Prepared for
Powerlink Queensland
ABN: 82 078 849 233

Appendix D

Ecology Technical Report

Oct-2021
Genex Kidston Connection Project - Ministerial Infrastructure Designation Assessment Report

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Prepared for
Powerlink Queensland
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Terrestrial Ecology Assessment

Genex Kidston Connection Project

25-Oct-2021
Doc No. 60577456

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Delivering a better world

Terrestrial Ecology Assessment

Genex Kidston Connection Project

Client: Powerlink Queensland

ABN: 82 078 849 233

Prepared by

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Executive Summary

Genex Power Limited (Genex) is seeking to establish the Kidston Renewable Energy Hub; a combination solar and pumped storage hydro power generation at the old Kidston mine, located within Einasleigh in North Queensland. Queensland Electricity Transmission Corporation Limited (trading as Powerlink Queensland) has been engaged by Genex to connect this facility to its existing transmission network at Mount Fox, via a new 275 kV electricity transmission infrastructure project known as the Genex Kidston Connection Project (the Project).

The Project includes a 275 kV single circuit transmission line that will traverse approximately 185 kilometres (km) between the localities of Kidston and Mount Fox, north-west of Townsville Queensland. A new 275 kV switching station is also required at Mount Fox to connect the transmission line into Powerlink's existing transmission network.

The aim of the terrestrial ecology assessment was to document the species and habitat types within and adjacent to the Project Area, with particular reference to the occurrence of conservation significant species, and to recommend mitigation measures to minimise potential impacts from the Project.

The terrestrial ecology assessment was a two stage process involving a desktop assessment followed by targeted field surveys in November 2017, May - June 2018, July 2018 and August 2018. Additional flora and fauna field assessments have also been completed in August 2021, targeted to a section of the Project Area that was previously unable to be accessed (Lots 5234 SP275834 and 1 OC64). The desktop assessment analysed existing data to identify conservation significant flora and fauna species, vegetation communities and potential habitat values present. This review formed the basis of the field surveys, in which potentially present conservation significant species were targeted and ecological values documented.

Key findings of the terrestrial ecology assessment include the following.

- The Project Area contains large areas of contiguous remnant vegetation including 37 field-verified regional ecosystems (REs). The field surveys confirmed the presence of nine fauna habitat communities.
- The field surveys recorded 281 flora species and 163 fauna species.
- No conservation significant flora species were identified within the Project Area; however *Leptospermum pallidum,* listed as Near Threatened under the *Nature Conservation Act 1992* (NC Act), was identified adjacent to the Project Area (approximately 34 metres north of the Project Footprint). An additional three conservation significant flora species are considered to have a potential likelihood of occurrence within the Study Area.
- A protected plants survey was undertaken on the eastern most extent of the alignment in accordance with the *Flora Survey Guidelines – Protected Plants* due to the high risk trigger area shown on the flora survey trigger map. The survey effort did not reveal any conservation significant flora species.
- Four conservation significant fauna species were identified during the field surveys:
  - Squatter pigeon (southern) (*Geophaps scripta scripta*), listed as Vulnerable under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and the NC Act.
  - Sharman's rock-wallaby (*Petrogale sharmani*), listed as Vulnerable under the EPBC Act and the NC Act.
  - Greater glider (*Petauroides volans*), listed as Vulnerable under the EPBC Act and the NC Act.
  - Short-beaked echidna (*Tachyglossus aculeatus*), listed as Special Least Concern under the NC Act.
- One EPBC Act migratory fauna species was identified during the field surveys:
  - Glossy ibis (*Plegadis falcinellus*), listed as Migratory under the EPBC Act and Special Least Concern under the NC Act.

- An additional 14 conservation significant fauna, and 11 migratory species are considered to have a potential or higher likelihood of occurring within the Project Area, based on recent/nearby records and/or the presence of suitable habitat.
- Habitat modelling was undertaken for the conservation significant species known to occur, or deemed a potential or higher likelihood of occurring.
- Matters of State Environmental Significance (MSES) that occur within the Project Area include:
  - Regulated vegetation (Of Concern REs)
  - Regulated vegetation (within the defined distance of a watercourse)
  - Connectivity areas
  - Protected wildlife habitat and Regulated Vegetation Essential Habitat
  - Waterway providing for fish passage
- Avoidance and mitigation measures to minimise potential impacts to conservation significant fauna and flora species have been provided including:
  - An extensive impact minimisation process has been implemented to achieve approximately 50% reduction in direct impacts to conservation significant species habitat.
  - Vegetation clearing to be minimised in sensitive environments, specifically riparian areas around creek lines and potential habitat for conservation significant flora and fauna species.
  - Appropriate erosion and sediment control measures will be installed and maintained.
  - A Biosecurity Management Plan will be developed and implemented for the Project.
  - Pre-clearance surveys to identify shelters and breeding places potentially utilised by Least Concern species, colonial breeders and conservation significant fauna will be undertaken.
  - Species-specific mitigation measures for conservation significant flora and fauna species have also been recommended to reduce and/or avoid impacts to the species.

1.0 Introduction

1.1 Background

Genex Power Limited (Genex) is seeking to establish the Kidston Renewable Energy Hub; a combination solar and pumped storage hydro power generation at the old Kidston mine, located within Einasleigh in North Queensland. Queensland Electricity Transmission Corporation Limited (trading as Powerlink Queensland) has been engaged by Genex to connect this facility to its existing transmission network at Mount Fox, via a new 275 kV electricity transmission infrastructure project known as the Genex Kidston Connection Project (the Project).

The Project includes a 275 kV single circuit transmission line that will traverse approximately 185 kilometres (km) between the localities of Kidston and Mount Fox, north-west of Townsville Queensland. A new 275 kV switching station is also required at Mount Fox to connect the transmission line into Powerlink's existing transmission network.

AECOM Australia Pty Ltd (AECOM) has been engaged by Powerlink Queensland (Powerlink) to undertake a terrestrial ecology assessment of the Project.

1.2 Aims and Objectives

The aim of the terrestrial ecology assessment was to document the terrestrial ecological values within and adjacent to the Project Area, with particular reference to the occurrence of Matters of State Environmental Significance (MSES). In meeting this aim, the following methodology was applied:

- Undertake a desktop assessment of existing terrestrial ecology data for the Project Area.
- Complete field surveys during the early wet season (November 2017) and dry season (June 2018, July 2018, August 2018), specifically looking at:
  - Flora:
    - "Ground truthing" representative sample sites within targeted mapped regional ecosystems (REs).
    - Identification of weed species, including those declared noxious under State legislation and local policy.
    - Targeted surveys to confirm the presence of populations and suitable habitat for Endangered, Vulnerable or Near Threatened flora species.
  - Fauna:
    - Habitat assessments describing landform characteristics, habitat size, shape, integrity and connectivity with other habitats, and important habitat features (e.g. vegetation structure, water sources, food plant availability, cliffs, rocks, tree hollows, fallen timber).
    - Surveys for animal signs (e.g. diggings, scats, tracks, tree-scratchings, remains) within representative habitat, and subsequent analysis of scats to detect predatory and prey species.
    - Songmeter ultra-sonic detector surveys for conservation significant bat species.
    - Spotlighting and call playback for nocturnal fauna.
    - Camera traps to record visitation by nocturnal and diurnal animals.
    - Targeted surveys for conservation fauna species identified during the desktop assessment.
    - Visual and call identification surveys of birds.
    - Direct searches under leaf litter, bark and rocks for reptiles and amphibians.
    - Opportunistic observations of all faunal groups (including feral or exotic animals).

- Map potential habitat for conservation significant species identified as known to occur or deemed a high likelihood of occurring.
- Identify potential impacts of the Project on ecological values and provide recommendations for measures to avoid or mitigate adverse impacts at the construction and operational phases of the Project.

1.3 Project Area and Project Footprint

The Project Area includes a 60 metre (m) wide corridor for the proposed transmission line between Kidston and Mount Fox as well as a 3.13 hectare (ha) plot for the switching station at Mount Fox (Appendix A Figure 1). Inclusive of the transmission line corridor and the switching station site, the Project Area covers a total area of approximately 1,124 ha. It intersects 22 properties of varying tenure.

The Project Area traverses three individual local government areas: Hinchinbrook Shire Council, Charters Towers Regional Council and Etheridge Shire Council. In addition to Mount Fox, a number of small townships also occur in the vicinity of the Project Area including Valley of Lagoons (approximately 6 km north at the closest point), Greenvale (<4 km south at the closest point) and Conjuboy (approximately 5 km north at the closest point). Ingham is the nearest major population centre located approximately 35 km to the north east of Mount Fox.

The Project Area is predominantly rural land characterised by woodlands and some grasslands used largely for agricultural development including cattle grazing. Topography along the Project Area ranges from flat, low-lying land to steep crossings of multiple ranges, including part of the Pelican Range (70 km west of Mount Fox) and the Great Dividing Range (100 km west of Mount Fox). Elevation generally ranges from 400 to 800 m Australian Height Datum.

Aerial imagery indicates that large tracts of relatively undisturbed vegetation occur within the local area and connect to the Project Area. Several watercourses intersect the Project Area including the Copperfield River, East Creek, Einasleigh River, Lee (McKinnons) Creek, Gray Creek, Burdekin River and Camel Creek, as well as dozens of unnamed smaller creeks and drainage lines (Appendix A Figure 9).

The Project Area is predominately centred on the existing Ergon electricity infrastructure in the region, namely sections of the Ross to Kidston 132 kV transmission line and the Greenvale 66 kV sub-transmission line. The alignment is immediately north of the existing Ergon lines. A 36 km stretch of the Project Area that occurs roughly between Greenvale and Conjuboy does not contain any existing electricity infrastructure. In this area, the siting of the Project Area has been dictated by the location of an existing mining interest, the optimal path through large escarpments and landholder feedback.

The Project Footprint (i.e. the maximum clearing extent) has been optimised to avoid and minimise impacts in environmentally sensitive areas. Of the 1,121 ha covered by the transmission-line portion of the Project Area, approximately 49% will be cleared for construction of the Project (550 ha) (Appendix A Figure 3).

1.4 Study Area

The assessment of ecology values potential presence and extent has been completed for an area larger than the Project Area, referred to as the Study Area (Appendix A Figure 1). The Study Area covers a total area of 5,851 ha and is approximately 300 m wide, except at the far eastern extent where the switching station occurs. The Project Area is largely centred within the Study Area.

Given the narrow and linear nature of both the Project Area and Study Area, subsequent figures have been spilt into five zones so greater detail can be displayed. Appendix A Figure 2 provides an overview of the five zones relevant to the Study Area and Project Area.

2.0 Regulatory Framework

2.1 Commonwealth

2.1.1 Environment Protection and Biodiversity Conservation Act 1999

The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) establishes a process for environmental assessment and approval of proposed actions that have, will have or are likely to have a significant impact on Matters of National Environmental Significance (MNES) or on Commonwealth land.

MNES are outlined in the EPBC Act to include:

- World Heritage Properties.
- National Heritage Places.
- Wetlands of International Importance (listed under the Ramsar Convention).
- Listed Threatened Species and Ecological Communities.
- Migratory Species (listed under international agreements).
- Commonwealth Marine Areas.
- Great Barrier Reef Marine Park.
- A Water Resource, in relation to coal seam gas development and large coal mining development.

Under the EPBC Act, a referral to the Department of Agriculture, Water and the Environment (DAWE) would be required if the Project had the potential to cause a 'significant impact' on MNES. The determination is made with reference to the *Matters of National Environmental Significance Significant Impact Guidelines 1.1* (DoE, 2013) and other EPBC Act policy statements including significant impact guidelines for individual threatened species, groups of species and threatened ecological communities.

2.1.2 Weeds of National Significance

Thirty two (32) Weeds of National Significance (WoNS) have been agreed by Australian governments using an assessment process that prioritised these weeds based on their invasiveness, potential for spread and environmental, social and economic impacts. For the existing 32 WoNS, customised and targeted plans have been developed. The presence of WoNS within the Project Area was assessed during the field surveys.

2.2 Queensland

2.2.1 Nature Conservation Act 1992

The object of the *Nature Conservation Act 1992* (NC Act) is "the conservation of nature" (Section 4, NC Act). In support of the NC Act, the *Nature Conservation (Wildlife) Regulation 2006* lists 'protected wildlife' (flora and fauna species), which are considered to be 'Extinct in the Wild', 'Endangered', 'Vulnerable', 'Near Threatened' and 'Least Concern' wildlife. Under Sections 88 and 89 of the NC Act, it is an offense to take or use protected wildlife, which is outside a 'protected area', unless exemptions apply or an approval (e.g. clearing permit) is obtained from the Department of Environment and Science (DES). The presence of conservation significant flora and fauna species was assessed during the surveys.

Appropriate authorisations or permits under the NC Act (e.g. Species Management Program) are required prior to clearing of listed conservation significant plant species, interfering with an animal breeding place, or removing protected animals unless the activity is exempt.

2.2.1.1 Protected Plants Flora Survey Trigger Map

In Queensland, all plants that are native to Australia are protected plants under the NC Act to prevent whole plants or protected plant parts from being illegally removed from the wild or illegally traded. The protected plants flora survey trigger map shows high risk areas for protected plants and is used to help determine flora survey and clearing permit requirements for a particular location. High risk areas

represent areas where Endangered, Vulnerable or Near Threatened plants are known to exist or are likely to exist.

Where clearing occurs within a high risk area, a flora survey is required to determine the presence of protected plants within the clearing impact area. The flora survey must then be lodged with DES to either obtain an approval, or an exemption notice (if none present).

2.2.2 Environmental Protection Act 1994

The object of the *Environmental Protection Act 1994* (EP Act) is to protect Queensland's environment while allowing for development that improves the total quality of life, both now and in the future, in a way that maintains the ecological processes on which life depends (ecologically sustainable development) (refer Section 3, EP Act).

The EP Act provides the key legislative framework for the protection of the environment in Queensland. Section 319 of the EP Act imposes a 'general environmental duty', which specifies that a person must not undertake any activity that may harm the environment without taking reasonable and practical measures to prevent or minimise the harm.

2.2.3 Vegetation Management Act 1999

The *Vegetation Management Act 1999* (VM Act) regulates the clearing of native vegetation in Queensland. The purpose of the VM Act is to regulate the clearing of vegetation in a way that: (a) conserves remnant vegetation; (b) conserves vegetation in declared areas; (c) ensures that clearing does not cause land degradation; (d) prevents the loss of biodiversity; (e) maintains ecological processes; (f) manages the environmental effects of the clearing to achieve the matters mentioned in paragraphs (a) to (e); and (g) reduces greenhouse gas emissions (refer Section 3(1) of the VM Act).

The VM Act protects and regulates the clearing of native vegetation including 'remnant' and 'high value regrowth' (HVR) vegetation (shown as Category B and C on the Regulated Vegetation Management Map) on freehold land, Indigenous land and State tenures.

The VM Act also protects Category R vegetation; that is native woody vegetation on freehold land, Indigenous land or leasehold land granted for agriculture or grazing purposes, located within 50 m of a watercourse in the Burdekin, Mackay, Whitsunday and Wet Tropics Great Barrier Reef catchments.

Clearing of native vegetation is assessed under the *Planning Act 2016*. Regional ecosystems and values protected and managed under the VM Act are discussed in Section 4.0 of this Report.

2.2.3.1 Essential Habitat

Essential habitat is regulated under the VM Act and is vegetation in which threatened species listed under the NC Act have been known to occur. Clearing of essential habitat is assessed through the development assessment process under the *Planning Act 2016*. Where clearing cannot be reasonably avoided or minimised, an offset may occur.

2.2.4 Biosecurity Act 2014

The *Biosecurity Act 2014* is administered by the Department of Agriculture and Fisheries (DAF). The Act provides management measures to protect agricultural and tourism industries and the environment from pests, diseases and contaminants.

Under the Act, invasive plants and animals are categorised as either a 'Prohibited Matter' or a 'Restricted Matter' and replace the 'Declared' status under the superseded *Land Protection (Pest and Stock Route Management) Act 2002*.The *Biosecurity Act 2014* also requires every local government in Queensland to develop a biosecurity plan for their area.

Invasive plants and animals will be further assessed through secondary surveys and the Environmental Assessment Report prepared in support of the Infrastructure Designation process. Biosecurity Management Plans will be developed to support construction of the Project and to achieve requirements under the *Biosecurity Act 2014*.

2.2.5 Electricity Act 1994

The *Electricity Act 1994* sets out the requirements which all electricity industry participants must follow to ensure a safe, efficient and reliable supply of electricity. It also requires that the supply of electricity is

undertaken in an environmentally sound manner. Under Section 31(b) of the *Electricity Act 1994*, a transmission entity is required to properly take into account the environmental effects of its activities under the transmission authority.

Section 112A of the *Electricity Act 1994* makes clearing of native vegetation on freehold land accepted development if the clearing is for operating works for a transmission entity on land designated for the operating works by a Minister under the *Planning Act 2016*.

2.2.6 Fisheries Act 1994

The *Fisheries Act 1994* (Fisheries Act) and the Fisheries Regulation 1995 govern both commercial and recreational fishing activities and provide for the management, use, development and protection of fisheries resources and fish habitats, and the management of aquaculture activities. The Fisheries Act holds provisions for the following:

- Removal, damage or disturbance to marine plants, including mangroves
- Works in a declared fish habitat
- Waterway barrier works.

2.2.6.1 Waterway barrier works

Waterway barrier works are regulated under the Fisheries Act when barriers to fish movement, including partial barriers, are installed across waterways. Common waterway barriers include dams, weirs, road crossings (culverts and causeways), bunds, sand dams, riffle structures, floodgates, trash racks and sediment curtains.

A Development Permit must be obtained through DAF to construct or raise a waterway barrier unless the works are considered “Accepted Development”.

2.2.7 Queensland Environmental Offsets Framework

The requirement to deliver State environmental offsets is provisioned under various environmental legislative acts and regulations in force in Queensland. Environmental offsets are not an assessment trigger and are only considered where an application for an approval is required, and the assessment considers the delivery of environmental offsets as a suitable and required outcome.

Upon triggering offset requirements, the conditioning and delivery of environmental offsets is directed under the Queensland offset framework consisting of the *Environmental Offsets Act 2014* (EO Act), Environmental Offsets Regulation 2014 (EO Regulations) and the Queensland Environmental Offset Policy 2017 (version 1.4). The EO Act provides the statutory platform that establishes the offset framework, co-ordinates the implementation of the framework in conjunction with other legislation, specifies the offset delivery and compliance process, and allows for the recognition of values that require protection through the delivery of offsets. The EO Regulations provide further details on aspects of the EO Act, including the activities and environmental matters to which the EO Act applies. The Queensland Environmental Offset Policy outlines how environmental offsets should be practically delivered to meet the requirements of the EO Act.

The environmental offset framework only applies when a prescribed activity is likely to have a significant residual impact on a prescribed environmental matter. Prescribed environmental matters include MSES, which for activities authorised under the EP Act are defined in the EO Regulations as the following:

- regulated vegetation – prescribed REs that:
  - are Endangered REs
  - are Of Concern REs
  - intersect with an area shown as a wetland on a Vegetation Management Wetland map
  - are located within a defined distance of a relevant watercourse or drainage feature.
- connectivity areas
- wetlands and watercourses
- designated precinct in a strategic environmental area

- protected wildlife habitat including essential habitat
- protected areas
- highly protected zones of State marine parks
- fish habitat areas
- waterway providing for fish passage
- marine plants
- legally secured offset areas.

Significant residual impacts are determined through the application of criteria outlined in the appropriate significant residual impact guidelines. MSES relevant to the Project Area have been identified and significant residual impacts assessed (Appendix H).

2.3 Classifications of Conservation Values

Conservation significant flora and fauna are assigned status according to Queensland or Commonwealth legislation as described in the:

- NC Act and the subordinate *Nature Conservation (Wildlife) Regulation 2006.*
- EPBC Act.

Conservation significant species are listed under the NC Act in the following categories:

- Extinct in the Wild.
- Endangered.
- Vulnerable.
- Near Threatened.
- Special Least Concern (Least Concern species of special cultural significance: migratory species, the short-beaked echidna (*Tachyglossus aculeatus*) and the platypus (*Ornithorhynchus anatinus*)).

Conservation significant species and communities are listed under the EPBC Act in the following categories:

- Extinct.
- Extinct in the Wild.
- Critically Endangered.
- Endangered.
- Vulnerable.

The EPBC Act also identifies and protects Threatened Ecological Communities (TECs). Types of TECs listed under the EPBC Act include woodlands, grasslands, shrublands, forests, wetlands, marine, ground springs and cave communities.

Additionally, the EPBC Act and NC Act include a list of bird species (listed as Migratory under the EPBC Act and Special Least Concern under the NC Act), comprising:

- Migratory species which are native to Australia and are included in the appendices to the Bonn Convention.
- Migratory species included in annexes established under the Japan-Australia Migratory Bird Agreement (JAMBA) and the China-Australia Migratory Bird Agreement (CAMBA).
- Native, migratory species identified in a list established under an international agreement such as the Republic of Korea-Australia Migratory Bird Agreement (ROKAMBA).

3.0 Methodology

3.1 Desktop Assessment

A desktop assessment was undertaken to characterise and identify ecological values that may be supported in the Study Area. The desktop assessment included a review of literature, and searches of publicly available datasets and online mapping. Initial desktop searches were undertaken in late 2017. Desktop searches were repeated in October 2019 and June 2021. The following information sources were reviewed as part of this assessment:

- EPBC Act Protected Matters Search Tool (PMST) to identify MNES within a search area extending at least 20 km from the Project Area boundaries (Department of Agriculture Water and the Environment, 2021b) (Appendix B)
- The Queensland Department of Environment and Science (DES) WildNet search results for flora and fauna species records within a search area extending 20 km from the boundary of the Project Area (Department of Environment and Science, 2021c) (Appendix B)
- Atlas of Living Australia (ALA) database for threatened flora and fauna species records (Atlas of Living Australia, 2021)
- eBird Australia (eBird) online record database for birds (eBird Australia, 2021)
- The Queensland Department of Resources (DoR) Regulated Vegetation mapping (DNRME, 2021a).
- The DoR Regional Ecosystem (RE) mapping (version 11) and Regional Ecosystem Description Database (REDD) for current descriptions for REs, geology and land zones (Queensland Herbarium, 2021)
- The DoR *Vegetation Management Act 1999* (VM Act) watercourse mapping
- The DoR VM Act wetland mapping
- The DoR Essential habitat mapping
- The DoR Mineral resource sites mapping
- The DES Map of Queensland wetland environmental values to identify wetlands of high ecological significance (HES) and general ecological significance (GES) (DES, 2020b)
- DES certified Biodiversity Planning Assessment (BPA) mapping to identify significant wildlife corridors and areas of state, regional and local biodiversity significance
- DES Queensland wetland classification mapping (Department of Environment and Science [DES], 2021b).
- DES Protected Plants Flora Survey Trigger Map to identify the high risk areas for threatened plants (DES, 2021b).
- Historical aerial imagery (Q Imagery, 2021).
- Desktop assessment reports completed for the Powerlink Corridor Selection Report (Powerlink, 2017) including:
    - Genex Kidston Final Corridor Selection Project – Brief Report on Woody Vegetation Mapping.
    - Ecological Constraints Assessment.
    - Preliminary Desktop-Based Likelihood of Occurrence Assessment.
- Species distribution maps from various current field guides.

Data sources above were reviewed based on the coordinates presented in Table 1.

Information collected as part of the desktop assessment was reviewed and used in the preparation of the field surveys, to identify flora and fauna species potentially found within and/or utilising the Project Area, and to determine appropriate survey techniques.

Table 1 Data source search parameters

Data source	Search coordinates	Search buffers
EPBC Act Protected Matters Search Tool	-18.8979 144.1263, -18.9272 144.2418, -18.9317 144.4221, -18.921 144.5059, -18.9521 144.609, -18.9783 144.6442, -18.9506 144.9464, -18.9768 145.0159, -18.8478 145.8204,	20 km
WildNet	The bounds of the Project Area	20 km
All other mapping		1 km

3.2 Previous Ecological Assessments

3.2.1 4 Elements Consulting (2021) Mt Fox Energy Park – Ecological Assessment

4 Elements Consulting was commissioned by Mt Fox Energy Park Pty Ltd to undertake detailed ecological investigations associated with the construction and operation of a proposed wind farm in Mount Fox, Queensland. The assessment was focused to a private property comprising five lot and plans located immediately south west of Mt Fox. These properties are located immediately east of the Project Area.

Desktop reviews of record databases and government mapping were followed by multiple field assessments from February to October 2020.

The flora field assessment was undertaken over 19 survey days between 29 March and 10 June 2020 and involved vegetation characterisation including Secondary and Quaternary assessments as per Neldner et al. (2019), and searches for threatened flora species.

Wet season fauna investigations were undertaken from February 2020 (initial frog surveys) to May 2020 (final camera and songmeter recordings returned) to assess the presence/ absence of threatened species and obtain a fauna inventory of general species on the site. The 10-day live trapping survey was taken over two consecutive periods between 24 March - 20 April 2020. Total survey effort across February 2020 wet season generic and targeted surveys to May 2020 is detailed below:

- 160 pitfall trap nights across 10 sites
- 320 funnel trap nights across 10 sites
- 800 Elliot trap nights across 10 sites
- 80 cage trap nights across 10 sites
- 560 camera trap nights across 10 sites.

Bird and bat utilisation surveys were also conducted within the site by Nature Advisory Pty Ltd and Greentape Solutions Pty Ltd on 31 March-2nd April 2020 and 6-9 October 2020.

3.2.2 AECOM (2018) Kidston Solar Farm (Stage 2) – Flora and Fauna Technical Reports

To support the referral of a proposed solar farm, AECOM completed a terrestrial ecology assessment on behalf of GENEX in 2018. The purpose of this assessment was to identify flora and fauna values within a site at Kidston, approximately 52 km south of Einasleigh Queensland. Properties assessed include Lot and Plans 4PY15, 66SP258871 and CPY13 (easement); all of which occur directly west of the far western end of the Project Area.

The assessment was completed in two parts, comprising a desktop review of publicly available data followed by site investigations in May (fauna only), July (fauna and flora) and November 2017 (flora only). Field investigations included the following methods relevant to this assessment:

- Vegetation characterisation including Secondary and Quaternary assessments as per Neldner *et al.* (2012)
- TEC assessments
- Habitat assessments
- Live capture and release trapping
- Bird census
- Spotlighting and call playback
- Microchiropteran bat call detection
- Active searches
- Camera traps
- Incidental observations
- Targeted surveys for the southern black-throated finch (*Poephila cincta cincta*) including water resource observations, targeted searches and habitat assessments.

Targeted surveys for southern black-throated finch conducted in May 2017 were consistent with the wet season survey guidelines detailed in the EPBC Act policy statement 3.13 Significant Impact Guidelines for the Endangered Black-throated Finch (southern).

3.2.3 AARC Pty Ltd (2012) Greenvale and Lucknow Project - Terrestrial Flora and Fauna Findings Report

On behalf of Metallica Minerals, AustralAsian Resource Consultants (AARC) Pty Ltd completed a terrestrial ecology assessment in 2012 to identify ecological values within the Greenvale Nickel Mine and the Lucknow tenement. The Greenvale Nickel Mine is situated approximately 5 km west-northwest of the township of Greenvale, and the Lucknow site approximately 2 km west of Greenvale. Both sites are located within 5 km of the Project Area.

The assessment was completed in two parts: a desktop review of publicly available data was first and followed by site investigations in September 2010 (dry season) and April 2011 (wet season). Each field survey was conducted over seven consecutive days. Field investigations included the following methods relevant to this assessment:

- Vegetation characterisation including Secondary and Quaternary assessments as per Neldner *et al.* (2005)
- Targeted searches for threatened flora species
- Pitfall and funnel trapping
- Elliot and cage trapping
- Anabat microchipteran call detection and harp trapping
- Spotlighting
- Diurnal birding
- Active searches
- Scat and signs searches
- Opportunistic observations.

The fauna survey methods utilised were reported to comply with the guidelines set out by the federal government for the detection of Australia's threatened fauna under the EPBC Act. All pitfall and funnel

trapping efforts were conducted over four consecutive days/three consecutive nights, with Elliot and cage traps being set over three consecutive nights.

3.3 Field Surveys

AECOM ecologists have conducted five field surveys from 2017 to 2018 across the Study Area and areas of representative habitat nearby:

- 13 – 19 November 2017 – Flora and fauna
- 28 May – 4 June 2018 – Flora only
- 11 – 19 June 2018 – Fauna only
- 12 – 16 July 2018 – Flora and fauna
- 7 August 2018 – Flora and fauna.

Where access permitted, field assessments were conducted within the Project Area or as close to as possible.

Ongoing landholder consultation has occurred, with survey effort restricted by landholder access at Lots 5234/SP275834 and 1/OC64. The data presented in this report was prior to access being granted at these lots, which was surveyed where public roads cross the Project Area (Appendix A Figure 4). Additional flora and fauna field assessments have since been completed in August 2021, targeted to this section of the Project Area that was previously unable to be accessed. Methodology and results used in the August 2021 assessments will be provided in a supplementary report at a later date.

3.3.1 Flora

3.3.1.1 Vegetation community assessment

The extent, classification and condition of ground-truthed vegetation communities within the Project Area and Study Area was validated in accordance with the Methodology for Surveying and Mapping Regional Ecosystem and Vegetation Communities in Queensland (Neldner *et al.*, 2017). This included traversing the Study Area undertaking tertiary and quaternary level assessments.

As per the Queensland Herbarium methodology (Neldner *et al.*, 2017), tertiary level site assessments were undertaken within a 10 by 50 m quadrat, collecting the following information:

- vegetation structure, species composition and percentage cover for each structural layer
- aspect and slope
- soil type
- landform
- disturbance type and severity
- RE and remnant status.

Quaternary-level sites were utilised to verify vegetation units and confirm dominant characteristic species. Structural analysis included recording the height class and life form of the dominant species within the mid and canopy strata as per (Neldner *et al.*, 2017). Several time-encoded digital photographs were taken at each tertiary and quaternary site assessment as a reference.

RE classification was determined based on the vegetation, soil and landform characteristics identified in the field, geological mapping for the region and the Regional Ecosystem Description Database (REDD). Condition status for woody vegetation was evaluated utilising the definitions of remnant vegetation under the VM Act. For the purposes of this assessment, vegetation was mapped into three categories:

- Remnant: woody vegetation that has not been cleared or vegetation that has been cleared but where the dominant canopy has greater than 70% of the height and greater than 50% of the cover relative to the undisturbed height and cover of that stratum and is dominated by species characteristic of the vegetation's undisturbed canopy.

- High-value regrowth (HVR): areas previously cleared or disturbed (e.g. by wildfire) over 15 years ago and containing woody vegetation floristically and structurally consistent with the RE but typically less than 70% of the height and less than 50% density of the RE.
- Regrowth or non-remnant: areas previously cleared or otherwise significantly disturbed.

During the course of the surveys, opportunistic flora species not observed at the tertiary and observation sites were recorded. At each tertiary site, searches for threatened flora were performed for approximately 20 minutes within a 50 m radius of the survey location.

Across the field surveys a total of 114 sites including 66 tertiary transects and 48 quaternary sites were undertaken within the Study Area (Appendix A Figure 4).

3.3.1.2 TEC assessments

A single TEC was identified during the desktop assessment:

- Broad leaf tea-tree (*Melaleuca viridiflora*) woodlands in high rainfall coastal north Queensland TEC.

Field assessment of Broad leaf tea-tree (*Melaleuca viridiflora*) woodlands in high rainfall coastal north Queensland TEC (Broad leaf tea-tree TEC) was completed by first determining the presence of key diagnostic features followed by condition thresholds, as detailed in the communities' Listing Advice (Threatened Species Scientific Committee, 2012b). These criteria are detailed in Table 2 below.

The following REs in Queensland correspond to the Broad-leaf tea-tree TEC: 7.3.8a, 7.3.8b, 7.3.8c, 7.3.8d, 7.5.4g, 8.3.2a, 8.5.2c and 8.5.6.

Table 2 Broad-leaf tea-tree TEC field assessment criteria

Criteria	Description
Key diagnostic characteristics	• It occurs in the Wet Tropics and Central Mackay Coast bioregions in landscapes characterised by high rainfall and near coastal or floodplain locations; • Sites are seasonally inundated during the wet season but are not permanently waterlogged; • The tree canopy is clearly dominated (i.e. more than 50% of canopy cover) by *Melaleuca viridiflora*; • A shrub layer is typically absent or sparse (juvenile canopy species and/or a conspicuous layer of Xanthorrhoea (grass tree) may sometimes be present); and • There is a diverse ground-layer of grasses, sedges and forbs. Should include species listed in the vegetation description of the Listing Advice.
Condition thresholds	Patch size: • Patch size must be ≥1 ha; AND Tree canopy layer: • A tree canopy must be present with a canopy cover of at least 15%; AND • The canopy must be dominated by *Melaleuca viridiflora* (broad leaf tea-tree); AND Species richness: • At least 10 perennial native plant species are present in the understorey (shrub and ground layers, excluding juvenile canopy trees) of a patch; AND Exotic species: • Perennial non-native plant species account for no more than 40% of the total ground layer vegetation cover at any time of the year.

3.3.1.3 Protected Plants Survey

A protected plants survey in accordance with the *Flora Survey Guidelines – Protected Plants* (Department of Environment and Heritage Protection, 2016) was undertaken within the high risk area on the flora survey trigger map. A detailed methodology is provided within the Protected Plants Survey Report prepared for the Project.

3.3.1.4 Specimen ID

Where plant species could not be identified in the field, fruiting and/or flowering specimens were taken to assist with identification. For those species not field identified during the surveys, samples were pressed and dried, and positive identifications of plant specimens were subsequently made under laboratory conditions.

3.3.1.5 Nomenclature

Taxonomic nomenclature used for the description of floral species is according to Census of the Queensland Flora 2018 (Bostock & Holland, 2018). Exotic flora species are signified in text by an asterisk (*). Field references used for the identification and description of floral species include: Anderson (2016); Brooker & Kleinig (2004); Lester (2008).

3.3.2 Fauna

The baseline sampling of fauna species was undertaken using standard methodologies for the systematic survey of terrestrial fauna in eastern Australia (Eyre *et al.*, 2018). Methods employed during the field program included:

- Habitat assessments.
- Active searches.
- Microchiropteran bat call detection.
- Camera traps.
- Spotlighting.
- Visual and auditory identification surveys of birds.
- Incidental observations.

Further information regarding each of these methods and survey effort is detailed in Table 3 below. At every fauna habitat assessment site, active searches, scat and sign searches and bird censusing was conducted.

The habitat assessment sites, camera trap sites and spotlighting sites are displayed in Appendix A Figure 4.

3.3.2.1 Fauna Habitat Assessments

Habitat assessments were undertaken to characterise the fauna habitat values within the Project Area. These assessments provide an indication of likely fauna utilisation, and suitability for fauna species, including conservation fauna. Habitat attributes recorded during the assessment include:

- Vegetation structure and dominant species, including a description of canopy, shrub and ground layer structure and composition.
- Presence and abundance of tree hollows and stags.
- Presence and abundance of woody debris such as habitat logs and ground timber.
- Rocky habitat such as surface rocks, boulders, crevices, overhangs and caves.
- Proximity to water (both permanent and ephemeral).
- Disturbance from invasive weeds/pests.
- Other disturbances such as grazing pressure, clearing, thinning or fire.
- Any other significant habitat features or values present.

Included in the habitat assessments were searches for signs of animal activity, including tracks, scats, scratches, bones, fur, feathers, nests, foraging holes and diggings.

3.3.2.2 Active Searches

Active searches were undertaken for reptiles, amphibians, small mammals and cryptic or ground-dwelling bird species. This included scanning the trees and ground, searching beneath microhabitat such as rocks, fallen timber and peeling bark, digging through leaf litter and soil at tree bases and flushing birds from areas with a dense or grassy ground cover. Active searches were undertaken within suitable microhabitat at each habitat assessment site (i.e. across the broad range of habitat types throughout the Project Area).

3.3.2.3 Microchiropteran Bat Call Detection

Microchiropteran bat echolocation calls were recorded using Songmeter SM2Bat+ ultrasonic bat call detectors, configured to record microchiropteran species potentially occurring in the area. Continuous access to properties was limited, restricting the number of locations and duration in which Songmeters could be deployed. Call data was forwarded for analysis to Balance! Environmental.

3.3.2.4 Camera Traps

Camera traps were deployed in strategic positions to record visitation by nocturnal and diurnal animals. Strategic locations included fauna corridors and watering points such as dams and creek lines. A combination of honey-oat mix and sardines or tuna was used as an attractant. Continuous access to properties was limited, restricting the number of locations and duration in which camera traps could be deployed.

3.3.2.5 Spotlighting

In order to locate nocturnal fauna, spotlighting on foot using head torches and hand-held spotlights was undertaken in areas of representative habitat. Spotlighting from the passenger window of a slow moving vehicle was undertaken along farm tracks, targeting larger ground and arboreal mammals and nocturnal birds.

3.3.2.6 Visual and Auditory Identification Surveys of Birds

Roaming/meandering bird surveys were undertaken using both visual and auditory identification. Surveys commenced at dawn and continued throughout the day. Surveys were conducted for the duration of each survey period at each habitat assessment site and during transit between sites. Hilltop vantage points were used to observe aerial hunters, feeders and scavengers. At least 15 minutes was spent at each survey site with an average time of approximately 30 minutes at each site.

3.3.2.7 Incidental Observations

All fauna observed incidentally within or in close proximity to the Project Area were recorded, including those seen while travelling along roads and tracks. Fauna species identified at dams and wetlands were also recorded.

Table 3 Fauna survey methods (total bolded)

Method	Target fauna	Description	Survey effort				
			13 – 19 Nov 2017	11 – 19 June 2018	12 – 16 July 2018	7 Aug 2018	Total
Habitat assessment	Reptiles, mammals, amphibians and birds	Habitat assessments have been completed across the Study Area during both surveys. Each habitat assessment site was one hectare (100 m x 100 m, or 200 m x 50 m). Habitat attributes recorded during the assessment included: • Vegetation structure and dominant species, including a description of canopy, shrub and ground layer structure and composition. • Soil composition and landform • Presence and abundance of nests; namely black-throated finch (southern) • Presence and abundance of tree hollows and stags. • Presence and abundance of woody debris such as habitat logs and ground timber. • Rocky habitat such as surface rocks, boulders, crevices, overhangs and caves. • Proximity to water (both permanent and ephemeral). • Disturbance from invasive weeds/pests. • Other disturbances such as grazing pressure, clearing, thinning or fire. Any other significant habitat features, or values present, such as leaf litter, gilgai, decorticating bark, dense grass/shrub shelter, seeding grass cover, fruiting plants, nectar and pollen producing plants (i.e. mistletoe), and koala food trees.	29 sites	32 sites	25 sites	11 sites	**97 sites**
Active search	Reptiles, mammals, amphibians and birds	Searches included scanning the trees and ground, searching beneath microhabitat such as rocks, fallen timber and peeling bark, digging through leaf litter and soil at tree bases and flushing birds from areas with a dense or grassy ground cover. Grass tussocks were gently disturbed to potentially flush ground-dwelling birds such as the threatened squatter pigeon (southern). Disturbance to microhabitat features and reptiles was kept to a minimum. Active searching was completed at habitat assessment sites across the Study Area.					

