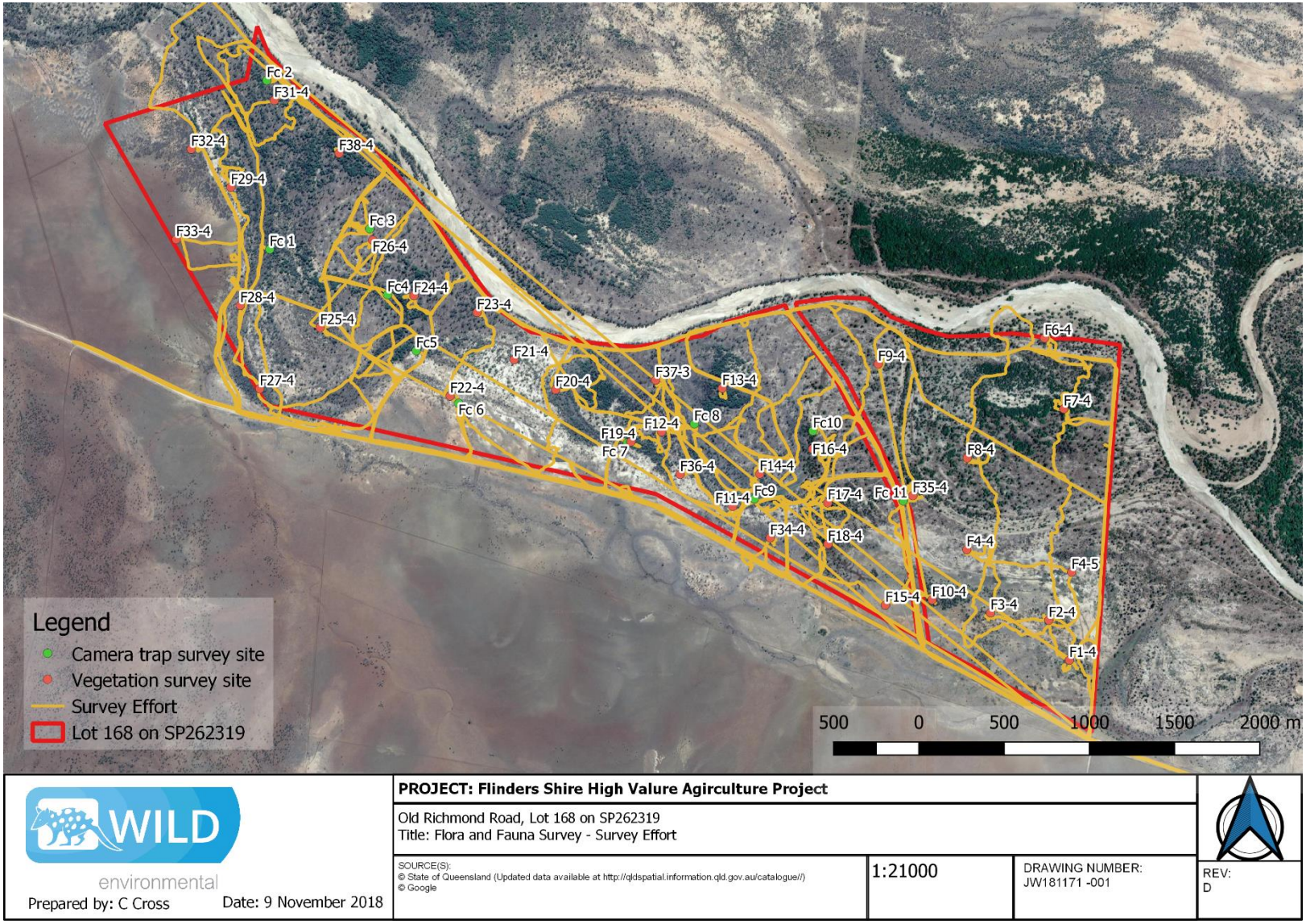

Figure 4: Survey Effort

4. Results

4.1 Desktop Assessment Flora

4.1.1 Mapped Vegetation Communities and Regional Ecosystems

The Queensland Government's Vegetation Management Regional Ecosystem Map provides mapping of regional ecosystems at a 1:100,000 scale. Regional ecosystem classification refers to vegetation communities in a bioregion that are consistently associated with a particular combination of geology, landform and soil[5].

A total of 7 regional ecosystems are mapped within the Project site. A description of each mapped existing regional ecosystem within Project area is provided in Table 2.

Table 2: Regional ecosystems of the Project Site

Regional Ecosystem	VMA Status	Short Description
10.3.12	Least concern	*Corymbia dallachiana* and *C. plena* or *C. terminalis* woodland to open woodland on sandy alluvial terraces (eastern)
10.3.26	Of concern	*Lysiphyllum carronii* low open woodland on alluvial plains
4.3.1	Least concern	*Eucalyptus camaldulensis* +/- *Melaleuca* spp. woodland on drainage lines
4.3.14	Least concern	*Astrebla lappacea, Astrebla* spp. +/- *Eulalia aurea* grassland on alluvium
4.3.20	Least concern	*Atriplex* spp. *and Sclerolaena* spp. +/- *Astrebla* spp. +/- *short grasses +/- forbs*, open herb land on braided or flat alluvial plains
4.3.3	Least concern	*Eucalyptus coolabah, E. camaldulensis* +/- *Lysiphyllum gilvum* open woodland on drainage lines
4.9.1	Least concern	*Astrebla lappacea* +/- *Aristida latifolia* +/- *Panicum decompositum* grassland on Cretaceous sediments

The results of the Regional Ecosystem mapping show one (1) of concern regional ecosystem.

[5] Sattler, P and Williams, R 1999, *The Conservation Status of Queensland's Bioregional Ecosystems, Part 11*, Environmental Protection Agency, Queensland

WILD environmental

Prepared by: C Cross Date: 14 September 2018

Project: Flinders Shire High Value Agriculture

Old Richmond Road, Lot 168 on SP262319
Title: Mapped Regional Ecosystems

SOURCE(S):
© State of Queensland (Updated data available at http://qldspatial.information.qld.gov.au/catalogue//)
© Google

1:20,000

DRAWING NUMBER: draft

REV: A

N

Figure 5: Vegetation Management Regional Ecosystem Map

4.1.2 Protected matters search

A search of the EPBC Act protected matters search tool database did not identify any TECs. The search did return two possible records for listed threatened flora. The results of the protected matters search for flora and vegetation are summarised in Table 3.

Table 3: EPBC Protected Matters Search Tool results for TECs and flora

MNES	Search Result	Description
Listed Threatened Ecological Communities	None	None
Listed flora	2	- Pink Gidgee (*Acacia crombiei*); and - Kind Blue-grass (*Dichanthium queenslandicum*).

Flora species of conservation significance are further discussed in section 5.

4.1.3 Flora species (summary of databases)

Several databases were searched for flora species known or likely to occur within the Project site. Wildlife database searches for flora resulted in approximately 343 species of flora considered to be present within or surrounding the Project site.

Only two (2) of the listed 343 species of plants were listed as conservation significant species. These species were the same as those identified in the EPBC protected matters search tool and summarised in Table 3.

4.2 Desktop Assessment Terrestrial Fauna

4.2.1 MNES and NCA Listed species

Protected Matters search

The DOEE website provides a Protected Matters Search Tool which aids in determining which protected MNES may occur in an area of interest. A Protected Matters search was conducted to guide the assessment of which MNES may occur in, or may relate to the proposed development area. provides a summary of the Protected Matters search results.

Table 4: Summary of protected matters search results

MNES	Search Result	Description
Listed Threatened Species	15	**Fauna:** ***Birds*** Black-throated finch (*Poephila cincta cincta*), Curlew sandpiper (Calidris ferruginea), Red Goshawk (Erythrotriorchis radiates), Star Finch (*Neochmia ruficauda ruficauda*), Australian Painted Snipe (*Rostratula australis*), Masked Owl (*Tyto novaehollandiae kimberli*) ***Mammals*** Ghost bat (*Macroderma gigas*), Greater Bilby (*Macotis lagotis*) Koala (*Phascolarctos cinereus*), Julia Creek Dunnart (*Sminthopsis dougglasi*) **Reptiles** Plains Death Adder (*Acanthiphis hawkei*), Yakka Skink (*Egernia rugosa*). **Fish** None
Listed Migratory Species	11	***Marine Birds*** Fork-tailed Swift (*Apus pacificus*) ***Terrestrial Birds*** Oriental Cuckoo (*Cuculus optatus*), Grey Wagtail (*Motacilla* cinereal), Yellow Wagtail (*Motacilla flava*) ***Wetland Birds*** Common Sandpiper (*Actitis hypoleucos*), Curlew Sandpiper (*Calidris ferruginea*), Sharp-tailed Sandpiper (*Calidris acuminata*), Pectoral Sandpiper (*Calidris melanotos*), Latham's Snipe (*Gallinago hardwickii*), ***Reptiles***

		None ***Fish*** None ***Mammals*** None
Listed Marine Species	18	***Birds*** Common Sandpiper (*Actitis* hypoleucous), Fork-tailed swift (*Apus* pacificus), Great Egret (*Ardea* alba), Cattle Egret (*Ardea* ibis), Sharp-tailed Sandpiper (*Calidris* acuminate), Pectoral Sandpiper (*Calidris* melanotos), Black-eared Cuckoo (*Chrysococcyx* osculans), Oriental cuckoo (*Cuculus saturatus*), Lantham's Snipe (*Gallinago hardwickii*), White-bellied Sea-Eagle (*Haliaeetus leucogaster*), Rainbow Bee-eater (*Merops ornatus*), Grey Wagtail (*Motacilla cinereal*), Yellow Wagtail (*Motacilla flava*), Painted Snipe (*Rostratula benghalensis*). ***Reptiles*** Freshwater Crocodile (*Crocodylus johnstoni*) ***Mammals*** None

Table 5: Summary of NCA listed conservation significant species sighted

Nature Conservation Act 1992 **listed species**	**Search Result**	**Description**	**Status**
Birds	5	Squatter Pigeon (*Geophaps scripta scripta*)	Vulnerable
Mammals	1	Short-beaked Echidna (*Tachyglossus aculeatus*)	Special Least Concern

Results of the protected matters search tool should be considered indicative only and contain a wide variety of species which may or may not actually occur within the region or the Project site. Therefore, local information, results from field surveys, and expert knowledge are used to assess the likelihood of each species occurring within the Project site based on habitat suitability, occurrence records, and ecological information.

4.2.2 Terrestrial fauna

In addition to the protected matters search results, results from the Atlas of Living Australia and Queensland Wildlife Online Database were sort. Each of the searches are appended and the results are summarised below.

In total, 210 fauna species are considered to have the potential to occur or have been previously recorded within or around the Project site, including:

- 1 amphibian species (1 introduced species);
- 32 reptile species (31 native species, 1 introduced species);
- 26 mammal species (21 common native species, 3 conservation significant species, 5 introduced
- species); and
- 160 birds (152 common native species, 6 conservation significant species, 2 introduced species)

Conservation significant terrestrial fauna species (including likelihood of occurrence assessment) are discussed in Section 5 and Appendix B.

Table 6: Terrestrial fauna species identified via database searches for the area

Scientific name	Common name	NC Act status	EPBC Act Status
Petauroides volans minor	Northern greater glider	V	V
Phascolarctos cinereus	Koala	V	V
Tachyglossus aculeatus	Short-beaked echidna	SL	
Grantiella picta	Painted honeyeater	V	V
Glareola maldivarum	Oriental pratincole	SL	
Actitis hypoleucos	Common sandpiper	SL	
Charadrius veredus	Oriental plover	SL	
Falco hypoleucos	Grey falcon	V	
Apus pacificus	Fork-tailed swift	SL	
Geophaps scripta scripta	Squatter pigeon (southern subspecies)	V	V

4.3 Field survey results

4.3.1 Vegetation communities

A total of 6 Mitchell Grass Downs RE's and 2 Desert Uplands RE communities are mapped within the Project site. Of the mapped RE's, 1 RE (10.3.26) is mapped as "of concern". The remaining mapped RE's are listed as "least concern".

Field surveys were undertaken on 27 August 2018 – 1 September 2018 (late dry season). A total of 38 survey sites were attended (37 rapid quaternary and 1 tertiary). The location of the vegetation survey sites is shown in Figure 7. Results of the vegetation surveys identified 7 Mitchell Grass Downs REs and no Desert Upland communities. The changes to the mapped REs are shown in the ground truth field verified map (Figure 7). Table 7 provides a summary of the vegetation communities surveyed and mapped with the Project site. Full survey results are contained in the Vegetation Assessment at Appendix C.

The vegetation within the survey area is predominantly remnant mixed eucalypt open woodlands, with fringing northern Mitchell Grass Downs grassland communities along the south western boundary of the Project site. Smaller areas of *Acacia cambagei* (Gidgee) woodlands on alluvial plains are found sporadically throughout the Project site.

In consultation with the Queensland Herbarium it was noted that the *Mitchell Grass Downs* bioregion is currently undergoing a review of regional ecosystems classification and mapping. Therefore, interpretation and classifications of regional ecosystems was prepared with some discretion given to correspondence between Wild Environmental and the Queensland Herbarium staff and on ground findings.

It is considered that the sparse open nature of the vegetation is indicative of its natural low density and reflects the seasonally dry and arid conditions of the site. In addition, the site has sustained and experienced intensive grazing pressure for a number of years, which may have suppressed tree recruitment and shrub density.

Ground cover is indicative of intensive over-grazing and is particularly sparse in some areas. Native grass *Astrebla* species dominate the ground cover across the majority of survey sites, although the survey timing was not conducive to identification of many grasses to species level.

Land Zone 3 - Cainozoic alluvial plains

Table 7: Vegetation communities within the Project Area

Vegetation community	RE association	Characteristic Species and description	Site ID	Representative Image
***Eucalyptus* riverine wetland or fringing riverine wetland**	4.3.2	*Eucalyptus camaldulensis* +/- *Eucalyptus coolabah* on drainage lines. This woodland community occurs fringing the Flinders river and along paleo channels of the site. This community is in good condition in the top strata, although the shrub layer is often dominated by invasive species such as prickly acacia and mesquite.	F6-4, F16-4, F27-4, and F30-4	
Low open *Eucalyptus coolabah* woodlands on alluvial plains with drainage lines	4.3.4x2	*Eucalyptus coolabah, Acacia cambagei* open woodland, often with mixed secondary story of associated species including *Atalaya hemiglauca* and *Lysiphyllum gilvum.*	F7-4, F11-4, F13-4, F14-4, F17-4, F18-4, F19-4, F20-4, F21-4, F24-4, F26-4, F28-4, F31-4, F34-4, F35-4, F36-4 and F38-4	

Vegetation community	RE association	Characteristic Species and description	Site ID	Representative Image
***Acacia cambagei* low open woodland on alluvial plains**	4.3.9	*Acacia cambagei* dominant woodland with occasion *Eucalyptus coolabah* on alluvial plains. *Acacia georginae* not present within Project site Ground layer dominated by *Astrebla* spp. and other hardy herbs and forbs. Areas which were dominated by *Acacia cambagei* were initially recorded as RE4.3.8. Following advice from the Herbarium, it was considered that these plains communities would be more consistent with the revised description of RE 4.3.9 which is *Acacia cambagei* on alluvial plains.	F1-4, F2-4, F3-4, F4-4, F10-4, F22-4, and F32 -4	
***Corymbia terminalis, C. dallachiana* mixed low open woodland on levees and banks of rivers and paleo channels**	4.3.10	*Corymbia terminalis, Corymbia dallachiana, Lysiphyllum gilvum, Acacia victoriae* sometimes mixed with *Eucalyptus camaldulensis, Grevillea striata, and Vachellia sutherlandii.* Ground cover mixed tussock grass species and forbs. These woodland communities occur on the levees and banks of abandoned river channels and Flinders River. These communities are thought to be yet to be formally described communities of 4.3.10. Correspondence from the Herbarium provides that this is an unmapped vegetation community around the Flinders River that is a These areas (approximate extent) were previously mapped as RE10.3.12a.	F9-4, F25-4 and F35-4	

Vegetation community	RE association	Characteristic Species and description	Site ID	Representative Image
Northern Mitchell Grass Downs grassland on cracking clay soils	4.3.14, 4.3.20, 4.9.1c	*Astrebla spp. Aristida* spp, *Sclerolaena birchii, Sclerolaena tricuspis, Sporobolus australasicus, Salsola kali, Enchylaena tomentosa, Alternanthera pungens.* *Vachellia nilotica* and *Erythoxylum australe* were sparse but present.	F5-4, F15-4, F33-4	
Bauhinia mixed woodland community on alluvial plains	4.3.23	*Lysiphyllum gilvum +/- Lysiphyllum carronii,* and associated species *Acacia cambagei, Atalaya hemiglauca.* Occasional canopy species may include *Corymbia terminalis, Eucalyptus camaldulensis* and *Eucalyptus coolabah*. A sparse shrub layer may occur. The ground layer is tussock grasses.	F12-4, F23-4, F29-4 and F37-3	

Survey timing was considered satisfactory for identifying native and exotic vegetation present, and ground truthing regional ecosystems as native perennial species started flowering. 38 vegetation survey sites were selected where changes in vegetation communities were obvious on both aerial imagery and during field traverses. These vegetation sites are considered satisfactory in displaying the changes in both vegetation communities and regional ecosystems across the Project site.

Wetlands

The abandoned river channels throughout the site are characteristic of wetland habitats within the survey area. These channel systems form depressions in an otherwise flat floodplain landscape and consist of sometimes bare ground or a distinct ground layer of native forbs or invasive species. These areas would be subject to seasonal wetting and drying cycles and therefore could be described as palustrine wetlands.

Figure 6: Wetland habitat examples from survey area

One small wetland held water during the August site visit, which was unusual given the time of year (late dry season). This is considered to be an artificial result due to an earthen bud wall constructed on the northern inside edge of the oxbow lake created to provide a permanent water source for cattle.

Weeds and invasive species

Woody weeds such as Mesquite (*Prosopis pallida*) and Prickly acacia (*Vachellia nilotica*) are widespread throughout the shrub and low tree layer within eucalypt and gidgee communities. The abundance of invasive weeds within the survey area may be a cause of the low dominance of native shrubs. Several species of declared noxious weeds were identified and relevantly include those listed in Table 8.

Table 8: Introduced and Invasive plants

Weed	Type:	Class of Pest *(Land Protection (Pest and Stock Route Management) Act 2002*
Rubber Vine (*Cryptostegia grandiflora*)	Introduced	Class 2
Mesquite (*Prosopis pallida*)	Introduced	Class 2
Prickly Acacia (*Vachellia nilotica*)	Introduced	Class 2
Chinee Apple (*Ziziphus mauritiana*)	Introduced	Class 2
Parkinsonia (*Parkinsonia aculeata*)	Introduced	Class 2
Mimosa Bush (*Vachellia farnesiana*)	Introduced	Class 2
Sida spp.	Introduced	Environmental
Malvastrum americanum	Introduced	Environmental

4.3.2 EPBC listed threatened ecological communities

There were no TECs identified with the Project site during the field surveys.

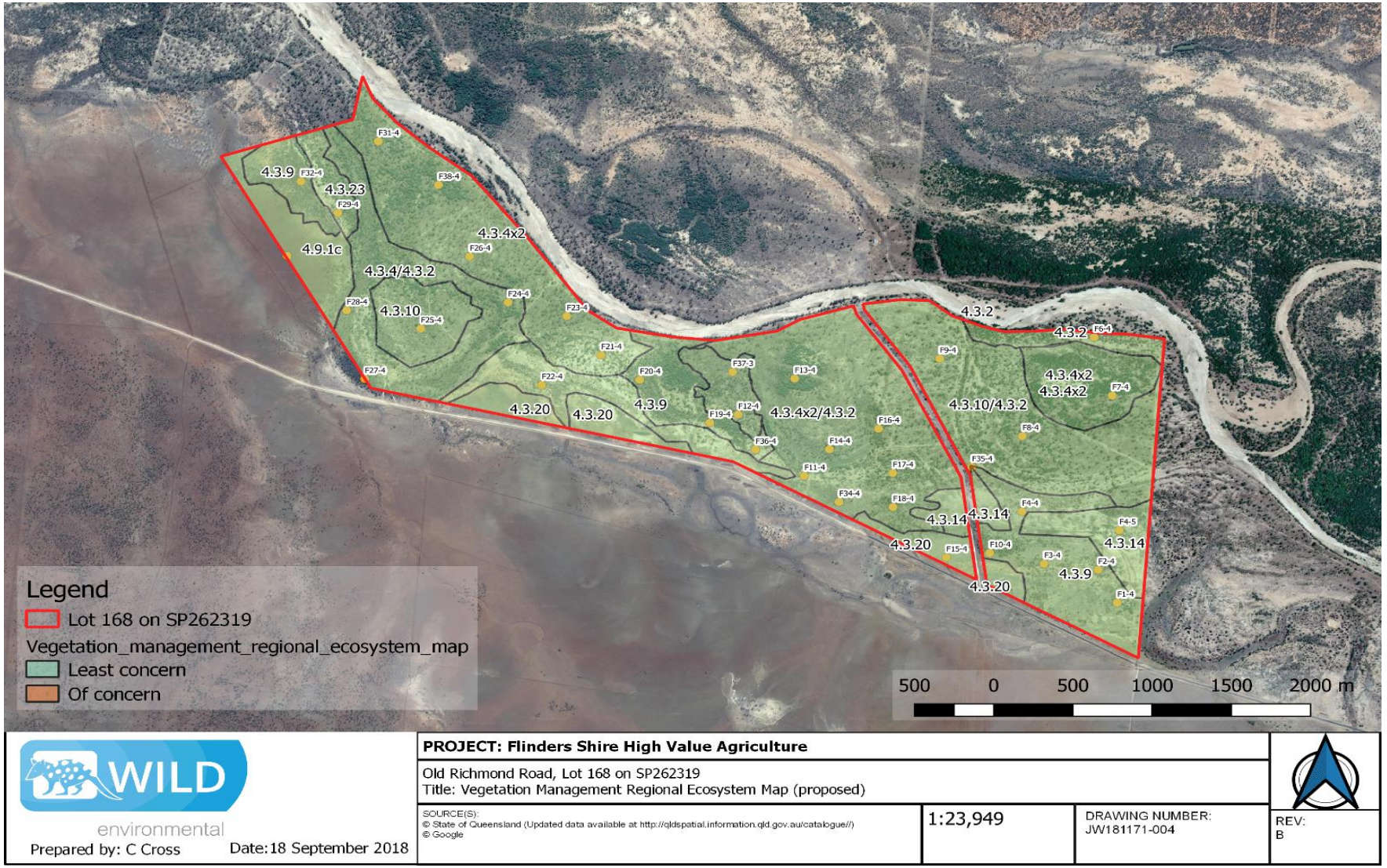

Figure 7: Vegetation survey sites and ground truth regional ecosystems

4.4 Fauna Survey Results

A total of 80 fauna species were recorded during field surveys within the Project site including 51 birds, 8 reptiles and 21 mammals. A summary of all species recorded is found at Appendix A. Fauna habitat types within the Project site consist of:

- Low open to open eucalyptus woodland;
- Mitchell grass downs grasslands on cracking clay soils;
- Sparse gidgee low open and shrubby woodland; and
- Woodland to tall open woodland fringing abandoned river channels and paleo channels / wetlands which consists of both seasonal and permanent water.

Figure 8: Low open to open eucalyptus woodland

Figure 9: Mitchell Grass downs cracking clay soils

Figure 10: Sparse Gidgee low open and shrubby land

Figure 11: Woodland fringing abandoned river channels wetlands

4.4.1 Birds

A total of 51 species of bird were recorded during the field surveys. Of the 51 species identified on-site, 1 is a listed vulnerable species under both the EPBC Act and NC Act (Squatter pigeon), and 1 listed marine species (Rainbow bee-eater) . No listed migratory species were identified.

The majority of bird species were woodland and grassland birds, with some waterbirds found to be associated with the permanent water storage of the central oxbow lake. Although there is substantial standing water (likely permanent), low ground cover was observed at the majority of the sites. This may be due to overgrazing. The standing water provided habitat for such waterbirds including, pink-eared ducks, pacific black ducks, and dotterels.

Large flocks of budgerigars, galahs, cockatiels, masked wood swallows, and white-browed wood swallows were noticeably dominant, especially in areas nearby to water. Large flocks of wood swallows were found to be feeding on flowering *Lysiphyllum gilvum* and *L. carronii* trees. The open woodland and grasslands also supported suitable habitat for generalist woodland and grassland species such as, emu, galah's, and quails.

Of the nocturnal bird species, the survey resulted in a lower than expected outcome, with only the barn owl being identified during night time surveys. This was considered unusual and possibly not representative of the sites full nocturnal bird assemblage.

Figure 12: Southern squatter pigeon (*Geophaps scripta scripta*) observed during the survey

Figure 13: Emus *(Dromaius novaehollandiae)*

4.4.2 Mammals

Twenty-one mammal species were recorded throughout the project site, with the majority being made up of 17 species of microbats.

Of the mammal species identified during investigations, Red Kangaroos (*Macropus rufus*), Eastern Grey Kangaroos (*Macropus giganteus*) and feral pigs (*Sus scrofa*) were the most frequently observed. A more detailed species list is provided in Appendix A.

A detailed microbat call identification report includes the findings of the bat call analysis for the Project site and provided in Appendix D. The report notes some difficulties in the identification of certain microbat species based on the available call recordings, however, these results do not relate to any species of conservation significance.

A distinct lack of arboreal mammals was noted, which may be due to a combination of distribution and dominance of arboreal nesting birds such as galah's which were present throughout the site.

The Short-beaked Echidna (*Tachyglossus aculeatus)* was identified during surveys and is listed as a special-least concern mammal under the NC Act (Figure 15).

Figure 14: Swamp wallaby *(Wallabia bicolor)*

Figure 15: Short-Beaked Echidna *(Tachyglossus aculeatus)*

4.4.3 Reptiles

Eight (8) species of reptile were recorded during surveys and included three (3) different species of snake (*Boiga irregularis*, *Pseudonaja textilis* and *Suta suta* [Figure 16]), two (2) species of skink (*Carlia munda* & *Carlia rubigo*), and three (3) species of gecko (*Heteronotia binoei*, *Gehyra versicolor,* and *Diplodactylus tessellatus* [Figure 17]). Only dragon species were found near the Projectsite (*Pogona barbata*). All species found are listed as least concern.

It is likely that the Project site supports many more reptile species and the observed species likely only represent a subset of the reptile diversity on the Project site. The chosen survey methodology, cryptic nature of many reptiles and seasonality may all play a part in the low numbers of identified reptiles.

Figure 16: Curl (*Suta suta*)

Figure 17: Tessellated Gecko (*Diplodactylus tessellatus*)

4.4.4 Tracks, scats, and other traces

The Project site encompassed a range of fauna tracks, dens, and scats which provided evidence for onsite activity and presence. Tracks were predominantly found along sandy open areas, roads and around water holes. Various burrows were found around the Project site with tracks and sometimes remains of mammals left behind providing positive evidence of dingos being present on site (Figure 19). Multiple sets of macropod tracks were identified. Most common tracks were signs of the Short-beaked echidna and feral cat were the only positive identification of mammal tracks.

