ecosure

Conservation significant fauna survey report (final)
Residue Management Area 2 expansion - Lot 7 SP228453

August 2016
RIO TINTO YARWUN PTY LTD

ecology / vegetation / wildlife / aquatic ecology / GIS

Executive summary

Rio Tinto Alcan Yarwun Pty Ltd commissioned Ecosure to conduct fauna surveys over an area of remnant vegetation proposed to be cleared on Lot 7 SP228453 for the expansion of Residue Management Area 2 in August 2015 and April 2016.

A baseline flora and fauna assessment was previously undertaken by CQG Consulting in April 2013. This survey collected opportunistic fauna data but did not undertake detailed survey techniques.

Ecosure undertook surveys across the project site in August 2015, targeting conservation significant species that could potentially occur within the area. Various survey methods were utilised including:

- trapping using Elliot traps, cage traps, pitfall and funnel traps
- area searches in potential habitat areas
- night surveys to detect nocturnal species
- motion camera traps
- playback of fauna calls
- Anabat© recording.

Conservation significant species

Eight species listed under the federal *Environment Protection and Biodiversity Conservation Act 1999* and/or listed under the state *Nature Conservation Act 1992* were recorded in the project site. These included:

- koala (*Phascolarctos cinereus*) listed as vulnerable under both acts, was recorded at one location
- squatter pigeon (*Geophaps scripta scripta*) listed as vulnerable under both acts, was recorded at several locations
- short-beaked echidna (*Tachyglossus aculeatus)*, a special least concern species under the Nature Conservation Act was recorded across the project site
- latham's snipe (*Gallinago hardwickii)* a migratory species listed under international treaties and the Environment Protection and Biodiversity Conservation Act, were recorded at well vegetated dams onsite
- rainbow bee-eater (*Merops ornatus*), satin flycatcher (*Myiagra cyanoleuca*) and Rufous fantail (*Rhipidura rufifrons*), all migratory species listed under international treaties and the Environment Protection and Biodiversity Conservation Act, were recorded at several locations.

Glossary, acronyms and abbreviations

ALA	Atlas of Living Australia
CQG	CQG Consulting
DBH	Diameter at breast height
DEHP	Queensland Department of Environment and Heritage Protection
DoE	Federal Department of the Environment
DNRM	Queensland Department of Natural Resource and Mines
Ecosure	Ecosure Pty Ltd
E	Endangered (conservation significant fauna species)
EPBC Act	Federal *Environment Protection and Biodiversity Conservation Act 1999*
EVNT	Endangered, vulnerable and near threatened (conservation significant fauna species)
LC	Least concern
LGA	Local government authority
MNES	Matters of national environmental significance
MSES	Matters of state environmental significance
NC Act	Queensland *Nature Conservation Act 1992*
NT	Near threatened (conservation significant fauna species status)
RE	Regional ecosystem
RTAY	Rio Tinto Aluminium Yarwun
RMA2	Residue management area 2
SAT	Spot Assessment Technique
SEVT	Semi-evergreen vine thicket
SLC	Special least concern under the NC Act
SMP	Species management program
SSMP	Significant species management program
V	Vulnerable (conservation significant fauna species status)
VM Act	Queensland *Vegetation Management Act 1999*

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1 Introduction

Rio Tinto Alcan Yarwun Pty Ltd (RTAY) commissioned Ecosure to conduct fauna surveys within the proposed expansion area of Residue Management 2. The expansion involves clearing an area containing remnant vegetation on Lot 7 SP228453. A baseline flora and fauna assessment report, the *Baseline Flora and Fauna Assessment Residue Management Area 2,* was prepared by CQG Consulting in March 2013. That report identified a range of species known or with the potential to occur on site. No targeted survey techniques were used to determine the presence of conservation significant fauna species or their habitat.

Conservation significant species include those which are endangered, vulnerable or near threatened (EVNT) species, special least concern (SLC) fauna species listed under the *Nature Conservation Act 1992* (NC Act) and species listed as threatened and/or migratory under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

The fauna and flora dry season survey and report conducted by Ecosure in August 2015 provided further information regarding conservation significant species which occur or potentially occur within the proposed clearing area (Ecosure 2015a, Ecosure 2015b). This report details the survey methods utilised during the wet season survey; but includes the results of both the August 2015 survey and the wet season survey undertaken by Ecosure in March 2016. This report should therefore be read in conjunction with Ecosure (2015a and 2015b).

1.1 Scope of works

The purpose of the wet season fauna survey was to provide additional information on conservation significant species which are known to occur or which are likely to occur within Lot 7 SP228453, taking into account seasonal variability.

The scope of this project includes:

- review of previous ecological surveys for the study area, including CQG (2013) and Ecosure survey in August 2015,
- targeted and/or incidental fauna and habitat survey for conservation significant species potentially occurring within the entire site (Lot 7 SP 228453).

The scope of this project did not include a detailed impact assessment, although a number of recommendations have been provided for consideration in project planning.

1.2 General description of project site

Lot 7 SP228453 is an 898.4 ha parcel of land situated adjacent to the current RMA 1 dam site. The site is situated in the Brigalow Belt bioregion and forms part of the Calliope catchment. 35.5% of the site is mapped as containing remnant vegetation (Mortimer & Cox 1999).

The site has largely been impacted by vegetation clearing in the past and is heavily infested with the non-native weed *Sporobolus pyramidalis* (giant rat's tail grass).

1.2.1 Habitat types and regional ecosystems present on site

The baseline report (CQG 2013) identified the broad habitat types (Table 1).

Table 1 Broad habitat types

Habitat	Habitat values	Department of Natural Resources & Mines (DNRM)- mapped regional ecosystems (REs) within the project area that contain potential habitat
Flat, gentle grassland slopes	Largely cleared, some fallen logs and other ground habitat. Few large hollow-bearing trees	Unmapped
Gullies and drainage lines	Some vine thicket with potential habitat for threatened species	11.3.25 – Riverine 11.11.18 – Vine thicket
Woodlands on low slopes and hills, predominate habitat remaining onsite	Some large hollow bearing trees, fallen logs and debris, leaf litter and rocky scree	11.3.4 – Alluvium flats 11.3.26 – *E. moluccana* 11.11.4 – *Eucalyptus crebra* woodland 11.11.15 – *Eucalyptus crebra* woodland
Ridge crests	Some hollow bearing trees, rocky outcrops and fallen logs, vine thicket	11.11.5 – Semi-evergreen vine thicket (SEVT) 11.11.18 – Vine thicket 11.11.4c – *Eucalyptus crebra, Corymbia citriodora*
Freshwater lake, dams, streams	Waterbird habitat – habitat diversity limited	Unmapped
Freshwater marsh, soak	Water bird habitat – habitat diversity limited	Unmapped

The Ecosure vegetation clearing report undertaken in August 2015 identified and mapped eight REs on site (Table 2). This table also notes the status of each RE under the Queensland *Vegetation Management Act 1999* (VM Act).

Table 2 Regional ecosystems

RE	Description
11.3.4 (11.7 ha) VM Act Status – Of Concern	*Eucalyptus tereticornis* woodland to open forest. Other tree species that may be present and locally dominant include *E. camaldulensis, Corymbia tessellaris, E. coolabah, C. clarksoniana, E. populnea or E. brownii, E. melanophloia, E. platyphylla or Angophora floribunda. E. crebra* and *Lophostemon suaveolens* may be locally dominant (subregion 14). A shrub layer is usually absent, and a tall grassy ground layer is often prominent, and may include any of *Bothriochloa bladhii subsp. bladhii, Aristida spp., Heteropogon contortus, Dichanthium spp.* and *Themeda triandra*. Heavily grazed areas tend to have shorter or annual grasses such as *Dactyloctenium radulans* or *Bothriochloa spp*. Occurs on Cainozoic alluvial plains and terraces. Occurs on variety of soils, including deep cracking clays,