Method	Target fauna	Description	Survey effort				
			13 – 19 Nov 2017	11 – 19 June 2018	12 – 16 July 2018	7 Aug 2018	Total
Scat and sign search	Reptiles, mammals, amphibians and birds	Searches included looking for signs of animal activity, including tracks, scats, scratches, bones, fur, feathers, nests, foraging holes and diggings. Scat and sign searches were completed at habitat assessment sites across the Study Area.					
Diurnal bird survey	Birds	Roaming/meandering bird surveys using both visual and auditory identification. Surveys commenced at dawn and continued throughout the day and were completed during all surveys. Active birding was also completed at wetland / farm dam sites where accessible.	112 person-hours	144 person-hours	80 person-hours	16 person-hours	**352 person-hours**
Incidental observations	Reptiles, mammals, amphibians and birds	All fauna observed incidentally within or in close proximity to the Study Area were recorded, including those seen while travelling along roads and tracks.	-	-	-	-	-
Spotlighting	Nocturnal birds and mammals, arboreal mammals, reptiles and amphibians	Roaming / meandering nocturnal searches were completed across the Study Area in habitat suitable for nocturnal species including koala, greater glider and ghost bat using headtorches and hand-held spotlights. Spotlighting from the passenger window of a slow-moving vehicle was also undertaken along farm tracks, targeting larger ground and arboreal mammals, nocturnal birds and pest fauna.	-	32 person-hours	-	-	**32 person-hours**
Camera trapping	Medium - large terrestrial mammals	Cameras were deployed within potential northern quoll habitat, including movement corridors (i.e. rock screes or narrow drainage lines where movement would be unhindered). Cameras were aimed at bait cannisters that contained a honey-oat mix with sardines or tuna. A maximum of 11 cameras were utilised over 5 nights. Analysis of still photos captured on cameras was undertaken by qualified ecologists. Captured images of fauna were identified to species level where possible.	-	61 trap nights	-	-	**61 trap nights**
Passive echolocation call detection	Microbats	A maximum of four Songmeter SM2Bat+ ultrasonic bat call detectors were used across six sites within the Study Area. Detectors were placed in the vicinity of foraging sites such as vegetation corridors, flyways, over watercourses and adjacent to	4 nights	22 nights	-	-	**26 nights**

Method	Target fauna	Description	Survey effort				
			13 – 19 Nov 2017	11 – 19 June 2018	12 – 16 July 2018	7 Aug 2018	Total
		artificial waterbodies (dams) in representative potential, likely and known habitat. Data recorded on the bat recorders were analysed by a qualified specialist, Greg Ford of Balance! Environmental. The format and content of the analysis summary reports comply with nationally accepted standards for the interpretation and reporting of Anabat data (Reardon, 2003).					

3.4 Likelihood of Occurrence

A likelihood of occurrence assessment for threatened species and communities identified during the desktop review was undertaken. Where possible, targeted assessments were undertaken in the field for species identified as either being likely to occur, or having potential to occur, within the Study Area, based on the desktop sources. The methodology was applied again after field surveys to re-assess the likelihood of occurrence once further site-based information became available.

Each species was assessed against the categories defined below.

- **Known**: Species was positively identified and recorded in the Study Area during the field surveys; or previous, reliable records occur within the Study Area
- **Likely**: Species was not recorded during the field surveys or previously, however there are known and current records within the surrounding area (generally within 20 km, however greater distances may be allowed for highly mobile fauna species and species with patchy distributions) and suitable habitat exists in the Project Area
- **Potential**: Species was not recorded during the field surveys or previously, however known records occur in the surrounding area and habitat in the Study Area is marginal or degraded
- **Unlikely**: Habitat in the Study Area might be suitable or marginally suitable; however, the species was not recorded during the field surveys, and no known records of the species exist within the surrounding area
- **No**: This is usually applied to marine species or seabirds for terrestrial sites.

3.5 Habitat Modelling

Following the completion of the field surveys, the likelihood of occurrence assessment and the mapping of ground-truthed vegetation communities and habitat, mapping for the conservation significant values known or having the potential to occur within the Study Area was undertaken.

Where available, information from the publicly available databases were used as a basis to develop the 'modelling rules' for conservation significant species, including relevant species recovery plans (where available), referral guidelines, approved conservation advice, the Species Profile and Threats database (SPRAT), management plans and peer-reviewed journal articles. Habitat assessments collected during the field surveys, species records (public and survey records), and Project vegetation mapping was used to map]the potential habitat according to the modelling rules. The habitat mapping rules are detailed in Appendix G.

3.6 Significant Residual Impact Assessment

A significant residual impact assessment in accordance with the criteria provided in the Significant Residual Impact Guidelines (Department of State Development, Infrastructure and Planning, 2014) has been undertaken for MSES identified within the Project Area.

Significant residual impact assessments for the relevant MSES values were completed using ground-truthed data and habitat mapping that has been completed for potentially occurring Endangered, Vulnerable or Near Threatened (EVNT) species. The full approach and specific significant impact criteria utilised is outlined in Appendix H.

3.7 Limitations

3.7.1 Approach and Land Access

This assessment has been completed using a combination of field-validated data, desktop information and extrapolated field survey results. As such the results are subject to the level of accuracy and detail associated with this information.

Due to land access restrictions, a section of the Project Area was unable to be surveyed in the 2017/18 field survey program (lot and plans 5234/SP275834 and 1/OC64). Based on aerial imagery, the allotment contains high quality intact vegetation, similar in composition to other areas of vegetation

within the Project Area. However due to the lack of field validation of this allotment it is possible not all vegetation communities potentially present have been identified. This property was assessed in August 2021; however at the time of this report results were not available.

To address these limitations, a precautionary approach has been applied. Where potential suitable habitat for MNES or MSES, presence has been assumed and therefore included in the impact assessment.

3.7.2 General

A flora assessment has inherent limitations associated with the variability of vegetation communities across a survey location, and changes to the detectability and presence of species over time. Field surveys have been conducted during multiple seasons and as such should capture representative levels of flora diversity. However prolonged dry periods in the months prior and during the winter surveys may have limited regeneration, flowering and growth. Furthermore, it is recognised that field studies undertaken over just one season cannot always account for 100% of potential floral diversity present across a survey location.

The general limitations to the fauna component of the ecology assessment conducted within the Study Area include the following:

- Highly mobile species with large home ranges may utilise the Study Area, but not at the time of the survey.
- The difficulty in detecting certain species during the survey period (e.g. cryptic species and species present in the Study Area in low densities).
- Biological factors such as sex, age-class, and breeding biology which may influence species' habitat use and detectability during different times of year.

For those fauna species not detected and with records nearby, habitat assessments were undertaken to determine the value of the Study Area to support such species. The absence of a species was not assumed because it was not detected. This same approach was used for flora species.

Field survey data collection to inform mapping was conducted using a hand-held iPad unit with aerial imagery. The accuracy of the iPad is generally <5 m and considered appropriate for the purpose of this assessment.

4.0 Ecological Values

4.1 Regional Context

4.1.1 Bioregion and Subregion

The Study Area is primarily located within the Einasleigh Uplands bioregion. This bioregion largely consists of a series of ranges and plateau surfaces, varying in altitude between 100 m in the west to 1,100 m in the east. The very far eastern extent of the Study Area occurs within the Wet Tropics bioregion, which is dominated by rugged, rainforest mountains as well as extensive plateau areas and low lying coastal plains (Sattler and Williams, 1999). However, this area accounts for <1% of the Study Area.

The Study Area traverses four subregions including Kidston, Broken River and Undara – Toomba Basalts (Einasleigh Uplands bioregion) and Paluma – Seaview (Wet Tropics bioregion). The Study Area primarily occurs within the Kidston and Broken River subregions (covering 27% and 70% respectively). The Kidston subregion occurs in the west largely at elevations between 500 and 800 m AHD, and comprises hills and ranges dominated by *Eucalyptus crebra*. The Broken River subregion is generally characterised by hills with shallow soils largely Palaeozoic in origin, also dominated by *Eucalyptus crebra*. However, there are also areas of Tertiary plateaus, sand sheets and alluvium. As per Sattler & Williams (1999), 'alluvials reach their greatest development in the bioregion along the Burdekin River'.

4.1.2 Surface Geology and Land Zones

The DNRME Townsville hinterland regional surface geological mapping (2000) identified the Study Area to contain twenty-three (23) different geology units (Department of Natural Resources Mines and Energy, 2020b). The geology units that dominate the Study Area (4 of the 23) are described in Table 4 below. Other units present include Td-tvh, Tb-tvh, Perry Creek Formation (Sp), Greenvale Formation (Sn), Oak River Granodiorite (Sgo), McKinnons Creek Granite (Sgm), Dido Tonalite (Sgi), Qb (Olivine basalt), Halls Reward Metamorphics (PLEh), Bioler Gully Complex (PLEb), Wairuna Formation (Ow), Pelican Range Formation (Op), Lucky Creek Metamorphic Group (Ol), Judea Formation (Oj), Cockie Spring Tonalite (Ogcs), Paddys Creek Phylite (EOp), Ryeburn Quartz Diorite (CPgrb) and Poison Creek Granite (Cgpc).

Table 4 Major surface geology units mapped within the Project Area

Unit Name	Map Symbology	Age	Lithology Summary	Dominant Rock Type	Project Area	
					General location	Coverage (%)
Qa-QLD	Qa	Quaternary	Clay, silt, sand and gravel; flood-plain alluvium.	Alluvium	Scattered	15
TQr-tvh	TQr	Late Tertiary - Quaternary	Clay, silt, sand, gravel, soil; colluvial and residual deposits.	Colluvium	Far east & west of Greenvale	8
Einasleigh Metamophics	PLee	Paleoproterozoic	Biotite and calc-silicate gneiss, sillimanite-biotite schist, quartzite, migmatite, amphibolite,	Metamorphic rock	Far west	20

Unit Name	Map Symbology	Age	Lithology Summary	Dominant Rock Type	Project Area	
					General location	Coverage (%)
			abundant leucogranite and pegmatite veins.			
Kangaroo Hills Formation	SDk	Late Silurian – Middle Devonian	Lithofeldspathic arenite and mudstone; local polymictic conglomerate with limestone clasts; allochthonous limestone blocks.	Sedimentary rock	East	22

Land zones are categories that describe the major geologies, the associated landforms and geomorphic processes in Queensland, and are a critical component of the RE classification scheme. Land zones have been delineated across the Project Area based on the available surface geology mapping. Six land zones (Table 5) have been identified and are broadly consistent with the surface geology mapping. Definitions are consistent with (Wilson and Taylor, 2012).

Table 5 Land zones and associated surface geologies present within the Project Area

Land Zone	Description
3	Recent Quaternary alluvial systems, including closed depressions, paleo-estuarine deposits currently under freshwater influence, inland lakes and associated wave built lunettes. Excludes colluvial deposits such as talus slopes and pediments. Includes a diverse range of soils, predominantly Vertosols and Sodosols; also with Dermosols, Kurosols, Chromosols, Kandosols, Tenosols, Rudosols and Hydrosols; and Organosols in high rainfall areas.
5	Tertiary-early Quaternary extensive, uniform near level or gently undulating plains with sandy or loamy soils. Includes dissected remnants of these surfaces. Also includes plains with sandy or loamy soils of uncertain origin, and plateau remnants with moderate to deep soils usually overlying duricrust. Excludes recent Quaternary alluvial systems (land zone 3), exposed duricrust (land zone 7), and soils derived from underlying bedrock (land zones 8 to 12). Soils are usually Tenosols and Kandosols, also minor deep sandy surfaced Sodosols and Chromosols. There may be a duricrust at depth.
7	Cainozoic duricrusts formed on a variety of rock types, usually forming mesas or scarps. Includes exposed ferruginous, siliceous or mottled horizons and associated talus and colluvium, and remnants of these features, for example low stony rises on downs. Soils are usually shallow Rudosols and Tenosols, with minor Sodosols and Chromosols on associated pediments, and shallow Kandosols on plateau margins and larger mesas.
8	Cainozoic igneous rocks, predominantly flood basalts forming extensive plains and occasional low scarps. Also includes hills, cones and plugs on trachytes and rhyolites,

Land Zone	Description
	and associated interbedded sediments, and talus. Excludes deep soils overlying duricrust (land zone 5). Soils include Vertosols, Ferrosols and shallow Dermosols.
11	Metamorphosed rocks, forming ranges, hills and lowlands. Primarily lower Permian and older sedimentary formations which are generally moderately to strongly deformed. Includes low- to high-grade and contact metamorphics such as phyllites, slates, gneisses of indeterminate origin and serpentinite, and interbedded volcanics. Soils are mainly shallow, gravelly Rudosols and Tenosols, with Sodosols and Chromosols on lower slopes and gently undulating areas. Soils are typically of low to moderate fertility.
12	Mesozoic to Proterozoic igneous rocks, forming ranges, hills and lowlands. Acid, intermediate and basic intrusive and volcanic rocks such as granites, granodiorites, gabbros, dolerites, andesites and rhyolites, as well as minor areas of associated interbedded sediments. Excludes serpentinites (Land Zone 11) and younger igneous rocks (Land Zone 8). Soils are mainly Tenosols on steeper slopes with Chromosols and Sodosols on lower slopes and gently undulating areas. Soils are typically of low to moderate fertility.

4.1.3 Climate

The climate of the region is sub-tropical, characterised by warm humid summers and mild dry winters. The nearest Bureau of Meteorology (BOM) station to the Project Area is located east in the township of Ingham (station number 032078). Of the survey periods, recorded maximum and minimum daily temperatures were highest in November. The lowest minimum daily temperatures were recorded in the May to June 2018 period, however maximum daily temperatures were similar across May to July 2018 (Table 6).

The annual mean rainfall is 2144.6 mm, however this is expected to be substantially higher than the rainfall received in the Project Area which is located further inland. Rainfall is highest during the months of summer.

Table 6 Survey climatic conditions

Parameter	Survey period				
	13-19 Nov 2017	28 May – 4 June 2018	11-19 June 2018	12-16 July 2018	7 August 2018
Maximum daily temperature (°C)	34.4 – 37.6	27.1 – 30.0	25.3 – 31.3	28.5 – 30.0	30.5
Minimum daily temperature (°C)	20.0 – 23.0	4.4– 15.2	10.1 – 16.0	7.6 – 11.3	19.9

4.2 Flora

4.2.1 Vegetation Communities

The DoR RE mapping (Version 11.0) was reviewed as part of the initial desktop assessment to determine the extent of REs across the Study Area. The Study Area was shown to primarily comprise remnant vegetation (including heterogenous polygons) analogous to up to forty-seven (47) REs (Appendix C). Based on the status under the VM Act, of the mapped REs five are listed Of Concern (RE 7.5.4f, 7.8.18a, 7.12.29a, 9.3.23 & 9.12.10) and the remaining are Least Concern. No state mapped REs are listed Endangered under the VM Act. Desktop RE mapping and a comparison to ground-truthed REs is shown in Appendix A Figure 5.

Results of the field survey confirmed the presence of twenty (20) of the 47 mapped REs as well as seventeen additional REs not previously mapped within the Study Area. Ground-truthed RE mapping is show in Appendix A Figure 7. For areas that could not be accessed during the survey (lot and plans 5234/SP275834 and 1/OC64), RE classification and extent was determined based on a combination of state mapping, extrapolated field data and aerial photograph interpretation.

To understand the ecologically distinct vegetation communities present within the Study Area, field-validated REs have been grouped based on their associated regional (1:1,000,000) Broad Vegetation Group (BVG) as per Neldner et al. (2019) (Table 7). Sixteen different BVGs are represented by the vegetation of the Study Area.

The extent, condition and dominant species of each field validated vegetation community is described below in Table 8 with representative site images (where available). Non-remnant communities recorded during the field surveys are also described. The mapped extent of each vegetation community within the Study Area is shown in Appendix A Figure 7.

Table 7 Study Area BVGs, REs and associated state conservation status

Vegetation Community	BVG	Relevant REs	VM Act Status[1]	BD Status[2]
Closed to open forest of *C. intermedia* and *Eucalyptus tereticornis* on coastal ranges	9c	7.8.7	OC	E
		7.8.18	OC	OC
		7.12.29	LC	NCAP
Open woodland dominated by *Eucalyptus crebra* on basalt plains	11b	9.8.1	LC	NCAP
		9.8.4	LC	NCAP
Eucalyptus microneura woodland on rolling metamorphic hills	13b	9.11.23b	LC	NCAP
Open forests and woodlands of *Eucalyptus crebra* and *Eucalyptus sp.* on granitic and metamorphic ranges	13c	9.11.2a	LC	NCAP
		9.11.16	LC	NCAP
		9.11.15a	LC	NCAP
		9.12.1a	LC	NCAP
		9.12.10	OC	OC
		9.12.12	LC	NCAP
		9.12.16	OC	OC
Eucalyptus moluccana woodland on igneous rocks	13d	9.12.26	OC	OC
Eucalyptus camaldulensis, Casuarina cunninghamiana and *Melaleuca sp*. riparian open forest on alluvium	16a	9.3.1	LC	OC
Eucalyptus leptophleba open woodland on alluvium	16b	9.3.3, 9.3.3a	LC	OC
	16c	9.3.6a	LC	NCAP
		9.3.16	LC	OC

Vegetation Community	BVG	Relevant REs	VM Act Status[1]	BD Status[2]
Eucalyptus platyphylla or *Eucalyptus crebra* woodlands on floodplains		9.3.22a	LC	OC
Eucalyptus brownii woodland on alluvium	17a	9.3.5	LC	OC
Eucalyptus melanophloia or *Eucalyptus shirleyi* low open woodland on hills and ranges	17b	9.11.1a	LC	NCAP
Eucalyptus crebra woodland on colluvial plains	18b	9.5.3	LC	NCAP
Eucalyptus microneura open forest to woodland on alluvium	18d	9.3.20	LC	NCAP
Eucalyptus persistens open forest to woodland on hills and ranges	19d	9.5.11	LC	NCAP
		9.7.1	LC	NCAP
		9.11.5	LC	NCAP
		9.12.32	LC	NCAP
Melaleuca spp., *Eucalyptus camaldulensis* and *Casuarina cunninghamiana* riparian open forest	22c	9.3.13	LC	OC
Acacia shirleyi low open forest on laterite	24a	9.7.2	LC	NCAP
Tussock grassland dominated by *Dichanthium spp.* on undulating downs or clay plains	30b	9.3.25	LC	OC
		9.8.13	LC	NCAP

[1] Conservation status of the RE under the VM Act: 'OC' – Of Concern, 'LC' – Least Concern

[3] Biodiversity (BD) status under the EP Act of the RE based on an assessment of the condition of remnant vegetation in addition to the pre-clearing and remnant extent of a RE: 'NCAP' – No Concern At Present, 'OC' – Of Concern and 'E' – Endangered.

Table 8 Vegetation communities within the Study Area

Vegetation Community	REs	Description	Study Area (ha)	Image
Closed to open forest of *C. intermedia* and *Eucalyptus tereticornis* on coastal ranges	7.8.7, 7.8.18 & 7.12.29	Forest complex of *Corymbia intermedia, Corymbia spp.* and *Eucalyptus tereticornis* up to 28 m on basalt-derived soils (RE 7.8.18) or granite (RE 7.12.29). The canopy is generally mid-dense but in some areas is dense (cover up to 90% recorded). A very sparse sub-canopy of *Lophostemon suaveolens* and *Corymbia tessellaris* up to 13 m tall is sometimes present. The shrub layer is generally very sparse and dominated by *Acacia flavescens* 3 m tall on average. However in some locations, the exotic *Lantana camara** dominates and forms dense thickets. Other species in the shrub include *A. implexa.* The ground layer is generally dominated by *Imperata cylindrica* or *Lantana camara**. Other recorded ground layer species include *Digitaria parviflora*, *Desmodium brachypodum*, *Lomandra longifolia*, *Sida acuta* and *Scleria brownii*.	186.25	
Eucalyptus camaldulensis, Casuarina cunninghamiana and *Melaleuca sp*. riparian open forest on alluvium	9.3.1	Open forest on sandy alluvial deposits dominated by *Eucalyptus camaldulensis*, *Casuarina cunninghamiana* and/or *Melaleuca fluviatilis*. In some locations the canopy also contains *Eucalyptus tereticornis* or *Ficus opposita.* The canopy is mid-dense (40 - 60% cover recorded) and has an average height of 17 m. A sub-canopy up to 10 m is present comprising *Lophostemon suaveolens*, *M. bracteata*, *M. trichostachya* or canopy species. The shrub layer is very sparse and 3 m tall or absent. Where present, shrub layer species include *Atalaya hemiglauca*, *Carissa ovata, M. bracteate, M. leucadendra* and *Vachellia bidwillii*. In some locations the exotic *Lantana camara** dominates the shrub layer. The ground layer primarily contains bare ground however where vegetated, is dominated by native species such as *Dichanthium fecundum* and *Lomandra longifolia* or exotic grasses *Bothriochloa pertusa** and *Urochloa mutica**.	44.53	

Vegetation Community	REs	Description	Study Area (ha)	Image
Eucalyptus leptophleba open woodland on alluvium	9.3.3, 9.3.3a	Open woodland of *Eucalyptus leptophleba* with *Eucalyptus crebra* up to 16 m on alluvial flats. The sub-canopy and shrub layer are absent. The ground layer is variable but often dominated by the exotic grass *Themeda quadrivalvis*.* Occasional occurrences of *Parthenium hysterophorus* were also recorded.	18.05	-
Eucalyptus brownii woodland on alluvium	9.3.5	Open forest to woodland dominated by *Eucalyptus brownii* up to 18 m on alluvial plains. The canopy is generally mid-dense (36%) and in some locations also contains *Lysiphyllum hookeri* and or *Eucalyptus dallachiana*. The sub-canopy is absent. A sparse shrub layer of *Atalaya hemiglauca*, *Carissa lanceolata* and *Eremophila mitchelli* sometimes occurs. The ground layer comprises a native grassland of *Dichanthium fecundum* with occasional tussocks of *Eriochloa crebra* and *Panicum decompositum*. Other species occasionally present in the ground layer include *Bonamia media*, *Chrysocephalum apiculatum*, *Neptunia gracilis* and *Phyllanthus sp.*. Grazing disturbance was recorded in areas of this community.	45.05	
Eucalyptus platyphylla or *Eucalyptus crebra* woodlands on floodplains	9.3.6a, 9.3.16 & 9.3.22a	Woodland dominated by *Eucalyptus platyphylla* or *Eucalyptus crebra* on alluvium. In some locations, *Corymbia clarksoniana* or *Eucalyptus dallachiana* may be sub-dominant in the canopy. A very sparse sub-canopy up to 15 m is generally present and contains *Corymbia erythrophloia*, *E. dallachiana* and *Melaleuca bracteata*. *Cassia brewsteri* sometimes forms a very sparse low canopy layer (T3). The shrub layer is also very sparse and dominated by *Carissa lanceolata* with occurrences of *Sida cordifolia**, *Denhamia oleaster* and *Eremophila mitchelli*. The ground layer is variable and contains *Cyperus gracilis* as well as weed species including *Ageratum sp.** and *Melinis repens*.*	304.68	-

Vegetation Community	REs	Description	Study Area (ha)	Image
		Disturbance due to grazing was generally high and at some locations *Parthenium hysterophorus** was also present.		
Melaleuca spp., *Eucalyptus camaldulensis* and *Casuarina cunninghamiana* riparian open forest	9.3.13	Open forest on sandy alluvial deposits dominated by *Eucalyptus camaldulensis* and *Melaleuca leucadendra*. The canopy is mid-dense (51.2% cover recorded) and has an average height of 18 m. Occasional *Casuarina cunninghamiana* also occur in the T1. The sub-canopy is sparse (9.2% cover recorded) and comprises canopy species and occasionally *Lophostemon grandiflorus* up to 11 m tall. A very sparse shrub layer with an average height of 3 m is also present and contains *Melaleuca bracteate and M. leucadendra*. The ground layer primarily contains bare ground and small areas of leaf litter. However where vegetated, the ground layer is generally dominated by exotic species including *Cynodon dactylon**, *Urochloa mosambicensis**, *Bothriochloa pertusa** and *Emilia sonchifolia**. Recorded native ground species were limited to *Dichanthium aristatum* and *Grewia retusifolia*.	105.37	
Eucalyptus microneura open forest to woodland on alluvium	9.3.20	Open forest to woodland of *Eucalyptus microneura* up to 19 m on alluvial plains. The canopy ranges from sparse to mid-dense and contains *Corymbia confertiflora, Corymbia clarksoniana* or *Corymbia dallachiana* as a sub-dominant species. A sparse sub-canopy of *Melaleuca citrolens* or canopy species is mostly present. The shrub layer is sparse and dominated by *Melaleuca sp.* or *Petalostigma pubescens* with *Gardenia vilhemii* sub-dominant. *Carrisa ovata* forms a very sparse low (1 m) shrub layer. The ground layer is dominated by native grasses including *Heteropogon contortus* and *Themeda triandra*, however leaf litter and bare ground is common.	13.02	-

Vegetation Community	REs	Description	Study Area (ha)	Image
Tussock grassland dominated by *Dichanthium spp.* on undulating downs or clay plains	9.3.25 & 9.8.13	*Dichanthium fecundum* grassland on alluvial deposits (9.3.25) or basalt clay plains (9.8.13). Other native grass species present include *Eriochloa crebra*, *Bothriochloa bladhii* and *Panicum decompositum*. Commonly occurring forb species include *Phyllanthus sp.*, *Polymeria longifolia* and *Neptunia gracilis*. Grazing disturbance was recorded in areas of this community.	13.10	
Eucalyptus crebra woodland on colluvial plains	9.5.3	Woodland dominated by *Eucalyptus crebra* up to 18 m on clay loam colluvial plains. Occasional *Corymbia dallachiana* also occur in the canopy. A sparse sub-canopy up to 10 m tall is sometimes present and contains *Corymbia clarksoniana*, *Grevillea striata* or canopy species. The shrub layer is very sparse and 3 m tall on average. Recorded species in this layer include *Acacia excelsa*, *Denhamia cunninghamiana*, *Petalostigma pubescens*, *Gardenia velhelmii* as well as regrowth canopy species. The ground layer is generally dominated by the native grass *Themeda triandra*, with *Bothriochloa decipiens*, *Heteropogon contortus* and *Chrysopogon fallax* also recorded. In some areas the exotic grass *Bothriochloa pertusa** is also common. Native forbs and vines also occur in the ground layer including *Brunoniella australis*, *Crotalaria medicaginea*, *Indigofera linifolia*, *Galactia tenuiflora* and *Grewia retusifolia*.	367.72	

Vegetation Community	REs	Description	Study Area (ha)	Image
Acacia shirleyi low open forest on laterite	9.7.2	*Acacia shirleyi* with an average height of 6.5 m forms a low open forest on laterite outcrops. Occasional *Cassia brewsteri* also occur within the canopy. A very sparse emergent layer is also present and contains scattered *Eucalyptus persistens* and *Corymbia sp.* up to 12 m. The shrub layer is mid-dense and dominated by *Santalum lanceolatum* and *Petalostigma spp.* 3 m tall on average. Other species recorded in the shrub layer include *Acacia gonoclada*, *Alphitonia excelsa*, *Dodonaea sp.* and *Larsenaikia ochreata*. The ground layer is dominated by bare ground and leaf litter. Native grasses *Chrysopogon fallax* and *Enneapogon lindleyanus* occur occasionally in the ground layer and form small tussocks.	49.62	
Open woodland dominated by *Eucalyptus crebra* on basalt plains	9.8.1 & 9.8.4	Woodland dominated by *Eucalyptus crebra* up to 15 m on basalt plains. In some areas, this community also contains *Eucalyptus dallachiana* as a co-dominant canopy species (RE 9.8.1). Other species that occur occasionally in the canopy include *Corymbia clarksonia*, *Corymbia confertiflora* and *Corymbia erythrophloia*. The shrub layer is generally very sparse and up to 3 m tall. Recorded species in this layer include *Corymbia tessellaris*, *Denhamia disperma*, *Grevillea wickhamii* and regrowth canopy species. In some areas, the exotic *Lantana camara** dominates the shrub, occurring in dense patches. The ground layer is generally dominated by the native grass *Heteropogon contortus*, with *Dichanthium fecundum*, *Heteropogon triticeus* and *Panicum effusum* also recorded. *Dianella caerulea*, *Flemingia parviflora, Galactia tenuiflora* and *Waltheria indica* are also occasionally present in this layer.	200.43	

Vegetation Community	REs	Description	Study Area (ha)	Image
E. melanophloia or *E. shirleyi low open woodland* on hills and ranges	9.11.1a	Low woodland to low open woodland of *Eucalyptus melanophloia* (silver-leaved ironbark) +/- *E. persistens* +/- *E. crebra* (narrow-leaved ironbark) +/- *Corymbia dallachiana* (Dallachy's gum) +/- *C. peltata* (rustyjacket) +/- *E. brownii* (Reid River box) +/- *Acacia julifera* (catkin wattle). *E. shirleyi* (silver-leaved ironbark) may sometimes be dominant. The shrub layer is usually absent but scattered juvenile canopy species, *Petalostigma spp.*, *Denhamia cunninghamii* and *Hakea spp.* may occur. The ground layer is dense grassy and includes *Themeda triandra* (kangaroo grass), *Cymbopogon bombycinus* (lemon-scented grass) and *Heteropogon contortus* (black speargrass). Occurs on skeletal soils of slopes and crests of undulating rises and low hills of folded metasediments and other metamorphic rocks.	44.25	-
E. persistens open forest to woodland on hills and ranges	9.5.11, 9.7.1, 9.11.5, 9.12.32	Open forest to woodland dominated by *Eucalyptus persistens* up to 15 m on a variety of substrates. Where this community is analogous to RE 9.5.11, *Eucalyptus crebra* is sub-dominant in the canopy. A sub-canopy layer comprising *E. persistens* up to 9 m is also sometimes formed. The shrub layer is generally sparse with an average height of 3 m, and dominated by *Acacia spp*., *Erythroxylum australe*, *Carissa lanceolata* and/or juvenile *E. persistens*. Other species recorded in this layer include *Alphitonia excelsa*, *Breynia oblongata*, *Carissa ovata Denhamia cunninghamii* and *Geijera salicifolia*. The ground layer is generally dominated by *Heteropogon contortus.* Where disturbance is high, the exotic grass *Bothriochloa pertusa** may be dominant however native grasses including *Aristida calycina*, *Enneapogon polyphyllus, Themeda triandra* and *H. contortus* still occur. Native forbs recorded in the ground layer include *Crotalaria brevis, Glycine tomentella* and *Grewia retusifolia*.	1648.41	

Vegetation Community	REs	Description	Study Area (ha)	Image
Open forests and woodlands of *E. crebra* and *Eucalyptus sp.* on granitic and metamorphic ranges	9.11.2a, 9.11.15a, 9.11.16, 9.12.1a, 9.12.10, 9.12.12 & 9.12.16	Open forests and woodlands dominated by *Eucalyptus crebra* up to 22 m on granitic and metamorphic sediments. In some locations, *Corymbia confertiflora* (RE 9.12.10) or *Corymbia erythrophloia* (RE9.11.15a and 9.11.16) is co-dominant. The canopy is generally sparse to mid-dense, and may also contain occasional *Corymbia dallachiana, Eucalyptus microneura* and *Grevillea parallela*. A mid-dense sub-canopy layer is containing canopy species occurs in some locations. The shrub layer is very sparse to sparse and highly variable in composition. Species recorded in this layer include *Acacia disparrima*, *Atalaya hemiglauca*, *Carissa lanceolata*, *Geijera parviflora*, *Melaleuca nervosa* and *Petalostigma spp*. The ground layer is generally dominated by the native grass *Heteropogon contortus,* however exotic grasses including *Bothriochloa pertusa** and *Urochloa mosambicensis** do also occur. Other ground layer species recorded include *Glycine tomentella*, *Grewia retusifolia* and *Stylosanthes scabra**. Varying levels of disturbance due to cattle grazing were recorded in areas of this community.	1,873.94	
Eucalyptus microneura woodland on rolling metamorphic hills	9.11.23b	Woodland of *Eucalyptus microneura* up to 12 m on metamorphic hills. Both the sub-canopy and shrub layer are absent. The ground layer comprises a native grassland dominated by *Heteropogon contortus,* with *Aristida sp.* and *Themeda triandra* also present. Other species that occur in the ground layer include *Grewia retusifolia*, *Polymeria pusilla*, *Melinis repens** and *Stylosanthes scabra**. The community generally recorded low levels of disturbance.	174.02	

Vegetation Community	REs	Description	Study Area (ha)	Image
Eucalyptus moluccana woodland on igneous rocks	9.12.26	Woodland dominated by *Eucalyptus moluccana* with an average height of 13 m on igneous rock hill slopes. The sub-canopy is absent. The shrub layer is sparse and dominated by *Petalostigma pubescens* with occasional *Acacia melanoxylon* and regrowth *E. moluccana*. Occasional dense patches of the exotic *Lantana camara** also occur in the shrub layer. The ground layer is dominated by *Themeda triandra* with *Chrysopogon fallax* and *Imperata cylindrica* also common. Other ground layer species recorded include *Flemingia parviflora*, *Galactia tenuiflora* and *Stylosanthes scabra**.	26.98	-
Non-remnant vegetation (including cleared pasture)	-	Small areas of historically cleared areas dominated by a mixture of native and exotic grasses occur within the Project Area. Cover in many areas was dense due to the restricted access to cattle. In some areas, dense patches of *Lantana camara** form a sparse shrub layer. Individual *Corymbia sp.* and *Eucalyptus sp.* trees occur sporadically near homesteads and cattle stock yards. Vegetation was determined to lack any demonstrable ecological function due to the high level of ongoing disturbance and isolation in the landscape.	735.57	

4.2.2 Regulated Vegetation

A review of the DNRME Regulated Vegetation mapping identified the presence of regulated vegetation at various locations within the Study Area. The Study Area contains large portions of Category B (remnant vegetation) mapping, as well as portions of Category C, R and X (Appendix A Figure 5).

The DES 'MSES - Regulated vegetation - intersecting a watercourse' mapping was reviewed as part of the desktop assessment. Regulated vegetation intersecting a watercourse is mapped to occur within a Category B regulated vegetation area within the Study Area.

There is no regulated vegetation within 100 m of a wetland mapped within the Study Area. Field surveys confirmed Queensland government mapping.

Regulated vegetation within the Project Area is discussed in Section 6.0 and Appendix H.

4.2.3 Threatened Ecological Communities

One Endangered (EPBC Act) Threatened Ecological Community (TEC) was identified in the desktop assessment as having potential to occur within the Project Area; Broad leaf tea-tree TEC (Appendix D). In Queensland, Broad leaf tea-tree TEC corresponds to the following REs: 7.3.8a, 7.3.8b, 7.3.8c, 7.3.8d, 7.5.4g, 8.3.2a, 8.5.2c and 8.5.6.

No TECs were encountered during the field surveys. REs confirmed during the field surveys were not analogous to the REs associated with the Broad leaf tea-tree TEC, and vegetation within the Survey Area does not meet the key diagnostic features or condition thresholds for the TEC, as detailed in the Listing Advice (Threatened Species Scientific Committee, 2012b).

4.2.4 Flora Diversity

The field surveys identified 281 flora species from 57 families. The dominant plant families recorded were Poaceae (45 species), followed by Fabaceae (32 species), Myrtaceae (32 species) and Mimosaceae (24 species). The full species list is provided in Appendix E.

4.2.5 Conservation Significant Flora

The desktop assessment identified 22 conservation significant flora species as having the potential to occur within 20 km of the Project Area, including 14 EPBC Act listed species and 20 NC Act listed species (Appendix B).

The likelihood of occurrence assessment identified four flora species that are known, likely or have potential to occur within the Survey Area, based on the flora and habitat observed during the field surveys (Table 9). Two species are listed under the EPBC Act, and all four species are listed under the NC Act. A complete likelihood of occurrence assessment is provided in Appendix D. One conservation significant flora species was identified during the field surveys:

- *Leptospermum pallidum*, listed as Near Threatened under the NC Act.
    - This species was discovered approximately 34 m north of the Project Footprint within the Study Area (-18.971496, 144.723464) on Lot 547/SP242570. The location of the record is shown on Appendix H Figure 12. The population was identified on the slopes of a lateritic jump-up (RE 9.7.2) and comprised >50 individuals. The species identification was confirmed by the Queensland Herbarium.

Plate 1 Leptospermum pallidum

Table 9 Flora Likelihood of Occurrence Assessment Results

Species	Status (EPBC Act[1], NC Act[2])	Likelihood of Occurrence in the Study Area
Tingoora wattle *Acacia tingoorensis*	-, V	Potential
Bluegrass *Dichanthium setosum*	V, -	Potential
Leptospermum pallidum	-, NT	Known
Tephrosia leveillei	V, V	Potential

[1]V=Vulnerable

[2] V=Vulnerable; NT=Near threatened

4.2.6 Essential Habitat

The desktop assessment identified a section adjacent to the east of the Project Area (Mount Fox end) that is mapped as essential habitat for the conservation significant flora species *Acacia tingoorensis* (Tingoora wattle) (Appendix A Figure 6). This species is listed as Vulnerable under the NC Act, and is discussed further in Section 4.2.7. An additional area of essential habitat for *Leptospermum pallidum* is mapped within the Study Area in Lot 547/SP242570 (Appendix A Figure 6). This species is discussed further in Section 4.2.5.

4.2.7 Protected Plants

The desktop assessment identified a section in the east of the Project Area (Mount Fox end) that is mapped as a 'high risk area' on the Protected Plants Flora Survey Trigger Map (Appendix A Figure 6). An additional area of essential habitat for *Leptospermum pallidum* is mapped within the Study Area in Lot 547/SP242570 (Appendix A Figure 6). This species is discussed further in Section 4.2.5.