4.4.5 Feral species

Four introduced species were recorded during field surveys: Dingo / Wild Dog (*Canis lupus dingo / familiaris*), Rabbit (*Oryctolagus cuniculus*), Cat (*Felis catus*), Pig (*Sus scrofa*). In addition to the feral species observed, both cattle and horses were found on site but were considered to be livestock.

All 4 species of pest identified are categorized as a Class 2 pest – an established pest in Queensland with substantial adverse economic environmental or social impacts under *Land Protection (Pest and Stock Route Management) Act 2002*. Of the 4 species, 3 of were introduced while 1 is considered native (Table 9). Dingo's are considered native wildlife under the *Nature Conservation Act 1992* and are protected in national parks. Elsewhere throughout Queensland they are considered a pest species under the *Land Protection (Pest and Stock Route Management*) *Act 2002.* The Dingo / Feral dog was identified through tracks and evidence of an active den, although it is difficult to tell the two different dogs apart without a visual representative.

Table 9: Recorded Feral Animals

Pest	Type	Class of Pest (*Land Protection (Pest and Stock Route Management) Act 2002*)
Cat (*Felis catusi)*	Introduced	Class 2
Dingo/ Feral Dog (*Canis lupus familiaris/Canis lupus dingo*)	Native	Class 2
European rabbit (*Oryctolagus cuniculus*)	Introduced	Class 2
Feral Pig (*Sus scrofa*)	Introduced	Class 2

Figure 18: Unidentified macropod tracks (Likely to be a swamp wallaby based off size and distribution)

Figure 19: Dingo den with Eastern Grey Kangaroo prey inside

Figure 20: Unidentified mammal print. Suspected of being feral cat based of size and earlier sightings.

Figure 21: Feral Cat *(Felis catus)* spotted on Camera traps

4.5 Habitat value, Connectivity, Condition, and Integrity

There are several broad habitat types present within the Project site.

- Eucalypt woodland with grassy understory;
- Paleo channels with fringing woodlands and levees;
- Riparian areas along the Flinders River; and
- Palustrine wetlands with intermittently ephemeral wetting cycles.

Most of the habitat would be considered woodland with a grassy understory with a sparse and occasional shrub layer. Many of the woodland habitats showed evidence of historical clearing. The site is characteristic of long-term grazing and stocking impacts, with denuded ground cover – although it may be expected that ground cover would be better in wet season and shortly after.

Introduced plant species are present in all vegetation communities found on site, and in some areas are forming or contributing to the predominant above ground biomass. Clearing and felling of large woody weeds has created piles of woody debris, which were found to provide refuge to some species, such as button quails.

Key habitat features of the Project site are the paleo channels which tend to have large cracks in the clay and contain coarse wooden debris. These areas were where the majority of reptiles were identified, often taking shelter in the cracks of the clay once disturbed.

The sites position in the landscape is one of a connected landscape forming a general wildlife corridor along the riparian and floodplain zone of the Flinders River.

Figure 22: Large hollow bearing trees

Figure 23: Cracking clays

Figure 24: Inside tree hollow with Yellow bellied sheath-tailed bat (*Saccolamius flaviventris*)

Figure 25: Burrow of unknown origin

5. Conservation Significant Species

For the purpose of this report, species of conservation significance are taken to mean:

- Flora and fauna relevantly scheduled in State and Commonwealth legislations as rare, vulnerable, endangered, or migratory, or otherwise listed with a conservation status deemed important.

5.1 Likelihood of Occurrence Assessments

The information obtained through the desktop and field assessments was used to characterise the existing ecological values of the Project site. For conservation significant species, a likelihood of occurrence assessment was undertaken to inform the impact identification process. This assessment considered information relating to species habitat preferences, known or suspected distribution, database records from the region, the occurrence of suitable habitat based on field observations, or confirmed presence of species within the Project site.

A likelihood of occurrence ranking was attributed to each conservation significant species according to the following definitions:

- **Unlikely to occur**: species has not been recorded in the region and/ or current known distribution does not encompass Project site and / or lack of suitable or potentially suitable habitat within the Project site.
- **Possible**: potentially suitable habitat occurs within the Project site, but no recent records from the area or nearby adjacent areas.
- **Likely to occur**: based on potentially suitable habitat within the Project site and records or distribution match.
- **Known to occur**: species recorded during field surveys, or other documented records of species within the Project site.

This section deals with species of conservation significance which were considered to warrant detailed assessment and consideration. For a comprehensive table of all conservation significant species, detailing the likelihood of occurrence for those identified during desktop analysis refer to Appendix B.

5.1.1 Summary

One conservation significant species was recorded during the field survey.

- Southern Squatter Pigeon (*Geophaps scripta scripta*) – a listed vulnerable species under the EPBC Act and NC Act.

One migratory and marine species occurred on the location site; the Rainbow Bee-eater (*Merops ornatus*). The following migratory and marine species were assessed as likely to occur within the site based of previous sightings;

- Cattle Egret (*Ardea ibis*); and
- Fork Tailed Swift (*Apus pacificus*).

It is also possible that the following species may occur on the Project site:

- Great Egret (*Areda alba*).

5.2 Listed Threatened Flora Species

Two threatened flora species were noted in the desktop assessment. These are King Blue-grass (*Dichanthium queenslandicum*) and Pink Gidgee (*Acacia crombiei*).

5.2.1 Pink Gidgee (*Acacia crombiei*) – likely to occur

Pink Gidgee is currently listed as vulnerable under the NCA and *EPBC Act*. Pink Gidgee was not observed on the Project site.

Pink Gidgee grows to approximately 10 m with pale green, narrowly linear phyllodes to 10 – 15 cm long and 3 – 8 mm wide. Branchlets are flexuous and angled at the extremities. Flowers are yellow in globular heads with narrowly oblong pods to 10 cm long and 2 cm wide. Seeds traverse, are oblong to widely elliptic, flat and 8 – 10mm long by 7 - 8.5 mm wide, slightly shiny, dark brown and exarillate. The species habit is like that of Gidgee (*Acacia cambagei*).

The species is endemic to central Queensland where it occurs in isolated populations. It occurs in the Burke, Mitchell and North Kennedy pastoral regions, and from south-east of Winton to the north-west of Greenvale. The species appears to be most abundant within an area 100km south and 1500km north-west of Hughenden.

The species has an area of occupancy of 1000 km^2 an extant of occurrence at 34 000 km^2, occurs at 15 subpopulations and may have an abundance of 76 000 plants. Pink Gidgee occurs on wooded downs in woodland and open woodland often associated with Gidgee (*Acacia cambagei*) and white wood (*Atalaya hemiglauca*) on alluvial, sandstone and basalt derived soils. The species is known to inhabit REs: 4.3.8, 4.3.23, 9.8.6. 9.8.5, 4.3.14, 4.9.7, 4.9.1, 4.3.3, 4.3.20, 4.9.11, and 4.3.19. Figure 26 shows the regional distribution of records for Pink Gidgee. Historically, specimens have been recorded in the surrounds of the Project site, and the habitat description is suitable for the Project site.

Appearance on Project site

It is considered possible to likely, that Pink Gidgee has the potential to occur on the Project site. The vegetation surveys conducted to inform this assessment found that two RE's that may include Pink Gidgee (4.3.23 and 4.3.14) have been ground truthed within the footprint of the Project site.

It is acknowledged that the systematic surveys conducted are not necessarily suitable for the identification of all plant species, including Ping Gidgee – especially if it was present in low numbers. Resource limitations mean that it cannot be confidently ruled out that the species does not exist. Further survey timing may not have been suitable and therefore, it cannot be ruled out that the species is present or absent on site.

5.2.2 King Blue-grass (*Dichanthium queenslandicum*) – unlikely to occur

King Blue-grass is a perennial grass growing to 80 cm tall. This species is endemic to central and southern Queensland where it mainly occurs on black cracking clay in tussock grasslands generally in association with other species of blue grasses (*Dichanthium* spp. and *Bothriochloa* spp.)[6].

This is considered unlikely to be found within the Project site due to not matching the habitat preference for the species.

6 Department of the Environment. 2016. Dichanthium queenslandicum in Species Profile and Threats Database, Department of the Environment, Canberra. Available from: http://www.environment.gov.au/sprat.

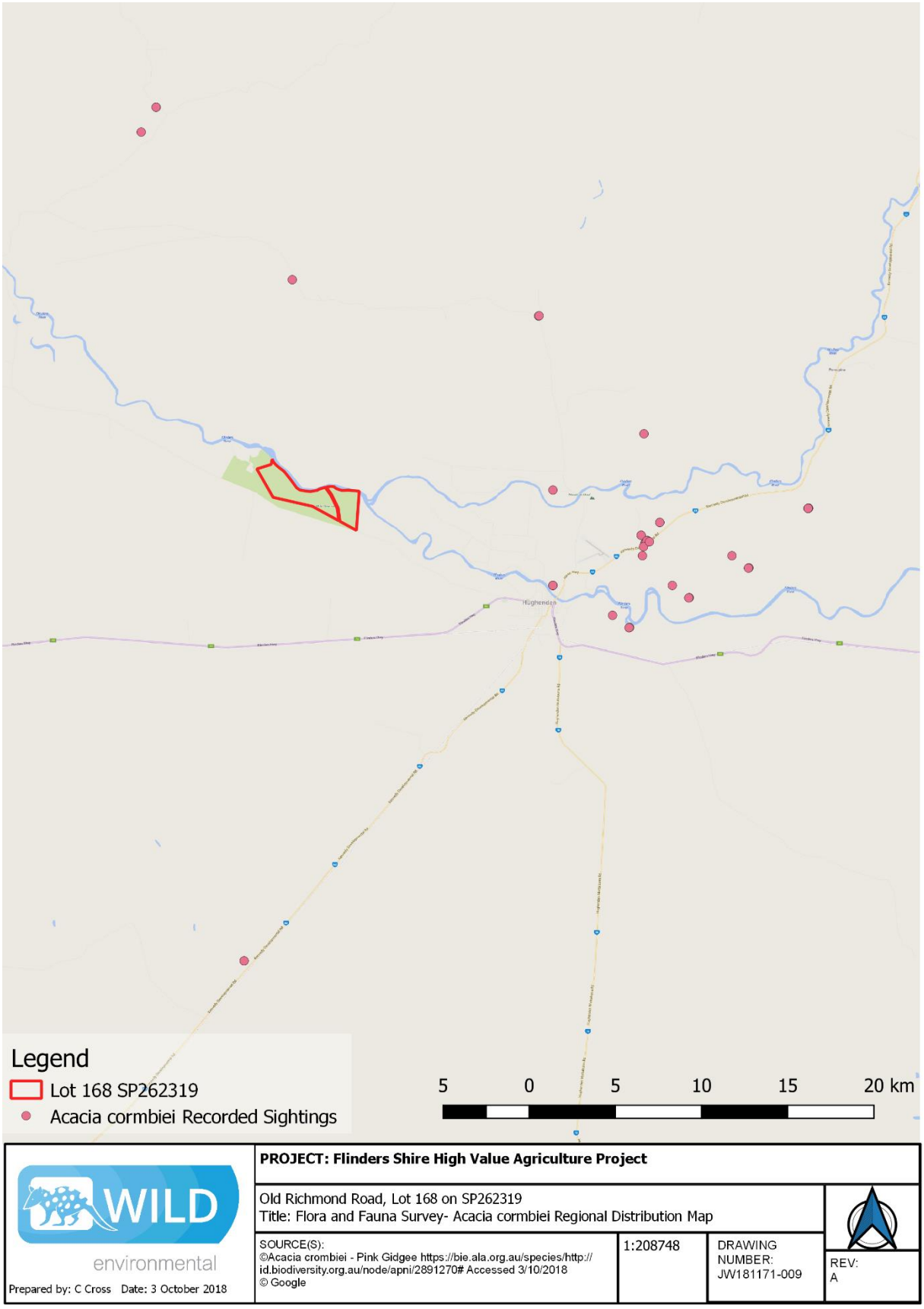

Figure 26: Distribution and database records of Pink Gidgee

5.3 Listed Threatened Fauna Species

5.3.1 Julia Creek Dunnart (*Sminthopsis douglasi)* – Possible to occur

The Julia Creek Dunnart is considered endangered in Queensland (NCA) and vulnerable nationally (EPBC Act). The species is a small carnivorous and nocturnal marsupial with a body length measuring approximately 13.5 cm long and a 12 – 13 cm long tail. The Dunnart is sandy brown in colour, speckled with grey above and almost white below. The species has facial stripe across the top of the head and ringed eyes, with rufous hairs on its cheeks and the base of its ears.

The Julia Creek Dunnart is restricted to Mitchell grass downs country of north-west Queensland characterised by heavy cracking clay soil of two types (ashy and stony) and dominated by grass (Mitchell grass (*Astrebla spp.)* and Flinders Grass (*Iseilema* spp.)). Distribution is poorly known due to population fragmentation and sporadic recodes. Museum specimens and records suggest that the population is found between Julia creek and Richmond with patchy populations east of Cloncurry extending south-east to Barcaldine.

Appearance on Project site

The Project site is located outside of the species 'confirmed distribution'. However, considering the species habitat type and the results of the habitat assessments from the field survey, it is considered that the habitat of the Project site is potentially suitable for the Julia Creek Dunnart. The Project site does match the habitat requirements of the Julia Creek Dunnart, being that it is dominated by tussock grasses and cracking clay soils. Other fauna species were observed sheltering in the cracks of the clay (Curl snake and Tessellated Gecko), indicative of the suitability of the clay habitat. Historical records have been found around the Project site, with the Project site being located in the possible distribution range of the species.

Importantly, several sightings of feral cats (both tracks and camera trap images) may impact on the possibility of the species being present in the area. Cats are known to prey heavily on this species. This, coupled with the degradation of the habitat by heavy grazing, is a reasonable risk to the presence of the species.

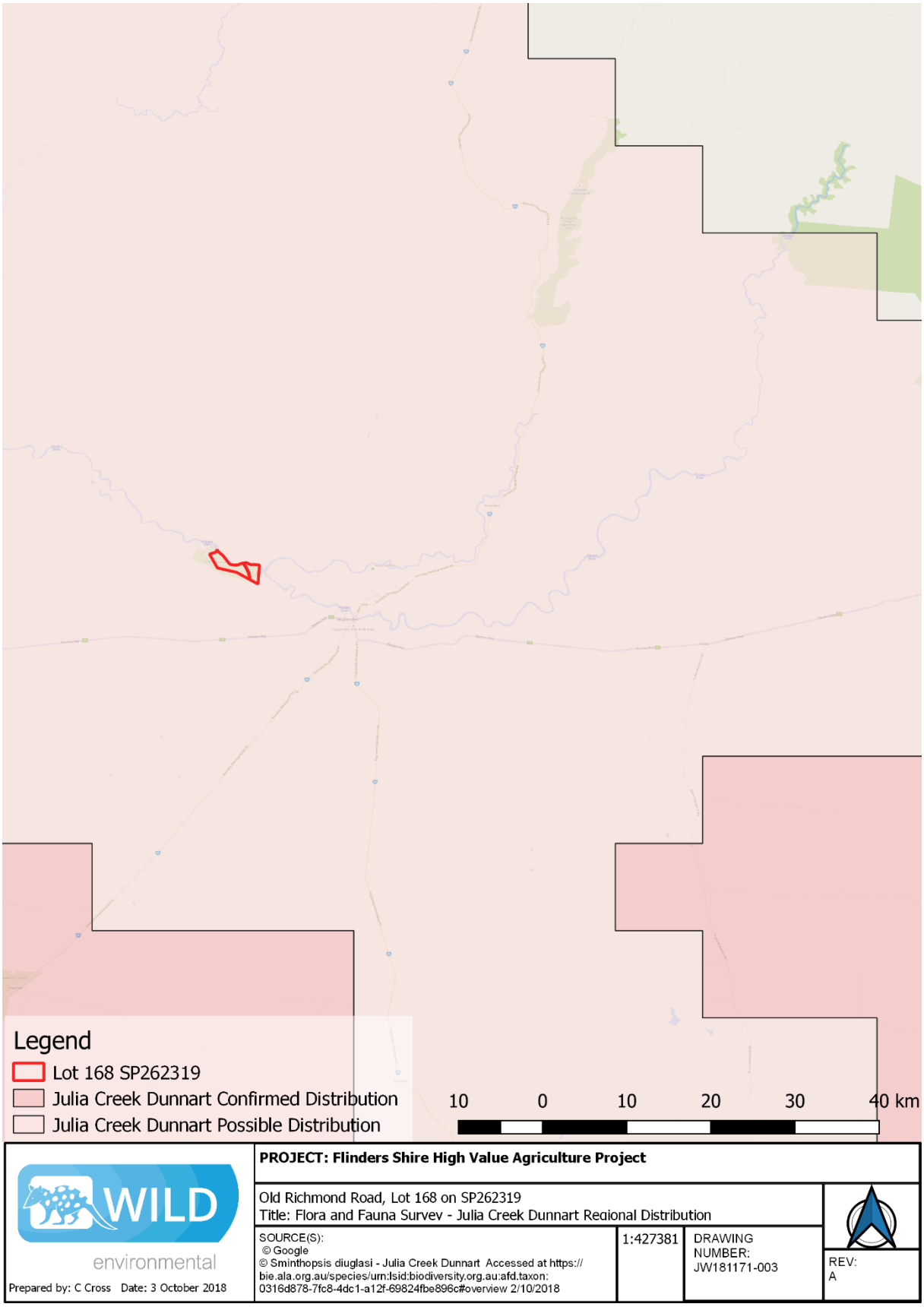

Figure 27: Julia Creek Dunnart Regional Distribution.

5.3.2 Southern Squatter Pigeon (*Geophaps scripta scripta*) – Known to occur

A flock of 5 Squatter Pigeons was recorded on site during field surveys. Sightings were always in close proximity (< 600 m) to standing water.

The Squatter Pigeon (Southern) is listed as vulnerable under the NCA and the EPBC Act. The Squatter Pigeon (Southern) is a medium sized ground dwelling pigeon that is generally grey-brown in appearance with distinct face markings and white underwings. Adults of the subspecies are predominantly grey brown, with bold black and white stripes on the face and throat. It is distinguished from the northern subspecies, which is listed as 'least concern', by the skin around its eye which is blue-grey rather than yellowy-orange to orange-red characteristic of the northern subspecies[7].

The upper wings are a light grey-brown fading to a blue-grey on the lower breast and the center of the belly and flanks are white. Underwings are white with a dark leading edge. It has a black bill and dull purple legs and feet.

The Squatter Pigeon (Southern) is distributed within grassy plains and woodlands throughout New South Wales and Queensland, extending its northern range to the Burdekin-Lynd divide[8,9]. The broad distribution of the Southern Squatter Pigeon is from the Burdekin-Lynd divide in the southern region of Cape York Peninsula to the border rivers region of northern NSW, and from the east coast to Hughenden, Longreach and Charleville.

Important sub-populations for this species are identified as all relatively small, isolated and sparsely distributed sub-populations occurring south of the Carnarvon Ranges in Central Queensland[10].

Further conservation processes will have to be undertaken to prevent the loss of these species.

The species is now almost exclusively restricted to Queensland and is considered more vulnerable in the southern parts of its distribution. The Southern Squatter Pigeon inhabits the grassy understory of open eucalypt woodland, and less often savannas. The species is always found near permanent water, often occurring in burnt areas and sometimes found on tracks and roadsides. The species is less commonly found on heavier soils with dense grass.

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[7] Threatened Species Scientific Committee. 2015. Conservation Advice Geophaps scripta scripta squatter pigeon (southern). Canberra.

[8] Graham Pizzey, F. K. 2003. A Field Guide to the Birds of Australia, Australia, HarperCollins, ibid., ibid., ibid.

[9] Department of The Environment (2016). Geophaps scripta scripta in Species Profile and Threats Database, Department of the Environment, Canberra. Available from: http://www.environment.gov.au/sprat.

[10] Department of The Environment (2016). Geophaps scripta scripta in Species Profile and Threats Database, Department of the Environment, Canberra. Available from: http://www.environment.gov.au/sprat.

Appearance on Project site

The Squatter Pigeon was present on the Project site with 5 individuals found (Figure 29).

Figure 28: Southern Squatter Pigeons *(Geophaps scripta scripta)* near standing water in oxbow lake

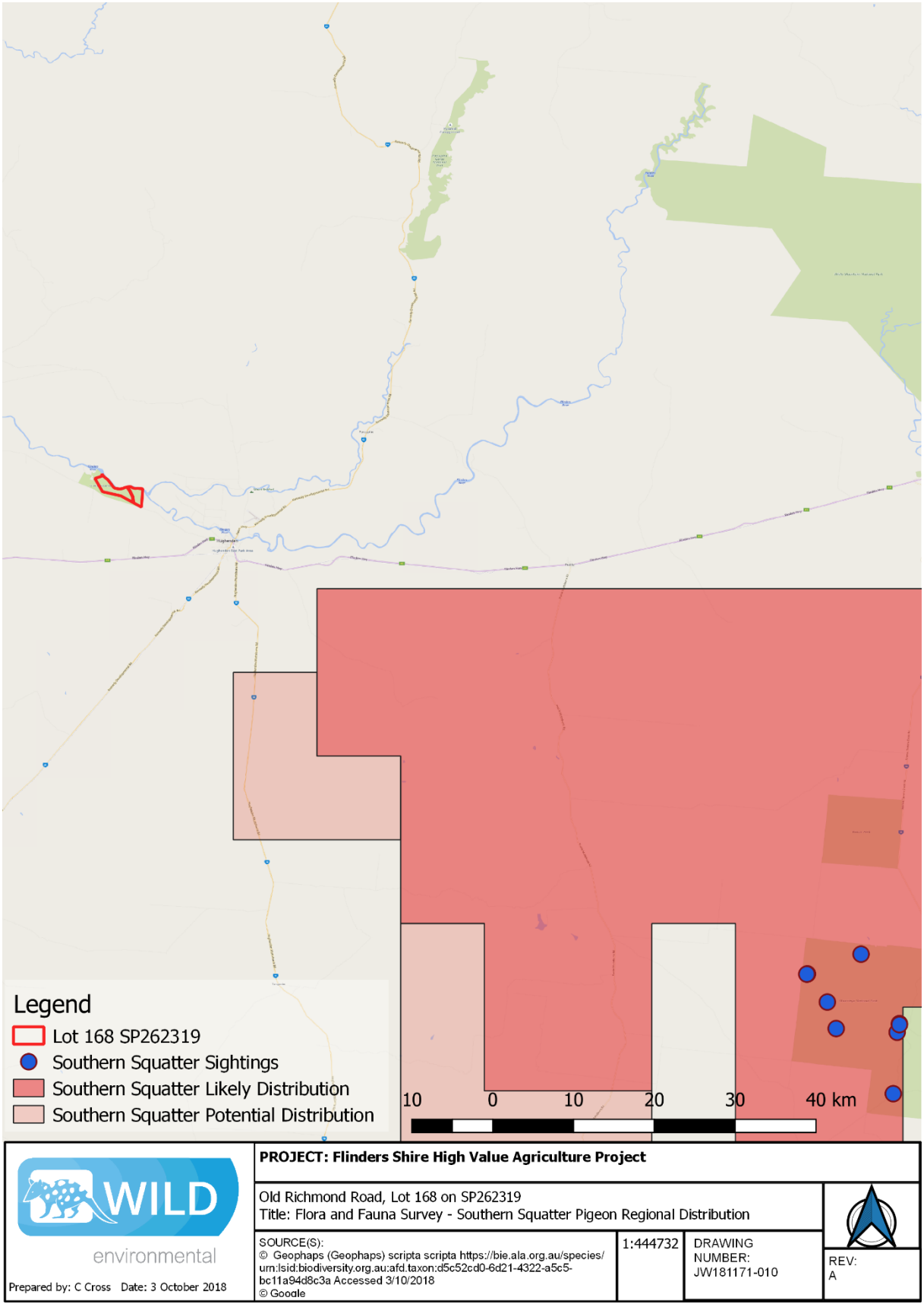

Figure 29: Squatter Pigeon Regional Distribution

5.3.3 Black-throated Finch (southern subspecies) (*Poephila cincta cincta*) – unlikely to occur

The southern species of the Black-Throated Finch (BTF) is currently listed as endangered under the NCA and nationally under EPBC Act[11]. The Black-throated finch is sleek but the thickest grass-finch approximately 12cm. It is characterised by its blue-grey head and black throat (from which it takes its common name), with a short black loral stripe and black bib over the chin. The species has a cinnamon coloured breast and a dark grey bill, as well as orange legs.[12].

The southern BTF is one of two BTF subspecies, the southern (white-rumped) and the northern BTF (black-rumped). The southern subspecies of BTF occurs in two general locations across Queensland, the Townsville region (around Townsville and Charters Towers) and at scattered sites across central-eastern Queensland. The species is generally considered extinct at sites south of the Burdekin River, and previously occurred in southeast Queensland and northern New South Wales, although hasn't been recorded since the 1940's and 1960's respectively[13].

The BTF is known to inhabit grassy woodlands and open forests, which have access to nearby freshwater watercourses or waterbodies as they drink throughout the day (although mainly in the morning and late afternoon). Habitat is usually dominated by *Eucalyptus, Melaleuca,* and *Corymbia species,* and occasionally tussock grasslands or other habitats often near water sources. They require habitat where there is access to seeding grasses and water and will utilize a variety of different habitats for foraging. The species mainly forage on grass seeds during the dry season and switch to half-ripe grass seed and insects in the wet season[8]. Common grasses which are known to make up the diet of the BTF include: *Themeda* spp. (Kangaroo Grass), *Schizachyrium* spp., *Dichanthium* spp., and *Panicum* spp.

Appearance on Project site

It is unlikely that the Black-throated finch is found on the Project site. However, Figure 30 shows that the Project site is located within the 'possible' distribution for the species. The National Recovery Plan does not list any of the regional ecosystems found with the Project Site as being ones within which the species has been recorded. The long-term viability of BTF populations is likely to be limited by either of the following factors:

- quality of habitat and availability of food;
- availability of permanent water sources which persist throughout the dry season; and

11 Department of the Environment (2018). Poephila cincta cincta in Species Profile and Threats Database, Department of the Environment, Canberra. Available from: http://www.environment.gov.au/sprat Accessed 2/10/2018.
12 Department of Envrionment and Science (2017 -2018) Black-throated finch (southern subspecies) Department of Environment, Avaliable from https://www.ehp.qld.gov.au/wildlife/animals-az/blackthroated_finch_southern_subspecies.html Accessed 2/10.2018
13 Department of the Environment, 2016, Species profile and threats database – Poephila cincta – Southern Black-throated Finch, Department of the Environment, viewed 6 July 2016, http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=64447

- suitability of trees for nesting.

The Project site is currently heavily grazed, which is not necessarily an inhibiting factor on its own. Connectivity to existing populations may be an issue for this site and previous surveys in other areas near Hughenden have not identified the species.