RE	Description
	medium to fine textured soils, and deep texture-contrast soils. (BVG1M: 16c)
11.3.25 (12.4 ha) VM Act Status – Of Concern	*Eucalyptus camaldulensis* or *E. tereticornis* open forest to woodland. Other tree species such as *Casuarina cunninghamiana, E. coolabah, Melaleuca bracteata, Melaleuca viminalis, Livistona spp*. (in north), *Melaleuca spp*. and *Angophora floribunda* are commonly present and may be locally dominant. An open to sparse, tall shrub layer is frequently present dominated by species including *Acacia salicina, A. stenophylla* or *Lysiphyllum carronii*. Low shrubs are present, but rarely form a conspicuous layer. The ground layer is open to sparse and dominated by perennial grasses, sedges or forbs such as *Imperata cylindrica, Bothriochloa bladhii, B. ewartiana, Chrysopogon fallax, Cyperus dactylotes, C. difformis, C. exaltatus, C. gracilis, C. iria, C. rigidellus, C. victoriensis, Dichanthium sericeum, Leptochloa digitata, Lomandra longifolia* or *Panicum spp*. Occurs on fringing levees and banks of major rivers and drainage lines of alluvial plains throughout the region. Soils are very deep, alluvial, grey and brown cracking clays with or without some texture contrast. These are usually moderately deep to deep, soft or firm, acid, neutral or alkaline brown sands, loams or black cracking or non-cracking clays, and may be sodic at depth (Burgess 2003). (BVG1M: 16a)
RE 11.3.26 (5 ha) VM Act Status – Least Concern	*Eucalyptus moluccana* or *E. woollsiana +/- E. populnea +/- E. melanophloia* tall open forest to woodland +/- *Allocasuarina luehmannii* low tree layer and a grassy ground layer. In northern subregions, there may be shrub layer of any of *Eremophila mitchellii, Flindersia dissosperma, Citrus glauca* or *Petalostigma pubescens*, with a sparse grassy ground layer. Occurs on margins of Cainozoic alluvial plains on deep texture contrast soils. (BVG1M: 13d)
RE 11.11.4 (161.7 ha) VM Act Status – Least Concern	*Eucalyptus crebra* woodland +/- *Corymbia citriodora +/- E. tereticornis +/- C. tessellaris +/- Lophostemon suaveolens* with *Xanthorrhoea spp*. and *Macrozamia spp*. often present in shrub layer. *Eucalyptus moluccana* often dominates the tree canopy on lower colluvial slopes. Generally occurs on coastal hills and ranges formed on moderately to strongly deformed and metamorphosed sediments and interbedded volcanics. (BVG1M: 13c)
RE 11.11.4c (8 ha) VM Act Status – Least Concern	*Eucalyptus moluccana* dominated woodland. Other tree species listed above may occur as sub or co-dominant species. (BVG1M: 13d)
RE 11.11.5 (3.7 ha) VM Act Status – Least Concern	Microphyll rainforest (with or without *Araucaria cunninghamii* emergents) and semi-evergreen vine thicket. Floristics and structure varies with site. There is usually a continuous tree canopy (9 - 15m high) with a wide range of species including *Flindersia australis, Backhousia kingii, Excoecaria dallachyana, Melia azedarach, Ficus spp., Strychnos psilosperma, Macropteranthes leichhardtii* and *Alstonia constricta*. An emergent tree layer (12- 20m high) commonly occurs with species including *Brachychiton australis, B. rupestris, Flindersia australis, Ficus spp. Araucaria cunninghamii* and sometimes *Eucalyptus spp*. There is a shrub layer (1-3m high) with density depending on canopy cover and frequent species including *Croton spp., Abutilon spp., Capparis spp. Acalypha eremorum* and *Codonocarpus attenuatus*. Ferns, mosses and vines are common. Occurs on hilly terrain with slopes ranging from 55 and up to 80% locally. Formed from moderately to strongly deformed and metamorphosed sediments and interbedded volcanics. Associated soils are generally shallow loams and clays with minor areas of deeper cover. (BVG1M: 7a)
RE 11.11.15 (111.6 ha) VM Act Status – Least Concern	*Eucalyptus crebra +/- Corymbia erythrophloia +/- E. populnea +/- E. melanophloia +/- C. tessellaris +/- C. clarksoniana* woodland to open woodland often with a shrubby layer. *Eucalyptus exserta* and *E. platyphylla* present in central coastal part of bioregion. Occurs on undulating rises and low hills, often with distinct strike pattern formed on moderately to strongly deformed and metamorphosed sediments and interbedded volcanics and Permian sediments. (BVG1M: 13c)
RE 11.11.18 (2.5 ha) VM Act Status – Endangered	Semi-evergreen vine thicket. Occurs on undulating plains, rises and gentle slopes of ranges formed on moderately to strongly deformed and metamorphosed sediments and interbedded volcanics. (BVG1M: 7a)

2 Methods

2.1 Desktop assessment

Prior to field surveys, a preliminary desktop assessment was undertaken to identify possible survey sites, as well as to identify conservation significant fauna species that may inhabit the area.

The desktop assessment included:

- EPBC protected matters database search conducted over a 2 km radius surrounding the coordinates; latitude: -23.8769 longitude: 151.0515
- Wildlife online database search was conducted over a 5 km radius surrounding the coordinates, latitude: -23.8769 longitude: 151.0515
- Essential habitat database – VM Act
- perusal of available environmental impact studies (EIS) data of surrounding major project sites existing reports and previous studies
- Queensland Government environmental reports relating to Matters of State Environmental Significance (MSES)
- the Atlas of Living Australia (2016) database for locations of conservation significant fauna species
- review of the Department of the Environment (DoE) SPRAT profiles (DoE 2016b) and recommended survey guidelines for potential threatened species as identified from the desktop study.

2.2 Field surveys

The field surveys were undertaken from 14 – 18 March 2016 by James Binkhorst (Wildlife Biologist) and Lindsay Boyd (Environmental Scientist). This included a four night survey period with one day (total) for deployment and retrieval of traps, cameras and other fauna surveying equipment. Additional resources were allocated for the setup of fauna trap lines, ensuring delivery of the fauna survey within the stipulated time.

Systematic fauna surveys using a full suite of techniques were undertaken across the six habitat types and REs previously identified in flora surveys, including:

- area search/transects
- spotlighting/night survey where appropriate
- broadcast survey – call back to determine presence of nocturnal
- trapping – pitfall/Elliot traps to determine species of small mammals and reptiles
- species habitat surveys – hollow logs, trees

- Anabat® – determination of bat species
- motion sensing camera traps
- incidental observations.

Early morning and evening surveys were undertaken to provide the best opportunity to observe fauna species.

Fauna survey sites (Figure 1), were selected based on the desktop analysis as well as the findings from the previous survey undertaken by Ecosure (2015) which identified the most likely habitat for potential conservation significant fauna species. The rest of the site was surveyed for incidental observations during vehicle and foot surveys.

2.2.1 Survey methods

A range of methods (detailed below) were used across the project site designed to maximise the number of vertebrate species observed.

2.2.2 Targeted survey methods

Conservation significant species identified in the desktop assessment as potentially occurring within the project area, and the required survey methods survey effort for each species are shown in Table 3.

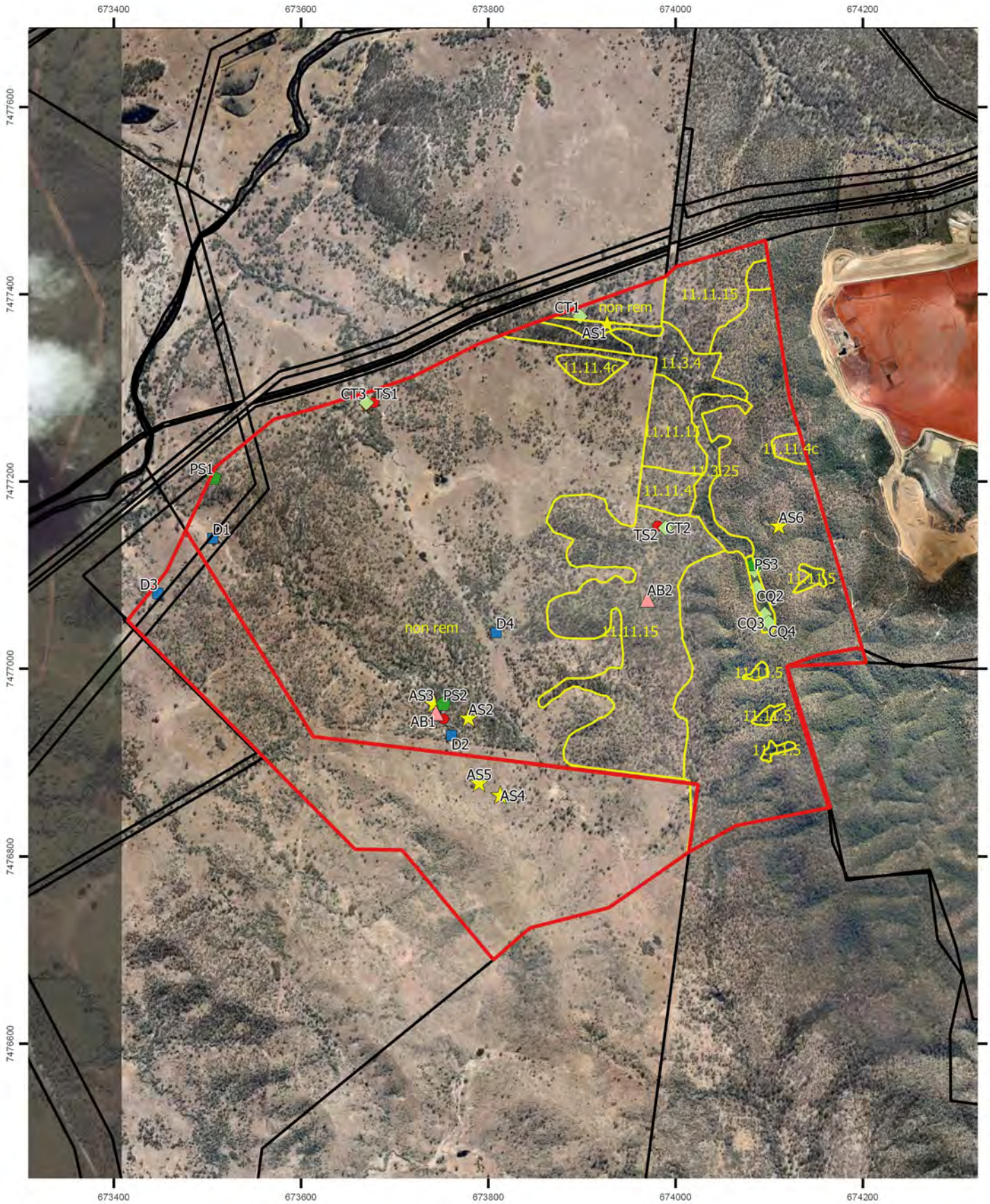

Figure 1: Location of fauna trapping sites

Rio-Tinto Yarwin

- Active Search
- Anabat
- Camera Trap
- Dam
- Playback Site
- Trapping Site
- Property Site
- Cadastre
- PMAV/RE boundaries

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Job number: PR1250
Revision: 0
Author: MROG
Date: 05/05/2016