A protected plants survey in accordance with the *Flora Survey Guidelines – Protected Plants* (Department of Environment and Science, 2019a) will be undertaken within the high risk areas.

4.2.8 Introduced Flora Species

The field surveys recorded 38 introduced flora species, accounting for 13% of the species observed Appendix E. Four of these species are listed as Category 3 restricted invasive plants/biosecurity matter under the *Biosecurity Act 2014*, including:

- *Parthenium hysterophorus* (parthenium); also listed as a WoNS.
- *Lantana camara* (lantana); also listed as a WoNS.
- *Cryptostegia grandiflora* (rubber vine); also listed as a WoNS.
- *Argyreia nervosa* (Elephant creeper).

The solitary *Cryptostegia grandiflora* specimen that was detected within the Study Area was affected by rubber vine rust (*Maravalia cryptostegiae*). Although not recorded during the field surveys, *Chromolaena odorata* (siam weed) is known to occur in the region and therefore may occur within the Study Area. Siam weed is a WoNS and a Category 3 restricted invasive plant under the *Biosecurity Act 2014*.

4.3 Fauna

4.3.1 Fauna Habitat Types

Nine dominant habitat types were recorded across the Study Area (Table 10, and Appendix A Figure 8). A description of each habitat type is detailed in the subsequent sections below.

Table 10 Fauna habitat types

Habitat No.	Habitat types	Analogous REs	Area (ha) within Study Area
1	Open *Eucalyptus* woodland on alluvium or sand plains	9.3.3, 9.3.3a, 9.3.5, 9.3.6a, 9.3.16, 9.3.20, 9.3.22a, 9.5.3, 9.5.11	874.53
2	Open *Eucalyptus*, *Casuarina* and *Melaleuca* riparian woodland	9.3.1, 9.3.13	149.89
3	Native grassland	9.3.25, 9.8.13	13.10
4	Low open forest of *Acacia shirleyi* and *Eucalyptus persistens* on laterite	9.7.1, 9.7.2	422.71
5	Open woodland of *Eucalyptus* and *Corymbia* on basalt	7.8.7, 7.8.18, 9.8.1, 9.8.4	380.09
6	Woodland of *Eucalyptus* and *Corymbia* on metamorphic hills	9.11.1a, 9.11.2a, 9.11.5, 9.11.15a, 9.11.16, 9.11.23b	2,835.98
7	*Eucalyptus and Corymbia w*oodland on igneous hills and/or granite	7.12.29, 9.12.1a, 9.12.6c, 9.12.10, 9.12.12, 9.12.16, 9.12.26, 9.12.32	439.10

Habitat No.	Habitat types	Analogous REs	Area (ha) within Study Area
8	Cleared areas	Non-remnant	733.12
9	Farm dams	Non-remnant	2.45

4.3.1.1 Open *Eucalyptus* woodland on alluvium or sand plains

This habitat occurs on low, gently undulating plains within proximity to watercourses or drainage lines (Plate 2).

Mature koala food trees (*Eucalyptus sp.* and *Corymbia sp.*) form a largely intact canopy. Trees and stags bearing hollows occasionally to commonly occur. Although large hollows are rare, medium-sized hollows were present and as such habitat is considered suitable for the denning of the threatened greater glider (*Petauroides volans*) which was recorded during the field survey. Small were more abundant and may be utilised by common microbat species or parrots such as the red-winged parrot (*Aprosmictus erythropterus*) and pale-headed rosella (*Platycercus adscitus*) which were also recorded.

This habitat was generally found to have a low level of structural diversity. Most areas lack a shrub layer and have a very simplistic ground layer, with bare ground common, occasional shallow soil cracks and limited microhabitat features. Where grazing pressures are low, the ground layer is denser and dominated by native grass species including *Heteropogon contortus* (black spear grass) and *Themeda triandra* (kangaroo grass). The threatened black-throated finch (southern) (*Poephila cincta cincta*) feeds on a variety of native grasses including kangaroo grass and as such habitat is considered suitable for the foraging of this species. The areas of grassy ground layer provide dispersal opportunities for small ground-dwelling mammals and foraging opportunities for macropods such as the eastern grey kangaroo (*Macropus giganteus*) which was recorded. Based on the presence of diggings, the soft alluvial substrate is also suitable for the foraging of bandicoots and the short-beaked echidna (*Tachyglossus aculeatus*).

Despite the low-level of structural complexity, suitable foraging conditions for a range of nectar-feeding and foliage-gleaning birds is provided. Bird species recorded include the white-throated gerygone (*Gerygone olivacea*), weebill (*Smicrornis brevirostris*), brown treecreeper (*Climacteris picumnus*), leaden flycatcher (*Myiagra rubecula*), little friarbird (*Philemon citreogularis*) and noisy friarbird *(Philemon corniculatus*). Arboreal termitaria also occasionally occur which once disused may be used for nesting by woodland birds such as the laughing kookaburra (*Dacelo novaeguineae*), which was also recorded during the field survey.

Decorticating bark is generally common providing opportunities for arboreal reptiles such as geckos. Other opportunities for reptiles in this habitat are limited to occasional woody debris, small and medium fallen logs and small areas of thin leaf litter. The presence of large fallen logs indicates habitat may be suitable for the threatened yakka skink (*Egernia rugosa*). The lively rainbow skink (*Carlia vivax*) was the only reptile species recorded in this habitat.

Drainage lines in the vicinity of this habitat were dry at the time of surveying, indicating that the systems are highly ephemeral and dependent on climatic conditions. In contrast to fringing riparian habitat, these alluvial areas are suitable for the burrowing of the threatened yakka skink as they are not frequently inundated. In the wet season, these areas will likely provide suitable habitat for a range of common amphibian species and some common reptiles such as snakes.

Disturbance is generally low and was primarily a result of weeds and historical selective clearing. Moderate to high levels of cattle grazing were also recorded in some locations.

Plate 2 Open eucalypt woodland on alluvial plains habitat

4.3.1.2 Open *Eucalyptus*, *Casuarina* and *Melaleuca* riparian woodland

This habitat occurs as linear patches along higher-order watercourses (Plate 3). Watercourses associated with this habitat were commonly found to have ponding or slow flowing water, suggesting that water availability is moderate and likely to be greater during the wet season. Such conditions create suitable habitat for common amphibian species and provide a source of drinking water for a variety of fauna throughout the year including threatened species such as the squatter pigeon (southern) (*Geophaps scripta scripta*), black-throated finch (southern) and northern quoll (*Dasyurus hallucatus*). The watercourses have a sandy substrate and banks are mostly gently sloping, providing suitable conditions for reptile species such as turtles and easy access for terrestrial ground-dwelling fauna. In some locations however banks are very steep as a result of bank scouring. Due to the potential for regular inundation and soft sandy substrates, habitat is not suitable for the yakka skink.

Tall, mature trees including eucalypts, *Melaleuca spp.*, and *Casuarina cunninghamiana* dominate the canopy and provide potential nesting opportunities for raptors including the threatened red goshawk (*Erythrotriorchis radiatus*). During the field survey canopy trees were found to occasionally contain stick or mud nests. Such nests were likely built by common raptors, or woodland birds such as apostlebirds (*Struthidea cinere*) and pied butcherbirds (*Cracticus nigrogularis*), both of which were recorded. The threatened grey falcon (*Falco hypoleucos*) may utilise disused raptor nests. Hollow-bearing trees (usually *Eucalyptus camaldulensis* or *Eucalyptus platyphylla*) and stags were commonly recorded. Hollows are generally medium to large in size and suitable for the denning of the threatened greater glider. Nocturnal birds may also utilise hollows for nesting, including the Australian owlet-nightjar (*Aegotheles cristatus*) and eastern barn owl (*Tyto javanica*) (both of which were recorded during the field survey), and the threatened masked owl (northern) (*Tyto novaehollandiae kimberli*).

Scratches were commonly recorded on the trunks of mature eucalypts, some of which were considered likely attributable to koala. Given the proximity to water, koalas may utilise habitat as refuge when water availability in the landscape is low. This habitat also provides suitable foraging opportunities for microbat species such as the threatened ghost bat (*Macroderma gigas*), which may utilise the flyways created by the creek line and vantage points created by the overhanging canopy vegetation.

The understorey is relatively complex. *Melaleuca bracteata* occasionally forms dense patches in the shrub layer creating refuge opportunities for small bird species and ground-dwelling mammals such as the rufous bettong (*Aepyprymnus rufescens*), which was also recorded. Microhabitat features in the ground layer include occasional grass tussocks, woody debris, small to medium fallen logs, decorticating bark and fine leaf litter, which provide habitat opportunities for small reptiles. Leaf litter was common to abundant in some locations, and especially notable underneath mature *Casuarina cunninghamiana*. The shaded-litter rainbow-skink (*Carlia munda*) was the only reptile recorded within this habitat during the field survey.

A large diversity of bird species are supported by this habitat including raptors, parrots, kingfishers, honeyeaters, finches and common woodland birds. Some of the bird species recorded during the field survey include fantail cuckoo (*Cacomantis flabelliformis*), Horsfield's bronze-cuckoo (*Chrysococcyx*

basalis), brown-backed honeyeater (*Ramsayornis modestus*), rufous whistler (*Pachycephala rufiventris*), mistletoe bird (*Dicaeum hirundinaceum*) and azure kingfisher (*Alcedo azurea*).

Although some disturbance from weeds, cattle grazing and stream bank erosion is present, habitat is generally high quality and likely to provide an important corridor for fauna movement across the landscape.

Plate 3 Open Eucalyptus, Melaleuca and Casuarina riparian woodland

4.3.1.3 Native grassland

This habitat occurs on low-lying plains dominated by either alluvial substrates (analogous to RE 9.3.25) or cracking clay soils (analogous to RE 9.8.13). Opportunities for fauna are generally limited and disturbance as a result of cattle and horse activity is generally moderate to high. An abundance of grass and shallow soil cracks were observed, providing refuge and dispersal opportunities for burrowing frogs, small ground-dwelling mammals and reptiles. Raptors, granivorous birds and common macropod species such as the eastern grey kangaroo were also observed foraging in this habitat. Due to the absence of canopy trees, habitat is not sufficient to support any MNES fauna values, other than temporary foraging and dispersal opportunities for highly mobile species such as the squatter pigeon (southern) and grey falcon.

4.3.1.4 Open forest to low open forest of *Acacia shirleyi* and *Eucalyptus persistens* on laterite

This habitat generally occurs as large patches on lateritic jump ups in the central Study Area with low to moderate levels of disturbance from cattle grazing.

The canopy is well developed and consistently contains mature *Eucalyptus persistens* (Plate 4). Where this habitat is analogous to RE 9.7.2, *Acacia shirleyi* dominates with occasional *E. persistens*. Koala may use these areas for temporary foraging and to facilitate movement to larger, more suitable patches of habitat. Where this habitat is analogous to RE 9.7.1, the canopy is dominated by *E. persistens* with other eucalypts such as *Eucalyptus exserta* also occasionally present. Rare to occasional stags and canopy Eucalypts trees were recorded to be hollow-bearing, however hollows were mostly small in size. Small hollows are likely to provide roosting opportunities for hollow-dependent microbats. Opportunities for arboreal mammals are limited to foraging.

The understorey is open, with dense shrubs rare and bare ground common. Some areas contain abundant grass tussocks, which provide foraging opportunities for macropods confirmed based on the presence of scats. Due to the well-draining skeletal soils, habitat is also likely to provide ideal breeding habitat for the threatened squatter pigeon (southern). Other opportunities for bird species were largely limited to common woodland birds, including the blue-winged kookaburra (*Dacelo leachii*), oriental dollarbird (*Eurystomus orientalis*), magpie (*Gymnorhina tibicen*) and little friarbird recorded during the field survey. Areas with a more defined shrub layer also provide refuge and foraging opportunities for small birds including the striated pardalote (*Pardalotus striatus*), grey fantail (*Rhipidura albiscapa*) and zebra finch (*Taeniopygia guttata*). Threatened birds of prey may also use this habitat to forage or disperse.

Microhabitat features such as stones and rocks, decorticating bark, woody debris and thin leaf-litter cover are occasionally to commonly present and provide opportunities primarily for reptiles and some small ground-dwelling mammals. On some plateau tops and ridgelines, large surface stones and rocky outcrops with deep crevices and sandy soils were a notable feature. These features at times were found to be suitable for the burrowing of the threatened yakka skink. Reptiles recorded within this community include the brown tree snake (*Boiga irregularis*) and Bynoe's gecko (*Heteronotia binoei*). Where disturbance is limited, these features are more prevalent and other features also occur including medium to large sized fallen logs. In some isolated areas, shallow crevices and rock overhangs were also recorded however these features were not considered suitable for threatened mammals including ghost bat, Sharman's rock wallaby (*Petrogale sharmani*) and the northern quoll. Ground-dwelling mammals were rarely recorded within this habitat; the short-beaked echidna being the only species recorded.

Plate 4 Open forest to low open forest of *A. shirleyi* or *E. persistens* on laterite habitat

4.3.1.5 Open woodland of *Eucalyptus* and *Corymbia* on basalt

This habitat generally occurs as smaller scattered patches across the Study Area, associated with basalt undulating plains.

Tall, scattered koala food trees (*Eucalyptus sp.* and *Corymbia sp.*) dominate the canopy and are occasionally hollow bearing. Hollows in all sizes including large were recorded which provide nesting opportunities for hollow-dependent microbats, birds such as parrots and owls and arboreal mammals including the threatened greater glider. Canopy vegetation is potentially suitable for the foraging of fruit-bats including the threatened spectacled flying-fox (*Pteropus conspicillatus*).

The understorey is highly variable, with some areas being very open and others containing an abundance of dense shrubs that are often exotic. Dense patches of *Lantana camara** in the understorey may hinder koala movement through this habitat. The ground layer contains occasional bare ground however where disturbance was low, native grass was abundant providing foraging opportunities for the threatened black-throated finch (southern). Due to the high grass cover and the soil type, habitat is considered to provide dispersal habitat only for the threatened squatter pigeon (southern). In some locations, areas of grass were limited likely due to the competition for resources with weed species. Nonetheless, these conditions are suitable for the refuge and dispersal of small ground-dwelling mammals, as well as for the foraging of macropods including the common wallaroo (*Macropus robustus*) which was recorded during the field survey.

Microhabitat features such as coarse woody debris, fallen logs and areas of thin leaf litter are common and suitable for a range of reptile species, however none were recorded during the field survey. Loose basalt rocks are occasional to common and at one location form larger rock piles supporting small crevices. Due to their small size these crevices are unsuitable for the denning of threatened mammals such as the threatened northern quoll. Habitat opportunities for amphibians are limited due to the lack of water resources.

Due to the relatively high level of floristic diversity, a variety of foraging opportunities for bird species occur. In addition to common woodland birds, nectar-feeding and foliage-gleaning birds including the

brown honeyeater (*Lichmera indistincta*), Lewin's honeyeater (*Meliphaga lewinii*), white-throated honeyeater (*Melithreptus albogularis*), rufous whistler and little friarbird were frequently recorded during the field survey. Small birds such as fairy-wrens and finches including the red-browed finch (*Neochmia temporalis*) may also use the thickets of *Lantana* for refuge. The bower of a great bowerbird (*Chlamydera nuchalis*) was also observed in this habitat.

This habitat had varying levels of disturbance. Areas in the east were notably of reduced quality due to a high level of weed incursion and low levels of cattle grazing, fire and historical thinning. In other areas, evidence of disturbance was low and largely limited to small areas of weed incursion from *Lantana* and some minor erosion (right-side image in Plate 5 below).

Plate 5 Eucalyptus sp. and Corymbia sp. open woodland on basalt habitat

4.3.1.6 Woodland of *Eucalyptus* and *Corymbia* on metamorphic hills

This habitat occurs on the rolling metamorphic hillslopes of the Study Area and generally dominates the landscape. During the field surveys habitat was found to generally be of moderate to high quality due to the high level of connectivity and low levels of disturbance, with only evidence of light grazing, weeds and historical thinning observed.

The canopy is well developed and often contains a variety of *Eucalyptus sp.* and *Corymbia sp.*, suitable for koala and potentially the foraging of the threatened spectacled flying-fox. The understorey is grassy and open, with dense shrubs generally rare. In addition to the abundant native grass tussocks, other microhabitat features such as stones (all sizes), coarse leaf litter and medium and large fallen logs were also occasionally to commonly recorded, creating shelter and dispersal opportunities for small ground-dwelling mammals and reptiles. Small areas containing rocky outcrops were recorded, however these were generally limited and discontinuous. Reptiles recorded within this community include the Bynoe's gecko and elegant snake-eyed skink (*Cryptoblepharus pulcher*). Habitat opportunities for amphibians are limited due to the lack of water resources.

Mammals were the primary fauna type observed utilising this habitat during the field survey, with the short-beaked echidna, common wallaroo and agile wallaby (*Macropus agilis*) recorded. As *Eucalyptus sp.* dominates the canopy, this habitat type is also likely suitable for koala. Large hollow-bearing trees were rare so habitat is not considered suitable for denning for greater glider. Small hollows were occasionally recorded in the canopy trees and stags, suitable for some hollow dependent birds and common microbat species. Given the complexity of the ground layer, this habitat is likely suitable for the denning of the threatened northern quoll.

Two mistletoe species were recorded during the field survey, and in some areas were common and flowering. Mistletoe provides foraging opportunities for foliage-gleaning bird species such as the striated pardalote, rufous whistler and white-throated gerygone, and nectar-feeders including the pale-headed rosella, rainbow lorikeet, brown honeyeater and white-throated honeyeater which were recorded. Given the high level of connectivity between this habitat and the others, suitable foraging habitat for the red goshawk, grey falcon and masked owl (northern) is also provided.

Plate 6 Woodland of *Eucalyptus* and *Corymbia* on metamorphic hillslopes

4.3.1.7 *Eucalyptus and Corymbia* woodlands on igneous hills and/or granite

This habitat occurs on low rolling hills largely at either end of the Study Area. During the field surveys this habitat was generally found to be high quality due to low levels of disturbance limited to minor weed incursion and cattle grazing.

The canopy is well developed and generally dominated by mature ironbark (*Eucalyptus crebra*) or box-gum (*Eucalyptus moluccana)*, suitable for the threatened koala. Hollow-bearing trees and stags were recorded occasionally during the field survey. Hollows were mostly small in size, providing nesting opportunities for hollow-dependent microbats and some birds such as parrots. Arboreal termitaria also occasionally occur which may also provide nesting opportunities for common woodland birds such as the laughing kookaburra or forest kingfisher (*Todiramphus macleayii*) which were both recorded. As large hollows were rare, habitat is not suitable for the denning of the threatened greater glider.

The understorey is generally moderately complex, with a variable shrub layer and grassy ground that occasionally contains granite outcrops with boulders. Although the shrub layer is generally very sparse or absent, in some areas a distinct mid-dense layer is formed by low *Acacia implexa* or weed species including shrubby stylo (*Stylosanthes scabra**) and *Lantana*. Shrubby areas provide refuge for a variety of small birds such as fairy wrens. Foraging opportunities are provided for a range of birds including birds of prey, granivorous birds, nectar-feeding and foliage-gleaning birds. Threatened bird species that may forage in this habitat include red goshawk, grey falcon, masked owl (northern) and black-throated finch (southern). Bird species recorded include the varied sittella (*Daphoenositta chrysoptera*), tree martin (*Petrochelidon nigricans*), white-throated gerygone, scarlet honeyeater, white-throated honeyeater and the threatened squatter (southern). Due to the underlying substrate, habitat is considered to provide dispersal habitat only for the squatter pigeon (southern).

In some locations, large boulders form loose aggregations that have crevices suitable for the refuge of the threatened Sharman's rock wallaby, multiple of which were recorded during the field survey. These features in addition to common large fallen logs indicate habitat may also be suitable for the denning and foraging of the threatened northern quoll. A range of common macropod species and small mammals such as the echidna (confirmed via the presence of scat) are likely to forage and shelter in the abundant areas of grass.

Other microhabitat features present include common small and medium stones, shallow leaf litter and occasional decorticating bark. Given the complexity of the ground layer, this habitat is suitable for a range of reptile species however opportunities for amphibians are limited due to the lack of water

resources. Reptiles recorded within this community include the shaded-litter rainbow skink, the lined rainbow skink, Bynoe's gecko and Tommy roundhead dragon (*Diporiphora australis*).

Plate 7 *Eucalyptus* and *Corymbia* woodlands on igneous hills

4.3.1.8 Cleared areas

Non-remnant vegetation as a result of historical clearing for existing electrical infrastructure, and to a lesser extent cattle grazing activities, covers long linear sections across the Study Area. These areas generally occur directly adjacent to the Project Area.

Habitat values in this community were limited but included rare individual paddock trees, some sparse shrubby *Lantana* and an abundance of exotic grass in the ground layer where grazing had been restricted (i.e. the existing powerline). In some areas bare ground is common as a result of significant grazing activity (Plate 8). Where grass cover is high, some dispersal opportunities for small mammals and reptiles. Small birds such as fairy-wrens may use the *Lantana* for refuge. Raptors, granivorous birds and larger mammal species such as the eastern grey kangaroo were also observed foraging in this habitat. Habitat opportunities provided for MNES are largely restricted to temporary foraging and dispersal opportunities for highly mobile species such as the grey falcon. Due to the presence of paddock trees, koala may utilise the habitat to disperse between areas of higher quality habitat.

Plate 8 Grazed cleared area

4.3.1.9 Farm dams

The Queensland DES wetland area mapping indicates only one lacustrine wetland (artificial) occurs within the Project Area, located at the western extent. However, field surveys confirmed the presence of four lacustrine wetlands in the form of farm dams at scattered locations within the Project Area. Farm dams were generally very small in size and had minimal fauna habitat value due to the steep man-made banks, extensive cattle pugging at the water's edge and little to no aquatic or canopy vegetation. Common waterbirds such as the Pacific black duck (*Anas superciliosa*), grey teal (*Anas gracilis*), Eurasian coot (*Fulica atra*), Australian pelican (*Pelecanus conspicillatus*) and straw-necked ibis (*Threskiornis spinicollis*) were frequently recorded at these locations.

One of the four farm dams (Murray's Lagoon) was higher quality (Plate 9). Small areas of wetland vegetation including reeds and macrophytes were occasionally present on the low-lying fringes, providing refuge and foraging opportunities for species such as the nankeen night heron (*Nycticorax caledonicus*), intermediate egret (*Ardea intermedia*), great egret (*Ardea alba*), brolga (*Grus rubicunda*), red-kneed dotterel (*Erythrogonys cinctus*) and masked lapwing (*Vanellus miles*), all of which were recorded in low numbers. Anecdotal information provided by the landholder indicated that the glossy ibis (*Plegadis falcinellus*), listed migratory under the EPBC Act has been sighted at Murray's Lagoon. Disturbance from cattle and pest species including pig has resulted in pugging at the water's edge, likely leading to sedimentation and reduced water quality.

All farm dams within the Project Area are conservatively considered to provide some foraging and dispersal opportunities for wetland birds including migratory species and the threatened Australian painted snipe (*Rostratula australis*) and curlew sandpiper (*Calidris ferruginea*).

Plate 9 Farm dam habitat

4.3.2 Fauna Diversity

The field surveys recorded 163 fauna species, comprising 115 bird, 35 mammal, 9 reptile, 2 amphibian and 2 fish species (Appendix E).

4.3.3 Conservation Significant Fauna

The desktop assessment identified 54 conservation significant fauna species with the potential to occur within the Study Area (Appendix B). This included 32 EPBC Act listed species, 23 EPBC Act migratory species, 29 NC Act listed species, and 24 NC Act listed special least concern species.

The likelihood of occurrence assessment determined 18 conservation significant fauna species and 14 migratory species that are known, likely or have potential to occur within the Survey Area, based on the fauna and habitat observed during the field surveys (Table 11). These species include 15 species listed under the EPBC Act, 14 listed as EPBC Act migratory species, and 17 species listed under the NC Act. A complete likelihood of occurrence assessment is provided in Appendix D.

Four conservation significant fauna species are known to occur as they were recorded during the field surveys:

- Squatter pigeon (southern), listed as Vulnerable under the EPBC Act and NC Act
  - Two small groups (two to six individuals) were observed adjacent to the Project Area in RE 9.11.15a on lot and plan 4/CD35 and on Lava Plains Mount Fox Road
- Sharman's rock-wallaby, listed as Vulnerable under the EPBC Act and NC Act
  - Multiple individuals were recorded in and adjacent to the Study Area on lot and plan 3198/PH2177 within RE 9.12.1a. A female with a joey in her pouch was captured via a camera trap.
- Greater glider, listed as Vulnerable under the EPBC Act and the NC Act and NC Act
  - Two individuals were recorded adjacent to the Study Area within RE 9.3.6a on lot and plan 5/CLK23 during spotlighting; one was recorded along a small unnamed creek that crosses the Project Area, and the other along the Burdekin River where it meets Gray Creek.
- Short-beaked echidna, listed as Special Least Concern under the NC Act.
  - The short-beaked echidna was recorded in the Study Area in REs 9.7.2, 9.11.2a/9.11.5, 9.11.23b and 9.12.32. This species can live anywhere with a good supply of food, and regularly feast on ants and termites, and are most common in forested areas with abundant, termite-filled, fallen logs.

In addition the Glossy ibis, listed as Migratory under the EPBC Act and Special Least Concern under the NC Act was recorded within the Project area.

The locations in which the above species were recorded are shown in Appendix A Figure 8.

Plate 10 Greater glider (*Petauroides volans*)

Plate 11 Sharman's rock-wallaby (*Petrogale sharmani*)

Plate 12 Squatter pigeon (southern) (*Geophaps scripta scripta*)

Plate 13 Short-beaked echidna (*Tachyglossus aculeatus*)

Table 11 Fauna Likelihood of Occurrence Assessment Results

Species	Status (EPBC Act[1], NC Act[2])	Likelihood of Occurrence in the Study Area
Birds		
Australian painted snipe *Rostratula australis*	E, V	Potential
Black-throated finch (southern) *Poephila cincta cincta*	E, E	Likely
Curlew sandpiper *Calidris ferruginea*	CE & Mi, E	Potential
Grey falcon *Falco hypoleucos*	V, V	Potential
Masked owl (northern) *Tyto novaehollandiae kimberli*	V, V	Likely
Red goshawk *Erythrotriorchis radiatus*	V, E	Potential
Squatter pigeon (southern) *Geophaps scripta scripta*	V, V	Known
White-throated needletail *Hirundapus caudacutus*	V & Mi, SLC	Likely
Mammals		
Chestnut dunnart *Sminthopsis archeri*	-, NT	Potential
Ghost bat *Macroderma gigas*	V, E	Potential
Greater glider *Petauroides volans* *Northern greater glider* *Petauroides minor*	V, V	Known
Koala *Phascolarctos cinereus*	V, V	Likely
Northern quoll *Dasyurus hallucatus*	E, -	Likely
Sharman's rock-wallaby *Petrogale sharmani*	V, V	Known
Short-beaked echidna *Tachyglossus aculeatus*	-, SLC	Known
Spectacled flying-fox	E, V	Potential

Species	Status (EPBC Act[1], NC Act[2])	Likelihood of Occurrence in the Study Area
Pteropus conspicillatus		
Reptiles		
Common death adder *Acanthophis antarcticus*	-, NT	Potential
Yakka skink *Egernia rugosa*	V, V	Potential
Migratory species		
Fork-tailed swift *Apus pacificus*	Mi, SLC	Likely
Oriental cuckoo *Cuculus optatus*	Mi, SLC	Likely
Black-faced monarch *Monarcha melanopsis*	Mi, SLC	Potential
Spectacled monarch *Monarcha trivirgatus (Syn. Symposiachrus trivirgatus)*	Mi, SLC	Potential
Satin flycatcher *Myiagra cyanoleuca*	Mi, SLC	Potential
Rufous fantail *Rhipidura rufifrons*	Mi, SLC	Potential
Common sandpiper *Actitis hypoleucos*	Mi, SLC	Potential
Sharp-tailed sandpiper *Calidris acuminata*	Mi, SLC	Potential
Red-necked stint *Calidris ruficollis*	Mi, SLC	Potential
Caspian tern *Hydroprogne caspia*	Mi, SLC	Potential
Common greenshank *Tringa nebularia*	Mi, SLC	Potential
Glossy ibis *Plegadis falcinellus*	Mi, SLC	Known

[1]CE=Critically Endangered; E=Endangered; V=Vulnerable, Mi=Migratory

[2] E=Endangered; V=Vulnerable; NT=Near threatened; SLC=Special Least Concern

4.3.4 Essential Habitat

The eastern end (Mount Fox end) of the Project Area intersects an area mapped as essential habitat for the Sharman's rock-wallaby (*Petrogale sharmani*) (Appendix A Figure 6). Essential habitat for the black-throated finch (southern) (*Poephila cincta cincta*) and the short-beaked echidna (*Tachyglossus aculeatus*) also occurs close to the Project Area.

4.3.5 Introduced Fauna

The field surveys recorded seven introduced fauna species, five of which are restricted under the *Biosecurity Act 2014*:

- European rabbit (*Oryctolagus cuniculus*) – Listed as a category 3, 4, 5, 6 restricted matter under the *Biosecurity Act 2014.*
- Feral cat (*Felis catus*) - Listed as a category 3, 4, 6 restricted matter under the *Biosecurity Act 2014.*
- Feral pig (*Sus scrofa*) – Listed as a category 3, 4, 6 restricted matter under the *Biosecurity Act 2014.*
- Chital deer (*Axis axis*) – Listed as a category 3, 4, 6 restricted matter under the *Biosecurity Act 2014.*
- Wild dog/dingo (*Canis lupus*) – Listed as a category 3, 4, 6 restricted matter under the *Biosecurity Act 2014.*
- Cane toad (*Rhinella marina*).
- Helmeted guineafowl (*Numida meleagris*).

Other introduced fauna likely to occur within the Project Area includes:

- European fox (*Vulpes vulpes*).
- Black rat (*Rattus rattus*).
- House mouse (*Mus musculus*).

4.4 Biodiversity and Conservation Values

Biodiversity significance is attributed by DES on a bioregional scale through a Biodiversity Planning Assessment (BPA). BPAs assign three levels of overall biodiversity significance –

1. State significance - areas assessed as being significant for biodiversity at the bioregional or state scales. They also include areas assessed by other studies / processes as being significant at national or international scales.
2. Regional significance - areas assessed as being significant for biodiversity at the subregional scale. These areas have lower significance for biodiversity than areas assessed as being of State significance.
3. Local significance and/or other values - areas assessed as not being significant for biodiversity at state or regional scales. Local values are of significance at the local government scale.

An analysis of the BPA for the Einasleigh Uplands bioregion shows that the entire Project Area is within areas of ‘State significance’, ‘regional significance’ and ‘local significance and/or other values’.

The Queensland Government has identified Bioregional State Wildlife Corridors across Queensland. These are not statutory areas, but are priority conservation areas to be accorded special consideration when development applications are lodged. The Project Area intersects State-wide ecological corridors, which are described as:

- A terrestrial corridor that runs from Undara Volcanic National Park to Blackbraes National Park, west of Greenvale.
- A terrestrial corridor that runs along the east coast of Queensland, from Lakefield to Mackay.

- Riparian corridors along the Copperfield River, the Einasleigh River, Lee (McKinnons) Creek, Gray Creek, the Burdekin River and Douglas Creek.

4.5 Wetlands and watercourses

Wetland mapping reviewed as part of the desktop assessment included the DES Queensland Wetland mapping, MSES High Ecological Significance (HES) wetland mapping and Vegetation management wetland mapping. VM Act watercourse mapping was also reviewed.

The Study Area contains several minor and major watercourse features recognised under the VM Act, with stream orders ranging from one to seven. The Burdekin River is the highest order watercourse (stream order 7) within the Project Area; however only traverses a small section north east of Greenvale. The Burdekin River is also the only perennial watercourses that traverses the Study Area, indicating water is present throughout the year. At scattered locations across the Study Area, an additional six major watercourses (stream order 6) intersect including Einasleigh River, Copperfield River, Camel Creek, Douglas Creek, Gray Creek and Lee (McKinnon's) Creek. All aforementioned watercourses although considered 'major' are non-perennial.

Minor watercourses and drainage lines are common across the Study Area and include East Creek, Hopewell Creek, Mannings Flat Creek, Paddys Creek, Perry Creek, Three Mile Creek, Five Mile Creek, Seven Mile Creek, Ten Mile Creek and a number of unnamed tributaries. These watercourses and drainage lines are considered highly ephemeral and were almost all dry at the time of the field survey. Almost all watercourses run in a northerly direction and due to the linear shape of the Study Area this means only small discrete sections are generally intersected.

Up to 63 of the watercourses and drainage lines that intersect the Study Area are associated with REs that may contain wetland values as per the Queensland wetland areas mapping. These areas are determined to contain potential riverine wetland characteristics or arid/semi-arid non-floodplain grass, sedge, herb swamp wetland characteristics. Based on waterbody data four artificial lacustrine wetlands are mapped within the Study Area. Of these four waterbodies, only one located at the far western extent occurs within the Project Area. However, based on the field survey an additional four artificial wetlands in the form of farm dams also occur. Further information regarding the habitat values associated with the farm dams are discussed in Section 4.3.1.9.

No waterbodies within the wider Study Area or Project Area are mapped VM Act wetlands or HES wetlands. However, VM Act wetland areas occur within 1 km north and south of the Study Area between the Einasleigh River and Lee (McKinnons) Creek. Wetlands and watercourses within the Project Area are shown on Appendix A Figure 9.

4.6 Landscape connectivity

A review of DES BPA corridor mapping identified State significant ecological corridors occur within the Study Area. Vegetation within the far eastern Study Area occurs within a terrestrial corridor that is associated with the Paluma Ranges and extends north into the Girringun National Park and Lannercost State Forest. Another north-south terrestrial corridor intersects the Study Area west of Greenvale, which connects to Blackbraes National Park to the south and Undara National Park to the north. At six locations the Study Area also intersects watercourses which are considered to provide State significant riparian corridors. This includes Douglas Creek in the far east, the Burdekin River and Gray Creek near Greenvale, Einasleigh River and Lee (McKinnons) Creek in the west and the Copperfield River and East Creek in the far west near Kidston.

Within the Study Area, connectivity is generally high due to the dominance of woody vegetation communities in remnant condition especially in an east - west direction. These patches of vegetation are disconnected only by narrow tracks, small areas of non-remnant or regrowth vegetation (often associated with the adjacent transmission lines), or watercourses that run perpendicular. Watercourses that intersect the Study Area include both minor drainage lines and major rivers. The latter especially is likely to provide important north and south movement opportunities for fauna as well as refuge. The only barriers to movement present within the Study Area are small areas of non-remnant vegetation, roads and tracks. Roads and tracks traverse the Study Area infrequently but are more common where the Study Area is close to a township such as Greenvale. Only two sealed roads intersect the Study Area: Gregory Developmental Road and Kennedy Developmental Road west of Greenvale.

The Study Area and Project Area also has a high degree of connectivity to the surrounding landscape. As per the Queensland Regulated Vegetation map, more than 37,000 ha of Category B remnant vegetation occurs within 1 km of the Project Area. Except at the far western extent, this remnant vegetation largely occurs as large intact patches directly adjacent to the Project Area to the north and south. Other habitat resources contained in the adjacent areas include connecting watercourses and VM Act wetlands.

4.7 Habitat Modelling

The likelihood of occurrence assessments identified five MSES species (two flora and three fauna) as either known to occur or potential to occur within the Study Area. Potential habitat for these species has been modelled within the Study Area, using the modelling rules detailed in Appendix G. Figures and area calculations for each conservation significant species are also presented in Appendix G.

MNES habitat modelling rules, figures and area calculations are provided in the supporting MNES report.

5.0 Matters of national environmental significance

A summary of MNES with the potential to be impacted by the Project is provide below. A detailed review of MNES values are addressed in a dedicated report that has been submitted to DAWE (AECOM, 2021). MNES values are therefore not considered further in this ecology report.

5.1 World Heritage Properties

The Wet Tropics of Queensland World Heritage Property occurs to the north-east and south-east of the Study Area. The Project will not interfere with and is not found within this World Heritage Property.

5.2 National Heritage Properties

The Wet Tropics of Queensland National Heritage Place occurs to the north-east and south-east of the Study Area. The Project will not interfere with and is not found within this National Heritage Place.

5.3 Wetlands of International Importance (RAMSAR)

There are no Wetlands of International Importance within proximity to the Study Area.

5.4 Great Barrier Reef Marine Park

The Great Barrier Reef Marine Park is not located within proximity to the Study Area.

5.5 Commonwealth Marine Area

The Study Area is sufficiently distant from any Commonwealth Marine Area that no impacts are anticipated.

5.6 Listed Threatened Ecological Communities

A review of the PMST report generated for the Project determined that a single EPBC Act listed TEC potentially occurs within the Study Area: Broad leaf tea-tree (*Melaleuca viridiflora*) woodlands in high rainfall coastal north Queensland. As detailed in the communities' Listing Advice, this TEC corresponds to the following REs in Queensland: 7.3.8a, 7.3.8b, 7.3.8c, 7.3.8d, 7.5.4g, 8.3.2a, 8.5.2c and 8.5.6. No vegetation communities analogous to the TEC were identified within the Study Area during the field surveys, and therefore this TEC is considered unlikely to occur.

5.7 Listed Threatened Species

The PMST report identified 39 threatened MNES species as potentially occurring within the Study Area and surrounds. Of the 39 threatened species, three fauna species were confirmed during the field survey:

- Squatter pigeon (southern), listed as Vulnerable under the EPBC Act
  - Two small groups (two to six individuals) were observed adjacent to the Project Area in RE 9.11.15a on lot and plan 4/CD35 and on Lava Plains Mount Fox Road
- Sharman's rock-wallaby, listed as Vulnerable under the EPBC Act
  - Multiple individuals were recorded in and adjacent to the Study Area on lot and plan 3198/PH2177 within RE 9.12.1a. A female with a joey in her pouch was captured via a camera trap.
- Greater glider, listed as Vulnerable under the EPBC Act and the NC Act
  - Two individuals were recorded adjacent to the Study Area within RE 9.3.6a on lot and plan 5/CLK23 during spotlighting; one was recorded along a small unnamed creek that crosses the Project Area, and the other along the Burdekin River where it meets Gray Creek.

No EPBC Act listed flora species were recorded during the field surveys.

A likelihood of occurrence assessment was conducted for the remaining species identified in the desktop assessment to determine which are possible or unlikely to occur within the Project Area (Table 12). This evaluation was based on an understanding of the preferred habitats of the species, knowledge of the type and condition of habitats present within the Project Area as well as field records and the proximity of publicly available records.