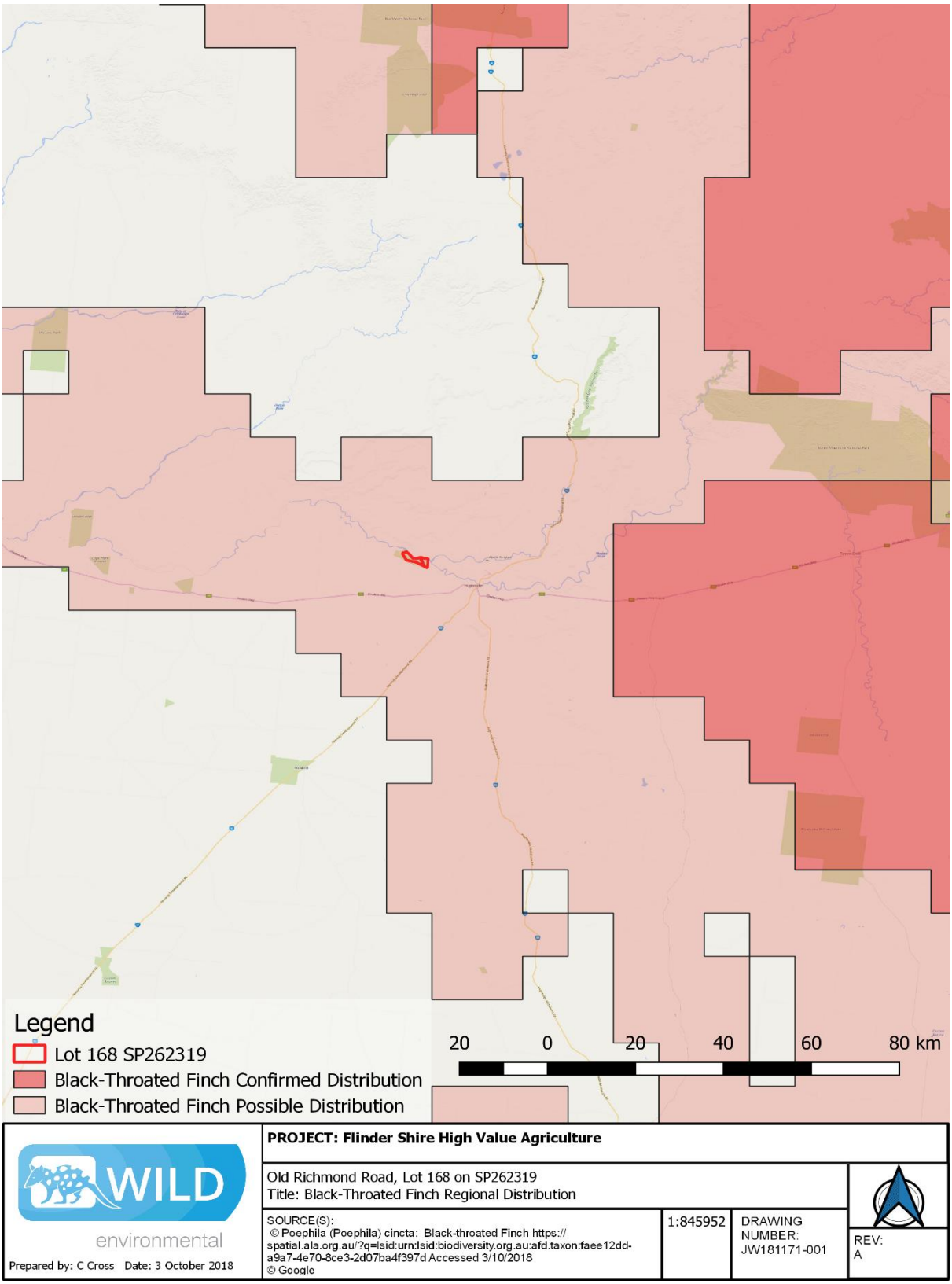

Figure 30: Black-Throated Finch Regional Distribution Map

5.3.4 Red Goshawk (*Erythrotriorchis radiatus*) – Possible to occur

The Red Goshawk is currently listed as endangered in Queensland under the NCA and vulnerable under the EPBC Act[14].

The Red Goshawk is a large raptor reaching the wingspan of 110-135cm and the body length of 45-60cm - females are generally larger than males. Overall body colour is reddish-brown and boldly mottled and streaked rufous scalloping on the back and upper wings. The species has massive yellow legs and feet. Red Goshawk can be distinguished from the other similar raptors by the species broad 'six-fingered' wings that are held at slightly angled planed when soaring, and the lack of place markings on the upperparts.

The species has a wide home range covering between 50 -220km^2. The regional extent is large and across coastal and sub-coastal Australia, from the Western Kimberly Division to north-eastern NSW and occasional continental islands. The Red Goshawk prefers mixed vegetation types, including tall open forest, woodland, lightly tree savannah and the edge of rainforest in eastern Queensland. Vegetation types include eucalyptus woodland, open forest, tall open forest, gallery rainforest, swamp sclerophyll forest and rainforest margin[15]

Appearance on Project site

It is possible that this species inhabits the Project site. As can be seen in Figure 31, the Project site is located within the possible distribution of the Red Goshawk, however no specimens were recorded during field surveys.

5.3.5 Short-beaked echidna (*Tachyglossus aculeatus*) – Special least concern – known to occur

The short-beaked echidna is listed as special least concern animal under the NC Act and is known to occur within the Project site.

[14] Department of the Environment (2018). *Erythrotriorchis radiatus* in Species Profile and Threats Database, Department of the Environment, Canberra. Available from: http://www.environment.gov.au/sprat. Accessed 2//10/2018

[15] Department of Environment and Science (2017-2018) Red Goshawk, Department of Environment and Science, Available from https://www.ehp.qld.gov.au/wildlife/threatened-species/endangered/endangered-animals/red_goshawk.html Accessed 2/10/2018

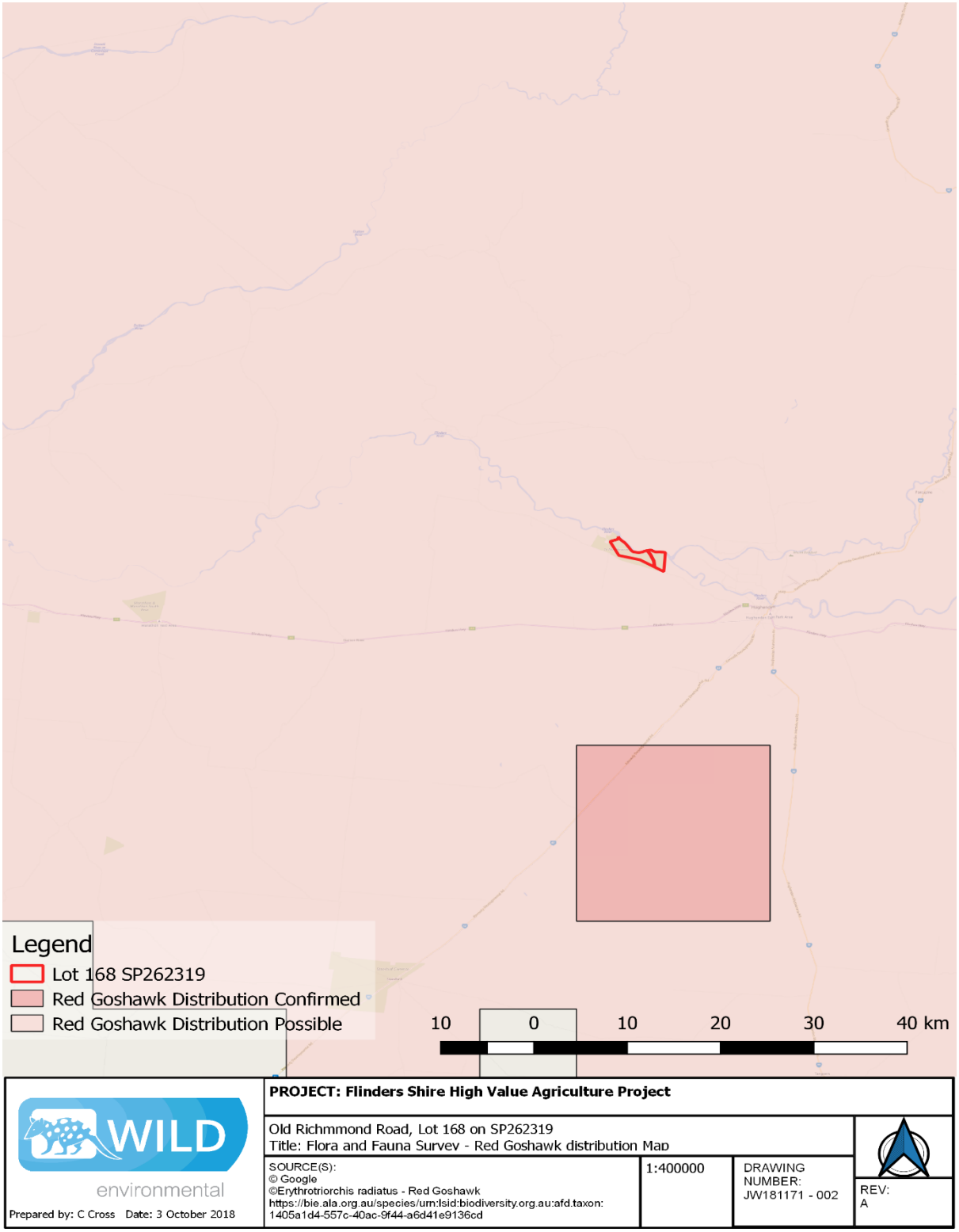

Figure 31: Red Goshawk Regional Distribution

6. Additional Flora and Fauna Surveys

Limitations of the survey findings relate to the original scope and purpose of the survey, including the adoption of generic non-specific survey methods aimed at a achieving a general inventory of flora and fauna of the Project site.

The findings of this assessment suggest that addition targeted surveys should be conducted for conservation significant species which were not identified during the survey but were subsequently assessed as being likely to occur with the Project site as a result of habitat findings. The scope of additional surveys should include:

- Protected plant surveys for Pink Gidgee (*Acacia crombiei*) within and surrounding the ground truthed RE 4.3.23 and RE 4.3.14 using an accepted survey method such as the random meander method; and
- Targeted surveys for the Julia Creek Dunnart (*Sminthopsis douglasi*) in accordance with the Queensland Government's *Terrestrial Vertebrate Fauna Survey Guidelines for Queensland*.

The outcomes of these additional surveys will provide evidence and supporting information relevant to the consideration of whether the Project should be referred under the EPBC Act.

7. Conclusion

A combination of desktop and field investigations were conducted to validate and ground truth the existing vegetation communities of the Project site and identify existing and potentially occurring flora and fauna of conservation significance.

Results of field surveys found that the mapped regional ecosystems on the Vegetation Management Regional Ecosystem Map contain some errors. In particular, the mapped 'of concern' RE 10.3.26 does not exist on the Project site. However, proposed changes to the RE mapping included adding RE 4.3.23, which is a known RE for which Pink Acacia (*Acacia crombiei*) may be associated.

The fauna survey was conducted in accordance with the environmental conditions of the site and using a variety of generic fauna survey methods. Up to 80 fauna species were recorded during field surveys including the vulnerably listed Squatter Pigeon (southern). 1 listed Marine species was recorded, being the Rainbow Bee Eater.

The Project site contains mostly woodland habitat which is interspersed with paleo channels of abandoned river meanders. These lower lying landforms are seasonal wetlands and had cracking clay soils, which were found to provide some habitat value to small reptiles, and potentially to the Julie Creek Dunnart. However, the Project site is also heavily grazed and contains heavy weed infestations in some areas. Pest species including the presence of feral cats is likely to reduce the habitat value for some species.

The following conclusions are noted:

- The Project site does not contain the 'of concern' regional ecosystem 10.3.26, instead least concern communities of 4.3.8, 4.3.23 and 4.3.4x2 were present.
- The site is largely dominated in some areas by Mesquite (*Prosopis pallida*) and Prickly acacia (*Vachellia nilotica*), which appears to have been previously cleared.
- The site does contain species of conservation significance including the Squatter Pigeon (Southern) and potential habitat for Pink Gidgee (*Acacia crombiei*) and the Julia Creek Dunnart (*Sminthopsis douglasi*).

Additional surveys are recommended in accordance with Section 6.

7.1 Assumption and Limitations

This report has been based upon the conditions encountered during the investigation and on the best available information. The accuracy of the advice provided throughout this report may be limited by reasonably unforeseeable error or misgivings in the searchers and information reviewed. In this report Wild Environmental have relied upon information provided by the client and/or their agents.

This report must be read in conjunction with all the attached notes and should be kept in its entirety without separation of individual pages or sections.

7.1.1 Seasonality

This vegetation survey was conducted during a single survey event in August 2018. Field work undertaken in the process of this report provide a snap-shot of species composition and communities at one time and may not account for any seasonal or inter-annual variability, especially in relation to ground cover species. As a result, survey findings are unlikely to provide a complete representation of species composition for the Project site.

In particular, it was evident that annual grasses of the survey area such as species of the genus *Astrebla,* were difficult to identify level due to lack of seeding and flowering individuals present.

This seasonal variability in species and/or vegetation community composition are addressed where necessary in this document, however are not considered to affect the overall results of the assessment regarding the assessment of regional ecosystems. The apparent absence of some species during field surveys does not unequivocally determine that the species does not occur or utilise the proposed site.

Appendix A – Species Records

Birds

Common Name	Scientific Name	NCA	EPBC	Record type
Apostle bird	*Struthidea cinerea*	N/A	N/A	*Seen*
Australian Bustard	*Ardeotis australis*	N/A	N/A	*Seen*
Australian Magpie	*Cracticus tibicen*	N/A	N/A	*Seen*
Australasian grebe	*Tachybaptus novaehollandiae*	N/A	N/A	*Seen*
Black-faced cuckoo-shrike	*Coracina novaehollandiae*	N/A	N/A	*Seen*
Black Fronted dotterel	*Elseyornnis cinctus*	N/A	N/A	*Seen*
Black kite	*Milvus migrans*	N/A	N/A	*Seen*
Black winged stilt	*Himantopus himantopus*	N/A	N/A	*Seen*
Blue-faced Honeyeater	*Entomyzon cyanotis*	N/A	N/A	*Seen*
Blue-winged kookaburra	*Dacelo leachii*	N/A	N/A	*Seen*
Brolga	*Grus rubicunda*	N/A	N/A	*Seen*
Budgerigar	*Melopsittacus undaulatus*	N/A	N/A	*Seen*
Cockatiel	*Nymphicus hollandicus*	N/A	N/A	*Seen*
Crested pigeon	*Ocyphaps lophotes*	N/A	N/A	*Seen*
Diamond dove	*Geopelia cunetata*	N/A	N/A	*Seen*
Eastern Barn Owl	*Tyto javanica*	N/A	N/A	*Seen*
Emu	*Dromaius novaehollandiae*	N/A	N/A	*Seen*
Eurasian Coot	*Fulica atra*	N/A	N/A	*Seen*
Galah	*Eolophus roseicapilla*	N/A	N/A	*Seen*
Grey crowned babbler	*Pomatostomus temporalis*	N/A	N/A	*Seen*
Hardhead	*Aythya australis*	N/A	N/A	*Seen*
Laughing Kookaburra	*Dacelo novaeguineae*	N/A	N/A	
Little corella	*Cacatua sanguinea*	N/A	N/A	*Seen*
Little friarbird	*Philemon citreogularius*	N/A	N/A	*Seen*

Magpie lark	*Grallina cyanoleuca*	N/A	N/A	*Seen*
Masked lapwing	*Vanellus triolor*	N/A	N/A	*Seen*
Masked Woodswallow	*Atramus personatus*	N/A	N/A	*Seen*
Mistletoebird	*Dicaeum hirundiaceum*	N/A	N/A	*Seen*
Nankeen Kestrel	*Falco cenchroides*	N/A	N/A	*Seen*
Noisy miner	*Manorina melanocephala*	N/A	N/A	*Seen*
Pale-headed Rosella	*Platycercus adscitus*	N/A	N/A	*Seen*
Peaceful dove	*Geopelia striata*	N/A	N/A	*Seen*
Pied Butcherbird	*Cracticus nigroglaris*	N/A	N/A	*Seen*
Pink-eared duck	*Malacorhunchus membranaceus*	N/A	N/A	*Seen*
Rainbow Bee-eater	*Merops ornatus*	N/A	N/A	*Seen*
Red-backed Kingfisher	*Todriamphus pyrrhopygius*	N/A	N/A	*Seen*
Red-capped Robin	*Oetricua goodenovii*	N/A	N/A	*Seen*
Red-kneed dotterel	*Erythrogonys cinctus*	N/A	N/A	*Seen*
Red-tailed Black Cockatoo	*Caluptrohynchus banksia*	N/A	N/A	*Seen*
Red-winged Parrot	*Aprosmictus erythropterus*	N/A	N/A	*Seen*
Southern squatter pigeon	*Geophaps scripta*	Vulnerable	Vulnerable	*Seen*
Spotted Bowerbird	*Ptilonorhynchus maculatus*	N/A	N/A	*Seen*
Straw-necked Ibis	*Threkiornis spinicollis*	N/A	N/A	*Seen*
Sulphur-crested cockatoo	*Cacatua galerita*	N/A	N/A	*Seen*
Torresian Crow	*Corvus orru*	N/A	N/A	*Seen*
Whistling kite	*Haliastur sphenurus*	N/A	N/A	*Seen*
White-browed woodswallow	*Artamus superciliosus*	N/A	N/A	*Seen*
White-winged triller	*Lalage tricolor*	N/A	N/A	*Seen*
Willie wagtail	*Rhipidura leucophrys*	N/A	N/A	*Seen*

Yellow-throated miner	*Manorina melanocephala*	N/A	N/A	*Seen*
Zebra finches	*Taeniopygia guttata*	N/A	N/A	*Seen*

Mammals

Common Name	Scientific Name	NCA	EPBC	
Eastern grey Kangaroo	*Macropus giganteus*	N/A	N/A	*Seen*
Red Kangaroo	*Macropus rufus*	N/A	N/A	*Seen*
Swamp wallaby	*Wallabia biocolor*	N/A	N/A	*Seen*
Dingo	*Canis lupus dingo*	N/A	N/A	*Tracks/ Den*
Feral Pig	*Sus scrofa**	N/A	N/A	*Seen*
Cat	*Felis catus**	N/A	N/A	*Seen*
Rabbit	*Oryctolagus cuniculus**	N/A	N/A	*Seen*
Short-beaked Echidna	*Tachyglossus acleatus*	Special Least Concern	N/A	*Seen*
Gould's Wattle Bat	*Chalinolobus gouldii*	N/A	N/A	*Call Analysis*
Yellow-bellied sheathtail	*Saccolamius flaviventris*	N/A	N/A	*Seen*
Chocolate Wattle Bat	*Chalinolobus morio*	N/A	N/A	*Call Analysis*
Little Pied Bat	*Cahlinolobus pictatus*	N/A	N/A	*Call Analysis*
Long eared bat sp.	*Nyctophilus sp.*	N/A	N/A	*Call analysis*
Inland Boardnose bat	*Scotorepens balstoni*	N/A	N/A	*Call Analysis*
Little Board-nose bat	*Scotrepens greyii*	N/A	N/A	*Call Analysis*
Little Bentwing bat	*Miniopterus australis*	N/A	N/A	*Call Analysis*
Eastern Bent wing bat	*MIniopterus orianae*	N/A	N/A	*Call Analysis*
White striped freetail bat	*Austronomus australis*	N/A	N/A	*Call Analysis*
Northern Mastiff bats	*Chaerephon jobensis*	N/A	N/A	*Call Analysis*
Northern Freetail bats	*Ozimops lumsdenae*	N/A	N/A	*Call Analysis*
Rides Freetail bat	*Ozimops ridei*	N/A	N/A	*Call Analysis*
Hairy nosed freetail bat	*Setirostris eleryi*	N/A	N/A	*Call Analysis*

Reptiles

Common Name	Scientific Name	NCA	EPBC	
Eastern bearded dragon	*Pogona barbata*	-	-	*Seen*
Eastern Brown	*Pseudonaja textilis*			*Seen*
Curl Snake	*Suta Suta*			*Seen*
Bynoe's Gecko	*Heteronotia binoei*			*Seen*
Variable Dtella	*Gehyra versicolor*			*Seen*
Tessellated Gecko	*Diplodactylus tessellatus*			*Seen*
Striped Rainbow Skink	*Carlia munda*			*Seen*
Orange flanked Rainbow Skink	*Carlia rubigo*			*Seen*

Appendix B – Conservation Significant Species Likelihood of Occurrence

Listed Threatened Species			
	Curlew sandpiper (*Calidris ferruginea*) (CE)	The Curlew Sandpiper is a migratory bird that inhabits Australia's coasts and wetlands. Invertebrates and seeds make up the diet of this species. The loss of available roosting and feeding habitat has damaged this species. Also, human and dog interference in roosting habitat can cause reduce local populations.	**Unlikely -** The habitat does not match the preferred habitat description for the species.
	Red Goshawk (*Erythrotriorchis radiates*) (V)	The Red Goshawk is an endemic species, primarily found in Northern Australia. This species inhabits riverine wetlands and woodland environments. This species feeds predominately upon other bird species.	**Possible** – Habitat is potentially suitable for this species; however, records are sporadic and uncommon in study area.
	Star Finch (*Neochmia ruficauda ruficauda*) (E)	The Star Finch is sedentary and inhabits central and eastern Queensland. Grasslands and woodlands near water sources are preferred habitats. Grasses and seeds in these environments are the major food source.	**Unlikely** – The habitat does not match the preferred habitat description for the species.
	Southern Black-throated Finch (*Poephila cincta cincta*) (E)	The Black-throated Finch (southern) occurs at either the Townsville region or and at scattered sites in central-eastern Queensland. The Townsville region is considered one of the last remaining strongholds for the species as it contains suitable habitat – grass, open woodlands, and forests along or near watercourses.	**Unlikely** – The habitat has some of the defining traits of BTF Habitat. However, distribution is a stretch.
	Australian Painted Snipe (*Rostratula australis*) (E)	The Australian Painted Snipe has been recorded at wetlands in all states of Australia. It is most common in eastern Australia, where it has been recorded at scattered locations throughout much of Queensland and inhabits shallow, temporary freshwater wetlands or saltmarshes.	**Unlikely** – The habitat does not match the preferred habitat description for the species.
	Squatter Pigeon (*Geophaps scripta scripta*)	The Squatter Pigeon (southern) is distributed within grassy plains and woodlands throughout New South Wales and Queensland, extending its northern range to the Burdekin - Lynd divide. Threats to this species include loss and fragmentation of habitat due to clearing for	**Known –** the habitat matches and this species is local common in surrounding areas.

		agricultural purposes, catastrophic droughts and fires.	
	Masked Owl (*Tyto novaehollandiae kimberli)* (V)	The distribution of the Masked Owl (northern) is very poorly known, but it inhabits riverside forest, rainforest, open forest, paperbark swamp and edge of mangroves.	**Unlikely** – The habitat does not match the preferred habitat description for the species.
Mammals	Ghost Bat (*Macroderma gigas*) (V)	The Ghost bat is Australia's largest micro-bat and occurs in a wide range of habitats from rainforest, monsoon, and vine scrub, to open woodlands in arid areas. In Queensland Ghost bats occur in tropical regions, along the central and northern coast from Rockhampton to Cape York. While foraging sites are diverse, roost sites are more specific and include undisturbed caves or mineshafts that have several openings.	**Unlikely** – The habitat does not match the preferred habitat description for the species.
	Greater Bilby (*Macrotis lagotis*)	The greater bilby is a solitary species that shelters in burrows during daylight. The remaining populations of the greater bilby occupy three main habitats: open tussock grassland on uplands and hills, *Acacia aneura* (mulga) woodland/shrubland growing on ridges and rises, and hummock grassland in plains and alluvial areas.	**Unlikely** – No records or observations. Occurrence unlikely, as habitat likely unsuitable.
	Koala (*Phascolarctos cinereus*) (V)	The koala's range extends from north-eastern Queensland to the south-east corner of SA. This species inhabits forest, woodlands and semi-arid communities dominated by Eucalyptus species and is uncommon throughout the mainland Townsville region.	**Unlikely** – No records or observed koalas from extensive field investigations. Occurrence unlikely, but habitat potentially suitable.
	Julia Creek Dunnart (*Sminthopis douglasi*)	The dunnart is a small carnivorous mammal, the largest of the dunnart species in Australia. It is mostly found in Mitchel Grass downs and in some regions of the Desert uplands. Its distribution seems to be based more on the amount of cracks and holes present in soil rather than vegetation spread.	**Possible-** The habitat does describe similar habitat that the dunnart lives in, however based of its distribution and the condition of the site, it is unlikely that the Dunnart is present.

Plant	Bluegrass *(Dichanthium Queenslandicum)* (V)	In Queensland, the species has been reported from the Leichhardt, Morton, North Kennedy, and Port Curtis regions where it is associated with heavy basaltic black soils and red-brown loams with clay subsoil. *Dichanthium Queenslandicum* is often found in moderately disturbed areas such as cleared woodland, grassy roadside remnants, and highly disturbed pasture.	**Unlikely** – The Project site is predominantly dominated by *Astrebla* species.
	Pink Gidgee (*Acacia crombiei*)	*Acacia crombiei* is found on basalt or heavier loamy soils. Often associated with Gidgee (*Acacia cambagei*), White wood (*Atalaya hemiglauca*) and Cabbage tree wattle (*Acacia cana*). Species is only in a 34 000km range from Hughenden 150km north west and 100kms south, out towards Richmond.	**Likely - Possible** Species is known to be associated with RE 4.3.23 and 4.3.14 which have been identified on the site. Records occur in surrounding nearby areas to the Project Site.
	Plains Death Adder (*Acanthophis hawkei*)	The known distribution of the Plains death Adder stretches from the in a wide ban from the top of Darwin towards south of distribution, found mostly in the western downs area 'Barkly Tablelands'.	Unlikely – The habitat does partially match the preferred habitat description for this species, however the conditions on site were not favourable for this species.
	Yakka Skink (*Egernia rugosa*) (V)	The known distribution of the Yakka Skink extends from the coast to the hinterland of sub-humid to semi-arid eastern Queensland. This vast area covers portions of the Brigalow Belt (North and South), Mulga Lands, South-east Queensland, Einasleigh Uplands, Wet Tropics, and Cape York Peninsula Biogeographical Regions. Most likely to occur in open dry sclerophyll forest, woodland, and scrub.	**Unlikely** – Distribution is not ideal and habitat conditions on site were not considered suitable.

Appendix C – Vegetation Assessment

Flinders Shire Council

15 Mile Irrigated Agricultural Development Project - Property Map of Assessable Vegetation

October 2018

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Document Control

15 Mile Irrigated Agricultural Development Project – Property Map of Assessable Vegetation

Project Ref:	JW181171
Document Title	15 Mile Irrigated Agricultural Development Project – Property Map of Assessable Vegetation
Client Name	Flinders Shire Council
Project Manager	Nicholas Baker B. Sc CEnvP

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Document history and status

Revision	Date	Description	By	Review
V0.1-V0.4	25/09/2018	1st Internal Draft	Caitlin Cross	Nicholas Baker
V0.5	03/10/2018	External Draft - Client review	Nicholas Baker	Flinders Shire
V1.0	04/10/2018	Final	Matthew Ayre	Nicholas Baker

Approval for Issue

Name and position	Signature	Date
Nicholas Baker, Director		4 October 2018

Permits and approvals

Wild Environmental Consultants operate in accordance with the following permits and approvals:

Scientific Use Registration Certificate (*Animal Care and Protection Act 2001*) – Registration Number 600

Scientific Purposes Permit (*Nature Conservation (Administration) Regulation 2006*) – Permit number WISP17791316

Animal Ethics Approval (Animal Ethics Committee) – AEC Application Reference Number CA 2016/08/997

Marine Parks Permit (*Great Barrier Reef Marine Park Regulations 1983* and *Marine Park Regulation 2006*) – G16/38539.1

Wildlife Authority (Rehabilitation Permit) (*Nature Conservation (Administration) Regulation 2017 – WA0002733*

Wildlife Authority (Damage Mitigation Permit) (*Nature Conservation (Administration) Regulation 2017 – WA0005146*

1. Introduction

1.1 Background:

Flinders Shire Council proposes to develop 918 ha of land known as '15 mile' into irrigated high value agriculture and low value agriculture (the Project). The Project will consist of approximately 344 ha of land for high value cropping and 101 ha of farming infrastructure and low value cropping[1]. The remaining 473 ha of the Project site will consist of water storage, and environmental buffers to watercourses, wetlands, and regulated vegetation[1].