0 300 600 900 1200 m

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

Table 3 Survey methods/effort for the EVNT species

Species (scientific and common name)	NC Act status*	EPBC Act status*	Survey methods required	Cumulative survey effort for dry and wet season surveys (person hours unless otherwise stated)
Australian painted snipe (*Rostratula australis*) RE: non-remnant and 11.3.25	V	E/Marine	- Bird survey - Incidental sightings throughout site - Area searches - (Targeted stationary observations 10hrs/5 days, Land based area searches/transects 10hrs/3 days)	- Bird surveys of dams and wetlands (32hrs/10 days)
Barn swallow (*Hirundo rustica*) RE: 11.3.25 & 11.3.4	SLC	Marine/ Migratory	- Bird survey - Incidental sightings throughout site	- Incidental surveys – none recorded
Black-breasted button quail (*Turnix melanogaster*) RE: 11.11.18, 11.11.5 & non remnant	V	V	- Search suitable habitat for platelets - Bird survey - Incidental sightings throughout suitable habitat - Call back - Motion sensor camera traps - (15hrs-3 days(50ha))	- Active searches of remaining habitat (10 hrs/2 people) - Motion sensor cameras (8 nights at 11 sites = 1056hrs total)
Black-faced monarch (*Monarcha melanopsis*) RE: 11.3.4, 11.11.4, 11.11.4c, 11.11.5, 11.11.15, 11.11.18 & 11.3.25	SLC	Marine/ Migratory	- Bird survey - Incidental sightings throughout site	- Incidental and active searches
Black-throated finch (southern) (*Poephila cincta cincta*) RE: 11.3.4, 11.11.4, 11.11.4c, 11.11.5, 11.11.15, 11.11.18 & 11.3.25	E	E	- Bird survey - Incidental sightings throughout site - (10hrs/5 days land-based area searches)	- Incidental sightings
Cattle egret (*Ardea ibis*) RE: 11.3.25, 11.3.4 & non remnant	SLC	Marine/ Migratory	- Bird survey - Incidental sightings throughout site -	- Bird surveys of dams and wetlands (32hrs/10 days)
Collared delma (*Delma torquata*)	V	V	- Pitfall trap lines comprising six 20 litre buckets and funnel traps	- Pitfall/funnel traps and Elliot traps (1440hrs/10 days)

Species (scientific and common name)	NC Act status*	EPBC Act status*	Survey methods required	Cumulative survey effort for dry and wet season surveys (person hours unless otherwise stated)
RE: 11.3.4, 11.11.4, 11.11.4c, 11.11.15, 11.3.25			spread along a 15 m fence - Active search	
Coxen's fig parrot (*Cyclopsitla diophthalma coxeni*) RE: 11.3.4, 11.3.25, 11.11.5, 11.11.18	E	E	- Bird survey - Incidental sightings throughout site - Mature fruiting figs to be surveyed (20hrs/5days)	- Incidental surveys - Active search of suitable Fig trees (4hrs/4 days)
Dunmall's snake (*Furina dunmalli*) RE: 11.3.4, 11.11.4, 11.11.15, 11.3.25	V	V	- Pitfall trapping - Active searches (Diurnal & Nocturnal)	- Pitfall/funnel traps and Elliot traps (1440hrs/10 days)
Eastern great egret (*Ardea modesta*) RE: 11.3.25, 11.3.4 & non remnant	SLC	Marine/ Migratory	- Bird survey - Incidental sightings throughout site	- Bird surveys of dams and wetlands (32hrs/10 days)
Fork-tailed swift (*Apus pacificus*) RE: 11.3.4, 11.11.4, 11.11.4c, 11.11.5, 11.11.15, 11.11.18, 11.3.25	SLC	Marine/ Migratory	- Bird survey - Incidental sightings throughout site	- Incidental sightings
Grey-headed flying-fox (*Pteropus poliocephalus*) RE: 11.3.4, 11.11.4, 11.11.4c, 11.11.5, 11.11.15, 11.11.18, 11.3.25	LC	V	- Night foraging survey - Check flowering *Eucalyptus* - spotlight	- Incidental sightings - Nocturnal surveys (16hrs/8 nights – 2 people)
Koala (*Phascolarctos cinereus*) RE: 11.3.4, 11.3.25, 11.11.4, 11.11.4c, 11.11.5, 11.11.15	V	V	- Determine suitable trees and check for scats - Night spot lighting - Spot Assessment Technique (SAT) recommended	- Nocturnal surveys (16hrs/8 nights – 2 people)
Large eared pied bat (*Chalinolobus dwyeri*) RE: 11.3.4, 11.3.25	V	V	- Identify potential rocky outcrops - Anabat (minimum 4 detector nights)	- Anabat detection surveys (144hrs/6 detector nights)

Species (scientific and common name)	NC Act status*	EPBC Act status*	Survey methods required	Cumulative survey effort for dry and wet season surveys (person hours unless otherwise stated)
Latham's snipe (*Gallinago hardwickii*) RE: 11.3.25 & non remnant	SLC	Marine/ Migratory	- Bird survey - Incidental sightings throughout site	- Bird surveys of dams and wetlands (32hrs/10 days)
Northern quoll (*Dasyurus hallucatus*) RE: 11.3.4, 11.11.5, 11.11.18	LC	E	- Camera traps with bait (Chicken frames/wings)	- Active searches of remaining habitat (10 hrs/2 people) - Motion sensor cameras (8 nights at 11 sites = 1056hrs total)
Powerful owl (*Ninox strenua*) RE: 11.3.4, 11.11.4, 11.11.4c, 11.11.5, 11.11.15, 11.11.18 & 11.3.25	V	-	- Night survey - Call back - Id suitable trees in landscape	- Callback (5.15 hours/6 nights)
Rainbow bee-eater (*Merops ornatus*) RE: 11.3.4, 11.11.4, 11.11.4c, 11.11.15, 11.3.25, 11.11.18 & 11.11.5	SLC	Marine/ Migratory	- Bird survey - Incidental sightings throughout site	- Incidental sightings
Red goshawk (*Erythrotriorchis radiatus*) RE: 11.3.4	E	V	- Bird survey - Incidental sightings throughout site - (80hrs/10 days)	- Incidental sightings - Active search (20hrs/5 days) - No suitable habitat trees
Rufous fantail (*Rhipidura rufifrons*) RE: 11.3.4, 11.11.5, 11.11.18	SLC	Marine/ Migratory	- Bird survey - Incidental sightings throughout site	- Bird survey - Incidental sightings throughout site
Satin flycatcher (*Myiagra cyanoleuca*) RE: 11.3.4, 11.11.5, 11.11.18	SLC	Marine/ Migratory	- Bird survey - Incidental sightings throughout site	- Bird survey - Incidental sightings throughout site
Short-beaked echidna (*Tachyglossus aculeatus*) RE: 11.3.4, 11.11.4, 11.11.4c, 11.11.15, 11.3.25, 11.11.18 &	SLC	-	- Incidental sightings - Active search - Identify diggings and possible burrows	- Bird survey - Incidental sightings throughout site

Species (scientific and common name)	NC Act status*	EPBC Act status*	Survey methods required	Cumulative survey effort for dry and wet season surveys (person hours unless otherwise stated)
11.11.5				
Spectacled monarch (*Symposiachrus trivirgatus*) RE: 11.3.4, 11.11.5, 11.11.18	SLC	Marine/ Migratory	- Bird survey - Incidental sightings throughout site	- Bird survey - Incidental sightings throughout site
Squatter pigeon (southern) (*Geophaps scripta scripta*) RE: 11.3.4, 11.11.4, 11.11.4c, 11.11.15 & 11.3.25	V	V	- Area searches or transect surveys (15hrs – 3 days) - Flushing surveys useful (10hrs – 3 days) - Random meander searches were undertaken on foot through the mapped areas. - (Area search less than 50ha 15hrs/3 days)	- Mapped Essential habitat survey (20hrs/5 days) - Incidental sightings
Star finch (eastern and southern) (*Neochmia ruficauda ruficauda*) RE:	E	E	- Bird survey - Incidental sightings throughout site - (Targeted surveys of waterholes during dry season 10hrs/4 days)	- Bird survey - Incidental sightings throughout site
White-throated needle tail (*Hirundapus caudacutus*) RE: 11.3.4, 11.11.4, 11.11.4c, 11.11.15, 11.3.25, 11.11.18, 11.11.5.	SLC	Marine/ Migratory	- Bird survey - Incidental sightings throughout site	- Bird survey - Incidental sightings throughout site
Yakka skink (*Egernia rugosa*) RE: 11.3.4, 11.11.4, 11.11.15	V	V	- search suitable habitats for potential colony sites, burrow systems and communal defecation sites - place Elliot traps adjacent burrows - minimum 3 survey days and nights	- Pitfall/funnel traps and Elliot traps (1440hrs/10 days)

Elliott trapping

Twenty Elliott traps were opened for four nights at each four trapping sites, 80 in total to survey small to medium sized mammals. Traps were placed under bushes and alongside logs (where possible) to increase the chances of trapping animals and to protect animals from the weather. Traps were placed at least 10m apart to increase the likelihood of detecting species and increase the area surveyed. Traps were baited with a mixture of peanut butter, honey, vanilla and oats. These methods conform to the suggested methods for Elliott trapping in the Queensland terrestrial fauna survey guidelines (Eyre et al. 2012).

Funnel and pitfall trapping

Pitfall trapping is an excellent method of surveying for reptiles, frogs and small ground mammals. One pitfall/funnel line was located at each of three sites in August 2015 and four sites in April 2016, to survey small mammals and reptiles. Each line consisted of three pitfall traps (20 L plastic buckets) along a drift fence. Six mesh funnel traps (Figure 2) were also placed in pairs along the drift fence to capture small terrestrial reptiles and mammals. Pitfalls and funnel traps were left open for four days and nights and checked daily. Leaf litter, bark and small twigs were left in the pits to provide shelter along with a dry island if there was unexpected rainfall.

Figure 2 Pitfall and funnel traps

Active searches

Searches involved hand searching for more cryptic fauna that are not normally captured in traps, including raking leaf litter, opening or turning over of deadfall timber and turning over rocks and other debris. This was undertaken randomly across five sites during both surveys, within likely habitat for conservation significant fauna.

The five sites were actively searched for at least two person hours (two people searching for one hour), during the mid-morning or mid-afternoon (i.e. the peak activity period).

Signs of animal presence (scats, bones, tracks, scratches, diggings, etc.) were recorded.

Ultrasonic bat detection

An ANABAT© detector was placed at two likely bat habitat sites or flyways but were removed due to inclement weather. One site (AB1) was situated on the edge of a well vegetated riparian area, with the other site (AB2) in an area with potential foraging trees. Unfortunately, the detectors had to be removed due to rain after two night of survey effort. The results were analysed by a bat call analysis specialist, Greg Ford, on completion of the survey.