The assessment determined two MNES flora and twelve MNES fauna species as 'potential' or 'likely' to occur within the Project Area. A total of twelve flora and seventeen threatened fauna species were found to be unlikely occurrences.

An impact assessment was completed to determine potential Project impacts on known, likely, or potential MNES. Following this assessment, a risk assessment of potential Project impacts was undertaken and MNES identified to be at 'potential' risk of impact were further investigated via a significant impact assessment (SIA).

Table 12 Threatened species assessed within MNES Report

Species	Status (EPBC Act[1], NC Act[2])	Likelihood of Occurrence
Plants		
Pink gidgee *Acacia crombiei*	V, V	**Unlikely**
Miniature moss-orchid *Bulbophyllum globuliforme*	V, NT	**Unlikely**
Yellowjacket *Corymbia leptoloma*	V, V	**Unlikely**
Cycas cairnsiana	V, V	**Unlikely**
Cycas platyphylla	V, V	**Unlikely**
Bluegrass *Dichanthium setosum*	V, -	**Potential**
Lindsaea pulchella var. blanda	V, EITW	**Unlikely**
Marsdenia brevifolia	V, V	**Unlikely**
Myrmecodia beccarii Ant plant	V, V	**Unlikely**
Lesser swamp-orchid *Phaius australis*	E, E	**Unlikely**
Phaius pictus	V, V	**Unlikely**
Native moth orchid *Phalaenopsis amabilis subsp. Rosenstromii* (Syn. *Phalaenopsis rosenstromii*)	E, E	**Unlikely**
Tephrosia leveillei	V, V	**Potential**
Velvet jewel orchid *Zeuxine polygonoides*	V, V	**Unlikely**
Birds		

Species	Status (EPBC Act[1], NC Act[2])	Likelihood of Occurrence
Australian painted snipe *Rostratula australis*	E, V	**Potential**
Black-throated finch (southern) *Poephila cincta cincta*	E, E	**Likely**
Buff-breasted button-quail *Turnix olivii*	E, E	**Unlikely**
Curlew sandpiper *Calidris ferruginea*	CE & Mi, E	**Potential**
Eastern curlew *Numenius madagascariensis*	CE & Mi, E	**Unlikely**
Gouldian finch *Erythrura gouldiae*	E, E	**Unlikely**
Grey falcon *Falco hypoleucos*	V, V	**Potential**
Masked owl (northern) *Tyto novaehollandiae kimberli*	V, V	**Likely**
Red goshawk *Erythrotriorchis radiatus*	V, E	**Potential**
Southern cassowary *Casuarius casuarius johnsonii*	E, V	**Unlikely**
Squatter pigeon (southern) *Geophaps scripta scripta*	V, V	**Known**
White-throated needletail *Hirundapus caudacutus*	V & Mi, SLC	**Likely**
Mammals		
Bare-rumped sheath-tailed bat *Saccolaimus saccolaimus nudicluniatus*	V, E	**Unlikely**
Black-footed tree-rat *Mesembriomys gouldii rattoides*	V, -	**Unlikely**
Ghost bat *Macroderma gigas*	V, E	**Potential**
Greater glider / *Northern greater glider* *Petauroides volans / Petauroides minor*	V, V	**Known**
Grey-headed flying-fox *Pteropus poliocephalus*	V, -	**Unlikely**

Species	Status (EPBC Act[1], NC Act[2])	Likelihood of Occurrence
Koala *Phascolarctos cinereus*	V, V	**Likely**
Large-eared horseshoe bat *Rhinolophus philippinensis*	V, E	**Unlikely**
Mahogany glider *Petaurus gracilis*	E, E	**Unlikely**
Northern quoll *Dasyurus hallucatus*	E, -	**Likely**
Northern bettong *Bettongia tropica*	E, E	**Unlikely**
Semon's leaf-nosed bat *Hipposideros semoni*	V, E	**Unlikely**
Sharman's rock-wallaby *Petrogale sharmani*	V, V	**Known**
Spectacled flying-fox *Pteropus conspicillatus*	E, V	**Potential**
Spotted-tailed quoll *Dasyurus maculatus gracilis*	E, E	**Unlikely**
Reptiles		
Atherton delma *Delma mitella*	V, NT	**Unlikely**
Yakka skink *Egernia rugosa*	V, V	**Potential**
Amphibians		
Australian lace-lid *Litoria dayi*	V, E	**Unlikely**
Magnificent brood frog *Pseudophryne covacevichae*	V, V	**Unlikely**
Fish		
Opal Cling Goby *Stiphodon semoni*	CE, LC	**Unlikely**
Shark		
Freshwater sawfish *Pristis pristis*	V & Mi, LC	**Unlikely**

[1]CE=Critically Endangered; E=Endangered; V=Vulnerable, Mi=Migratory

[2] E=Endangered; V=Vulnerable; NT=Near threatened; SLC=Special Least Concern; LC=Least Concern

5.8 Listed Migratory Species

Excluding species also listed as critically endangered, endangered or vulnerable, the PMST identified an additional sixteen migratory species as potentially occurring within the Study Area and surrounds. One migratory species was recorded during the field surveys: glossy ibis.

A likelihood of occurrence assessment was conducted for species identified in the desktop assessment to determine which species are possible or unlikely to occur within the Study Area. This evaluation was based on an understanding of the preferred habitats of the species, knowledge of the type and condition of habitats present at the Study Area as well as field records and the proximity of publicly available records.

The assessment determined twelve species were 'potential' or 'likely' to occur within the Study Area. A total of seven migratory species were found to be unlikely occurrences.

Table 13 Migratory species assessed within MNES Report

Species	Status (EPBC Act[1], NC Act[2])	Likelihood of Occurrence
Marine Reptiles		
Saltwater crocodile *Crocodylus porosus*	Mi, V	**Unlikely**
Marine Birds		
Fork-tailed swift *Apus pacificus*	Mi, SLC	**Likely**
Terrestrial Birds		
Oriental cuckoo *Cuculus optatus*	Mi, SLC	**Likely**
Barn swallow *Hirundo rustica*	Mi, SLC	**Unlikely**
Black-faced monarch *Monarcha melanopsis*	Mi, SLC	**Potential**
Spectacled monarch *Monarcha trivirgatus (Syn. Symposiachrus trivirgatus)*	Mi, SLC	**Potential**
Grey wagtail *Motacilla cinerea*	Mi, SLC	**Unlikely**
Yellow wagtail *Motacilla flava*	Mi, SLC	**Unlikely**
Satin flycatcher *Myiagra cyanoleuca*	Mi, SLC	**Potential**
Rufous fantail *Rhipidura rufifrons*	Mi, SLC	**Potential**
Wetland Birds		

Species	Status (EPBC Act[1], NC Act[2])	Likelihood of Occurrence
Common sandpiper *Actitis hypoleucos*	Mi, SLC	**Potential**
Sharp-tailed sandpiper *Calidris acuminata*	Mi, SLC	**Potential**
Pectoral sandpiper *Calidris melanotos*	Mi, SLC	**Unlikely**
Red-necked stint *Calidris ruficollis*	Mi, SLC	**Potential**
Latham's snipe *Gallinago hardwickii*	Mi, SLC	**Unlikely**
Caspian tern *Hydroprogne caspia*	Mi, SLC	**Potential**
Osprey *Pandion haliaetus*	Mi, SLC	**Unlikely**
Common greenshank *Tringa nebularia*	Mi, SLC	**Potential**
Glossy ibis *Plegadis falcinellus*	Mi, SLC	**Known**

[1] Mi=Migratory

[2] V=Vulnerable; SLC=Special Least Concern

5.9 Nuclear Actions

The Project is not and does not involve a nuclear action.

5.10 A water resource, in relation to coal seam gas development and large coal mining development

The Project does not involve coal seam gas or coal mining development and as such impacts to ‘a water resource’ are not anticipated.

6.0 Matters of State Environmental Significance

Matters of State Environmental Significance (MSES) are defined under the Environmental Offsets Regulation 2014. MSES include certain environmental values that are protected under Queensland legislation including the:

- Nature Conservation Act 1992
- *Marine Parks Act 2004*
- *Fisheries Act 1994*
- Environmental Protection Act 1994
- *Regional Interests Planning Act 2014*
- Vegetation Management Act 1999
- Environmental Offsets Act 2014.

MSES that occur within the Project Area and may be affected by the Project are presented in Table 14 below. To avoid duplication of offset conditions between jurisdictions, state and local governments can only impose an offset condition in relation to a prescribed activity if the same or substantially the same impact and the same or substantially the same matter has not been subject to assessment under the EPBC Act. As such, the MSES values presented in this section are those that have not already been assessed under the EPBC Act policy statement 'Significant Impact Guidelines 1.1 – Matters of National Environmental Significance'(DotE, 2013a) (Section 5.0). Therefore, any values that are both MNES and MSES are addressed in a separate MNES report and will not be considered in this section.

Table 14 MSES values within the Project Area

MSES	Description	Present in the Project Area
Regulated vegetation (Endangered REs)	Regional ecosystems which: • are listed in schedule 1 of the Vegetation Management Regulation 2012; • occur within a Category B area on the regulated vegetation management map; and • fit the description for the regional ecosystem contained in the Regional Ecosystem Description Database.	**No** No Regulated vegetation (Endangered REs) are mapped within the Project Area.
Regulated vegetation (Of Concern REs)	Regional ecosystems which: • are listed in schedule 2 of the Vegetation Management Regulation 2012; • occur within a Category B area on the regulated vegetation management map; and • fit the description for the regional ecosystem contained in the Regional Ecosystem Description Database.	**Yes** Regulated vegetation (Of Concern REs) occurs within the Project Area, including REs 7.8.18, 9.12.10 and 9.12.26.
Regulated Vegetation (within a Vegetation Management Wetland Area)	Regional ecosystems which: • are mapped as a Category B area on the regulated vegetation management map; and	**No** No VM wetlands are mapped in the Project Area.

MSES	Description	Present in the Project Area
	• identified as a wetland on the vegetation management wetlands map.	
Regulated vegetation (within the defined distance of a watercourse)	Regional ecosystems which: • occur within a Category B area on the regulated vegetation management map; • intersect or occur within a wetland area as identified on the vegetation management wetlands map; and • are located within the defined distance from the defining banks of a relevant watercourse or relevant drainage feature (being those that are identified on the vegetation management watercourse and drainage feature map).	**Yes** Regulated vegetation (intersecting a watercourse) occurs within the Project Area.
Connectivity areas	Areas which consist of vegetation mapped as prescribed regional ecosystem that: • are of sufficient size or configured in a way that maintains ecosystem functioning; and • will remain despite a threatening process within the meaning of the NC Act.	**Yes** Connectivity areas occur within the Project Area as per the MSES description.
Wetlands and Watercourses	Means an area shown as a: • wetland in a wetland protection area; or • wetland of high ecological significance on the Map of Referrable Wetlands; or • watercourse in high ecological value waters (as defined under the Environmental Protection (Water) Policy 2009, schedule 2.	**No** No wetland or watercourse protection areas occur within the Project Area.
Strategic Environmental Area	Means an area shown as a strategic environmental area (designated precinct).	**No** No strategic environmental areas occur within the Project Area.
Protected wildlife habitat and Regulated Vegetation Essential Habitat	Protected wildlife habitat includes: • an area of Essential Habitat on the Essential Habitat map for an animal or plant that is endangered or vulnerable wildlife • a high-risk area on the flora survey trigger map which also contains endangered, vulnerable or near threatened (EVNT) plant species	**Yes** Essential habitat is mapped on lot plans 3198PH2177 and 547SP242570. Potential habitat for state listed species occurs within the Project Area, including: Two EVNT plant species:

MSES	Description	Present in the Project Area
	• an area which contains EVNT plants and is not shown on the flora survey trigger map • an area of habitat (e.g. foraging, roosting, nesting or breeding habitat) for an animal that is endangered, vulnerable or a special least concern animal (non-migratory).	• Tingoora wattle *(Acacia tingoorensis)* • *Leptospermum pallidum* Three endangered, vulnerable, near threatened or SLC (non-migratory) fauna species: • Chestnut dunnart (*Sminthopsis archeri*) • Short-beaked echidna (*Tachyglossus aculeatus*) • Common death adder (*Acanthophis antarcticus*)
Protected areas	This relates to protected areas as declared under the NC Act, including: • National parks • National parks (Aboriginal land) • National parks (Torres Strait Islander land) • National parks (Cape York Peninsula Aboriginal land) • Regional parks • Nature refuges.	**No** No protected areas are present within the Project Area.
Fish Habitat Areas and Highly Protected Zones of State marine parks	An area declared under the *Fisheries Act 1994* to be a fish habitat area.	**No** No state marine parks or fish habitat areas occur within the Project Area.
Waterway providing for fish passage	Any part of a waterway providing for passage of fish if the construction, installation or modification of waterway barrier works carried out under an authority will limit the passage of fish along the waterway.	**Yes** Waterways which provide for fish passage are present within the Project Area. The detailed design of the Project will determine if construction, installation or modification of waterway barrier works within these waterways will limit the passage of fish.
Marine plants	A marine plant within the meaning of the *Fisheries Act 1994.*	**No** Marine plants do not occur within the Project Area.
Legally secured offset area under State legislation	An offset area approved by the administering authority associated with a legislative or policy requirement for the provision of an offset.	**No** No legally secured offset areas are present within the Project Area.

7.0 Potential Impacts

Information on the potential impacts associated with the Project are outlined below. Proposed mitigation measures to minimise the potential impacts on the relevant ecological values are outlined in Section 8.0.

7.1 Construction Phase

The greatest risk of potential impact on ecological values from the Project will occur during the construction phase. The construction activities to support the installation of switching station, transmission towers, associated lines and access tracks will involve vegetation clearing, excavation and ground reinstatement. Direct and indirect impacts potentially associated with this are described below.

7.1.1 Direct Impacts

Vegetation clearing is a direct impact that can result in the loss of vegetation values and habitat, with the severity of impacts more pronounced in habitats that provide values for conservation significant species and communities. Potential impacts resulting from clearing native vegetation can include:

- Reduced patch size of vegetation communities potentially compromising the viability of the community and associated habitat
- Loss of habitat causing a reduction of biological diversity or loss of local populations and genotypes
- Loss of or disturbance to microhabitat features such as tree hollows, leaf litter, ground timber, dense shrubs and hollows
- Loss of floristic diversity and the food resources this provides such as foliage, flowers, nectar, fruit and seeds
- Fragmentation of habitats resulting in reduced dispersal opportunities for fauna
- Destruction of abiotic features necessary to support vegetation communities and habitat types

Pre-clearance surveys will identify any potentially occurring threatened flora species within the Project Area. Should threatened flora species be identified, these individuals will be demarcated and avoided by construction.

The total extent of Project Footprint is 575.02 ha and includes 529.28 ha of mapped reginal ecosystems (Table 15).

Table 15 REs within Project footprint

RE ID	Short Description[1]	VM Act Status[2]	BDStatus[3]	Extent within Project footprint (ha)
7.12.29	*Corymbia intermedia* and/or *Lophostemon suaveolens* open forest to woodland +/- areas of *Allocasuarina littoralis* and *A. torulosa* on uplands on granites and rhyolites.	LC	NCAP	1.98
7.8.18	*Corymbia intermedia* (pink bloodwood) and/or *Lophostemon suaveolens* (swamp mahogany) +/- *Allocasuarina torulosa* (forest sheoak) open forest to woodland. Basalt.	OC	OC	19.39
9.3.1	*Eucalyptus camaldulensis* and/or *Eucalyptus tereticornis* +/- *Melaleuca* spp. +/- *Casuarina cunninghamiana* fringing woodland on channels and levees.	LC	OC	3.24
9.3.3	*Corymbia spp*. and *Eucalyptus spp.* dominated mixed woodland on alluvial flats, levees and plains.	LC	OC	0.09
9.3.3a	Woodland to low open woodland of *Eucalyptus leptophleba* +/- *Eucalyptus platyphylla* +/- *Corymbia confertiflora* +/- *Eucalyptus crebra* or *Eucalyptus cullenii* +/- *Corymbia clarksoniana* on alluvial plains and terraces.	LC	OC	1.20
9.3.5	*Eucalyptus brownii* +/- *Eucalyptus* spp. +/- *Corymbia* spp. open woodland on alluvial plains.	LC	OC	3.35
9.3.6a	Woodland to open woodland of *Eucalyptus platyphylla* +/- *Corymbia clarksoniana* +/- *Corymbia tessellaris* +/- *Eucalyptus tereticornis* on alluvial plains.	LC	NCAP	1.96
9.3.13	*Melaleuca* spp., *Eucalyptus camaldulensis* and *Casuarina cunninghamiana* fringing open forest on streams and channels.	LC	OC	7.71
9.3.20	*Eucalyptus microneura* +/- *Corymbia* spp. +/- *Eucalyptus leptophleba* woodland on alluvial plains.	LC	NCAP	1.37
9.3.22a	Open woodland to woodland of *Eucalyptus crebra*, *Corymbia clarksoniana* and/or *Corymbia dallachiana* +/- *Eucalyptus platyphylla* +/- *Eucalyptus brownii* +/- *Eucalyptus* spp. on levees, terraces and banks of larger rivers and on flat to very gentle slopes associated with drainage lines.	LC	OC	31.39

RE ID	Short Description[1]	VM Act Status[2]	BDStatus[3]	Extent within Project footprint (ha)
9.3.25	*Dichanthium* spp., and/or *Astrebla* spp. +/- *Iseilema* spp. grassland on alluvial deposits derived from basalt soils.	LC	OC	0.75
9.5.3	*Eucalyptus crebra* or *Eucalyptus drepanophylla* and *Corymbia clarksoniana* woodland on sand plains.	LC	NCAP	37.19
9.5.11	*Eucalyptus persistens* +/- *Eucalyptus crebra* woodland on flats on Tertiary remnant plains.	LC	NCAP	16.58
9.7.1	*Eucalyptus persistens* woodland on lateritised and deeply weathered surfaces on undulating terrain.	LC	NCAP	43.07
9.7.2	*Acacia shirleyi* low woodland on mesas and lateritised surfaces.	LC	NCAP	5.44
9.8.1	*Eucalyptus crebra* +/- *Corymbia dallachiana* +/- *E. leptophleba* open woodland on plains and rocky rises of basalt geologies.	LC	NCAP	8.70
9.8.4	*Eucalyptus crebra* and/or *E. tereticornis* open woodland on basalt plains.	LC	NCAP	4.90
9.8.13	*Iseilema* spp. and/or *Dichanthium* spp. tussock grassland on basalt plains.	LC	NCAP	0.48
9.11.1a	Low woodland to low open woodland of *Eucalyptus melanophloia* +/- *Eucalyptus persistens* +/- *Eucalyptus crebra* +/- *Corymbia dallachiana* +/- *Corymbia peltata* +/- *Eucalyptus brownii* +/- *Acacia julifera* on skeletal soils of slopes and crests of undulating rises and low hills of folded metasediments and other metamorphic rocks.	LC	NCAP	4.07
9.11.2a	Woodland to open woodland of *Eucalyptus crebra* +/- *Corymbia dallachiana* +/- *Corymbia erythrophloia* +/- *Corymbia clarksoniana* +/- *Eucalyptus* spp. +/- *Corymbia* spp. on metamorphic hills and rises.	LC	NCAP	52.31
9.11.2a / 9.11.5	Woodland to open woodland of *Eucalyptus crebra* +/- *Corymbia dallachiana* +/- *Corymbia erythrophloia* +/- *Corymbia clarksoniana* +/- *Eucalyptus* spp. +/- *Corymbia* spp. on metamorphic hills and rises. / *Eucalyptus persistens* +/- *Eucalyptus crebra* woodland on low metamorphic hills.	LC / LC	NCAP / NCAP	22.00

RE ID	Short Description[1]	VM Act Status[2]	BDStatus[3]	Extent within Project footprint (ha)
9.11.5	*Eucalyptus persistens* +/- *Eucalyptus crebra* woodland on low metamorphic hills.	LC	NCAP	40.72
9.11.5 / 9.22.2a	*Eucalyptus persistens* +/- *Eucalyptus crebra* woodland on low metamorphic hills. / Woodland to open woodland of *Eucalyptus crebra* +/- *Corymbia dallachiana* +/- *Corymbia erythrophloia* +/- *Corymbia clarksoniana* +/- *Eucalyptus* spp. +/- *Corymbia* spp. on metamorphic hills and rises.	LC / LC	NCAP / NCAP	44.10
9.11.5 / 9.7.2 / 9.7.1	*Eucalyptus persistens* +/- *Eucalyptus crebra* woodland on low metamorphic hills. / *Acacia shirleyi* low woodland on mesas and lateritised surfaces. / *Eucalyptus persistens* woodland on lateritised and deeply weathered surfaces on undulating terrain.	LC / LC/ LC	NCAP / NCAP / NCAP	51.06
9.11.15a	Woodland to low open woodland of *Eucalyptus crebra* or *Eucalyptus cullenii* +/- *Corymbia erythrophloia* or *Corymbia pocillum* +/- *Corymbia dallachiana* +/- *Erythrophleum chlorostachys* +/- *Eucalyptus microneura* on low hills and rises with moderately deep soils derived from metamorphic geologies.	LC	NCAP	62.46
9.11.16	*Eucalyptus crebra* +/- *Corymbia erythrophloia* or *Corymbia pocillum* woodland on steep to rolling hills.	LC	NCAP	6.24
9.11.16 / 9.11.23	*Eucalyptus crebra* +/- *Corymbia erythrophloia* or *Corymbia pocillum* woodland on steep to rolling hills. / *Eucalyptus microneura* +/- *Corymbia erythrophloia or C. pocillum* low open woodland on rolling metamorphic hills and rises	LC / LC	NCAP / NCAP	0.66
9.11.23b	Low open woodland to woodland of *Eucalyptus microneura* +/- *Eucalyptus cullenii* or *Eucalyptus crebra* on metamorphic hills.	LC	NCAP	21.87

RE ID	Short Description[1]	VM Act Status[2]	BDStatus[3]	Extent within Project footprint (ha)
9.12.1a	Woodland to low open woodland of *Eucalyptus crebra* +/- *Corymbia dallachiana* +/- *Corymbia erythrophloia* +/- *Corymbia clarksoniana* +/- *Corymbia* spp. *Eucalyptus exilipes* on a variety of landforms from undulating plains to steep hills.	LC	NCAP	5.21
9.12.10	*Corymbia confertiflora* and *Eucalyptus crebra* +/- *Corymbia clarksoniana* open woodland on rolling igneous hills.	OC	OC	13.03
9.12.12	*Eucalyptus crebra* and *Corymbia erythrophloia* +/- *Eucalyptus microneura* open woodland on igneous rocks.	LC	NCAP	2.09
9.12.16	*Eucalyptus crebra* and *Corymbia dallachiana* +/- *C. erythrophloia* open woodland on pre-Cainozoic basalt loams and flats to undulating plains	OC	OC	10.51
9.12.26	*Eucalyptus moluccana* +/- *E. crebra* and/or *E. granitica* woodland on igneous rocks.	OC	OC	2.19
9.12.32	*Eucalyptus persistens* woodland on rhyolites and granites.	LC	NCAP	1.97
-	**Total regional ecosystems**	**529.28**		
-	Non-remnant	45.74		
-	**Total footprint**	**575.02**		

[1] Short description as per the Regional Ecosystem Description Database (REDD). Version 12 (March 2021)

[2] Conservation status of the RE under the VM Act.

[3] Biodiversity (BD) status under the EP Act of the RE based on an assessment of the condition of remnant vegetation in addition to the pre-clearing and remnant extent of a regional ecosystem.

As per the State regulated vegetation mapping, Category B, C, R and X occur within the Project Area. The significance of impacts to MSES regulated vegetation and connectivity values are detailed in Appendix H.

The extent of potential clearing impacts to each potential or known MSES species are detailed in Table 16. For MSES identified as unlikely, no direct impacts are anticipated to occur due to the unlikely presence of these values within the Study Area and associated habitat. It is noted that not all areas within the Project Area have been field validated however a conservative and precautionary approach has been implemented in the mapping of potential MSES.

Table 16 Direct impacts on MSES protected wildlife habitat associated with the Project Area

MNES	Status (EPBC Act[1], NC Act[2])	Likelihood of Occurrence	Potential habitat within Study Area	Total area (direct impact)
			Utilisation	(ha)
Flora				
Tingoora wattle	-. V	Potential	Potential habitat	90.74
Leptospermum pallidum	-. NT	Known	Potential habitat	99.58
Fauna				
Chestnut dunnart	-. NT	Potential	Breeding, foraging and dispersal habitat	41.88
Short-beaked echidna	-, SLC	Known	Breeding, foraging and dispersal	575.02
Common death adder	-. NT	Potential	Breeding and foraging habitat	528.06

[2]V=Vulnerable; NT=Near threatened; SLC=Special Least Concern

As the Project Area has largely been co-located with an existing transmission line and some tracks also intersect, habitat within has already been subjected to low level fragmentation. Further vegetation clearing will be required for the construction of the Project. Clearing has the potential to dissect and disconnect vegetation communities, reducing the size of patches or potentially isolating them, which can impact on the success of seed dispersal, species recruitment and ultimately the long-term viability and persistence of a vegetation community within the landscape. Fragmentation impacts may also result in reduced fauna movement opportunities, leading to reduced species recruitment, genetic flow and ultimately affect the long-term viability and persistence of fauna populations within the landscape.

MSES that are considered most susceptible to fragmentation impacts as a result of the construction of the Project include chestnut dunnart and common death adder. The chestnut dunnart is likely to be very timid in nature and easily disturbed; and the common death adder is not considered to be highly mobile. Therefore, cleared areas between or within areas of suitable habitat may be no longer used by these species due to their exposed nature, lack of microhabitat features and the increased risk of predation. Gaps between areas of suitable habitat may affect MSES species by restricting movement of individuals and access to required habitat resources.

The maximum clearing widths for infrastructure reflect the Project Area width (60 m) and as such fragmentation impacts to short-beaked echidna are considered low. This species has generalist habitat requirements, is highly mobile, adapted to fragmented landscapes and is known to still traverse cleared or modified areas without significant risk. As detailed above, infrastructure siting has maximised the use of existing cleared areas to ensure fragmentation impacts are minimised.

Fauna mortality is another direct impact that may occur to conservation significant species during the construction phase. Fauna may be injured or killed during construction principally through:

- Strike from moving vehicles/machinery – key issue for ground dwelling species, particularly those with poor mobility

- Entrapment in habitat during removal – key issue during tree felling for species that use tree hollows or hollow logs for roosting and denning
- Entrapment in trenches/holes – key issue for ground dwelling species (reptiles and small mammals), particularly those that are active at night and cannot detect trenches to avoid.

MSES that are most susceptible to fauna mortality as a result of construction of the Project include chestnut dunnart, short-beaked echidna, common death adder.

7.1.2 Indirect Impacts

The loss of vegetation and habitat as well as the construction activities required to be undertaken to clear vegetation or complete construction, can potentially result in indirect or secondary impacts to the associated fauna and floristic values. This includes:

- Increased edge effects reducing the condition of quality of remaining vegetation communities and habitat types.
- Although exotic weeds were found to be relatively common across the Project Area, further disturbance can permit the establishment and spread of exotic species that may displace native species, native habitat resources and alter fire regimes.
- Soil exposure resulting in an increased risk of erosion and sedimentation of water bodies, reducing water quality and degrading aquatic habitats.
- Changes in hydrology from installation of infrastructure creating a barrier to surface flow and increasing stormwater run-off.
- Generation of dust emissions leading to excessive deposition of dust on leaves of plants suppressing photosynthesis and growth.
- Increased noise and light levels affecting foraging and breeding behaviour for some fauna species or resulting in complete avoidance and displacement from habitats.
- Periodic burst of elevated noise levels may startle and disorientate fauna species within proximity.
- Although the Project will not increase food resources or facilitate the movement of pests via the creation of new pathways, increased anthropogenic activity may lead to temporary increased pest levels.

MSES flora and fauna species are each susceptible to these indirect impacts with varying degrees.

7.2 Operation and Maintenance Phase

Potential impacts on ecological values during the operation and maintenance phase of the Project are likely to be low. Activity within the Project Area will be very low and limited to periodic maintenance.

Maintenance will involve vegetation clearing (predominantly treatment of regrowth) in areas that were cleared during the construction phase and along tracks. As parts of the Project Area are dominated by highly erodible soils, this further removal of vegetation may lead to new occurrences of erosion or increased severity in areas already eroded. Increased erosion will result in the loss of soil structure and inadvertently lead to the loss of vegetation and potentially MSES values in adjacent areas over time. In riparian communities this may result in the loss of bank structure and key habitat values such as hollow-bearing or tall nesting trees.

As per the construction phase, clearing will be completed in phases allowing time for fauna to disperse and temporarily avoid active areas. Traversing maintenance vehicles may inadvertently introduce weeds and potentially collide with ground dwelling species resulting in injury or mortality. These potential impacts will be mitigated through the implementation of the Project's Environmental Management Plan (EMP) which will include specific controls such as weed hygiene procedures, designated tracks and site speed limits and triggers for erosion and sediment control management.

7.3 Decommissioning and Rehabilitation Phase

Similar to the operation and maintenance phase of the Project, decommissioning and rehabilitation activities are also considered to have only low and temporary impacts on MSES values. All works in this phase will be conducted in consultation with landholders. Other than for surface rehabilitation, no ground disturbance will occur as subsurface components of the Project infrastructure will likely remain in-situ.

Temporary and localised increases in noise and potentially dust may occur, but will be managed using the same methods used during construction. Traversing vehicles required to complete decommissioning or rehabilitation activities may inadvertently introduce weeds and potentially collide with ground dwelling species resulting in injury or mortality. Any impacts would be mitigated through implementation of the Project EMP as per the other phases of the Project.

8.0 Mitigation Measures

Powerlink has implemented the hierarchy of management principles in the planning for and development of the Project. These principles and the order in which they have been applied is as follows.

1. **Avoid:** locating activities to avoid direct and indirect impacts on ecological values.
2. **Minimise:** minimising direct and indirect impacts where they cannot be completely avoided.
3. **Mitigate**: implementing mitigation and management measures to reduce direct, indirect and cumulative impacts.
4. **Remediate and rehabilitate:** actively remediate and rehabilitate impacted areas to promote long-term recovery.
5. **Offset (where necessary):** provide suitable offsets for activities that result in significant residual impacts to ecological values even with the implementation of the above principles.

Sections 8.1 and 8.2 describe how impacts on ecological values will be avoided and minimised for the Project and Section 8.3 describes mitigation measures.

A draft EMP has already been prepared for the Project. This plan identifies the performance criteria and general requirements / standard operational controls under sixteen different themes that will be implemented to meet Powerlink's environmental management requirements. Key themes relevant to the management of potential impacts on MSES values include biosecurity, agricultural chemicals, soils and water, acid sulfate soils, native fauna, vegetation management, contaminated land, waste, hazardous materials, air quality, noise and vibration, visual amenity, bushfire and transport and traffic.

8.1 Avoidance

The avoidance of ecological values has been demonstrated in two phases of the Project:

- Project Area siting: the initial siting of the Project Area (the transmission line easement and switching station site).
- Project footprint development: development of an optimised Project footprint (maximum clearing extent).

These stages are explained further below.

8.1.1 Project Area Siting

The Project Area detailed in this report reflects the findings of a corridor selection report (CSR) that was completed in 2017. Three different alignments were first developed and two were investigated in detail in the CSR. The CSR was completed using a range of detailed desktop and field assessments, interrogation of existing agency data, aerial reconnaissance and stakeholder and landholder engagement.

The potential and known presence of conservation significant ecological values, a number of other matters were also considered including topography, hydrology, native title and cultural heritage, tenure, land use and existing infrastructure. The alignment recommended by the CSR, which largely forms the current Project Area, was selected as it offered the lowest potential for environmental, social and economic impact.

The Project Area is predominantly co-located with existing Ergon infrastructure in the region, being the Greenvale 66kV and Kidston 132kV transmission lines. Co-locating the Project with this infrastructure maximises the use of areas that have already been cleared and potentially allows for MSES values that are highly sensitive to disturbance to be avoided (as they are unlikely to occur in the area in the first place). Unnecessary vegetation clearing for some Project elements such as access tracks and laydown areas is also avoided and habitat fragmentation impacts are minimised as the areas affected are already impacted by edge effects.

8.1.2 Project Footprint Development

Full clearance of the Project Area was originally proposed to ensure Powerlink's safety, reliability and operational requirements could be easily met during all phases of the Project. However, findings of the ecology desktop and field assessments (detailed in this report) indicated the known and potential presence of a number of ecological values and sensitive environments.

Using the habitat modelling (Appendix G), constraints mapping was developed to prioritise areas for footprint avoidance or minimisation. Constraints mapping considered both the sensitivity of ecological values to significant impacts, and the opportunities and feasibility to effectively manage risk of significant impacts through avoidance and minimisation. The constraints mapping primarily reduced the impact footprint in the eastern extent of the Project Area for MNES values. However, this would have ensured minimisation to areas of potential habitat for MSES species, particularly common death adder and short-beaked echidna.

Powerlink have gone through an extensive impact minimisation process to achieve approximately 50% reduction in direct impacts to conservation significant species habitat. Although no ecological values could be completely avoided by the Project footprint, a significant reduction in direct impacts was gained for almost all values. Key actions have included the following.

- Review of preliminary design to increase ground clearance where possible and hence reducing the amount of vegetation required to be cleared for the safe operation of the transmission line (i.e. required to maintain electrical clearances). This included adjustments in tower placements along the alignment (utilising topography); addition of towers along the alignment in locations to minimise span lengths; and raising of tower heights.
- Following this optimisation of the preliminary design to minimise the clearing impact along the alignment, review transmission line design in relation to existing vegetation on the alignment (LiDAR) to determine how much vegetation is required to be removed to construct, operate and maintain the transmission line. The following clearing areas are used:
    - Full Width Clearing – where vegetation is required to be removed across the easement corridor (60 metres wide)
    - Draw Wire Path Clearing – where vegetation is required to be removed in the centre of the corridor (21 metres wide)
    - Tower pad sites – require a 30 x 30 metre pad to be cleared.

8.2 Minimise

Development of the Project within the Project Area will occur progressively and in phases. By doing this, only a small subset of the Project Area will be impacted at one time. Indirect impacts resulting from the construction of the Project will be localised and temporary, and actively managed as detailed below. Furthermore, clearing extents detailed in Table 16 represent a maximum area. Direct impacts to MSES will be minimised where possible including through micro-siting.

8.3 Mitigate

To mitigate potential impacts to potentially occurring ecological values, an EMP has been developed for the Project. At present, only general mitigation and management measures relevant to MSES are included in the EMP. However, species-specific mitigation and management measures have also been developed. Further detail on these measures are detailed in the subsequent sections.

8.3.1 General Mitigation Measures

The key general mitigation measures are detailed below:

- Prior to construction, the occurrence and extent of conservation significant species habitat will be identified and delineated.
- Exclusion areas will be delineated to avoid unauthorised disturbance and access of areas of threatened species habitat.

- When siting infrastructure, existing breaks between patches of potential conservation significant species habitat will be utilised as much as practical to minimise habitat fragmentation.
- Movement within the Project Area will be via approved access tracks only with speed limits enforced. The requirement to enter and traverse the Project Area will be minimised where possible and limited to those required for essential Project activities.
- All clearing will be conducted with a suitably qualified spotter catcher present.
- In areas of conservation significant species, spotter-catchers will scout the area to be disturbed for the presence of fauna species immediately prior to the commencement of disturbance and relocate the fauna to an undisturbed location.
- Where approved, Powerlink or the construction contractor may extract water from select farm dams for construction purposes. Water will only be taken where available supplies provide continuity of habitat function and quality.
- Exclusion zones will be established around identified active breeding places and any fauna habitat features to be retained (e.g. mature trees, inactive breeding places) and appropriately marked out. Where there is the potential an active breeding place will be tampered with, this will only be done in accordance with an approved low-risk and/or high risk DES Species Management Plan (SMP) (depending on the species to be impacted).
- Night works within or adjacent to areas of potential conservation significant species habitat will be avoided where possible. Where night works are required, lights will be directed to minimise light spill into adjacent habitats.
- Construction activities that may result in loud sudden noise will be not permitted in proximity to areas determined to contain potential breeding habitat for threatened fauna species.
- Microhabitat features such as large fallen logs will be relocated to adjacent areas of undisturbed vegetation prior to vegetation clearing where practicable.
- Dust suppression measures will be implemented as required i.e. on high wind days during extended dry periods.
- Undertake refuelling and chemical storage in designated containment areas and follow emergency response procedures in the event of a spill. Containment areas will be designed and managed in accordance with relevant regulatory requirements and standards.
- Threat of wildfire caused by Powerlink activities will be minimised through maintenance of firebreaks around ignition sources as appropriate.
- Weed and pest management strategies to be implemented for controlling the spread of weeds and pests, particularly vehicles traversing the Project Area. This includes:
    - Pre-construction and post-construction weed surveys will be undertaken within the Project Area.
    - Clean down protocols are required for any vehicles or machinery entering and leaving the Project Area.
    - Ongoing monitoring of the Project Area to identify any new incidence of weed and pest infestation.
- Disturbed areas will be assessed and progressively rehabilitated in accordance with a Rehabilitation Monitoring Plan to be developed prior to construction.

8.3.2 Species-specific Mitigation Measures

Mitigation measures specific to the potentially occurring conservation significant species are detailed in Table 17.

Table 17 Species-specific mitigation measures

MSES	Mitigation measure
• Tingoora wattle • *Leptospermum pallidum*	• Any populations should be identified, and the extent mapped during pre-clearance surveys. Confirmation of population avoidance should be completed during final scouting. The siting of infrastructure should avoid areas of known occurrence as a priority. • Clearing works should maintain a sufficient vegetation buffer where possible around identified locations of threatened flora to maintain suitable micro-climatic conditions. • Siting of infrastructure should aim to minimise fragmentation of potential habitat as much as possible (i.e. clear edges rather than dissect patches) to maintain core patch and population viability.
• Ground-dwelling MSES fauna	• Any open excavations will be checked for trapped fauna in the morning and at the end of the day by a spotter catcher • Trench ladders, ramps, sticks, ropes and moist hessian sacks at regular intervals (or similar) will be utilised where trenches or excavations are anticipated to remain open for extended periods. This will help trapped fauna escape and/or survive until removed by a fauna spotter-catcher. • All vehicles, plant, equipment and machinery to remain within the designated access tracks in identified habitat areas.

9.0 MSES Significant Residual Impact Assessment

As discussed in Section 6.0, the following MSES are found within the Project Area:

- Regulated vegetation: Of concern REs
- Regulated vegetation: Essential habitat
- Protected wildlife habitat
- Connectivity areas
- Waterways providing fish passage.