On 24 August 2018, the Project was declared a coordinated project under the *State Development and Public Works Organisation Act 1971,* for which an impact assessment report (IAR) is required.

Assessment of the vegetation communities is required to ground truth the existing vegetation and its status under the *Vegetation Management Act 1999.* The Project site is mapped as Category B Remnant Vegetation on the Regulated Vegetation Management Map[2]. Approximately 35 ha of the Project site includes an area mapped as a mixed polygon of regional ecosystems 4.3.3 (80%) and 10.3.26 (20%), of which 10.3.26 is an 'Of concern' status regional ecosystem being *Lysiphyllium caronii* low open woodland community on alluvial plains[3].

Wild Environmental Consultants (Wild Environmental) was engaged by Flinders Shire Council to conduct vegetation assessments of the Project site to ground truth the regional ecosystems, and to map vegetation to a finer scale than previously recorded on the Vegetation Management Regional Ecosystem Map. Wild Environmental conducted field surveys from the 27 August through to 1 September 2018, to collect data used to map vegetation communities.

This report provides evidence which supports the application to make a Property Map of Assessable Vegetation (PMAV) for the Project in accordance with the *Vegetation Management Act 1999*.

The information and classification of vegetation communities outlined in this report improved the existing Regional Ecosystem mapping, which is most likely a result of numerical modelling or extrapolation of perceived desktop analysis or remotely sensed imagery and not *in situ* field knowledge gained from ground truthing during the flowering season.

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[1] GHD 2018, *Flinders Shire Council 15 Mile Irrigated Agricultural Development Project Initial Advice Statement, GHD, Townsville*
[2] *Department of Natural Resources and Energy, 2018, Regulated Vegetation Management Map: Lot 168 SP262319*
[3] *Department of Natural Resources and Energy, 2018, Vegetation Management Report: Lot 168 SP262319*

1.2 Objectives

The primary objective of this report and associated field work is to identify, describe and map vegetation communities at a suitable scale within the Project site. Additional objectives include:

- identifying remnant status of vegetation communities (if warranted); and
- confirmation of the status of vegetation communities (i.e., least concern, or endangered ecosystems) in accordance with the *Vegetation Management Act 1999*.

1.3 Existing reports and important literature:

The Project is subject to an Initial Advice Statement (IAS) and pending an Impact Assessment Report (IAR) pursuant to section 26(I)(b) of the *State Development and Public Works Organisation Act 1971.*

1.4 Site description

The Project is located off Old Richmond Road, approximately 12 km north-west of the Township of Hughenden on Lot 168 SP262319 (See). The site description is detailed in Table 1.

Table 1 Site Information

Address	Off Old Richmond Road
Lot/Plan	Lot 168 on SP262319
Total Area (ha)	918
Site Owner	Flinders Shire Council
Local Government Area	Flinders Shire Council
Current Zoning	Rural
Current Land Use	Grazing
Proposed land use	High-value Irrigated Agriculture

Figure 1: Site Locality

1.5 Assumptions and limitations

This report has been based upon the conditions encountered during the investigation and on the best available information. The accuracy of the advice provided throughout this report may be limited by reasonably unforeseeable error or misgivings in the searchers and information reviewed. In this report Wild Environmental have relied upon information provided by the client and/or their agents.

This report must be read in conjunction with all the attached notes and should be kept in its entirety without separation of individual pages or sections.

1.5.1 Seasonality

This vegetation survey was conducted during a single survey event in August 2018. Field work undertaken in the process of this report provide a snap-shot of species composition and communities at one time and may not account for any seasonal or inter-annual variability, especially in relation to ground cover species. As a result, survey findings are unlikely to provide a complete representation of species composition for the study area.

In particular, it was evident to Wild Environmental ecologists that annual grasses of the survey area such as species of the genus *Astrebla,* were difficult to identify level due to lack of seeding and flowering individuals present.

This seasonal variability in species and/or vegetation community composition are addressed where necessary in this document, however are not considered to affect the overall results of the assessment regarding the assessment of regional ecosystems.

The apparent absence of some species during field surveys does not unequivocally determine that the species does not occur or utilise the proposed site.

2. Legislation

The clearing of native vegetation in Queensland is regulated by the *Vegetation Management Act 1999* (VM Act), in conjunction with the *Planning Act 2016*, Queensland Government *State Policy for Vegetation Management* and other associated policies and codes.

2.1 Planning act 2016

Under Schedule 10 of the *Planning Regulation 2017*, the clearing of native vegetation is prohibited development unless it is for a relevant purpose under section 22A of the *Vegetation Management Act 1999,* exempt clearing work, or accepted development.

Applications for development approvals can only be granted if the clearing is for a relevant purpose as prescribed under the VM Act:

1. a project declared to be a coordinated project under the *State Development and Public Works Organisation Act 1971*, section 26;
2. the necessary control of non-native plants or declared pests;
3. ensuring public safety;
4. establishing a necessary fence, firebreak, road or vehicular track, or constructing necessary built infrastructure, and the clearing for the relevant infrastructure cannot reasonably be avoided or minimised;
5. a natural and ordinary consequence of other assessable development for which a development approval was given under the repealed *Integrated Planning Act 1997*, or a development application was made under that Act, before 16 May 2003;
6. fodder harvesting;
7. thinning of thickened vegetation;
8. clearing of encroachment;
9. an extractive industry;
10. a special Indigenous purpose under the *Cape York Peninsula Heritage Act 2007*;
11. necessary environmental clearing; and
12. irrigated and non-irrigated high-value agriculture clearing.

2.2 Vegetation Management Act 1999

The VM Act establishes a framework for the protection of Queensland's native vegetation.

Areas shown on the map as Category X are not regulated under the VM Act, however, areas shown as a Category A, B, C or R are subject to regulation. The latter vegetation categories can only be cleared in accordance with an exemption, self-assessable vegetation clearing code, area management plan or development approval.

The VM Act also protects 'essential habitat' vegetation where listed threatened species have been known to occur. Regulated Vegetation Management Mapping shows vegetation categories used to determine clearing requirements.

2.2.1 2.. Property Map of Assessable Vegetation

Sections 20B and 20C of the VM Act provide opportunities for the making of a Property Map of Assessable Vegetation (PMAV). PMAV's allow amendments to the regulated vegetation management map at the property scale.

A PMAV is made through agreement between the applicant and the Department of Natural Resources, Mines and Energy (DNRME). Once certified, the PMAV replaces the Regulated Vegetation Management Map and Vegetation Management Regional Ecosystem Map for the purpose of vegetation management and applications to clear native vegetation.

3. Methodology

3.1 Overview

Vegetation was assessed to identify the regional ecosystem and remnant status (if required) of the survey area. Regional ecosystem classification refers to "*vegetation communities in a bioregion that are consistently associated with a combination of landform, geology, and soils*[4]". For remnant vegetation, consideration has been given to the definition prescribed by the VM Act. Remnant vegetation is defined as follows:

Remnant vegetation means vegetation –

a) *That is*
   i) *An endangered regional ecosystem; or*
   ii) *An of concern regional ecosystem; or*
   iii) *A least concern regional ecosystem; and*
b) *Forming the predominant canopy of the vegetation-*
   i) *Covering more than 50% of the undisturbed predominate canopy; and*
   ii) *averaging more than 70% of the vegetations undisturbed height; and*
   iii) *composed of specie characteristic of the vegetations undisturbed predominant canopy*[5]*.*

Areas of vegetation suspected of being previously cleared (due to comparison with historical aerial imagery) were assessed in accordance with the above criteria for remnant vegetation, and against reference site of each regional ecosystem. A desktop assessment of relevant imagery and mapping was conducted to inform field assessments.

For areas where regional ecosystems are not dominated by woody vegetation, an alternative method of assessing remnant status was adopted based on the method described by Neldner *et al* (2017)[6].
Non-woody vegetation is remnant if it:

- *has not been cultivated for 15 years; and*
- *contains native species normally found in the regional ecosystem; and*
- *is not dominated by non-native perennial species.*

[4] Queensland Government, 2018, About regional ecosystems, Available Online, https://www.qld.gov.au/environment/plants-animals/plants/ecosystems/about, Accessed 04/10/2018
[5] Queensland Government, 2017, Vegetation Management Act 1999, Part 1, Schedule 3.
[6] 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. 124 pp.

3.2 Desktop assessment:

A desktop review consisting of a literature and data review was conducted using existing reports, aerial or satellite imagery and geological mapping. The review focused on flora database records of the area and existing vegetation classification/ mapping.

Historical aerial imagery was obtained from the DNRME QImagery portal and reviewed in detail for evidence of past clearing or large-scale land modifications. Each image was orthorectified using GIS software, and reviewed for evidence of past clearing or land modification activities, and to assess the extent of any pre-clear vegetation communities. Interpretation of all aerial and satellite imagery was conducted before ground truthing commenced.

Geology was assessed using the "G*eology of the North Eastern Part of the Hughenden 1:250 000 Sheet Area*" report and the Detailed Surface Geology Mapping, accessed via Queensland globe.

3.3 Field survey

A six (6) day field survey was undertaken between 27 August 2018 and 1 September 2018 inclusive. The survey combined both flora and fauna investigations including the identification of flora and fauna species, and weeds. Consideration was given to Version 4 of the Queensland Herbariums *Methodology for Survey and Mapping of Regional Ecosystems and Vegetation Communities in Queensland*[7]. The method includes all detail relevant to the assessment of regional ecosystems in the field and required to delineate more concise regional ecosystem mapping polygon in areas currently mapped as a mosaic.

3.3.1 Site Selection

Sites were chosen using a combination of desktop assessment and during field traverses, where changes in vegetation communities occurred or where patches of vegetation communities were obvious. Sites were selected if they were considered representative of the on-ground vegetation communities of contiguous vegetation patches.

[7] 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. 124 pp.

3.3.2 Timing and Details.

Survey effort consisted of 48 man-hours over six (6) consecutive days on site to survey the Project area. During the field survey, the area was traversed by vehicle and on foot.

3.3.3 Survey Method

Field data at each survey site was recorded as per the Queensland Herbariums *Methodology for Survey and Mapping of Regional Ecosystems and Vegetation Communities in Queensland* for quaternary and tertiary methods to include the parameters specified in Table 2.

Field survey methodology involved sampling in the form of transects of 500m^2 (10m x 50 m or 20m X 25 m) for Quaternary sites, located in each mapped regional ecosystem. A tertiary survey site was completed along a 1,000m^2 transect in areas that had been ground truthed as Category B 'Remnant vegetation'.

A total of 38 sites were recorded throughout the study area and are mapped in detail in Figure 16. Data collected at each survey site was designed to capture regional ecosystems on site, and structural formation to be used for numerical data analyses if need be.

Table 2: Field data collected during ground truthing survey

Attribute	Data Type	Comments or example
Date	Survey Date	27August 2018
Site Number	Numerical	1-4
Recorder	Names	N. Baker & C. Cross
Location Information	GPS & GLONASS	Decimal Degrees on Datum GDA 94
Regional Ecosystem (RE)	From regional ecosystem descriptions database	10.3.12
Image number	Digital Image	Several digital images were generally recorded from each polygon or transect site
Land zone	Land form in accordance with Land Zones of Queensland	Land Zone 4: Tertiary- early Quaternary clay plains
Soil	Basic	Sandy clay.
Ground Cover	Obvious Basic	Bare ground, *Astrebla spp.*
Disturbance	Obvious Basic	Grazing, trampling, gully erosion, tidal, historically cleared, weeds, non-remnant if it was mapped as such
Vegetation Structural Information	Estimated Height Range and Cover Density	For each transect. Tree height and cover by layer, Shrub cover by layer, Ground cover by layer. T1, T2, S1, S2, G1, G2 layers. Height in meters and cover in percentage (for tertiary)

Additional Species	Species list	Minor taxa. Mostly identified in the field and compiled as site species list and individual transect species list

3.4 Plant Identification

The majority of plant species were identified in the field. Small samples were collected for unknown taxa and identified later using standard keys from local and regional flora publications where necessary.

Nomenclature within this report follows that of the Queensland Herbarium as it was current in August 2018.

3.5 Vegetation Mapping.

Mapping of Regional Ecosystems (REs) was conducted using Quantum GIS (QGIS). Vegetation mapping was conducted to delineate individual regional ecosystems found on the ground, and separate those RE's currently associated with mosaics of multiple regional ecosystems to create homogenous polygons at the property scale.

The scale of the mapping conducted in field was a consideration of which vegetation communities were truly independent ecosystems, and which were simply components of a larger ecosystem which occurred naturally throughout that ecosystem. For example, where *Lysiphyllum carronii* occurred scattered throughout RE 4.3.9 as an associated taxon, but not as an individual community of RE 10.3.26.

Mapping was attempted at a map scale of 1:25,000 to ensure a property level assessment of all vegetation communities was possible. Vegetation polygons were delineated by mapping on-screen analysis of survey results and obvious vegetation community boundaries shown on recent satellite imagery.

4. Results

4.1 Desktop Assessment.

4.1.1 Evidence of historical clearing

Aerial imagery for the site is available dating back as early as 1966. Preliminary analysis of the aerial imagery shows changes to the vegetation community between 1998 and 2017. These changes appear to be due to large scale thinning or clearing of invasive woody species, as the apparent density of the vegetation appears modified. Clearing was evident during field investigations, as can be seen in Figure 11.

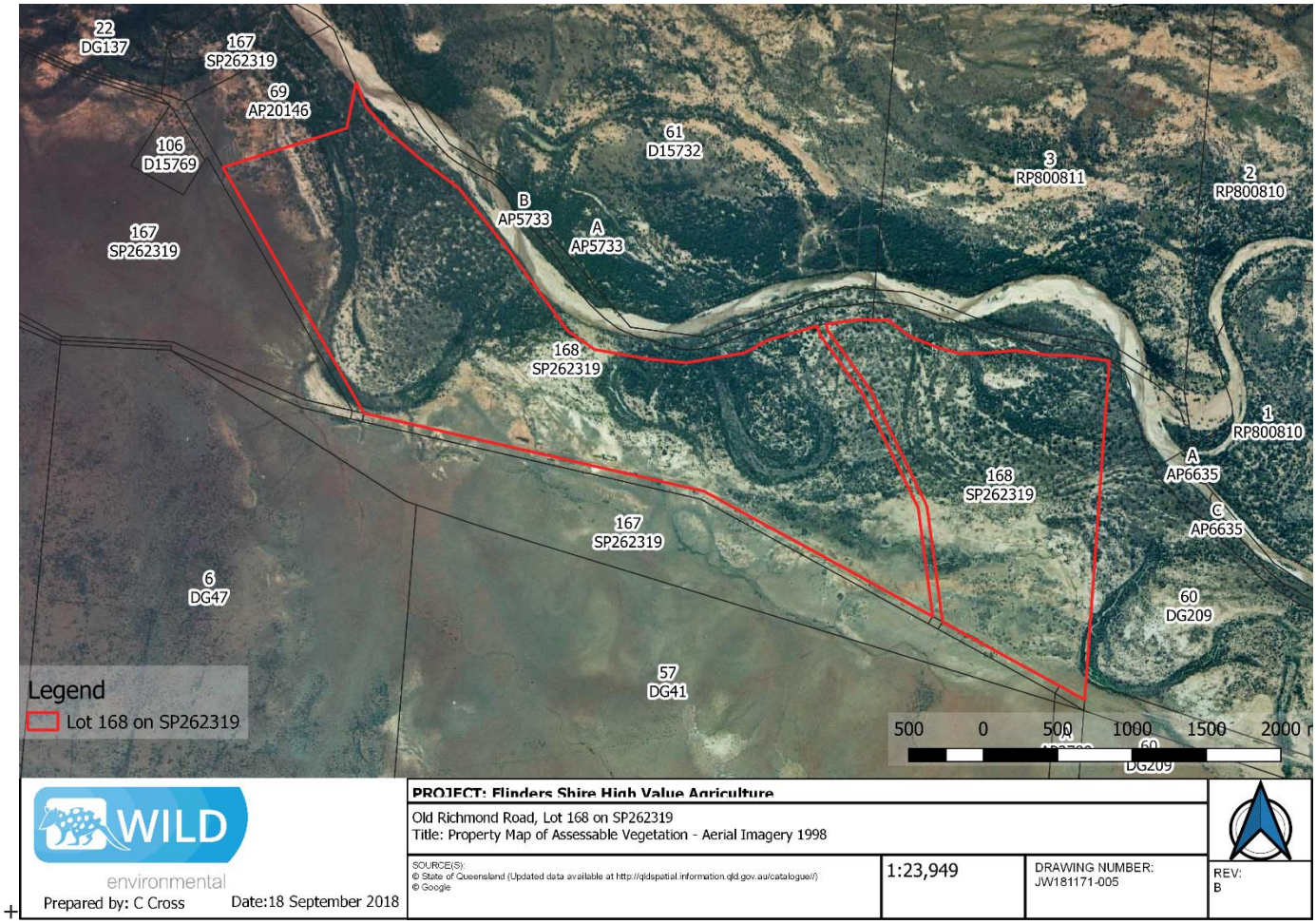


Figure 2 Aerial photography circa January 1998

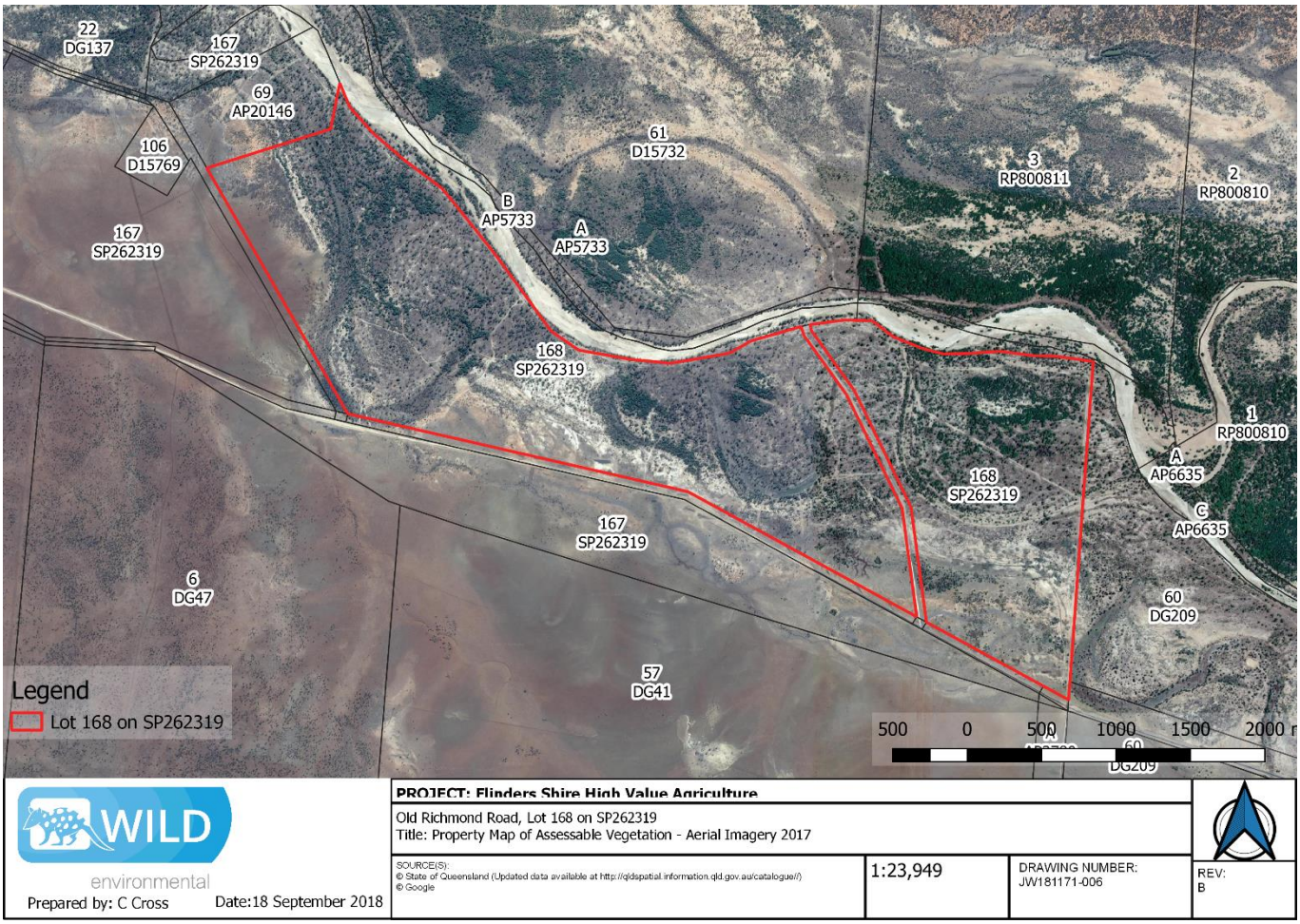


Figure 3: Aerial photography in circa July 2017

4.2 Bioregion

There are thirteen recognised bioregions for Queensland. The Project is located mapped within the Mitchell Grass Downs, although it is evident there may be transitional zones where regional ecosystems are required to be mapped as Desert Uplands communities.

4.2.1 Land zone

The land zone is mostly homogeneous throughout the site and located predominantly on Land zone 3, in recent quaternary alluvial systems/ alluvial river and creek flats. The desktop assessment defined grasslands and areas fringing the southern boundary of the site occurring across an ecotone where the area is a mix Land Zone 3 and Land Zone 9.

The survey site is characterised by abandoned river meander (paleo channels) or oxbow lakes which are isolated from the main stream (Flinders River), except during periods of overflow. These lakes now serve as

intermittent wetlands and ephemeral streams, which are filled with fine-grained sediments. The existing and past flood plains of the site are the result of deposition on the inside of the existing and past river curves and deposition from overbank flows. Evidence of coarse river sediments is found throughout the site with sand in some locations and alluvial material with river stones and coarse sediments in others.

4.3 Geology

Geological maps used in the classification of REs are often mapped on a large scale. While these maps provide details into regional geology, often on a site-specific scale the actual geology will differ from the large-scale classification. According to the Queensland Governments Queensland Globe Portal, Regional Ecosystem 4.9.1c - *"Astrebla spp., Iseilema spp. tussock grassland, commonly with Panicum decompositum, Dichanthium spp., Eulalia aurea, Chrysopogon fallax, Sorghum plumosum. Emergent Atalaya hemiglauca commonly occur. Occurs on level to gently undulating downs derived from Cretaceous mudstones* has been identified within the development area, adjacent to Old Richmond Road. As a part of this PMAV, a desktop review of geological data and a site inspection has been conducted, to determine the presence of undulating downs derived from Cretaceous mudstones.

4.3.1 Existing Information

4.3.1.1 Regional Geology

The Project is situated within the Carpentaria Basin, a sedimentary basin which formed during the Jurassic – Cretaceous. The basin is bound by the Great Dividing Range to the east, the Euroka Arch to the south, longitude 137°E to the west and Latitude of 8°S[8].

The basin is an epeirogenic intracratonic downwarp, a sediment basin within the middle a cratonic block. Igneous and sedimentary craton basement rock of Precambrian age were initially covered by the deposition of Jurassic aged sands. This initial deposition was followed by subsequent depositions of marine and terrestrial sands. During the Apitan and Albian Age, a period of transgression lead to the deposition of marine mudstones. These mudstones are known as the Wallurnbilla Formation and Allaru Mudstone[8].

According to Geoscience Australia and Queensland Globe, the Wallurnbilla Formation outcrops within the Hughenden Region. The Wallurnbilla Formation is characterised by *"Marine grey mudstone and siltstone with minor interbeds of fine-grained glauconitic and calcareous sandstone, local thin micritic limestone beds and*

[8] *A.G.L Paine, R.R Harding & D.E Clarke, 1966, The Geology of the North Eastern Part of the Hughenden 1:250,000 Sheet Area, North Queensland, Department of Natuinal Development – Bureau of Mineral Resources, Geology and Physics,*

heavy mineral strandline accumulations; down-sequence glacial ice-rafted erratics"[8]. The formation consists of five (5) sub-groups:

- Coreena Member;
- Doncaster Member;
- Jones Valley Member;
- Ranmoor Member; and
- Trimble Member.

During the late Miocene, uplift following the incision of marginal drainage gave rise to the Sturgeon volcanic province. Lava flows from 46 volcanic centres followed drainage lines, resulting in the formation of new valleys. Consecutive eruptions led to the formation of a series of narrow and elongate plateaux. The youngest of these lava flows originated from Mount Sturgeon. Mass eruptions terminated north of Hughenden and resulted in the formation of high mesas. The Sturgeon province basalt (Sturgeon Basalt) is slightly to moderately undersaturated in silica and has magnesium ratios, similar to those of other volcanic provinces within North Queensland[8].

Younger members of the Carpentaria Basin within the Hughenden region is the Quaternary alluvial sediments deposited by the Flinders River. The Flinders River flows from its headwaters north of the White Mountains, depositing material west-north west as it meanders towards the Gulf of Carpentaria passing through the townships of Hughenden and Richmond. Quaternary sediments deposited within the Flinders River Floodplain are characterised by clay, silt, sand and gravel.

4.3.1.2 Site Geology

Lot 168 on SP262319 is underlain by:

- The Flinders Floodplain Quaternary alluvium comprised of Quaternary clays, sands, and gravels; and
- The Ranmoor Member comprised of Albian mudstone, in part carbonaceous and calcareous siltstone.

According to Queensland Globe, the Ranmoor Member outcrops within the development boundary parallel to Old Richmond Road with alluvial material of the southern riverbank confined to the vegetation boundary.

4.3.1.3 Drill Logs

As a part of the initial PMAV desktop review, bore logs from within the development boundary were queried and analysed. The analysis of drill logs is outlined in Table 3.

Table 3: Drill Logs analysis

Hole ID	Sand/Gravel (m)	Clay (%)	Mudstone (%) *
RN183100	2	17	5
RN163825	9	12	3
RN175263	10.1	1.2	14.3*
RN175316	0	15	0
RN175319	10.8	6.8	0
RN175320	0	15	0
RN183044	4.5	15.5	4
RN183102	3	12	4

*Contact not between clay and mudstone not defined

In addition, cross sections were prepared from the geology intersected during piezometer establishment. The cross sections demonstrate that within the lot boundary, the Ranmoor Member does not outcrop, and the development is underlain by alluvial material.