Bird surveys

Bird surveys (vocalisations and sightings) were undertaken for eight mornings (between 0530 and 0900) and during nocturnal searches at random areas along tracks, as well as at each trapping site. Surveys were conducted for 1-2 person hours per day using the random meander survey technique.

Nocturnal searches and spotlighting

Spotlighting was conducted by walking around the site or driving at around at 5 km per hour on nearby tracks and firebreaks. Where possible, areas such as waterbodies and creeks were targeted, any animals heard calling were also recorded.

At least two person hours (two people searching for one hour) was spent at potential habitat sites, as well as at each trapping site detailed survey site surveying for amphibians, reptiles and nocturnal mammals and birds.

Call playback was used for species for powerful owl and black-breasted button-quail, in areas which had suitable habitat for the species. Calls were generally played for 2 minutes and then followed by 3 minutes of listening, with the process repeated 5 times (or until the species responded).

Camera trapping

Several SEVT habitat sites (i.e. Figure 3) were targeted, using automatic fauna cameras with motion sensors which were installed for four nights to detect the presence of terrestrial fauna. Cameras were set up along likely transit routes, such as paths or creek lines to increase the likelihood of detecting fauna including northern quoll or black-breasted button-

quail. Three cameras were placed at trapping sites to detect any potential mammal movement and four cameras were placed in suitable quoll habitat.

Meat baits (chicken frames) were secured on a tree in front of each camera to attract introduced and native predators. Baited cameras are a proven technique for detecting quolls (DSEWPaC 2011c).

Figure 3 SEVT habitat

Incidental sightings

Any fauna observed within the project site were recorded to provide a list of fauna species occurring in the project area. A combined survey list of faunal observations from both the survey undertaken in August 2015 and the survey undertaken in April 2016 can be found in Appendix 1.

2.2.3 Survey effort in relation to published survey guidelines

The federal government has published several recommended survey guidelines for the survey of threatened species. These include:

- survey guidelines for Australia's threatened bats (DEWHA 2010a)
- survey guidelines for Australia's threatened frogs (DEWHA 2010b)

- survey guidelines for Australia's threatened birds (DEWHA 2010c)
- survey guidelines for Australia's threatened reptiles (DEWHA 2011)
- survey guidelines for Australia's threatened mammals (DSEWPaC 2011c).

In addition, some specific fauna or fauna groups have draft referral guidelines which include specific targeted survey guidelines. The relevant draft guidelines include:

- draft referral guidelines for the nationally listed Brigalow Belt reptiles (not limited to the Brigalow Belt Bioregion) (DSEWPaC 2011a)
- EPBC Act referral guidelines for the endangered northern quoll, *Dasyurus hallucatus* (DSEWPaC 2011b).

None of these guidelines are mandatory, but they outline the recommended survey effort and survey methods for EPBC Act listed species.

The Queensland Government has also released the Terrestrial Vertebrate Fauna Survey Guidelines for Queensland (Eyre et al. 2012), which has generic survey guideline methods for all terrestrial fauna species. Species specific survey guidelines have been developed for some species which are relevant and include targeted species survey guidelines - Yakka skink *Egernia rugosa* (Ferguson 2014).

Survey methods and effort utilised during this fauna survey closely aligned with these guidelines.

2.3 Survey limitations

Survey limitations included:

- Data obtained from the Atlas of Living Australia comes from a large variety of sources including Australian Museum specimen records, Birds Australia and government departments (including the QLD Department of Environment and Heritage Protection (DEHP) Wildlife Online). The absence of any specimen records for a particular species from an area does not imply that that species does not occur in that area.
- Data from the (DoE Protected Matters Search Tool are based on actual records, primarily from State Government databases, combined with modelled distributions of species according to their ecological characteristics. Modelled distributions provided by DoE are based on distributions given in published sources such as recovery plans and habitat studies as well as bioclimatic models built on known records. Species and communities identified by this search may occur in the search area, but require further investigation to confirm their presence.
- Targeted surveys can confirm the presence of a particular species from a given area, but cannot confirm the absence of a species. Many of the species targeted in the surveys are cryptic and difficult to detect. Species detectability may also be affected by factors outside the control of survey design, such as climate, cyclical variations in species abundance and disturbances such as grazing and fire. This assessment

included thorough field searches for target species using currently accepted methods. However, it cannot entirely rule out the presence of a species in areas containing suitable habitat for the species, based on existing knowledge of the species' ecological requirements.

- The most recent Queensland Herbarium RE mapping (Version 8.0) and ground-truthed vegetation mapping during August 2015 was used to determine optimal locations of potential habitats. Actual vegetation and habitats may differ from mapped REs due to mapping scale and clearing activities since 2009.
- Wet conditions due to good rainfall, in excess of 200 mm prior to the survey, resulted in some wet boggy conditions on site. Light rainfall during the assessment created slippery unsafe conditions on the tracks and resulted in limited access to undertake night spotting.
- Limited data from the Anabat© detectors was collected due to wet conditions resulting in the removal of the equipment after only two consecutive nights of survey effort.

3 Results

3.1 Conservation significant fauna species:

Desktop analysis identified 30 conservation significant species as potentially occurring within the project site (see Section 4). Of these the following species have been recorded onsite during August 2015 and April 2016

The locations of observed conservation significant species are indicated in Figure 5.

3.1.1 Koala (Phascolarctos cinereus)

Although previous studies had indicated that no suitable habitat for koala exists within the project area, one single koala was observed during a nocturnal spotlight survey in August 2015. This animal was spotted in a tall *Eucalyptus crebra* (narrow-leaved ironbark) tree on the north western section of the project site. Further active searches the following days failed to reveal any further sighting of the koala.

Koalas are known to occupy woodlands where *Eucalyptus crebra, E. camaldulensis*, *E. tereticornis, E. chloroclada, E. melanophloia* and *E. populnea* are available (DSEWPaC 2012, Mitchell 2012). The koala is listed as vulnerable under the NC Act and under the EPBC Act. The Draft EPBC referral guideline (DoE 2013a) for the vulnerable koala recommends the SAT method for surveying koala, which uses a point-based, tree sampling methodology utilising the presence/absence of Koala faecal pellets within a prescribed search area around the base of trees to derive a measure of Koala activity or presence (Philips & Callaghan 2011).

The SAT to determine localised levels of habitat use by koala and a Rapid SAT to determine presence or absence of koala onsite were recommended to RTA Yarwun Pty Ltd, who opted for the Rapid SAT technique and this survey has been completed, with a report in preparation (Ecosure 2016).

Figure 4 Koala habitat tree

3.1.2 Squatter pigeon (Geophaps scripta scripta)

Squatter pigeons forage on the ground for seeds and invertebrates. They prefer dry grassy eucalypt woodlands and open forests in sandy country never far from water and nest in a depression in the ground.

Essential habitat for squatter pigeon had been mapped by the Queensland Government. No individuals were observed during the survey in August 2015, however since the initial survey, Ecosure staff have recorded squatter pigeons at various locations onsite, including the April 2016 survey, indicating that an existing resident population may be present.

3.1.3 Latham's snipe (Gallinago hardwickii)

This migratory species is a regular migrant to Australia from Japan and has been recorded in the Gladstone region on several occasions (L Boyd, personal observation).

Latham's snipe generally prefers freshwater wetlands with cover nearby and can be found in short tussock grass, and sedge surrounding wetlands. They are fairly secretive and are often only seen when flushed, feeding at night.

During the August 2015 survey a single individual was observed flying off from the dam site on the north-west edge of the project site. This is a migratory species under the *EPBC Act* and is listed as SLC under the *NCA Act*.

3.1.4 Rainbow bee-eater (*Merops ornatus*)

Rainbow bee-eaters prefer open country including woodlands, open forest, semi-arid scrub, grasslands, clearings in heavier forests and farmlands, generally avoiding dense forest (Pizzey & Knight 2012). This is a migratory species listed as SLC under the NC Act.

This species is not uncommon in the Gladstone area and was recorded in a number of locations onsite, across various eucalypt habitats.

3.1.5 Satin flycatcher (*Myiagra cyanoleuca*)

The preferred habitats of satin flycatchers include coastal forests, woodlands, mangroves and drier woodlands and open forests. They inhabit heavily vegetated gullies in eucalypt-dominated forests and taller woodlands, and on migration, occur in coastal forests, woodlands, mangroves and drier woodlands and open forests.

Satin flycatchers move north in autumn to spend winter in northern Australia and New Guinea. They return south in spring to spend summer in south-eastern Australia (Blakers et al. 1984).

This migratory species (EPBC Act) is listed as SLC under the NCA Act and was recorded in several locations onsite, along riparian zones in the SEVT area.

3.1.6 Short-beaked echidna (*Tachyglossus aculeatus*)

Short-beaked echidna are one of Australia's most widely distributed species and occur in most habitat types (Van Dyck and Strahan 2008).

Numerous diggings were observed across the entire site which indicated the presence of this species, listed as SLC under the NC Act.

3.1.7 Rufous fantail (Rhipidura rufifrons)

The rufous fantail occurs in coastal and near coastal districts of northern and eastern Australia. (DoE 2015). *Rhipidura rufifrons* is migratory, being virtually absent from south-east Australia in winter (DoE 2016).

In east and south-east Australia, the rufous fantail mainly inhabits wet sclerophyll forests, often in gullies dominated by eucalypts such as tallowwood (*Eucalyptus microcorys*), mountain grey gum (*E. cypellocarpa*), narrow-leaved peppermint (*E. radiata*), mountain ash (*E. regnans*), alpine ash (*E. delegatensis*), blackbutt (*E. pilularis*) or red mahogany (*E. resinifera*); usually with a dense shrubby understorey often including ferns. They are also recorded from parks and gardens when on passage. In north and north-east Australia, they often occur in tropical rainforest and monsoon rainforests, including semi-evergreen mesophyll vine forests, semi-deciduous vine thickets or thickets of paperbarks (*Melaleuca spp.*) (DoE 2016).

Onsite this species was recorded in riparian vegetation and SEVT.