A significant residual impact (SRI) assessment has been undertaken for the Project (Appendix H) in accordance with the criteria provided in the Significant Residual Impact Guidelines (Department of State Development, Infrastructure and Planning, 2014).

SRI assessments were completed using the Project Footprint, which is considered to represent the maximum impact area. The outcomes of these assessments and the associated justification is summarised in Table 18 below. After considering potential impacts, mitigation measures and the state significant residual impact criteria, the Project will have a significant residual impact on MSES values for 'regulated vegetation; Of Concern REs', 'REs within the defined distance of a watercourse', and 'essential habitat'. No other MSES were considered to have a significant residual impact.

It is important to note that the SRI assessments are not to be used to determine if the Project requires assessment for potential impacts on MNES protected by the Commonwealth EPBC Act, or if an offset would be required under that Act (Section 5.0). Where MSES species are common with MNES Species an assessment has not been undertaken as these species are being assessed through the EPBC Act Referral process.

Table 18 Summary of SRI assessment for MSES within the Project Area

MSES	SRI expected?	Primary justification
Regulated vegetation: Of Concern REs	Yes	An SRI is anticipated for each 'Of Concern' RE due to the impact area within the Project Footprint exceeding 5 ha, and/or the maximum clearing width exceeding the appropriate impact threshold. Therefore, the Project is likely to have a significant residual impact to 32.7 ha of MSES regulated vegetation: 'Of Concern' REs.
Regulated vegetation: Prescribed REs within the defined distance of a watercourse	Yes	Due to the permanent removal of vegetation within the defined distance of a stream order 2 or higher with no rehabilitation proposed, the Project Footprint is likely to have a significant residual impact to REs within the defined distance of a watercourse.
Regulated vegetation: Essential habitat	Yes	Due to the permanent removal of regulated vegetation considered essential habitat under the VM Act that is wider than 20 metres and results in a greater than 10% permanent reduction in the extent of essential mapped in the Project Area, the Project is likely to have a significant residual impact to essential habitat.
Connectivity areas	No	The LFC tool determined that Project related impacts on connectivity areas are not significant.
Protected wildlife habitat	No	The Project is not deemed to have a significant residual impact on protected wildlife habitat, due to the generalist habitat requirements for both the common death adder and short-beaked echidna, the large availability of suitable habitat

MSES	SRI expected?	Primary justification
		adjacent to the Project Footprint, and the linear nature of the impact. The MNES Report (AECOM 2021) identified potential significant impact on the following seven species (that are both MNES and MSES) and these species are also considered to potentially have a significant residual impact as per the criteria provided in the Significant Residual Impact Guidelines (Department of State Development, Infrastructure and Planning, 2014): • Black-throated finch (southern) • Sharman's rock wallaby • Koala • Greater glider • Ghost bat • Yakka skink • Satin flycatcher.
Waterways providing for fish passage	No	The project is not anticipated to require waterway barrier works. However, if any waterway barrier works are required they will be conducted in accordance with the Guide ((Department of Agriculture and Fisheries, 2018). Areas of fish passage within the Project Footprint are unlikely to be substantially modified or fragmented as a result of the Project. The Project is unlikely to impact a major or high risk waterway for waterway barrier works, however any waterway barrier works are likely to have a short-term impact to major and high risk waterways.

10.0 Conclusion

This report documents the findings of terrestrial ecological surveys undertaken for the Genex Kidston Connection Project.

Flora

Remnant vegetation is mapped across the majority of the Project Area , with non-remnant vegetation limited to access tracks and the current powerline easements. The field assessment identified 37 REs. Three Of Concern REs were recorded during the field program (RE 7.8.18, 9.12.10, and 9.12.26).

The flora surveys recorded a total of 281 species, representing 57 families.

No conservation significant flora species were identified within the Project Area; however *Leptospermum pallidum,* listed as Near Threatened under the NC Act, was identified adjacent to the Project Area. An additional three conservation significant flora species are regarded as having a potential likelihood of occurrence within the Project Area, based on observed habitat and known species distributions.

Four introduced species are listed as Category 3 restricted invasive plants/biosecurity matter under the *Biosecurity Act 2014*, including:

- *Parthenium hysterophorus* (parthenium).
- *Lantana camara* (lantana).
- *Cryptostegia grandiflora* (rubber vine).
- *Argyreia nervosa* (Elephant creeper).

The first three species listed above are also listed as WoNS by the Australian government. The solitary *Cryptostegia grandiflora* specimen that was detected within the Project Area was affected by rubber vine rust (*Maravalia cryptostegiae*).

Fauna

The fauna surveys identified a range of habitat values suitable to support both conservation significant and Least Concern species. Nine broad habitat types were recorded during the field surveys, all of which provide a range of habitat opportunities for all vertebrate groups. Fauna diversity recorded during the field surveys totalled 163 species, comprising 115 bird, 35 mammal, 9 reptile, 2 amphibian and 2 fish species.

Four conservation significant species were identified during the field surveys:

- Squatter pigeon (southern) (*Geophaps scripta scripta*), listed as Vulnerable under the EPBC Act and the NC Act.
- Sharman's rock-wallaby (*Petrogale sharmani*), listed as Vulnerable under the EPBC Act and the NC Act.
- Greater glider (*Petauroides volans*), listed as Vulnerable under the EPBC Act and the NC Act.
- Short-beaked echidna (*Tachyglossus aculeatus*), listed as Special Least Concern under the NC Act.

One EPBC Act migratory fauna species was identified during the field surveys:

- Glossy ibis (*Plegadis falcinellus*), listed as Migratory under the EPBC Act and Special Least Concern under the NC Act.

A further 14 conservation significant fauna species and 11 migratory species are regarded as having a potential or likely likelihood of occurrence within the Project Area, based on observed habitat values and known species distributions.

Habitat Modelling

Habitat modelling was undertaken conservation significant species known to occur, or deemed a potential or higher likelihood of occurring.

Potential Impacts

A number of potential impacts to flora and fauna, MNES and MSES may occur as a result of the Project. Potential impacts with the greatest risk to ecological values are associated with the direct clearing of vegetation during the construction phase of the Project. Avoidance, mitigation and management measures are recommended to ensure the potential impact on ecological values are minimised or avoided.

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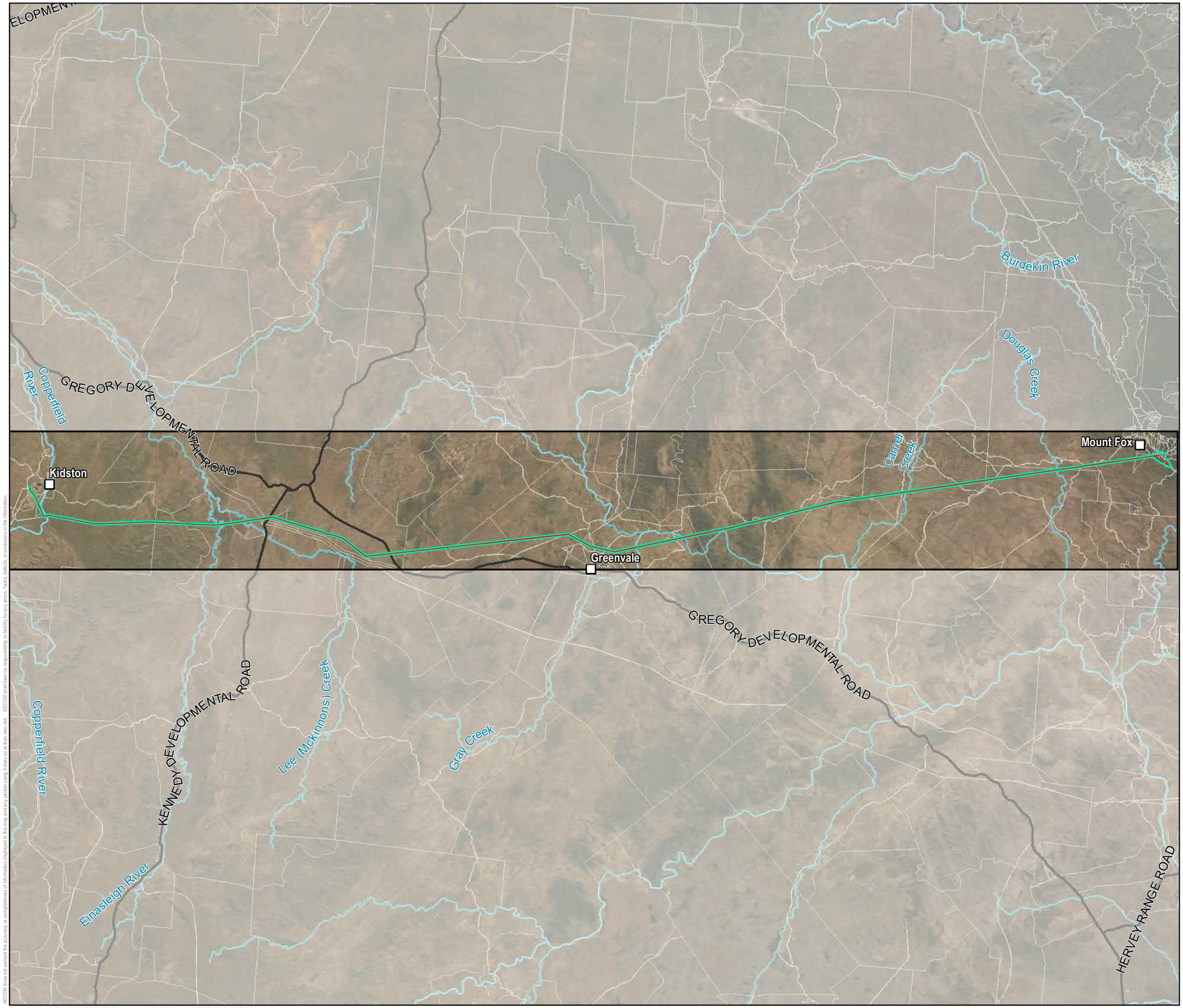
Appendix A

Figures



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Kilometers

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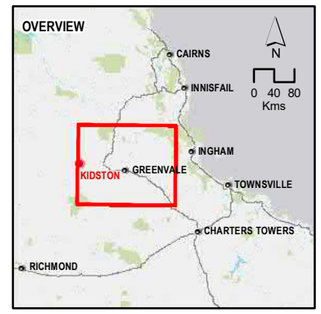
Legend

- Study Area
- Project Area
- Places
- Major Roads
- Major Watercourses
- Regional Context Area
- Cadastral Boundaries



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PROJECT AREA & STUDY AREA

PROJECT ID:	60554486
CREATED BY:	JR
LAST MODIFIED:	JB - 12/10/2021
VERSION:	2

Figure F1

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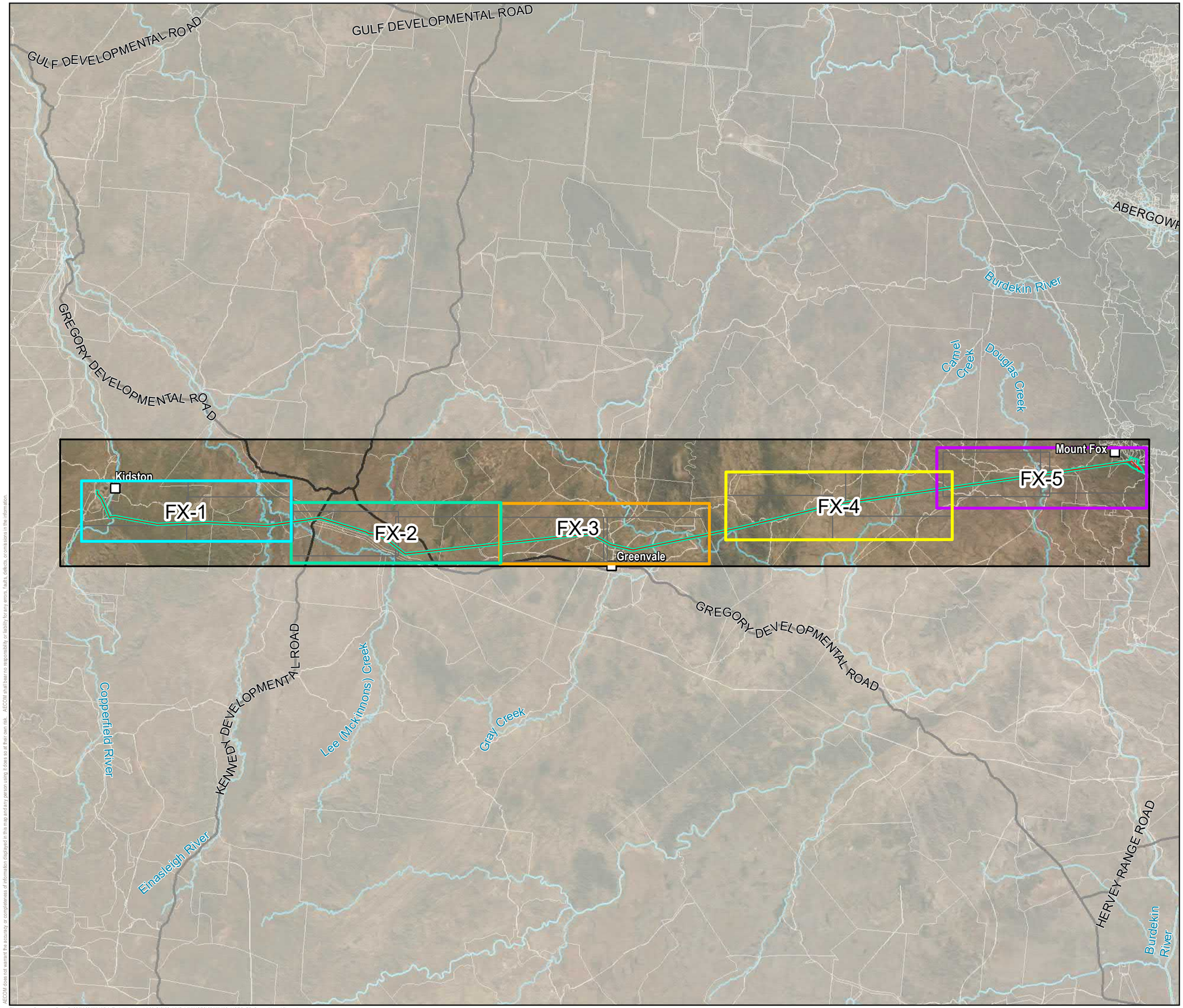

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Coordinate System: GDA 1994 MGA Zone 55
Projection: Transverse Mercator

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Kilometers

1:600,000 (when printed at A3)

Legend

- Study Area
- Project Area
- Places
- Major Roads
- Major
- Regional Context
- Cadastral

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MAP ZONE REFERENCE

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CREATED BY:	JR
LAST MODIFIED:	JB - 12/10/2021
VERSION:	2

Figure F2

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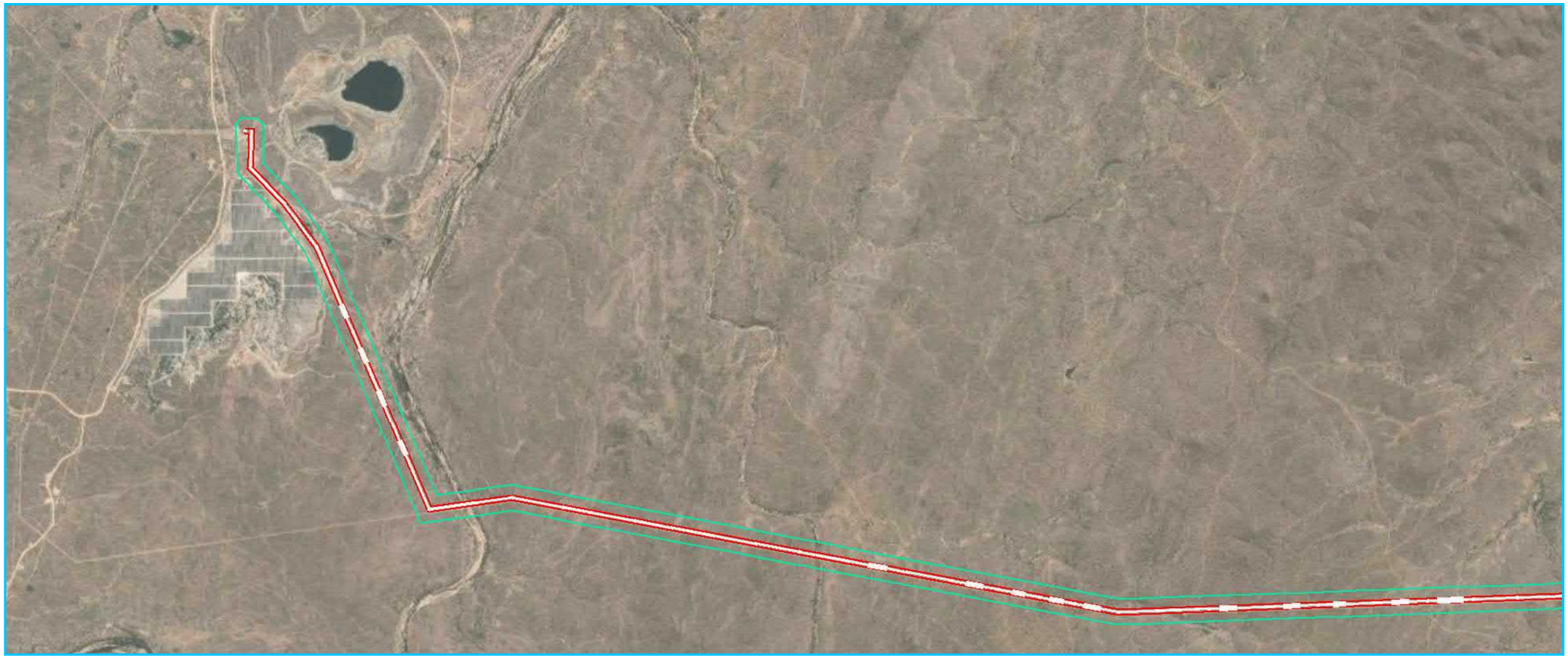

WEST - ABOVE

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Coordinate System: GDA 1994 MGA Zone 55
Projection: Transverse Mercator

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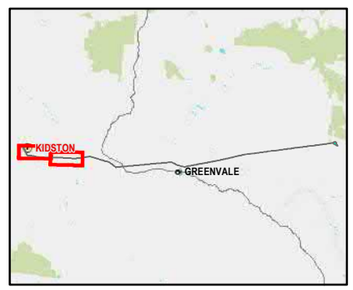
Meters

1:55,000 (when printed at A3)

Legend

- Study Area
- Project Area
- Project Footprint - Tranmission Line



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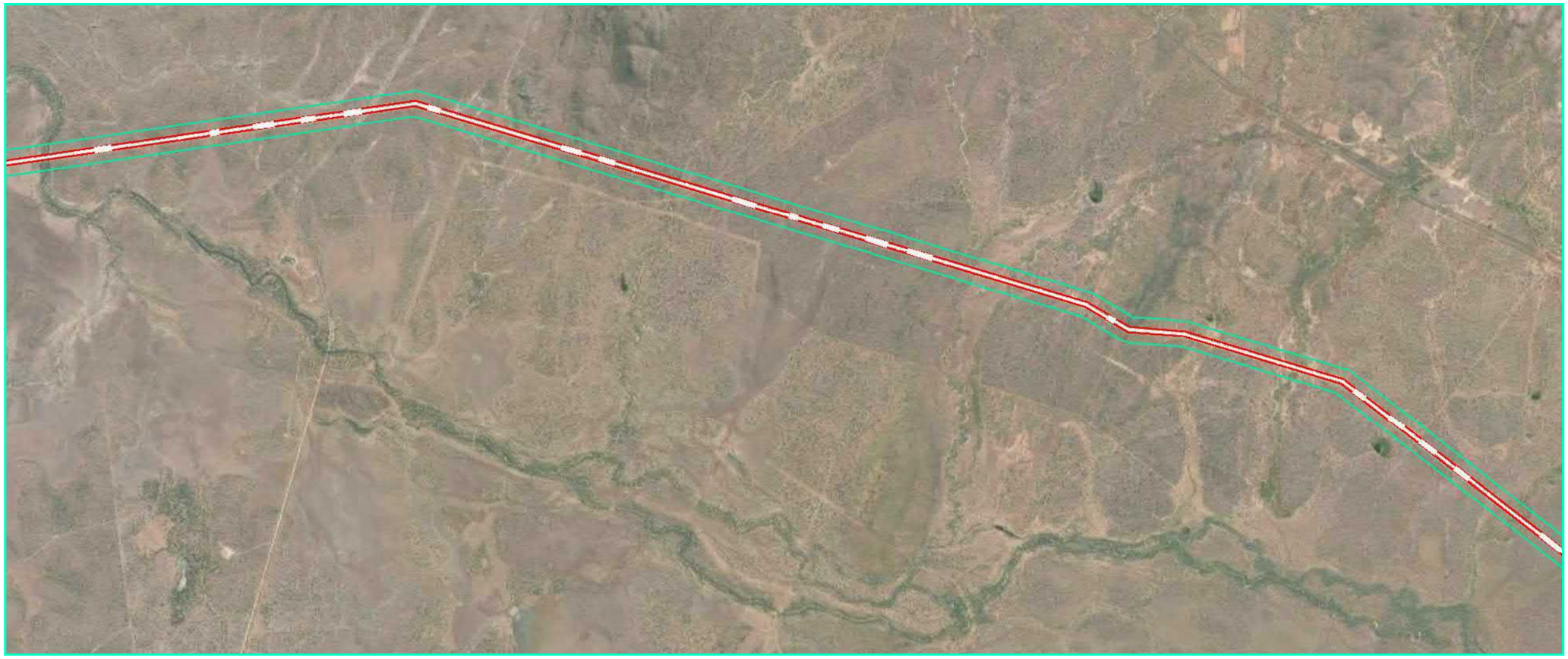

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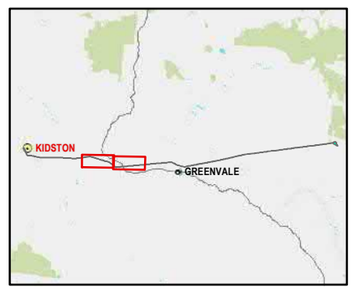
Legend

- Study Area
- Project Area
- Project Footprint - Tranmission Line



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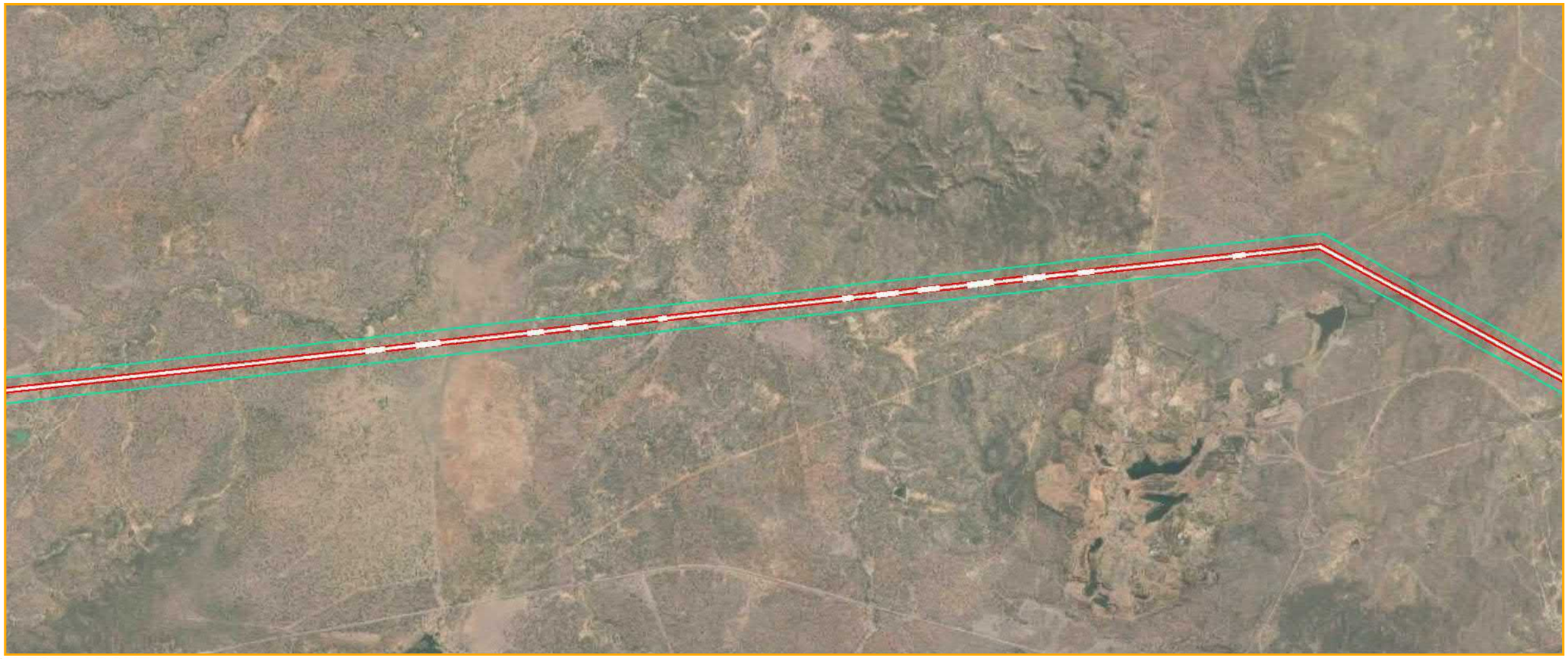

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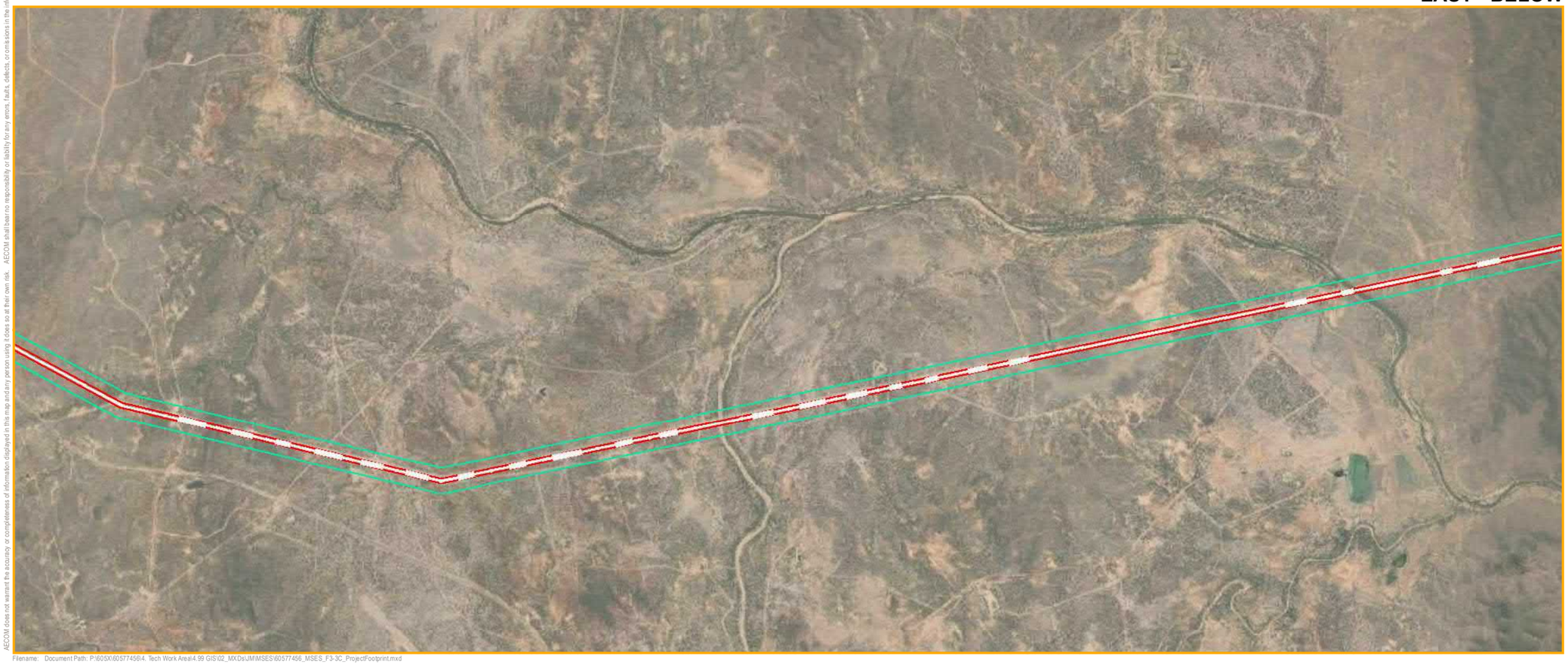

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Projection: Transverse Mercator

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Meters

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Legend

- Study Area
- Project Area
- Project Footprint - Tranmission Line

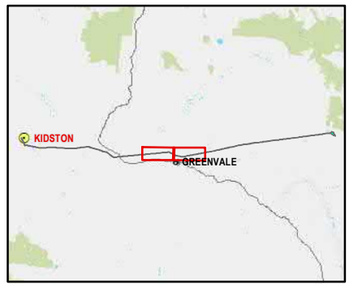

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Figure F3.3

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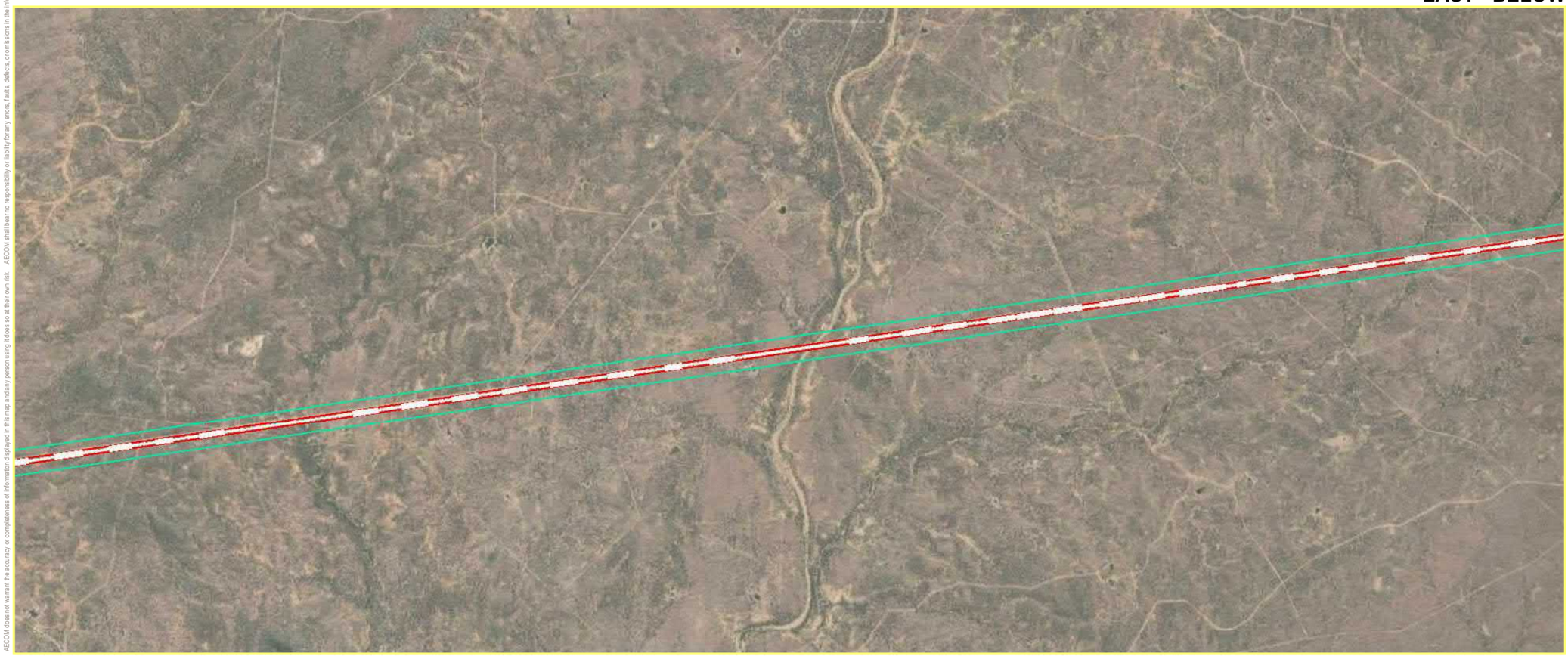

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Coordinate System: GDA 1994 MGA Zone 55
Projection: Transverse Mercator

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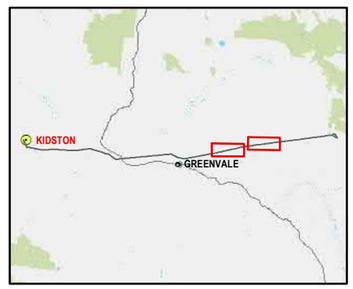
Legend

- Study Area
- Project Area
- Project Footprint - Tranmission Line



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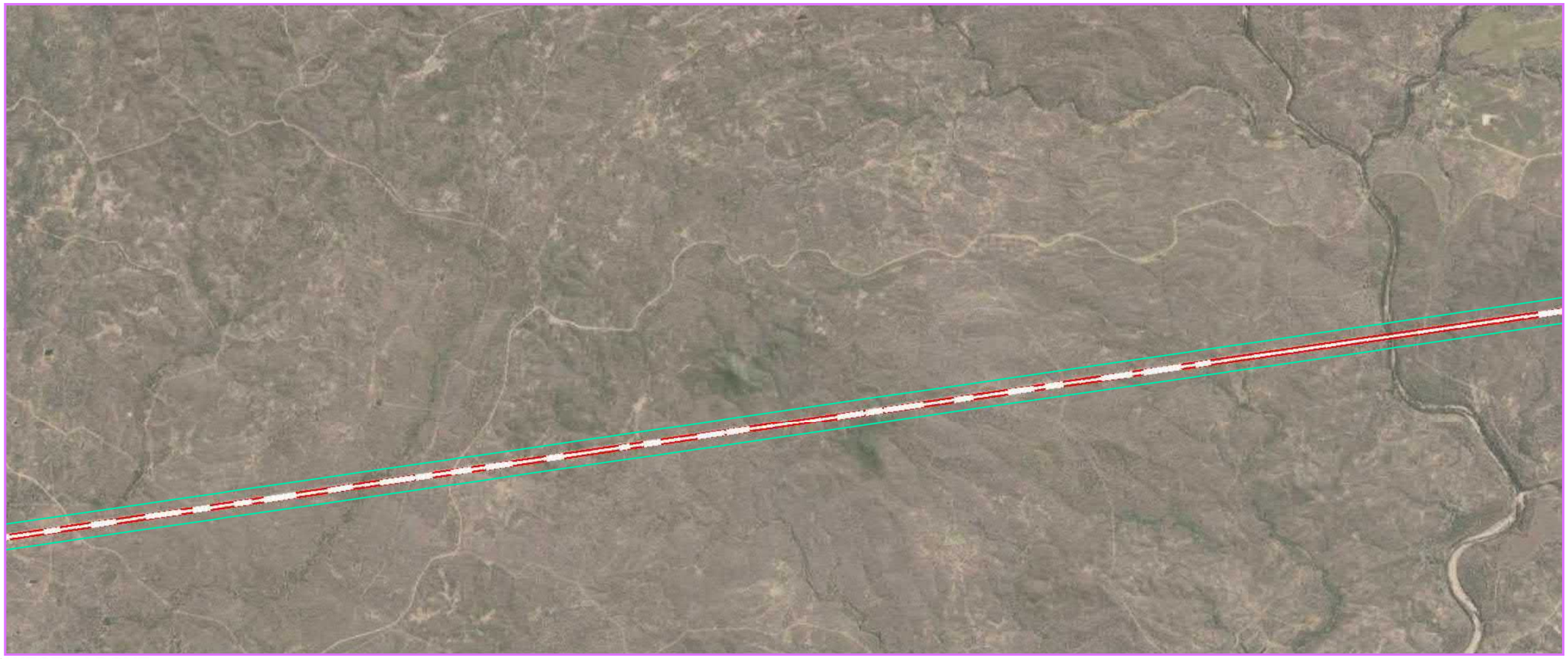

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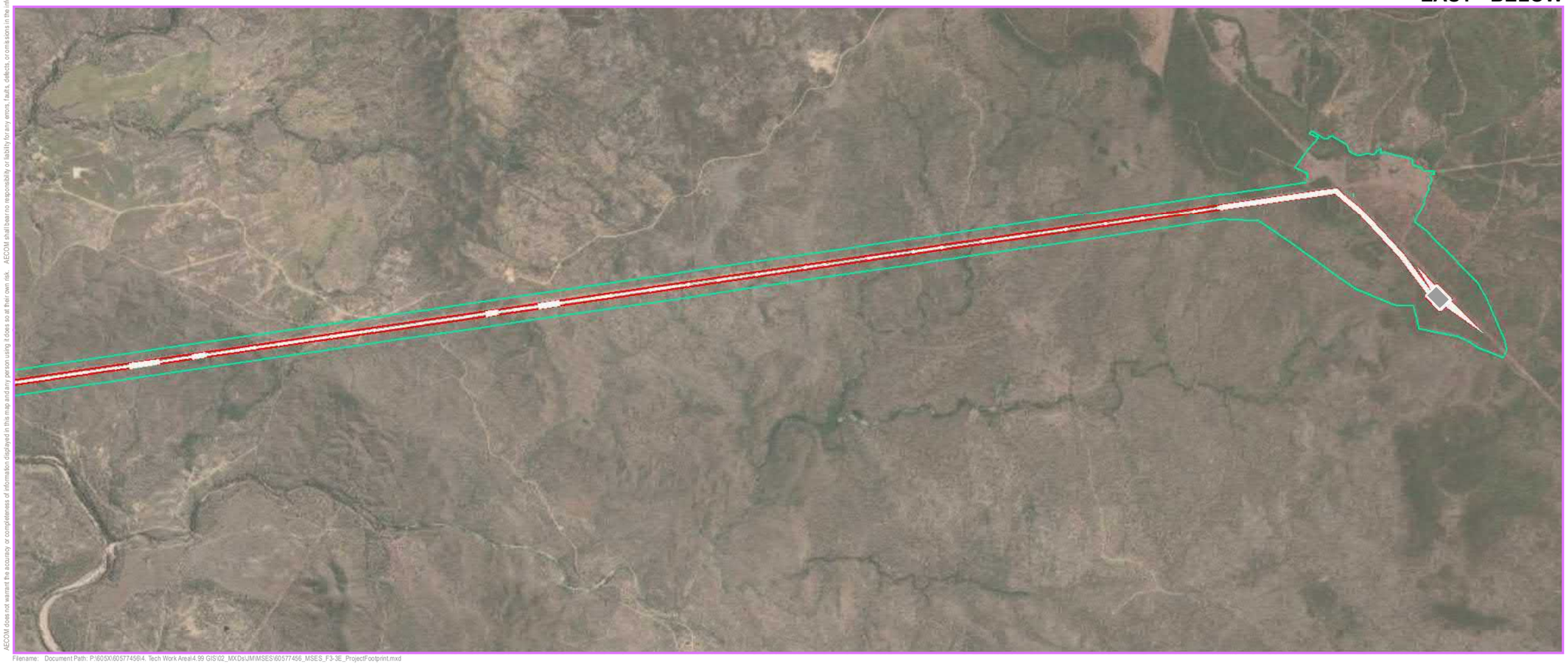