4.3.2 Site Inspection

Where geological data derived from bore logs was not available, Wild Environmental conducted geological field mapping as a part of PMAV surveys effort. The aim of mapping was to identify outcrops (if any) of outcrops of the underlying Ranmoor Member. Site inspections included;

- collection of photos;
- inspection of riverbanks; and
- opportunistic observations of surface outcrops (if any).

The site inspection indicates that there is no outcropping of the Ranmoor Member. Inspections determined that the site surface geology was dominated by alluvial material. Clays to cobbles and pebbles were identified without evidence of consolidation. Large spherical ad ellipsoid concretions were identified on the site. It is assumed that these concretions have been transported by the Flinders River. Concretions have a greater resistance to weathering than the surrounding material and have remain intact during fluvial transport onto the development site.

Figure 4: The Flinders River channel and associated quaternary alluvium

Figure 5: The Flinders River channel looking towards alluvial terrace

Figure 6: Vegetation on Alluvial Terrace Facing the Flinders River

Figure 7: Drainage Line of Alluvial Derived Cracking Clay

Figure 8: Abandoned river meander loop or oxbow lake and Associated Quaternary alluvium

Figure 9: Cracking Clay, Pebbles and Lithic Fragments within Quaternary alluvium Terrace

4.3.3 Determination

Wild Environmental conducted a field inspection and desktop assessment as a part of the PMAV & Flora and Fauna Assessment. Field inspections failed to identify evidence of sedimentary rocks outcropping within the development. Furthermore, cross sections prepared as a part of the desktop assessment indicate that the mudstone intersected as a part of borehole establishment is beneath the surface, dipping towards the north. At this low angle dip and depth, it has been determined that the chance of the Ranmoor Member outcropping within the development is unlikely.

4.4 Mapped Vegetation Communities and Regional Ecosystems

A description of each mapped regional ecosystem within Project is provided in Table 4.

Table 4: Regional Ecosystems of the Project Site

Regional Ecosystem	VMA Status	Short Description
10.3.12	Least concern	*Corymbia dallachiana* and *C. plena* or *C. terminalis* woodland to open woodland on sandy alluvial terraces (eastern)
10.3.26	Of concern	*Lysiphyllum carronii* low open woodland on alluvial plains
4.3.1	Least concern	*Eucalyptus camaldulensis* +/- *Melaleuca spp.* woodland on drainage lines
4.3.14	Least concern	*Astrebla lappacea, Astrebla spp*. +/- *Eulalia aurea* grassland on quaternary alluvium
4.3.20	Least concern	*Atriplex spp.* and *Sclerolaena spp.* +/- *Astrebla spp*. +/- short grasses +/- forbs, open herbland on braided or flat alluvial plains
4.3.3	Least concern	*Eucalyptus coolabah, E. camaldulensis* +/- *Lysiphyllum gilvum* open woodland on drainage lines
4.9.1	Least concern	*Astrebla lappacea* +/- *Aristida latifolia* +/- *Panicum decompositum* grassland on Cretaceous sediments

Although the site is situated within the Mitchell Grass Downs biogeographic region, the extent of the Desert Upland bioregion communities is associated with differences in landscape patterns.

4.5 Vegetation survey results

The vegetation within the survey area is predominantly remnant mixed eucalypt open woodlands, with fringing northern Mitchell Grass Downs grassland communities along the south western boundary of the Project site. Smaller areas of *Acacia cambagei* (Gidgee) woodlands on alluvial plains are found sporadically throughout the Project site.

In correspondence with the Queensland Herbarium it was noted that the *Mitchell Grass Downs* bioregion is currently undergoing a review of regional ecosystems classification and mapping. Therefore, interpretation and classifications of regional ecosystems was prepared with some discretion given to correspondence between Wild Environmental and the Queensland Herbarium staff and on ground findings.

It is considered that the sparse open nature of the vegetation is indicative of the vegetations natural low density and reflects the seasonally dry and arid conditions of the site. In addition, the site has sustained and experienced intensive grazing pressure for a number of years, which may have suppressed tree recruitment or shrub density.

Ground cover is indicative of intensive over-grazing and is particularly sparse in some areas. Native grass *Astrebla* species dominate the ground cover across the majority of survey sites, although the survey timing was not conducive to identification of many grasses to species level.

Woody weeds Mesquite (*Prosopis pallida)* and Prickly acacia (*Vachellia nilotica)* are widespread throughout the shrub and low tree layer within eucalypt and gidgee communities. The abundance of invasive weeds within the survey area may be a cause of the low dominance of native shrubs.

Open eucalyptus woodlands

The predominant vegetation community across the Project site is *Eucalyptus coolabah* low open to open woodland. Previously mapped as 4.3.3, these communities more closely resemble 4.3.4x2, *Eucalyptus coolabah* low open woodland, commonly with *Acacia georginae*, *Acacia cambagei*, *Atalaya hemiglauca* and *Corymbia terminalis*[9]*,* although *A. georginae* is not thought to occur on site.

Flinders River and paleo channel/s fringing communities

The banks of the Flinders River and the abandoned river channels (paleo channels) support RE 4.3.2 communities, mostly described as *E. camaldulensis* and/ or *E. coolabah* woodlands.

[99] C. Appelman 2018, pers. com, 19 September 2018, Queensland Herbarium

These existing and abandoned river channels are defined by a series of levees across the plain – some very active right up at the river. Of those levees and flood banks associated with the paleo channels, some of the vegetation communities are thought to be yet to be formally described communities of 4.3.10[9]. Correspondence from the Herbarium provides that this is an unmapped vegetation community around the Flinders River that is a *Corymbia terminalis* and *C. dallachiana* woodland[10]. Lower trees may include *Lysiphyllum spp*., *Grevillea striata* and *Vachellia sutherlandii*[10]. This unmapped community is currently undescribed and subject to review, which may become part of RE 4.3.10[10]. These areas (approximate extent) were previously mapped as RE10.3.12a.

RE 4.3.2, *Eucalyptus camaldulensis +/- E. coolabah* woodland on drainage lines was surveyed on the north eastern corner of the Project site.

Gidgee communities

Areas which were dominated by *Acacia cambagei* were initially recorded as RE4.3.8. Following advice from the Herbarium, it was considered that these plains communities would be more consistent with the revised description of RE 4.3.9 which is *Acacia cambagei* on alluvial plains.

***Lysiphyllum* communities**

The 'Of Concern' regional ecosystem 10.3.26 *Lysiphyllum carronii* low open woodland on alluvial plains, was not present within the surveyed area. Instead, communities where *Lysiphyllum gilvum* was dominant were identified with intermittent individuals of *Lysiphyllum caronii* present in low numbers.

These communities are considered to be inconsistent with the description provided for regional ecosystem 10.3.26 and further information was sought from the Queensland Herbarium to confirm the appropriate regional ecosystem for mapping. Correspondence with the Herbarium found that a revised description of RE10.3.23 may be more along the lines of:

"4.3.23 – Mixed low open woodland, including combinations of the species Acacia tephrina, Lysiphyllum spp., Acacia cambagei, Ventilago viminalis, Atalaya hemiglauca and Flindersia maculosa. Occasional canopy species may include Alectryon oleifolius, Corymbia terminalis and Eucalyptus coolabah. A sparse shrub layer may occur. The ground layer is tussock grasses"[9].

It follows that areas identified as *Lysiphyllum* communities during this survey are proposed to be reclassified as RE 4.3.23.

[10] C. Appelman 2018, pers. com, 19 September 2018, Queensland Herbarium

Northern Mitchell Grass Downs grasslands

Several areas of grasslands were located along the ecotone between the alluvial river floodplain the undulating flats.

Survey timing was considered satisfactory for identifying native and exotic vegetation present and ground truthing regional ecosystems as native perennial species started flowering. 38 vegetation survey sites were selected where changes in vegetation communities were obvious on both aerial imagery and during field traverses. These vegetation sites are considered satisfactory in displaying the changes in both vegetation communities and regional ecosystems across the Project site.

Wetlands

The abandoned river channels throughout the site are characteristic of wetland habitats within the survey area. These channel systems form depressions in an otherwise flat floodplain landscape and consist of sometimes bare ground or a distinct ground layer of native forbs or invasive species. These areas would be subject to seasonal wetting and drying cycles and therefore could be described as palustrine wetlands.

Figure 10: Wetland habitat examples from survey area

One small wetland held water during the August site visit, which was unusual given the time of year (late dry season). This is considered to be an artificial result due to an earthen bud wall constructed on the northern inside edge of the oxbow lake created to provide a permanent water source for cattle.

4.5.1 Vegetation Maps:

Vegetation mapping was undertaken using two methods. (1) by walking or driving the perimeter of an area of well-defined vegetation (such as *Lysiphyllum* communities), and (2) by using vegetation survey sites to provide accurate representation of each regional ecosystem by delineating contiguous vegetation communities identifiable on aerial imagery.

The survey effort including vegetation survey sites, and field traverses are shown in Figure 16. Vegetation communities and proposed changes to the regional ecosystem are displayed in Figure 19. Appendix A provides a detailed record of the field data collected for each survey site shown on Figure 16.

4.5.2 Remnant status

The results of the field surveys lend weight to the conclusions reached in the desktop assessment that the vegetation has been either lightly or heavily thinned in the past. Evidence of mechanical clearing and logging is scattered throughout the survey area, although it appears to be limited to trees with a diameter of less than 20cm. The purpose of this thinning is not obvious on the ground given the age, but is thought to be thinning of non-native weeds such as Mesquite and Prickly Acacia, rather than targeted thinning of thickened native vegetation. A number of cut tree stumps were found at some sites, which may be results of past fence post cutting or timber getting.

It is considered that although there may be circumstances which have resulted in the vegetation having undergone considerable changes in structure and composition, the vegetation communities are reasonably consistent with the definition of natural or native vegetation.

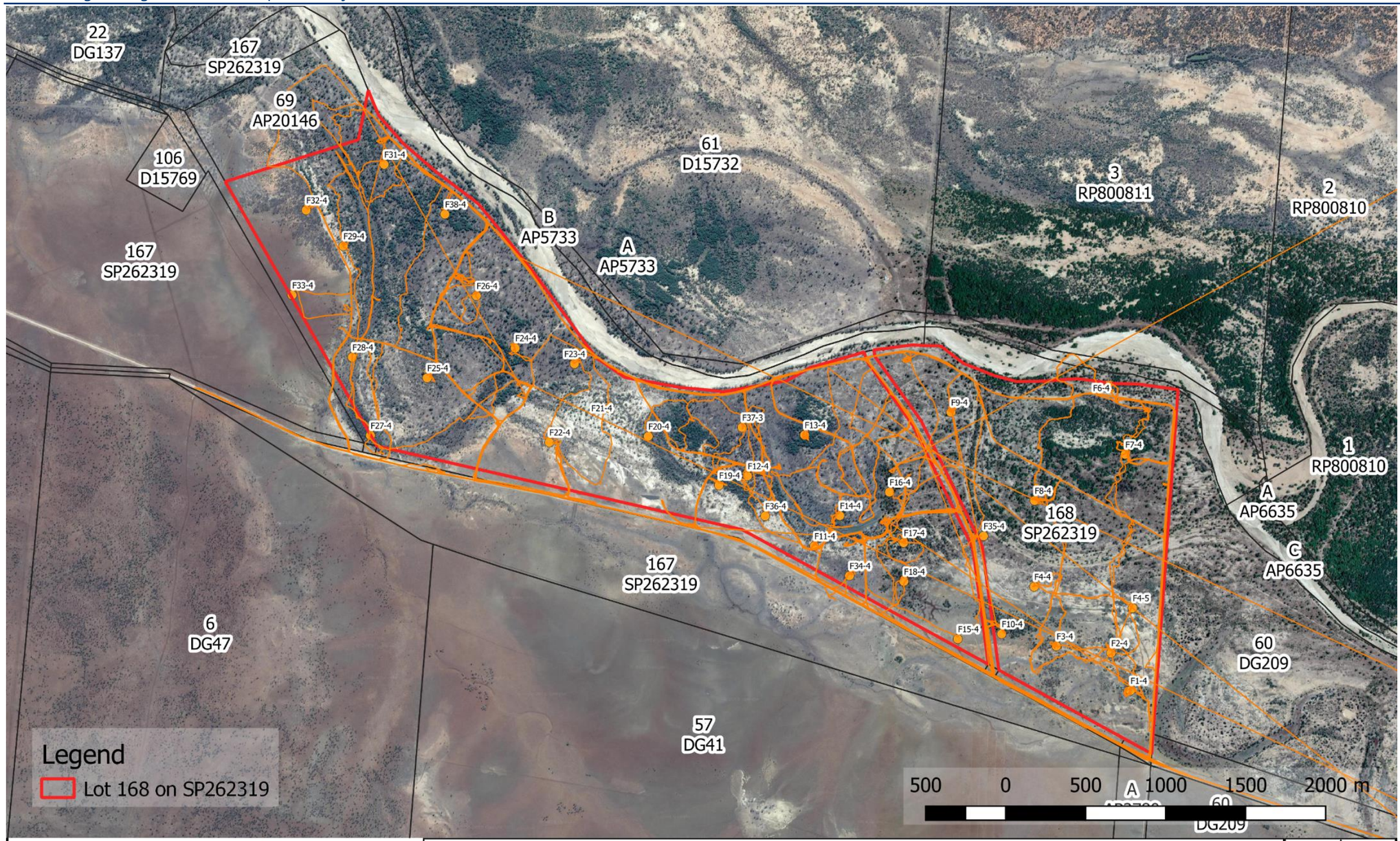
Further, it is considered that any proposed changes of remnant vegetation to non-remnant (Category X) status within the survey area, may result in Category C vegetation due to having not been cleared within the last 15 years. This is a less desirable outcome and therefore not recommended.

Figure 11: Evidence of logging

Figure 12: Evidence of mechanical clearing with root ball lifted

Figure 13: Further evidence of mechanical clearing showing raked vegetation

Figure 14: Cut stump



WILD environmental

Prepared by: C Cross Date: 18 September 2018

PROJECT: Flinders Shire High Value Agriculture

Old Richmond Road, Lot 168 on SP262319
Title: Survey effort and vegetation survey sites

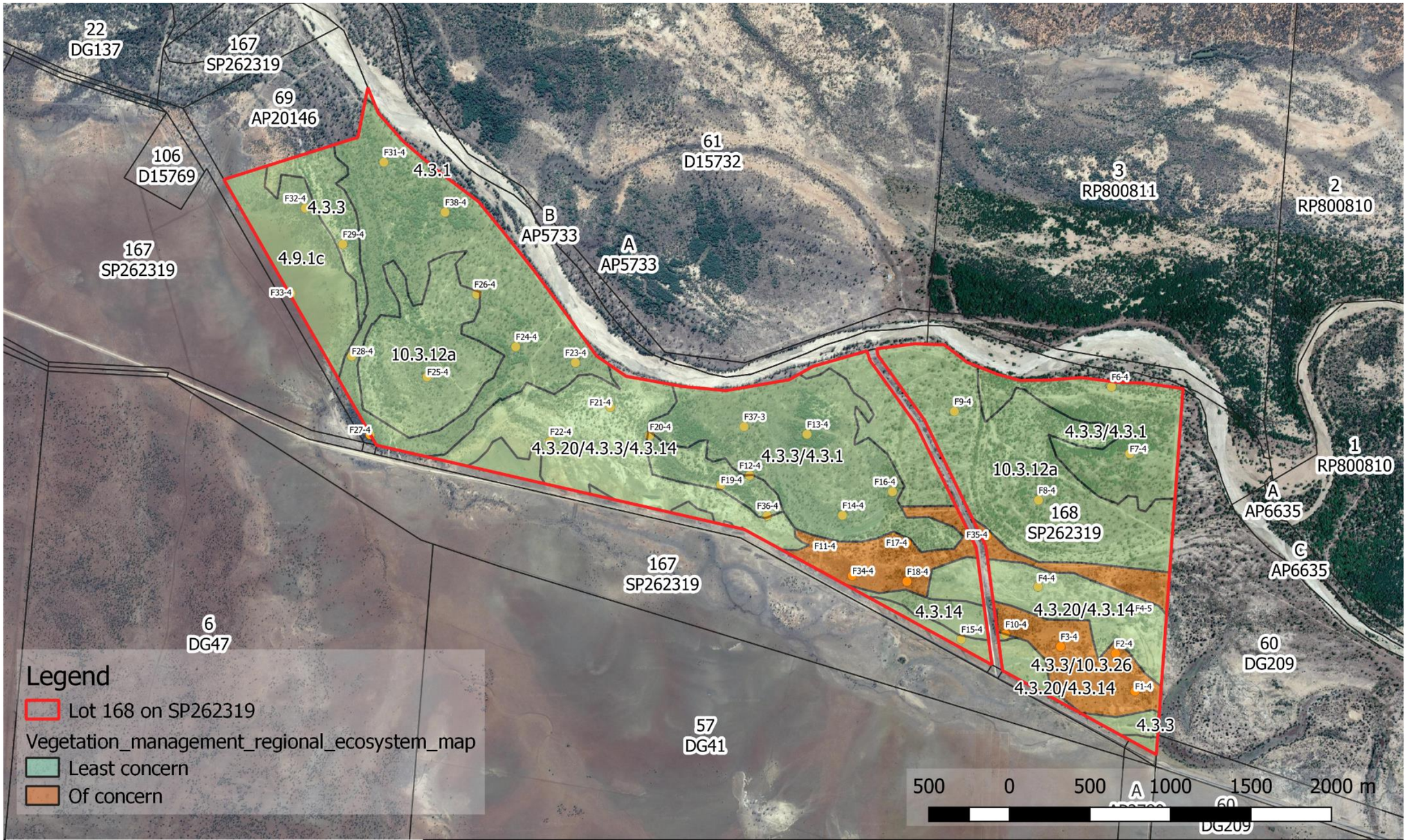
SOURCE(S):
© State of Queensland (Updated data available at http://qldspatial.information.qld.gov.au/catalogue//)
© Google

1:23,949

DRAWING NUMBER:
JW181171-003

REV:
B

Figure 15: Survey effort and vegetation observation sites



WILD environmental Prepared by: C Cross Date:18 September 2018	**PROJECT: Flinders Shire High Value Agriculture** Old Richmond Road, Lot 168 on SP262319 Title: Vegetation Management Regional Ecosystem Map (current)		
	SOURCE(S): © State of Queensland (Updated data available at http://qldspatial.information.qld.gov.au/catalogue//) © Google	1:23,949	DRAWING NUMBER: JW181171-004
			REV: B

Figure 17:Existing Regional Ecosystem mapping

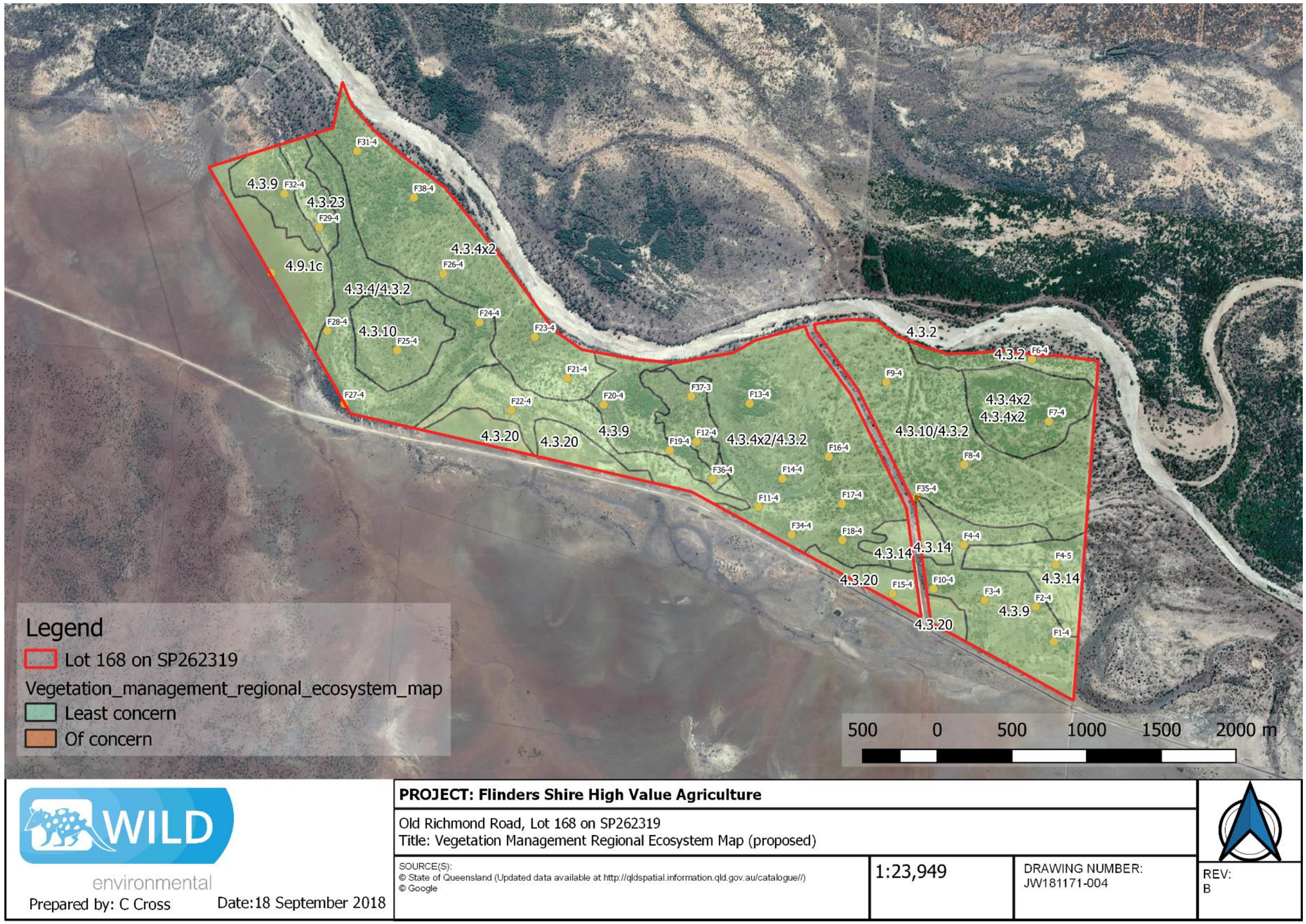


Figure 18: Proposed regional ecosystem mapping (PMAV)

5. Conclusion and recommendations

5.1 Conclusion

Detailed desktop and field investigations were conducted to validate and ground truth the regional ecosystems occurring on the Project site. Field surveys conducted by Wild Environmental have identified that existing mapping which includes areas of the 'of concern' RE 10.3.26, is likely out of date. There was no evidence of RE10.3.26 within the Project site, instead some areas of *Lysiphyllum gilvum* communities were observed. Based on advice from the Queensland Herbarium, it is considered that these communities are consistent with RE 4.2.23, a regional ecosystem with a 'least concern' vegetation management status.

The ground truth surveys have shown that there are several errors in the existing Vegetation Management Regional Ecosystem Map for the Project site, which is likely to be due to the out of date regional ecosystem descriptions, mapping, which is acknowledged as being under a state of review by the Herbarium.

The following conclusions are noted:

- The vegetation assessment was able to identify and classify the regional ecosystems listed on the site and classify their regional ecosystem status.
- This report provides a recommended map of the existing regional ecosystems based on a detailed survey to ground truth vegetation communities.
- The Project site consist of dense weed infestations, throughout and in the majority of sites, in some cases, Mesquite *(Prosopis pallida*) and Prickly Acacia *(Vachellia nilotica*) are often the dominant structure.

5.2 Recommendations:

As a result of the detailed assessment undertaken to inform this report for the Project, the following recommendations are given:

1. Amend the Regulated Vegetation Management Map and Vegetation Management Regional Ecosystem Map to include the proposed changes to the mapped regional ecosystems; and
2. Note that all proposed regional ecosystems have a Vegetation Management status of least concern.

Appendix A – Flora Survey Records

Date: 27/08/2018
Site ID: F1-4
Survey method: Quaternary
Locality: Lot 168 on SP262319
Coordinates: S20° 47.909' E144° 05.337'
Survey site size: 500m^2
Landform: Alluvial Plain
Geology: Quaternary alluvium
Soils: Cracking clay
Regional Ecosystem:4.3.9
Description: *Eucalyptus coolabah* and *Acacia cambagei* open woodland

Collector: N. Baker and C. Cross

Structure	Relative Dominance	Est cover density	Median height	Height interval	Scientific name
T_1	Dominant	Sparse	*7.5*	*6 – 8.5*	*Eucalyptus coolabah*
T_2	Co-dominant	Sparse	*5.5*	*4-6*	*Acacia cambagei, Lysiphyllum gilvum*
T_3	Associated	Sparse	*3.5*	*3-4*	*Acacia victoriae, Alectryon oleifolius*
S_1	Associated	*Sparse*	*1.5*	*1 - 2*	*Eremophila mitchellii, Parkinsonia aculeata, Acacia cambagei, Pittosporum angustifolium*
G					*Astrebla squarrosa, Alternanthera pungens, Dactyloctenium radulans, Sporobolus australasicus, Sclerolaena birchii, Salsola kali*

Ecologically dominant layer: T_1

Notes:

Existing Regional Ecosystem:	4.3.3
Proposed Regional Ecosystem:	4.3.9

Date: 27/08/2018
Site ID: F2-4
Survey method: Quaternary
Locality: Lot 168 on SP262319
Coordinates: S20° 47.773' E144° 05.268'
Survey: 500m^2
Landform: Alluvial Plain near Rivers or Creek beds
Geology: Quaternary alluvium
Soils: Grey black clay
Regional Ecosystem: 4.3.9
Description: *Acacia cambagei* low open woodland

Collector: N. Baker and C. Cross

Structure	Relative Dominance	Est. cover density	Median height	Height interval	Scientific name
T_1	Dominant: Associated:	Sparse	*5.8*	*4 - 7*	*Acacia cambagei* *Santalum lanceolatum*
T_2	Dominant:	Sparse	*3*	*2 - 4*	*Acacia cambagei,*
S_1	Co-dominant:	Sparse	*1.5*	*1 - 2*	*Santalum lanceolatum, Erythoxylum australe*
G	Co-dominant:				*Astrebla squarrosa, Astrebla spp. Dactyloctenium radulans, Sporobolus australasicus, Sida sp., Iseilema vaginiflorum, Sclerolaena birchii*

Ecologically dominant layer: T_1

Notes: Dominant layer is sparse, very little ground cover available

Existing Regional Ecosystem:	4.3.3
Proposed Regional Ecosystem:	4.3.9

Date: 27/08/2018
Site ID: F3-4
Survey method: Quaternary
Locality: Lot 168 on SP262319
Coordinates: S20° 47.749' E144° 05.071'
Survey: 500m^2
Landform: Alluvial Plain near river or creek beds
Geology: Quaternary alluvium
Soils:
Regional Ecosystem: 4.3.9
Description: *Acacia cambagei* low open woodland


Collector: N. Baker and C. Cross

Structure	Relative Dominance	Est. cover density:	Median height (m):	Height interval (m):	Scientific name:
T_1	Dominant:	Sparse	6.09	3 -8.4	*Acacia cambagei*
T_2	Dominant:	Sparse	2.5	2 – 3	*Acacia cambagei*
S_1	Dominant: Associated:	Sparse	1.5	1 – 2	*Acacia cambagei, Erthroxylum australe. Vachellia nilotica*
G	Co-Dominant:				*Astrebla squarrosa, Astrebla spp., Dactyloctenium radulans, Sporobolus australasicus, Sclerolaena sp. , , Salsola kali*

Ecologically dominant Layer: T_2

Notes:

Existing Regional Ecosystem:	4.3.3
Proposed Regional Ecosystem:	4.3.9

Date: 27/08/2018
Site ID: F4-4
Survey Method: Quaternary
Locality: Lot 168 on SP262319
Coordinates: S20° 47.534' E144° 04.991'
Survey Site size 500m^2
Land form: Alluvial Plain
Geology: Quaternary alluvium
Soils: Sandy soil
Regional Ecosystem: 4.3.9
Description: *Acacia cambagei* low open woodland


Collector: N. Baker and C. Cross

Structure	Relative Dominance	Est. cover density:	Median height (m):	Height interval (m):	Scientific name:
T_1	Dominant: Associated:	Sparse	7.36	5 –8.28	*Acacia cambagei* *Atalaya hemiglauca*
T_2	Co-dominant:	Sparse	3	2 – 5	*Acacia cambagei, Eremophila mitchellii*
S_1	Dominant: Associated:	Sparse	1.5	1 – 2	*Acacia cambagei,* *Parkinsonia aculeate, Capparis lasiantha*
G					*Astrebla squarrosa, Astrebla spp., Sclerolaena sp., Enchyalena tomentosa, Salsola kali*

Ecologically dominant layer: T1

Notes:

Existing Regional Ecosystem:	4.3.3
Proposed Regional Ecosystem:	4.3.9

Date: 27/08/2018
Site ID: F5-4
Survey Method: Quaternary
Locality: Lot 168 on SP262319
Coordinates: S20° 47.611' E144° 05.345'
Survey Site size: 500m^2
Land form: Alluvial Plain
Geology: Quaternary alluvium
Soils: Alluvial Soils, Sandy
Regional Ecosystem: 4.3.14
Description: Low open woodland located on old flood plain

Collector: N. Baker & C. Cross

Structure	Relative Dominance	Est. cover density:	Median height (m):	Height interval (m):	Scientific name:
T_1	Co-dominant: Associated:	Sparse	2	1 – 3	*Erythoxylum australe., Vachellia nilotica* *Atalaya hemiglauca*
G	Co-dominant Associated:	Sparse			*Sclerolaena birchii Sclerolaena tricuspis, Astrebla squarrosa, Astrebla spp., Aristida spp., Dactyloctenium radulans* *Capparis lasiantha*

Ecologically dominant layer: G

Notes: Very low tree layer of sparse density

Existing Regional Ecosystem:	4.3.3
Proposed Regional Ecosystem:	4.3.14

Date:28/08/2018
Site ID: F6-4
Survey Method: Quaternary
Locality: Lot 168 on SP262319
Coordinates: S20° 46.819' E144° 05.253'
Survey site size: 500m^2
Land form: Alluvial Plain
Geology: Quaternary alluvium
Soils: Alluvial
Description: Low open woodland, *Eucalyptus* dominated.