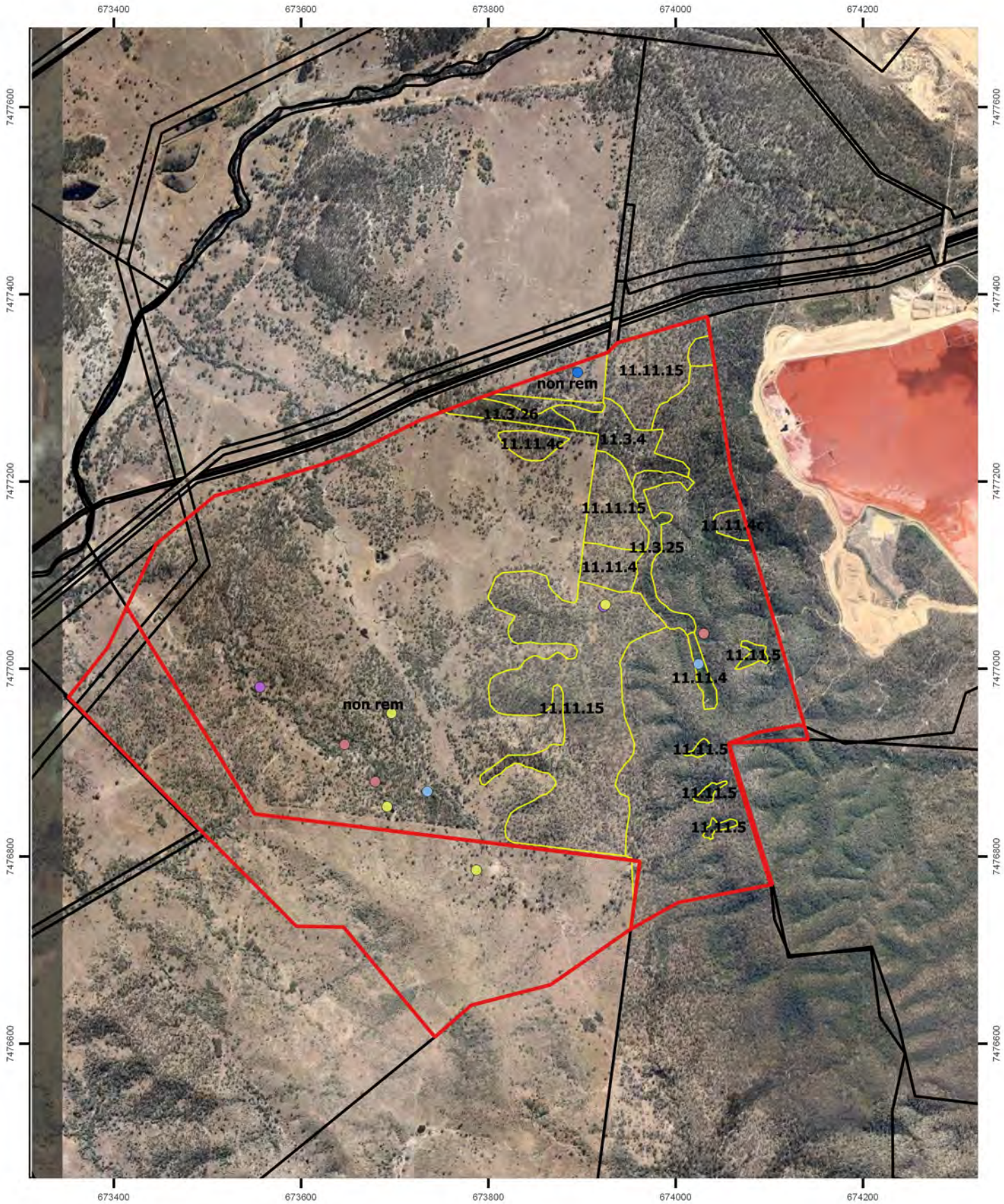

Figure 5 : Conservation significant fauna species survey results

Rio Tinto Yarum Alcan Pty Ltd

State and Federal Legislation
- Squatter Pigeon

State Legislation
- Rainbow Bee-eater
- Rufous Fantail
- Satin Flycatcher
- Short-beaked echidna

- Property Boundary
- Cadastre
- RE

ecosure

Job number: PR1250
Revision: 0
Author: MROG
Date: 05/05/2016

0 250 500 750 1000 m

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

4 Considerations for development

Seven conservation significant species were recorded during the surveys of the proposed RMA2 site, including koala, squatter pigeon, rufous fantail, short-beaked echidna, satin flycatcher, rainbow bee-eater and Latham's snipe.

The presence of these conservation significant species, which include both MSES and MNES, will necessitate further assessment once the detail of any future development in Lot 7 SP228453 is known.

This may necessitate approvals under the NC Act and/or EPBC Act, and could also require an offset under the *Environmental Offsets Act 2014* (EHP 2014). Below is a brief discussion on possible requirements under both state and federal environment legislation.

4.1 Queensland legislation

MSES species recorded onsite are indicated in Table 5. Clearing activities that tamper with a protected animal breeding place, require a species management plan (SMP), to be approved by EHP.

Table 4 MSES known to occur within the study site, and potential for an impact

Species	Classification (NC Act)	Habitat onsite (RE)	Potential for impact	Rationale
Koala*	V	RE: 11.3.4, 11.3.25, 11.11.4, 11.11.4c, 11.11.5, 11.11.15	Possible	The project area contains habitat critical to the survival of the koala, and that a further detailed population survey and referral to the Minister is likely to be required.
Squatter pigeon	V	RE: 11.3.4, 11.11.4, 11.11.4c, 11.11.15 & 11.3.25	Possible	Disruption in ecologically significant location
Rainbow bee-eater	SLC	RE: 11.3.4, 11.11.4, 11.11.4c, 11.11.15, 11.3.25, 11.11.18 & 11.11.5	Unlikely	Common across the Gladstone region, unlikely to have significant impact on population
Rufous fantail	SLC	RE: 11.3.4, 11.11.5, 11.11.18	Unlikely	Unlikely to have significant impact on population.
Satin flycatcher	SLC	RE: 11.3.4, 11.11.5, 11.11.18	Unlikely	Unlikely to have significant impact on population.
Short-beaked echidna	SLC	RE: 11.3.4, 11.11.4, 11.11.4c, 11.11.15, 11.3.25, 11.11.18 & 11.11.5	Unlikely	Common across the Gladstone region, unlikely to have significant impact on population

Species	Classification (NC Act)	Habitat onsite (RE)	Potential for impact	Rationale
Wildlife habitat: · Black-breasted button-quail · Northern quoll	V E	RE: 11.11.18, 11.11.5 & non remnant RE: 11.11.18, 11.11.5 & non remnant	Possible	Could lead to long-term decrease in the size of a local population. Could cause disruption to ecologically significant locations (breeding, feeding, nesting, migration or resting sites) of a species.

*Refer to Koala presence/absence survey report (Ecosure 2016)

Avoidance and mitigation measures are the first obligation under the Environmental Offsets Act, however if there is still determined to be an impact on an MSES, then the Significant Residual Impact Guideline should be used to determine the significance of the impact. An environmental offset can only be required if residual impacts from a prescribed activity constitute a significant residual impact (DEHP 2014). Note that the following criteria relate to populations and the characteristics of populations.

Significant residual impact criteria

An action is likely to have a significant impact on endangered and vulnerable wildlife if the impact on the habitat is likely to:

- lead to a long-term decrease in the size of a local population or
- reduce the extent of occurrence of the species; or
- fragment an existing population; or
- result in genetically distinct populations forming as a result of habitat isolation; or
- result in invasive species that are harmful to an endangered or vulnerable species becoming established in the endangered or vulnerable species' habitat; or
- introduce disease that may cause the population to decline, or
- interfere with the recovery of the species; or
- cause disruption to ecologically significant locations (breeding, feeding, nesting, migration or resting sites) of a species.

4.2 Commonwealth legislation

The EPBC Act requires that actions that may have a significant impact on MNES be assessed and approved by the Federal Environment Minister. MNES (called Protected

Matters by the EPBC Act) include:

- world heritage properties
- national heritage places
- Ramsar wetlands – wetlands of international importance
- listed threatened species and ecological communities
- migratory species protected under international agreements
- Commonwealth marine areas
- nuclear actions

Significant impact guidelines assist have been prepared by the DoE to assist proponents to determine whether or not a proposed action requires referral for a decision on whether assessment and approval is required under the EPBC Act (i.e. a controlled action).

Referral is based on the significant impact guidelines, as well as any species specific referral guidelines and industry guidelines for avoiding, assessing and mitigating impacts.

The following MNES (threated & migratory species) have been recorded during surveys of RTAY site (Table 5).

Table 5 MNES known to occur within the study site, and potential for an impact

Species	Status (EPBC)	MNES	Potential for impact
Koala*	V	Threatened species	Possible
Squatter pigeon	V	Threatened species	Possible
Rainbow bee-eater	Marine/migratory	Migratory species	Unlikely
Rufous fantail	Marine/migratory	Migratory species	Unlikely
Satin flycatcher	Marine/migratory	Migratory species	Unlikely
Latham's snipe	Marine/migratory	Migratory species	Unlikely

* Refer to Koala presence/absence survey report (Ecosure 2016)

4.3 Likelihood of conservation significant species occurrence

An assessment was conducted of the likelihood of each EPBC and/or NCA listed threatened fauna species and EPBC listed migratory species occurring within the survey area.