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Coordinate System: GDA 1994 MGA Zone 55
Projection: Transverse Mercator

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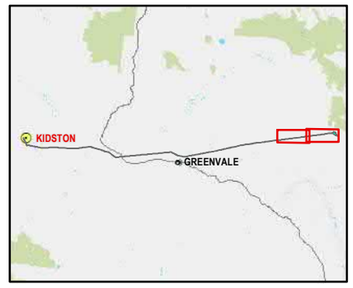
Legend

- Study Area
- Project Area

Project Footprint

- Tranmission line components
- Mt Fox switching station site



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Coordinate System: GDA 1994 MGA Zone 55
Projection: Transverse Mercator

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Meters

1:55,000 (when printed at A3)

Legend

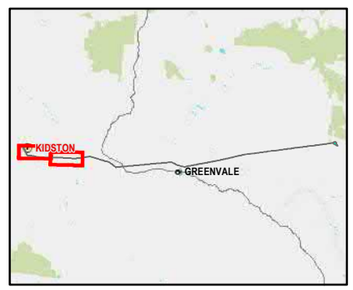
- Study Area
- Observations (flora or fauna)

Flora

- Tertiary sites
- Quaternary sites

Fauna

- Habitat assessment sites
- Anabat sites
- Bird survey sites
- Camera trap sites
- Spotlighting sites
- Songmeter sites



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FIELD SURVEY SITES

PROJECT ID: 60577456
CREATED BY: JR
LAST MODIFIED: JB - 12/10/2021
VERSION: 1

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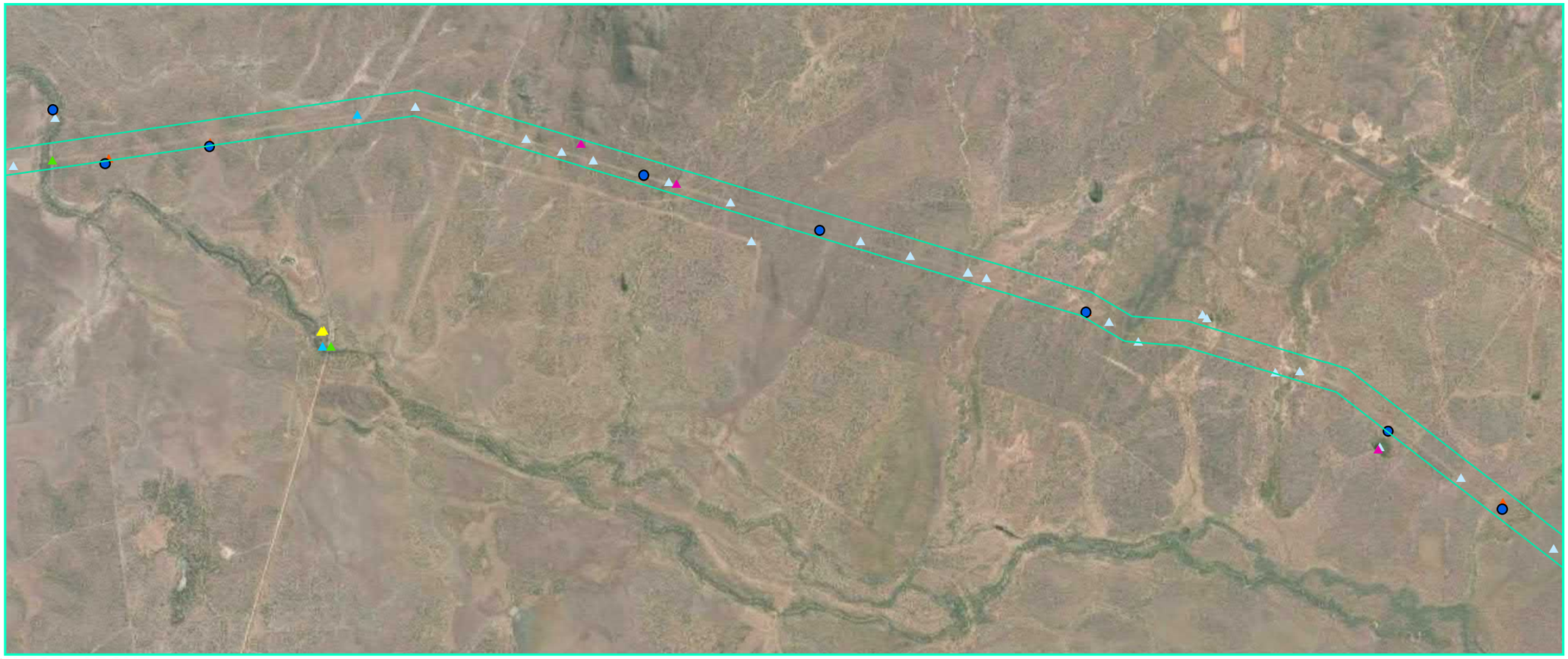

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Coordinate System: GDA 1994 MGA Zone 55
Projection: Transverse Mercator

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Meters

1:55,000 (when printed at A3)

Legend

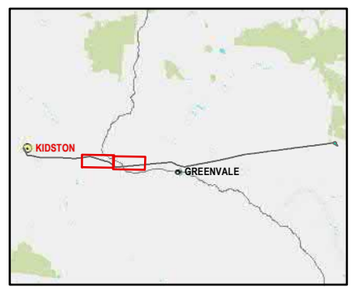
- StudyArea
- Observations (flora or fauna)

Flora

- Tertiary sites
- Quaternary sites

Fauna

- Habitat assessment sites
- Anabat sites
- Bird survey sites
- Camera trap sites
- Spotlighting sites
- Songmeter sites



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LAST MODIFIED: JB - 12/10/2021
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Meters

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Legend

- StudyArea
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Flora

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Fauna

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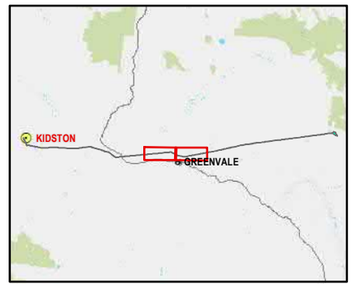
- Camera trap sites
- Spotlighting sites
- Songmeter sites



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FIELD SURVEY SITES

PROJECT ID:	60577456
CREATED BY:	JR
LAST MODIFIED:	JB - 12/10/2021
VERSION:	1

Figure F4.3

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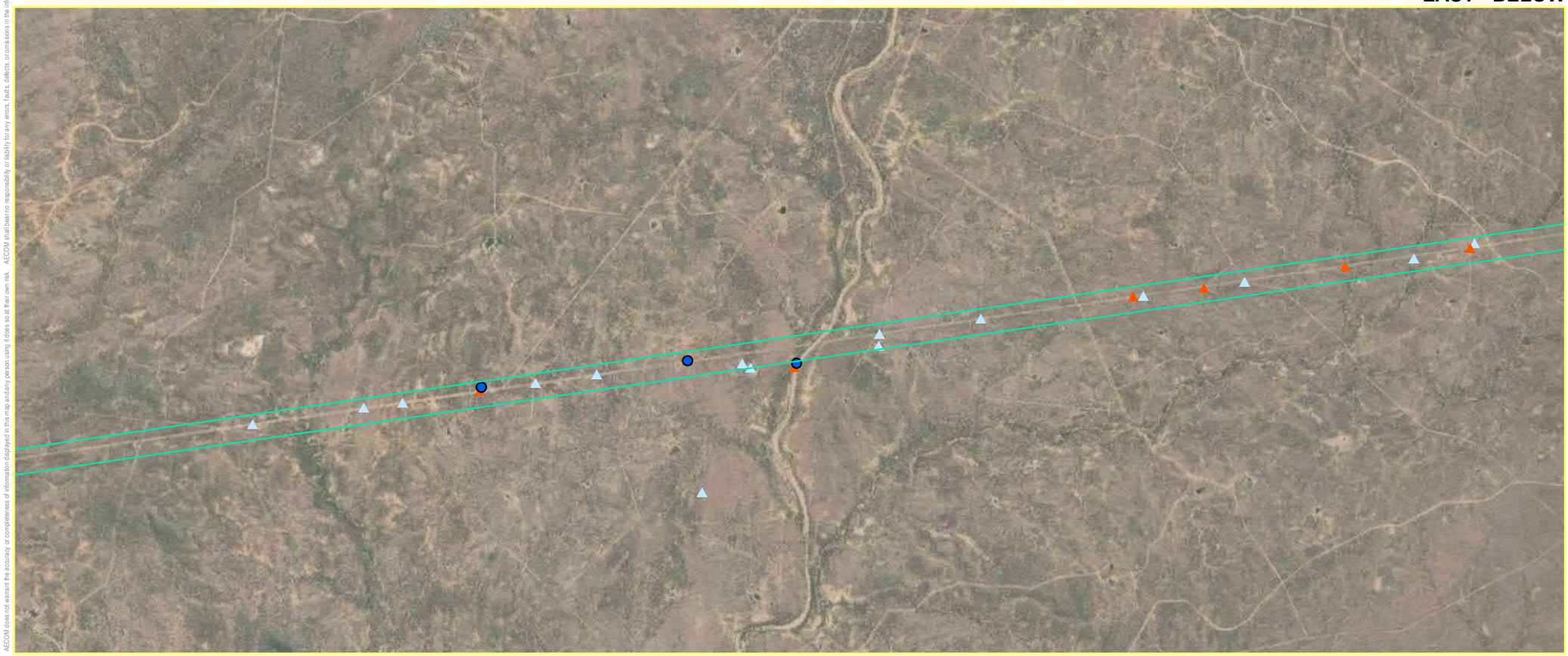

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N

Coordinate System: GDA 1994 MGA Zone 55
Projection: Transverse Mercator

0 650 1,300 1,950 2,600
Meters

1:55,000 (when printed at A3)

Legend

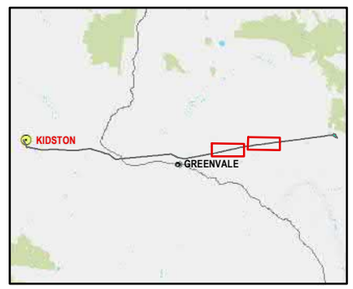
- Study Area .
- Observations (flora or fauna)

Flora Assessments

- Tertiary sites
- Quaternary sites

Fauna Assessments

- Habitat assessment sites
- Anabat sites
- Bird survey sites
- Camera trap sites
- Spotlighting sites
- Songmeter sites



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FIELD SURVEY SITES

PROJECT ID: 60577456
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LAST MODIFIED: JB - 12/10/2021
VERSION: 1

Figure F4.4

A3 size

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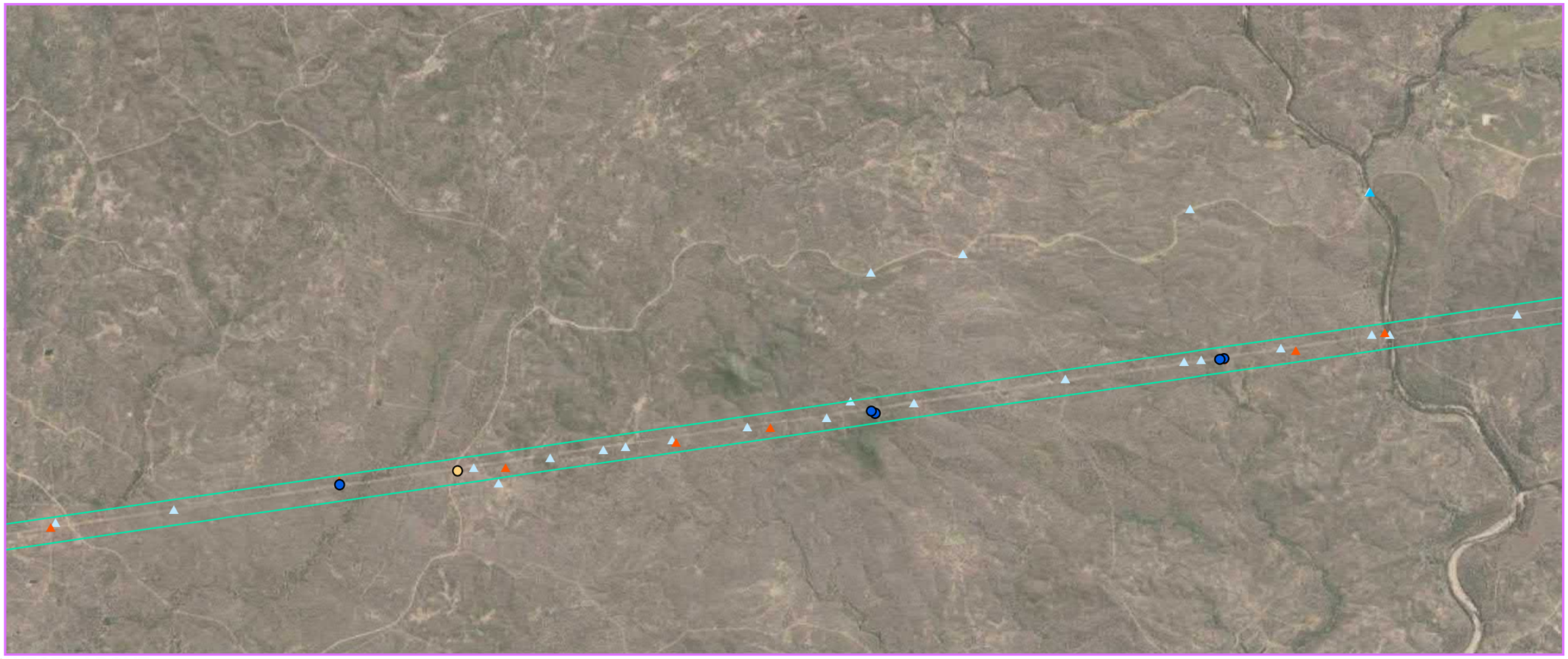

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Coordinate System: GDA 1994 MGA Zone 55
Projection: Transverse Mercator

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Meters

1:55,000 (when printed at A3)

Legend

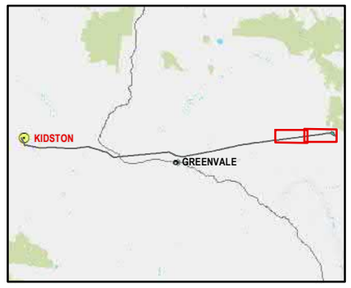
- Study Area
- Observations (flora or fauna)

Flora Assessments

- Tertiary sites
- Quaternary sites

Fauna Assessments

- Habitat assessment sites
- Anabat sites
- Bird survey sites
- Camera trap sites
- Spotlighting sites
- Songmeter sites



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FIELD SURVEY SITES

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VERSION: 1

Figure F4.5

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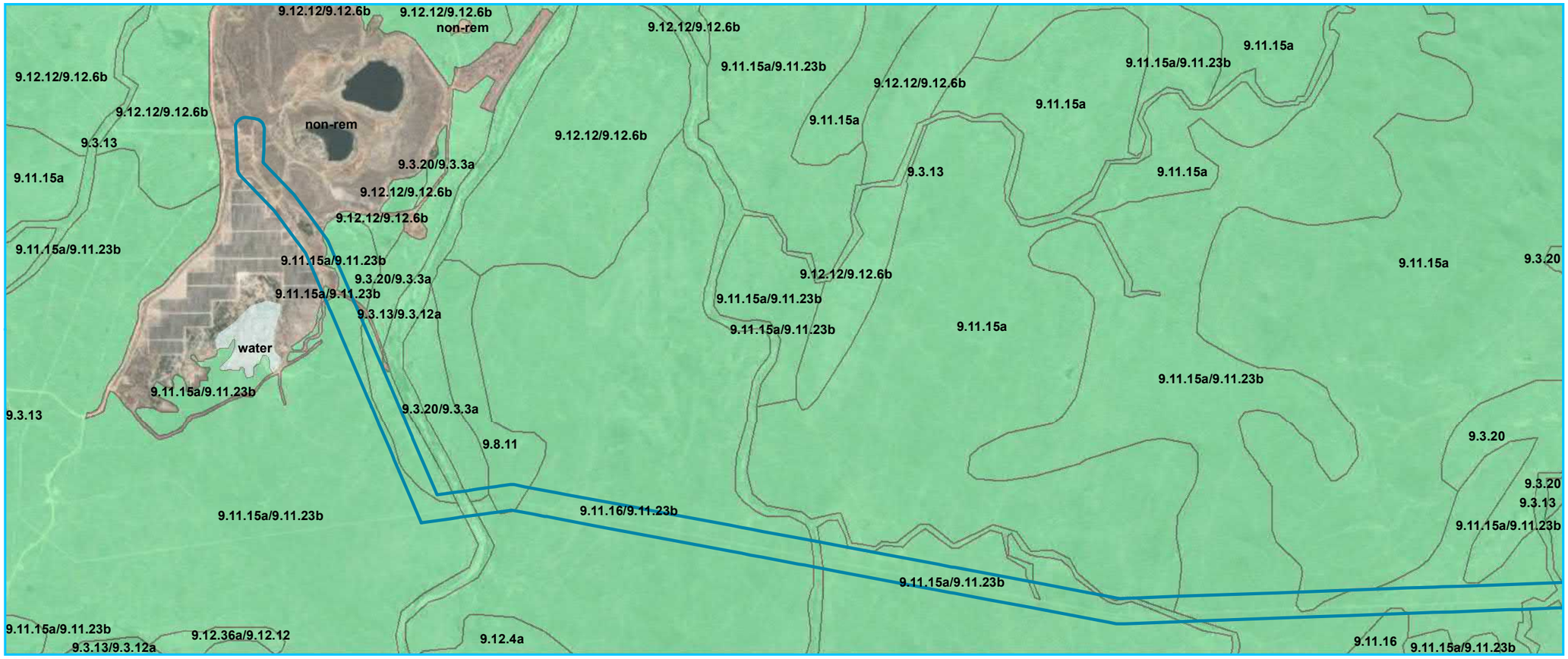

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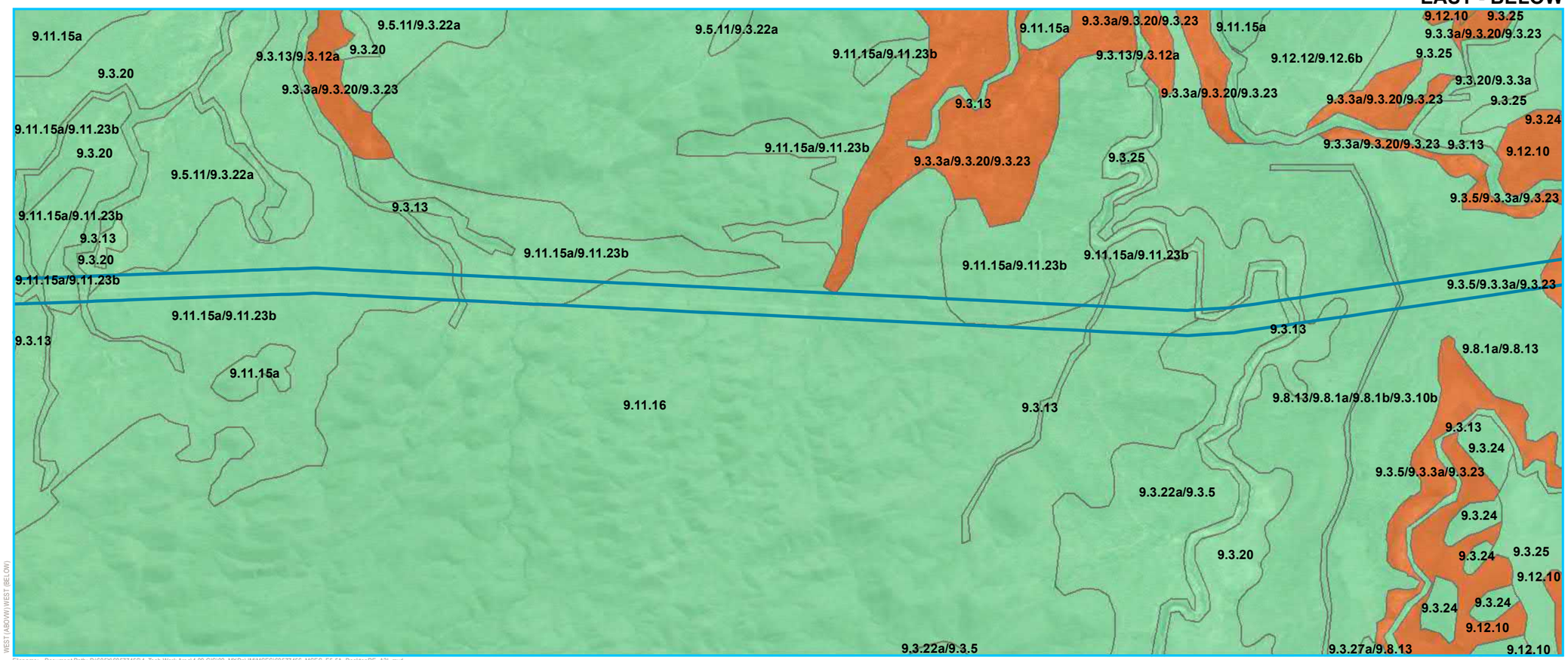

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N

Coordinate System: GDA 1994 MGA Zone 55
Projection: Transverse Mercator

0 650 1,300 1,950 2,600
Meters

1:55,000 (when printed at A3)

Legend

- Study Area

Queensland DoR RE Mapping

- Category A or B area containing endangered
- Category A or B area containing endangered and is S20AH
- Category A or B area containing of concern
- Category A or B area containing of concern and is S20AH
- Category A or B area that is least concern
- Category A or B area that is least concern and is S20AH
- Category C or R area containing endangered
- Category C or R area containing of concern
- Category C or R area that is of least concern
- Water
- Non-remnant
- Area not categorised

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Figure F5.1

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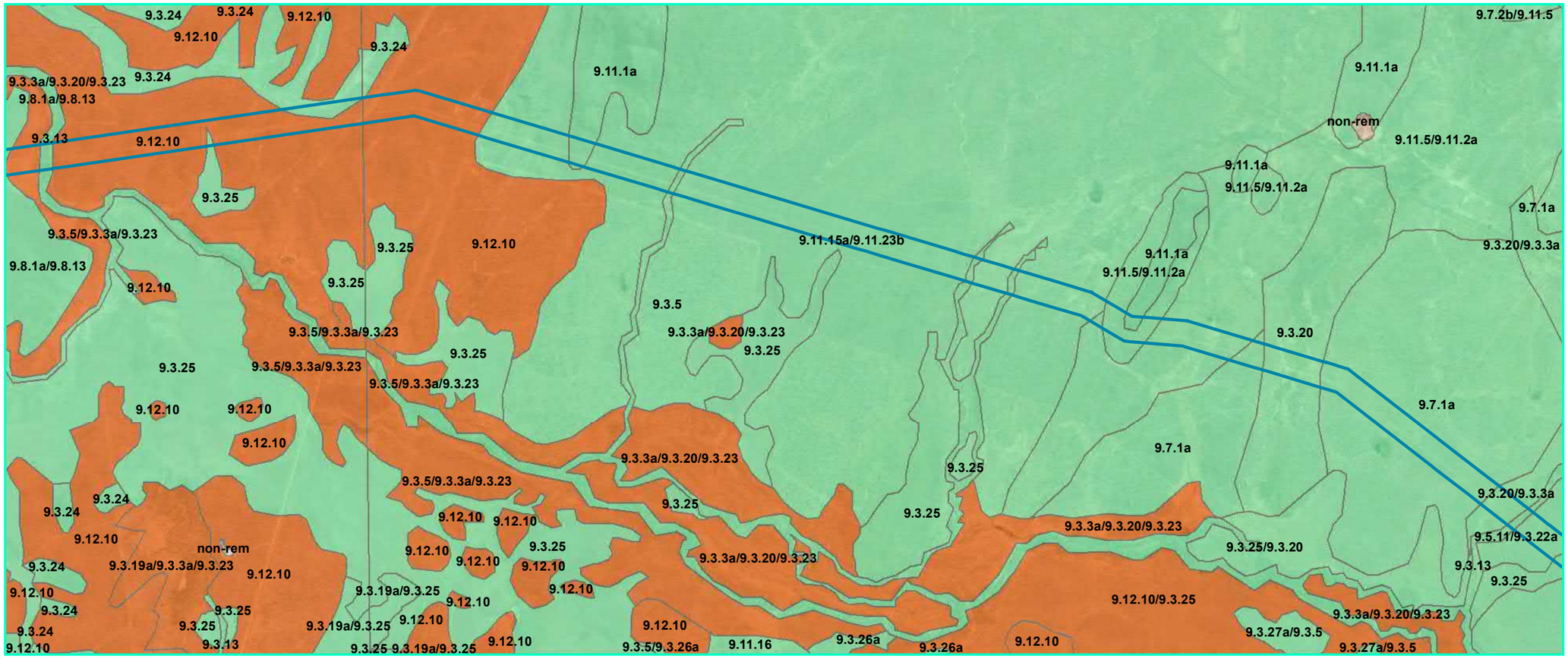

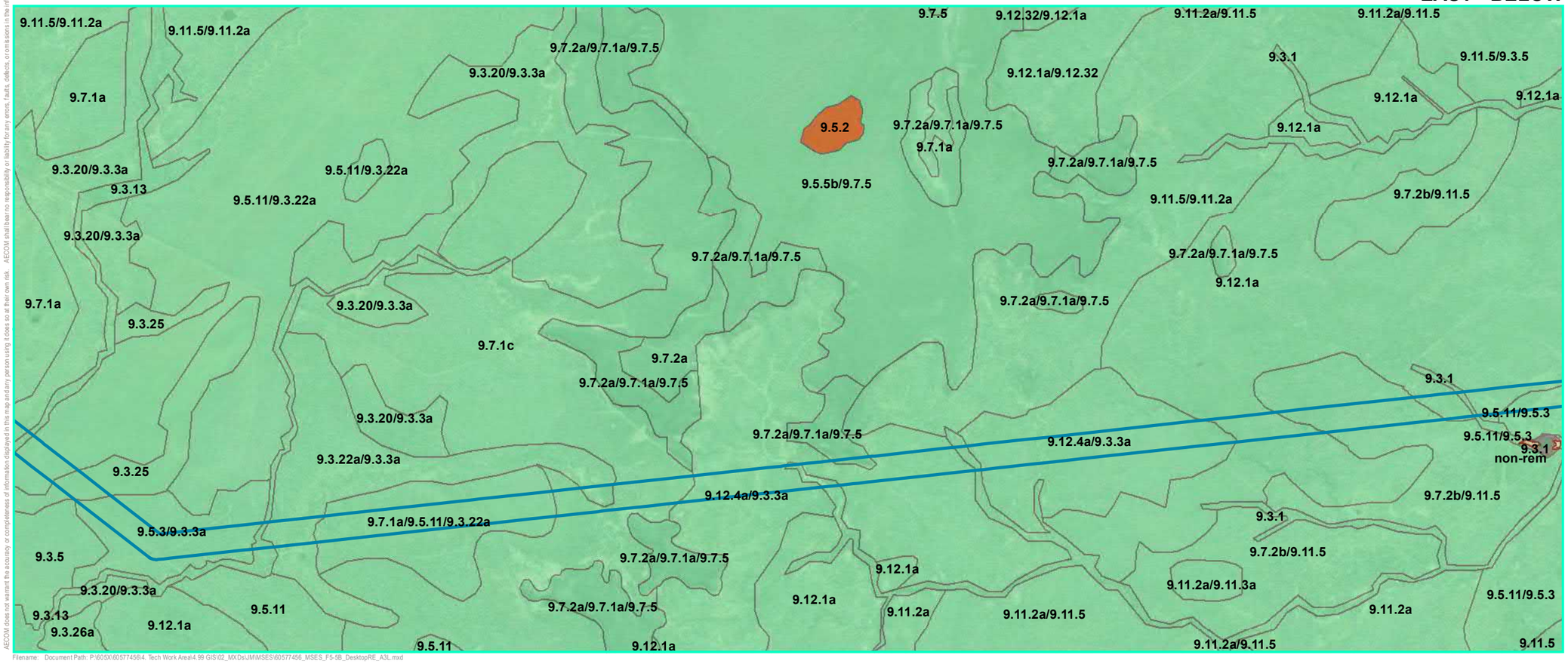

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Coordinate System: GDA 1994 MGA Zone 55
Projection: Transverse Mercator

0 650 1,300 1,950 2,600

Meters

1:55,000 (when printed at A3)

Legend

- Study Area

Queensland DoR RE Mapping

- Category A or B area containing endangered
- Category A or B area containing endangered and is S20AH
- Category A or B area containing of concern
- Category A or B area containing of concern and is S20AH
- Category A or B area that is least concern
- Category A or B area that is least concern and is S20AH
- Category C or R area containing endangered
- Category C or R area containing of concern
- Category C or R area that is of least concern
- Water
- Non-remnant
- Area not categorised

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Figure F5.2

A3 size

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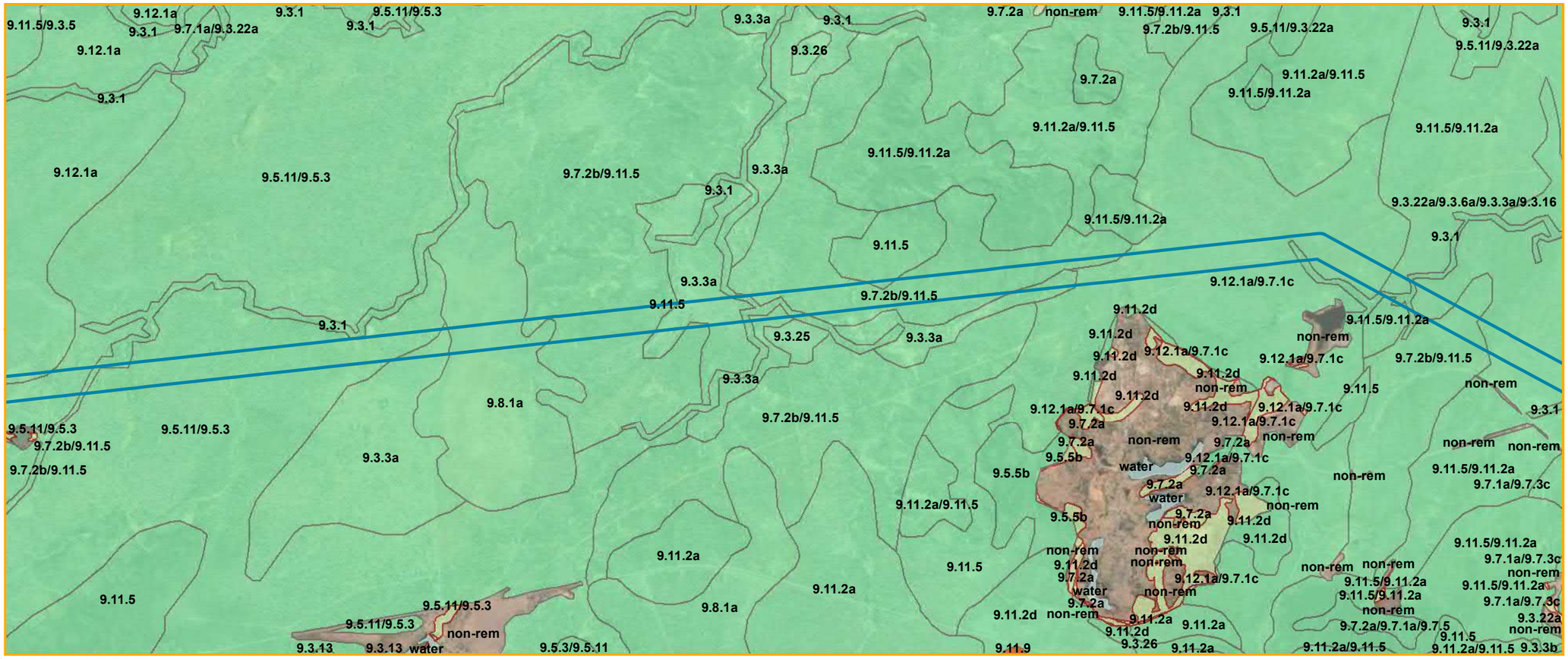

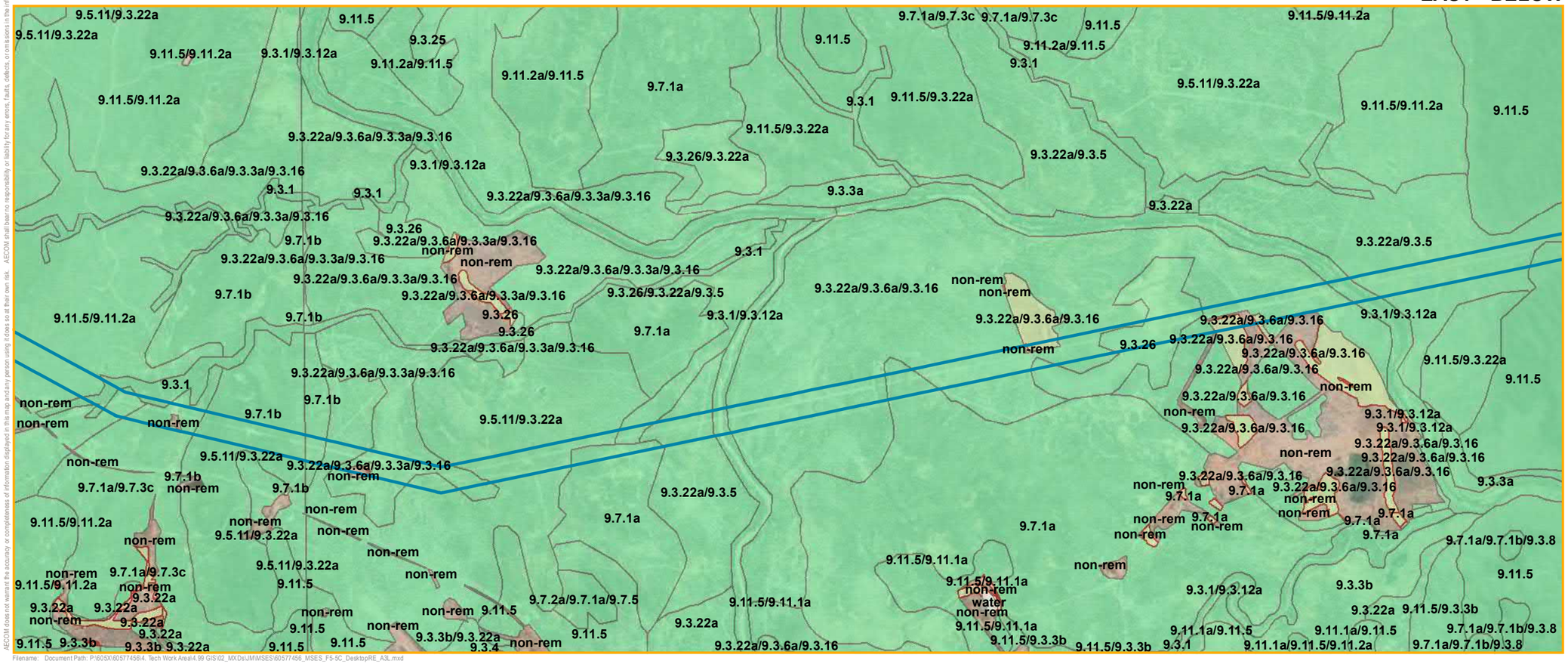

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Coordinate System: GDA 1994 MGA Zone 55
Projection: Transverse Mercator

0 650 1,300 1,950 2,600

Meters

1:55,000 (when printed at A3)

Legend

- Study Area

Queensland DoR RE

- Category A or B area containing endangered
- Category A or B area containing endangered and is S20AH
- Category A or B area containing of concern
- Category A or B area containing of concern and is S20AH
- Category A or B area that is least concern
- Category A or B area that is least concern and is S20AH
- Category C or R area containing endangered
- Category C or R area containing of concern
- Category C or R area that is of least concern
- Water
- Non-remnant
- Area not