Collector: N. Baker and C. Cross

Structure	Relative Dominance	Est. cover density:	Median height (m):	Height interval (m):	Scientific name:
T_1	Dominant: Sub-dominant	Mid-dense	7.4	6.4 – 14.31	*Eucalyptus camaldulensis* *Eucalyptus coolabah*
T_2	Dominant: Associates:	Sparse	3	2 – 5	*Vachellia nilotica** *Lysiphyllium gilvum*
S_1	Dominant: Associated:	Sparse	1.5	1 – 2	*Cryptostegia grandiflora* *Eremophila mitchellii*
G					*Astrebla spp.,*

Ecologically dominant layer:

Notes: Alluvial terrace located on flood plain

Existing Regional Ecosystem:	4.3.1
Proposed Regional Ecosystem:	4.3.2

Date: 28/08/2018
Site: F7-4
Survey Method: Quaternary
Locality: Lot 168 on SP262319
Coordinates:
Survey site size: 500m^2
Land form: Alluvial Plain
Geology: Quaternary alluvium
Soils: Sandy soil
Regional Ecosystem: 4.3.4x2
Description: *Vachellia nilotica* and *Prosopis pallida l*ow mid-dense woodland

Collector: N. Baker and C. Cross

Structure	**Relative Dominance**	**Est. cover density:**	**Median height (m):**	**Height interval (m):**	**Scientific name:**
E	Associated:	Sparse	10	9 – 13	*Eucalyptus coolabah*
T_1	Dominant Associated	Dense	5	2 – 8	*Vachellia nilotica, Prosopis pallida* *Lysiphyllium gilvum*
G		Sparse			*Astrebla spp., Salsola australis*

Ecologically dominant layer: Non-remnant prickly acacia

Notes:

Existing Regional Ecosystem:	4.3.1
Proposed Regional Ecosystem:	4.3.4x2

Date: 28/08/2018
Site: F8-4
Survey Method: Quaternary
Locality: Lot 168 on SP262319
Coordinates: S20° 47.224' E144° 04.992'
Survey site size: 500m^2
Land Form: Alluvial Plain
Geology: Quaternary alluvium
Soils: Sandy clay
Regional Ecosystem: 4.3.10
Description: *Corymbia terminalis* open woodland


Collector: N. Baker and C. Cross

Structure	Relative Dominance	Est. cover density:	Median height (m):	Height interval (m):	Scientific name:
T_1	Co-dominant	Sparse	15.16	11.46 – 21.9	*Corymbia terminalis, Corymbia Dallachiana*
T_2	Co-dominant Associated	Sparse	8	7.85 – 8.8	*Vachellia nilotica, Grevillea striata* *Lysiphyllium gilvum*
T_3	Associated	Sparse	4	3 – 5	*Acacia victoriae*
S_1	Dominant Associated	Sparse	2.5	2 – 3	*Eremophila mitchellii,* *Capparis lasiantha*
S_2	Co-dominant	Sparse	1.5	1 – 2	*Vachellia nilotica, Grevillea striata*
G	Dominant Associated	Sparse			*Astrebla squarrosa, Astrebla spp.,* *Salsola kali, Passiflora foetida*

Ecologically dominant layer: T_2

Notes: Heavily overgrazed.

Existing Regional Ecosystem:	10.3.12a
Proposed Regional Ecosystem:	10.3.10

Date: 28/08/2018
Site: F9-4
Survey method: Quaternary
Locality: Lot 168 on SP262319
Coordinates:
Survey site size: 500m^2
Land form: Alluvial plain
Geology: Quaternary alluvium
Soils: Sandy clay soils
Regional Ecosystem: 4.3.10
Description: *Corymbia terminalis* open woodland

Collector: N. Baker and C. Cross

Structure	**Relative Dominance**	**Est. cover density:**	**Median height (m):**	**Height interval (m):**	**Scientific name:**
T_1	Co-dominant	Sparse	14.4	11.5 – 20	*Corymbia terminalis, Eucalyptus camaldulensis*
T_2	Co-dominant Associated	Sparse	7.5	7.2 – 13	*Prosopis pallida* *Lysiphyllium gilvum, Grevillea striata, Ziziphus mauritiana, Vachellia nilotica.*
T_3	Associated	Sparse	4	3 – 5	*Acacia victoriae*
S_1	Dominant: Associated:	Sparse	2.5	2 – 3	*Vachellia farnesiana, Eremophila mitchellii, Carissa lanceolata*
G	Dominant: Associated:	Sparse			*Astrebla squarrosa, Astrebla spp., Salsola australis,*

Ecologically dominant layer: T_2

Notes: Area heavily overgrazed Existing Regional Ecosystem:	10.3.12a
Proposed Regional Ecosystem:	4.3.10

Date: 28/8/2018
Site: F10-4
Survey method: Quaternary
Locality: Lot 168 on SP262319
Coordinates: S20° 47.704' E144° 04.873'
Survey site size: 500m^2
Land form: Alluvial plain
Geology: Quaternary alluvium
Soils: Cracking clay
Regional ecosystem: 4.3.9
Description: *Acacia cambagei Eucalyptus coolabah, low open woodland fringing drainage lines*

Collector: N. Baker and C. Cross

Structure	Relative Dominance	Est. cover density:	Median height (m):	Height interval (m):	Scientific name:
T_1	Dominant: Associated:	Sparse	8.28	5.1-14.25	*Acacia cambagei* *Eucalyptus coolabah*
T_2	Associated:	Sparse	4.3	3 – 5	*Prosopis pallida*
S_1	Associated	Sparse	1.5	1 – 3	*Eremophila bignoniiflora,*
G	:				*Astrebla spp., Sporobolus australasicus, Astrebla squarrosa, Sclerolaena birchii*

Ecologically dominant layer: T_1

Notes:

Existing Regional Ecosystem:	4.3.3
Proposed Regional Ecosystem:	4.3.9

Date: 28/08/2018
Site: F11-4
Survey method: Quaternary
Locality: Lot 168 on SP262139
Coordinates:S20°47.388' E144° 04.198'
Survey site size: 500m^2
Land form: Alluvial Plain
Geology: Quaternary alluvium
Soils: Sandy Clay soils
Regional ecosystem:4.3.4x2
Description: Open woodland fringing oxbow lake.


Collector: N. Baker and C. Cross

Structure	Relative Dominance	Est. cover density:	Median height (m):	Height interval (m):	Scientific name:
T_1	Dominant	Dense	12.3	9 – 18.6	*Eucalyptus coolabah*
T_2	Dominant Associated:	Sparse:	4	3 – 5	*Prosopis pallida,* *Parkinsonia aculeata*
S_1	Dominant Associated:	Sparse	2.5	1 – 3	*Prosopis pallida* *Eremophila mitchellii, Eremophila bignoniiflora, Lysiphyllum gilvum, Lysiphyllum caronii*
G	Associated:	Sparse			*Sclerolaena birchii., Salsola kali, Pterocaulon serrulatum, Malvastrum americanum, Argemone ochroleuca*, *Aerva javanica*, *Glinus lotoides*

Ecologically dominant layer: T_1
Notes: Heavily Grazed, Cattle present on site.

Existing Regional Ecosystem:	4.3.3
Proposed Regional Ecosystem:	4.3.4x2

Date: 28/08/2018
Site: F12-4
Survey method: Quaternary
Locality: Lot 168 on SP262319
Coordinates: S20°47.136' E144° 03.958'
Survey site size: 500m^2
Landform: Alluvial Plain
Geology: Quaternary alluvium
Soils: Sandy Clay soils
Description: *Lysiphyllum gilvum* low open woodland community

Collector: N. Baker and C. Cross

Structure	Relative Dominance	Est. cover density:	Median height (m):	Height interval (m):	Scientific name:
T_1	Dominant: Associated	Sparse	6.3	5.6 – 9.4	*Lysiphyllum gilvum, Lysiphyllum caronii* *Eucalyptus coolabah*
T_2	Dominant	Sparse	4.5	3 – 5	*Acacia salicina*
S_1	Co-Dominant:	Sparse	2	1 – 3	*Eremophila mitchellii, Vachellia nilotica, Prosopis pallida, Myoporum acuminatum*
G	Co-dominant:				*Astrebla spp., Capparis lasiantha, Salsola kali*

Ecologically dominant layer: T1

Notes: Heavily over grazed, very little ground cover.

Existing Regional Ecosystem:	4.3.3
Proposed Regional Ecosystem:	4.3.23

Date: 28/08/2018
Site: F13-4
Survey method: Quaternary
Locality: Lot 168 on SP262319
Coordinates: S20°46.988' E144° 04.163'
Survey size: 500m^2
Landform: Alluvial Plain
Geology: Quaternary alluvium
Soils: Silty sandy clay
Description: Closed forest; mesquite dominated.

Collector: N. Baker and C. Cross

Structure	Relative Dominance	Est. cover density:	Median height (m):	Height interval (m):	Scientific name:
T_1	Dominant: Associated:	Sparse	8.2	7.5 – 13	*Lysiphyllium gilvum* *Acacia cambagei*
T_2	Dominant:	Dense	5	3 – 7	*Prosopis pallida* *Atalaya hemiglauca*
S_1	Dominant:	Sparse	2	1 – 3	*Prosopis pallida, Cryptostegia grandiflora*
G	Associated:	Sparse:			*Astrebla spp.*

Ecologically dominant layer: T_2

Notes: Ground is heavily exposed, very little to no grass cover

Existing Regional Ecosystem:	4.3.3
Proposed Regional Ecosystem:	4.3.4x2

Date: 28/08/2018
Site ID: F14-4
Survey Method: Quaternary
Locality: Lot 168 on SP262139
Coordinates: S20° 47.279' E144° 04.290'
Survey size: 500m^2
Landform: Alluvial Plain
Geology: Quaternary alluvium
Soils: Cracking alluvial clay
Description: Open woodland, little ground cover fringing oxbow lake,

Collector: N. Baker and C.Cross

Structure	Relative Dominance	Est. cover density:	Median height (m):	Height interval (m):	Scientific name:
T_1	Co-dominant: Associated:		12.9	10.8 – 13.3	*Eucalyptus coolabah, Lysiphyllum gilvum* *Lysiphyllium caronii*
T_2	Dominant:	Dense	8.2	4.7 – 9.75	*Eucalyptus coolabah, Lysiphyllum gilvum*
S_1	Dominant:	Sparse	1.7	1 – 3	*Lysiphyllium sp. Prosopis pallida, Cryptostegia grandiflora, Vachellia nilotica,*
G	Associated:	Sparse			*Nicotiana megalosiphion subsp. megalosiphion, Centipeda sp. Argemone ocholeuca, Pterocaulon serrulatum, Astrebla spp. Glinus lotoides, Pimelea decora*

Ecological dominant layer: T_1

Notes: Site appears to be heavily over grazed.

Existing Regional Ecosystem:	4.3.3
Proposed Regional Ecosystem:	4.3.4x2

Date: 29/08/2018
Site ID: F15-4
Survey method: Quaternary
Locality: Lot 168 on SP262319
Coordinates: S20° 47.723' E144° 04.715'
Survey size: 500m^2
Landform: Alluvial Plain
Geology: Quaternary alluvium
Soils: Sandy Cracking Soils
Description: Grasslands located on sandy alluvial soil

Collector: N. Baker and C. Cross

Structure	Relative Dominance	Est. cover density:	Median height (m):	Height interval (m):	Scientific name:
G	Co-dominant:	Sparse:	NA	NA	*Astrebla squarrosa, Astrebla spp., Aristida spp., Sporobolus australasicus, Salsola kali, Sclerolaena sp., Alternanthera pungens, Enchylaena tomentosa, Malvastrum americanum, Iseilema vaginiflorum*

Notes:

Existing Regional Ecosystem:	4.3.20
Proposed Regional Ecosystem:	4.3.20

Date: 29/08/2018
Site ID: F16-4
Survey method: Quaternary
Locality: Lot 168 on SP262319
Coordinates: S20°47.194' E144° 04.469'
Survey Size: 500m^2
Landform: Alluvial Plain
Geology: Quaternary alluvium
Soils: Dry Cracking alluvial soils
Description: *E. camaldulensis* and *E. coolabah* open woodland

Collector: N. Baker and C. Cross

Structure	Relative Dominance	Est. cover density:	Median height (m):	Height interval (m):	Scientific name:
T_1	Co-dominant:	Sparse	14.5	12 – 21.2	*Eucalyptus camaldulensis, Eucalyptus coolabah,*
T_2	Dominant: Associated:	Dense	8.2	4.7 – 9.75	*Lysiphyllum gilvum, Vachellia nilotica. Prosopis pallida,* *Parkinsonia aculeata,*
S_1	Associated:	Sparse	1.7	1 – 4	*Vachellia nilotica, Prosopis pallida*
G	Associated:	Sparse			*Argemone ochroleuca, Pterocaulon serrulatum, Nicotiana megalosiphion sub sp. megalosiphion, Salsola kali, Citrullus sp. Glinus lotoides*

Ecologically dominant layer: T_1

Notes: Small amounts of water present on site

Existing Regional Ecosystem:	4.3.3
Proposed Regional Ecosystem:	4.3.2

Date: 29/08/2018
Site: F17-4
Survey method: Quaternary
Locality: Lot 168 on SP262319
Coordinates: S20° 47.376' E144° 04.520'
Survey site size: 500m^2
Landform: Alluvial Plain
Geology: Quaternary alluvium
Soils: Sandy soils
Description: Low open woodland

Collector: N. Baker and C. Cross

Structure	Relative Dominance	Est. cover density:	Median height (m):	Height interval (m):	Scientific name:
T_1	Co-dominant: Associate:		7.6	5.2 – 13.5	*Eucalyptus coolabah, Acacia cambagei* *Lysiphyllum gilvum, Atalaya hemiglauca*
T_2	Dominant: Associated:	Dense	8.2	2 – 5.8	*Lysiphyllum gilvum, Prosopis pallida,* *Vachellia nilotica, Eremophila mitchellii, Grevillea striata, Acacia cambagei*
S_1	Dominant:	Sparse	1.5	1 – 2	*Vachellia nilotica, Eremophila mitchellii Acacia victoriae*
G	Associated:	Sparse:			*Sclerolaena birchii, Salsola australis, Astrebla spp., Enchylaena tomentisa, Capparis lasiantha.*

Ecologically dominant layer: T_1

Notes:

Existing Regional Ecosystem:	10.3.26
Proposed Regional Ecosystem:	4.3.4x2

Date: 29/08/2018
Site ID: F18-4
Survey Method: Quaternary
Locality: Lot 168 on SP262319
Coordinates: S20° 47.516' E144° 04.521'
Survey site size: 500m^2
Landform: Alluvial Plain
Geology: Quaternary alluvium
Soils: Sandy Soils
Regional ecosystem: 4.3.4x2
Description: Open woodland, located in drainage system

Collector: N. Baker and C. Cross

Structure	Relative Dominance	Est. cover density:	Median height (m):	Height interval (m):	Scientific name:
T_1	Dominant:	Sparse	12.7	8.3 – 13.6	*Eucalyptus coolabah*
T_2	Dominant: Associated:	Sparse	7	3 – 8	*Prosopis pallida, Eucalyptus coolabah* *Vachellia nilotica*
S_1	Associated:	Sparse	1.8	1 – 3	*Cryptostegia grandiflora, Parkinsonia aculeate, Vachellia nilotica.*
G	Associated:	Sparse:			*Astrebla spp.*

Ecologically dominant layer: T_2

Notes: Very little and sparse ground cover.

Existing Regional Ecosystem:	4.3.3
Proposed Regional Ecosystem:	4.3.4x2

Date: 29/08/2018
Site ID: F19-4
Survey method: Quaternary
Locality: Lot 168 on SP262319
Coordinates: S20° 47.170' E144° 03.855'
Survey site size: 500m^2
Landform: Alluvial Plain located in dry creek bed
Geology: Quaternary alluvium
Soils: Cracking clay soils
Description: Open woodland fringing creek bed. Density is caused by invasive weeds.


Collector: N. Baker and C. Cross

Structure	Relative Dominance	Est. cover density:	Median height (m):	Height interval (m):	Scientific name:
T_1	Co-dominant:	Sparse	9.95	6.9 - 11.7	*Acacia cambagei, Eucalyptus coolabah*
T_2	Dominant: Associated:	Dense	5.2	2 – 6	*Prosopis pallida, Eucalyptus coolabah* *Vachellia nilotica*
S_1	Associated:	Dense	1.5	1 – 2	*Cryptostegia grandiflora, Parkinsonia aculeata, Vachellia nilotica.*
G	Associated:	Sparse:			*Astrebla spp., Sporobolus australasicus, Sclerolaena birchii, Pterocaulon serrulatum , Salsola kali, Glinus lotoides, Streptoglossa sp.*

Ecologically Dominant Layer: T_2

Notes: Fringing dry creek bed with little to no ground cover, the density is caused by invasive species.

Existing Regional Ecosystem:	4.3.3
Proposed Regional Ecosystem:	4.3.4x2

Date: 29/08/2018
Site ID: F20-4
Survey Method: Quaternary
Locality: Lot 168 on SP262319
Coordinates: S20° 46.993' E144° 03.600'
Survey site size: 500m^2
Landform: Alluvial Plain
Geology Quaternary alluvium
Soils: Cracking clay/sandy soils
Description: Open woodland sparse grass cover, located in the drainage system

Collector: N. Baker and C. Cross

Structure	Relative Dominance	Est. cover density:	Median height (m):	Height interval (m):	Scientific name:
T_1	Dominant: Associated:	Sparse	10.2	9.1 – 13.2	*Eucalyptus coolabah,* *Acacia cambagei*
T_2	Co-dominant: Associated:	Sparse	6.9	4.5 – 7.5	*Eucalyptus coolabah, Prosopis pallida,* *Acacia cambagei,*
S_1	Associated:	Sparse	2.7	1 – 3	*Eremophila bignoniiflora, Eremophila mitchellii, Parkinsonia aculeata, Cryptostegia grandiflora*
G	Co-dominant:				*Astrebla spp. Sporobolus australasicus, Sclerolaena birchii, Pterocaulon serrulatum, Salsola kali, Enchylaena tomentosa, Alternanthera nodiflora*

Ecologically Dominant Layer: T_2

Notes: Survey site was conducted in drainage system.

Existing Regional Ecosystem:	4.3.3
Proposed Regional Ecosystem:	4.3.4x2

Date: 30/08/2018
Site ID: F21-4
Survey method: Quaternary
Locality: Lot 168 on SP262319
Coordinates: S20° 46.892' E144° 03.459'
Survey site size: 500m^2
Landform: Alluvial Plain
Geology: Quaternary alluvium
Soil: Cracking clay soils
Description: Low open woodland, Dense Shrub layer


Collector: N. Baker and C. Cross

Structure	Relative Dominance	Est. cover density:	Median height (m):	Height interval (m):	Scientific name:
T_1	Dominant:	Sparse	7	5 – 10	*Eucalyptus coolabah*
T_2	Co-dominant: Associated:	Sparse	4	2.5 – 5	*Acacia cambagei, Eucalyptus coolabah,* *Vachellia bidwillii*
S_1	Co-dominant:	Sparse	1.3	1 – 2	*Eremophila mitchellii, Prosopis pallida, Acacia cambagei, Acacia victoriae, Eremophila bignoniiflora*
G					*Astrebla spp. Sporobolus australasicus, Sclerolaena birchii, Pterocaulon serrulatum, Salsola kali, Glinus lotoides.*

Ecologically dominant layer: T_2

Notes: Ground cover is very sparse, grouped together otherwise

Existing Regional Ecosystem:	4.3.3
Proposed Regional Ecosystem:	4.3.4x2

Date: 30/08/2018
Site ID: F22-4
Survey method: Quaternary
Locality: Lot 168 on SP262319
Coordinates: S20° 47.016' E144° 03.244'
Survey site size: 500m^2
Landform: Alluvial Plain
Geology: Quaternary alluvium
Soil: Sandy clay
Description: *Acacia cambagei open woodland*


Collector: N, Baker and C. Cross

Structure	**Relative Dominance**	**Est. cover density:**	**Median height (m):**	**Height interval (m):**	**Scientific name:**
T_1	Dominant:	Sparse	4	3.5 – 5	*Acacia cambagei*
S_1	Co-dominant:	Sparse	1.6	1 – 3	*Eremophila mitchellii, Acacia cambagei, Vachellia nilotica, Eremophila bignoniiflora,*
G					*Astrebla spp. Sporobolus australasicus, Salsola kali, Enchylaena tomentosa, Streptoglossa spp. Salsola australis*

Ecologically dominant layer: S_1

Notes: Survey site is full of erosion scars. Very little ground cover in majority of the property

Existing Regional Ecosystem:	4.3.3
Proposed Regional Ecosystem:	4.3.9

Date: 30/08/2018
Site ID: F23-4
Survey method: Quaternary
Locality: Lot 168 on SP262319
Coordinates: S20° 46.732' E144° 03.334'
Survey site size: 500m^2
Landform: Alluvial Plain
Geology: Quaternary alluvium
Soils: Sandy, Clay soils
Description: *Lysiphyllum sp. o*pen woodland

Collector: N. Baker and C. Cross

Structure	Relative Dominance	Est. cover density:	Median height (m):	Height interval (m):	Scientific name:
T_1	Dominant Co-Dominant: Associated:	Sparse	13	11 – 18	*Eucalyptus camaldulensis Eucalyptus coolabah,* *Vachellia bidwillli*
T_2	Dominant: Associated:	Sparse	7	4 – 10	*Lysiphyllium gilvum, Lysiphyllum caronii Prosopis pallida, Acacia cambagei, Cryptostegia grandiflora, Vachellia bidwillii*
S_1	Co-dominant:	Sparse	2	1 – 3	*Lysiphyllium gilvum, Lysiphyllum caronii, Eremophila mitchellii, Vachellia nilotica, Capparis lasiantha.*
G					*Astrebla spp. Salsola kali, Enchylaena tomentose, Sclerolaena sp.*

Ecologically dominant layer: S_1
Notes:

Existing Regional Ecosystem:	4.3.3
Proposed Regional Ecosystem:	4.3.23

Date: 30/08/2018
Site ID: F24-4
Survey method: Quaternary
Locality: Lot 168 on SP262319
Coordinates:S20°46.675' E144° 03.121'
Survey site size: 500m^2
Landform: Alluvial plain
Geology: Quaternary alluvium
Soils: Cracking clay soils
Description: Low open woodland.

Collector: N. Baker and C. Cross

Structure	Relative Dominance	Est. cover density:	Median height (m):	Height interval (m):	Scientific name:
T_1	Co-Dominant: Associated:	Sparse	10.9	7.6 – 21	*Eucalyptus camaldulensis, Lysiphyllum gilvum, Lysiphyllum caronii, Eucalyptus coolabah, Vachellia bidwillii, Corymbia terminalis*
T_2	Co-dominant: Associated:	Sparse	9	4.3 – 7.6	*Lysiphyllium gilvum, Prosopis pallida,* *Vachellia nilotica, Grevillea striata.*
S_1	Co-dominant: Associated:	Sparse	2	1 – 4	*Prosopis pallida, Vachellia nilotica* *Ficus opposita, Capparis lasiantha,*
G					*Astrebla spp.*

Ecologically dominant layer: T1

Notes:

Existing Regional Ecosystem:	4.3.3
Proposed Regional Ecosystem:	4.3.4x2

Date: 30/08/2018
Site ID: F25-4
Survey method: Quaternary
Locality: Lot 168 on SP262319
Coordinates: S20° 46.783' E144° 02.804'
Survey site size: 500m^2
Landform: Alluvial Plain
Geology: Alluvial
Soils: Sandy soils
Description: Low open woodland, little to no grass cover.