Table 6 Likelihood of conservation significant species occurrence

Common Name	Scientific Name	EPBC Status	NC Act Status	Habitat Description/ Regional ecosystems present	Likelihood of Occurrence
Rostratula australis	Australian painted snipe	E/marine	V	This species is a resident of well-vegetated shallows and margins of wetlands, dams, sewage ponds and marshy areas. (Pizzey & Knight 2012). Dams onsite with well vegetated banks are potential habitat, species is cryptic and difficult to observe.	**Possible** Species has been recorded in the Gladstone region. (L Boyd, personal observation).
Hirundo rustica	Barn swallow	Marine/ migratory	SLC	Barn Swallows are a cosmopolitan species, breeding throughout most of the northern hemisphere, small numbers are regular non-breeding migrants to northern Australia, with vagrants further south. Habitat in the air above open vegetated areas including farmland, sports grounds, native grasslands and airstrips as well as over open water such as billabongs, lagoons, creeks and sewage treatment plants, foraging on the wing.	**Unlikely** Not recorded in region.
Turnix melanogaster	Black-breasted button-quail	V	V	The black-breasted button-quail is restricted to rainforests and forests, prefer ring drier low closed forests, particularly semi-evergreen vine thicket (DoE 2016).	**Likely** Individuals have been recorded within adjoining RMA. Essential habitat located on RMA site and essential habitat species record present within neighbouring lot to the south.
Monarcha melanopsis	Black-faced monarch	Marine/ migratory	SLC	The Black-faced Monarch is a small insectivorous bird species. It breeds in eastern coastal Australia during summer and migrates to spend the non-breeding winter period in New Guinea, with a portion of the population overwintering in northern Australia. Habitat preference includes rainforests, eucalypt woodland and riparian zones (Pizzey & Knight 2012). Habitat onsite includes the SEVT and remaining riparian vegetation.	**Likely** Species has been recorded in the Gladstone region. (L Boyd, personal observation.
Poephila cincta cincta	Black-throated finch (southern)	E	E	The Black-throated Finch (southern) occurs in grassy woodland dominated by eucalyptus, paperbarks or acacias with access to water and seeding grasses (Garnett & Crowley 2000).	**Unlikely** Suitable habitat is not present within the site.
Ardea ibis	Cattle egret	Marine/ migratory	SLC	Stock paddocks, pastures, cropland, wetlands and drains are preferred habitat. (Pizzey & Knight, 2012).	**Likely to occur** Records within 3 km of the RMA (Atlas of living Australia). Potential suitable habitat present.

Common Name	Scientific Name	EPBC Status	NC Act Status	Habitat Description/ Regional ecosystems present	Likelihood of Occurrence
Delma torquata	Collared delma	V	V	This species is endemic, recorded disjunctly from the western edges of Brisbane north-west to Blackdown Tableland and inland to the Roma area (Wilson, 2005). This species habitat is associated with rocky terrain, however this species has also been recorded in woodlands with no significant rock components (Wilson, 2005).	**Unlikely to occur** Suitable habitat is not present within the RMA.
Cyclopsitta diophthalma coxenii	Coxen's fig parrot	E	E	Habitat includes rainforests, adjacent eucalypt woodlands, coastal scrub and riparian vegetation (Pizzey & Knight 2012). Coxen's fig-parrot occurs wherever fig trees are present in lowland and upland forest types, riparian corridors, farmland and urban environments. It feeds primarily on the seeds of figs (Coxen's Fig-Parrot Recovery Team 2001).	**Possible** Unconfirmed record from Boat Creek, Yarwun.
Furina dunmalli	Dunmall's snake	V	V	This species occurs from near the Queensland border in the brigalow belt south and Nandewar regions (SEWPaC, 2012c). Habitat for this species includes forest and woodlands on cracking clays and clay loams dominated by brigalow (*Acacia harpophylla*), other Wattles (*A. burowii*, *A. deanii*, *A. leiocalyx*), and native Cypress (*Callitris* spp.). Little is known about this species ecological requirements, however it is suggested that fallen timber, ground litter, and cracks in alluvial soils provide shelter for this species (DSEWPaC, 2012c).	**Unlikely** Suitable habitat is not present within the RMA. One record for Gladstone city from 1986.
Ardea modesta	Eastern great egret	Marine/ migratory	SLC	Great Egrets prefer shallow water, particularly when flowing, but may be seen on any watered area, including damp grasslands. Great Egrets can be seen alone or in small flocks, often with other egret species, and roost at night in groups (Pizzey & Knight 2012).	**Likely** Records within 3 km of the RMA (Atlas of living Australia). Potential suitable habitat present.
Apus pacificus	Fork-tailed swift	Marine/ migratory	SLC	The Fork-tailed swift is a non-breeding migrant to Australia. It is widespread across Australia and territories arriving in north west Australia in October and November. Almost exclusively aerial from <1 m to 1000m. Most observed over inland plains in Australia, but sometimes recorded over coastal cliffs and beaches as well as urban areas.	**Likely** Recorded in Gladstone region. (ALA 2016).
Pteropus poliocephalus	Grey-headed flying-fox	V	LC	The grey-headed flying-fox requires foraging resources and roosting sites. It is a canopy-feeding frugivore and nectarivore, which utilises vegetation communities including rainforests, open forests, closed and open woodlands, The Grey-headed Flying-fox roosts in aggregations of various sizes on exposed branches typically near water, such as lakes, rivers or the coast (van der Ree et al. 2005). Roost vegetation includes rainforest patches, stands of Melaleuca, mangroves and riparian vegetation (Nelson 1965a; Ratcliffe 1931). (SEWPaC, 2012e)	**Likely** Potential suitable foraging habitat present. Recorded in Gladstone region.

Common Name	Scientific Name	EPBC Status	NC Act Status	Habitat Description/ Regional ecosystems present	Likelihood of Occurrence
Phascolartos cinereus	Koala	V	V	Koalas live over a range of open forest and woodland communities but ultimately their habitat is defined by the presence of a select group of food trees. Koalas are found in higher densities where food trees are growing on more fertile soils and along watercourses.	**Known** One individual recorded onsite in August 2015. Previously recorded within 6km of the site. Koala faecal pellets were collected and confirmed from five sites across the project area during the SAT survey.
Chalinolobus dwyeri	Large-eared pied bat,	V	V	The species has been found roosting in caves, overhangs, abandoned mine tunnels and disused fairy martin nests (Hoye & Dwyer 1995; Schulz 1998). No evidence exists of the large-eared pied bat roosting in tree hollows. (DERM. 2011).	**Unlikely** Suitable habitat is not present within the RMA.
Gallinago hardwickii	Latham's snipe	Marine/ migratory	SLC	Latham's Snipe is a non-breeding migrant to the south east of Australia including Tasmania, passing through the north and New Guinea on passage. Latham's Snipe breed in Japan and on the east Asian mainland. Usually seen in small groups or singly in freshwater wetlands on or near the coast (Pizzey & Knight 2012).	**Known** One individual recorded in August 2015. Additional record from Gladstone (L Boyd, personal observation)
Dasyurus hallucatus	Northern quoll	E	LC	*Dasyurus hallucatus* is commonly found in a wide range of eucalypt forest and woodland habitats associated with steep dissected rocky terrain, also found in rainforest patches, vegetation along creek lines, adjacent to mangroves, around human settlement and on beaches. (DoE 2013)	**Possible** Two individual records from Gladstone city in last decade.
Ninox strenua	Powerful owl	-	V	Pairs occupy a large, probably permanent, home range in mountain forests, gullies and forest margins, sparser hilly woodlands, coastal forests, woodlands, scrubs, exotic pine plantations, large trees in private pubic gardens, some in cities (Pizzey and Knight, 2012).	**Likely** Records within 3 km of the site (Wildlife Online & ALA 2016). .
Merops ornatus	Rainbow bee-eater	Marine/ migratory	SLC	The Rainbow Bee-eater is most often found in open forests, woodlands and shrub lands, and cleared areas, usually near water. It will be found on farmland with remnant vegetation and in orchards and vineyards. It will use disturbed sites such as quarries, cuttings and mines to build its nesting tunnels (Pizzey & Knight 2012).	**Known** Recorded onsite in August 2015 and April 2016.

Common Name	Scientific Name	EPBC Status	NC Act Status	Habitat Description/ Regional ecosystems present	Likelihood of Occurrence
Erythrotriorchis radiatus	Red goshawk	V	E	Typically occurs in woodland and forests in subtropical and warm temperate regions of Australia (Marchant and Higgins, 1993). It prefers landscapes that contain a mix of habitats including coastal and sub-coastal tall open forest, woodland and rainforest edges (Marchant & Higgins 1993). Resident pairs of red goshawks prefer intact, extensive woodlands and forests with a mosaic of vegetation types that are open enough for fast manoeuvring flight (Marchant and Higgins 1993). These favoured areas contain permanent water, are relatively fertile and biologically rich with large populations of birds. Such areas are also preferentially selected for agricultural development (Sattler and Williams 1999). Nests are typically built at an average height of 20m (DERM 2012	**Unlikely** No records from within the study area.
Rhipdura ruffrons	Rufous fantail	Marine/ migratory	SLC	Habitat includes undergrowth of rainforests/ wetter eucalypt forest, gullies, scrubs, watercourses, parks and gardens (Pizzey & Knight 2012).	**Known** Recorded in August 2015 & April 2016 surveys in SEVT & riparian vegetation.
Myiagra cyanoleuca	Satin flycatcher	Marine/ migratory	SLC	Occur in heavily vegetated gullies in forests, woodlands, mangroves and parks (Pizzey & Knight 2012). Recorded in riparian vegetation and SEVT onsite.	**Known** Recorded during fauna surveys.
Tachyglossus aculeatus	Short-beaked echidna	-	SLC	The Short-beaked Echidna can be found across a wide range of terrestrial habitats wherever there are enough ants or termites: including desert, rainforest, open forest, bushland, farmland, suburban backyards.	**Known** Commonly found across the Gladstone region.
Symposiochrus trivirgatus	Spectacled monarch	Marine/ migratory	SLC	Spectacled monarchs are largely confined to the north east and east coastal and near coastal regions of Australia. Prefer understorey of rainforest, thickly wooded gullies and waterside vegetation (Pizzey & Knight 2012).	**Likely** Potential habitat exists onsite. Recorded on RMA1 site (ALA 2016).
Geophaps scripta scripta	squatter pigeon (southern)	V	V	The squatter pigeon is regionally abundant within the Brigalow and Desert Uplands Bioregions. The species occurs in a wide range of habitats wherever there is a grassy understorey. It is commonly encountered in grassy woodlands and open forests dominated by Eucalypts (Frith, 1982; Leach, 1988).	**Known** Individual recorded during CQG rapid assessment of RMA 2. Recorded in October 2015 & April 2016 Ecosure surveys.
Neochmia ruficauda ruficauda	Star finch	E	E	The Star Finch (eastern) occurs in central Queensland and its population is extremely limited. (Garnett and Crowley 2000). It has been recorded from damp grasslands, sedge lands or grassy woodlands near permanent water or areas of regular inundation.	**Highly unlikely** No records in Gladstone area (ALA 2016).