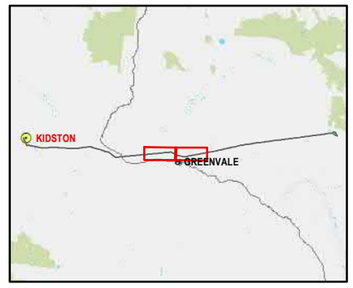

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Figure F5.3

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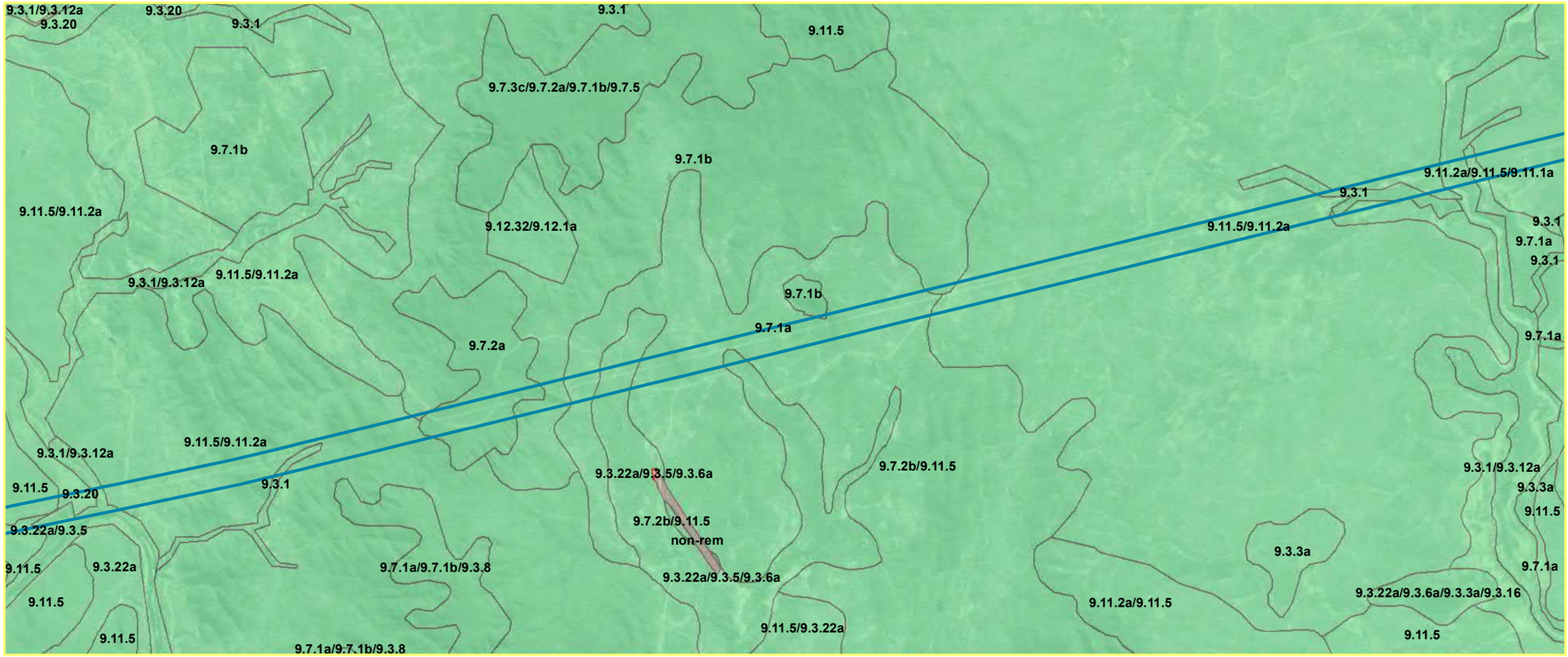

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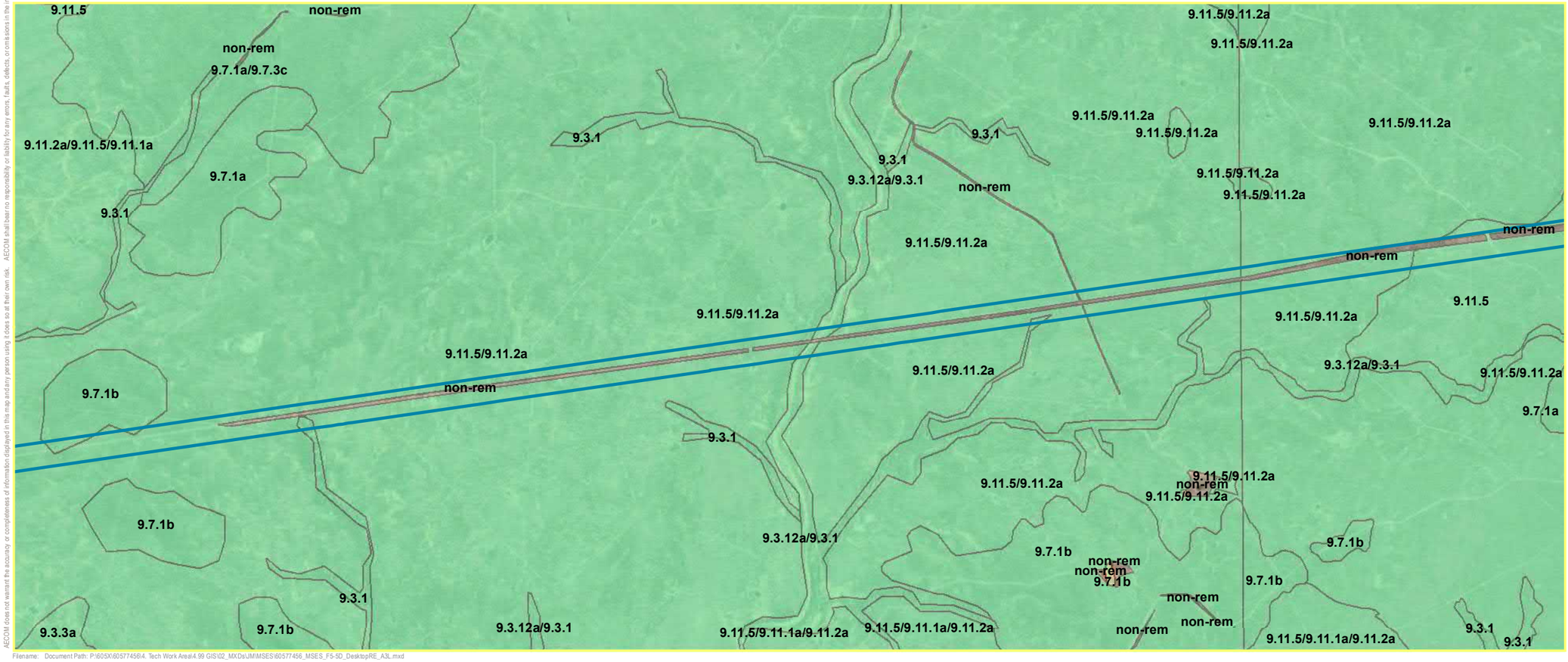

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Coordinate System: GDA 1994 MGA Zone 55
Projection: Transverse Mercator

0 650 1,300 1,950 2,600

Meters

1:55,000 (when printed at A3)

Legend

- Study Area

Queensland DoR RE Mapping

- Category A or B area containing endangered
- Category A or B area containing endangered and is S20AH
- Category A or B area containing of concern
- Category A or B area containing of concern and is S20AH
- Category A or B area that is least concern
- Category A or B area that is least concern and is S20AH
- Category C or R area containing endangered
- Category C or R area containing of concern
- Category C or R area that is of least concern
- Water
- Non-remnant
- Area not categorised

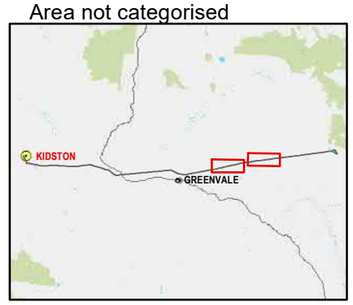

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Figure F5.4

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Coordinate System: GDA 1994 MGA Zone 55
Projection: Transverse Mercator

0 650 1,300 1,950 2,600

Meters

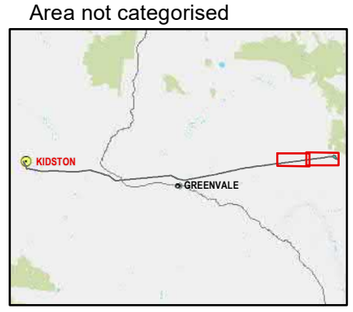
1:55,000 (when printed at A3)

Legend

- Study Area

Queensland DoR RE Mapping

- Category A or B area containing endangered
- Category A or B area containing endangered and is S20AH
- Category A or B area containing of concern
- Category A or B area containing of concern and is S20AH
- Category A or B area that is least concern
- Category A or B area that is least concern and is S20AH
- Category C or R area containing endangered
- Category C or R area containing of concern
- Category C or R area that is of least concern
- Water
- Non-remnant
- Area not categorised



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Projection: Transverse Mercator

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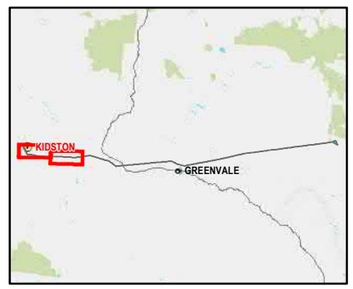
Legend

- Study Area
- Essential Habitat
- Flora Survey Trigger Map for Clearing Protected Plants



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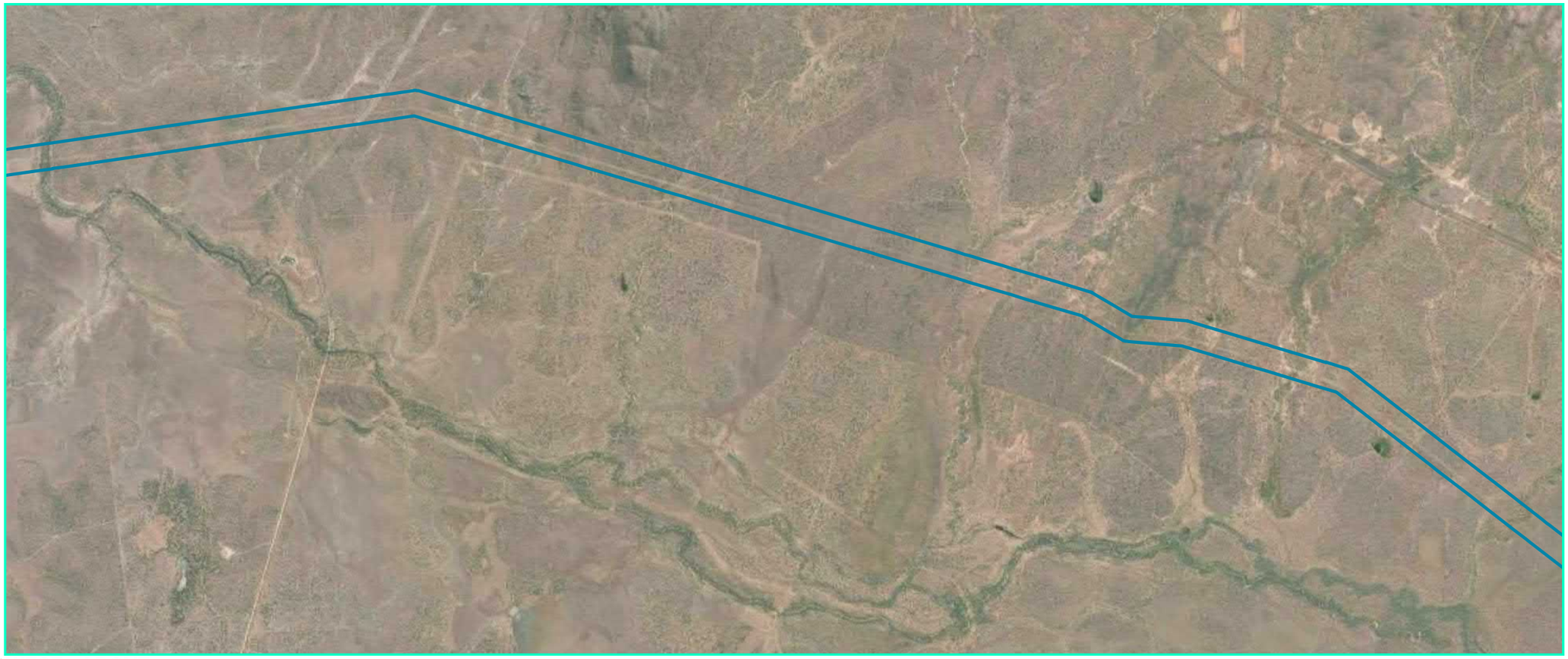
ESSENTIAL HABITAT AND PROTECTED PLANTS

PROJECT ID: 60577456
CREATED BY: JR
LAST MODIFIED: JB - 12/10/2021
VERSION: 1

Figure F6.1

A3 size



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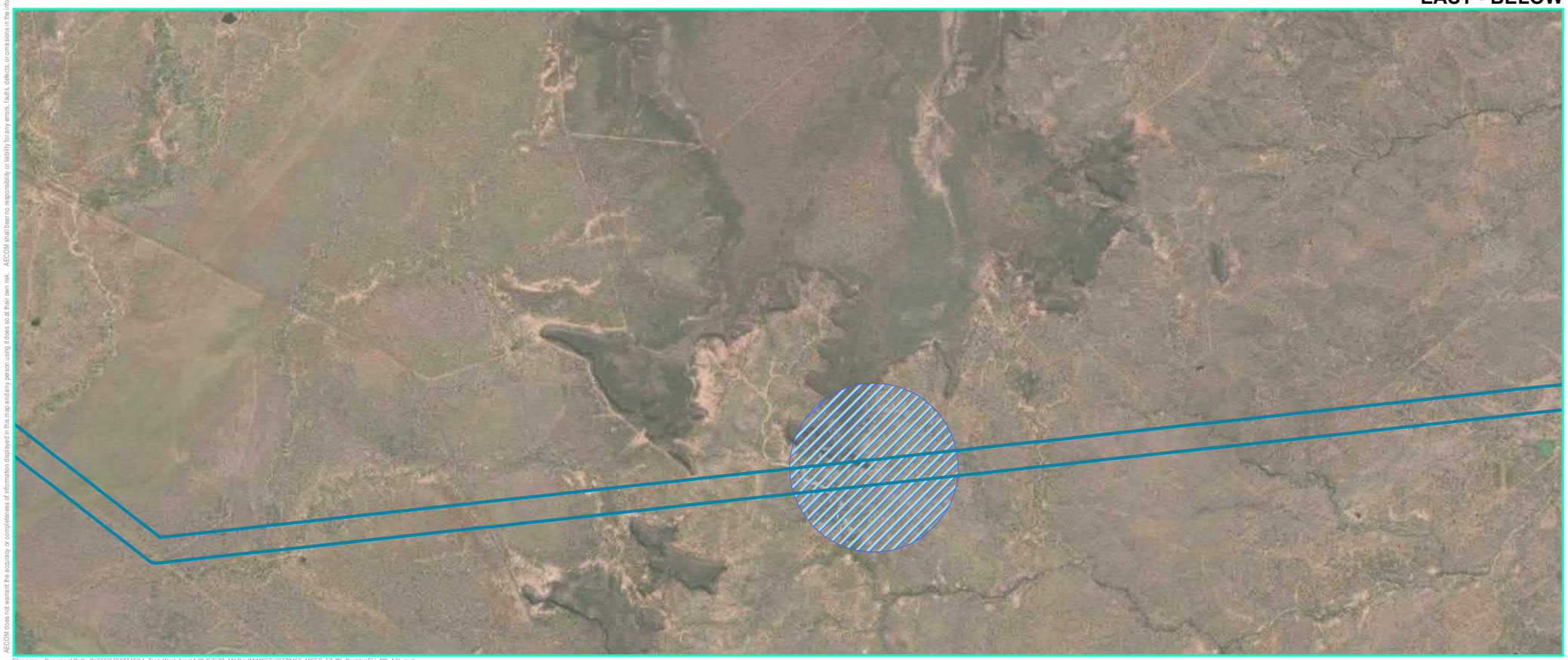

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Coordinate System: GDA 1994 MGA Zone 55
Projection: Transverse Mercator

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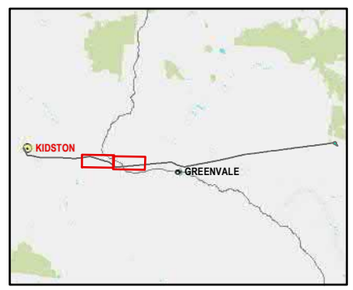
Meters

1:55,000 (when printed at A3)

Legend

- Study Area
- Essential Habitat
- Flora Survey Trigger Map for Clearing Protected Plants



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ESSENTIAL HABITAT AND PROTECTED PLANTS

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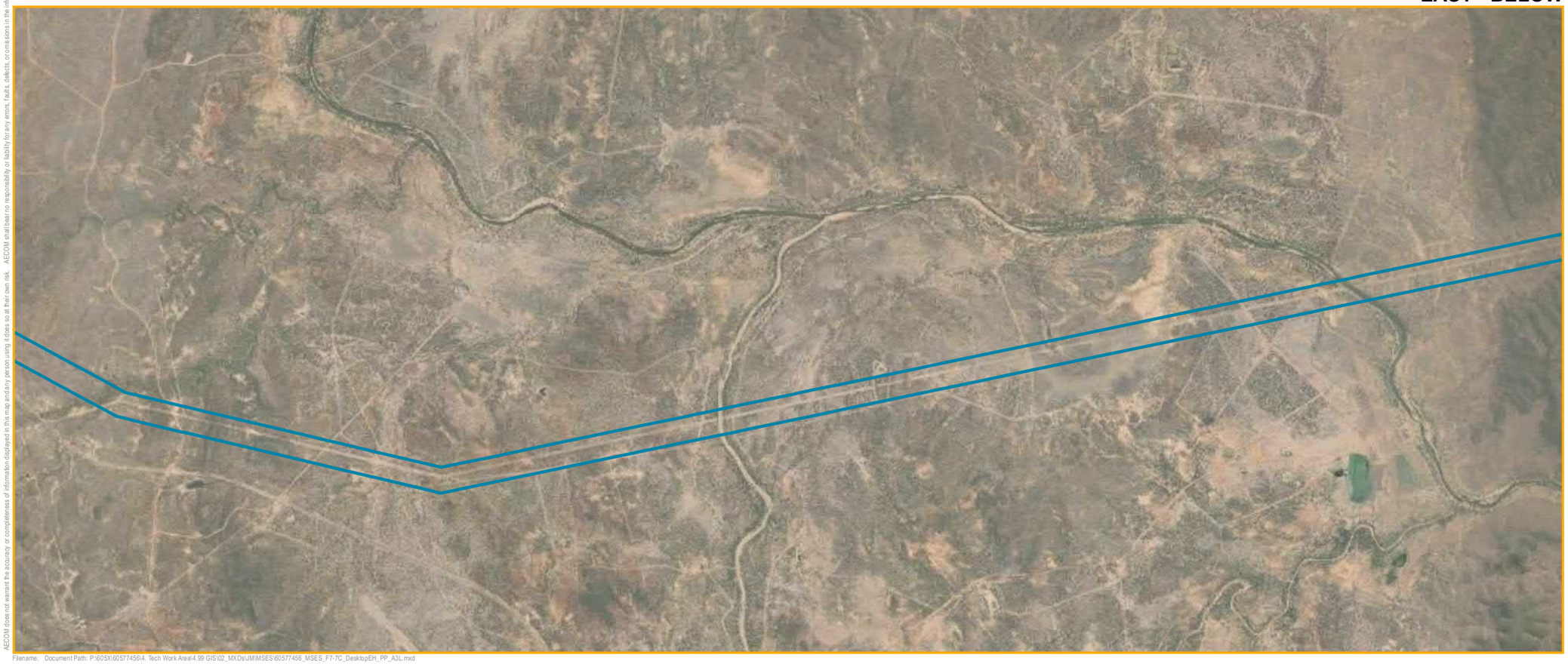
VERSION: 1

Figure F6.2

A3 size

WEST - ABOVE

EAST - BELOW



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Projection: Transverse Mercator

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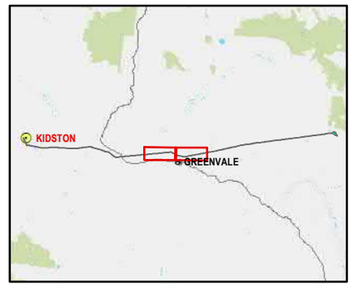
Meters

1:55,000 (when printed at A3)

Legend

- Study Area
- Essential Habitat
- Flora Survey Trigger Map for Clearing Protected Plants



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ESSENTIAL HABITAT AND PROTECTED PLANTS

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LAST MODIFIED:	JB - 12/10/2021
VERSION:	1

Figure
F6.3

A3 size

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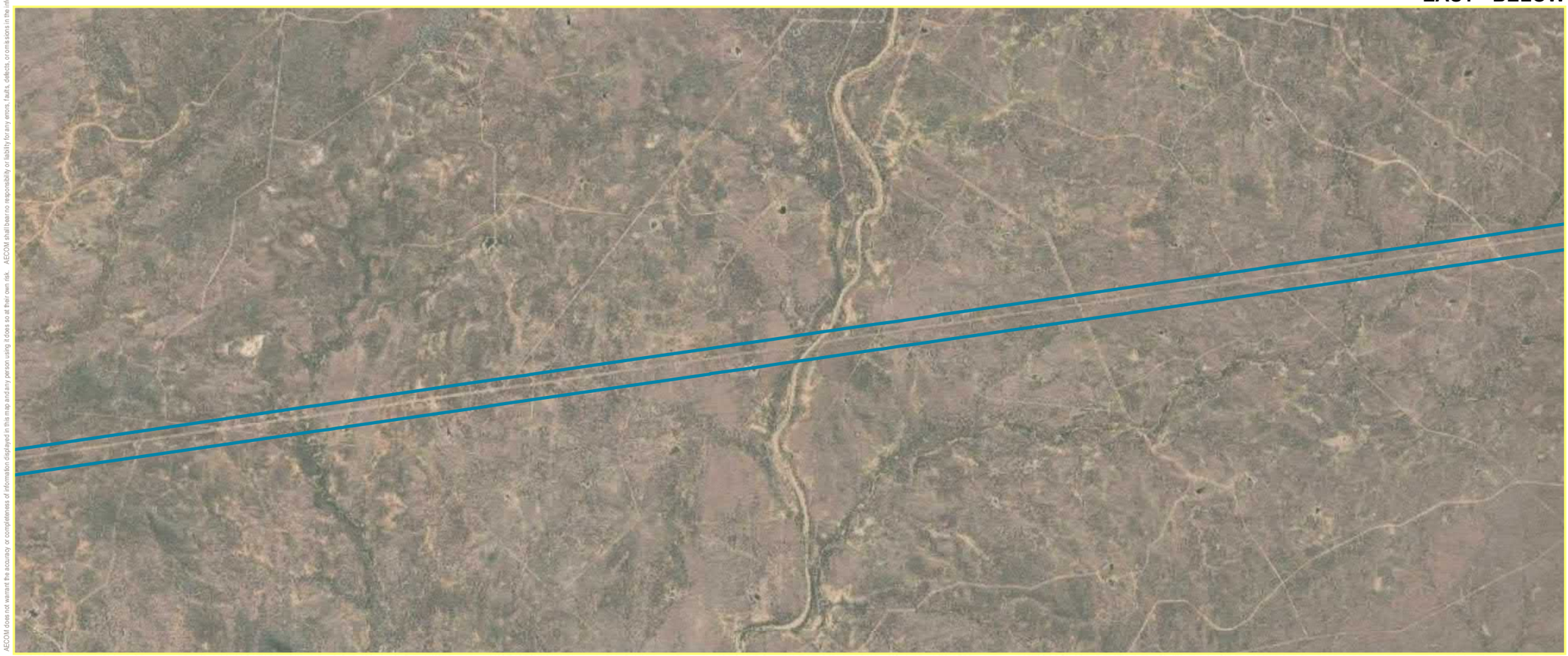

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N

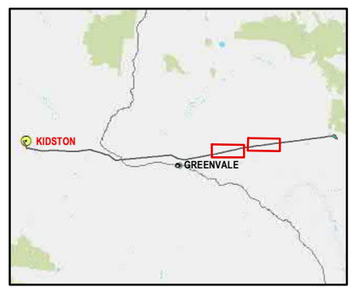
Coordinate System: GDA 1994 MGA Zone 55
Projection: Transverse Mercator

0 650 1,300 1,950 2,600
Meters

1:55,000 (when printed at A3)

Legend

- Study Area
- Essential Habitat
- Flora Survey Trigger Map for Clearing Protected Plants



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ESSENTIAL HABITAT AND PROTECTED PLANTS

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CREATED BY: JR
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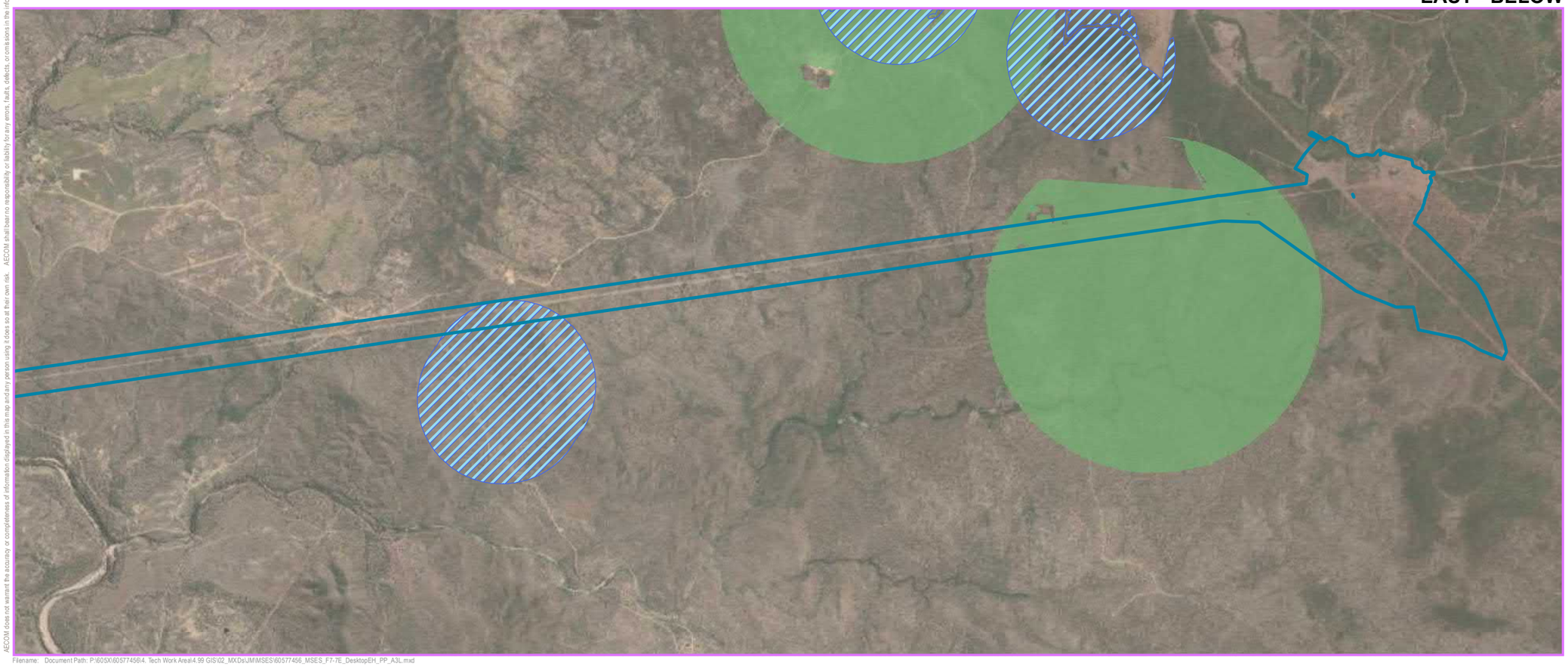
VERSION: 1

Figure F6.4

A3 size

WEST - ABOVE

EAST - BELOW



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Coordinate System: GDA 1994 MGA Zone 55
Projection: Transverse Mercator

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Meters

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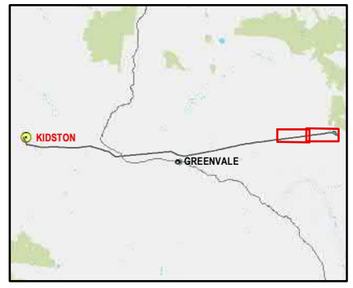
Legend

- Study Area
- Essential Habitat
- Flora Survey Trigger Map for Clearing Protected Plants



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ESSENTIAL HABITAT AND PROTECTED PLANTS

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VERSION: 1

Figure
F6.5

A3 size

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Coordinate System: GDA 1994 MGA Zone 55
Projection: Transverse Mercator

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Meters

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Study Area

Vegetation Communities

- Closed to open forest of C. intermedia and Eucalyptus tereticornis on coastal ranges
- Open woodland dominated by Eucalyptus crebra on basalt plains
- Eucalyptus microneura woodland on rolling metamorphic hills
- Open forests and woodlands of Eucalyptus crebra and Eucalyptus sp. on granitic and metamorphic ranges
- Eucalyptus moluccana woodland on igneous rocks
- Eucalyptus camaldulensis, Casuarina cunninghamiana and Melaleuca sp. riparian open forest on alluvium
- Eucalyptus leptophleba open woodland on alluvium
- Eucalyptus platyphylla or Eucalyptus crebra woodlands on floodplains
- Eucalyptus brownii woodland on alluvium
- Eucalyptus melanophloia or Eucalyptus shirleyi low open woodland on hills and ranges
- Eucalyptus crebra woodland on colluvial plains
- Eucalyptus microneura open forest to woodland on alluvium
- Eucalyptus persistens open forest to woodland on hills and ranges
- Melaleuca spp., Eucalyptus camaldulensis and Casuarina cunninghamiana riparian open forest
- Acacia shirleyi low open forest on laterite
- Tussock grassland dominated by Dichanthium spp. on undulating downs or clay plains
- Non-remnant

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VEGETATION COMMUNITIES

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VERSION: 1

Figure F7.1

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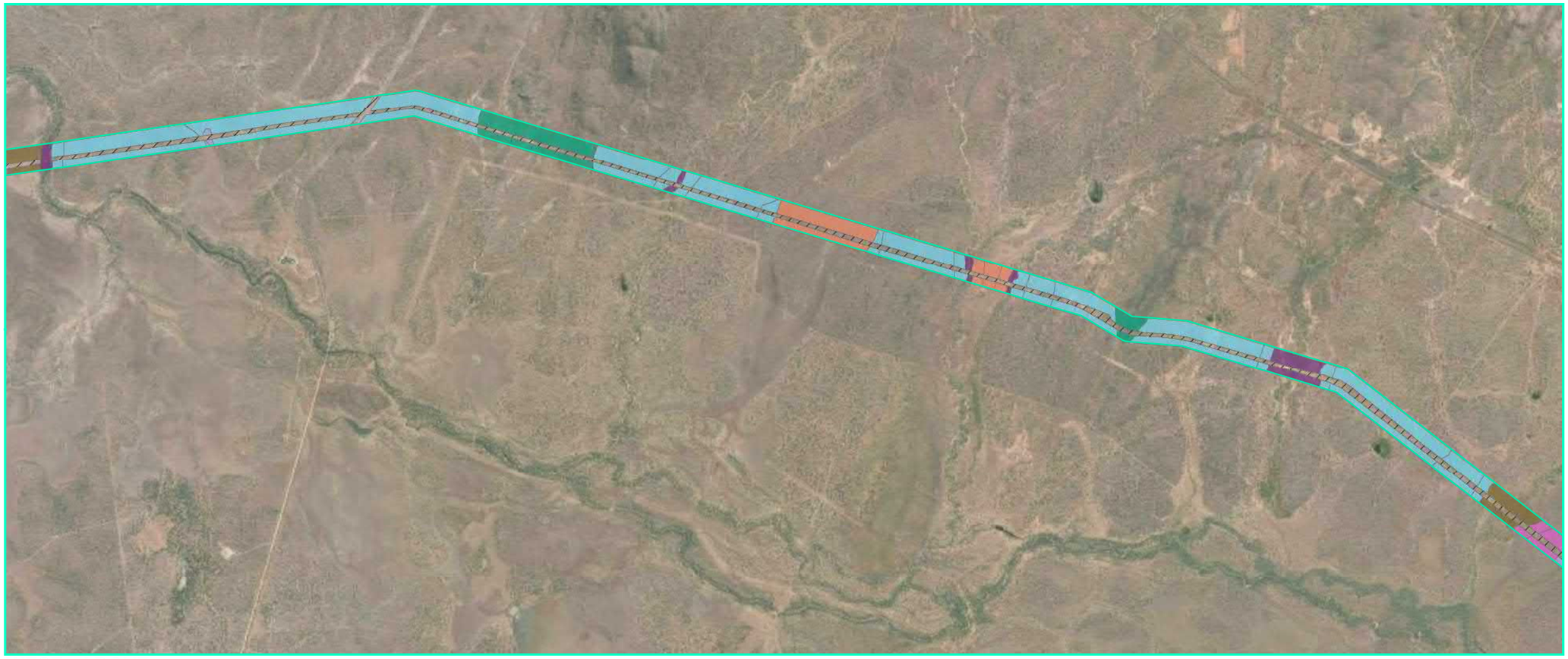

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Coordinate System: GDA 1994 MGA Zone 55
Projection: Transverse Mercator

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Meters

1:55,000 (when printed at A3)

Legend

Study Area

Vegetation Communities

- Closed to open forest of C. intermedia and Eucalyptus tereticornis on coastal ranges
- Open woodland dominated by Eucalyptus crebra on basalt plains
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VEGETATION COMMUNITIES

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Figure F7.2

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EAST - BELOW

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Projection: Transverse Mercator

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Meters

1:55,000 (when printed at A3)

Legend

Study Area

Vegetation Communities

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VEGETATION COMMUNITIES

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VERSION: 1

Figure

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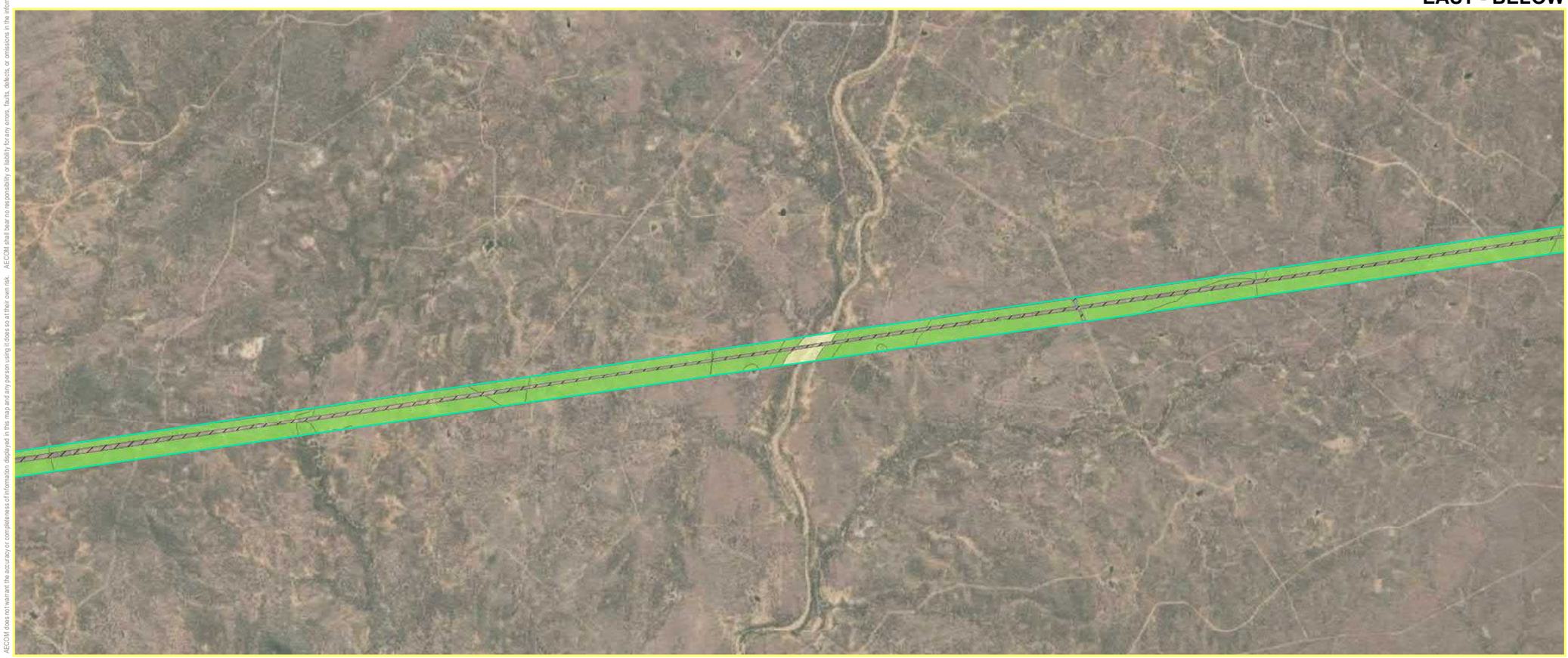

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Coordinate System: GDA 1994 MGA Zone 55
Projection: Transverse Mercator

0 650 1,300 1,950 2,600
Meters

1:55,000 (when printed at A3)

Legend

Study Area

Vegetation Communities

- Closed to open forest of C. intermedia and Eucalyptus tereticornis on coastal ranges
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- Tussock grassland dominated by Dichanthium spp. on undulating downs or clay plains
- Non-remnant

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Meters

1:55,000 (when printed at A3)

Legend

Study Area

Vegetation Communities

- Closed to open forest of C. intermedia and Eucalyptus tereticornis on coastal ranges
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VEGETATION COMMUNITIES

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Coordinate System: GDA 1994 MGA Zone 55
Projection: Transverse Mercator

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Meters

1:55,000 (when printed at A3)

Legend

Study Area

Fauna Habitat Types

- Open Eucalyptus woodland on alluvium or sand plains
- Open Eucalyptus, Casuarina and Melaleuca riparian woodland
- Native grassland
- Low open forest of Acacia shirleyi and Eucalyptus persistens on laterite
- Open woodland of Eucalyptus and Corymbia on basalt
- Woodland of Eucalyptus and Corymbia on metamorphic hills
- Eucalyptus and Corymbia woodland on igneous hills and/or granite
- Cleared areas and farm dams
- Greater glider record (AECOM)
- Sharman's rock-wallaby record (AECOM)
- Short-beaked echidna record (AECOM)
- Squatter pigeon (southern) record (AECOM)

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Projection: Transverse Mercator

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Study Area

Fauna Habitat Types

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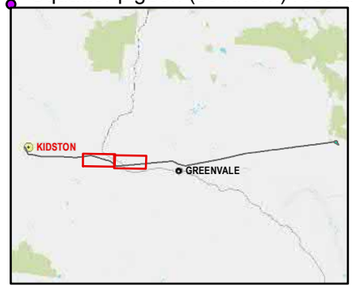

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Coordinate System: GDA 1994 MGA Zone 55
Projection: Transverse Mercator

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Meters

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Study Area

Fauna Habitat Types

- Open Eucalyptus woodland on alluvium or sand plains
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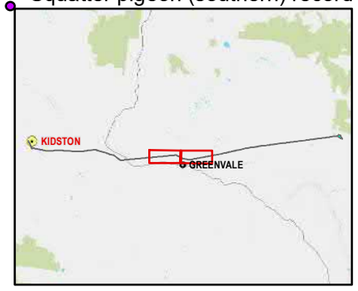

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Figure
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Coordinate System: GDA 1994 MGA Zone 55
Projection: Transverse Mercator

0 650 1,300 1,950 2,600

Meters

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Study Area

Fauna Habitat Types

- Open Eucalyptus woodland on alluvium or sand plains
- Open Eucalyptus, Casuarina and Melaleuca riparian woodland
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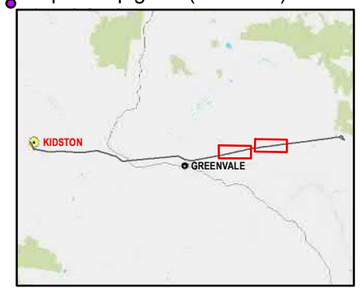