Collector: N. Baker and C. Cross

Structure	Relative Dominance	Est. cover density:	Median height (m):	Height interval (m):	Scientific name:
T_1	Dominant: Associated:	Sparse	7	4 – 9.5	*Lysiphyllum gilvum* *Eucalyptus camaldulensis, Corymbia terminalis, Corymbia dallachiana, Prosopis pallida,*
T_2	Co-dominant: Associated:	Sparse	3	4.3 – 7.6	*Acacia victoriae, Lysiphyllum gilvum* *Vachellia nilotica*
S_1	Co-dominant: Associated:	Sparse	1.3	1 – 3.5	*Lysiphyllum gilvum, Vachellia nilotica* *Acacia victoriae, Eremophila bignoniiflora*
G					*Astrebla spp*

Ecologically dominant layer: T_2

Existing Regional Ecosystem:	4.3.3
Proposed Regional Ecosystem:	4.3.10

Date: 30/08/2018
Site ID: F26-4
Survey method: Quaternary
Locality: Lot 168 on SP262319
Coordinates: S20° 46.487' E144° 02.981'
Survey site size: 500m^2
Landform: Alluvial plain
Geology: Quaternary alluvium
Soils: Clay
Description: Tall open woodland


Collector: N. Baker and C. Cross

Structure	Relative Dominance	Est. cover density:	Median height (m):	Height interval (m):	Scientific name:
T_1	Co-dominant:	Sparse	12.5	7.5 – 16.2	*Eucalyptus camaldulensis, Corymbia terminalis.*
T_2	Co-dominant: Associated:	Sparse	6.25	4.8 – 7.5	*Eucalyptus camaldulensis, Prosopis pallida, Corymbia terminalis, Lysiphyllum gilvum, Grevillea striata.*
S_1	Co-dominant: Associated:	Sparse	2.8	1 – 4	*Vachellia farnesiana, Ziziphus mauritiana, Grevillea striata, Prosopis pallida, Eremophila mitchellii.*
G					*Astrebla spp., Salsola kali.*

Ecologically dominant layer: T_2

Notes: Ground cover very sparse, Trees are wide spread but very little ground cover.

Existing Regional Ecosystem:	4.3.3
Proposed Regional Ecosystem:	4.3.4x2

Date: 31/08/2018
Site ID: F27-4
Survey method: Quaternary
Locality: Lot 168 on SP262319
Coordinates: S20° 46.990' E144° 02.600'
Survey site size: 500m^2
Landform: Alluvial plain
Geology: Quaternary alluvium
Soils: Cracking clay soils
Description: Open woodland in old river channel.

Collector: N. Baker and C. Cross

Structure	Relative Dominance	Est. cover density:	Median height (m):	Height interval (m):	Scientific name:
T_1	Dominant:	Sparse	8	4 – 13	*Eucalyptus coolabah*
T_2	Dominant	Sparse	3	2.5 – 4	*Lysiphyllum gilvum*
S_1	Dominant: Associated:	Sparse	1.5	1 – 2	*Parkinsonia aculeata, Vachellia nilotica Eremophila bignoniiflora*
G					*Pterocaulon serrulatum, Alternanthera pungens, Malvastrum americanum, Glinus lotoides, Enchylaena tomenstosa , Cullen cinereum, Astrebla spp.,*

Ecologically dominant layer: T1

Notes: No natives present in the shrub layer, shrub layer is made up of invasive weeds. previous drainage system, little to no ground cover

Existing Regional Ecosystem:	4.3.3
Proposed Regional Ecosystem:	4.3.2

Date: 31/08/2018
Site ID: F28-4
Survey method: Quaternary
Locality: Lot 16 on SP262319
Coordinates: S20° 46.708' E144° 02.534'
Survey site size: 500m^2
Landform: Alluvial Plain
Geology: Quaternary alluvium
Soils: Sandy soils
Description:

Collector: N. Baker and C. Cross

Structure	Relative Dominance	Est. cover density:	Median height (m):	Height interval (m):	Scientific name:
T_1	Dominant:	Sparse	6	5 - 15	*Eucalyptus coolabah*
T_2	Co-dominant: Associated:	Sparse	4	2.5 – 5	*Acacia cambagei, Lysiphyllum gilvum,* *Prosopis pallida*
S_1	Co-dominant: Associated:	Sparse	1.5	1 – 2.5	*Lysiphyllum gilvum, Parkinsonia aculeata,* *Acacia cambagei, Xanthium strumarium, Eremophila bignoniiflora, Vachellia bidwillii*
G					*Sporobolus australasicus, Alternantera pungens, Salsola kali, Sida spp., Malvastrum americanum, Astrebla spp.*

.

Ecologically dominant layer: T_2

Existing Regional Ecosystem:	4.3.3
Proposed Regional Ecosystem:	4.3.4x2

Date: 31/08/2018
Site ID: F29-4
Survey method: Quaternary
Locality: Lot 168 on SP262319
Coordinates: S20° 46.308' E144° 02.502'
Survey site size: 500m^2
Landform: Alluvial plain
Geology: Quaternary alluvium
Soils: Sandy soils
Description: *Lysiphyllum gilvum* low open woodland

Collector: N. Baker and C. Cross

Structure	Relative Dominance	Est. cover density:	Median height (m):	Height interval (m):	Scientific name:
T_1	Dominant: Associated:	Sparse	4.5	3 – 6	*Lysiphyllum gilvum* *Grevillea striata, Prosopis pallida, Amyema miquelii*
T_2	Co-dominant: Associated:	Sparse	2.5	2 – 3	*Acacia cambagei, Lysiphyllum gilvum,* *Acacia victoriae, Acacia salicina*
S_1	Co-dominant: Associated:	Sparse	1.5	1 – 2	*Eremophila mitchellii, Lysiphyllum gilvum,* *Capparis lasiantha, Acacia salicina*
G					*Salsola kali, Astrebla spp. Sporobolus australasicus, Sida spp.*

Ecologically dominant layer: T2

Notes: *Lysiphyllum gilvum* woodland located on sandy soils

Existing Regional Ecosystem:	4.3.3
Proposed Regional Ecosystem:	4.3.23

Date: 31/08/2018
Site ID: F30-4
Survey method: Quaternary
Locality: Lot 168 on SP262319
Coordinates:
Survey site size: 500m^2
Landform: Alluvial Plain located in old drainage system
Geology: Quaternary alluvium
Soils: Cracking clay soils
Description: Eucalyptus woodland fringing paleo channel


Collector: N. Baker and C. Cross

Structure	**Relative Dominance**	**Est. cover density:**	**Median height (m):**	**Height interval (m):**	**Scientific name:**
T_1	Dominant: Sub-dominant:	Sparse	18	15 – 25	*Eucalyptus camaldulensis* *Eucalyptus coolabah*
T_2	Dominant: Associate:	Sparse	5	4-15	*Lysiphyllum gilvum* *Acacia sp.*
S_1	Co-dominant:	Sparse	2	1 – 3.5	*Acacia spp, Cryptostegia grandiflora,*
G					*Salsola kali, Astrebla spp. Sporobolus australasicus, Sida spp, Glinus lotoides*

Ecologically dominant layer: T1

Notes:

Existing Regional Ecosystem:	4.3.3
Proposed Regional Ecosystem:	4.3.2

Date: 31/08/2018
Site ID: F31-4
Survey method: Quaternary
Locality: Lot 168 on SP262319
Coordinates: S20° 46.014' E144° 02.649'
Survey site size: 500m^2
Landform: Alluvial Plain
Geology: Quaternary alluvium
Soils: Sandy Soils
Description: Open woodland


Collector: N. Baker and C. Cross

Structure	Relative Dominance	Est. cover density:	Median height (m):	Height interval (m):	Scientific name:
T_1	Dominant	Sparse	7	12 – 18	*Eucalyptus coolabah*
T_2	Dominant: Associated:	Mid-dense	5	3.5 - 10	*Lysiphyllum gilvum, Atalaya hemiglauca Cryptostegia grandiflora, Prosopis pallida*
S_1	Dominant:		1.5	1 – 3	*Acacia species, Eremophila mitchellii, Eremophila sp.*
G					*Astrebla spp. Salsola kali*

Ecologically dominant layer: T_1
Notes:

Existing Regional Ecosystem:	4.3.3
Proposed Regional Ecosystem:	4.3.4x2

Date: 31/08/2018
Site ID: F32-4
Survey method: Quaternary
Locality: Lot 168 on SP262319
Coordinates: S20° 46.179' E144° 02.368'
Survey site size: 500m^2
Landform: Quaternary alluvium Plain
Geology: Quaternary alluvium
Soils: Cracking clay soils
Description: *A. cambagei* low open woodland on alluvial plains

Collector: N. Baker and C. Cross

Structure	**Relative Dominance**	**Est. cover density:**	**Median height (m):**	**Height interval (m):**	**Scientific name:**
T_1	Dominant	Sparse	5	3 – 7	*Acacia cambagei*
S_1	Co-dominant: Associated:		1.5	1 – 3	*Acacia cambagei, Vachellia nilotica,* *Acacia victoriae, Eremophila mitchellii,*
G					*Astrebla spp. Salsola kali, Glinus lotoides, Atriplex muelleri, Sida spp., Sclerolaena spp., Capparis lasiantha, Alternanthera pungens*

Ecologically dominant layer:

Notes:

Existing Regional Ecosystem:	4.3.3
Proposed Regional Ecosystem:	4.3.9

Date: 31/08/2018
Site ID: F33-4
Survey method: Quaternary
Locality: Lot 168 on SP262319
Coordinates: S20° 46.485' E144° 02.317'
Survey site size: 500m^2
Landform: Alluvial plain
Geology: Quaternary alluvium
Soils: Cracking sandy soils
Description: Open grassland

Collector: N. Baker and C. Cross

Structure	Relative Dominance	Est. cover density:	Median height (m):	Height interval (m):	Scientific name:
G					*Astrebla spp., Sclerolaena sp., Malvastrum americanum, Atriplex muelleri, Enchylaena tomentosa, Salsola kali*

Ecologically dominant layer: G

Notes:

Existing Regional Ecosystem:	4.9.1c
Proposed Regional Ecosystem:	4.9.1c

Date: 31/08/2018
Site ID: F34-4
Survey Method: Quaternary
Locality: Lot 168 on SP262319
Coordinates: S20° 47.495' E144° 04.325'
Survey Site size: 500m^2
Landform: Alluvial plain
Geology: Quaternary alluvium
Soils: Sandy clay
Description: *E. coolabah* and *A. cambagei* low open woodland

Collector: N. Baker and C. Cross

Structure	Relative Dominance	Est. cover density:	Median height (m):	Height interval (m):	Scientific name:
T_1	Dominant: Associated:		10	8.2 – 12.5	*Eucalyptus coolabah,* *Acacia cambagei. Vachellia bidwillii*
S_1	Dominant: Associated:		2.5	1 – 3.5	*Vachellia nilotica* *Sandalwood, Eremophila mitchellii,*
G					*Astrebla spp., Sporobolus australasicus, Sida spp., Sclerolaena birchii, Malvastrum americanum, Salsola australis, Atriplex muelleri*

Ecologically dominant layer: T_1

Notes:

Existing Regional Ecosystem:	4.3.3
Proposed Regional Ecosystem:	4.3.4x2

Date: 31/08/2018
Site ID: F35-4
Survey Method: Quaternary
Locality: Lot 168 on SP262319
Coordinates: S20° 47.352' E144° 04.808'
Survey site size: 500m^2
Landform: Alluvial plain
Geology: Quaternary alluvium
Soils: Sandy clay
Description: Mixed eucalyptus open woodland

Collector: N. Baker and C. Cross

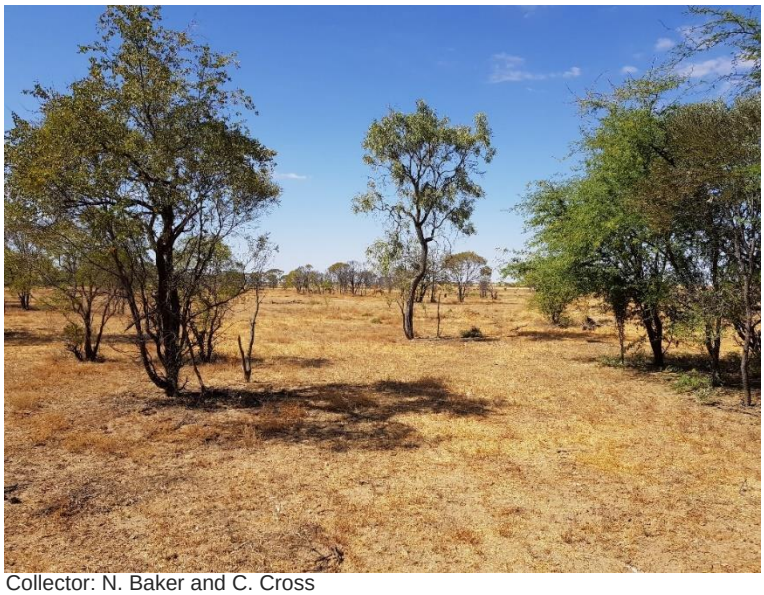
Structure	Relative Dominance	Est. cover density:	Median height (m):	Height interval (m):	Scientific name:
T_1	Co-dominant: Associated:	Sparse	18	11-21	*Eucalyptus camaldulensis s, Eucalyptus coolabah, Corymbia terminalis* *Lysiphyllum gilvum*
T_2	Dominant: Associated:	Sparse	9	7 – 10	*Prosopis pallida.* *Grevillea striata, Lysiphyllum gilvum, Corkwood wattle*
S_1	Co-dominant: Associated:		2	1 – 4	*Eremophila mitchellii, Acacia victoriae,* *Prosopis pallida, Capparis lasiantha, Vachellia farnesiana*
G					*Astrebla spp.*

Ecologically dominant layer: T1

Notes:

Existing Regional Ecosystem:	4.3.3
Proposed Regional Ecosystem:	4.3.10

Date; 1/09/2018
Site ID: F36-4
Survey method: Quaternary
Locality: Lot 168 on SP262319
Coordinates: S20° 47.280' E144° 04.021'
Survey site size: 500m^2
Landform: Alluvial Plain
Geology: Quaternary alluvium
Soils: Sandy soils
Description: Mixed low open woodland


Collector: N. Baker and C. Cross

Structure	Relative Dominance	Est. cover density:	Median height (m):	Height interval (m):	Scientific name:
T_1	Dominant:	Sparse	6	5 – 10	*Eucalyptus coolabah*
T_2		Sparse	4	3 – 5	*Acacia cambagei, Lysiphyllum gilvum, Prosopis pallida*
S_1	Co-dominant: Associated:		1.5	1 – 3	*Lysiphyllium gilvum, Eremophila mitchellii, Acacia cambagei,*
G					*Astrebla spp., Sclerolaena birchii, Atriplex muelleri, Salsola Kali, Enchylaena tomenstosa, Sclerolena sp.*

Ecologically dominant layer:

Notes:

Existing Regional Ecosystem:	4.3.3
Proposed Regional Ecosystem:	4.3.4x2

Date: 1/09/2018
Site ID: F37-3
Survey method: Tertiary
Locality: Lot 168 on SP262319
Coordinates: S20° 46.961' E144° 03.938'
Survey site size: 500m^2
Landform: Alluvial plain
Geology: Quaternary alluvium
Soils: Sandy/ Clay soils
Description: *Lysiphyllum gilvum* open woodland


Collector: N. Baker and C. Cross

Structure	Relative Dominance	Est. cover density:	Median height (m):	Height interval (m):	Scientific name:
T_1	Dominant: Sub-dominant: Associated:	Sparse	8.52	6.7 – 16.7	*Lysiphyllum gilvum* *Eucalyptus camaldulensis, Eucalyptus coolabah* *Grevillea striata,*
T_2	Dominant: Associated:	Sparse	5	4.5 – 6	*Lysiphyllum gilvum* *Prosopis pallida*
S_1	Co-dominant: Associated:		2.5	2 – 3	*Acacia salicina, Eremophila mitchellii*
S_2	Dominant:	Sparse	1.5	1 – 3	*Capparis lasiantha*
G					*Astrebla spp., Salsola kali*

Ecologically dominant Layer: T_1

Transect crown covered measured:

Interval (m):	Intercept	Str.	Height:
0 – 3.5	3.5m	T_1	11m
21 – 31	10m	T_1	16m

43 – 47	4m	T_1	10m
Summary: *Eucalyptus camaldulensis,* almost overtakes *Lysiphyllum gilvum.*			

Existing Regional Ecosystem:	4.3.3
Proposed Regional Ecosystem:	4.3.23

Date: 1/08/2018
Site ID: F38-4
Survey method: Quaternary
Locality: Lot 168 on SP262319
Coordinates: S20° 46.194' E144° 02.868'
Survey site size: 500m^2
Landform: Alluvial Plain
Geology: Quaternary alluvium
Soils: Sandy clay
Description: *E. coolabah* and *E. Camaldulensis* tall open woodland


Collector N. Baker and C. Cross

Structure	Relative Dominance	Est. cover density:	Median height (m):	Height interval (m):	Scientific name:
T_1	Co-dominant		12.4	9.7 – 19.7	*Eucalyptus coolabah, Eucalyptus camaldulensis*
T_2	Co-dominant:		8	4.5 – 12.2	*Lysiphyllum gilvum, Eucalyptus coolabah*
T_3	Co-dominant		3	2 – 4	*Vachellia nilotica, Prosopis pallida, Santalum lanceolatum*
S_1			1.5	1 – 3	*Carissa sp. Ficus opposita, Ziziphus mauritiana,*
G					*Astrebla spp., Malvastrum americanum, Capparis lasiantha.*

Ecologically Dominant Layer: T^1

Notes:

Existing Regional Ecosystem:	4.3.3
Proposed Regional Ecosystem:	4.3.4x2

Appendix D – Microbat Echolocation Call Analysis

Microbat Call Identification Report

Prepared for ("Client"):	Wild Environmental Consultants
Survey location/project name:	Hughenden area
Survey dates:	27th-31st August 2018
Client project reference:	
Job no.:	WIL-1801
Report date:	14 September 2018

Methods

Data received

Balance! Environmental received acoustic data recorded on three bat detectors (1 x Anabat SD2 and 2 x Song Meter SM2) over five consecutive nights (27-31 August 2018) near Hughenden, north-western Queensland. The data set included 330 zero-crossing analysis sequence files (ZC files) from the Anabat and 13,889 full-spectrum (WAV) files from the two SM2 units.

Data post-processing

The Song Meter WAV files were processed with *Kaleidoscope Pro* (version 5.0.1; Wildlife Acoustics, Maynard MA, USA) to extract bat calls and convert them to ZC file format. This process yielded 286 ZC files from SM2-011037 and 2731 from SM2-015213.

Call identification

Kaleidoscope Pro was used to perform a cluster analysis on the final set of 3347 ZC files. Calls within the resulting clusters were then identified manually by comparing the ZC call spectrograms with those of reference calls from northern and central Queensland and with published call descriptions (e.g. Reinhold *et al.* 2001; Pennay *et al.* 2004). Species distribution information (e.g. Churchill 2008; van Dyck *et al.* 2013) and on-line database records (e.g. http://www.ala.org.au) also guided the identification process. In most cases species identities were assigned in bulk to a cluster based on reviewing a subset of calls within the cluster; however, some clusters clearly contained more than one species, in which case species identities were assigned to individual files.

Species identification was based largely on sequences of more than four search-phase pulses; however, where good-quality foraging sequences were available (*i.e.* a call sequence with contiguous search-phase, attack-phase and feeding-buzz components), those calls were used to provide additional evidence of some species' presence. The feeding buzzes of *Miniopterus* species (bent-winged bats) and some Molossids (free-tailed bats) are quite distinctive, compared with those of Vespertilionids (vesper bats) with which they often share search-phase characteristics (Corben 2010).

Reporting standard

The format and content of this report follows Australasian Bat Society standards for the interpretation and reporting of bat call data (Reardon 2003), available on-line at http://www.ausbats.org.au/.

Species nomenclature follows Jackson & Groves (2015), which uses several new genus/species names compared with widely-used field guides (*e.g.* Churchill 2008; Van Dyck *et al.* 2013). New names used in this report include:

- *Ozimops lumsdenae* (Northern Free-tailed Bat) – formerly *Mormopterus beccarii*;
- *Ozimops ridei* (Ride's Free-tailed Bat) – formerly *Mormopterus ridei* or *M.* 'species 2';
- *Setirostris eleryi* (Bristle-faced Free-tailed Bat) – formerly *Mormopterus eleryi* and *M.* 'species 6'; and
- *Miniopterus orianae* (Large Bent-winged Bat) – formerly *M. schreibersii.*

Results & Discussion

At least thirteen and up to 17 species were recorded during this survey (see **Table 1**). Twelve species were positively identified, with one additional call type attributed to the *Nyctophilus* genus, within which species cannot be differentiated acoustically. Two *Nyctophilus* species potentially occur in the study area – *N. geoffroyi* and *N. gouldi*.

Many calls could not be reliably identified due to similarities in the characteristics of several species that may occur in the study area. These "unresolved" calls were attributed to one of 10 species-groups. Where "unresolved" calls were identified, all group members are listed as "possible" in **Table 1** unless other calls from the same detector-night were positively attributable to those species. Most unresolved groups contained species that were also positively identified; however, four groups potentially represented additional species that were not otherwise identified. These were:

- *Scotorepens greyii* and/or *Chalinolobus nigrogriseus*;
- *Scotorepens greyii* and/or *Setirostris eleryi*;
- *Chalinolobus picatus* and/or *Vespadelus baverstocki*; and
- *Miniopterus orianae* and/or *V. baverstocki*.

Appendix 1 contains sample call spectrograms recorded from each species during this survey.

Table 2 Bats recorded during the Hughenden survey, 27-31 August 2018.

♦ = 'definite' - at least one call was attributed unequivocally to the species
□ = 'possible' - calls like those of the species were recorded, but were not reliably identified

Detector:	Anabat				SM 011037				SM 015213			
Date:	27-Aug	29-Aug	31-Aug	27-Aug	28-Aug	29-Aug	30-Aug	27-Aug	28-Aug	29-Aug	30-Aug	31-Aug
Chalinolobus gouldii	♦	□	♦	□	♦	♦	♦	♦	♦	♦	♦	♦
Chalinolobus morio				♦	♦	♦		♦	♦	♦	♦	
Chalinolobus nigrogriseus	□			□	□	□	□	□	□	□	□	□
Chalinolobus picatus	□	□	♦	♦	♦	♦	□	♦	♦	♦	♦	♦
Nyctophilus species							♦	♦				♦
Scotorepens balstoni		♦		♦	♦	□	♦	□	□	♦	♦	♦
Scotorepens greyii	□	□	□	□	□	□	□	♦	♦	♦	□	♦
Vespadelus baverstocki			□	□	□	□		□	□	□	□	□
Miniopterus australis										♦	♦	♦
Miniopterus orianae		♦	□		□	♦		♦	♦	♦	♦	♦
Austronomus australis	♦	♦								♦	♦	♦
Chaerephon jobensis	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦
Ozimops lumsdenae		♦	♦	♦	♦	♦	♦	□	♦	♦	♦	♦
Ozimops ridei	♦	□	□	♦	♦	♦	□	♦	♦	♦	♦	♦
Setirostris eleryi											□	
Saccolaimus flaviventris	□	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦

References

Churchill, S. (2008). *Australian Bats*. Jacana Books, Allen & Unwin; Sydney.

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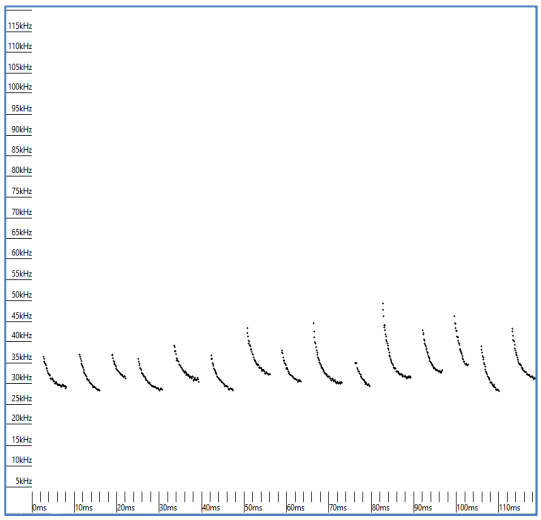
Glossary

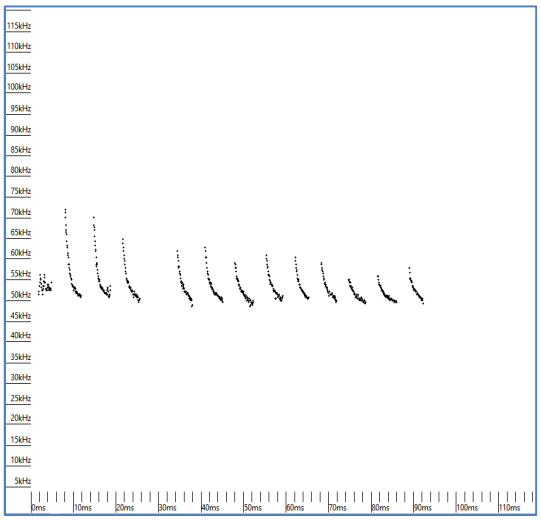
Technical terms used in this report are described in the following table.

Approach phase	The part of a bat *call* emitted as the bat starts to home in on a detected prey item; a transitional series of *pulses* between the *search phase* and *feeding buzz*, that become progressively steeper and shorter in duration.
Call	Refers to a single bat call, made up of a series of individual sound *pulses* in one or more *phases* (*search, approach, feeding buzz*).
CF (=Constant Frequency)	A type of *pulse* in which the dominant component consists of a more-or-less 'pure tone' of sound at a Constant Frequency; with *shape* appearing flat on the sonogram. Often also contains a brief *FM* component at the beginning and/or end of the CF component (*viz.* FM-CF-FM).
Characteristic frequency (Fc)	The frequency of the flattest part of a *pulse*; usually the lowest frequency reached in the *qCF* component of a pulse. This is often the primary diagnostic feature for species identification.
Duration	The time period from the beginning of a *pulse* to the end of the pulse.
Feeding buzz	The terminal part of a *call*, following the *approach phase*, emitted as the bat catches a prey item; a distinctive, rapid series of very steep, very short-duration pulses.
FM (=Frequency Modulated)	A type of *pulse* in which there is substantial change in frequency from beginning to end; *shape* ranges from almost vertical and linear through varying degrees of curvature.
FC range	Refers to the range of frequencies occupied by the *characteristic frequency* section of *pulses* within a call or set of calls.
Frequency sweep or "band-width"	The range of frequencies through which a *pulse* sweeps from beginning to end; Maximum frequency (Fmax) – minimum frequency (Fmin).
Knee	The transitional part of a *pulse* between the initial (usually steeper) frequency sweep and the *characteristic frequency* section (usually flatter); time to knee (Tk) and frequency of knee (Fk) can be diagnostic for some species.
Pulse	An individual pulse of sound within a bat *call*; the *shape*, *duration* and *characteristic frequency* of a pulse are the key diagnostic features used to differentiate species.
Pulse body	The part of the *pulse* between the *knee* and *tail* and containing the *characteristic frequency* section.
Pulse shape	The general appearance of a *pulse* on the sonogram, described using relative terms related to features such as slope and degree of curvature. See also *CF, qCF* and *FM*.
qCF (=quasi Constant Frequency)	A type of *pulse* in which there is very little change in frequency from beginning to end; *shape* appears to be almost flat. Some pulses also contain an *FM* component at the beginning and/or end of the qCF component (*viz.* FM-qCF).
Search phase	The part of a bat *call* generally required for reliable species diagnosis. A consistent series of *pulses* emitted by a bat that is searching for prey or and/or navigating through its habitat. Search phase pulses generally have longer duration, flatter slope and more consistent shape than *approach phase* and *feeding buzz* pulses.
Sequence	Literally, a sequence of *pulses* that may be from one or more bats; but generally refers to a *call* or part (e.g. *phase*) of a call.
Tail	The final component of a *pulse*, following the *characteristic frequency* section; may consist of a short or long sweep of frequencies either upward or downward from the Fc; or may be absent.