Common Name	Scientific Name	EPBC Status	NC Act Status	Habitat Description/ Regional ecosystems present	Likelihood of Occurrence
Hirundopus caudacatus	White-throated needle tail	Marine/ migratory	SLC	The White-throated needletail is a non-breeding migrant to Australia (present October-April). It is widespread across eastern and south-eastern Australia but is considered a vagrant in central and western Australia. White-throated needletails are aerial birds, utilising the airspace above forests, woodlands, farmlands and ridge tops (Pizzey & Graham, 2012).	**Possible** Has been recorded in in adjacent area in 1997 (ALA 2016). Area could be utilised for foraging.
Egernia rugosa	Yakka skink	V	V	*Egernia rugosa* is typically found in open dry sclerophyll forest or woodland (Wilson & Knowles 1988; Cogger 2000).	**Unlikely** Has been recorded at Raglan

Likelihood definitions:
'Known' = the species has been recorded within the survey area within the last decade.
'Likely' = a medium to high probability that a species uses the survey area. The species has been recorded within the local area and habitat within the site is considered to be highly suitable.
'Possible' = a medium to low probability that a species used the survey area. The species has been recorded within the local area or region and habitat within the site is considered to be moderately suitable.
'Unlikely' = a very low to low probability that a species uses the survey area. The species may or may not occur locally or regionally, however based on the known habitat requirements of the species, and habitat available within the site, the site is considered unlikely to be suitable or marginal at best.
'Highly unlikely'= habitat on and in the vicinity is highly unsuitable for the species. Based on the known habitat requirements of the species, the site lacks the required habitat.
**Distance has been recorded to nearest whole kilometre

4.4 General recommendations

4.4.1 Retention of high value habitat

Despite not recording black-breasted button quail and northern quoll during the surveys, suitable habitat exists for these species onsite (predominantly SEVT and riparian vegetation).

The SEVT endangered ecosystem (2.5 ha), some mapped riparian vegetation (24.1 ha) and some unmapped riparian mapped are potential suitable habitat for several conservation significant species, including Rufous fantail, Satin flycatcher, koala and short-beaked echidna.

4.4.2 Assessment of impact

Once the clearing footprint and development/construction scope is known, an assessment of impact on fauna could be undertaken to determine whether a referral is necessary for threatened MNES and MSES.

4.4.3 Management of site during construction

Appropriate fauna management measures will be required to minimise impacts on native fauna during preclearance, clearing, construction and post construction phases. This is likely to take the form of a construction environmental management plan and may also necessitate a SMP if breeding places will be tampered with.

A draft species management program has been developed for the project which outlines preferred management strategies if tampering with the breeding places of EVNT, SLC and colonial breeding species is required (RTA 2015).

References

Atlas of Living Australia 2015, *Atlas of Living Australia*, http://www.ala.org.au/

Blakers, M., S.J.J.F. Davies & P.N. Reilly (1984). *The Atlas of Australian Birds*. Melbourne, Victoria: Melbourne University Press.

Coxen's Fig-Parrot Recovery Team. 2001. *Coxen's fig-parrot Cyclopsitta diophthalma coxeni recovery plan 2001−2005*. Report to Environment Australia, Canberra. Queensland Parks and Wildlife Service, Brisbane.

Department of Environment & Heritage Protection (2016), *Back on Track Species Prioritisation Framework,* https://species-recovery.ehp.qld.gov.au/ehp/thespring/Lists/Species/Fitzroy.aspx

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

Department of Environment and Heritage Protection 2014, *Queensland Environmental Offsets Policy – Significant Residual Impact Guideline*, Queensland.

Department of Environment and Resource Management. 2011. National recovery plan for the large-eared pied bat *Chalinolobus dwyeri*. Report to the Department of Sustainability, Environment, Water, Population and Communities, Canberra.

Department of Environment and Resource Management 2012. National recovery plan for the red goshawk *Erythrotriorchis radiatus*. Report to the Department of Sustainability, Environment, Water, Population and Communities, Canberra. Queensland Department of Environment and Resource Management, Brisbane.

DEWHA 2010a, *Survey guidelines for Australia's threatened bats*, Department of Environment, Water, Heritage and the Arts, http://www.environment.gov.au/resource/survey-guidelines-australias-threatened-bats-guidelines-detecting-bats-listed-threatened

DEWHA 2010c, *Survey guidelines for Australia's threatened birds*, Department of Environment, Water, Heritage and the Arts, http://www.environment.gov.au/resource/survey-guidelines-australias-threatened-birds-guidelines-detecting-birds-listed-threatened

DEWHA 2011, *Survey guidelines for Australia's threatened reptiles*, Department of Environment, Water, Heritage and the Arts, http://www.environment.gov.au/resource/survey-guidelines-australias-threatened-reptiles-guidelines-detecting-reptiles-listed

DNRM 2014, *Vegetation management regional esosystem and remnant map Version 8.0*, Department of Natural Resources and Mines, Queensland, http://dds.information.qld.gov.au/dds/

DNRM 2015, *Essential habitat mapping Version 4.16*, Department of Natural Resources and Mines, Queensland, http://www.derm.qld.gov.au/vegetation/code_review_06/eh_review.html

DoE 2013a, *Draft EPBC Act referral guideline for the vulnerable koala (combined populations of Queensland, New South Wales and Australian Capital Territory)*, Department of Environment, http://www.environment.gov.au/system/files/resources/660be80e-01f5-407d-bd1a-3f40f6d6a5a9/files/draft-koala-referral-guidelines.pdf

DoE 2016b, *Species profile and threats database*, Department of the Environment, http://www.environment.gov.au/cgi-bin/sprat/public/sprat.pl

DoE 2014b, *EPBC Act Protected Matters Search Tool*, Department of the Environment, http://www.environment.gov.au/topics/about-us/legislation/environment-protection-and-biodiversity-conservation-act-1999/protected

DoE 2015, *EPBC Act Policy Statement 3.21 Industry guidelines for avoiding, assessing and mitigating impacts on EPBC Act listed migratory shorebird species*, Department of the Environment, Canberra.

DoE 2015, *Referral guideline for 14 birds listed as migratory species under the EPBC Act*, Department of the Environment, Canberra.

DSEWPaC 2011b, *Environment Protection and Biodiversity Conservation Act 1999 referral guidelines for the endangered northern quoll, Dasyurus hallucatus (EPBC policy statement 3.25)* Department of Sustainability, Environment, Water, Population and Communities, http://www.environment.gov.au/system/files/resources/f31d0eec-04d5-4743-9cc7-ad877ae0a6ef/files/northern-quoll.pdf

DSEWPaC 2011c, *Survey guidelines for Australia's threatened mammals*, Department of Environment, Water, Heritage and the Arts, http://www.environment.gov.au/resource/survey-guidelines-australias-threatened-mammals-guidelines-detecting-mammals-listed

Ecosure 2015a, *Conservation significant fauna survey report - Lot 7 SP228453, October 2015, Rio Tinto Yarwun Pty Ltd*, Rockhampton.

Ecosure 2015b*, PR1144-RE.Vegetation clearing report 7 SP228753., September 2015, Rio Tinto Yarwun,* Rockhampton.

Eyre, TJ Ferguson, DJ Hourigan, CL Smith, GC Mathieson, MT Kelly, AL Venz, MF and Hogan, LD 2012, *Terrestrial Vertebrate Fauna Survey Assessment Guidelines for Queensland*, Queensland Department of Science, Information Technology, Innovation and the Arts, https://www.ehp.qld.gov.au/ecosystems/biodiversity/pdf/fauna_survey_guidelines.pdf

Hill B M & Ward S J 2010, *National Recovery Plan for the Northern Quoll Dasyurus hallucatus,* Department of Natural Resources, Environment, The Arts and Sport, Darwin

Higgins P J & S J J F Davies (Eds) 1996, *Handbook of Australian, New Zealand & Antarctic Birds*. *Volume 3 Snipes to Pigeons*, Oxford University press, Melbourne

Mathieson M T & Smith G C 2009, *National recovery plan for the black-breasted button-quail Turnix melanogaster*, Report to the Department of the Environment, Water, Heritage and the Arts, Canberra. Department of Environment and Resource Management, Brisbane

Philips S & Callaghan J 2011, *The Spot Assessment Technique: a tool for determining localised levels of habitat use by Koalas Phascolarctos cinereus*, Australian Zoologist, vol 35 (3),

Queensland Government 2015, *Regional Ecosystems - biodiversity status, Environmental Report*, Queensland Department of Environment and Heritage Protection

Appendix 1 Fauna species recorded onsite during both wet (2016) and dry (2015) season surveys

Key to species codes
sp. Identified to genus level only
Q - Queensland conservation status under *Nature Conservation Act 1992*.
PE = Presumed Extinct, E = Endangered, V = Vulnerable, NT = Near Threatened, LC = Least Concern, SLC = Special Least Concern
EPBC - Australian conservation status under *Environmental Protection & Biodiversity Conservation Act 1999*.
CD = Conservation Dependent, CE = Critically Endangered, E = Endangered, V= Vulnerable, M = Migratory Species
* Exotic species