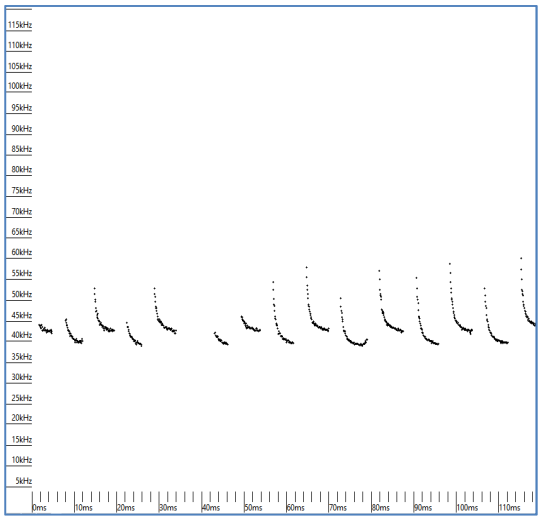
Appendix 1 Representative call sequences from the Hughenden survey, 27-31 August 2018.
Kaleidoscope zero-crossing spectrograms; time between pulses removed



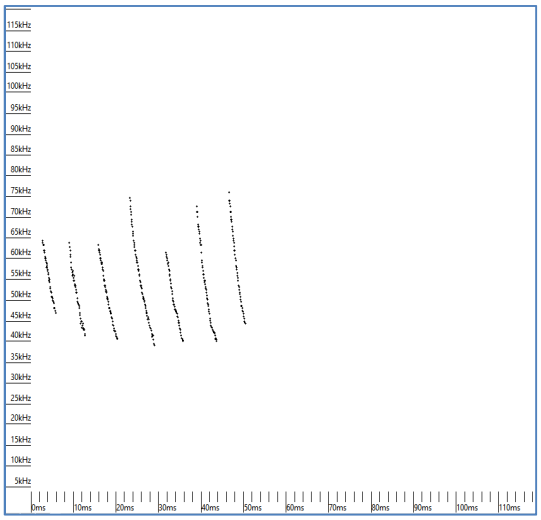
Chalinolobus gouldii



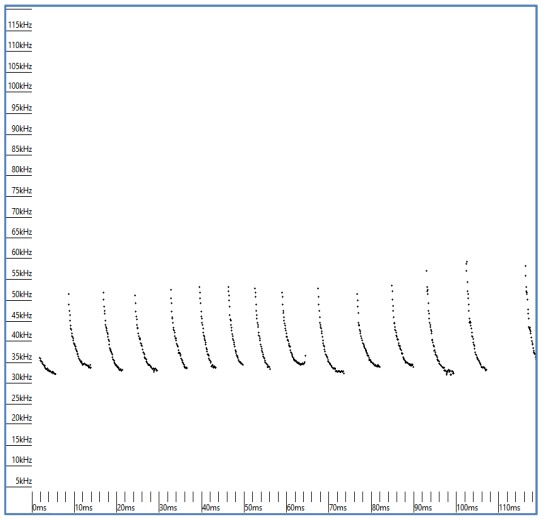
Chalinolobus morio



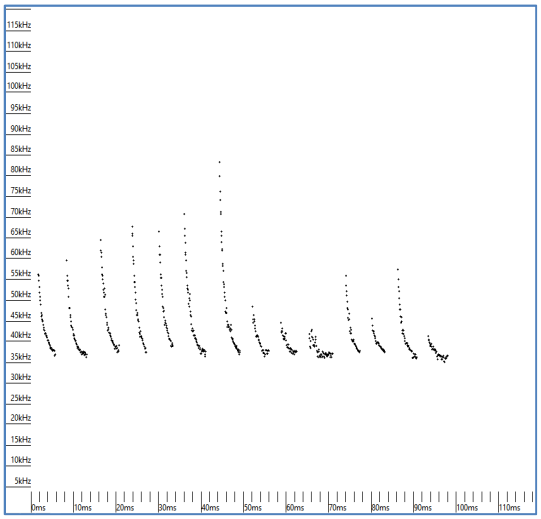
Chalinolobus picatus



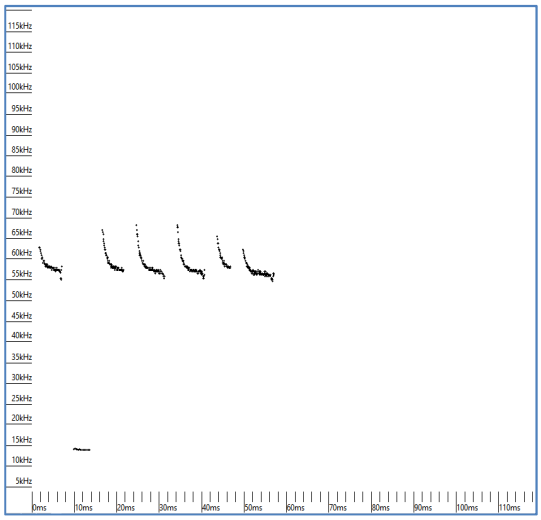
Nyctophilus species



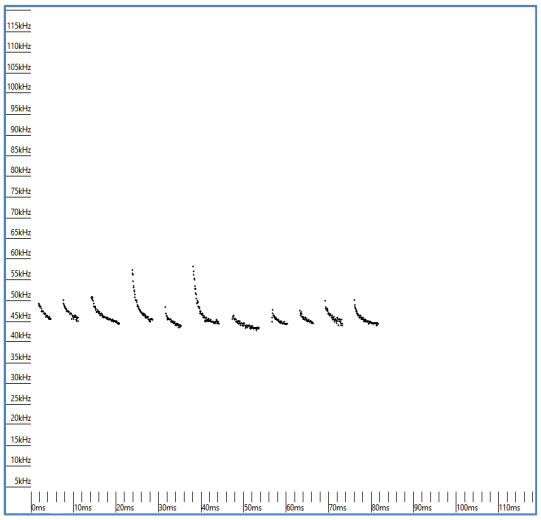
Scotorepens balstoni



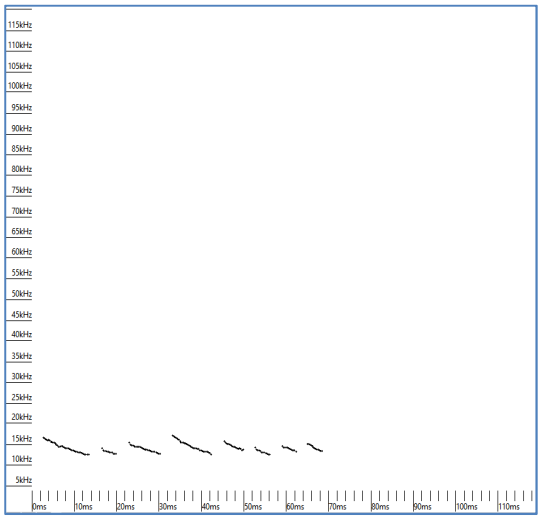
Scotorepens greyii



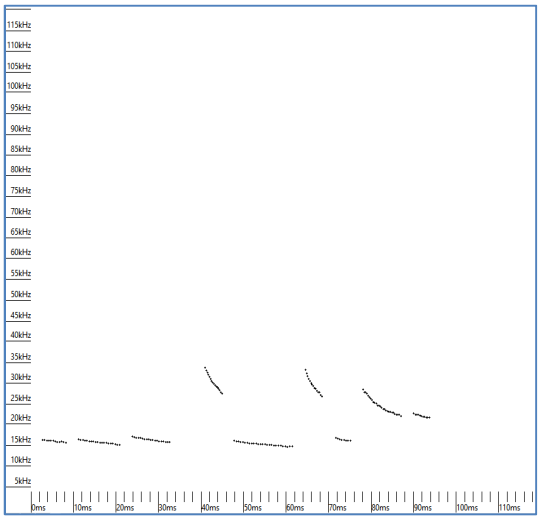
Miniopterus australis



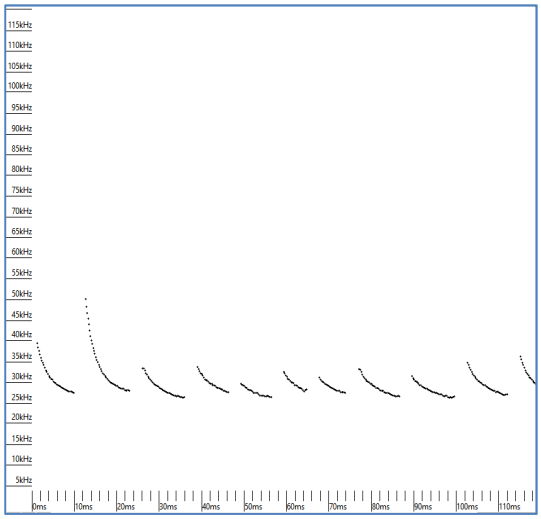
Miniopterus orianae



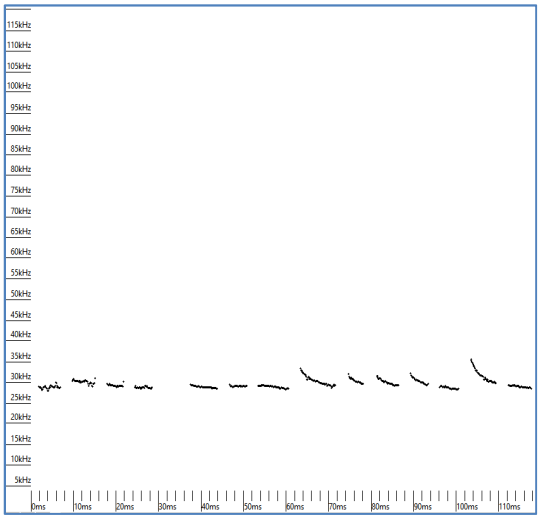
Austronomus australis



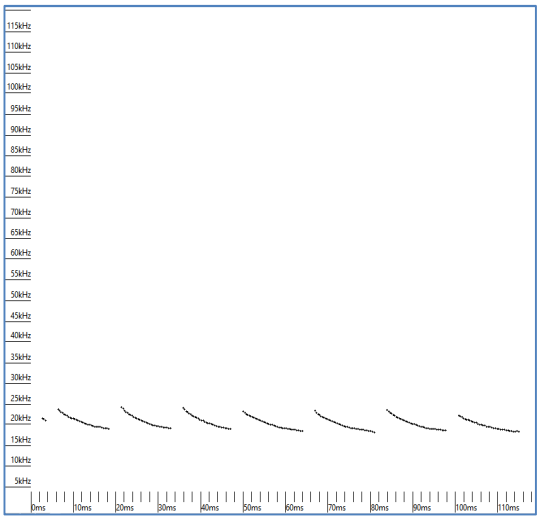
Chaerephon jobensis



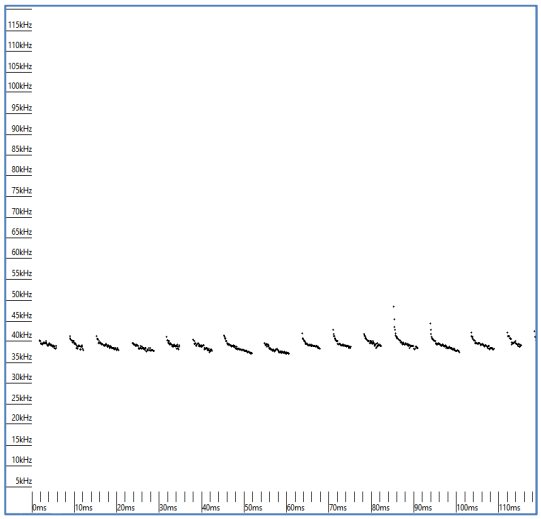
Ozimops lumsdenae



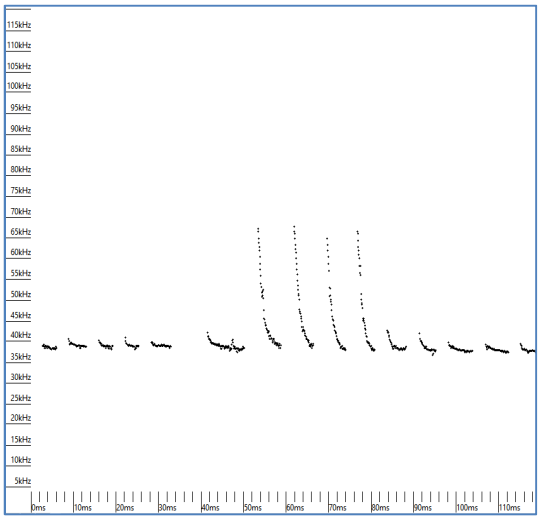
Ozimops ridei



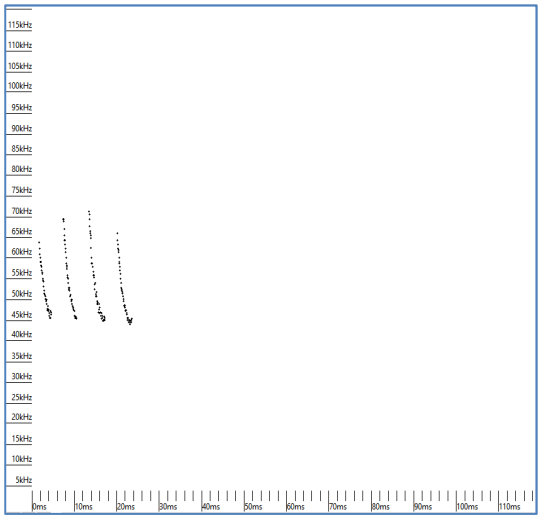
Saccolaimus flaviventris



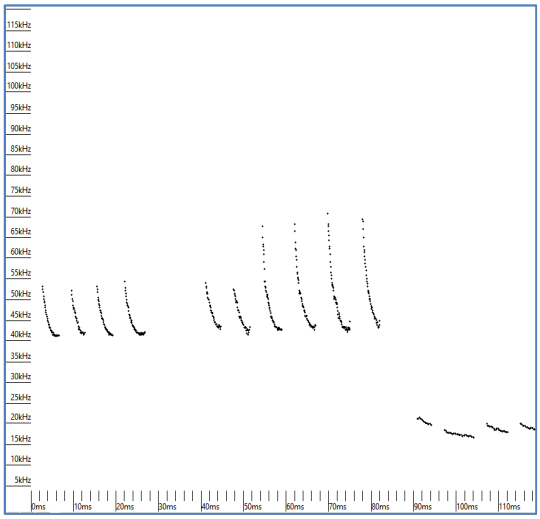
S. greyii / Chalinolobus nigrogriseus



S. greyii / *Setirostris eleryi*



M. orianae / Vespadelus baverstocki



C. picatus / Vespadelus baverstocki

Appendix E – Database Search Records

Australian Government
Department of the Environment and Energy

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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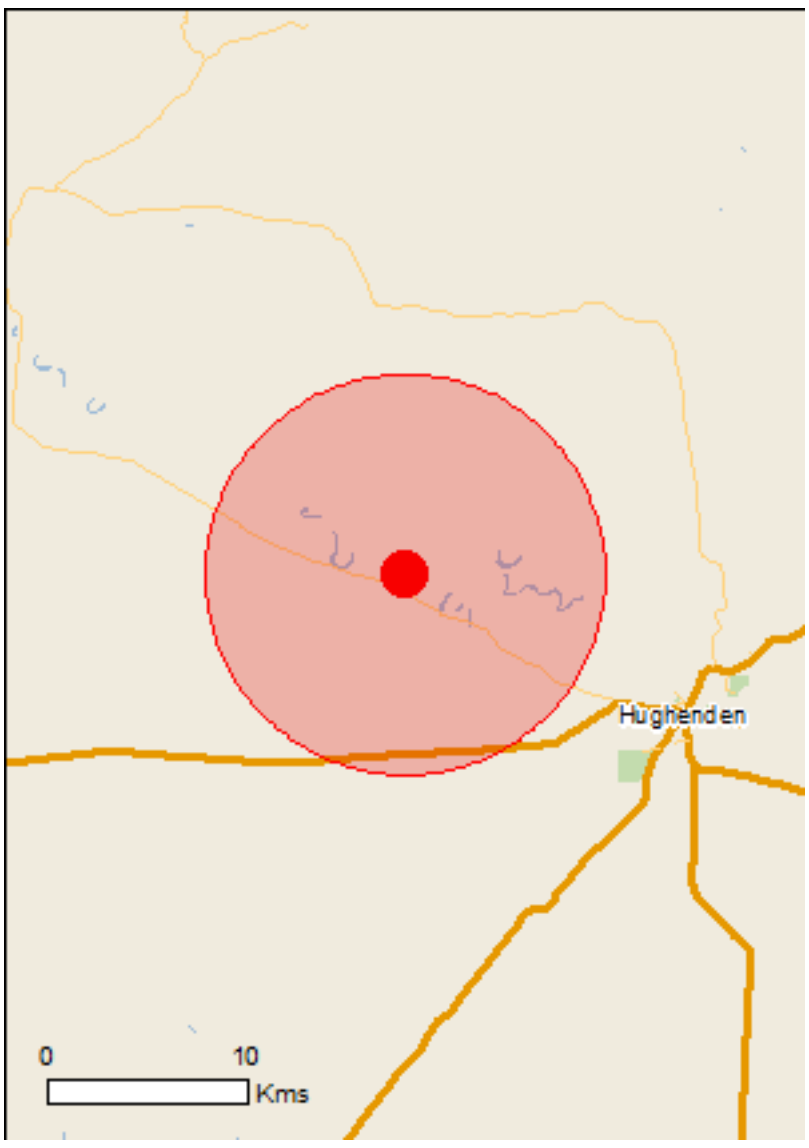

This map may contain data which are ©Commonwealth of Australia (Geoscience Australia), ©PSMA 2010

Coordinates
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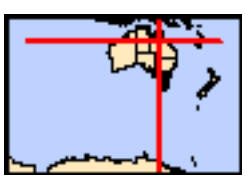

Summary

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:	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	None
Listed Threatened Species:	15
Listed Migratory Species:	9

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:	16
Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	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:	16
Nationally Important Wetlands:	None
Key Ecological Features (Marine)	None

Details

Matters of National Environmental Significance

Listed Threatened Species		[Resource Information]
Name	Status	Type of Presence
Birds		
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Erythrotriorchis radiatus Red Goshawk [942]	Vulnerable	Species or species habitat may occur within area
Grantiella picta Painted Honeyeater [470]	Vulnerable	Species or species habitat may occur within area
Neochmia ruficauda ruficauda Star Finch (eastern), Star Finch (southern) [26027]	Endangered	Species or species habitat likely to occur within area
Poephila cincta cincta Southern Black-throated Finch [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
Tyto novaehollandiae kimberli Masked Owl (northern) [26048]	Vulnerable	Species or species habitat may occur within area
Mammals		
Macroderma gigas Ghost Bat [174]	Vulnerable	Species or species habitat likely to occur within area
Macrotis lagotis Greater Bilby [282]	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 likely to occur within area
Sminthopsis douglasi Julia Creek Dunnart [305]	Vulnerable	Species or species habitat may occur within area
Plants		
Acacia crombiei Pink Gidgee [10927]	Vulnerable	Species or species habitat likely to occur within area

Name	Status	Type of Presence
Dichanthium queenslandicum King Blue-grass [5481]	Endangered	Species or species habitat may occur within area
Reptiles		
Acanthophis hawkei Plains Death Adder [83821]	Vulnerable	Species or species habitat may occur within area
Egernia rugosa Yakka Skink [1420]	Vulnerable	Species or species habitat may occur within area

Listed Migratory Species [Resource Information]

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

Name	Threatened	Type of Presence
Migratory Marine Birds		
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Migratory Terrestrial Species		
Cuculus optatus Oriental Cuckoo, Horsfield's Cuckoo [86651]		Species or species habitat may occur within area
Motacilla cinerea Grey Wagtail [642]		Species or species habitat may occur within area
Motacilla flava Yellow Wagtail [644]		Species or species habitat may occur within area
Migratory Wetlands Species		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat likely to occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Calidris melanotos Pectoral Sandpiper [858]		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		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat likely to 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]		Species or species habitat likely to occur within area
Ardea ibis Cattle Egret [59542]		Species or species habitat may occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area
Chrysococcyx osculans Black-eared Cuckoo [705]		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 may occur within area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area
Motacilla cinerea Grey Wagtail [642]		Species or species habitat may occur within area
Motacilla flava Yellow Wagtail [644]		Species or species habitat may occur within area
Rostratula benghalensis (sensu lato) Painted Snipe [889]	Endangered*	Species or species habitat may occur within area
Reptiles		

Name	Threatened	Type of Presence
Crocodylus johnstoni Freshwater Crocodile, Johnston's Crocodile, Johnston's River Crocodile [1773]		Species or species habitat may occur within area

Extra Information

Invasive Species [Resource Information]

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

Name	Status	Type of Presence
Birds		
Columba livia Rock Pigeon, Rock Dove, Domestic Pigeon [803]		Species or species habitat likely to occur within area
Passer domesticus House Sparrow [405]		Species or species habitat likely to occur within area
Frogs		
Rhinella marina Cane Toad [83218]		Species or species habitat known to occur within area
Mammals		
Canis lupus familiaris Domestic Dog [82654]		Species or species habitat likely to occur within area
Felis catus Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
Oryctolagus cuniculus Rabbit, European Rabbit [128]		Species or species 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		
Acacia nilotica subsp. indica Prickly Acacia [6196]		Species or species habitat likely to occur within area
Cryptostegia grandiflora Rubber Vine, Rubbervine, India Rubber Vine, India		Species or species

Name	Status	Type of Presence
Rubbervine, Palay Rubbervine, Purple Allamanda [18913] Jatropha gossypifolia		habitat likely to occur within area
Cotton-leaved Physic-Nut, Bellyache Bush, Cotton-leaf Physic Nut, Cotton-leaf Jatropha, Black Physic Nut [7507] Parkinsonia aculeata		Species or species habitat likely to occur within area
Parkinsonia, Jerusalem Thorn, Jelly Bean Tree, Horse Bean [12301] Parthenium hysterophorus		Species or species habitat likely to occur within area
Parthenium Weed, Bitter Weed, Carrot Grass, False Ragweed [19566] Prosopis spp.		Species or species habitat likely to occur within area
Mesquite, Algaroba [68407] Vachellia nilotica		Species or species habitat likely to occur within area
Prickly Acacia, Blackthorn, Prickly Mimosa, Black Piquant, Babul [84351]		Species or species habitat likely to occur within area
Reptiles		
Hemidactylus frenatus Asian House Gecko [1708]		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.

Threatened, migratory and marine species distributions have been derived through a variety of methods. Where distributions are well known and if time permits, maps are derived using either thematic spatial data (i.e. vegetation, soils, geology, elevation, aspect, terrain, etc) together with point locations and described habitat; or environmental modelling (MAXENT or BIOCLIM habitat modelling) using point locations and environmental data layers.

Where very little information is available for species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc). In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More reliable distribution mapping methods are used to update these distributions as time permits.

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

-20.7866 144.0742

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
-Department of Land and Resource Management, Northern Territory
-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, Canberra
-University of New England
-Ocean Biogeographic Information System
-Australian Government, Department of Defence
Forestry Corporation, NSW
-Geoscience Australia
-CSIRO
-Australian Tropical Herbarium, Cairns
-eBird Australia
-Australian Government – Australian Antarctic Data Centre
-Museum and Art Gallery of the Northern Territory
-Australian Government National Environmental Science Program
-Australian Institute of Marine Science
-Reef Life Survey Australia
-American Museum of Natural History
-Queen Victoria Museum and Art Gallery, Inveresk, Tasmania
-Tasmanian Museum and Art Gallery, Hobart, Tasmania
-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.

Department of the Environment
GPO Box 787
Canberra ACT 2601 Australia
+61 2 6274 1111

Queensland Government

Wildlife Online Extract

Search Criteria: Species List for a Specified Point
Species: All
Type: All
Status: All
Records: All
Date: All
Latitude: -20.7822
Longitude: 144.0590
Distance: 10
Email: nicholas.baker@wildenvironmental.com
Date submitted: Saturday 25 Aug 2018 20:25:49
Date extracted: Saturday 25 Aug 2018 20:30:02

The number of records retrieved = 32

Kingdom	Class	Family	Scientific Name	Common Name	I	Q	A	Records
animals	birds	Accipitridae	*Haliastur sphenurus*	whistling kite		C		1
animals	birds	Accipitridae	*Milvus migrans*	black kite		C		2
animals	birds	Alaudidae	*Mirafra javanica*	Horsfield's bushlark		C		1
animals	birds	Artamidae	*Artamus cinereus*	black-faced woodswallow		C		6
animals	birds	Artamidae	*Cracticus tibicen*	Australian magpie		C		2
animals	birds	Artamidae	*Cracticus nigrogularis*	pied butcherbird		C		1
animals	birds	Cacatuidae	*Eolophus roseicapilla*	galah		C		1
animals	birds	Columbidae	*Ocyphaps lophotes*	crested pigeon		C		2
animals	birds	Estrildidae	*Taeniopygia guttata*	zebra finch		C		1
animals	birds	Falconidae	*Falco cenchroides*	nankeen kestrel		C		2
animals	birds	Monarchidae	*Grallina cyanoleuca*	magpie-lark		C		1
animals	birds	Rhipiduridae	*Rhipidura leucophrys*	willie wagtail		C		2
plants	higher dicots	Aizoaceae	*Zaleya galericulata subsp. galericulata*			C		1/1
plants	higher dicots	Amaranthaceae	*Amaranthus cochleitepalus*			C		1/1
plants	higher dicots	Amaranthaceae	*Aerva javanica*		Y			1/1
plants	higher dicots	Amaranthaceae	*Amaranthus mitchellii*	Boggabri weed		C		2/2
plants	higher dicots	Asteraceae	*Peripleura arida*			C		1/1
plants	higher dicots	Capparaceae	*Capparis nummularia*			C		1/1
plants	higher dicots	Chenopodiaceae	*Salsola australis*			C		1/1
plants	higher dicots	Cleomaceae	*Cleome viscosa*	tick-weed		C		2/2
plants	higher dicots	Euphorbiaceae	*Euphorbia coghlanii*			C		1/1
plants	higher dicots	Euphorbiaceae	*Euphorbia inappendiculata var. queenslandica*			C		1/1
plants	higher dicots	Fabaceae	*Cullen cinereum*			C		2/2
plants	higher dicots	Fabaceae	*Tephrosia sp. (Magazine Hill P.Jones 365)*			C		1/1
plants	higher dicots	Malvaceae	*Sida laevis*			C		1/1
plants	higher dicots	Mimosaceae	*Vachellia nilotica*	prickly acacia	Y			6
plants	higher dicots	Mimosaceae	*Neptunia amplexicaulis forma amplexicaulis*			C		1/1
plants	higher dicots	Phyllanthaceae	*Notoleptopus decaisnei*			C		1/1
plants	higher dicots	Sparrmanniaceae	*Corchorus pumilio*			C		1/1
plants	monocots	Poaceae	*Cenchrus ciliaris*		Y			1/1
plants	monocots	Poaceae	*Iseilema vaginiflorum*	red flinders grass		C		1/1
plants	monocots	Poaceae	*Bothriochloa pertusa*		Y			1/1

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.