AMPHIBIANS:				
Family	***Genus & species***	**Common Name**	**NCA**	**EPBC**
Bufonidae	*Rhinella marina**	Cane Toad	-	-
Hylidae	*Cyclorana alboguttata*	Green Striped Frog	LC	-
	Litoria fallax	Eastern Sedgefrog	LC	-
	Litoria rothii	Northern Laughing Treefrog	LC	-
Limnodynastidae	*Platyplectrum ornatum*	Ornate Burrowing Frog	LC	-
	Limnodynastes peronii	Striped Marshfrog	LC	-
	Limnodynastes tasmaniensis	Spotted Marsh Frog	LC	
BIRDS:				
Family	**Genus & species**	**Common Name**	**NCA**	**EPBC**
Acanthizidae	*Smicrornis brevirostris*	Weebill	LC	-
Accipitridae	*Aquila audax*	Wedge-tailed Eagle	LC	-
	Aviceda subcristata	Pacific Baza	LC	-
	Haliastur sphenurus	Whistling Kite	LC	-
	Milvus migrans	Black Kite	LC	-
Acrocephalidae	*Acrocephalus australis*	Australian Reed Warbler	SLC	--
Aegothelidae	*Aegotheles cristatus*	Australian Owlet-Nightjar	LC	-
Anatidae	*Anas superciliosa*	Pacific Black Duck	LC	-
	Chenonetta jubata	Australian Wood Duck	LC	-
	Dendrocygna eytoni	Plumbed Whistling Duck	LC	-
Ardeidae	*Ardea pacifica*	White-necked Heron	LC	-
	Egretta novaehollandiae	White-faced Heron	LC	-
Artamidae	*Cracticus nigrogularis*	Pied Butcherbird	LC	-
	Cracticus tibicen	Australian Magpie	LC	-
	Strepera graculina	Pied Currawong	LC	-
Burhinidae	*Burhinus grallarius*	Bush Stone Curlew	LC	-
Cacatuidae	*Calyptorhynchus banksii*	Red-tailed Black-Cockatoo	LC	-
	Eolophus roseicapillus	Galah	LC	-
Campephagidae	*Caprimulgus macrurus*	Large-tailed Nightjar	LC	-
	Coracina novaehollandiae	Black-faced Cuckoo-shrike	LC	-
	Coracina papuensis	White-bellied Cuckoo-shrike	LC	-
	Lalage leucomela	Varied Triller	LC	-
Charadriidae	*Elseyornis melanops*	Black-fronted Dotterel	LC	-
	Vanellus miles	Masked Lapwing	LC	-
Cisticolidae	*Cisticola exilis*	Golden-headed Cisticola	LC	-
	Cisticola juncidis laveryi	Zitting Cisticola	LC	-
Climacteridae	*Climacteric picumnus*	Brown Treecreeper	LC	-
Columbidae	*Geopelia humeralis*	Bar-shouldered Dove	LC	-
	Geopelia striata	Peaceful Dove	LC	-
	Geophaps scripta scripta	Squatter Pigeon (southern subspecies)	V	V
	Lopholaimus antarcticus	Topknot Pigeon	LC	-
	Ocyphaps lophotes	Crested Pigeon	LC	-
Coraciidae	*Eurystomus orientalis*	Dollarbird	LC	-
Corcoracidae	*Corcorax melanorhamphos*	White-winged Chough	LC	-
Corvidae	*Corvus orru*	Torresian Crow	LC	-
Cuculidae	*Cacomantis flabelliformis*	Fan-tailed Cuckoo	LC	-
	Centropus phasianinus	Pheasant Coucal	LC	-
	Eudynamys scolopacea	Eastern Koel	LC	-
	Scythrops novaehollandiae	Channel-billed Cuckoo	LC	-

BIRDS:				
Family	**Genus & species**	**Common Name**	**NCA**	**EPBC**
Dicruridae	*Dicrurus bracteatus*	Spangled Drongo	LC	-
Estrildidae	*Taeniopygia bichenovii*	Double-barred Finch	LC	-
Falconidae	*Falco berigora*	Brown Falcon	LC	-
	Falco cenchroides	Nankeen Kestrel	LC	-
	Falco longipennis	Australian Hobby	LC	-
Halcyonidae	*Dacelo leachii*	Blue-winged Kookaburra	LC	-
	Dacelo novaeguineae	Laughing Kookaburra	LC	-
	Todiramphus macleayii	Forest Kingfisher	LC	-
Hirundinidae	*Hirundo neoxena*	Welcome Swallow	LC	-
	Malurus lamberti	Variegated Fairy-wren	LC	-
Maluridae	*Malurus melanocephalus*	Red-backed Fairy-wren	LC	-
Megaluridae	*Megalurus timoriensis*	Tawny Grassbird	LC	-
Megapodiidae	*Alectura lathami*	Australian Bush Turkey	LC	-
Meliphagidae	*Entomyzon cyanotis*	Blue-faced Honeyeater	LC	-
	Lichmera indistincta	Brown Honeyeater	LC	-
	Manorina melanocephala	Noisy miner	LC	-
	Meliphaga lewinii	Lewin's Honeyeater	LC	-
	Melithreptus albogularis	White-throated Honeyeater	LC	-
	Melithreptus gularis	Black-chinned Honeyeater	LC	-
	Melithreptus lunatus	White-naped Honeyeater	LC	-
	Myzomela obscura	Dusky Honeyeater	LC	-
	Philemon citreogularis	Little Friarbird	LC	-
	Philemon corniculatus	Noisy Friarbird	LC	-
Meropidae	*Merops ornatus*	Rainbow Bee-eater	SLC	-
Monarchidae	*Grallina cyanoleuca*	Magpie-lark	LC	-
	Myiagra cyanoleuca	Satin Flycatcher	SLC	M
	Myiagra rubecula	Leaden Flycatcher	LC	-
Nectariniidae	*Dicaeum hirundinaceum*	Mistletoebird	LC	-
Oriolidae	*Sphecotheres vieilloti*	Australasian Figbird	LC	-
Pachycephalidae	*Colluricincla harmonica*	Grey Shrike-thrush	LC	-
	Pachycephala rufiventris	Rufous Whistler	LC	-
Phasianidae	*Coturnix ypsilophora*	Brown Quail	LC	-
Podargidae	*Podargus strigoides*	Tawny Frogmouth	LC	-
Podicipedidae	*Tachybaptus novaehollandiae*	Australasian Grebe	LC	-
Psittacidae	*Platycercus adscitus*	Pale-headed Rosella	LC	-
	Trichoglossus chlorolepidotus	Scaly-breasted Lorikeet	LC	
	Trichoglossus haematodus moluccanus	Rainbow Lorikeet	LC	-
Psophodidae	*Psophodes olivaceus*	Eastern Whipbird	LC	-
Rhipiduridae	*Rhipidura albiscapa*	Grey Fantail	LC	-
	Rhipidura rufifrons	Rufous Fantail	SLC	-
	Rhipidura leucophrys	Willie Wagtail	LC	-
Scolopacidae	*Tringa stagnatilis*	Marsh Sandpiper	SLC	M
	Gallinago hardwickii	Latham's Snipe	SLC	M
Strigidae	*Ninox boobook*	Southern Boobook	LC	-
Timaliidae	*Zosterops lateralis*	Silvereye	LC	-
MAMMALS:				
Bovidae	*Bos taurus**	European Cattle	-	-
Canidae	*Canis familiaris**	Dog	-	-
Emballonuridae	*Saccolaimus flaviventris*	Yellow-bellied sheathtail bat	LC	-
Macropodidae	*Macropus agilis*	Agile Wallaby	LC	-
	Macropus parryi	Whiptail Wallaby	LC	-
	Macropus giganteus	Eastern Grey Kangaroo	LC	-
Miniopteridae	*Miniopterus australis*	Little bentwing bat	LC	-
Molossidae	*Chaerephon jobensis*	Northern free-tailed bat	LC	-
	Mormopterus lumsdenae	Northern freetail bat	LC	-
	Mormopterus ridei	Eastern freetail bat	LC	-
Phalangeridae	*Trichosurus vulpecula*	Common Brushtail Possum	LC	-
Phascolarctidae	*Phascolarctos cinereus*	Koala	V	V
Potoroidae	*Aepyprymnus rufescens*	Rufous Bettong	LC	-
Pseudocheiridae	*Pseudocheirus peregrinus*	Common Ringtail Possum	LC	-
Pteropodidae	*Pteropus scapulatus*	Little Red Flying-fox	LC	-
Suidae	*Sus scrofa**	Pig	-	-
Tachyglossidae	*Tachyglossus aculeatus*	Short-beaked Echidna	SLC	-
	Miniopterus australis	Little Bent-wing Bat	LC	-
Vespertilioniidae	*Chalinolobus gouldii*	Gould's wattled bat	LC	-
	Scotorepens greyii	Little broad-nosed bat	LC	-
MOLLUSCS				
Family	**Genus & species**	**Common Name**	**NCA**	**EPBC**
Camaenidae	*Figuladra mattea*	Pale Banded Snail	LC	-

REPTILES				
Family	**Genus & species**	**Common Name**	**NCA**	**EPBC**
Boidae	*Morelia spilota*	Carpet Python	LC	-
Colubridae	*Boiga irregularis*	Brown Tree Snake	LC	-
	Tropidonophis mairii	Freshwater Snake	LC	-
Elapidae	*Demansia psammophis*	Yellow-faced Whip Snake	LC	-
Scincidae	*Carlia munda*	Shaded-litter rainbow-skink	LC	-
	Carlia schmeltzii	Robust rainbow-skink	LC	-
	Cryptoblepharus virgatus sensu lato	Fence skink	LC	-
	Ctenotus sp.		LC	-
	Ctenotus taeniolatus	Copper-tailed Skink	LC	-
	Lampropholis guichenoti	Common garden skink	LC	-
	Morethia taeniopleura	Fire-tailed Skink	LC	-
Varanidae	*Varanus varius*	Lace Monitor	LC	-

Revision History

Revision No.	Revision date	Details	Prepared by	Reviewed by	Approved by
00	03/06/2016	Conservation significant fauna survey report Lot 7 SP228453 (draft)	Lindsay Boyd, Environmental Scientist	Leigh Knight, Senior Environmental Planner	Beth Kramer, Senior Environmental Scientist
	23/08/2016	Conservation significant fauna survey report Lot 7 SP228453	Lindsay Boyd, Environmental Scientist		Jodi Liddell, Senior Environmental Scientist

Distribution List

Copy #	Date	Type	Issued to	Name
1	23/08/2016	Electronic	RTA Yarwun Pty Ltd	Alison Cox
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