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Figure F8.4

A3 size

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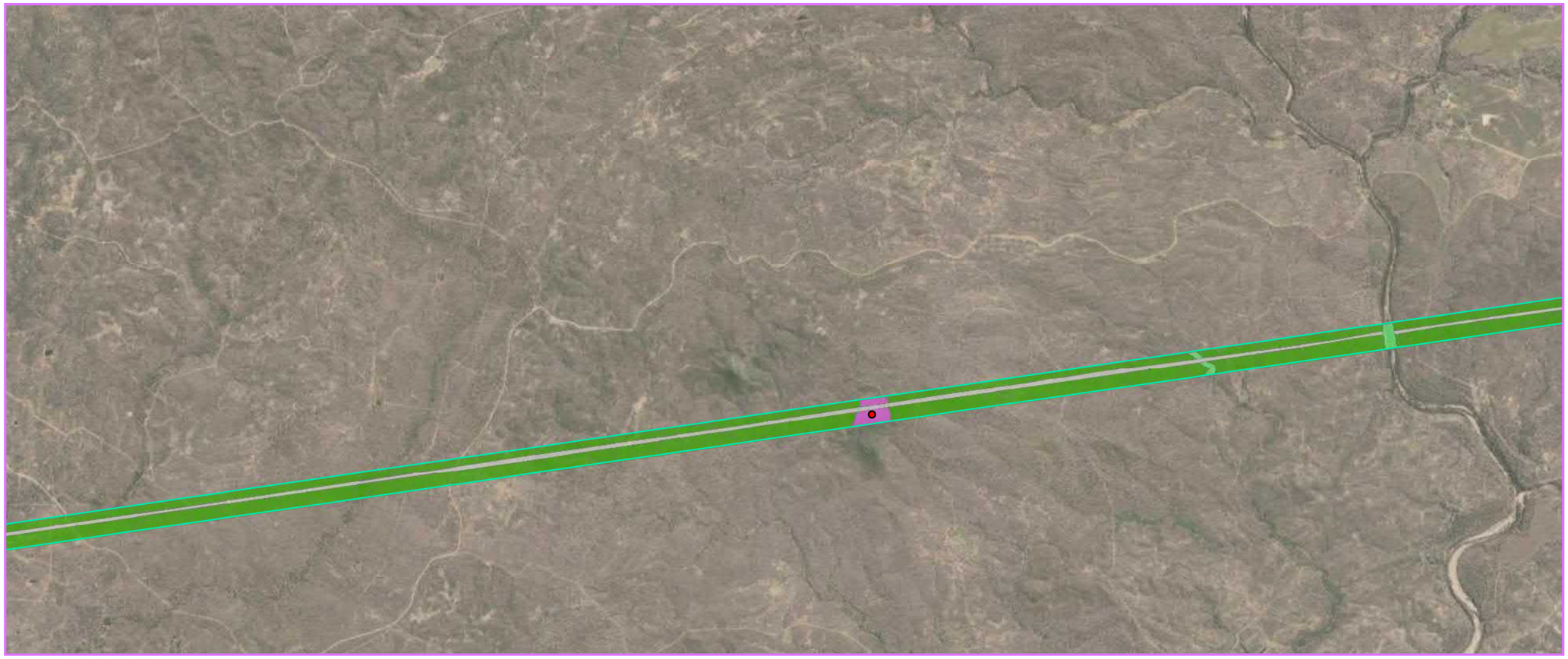

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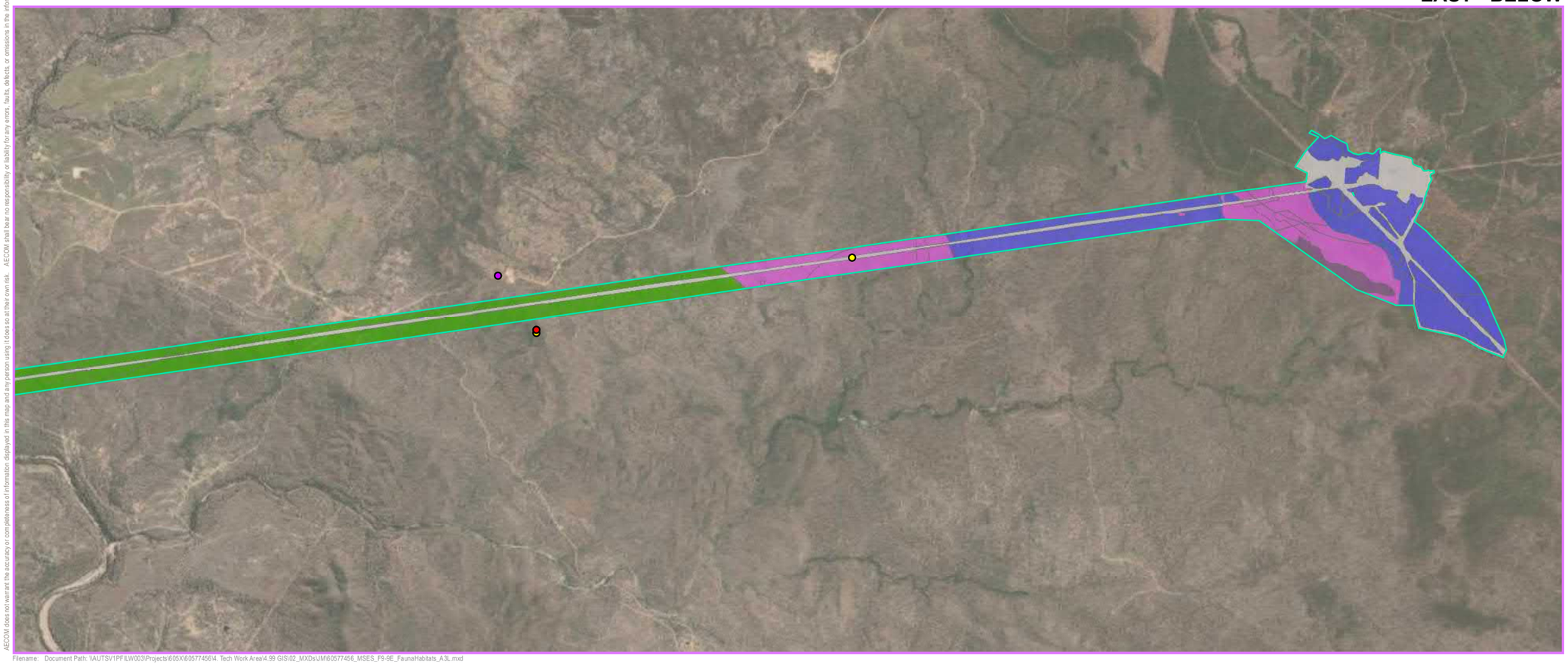

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Coordinate System: GDA 1994 MGA Zone 55
Projection: Transverse Mercator

0 650 1,300 1,950 2,600

Meters

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Legend

- Study Area

Fauna Habitat Types

- Open Eucalyptus woodland on alluvium or sand plains
- Open Eucalyptus, Casuarina and Melaleuca riparian woodland
- Native grassland
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FAUNA HABITAT TYPES

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VERSION:	1

Figure
F8.5

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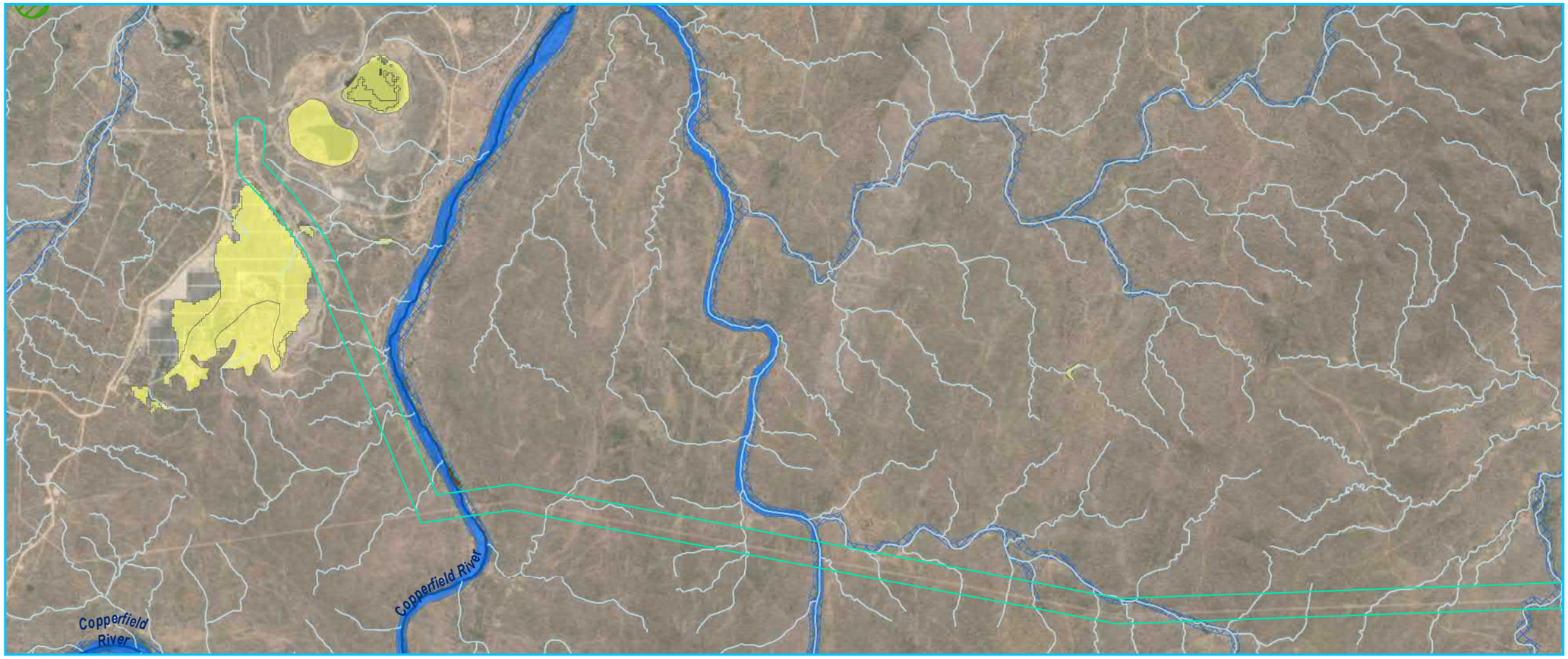

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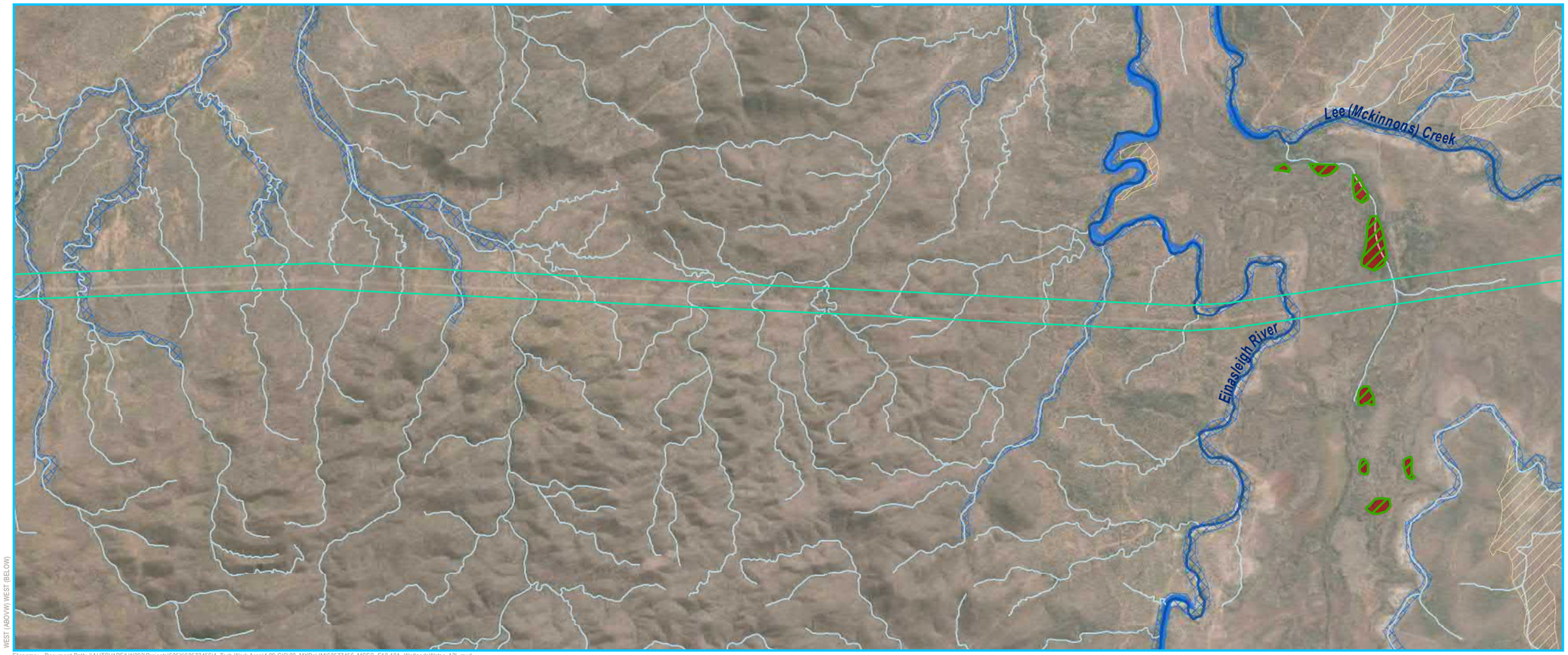

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Projection: Transverse Mercator

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Meters

1:55,000 (when printed at A3)

Legend

- Study Area
- VM Act Wetlands

VM Act Watercourses

- Major
- Minor

Queensland Wetland Areas Mapping

- Riverine wetland (Waterbody data)
- Lacustrine wetland (Waterbody data)
- Palustrine wetland (Waterbody data)
- Riverine wetland (RE based)
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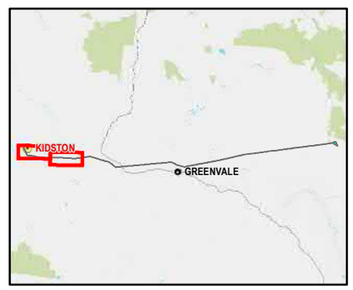

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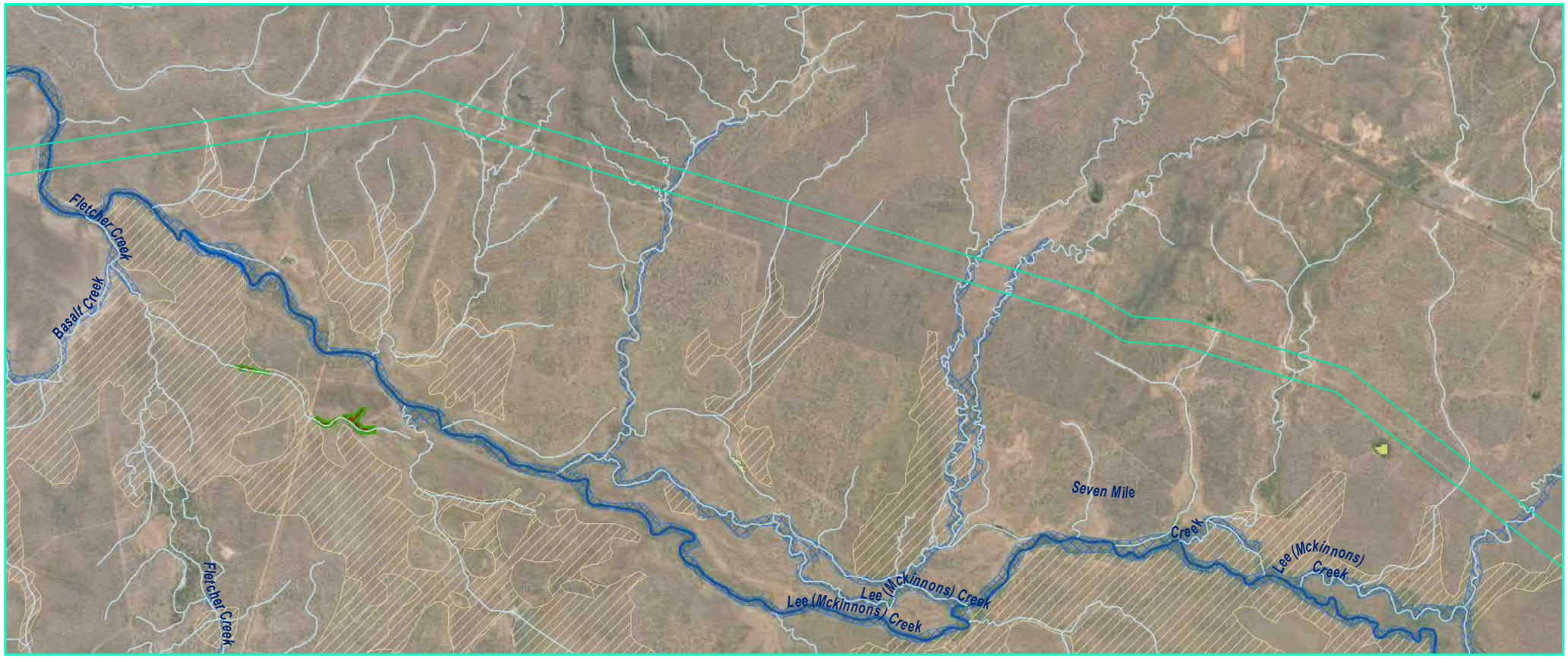

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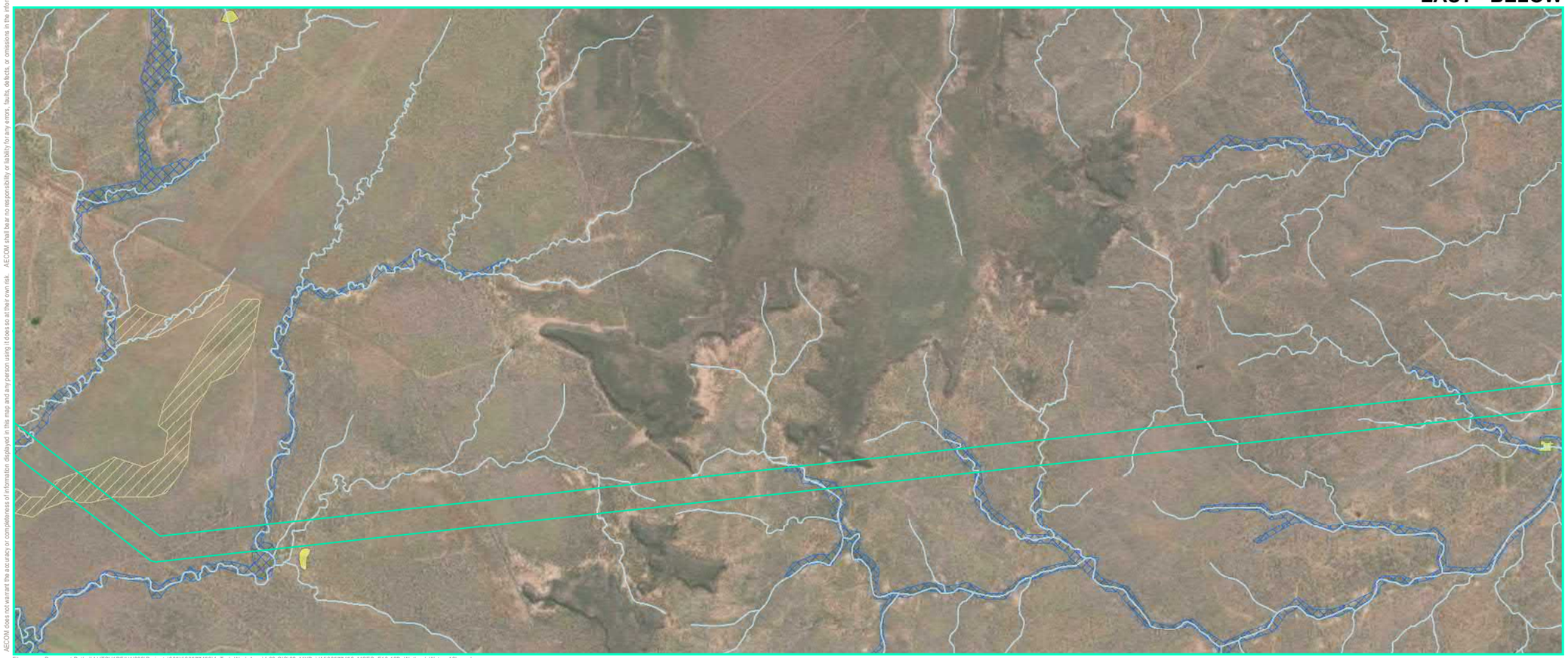

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Meters

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Legend

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- VM Act Wetlands

VM Act Watercourses

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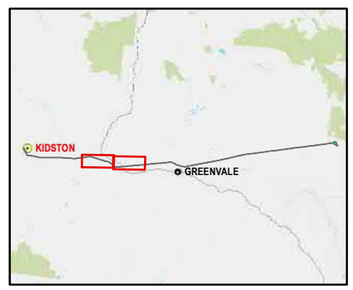

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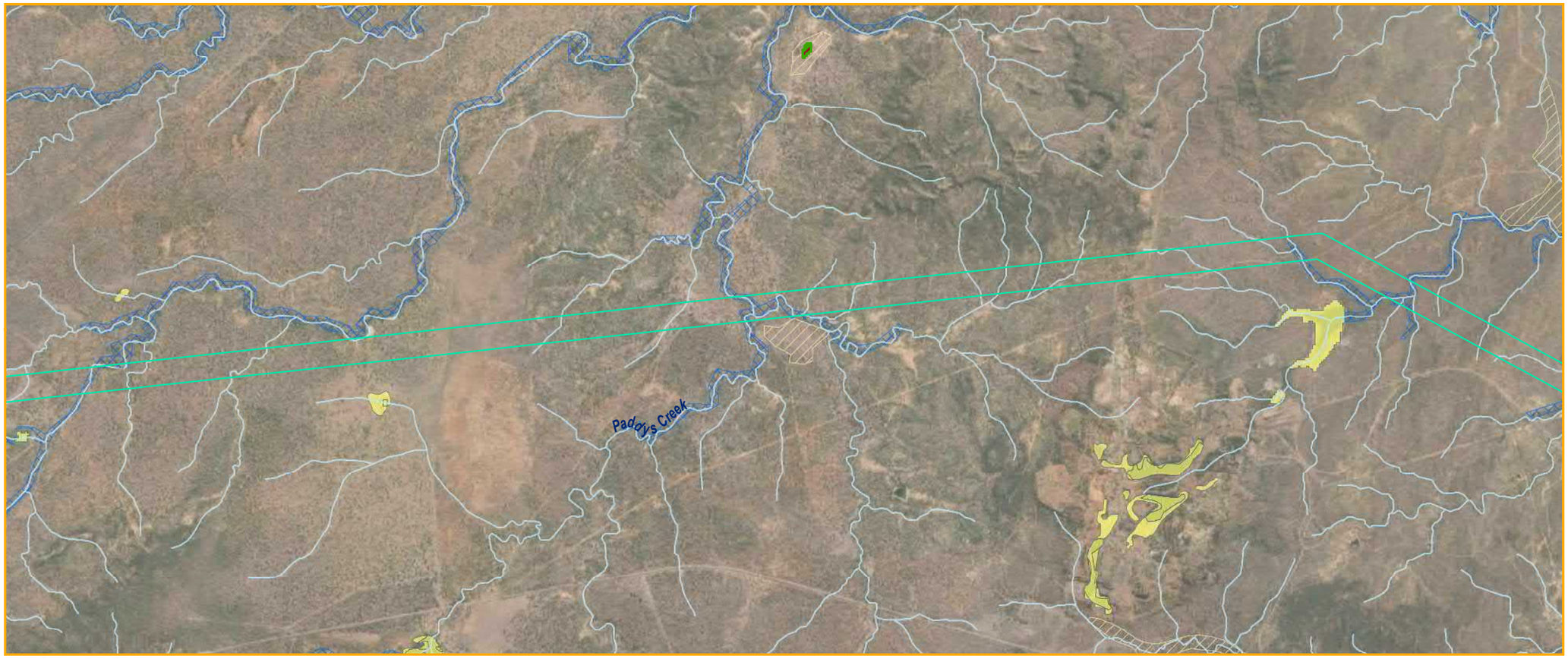

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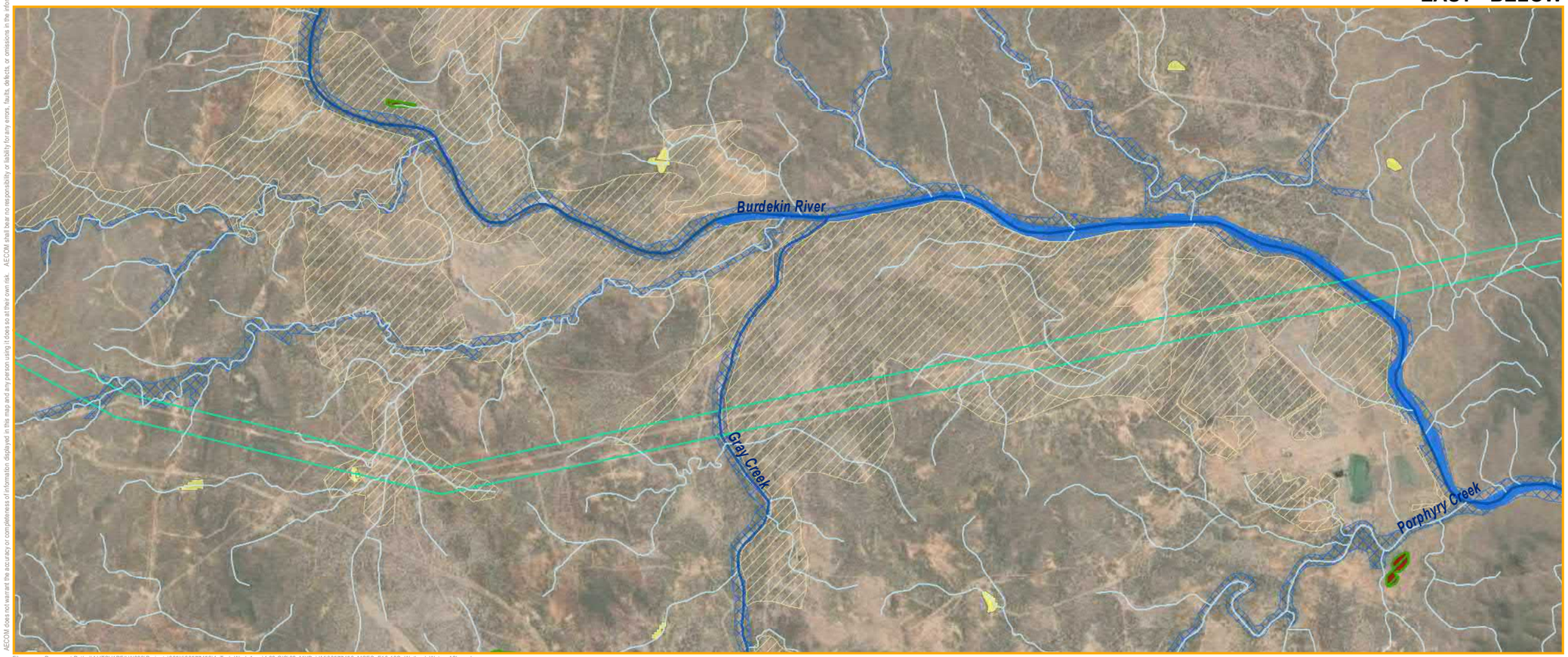

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Legend

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- VM Act Wetlands

VM Act Watercourses

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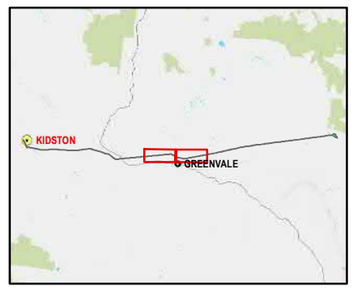

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Figure
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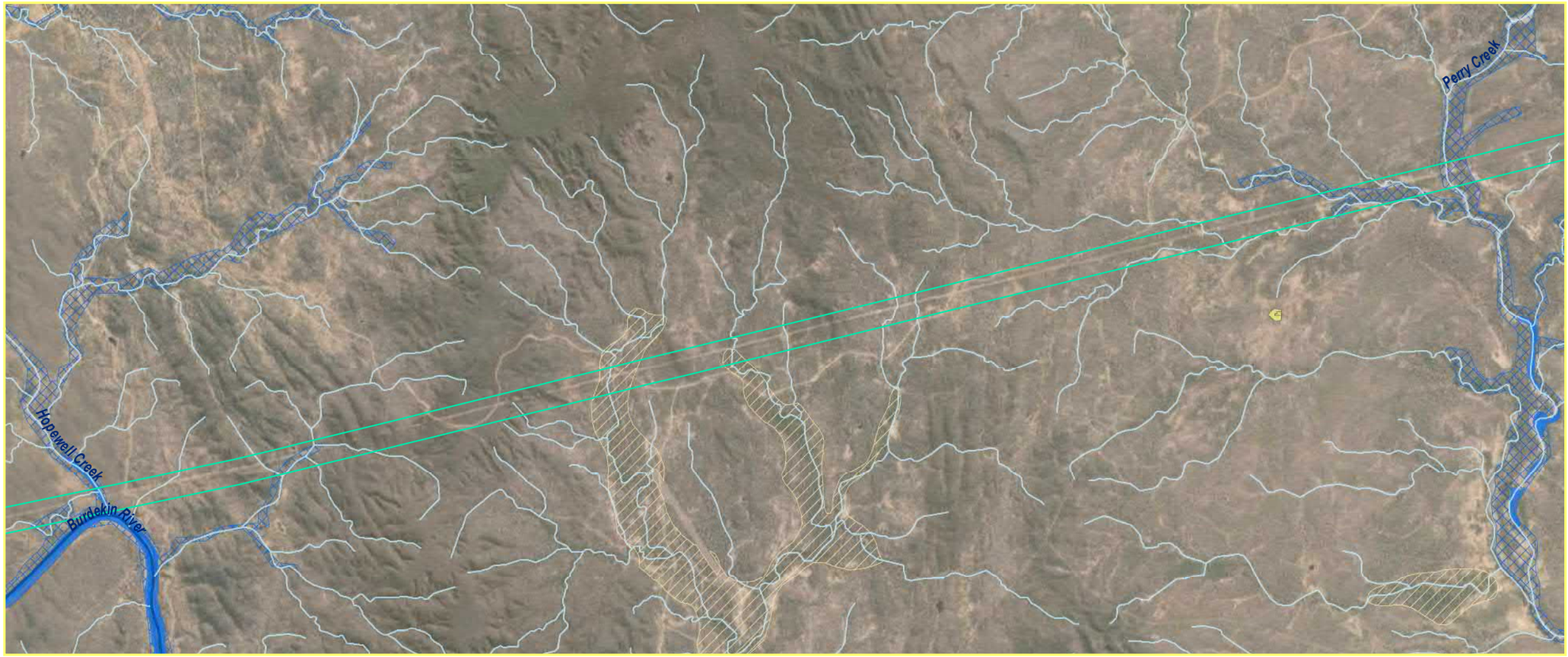

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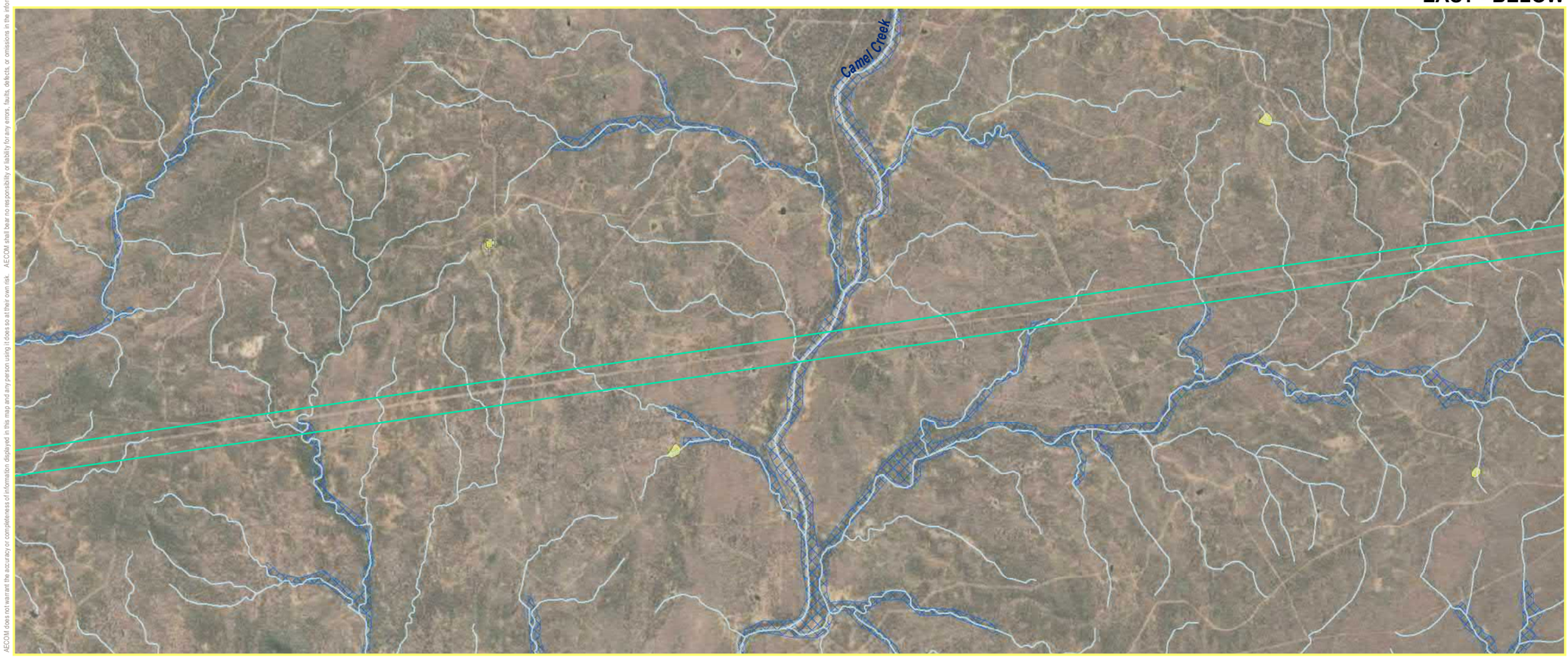

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Legend

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- VM Act Wetlands

VM Act Watercourses

- Major
- Minor

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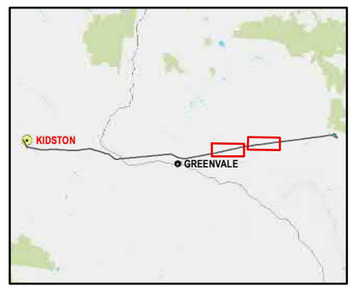

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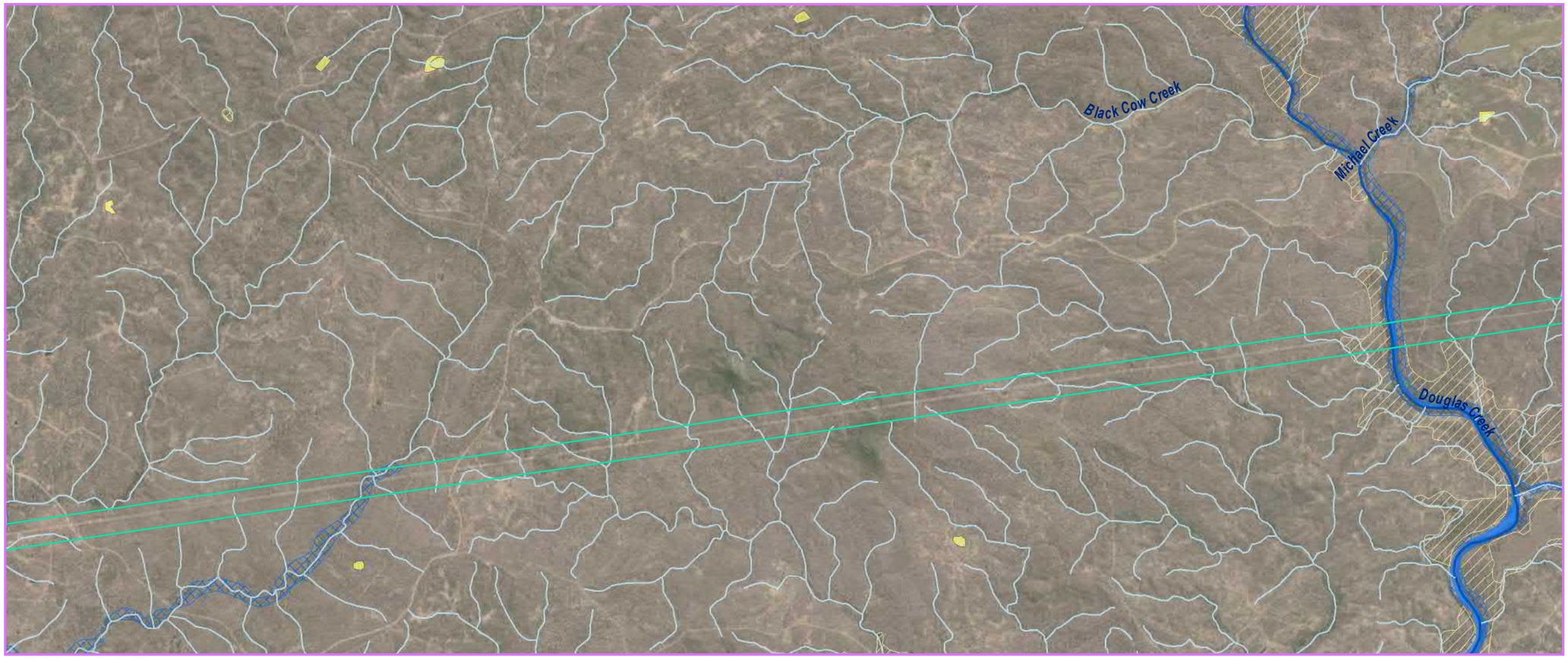

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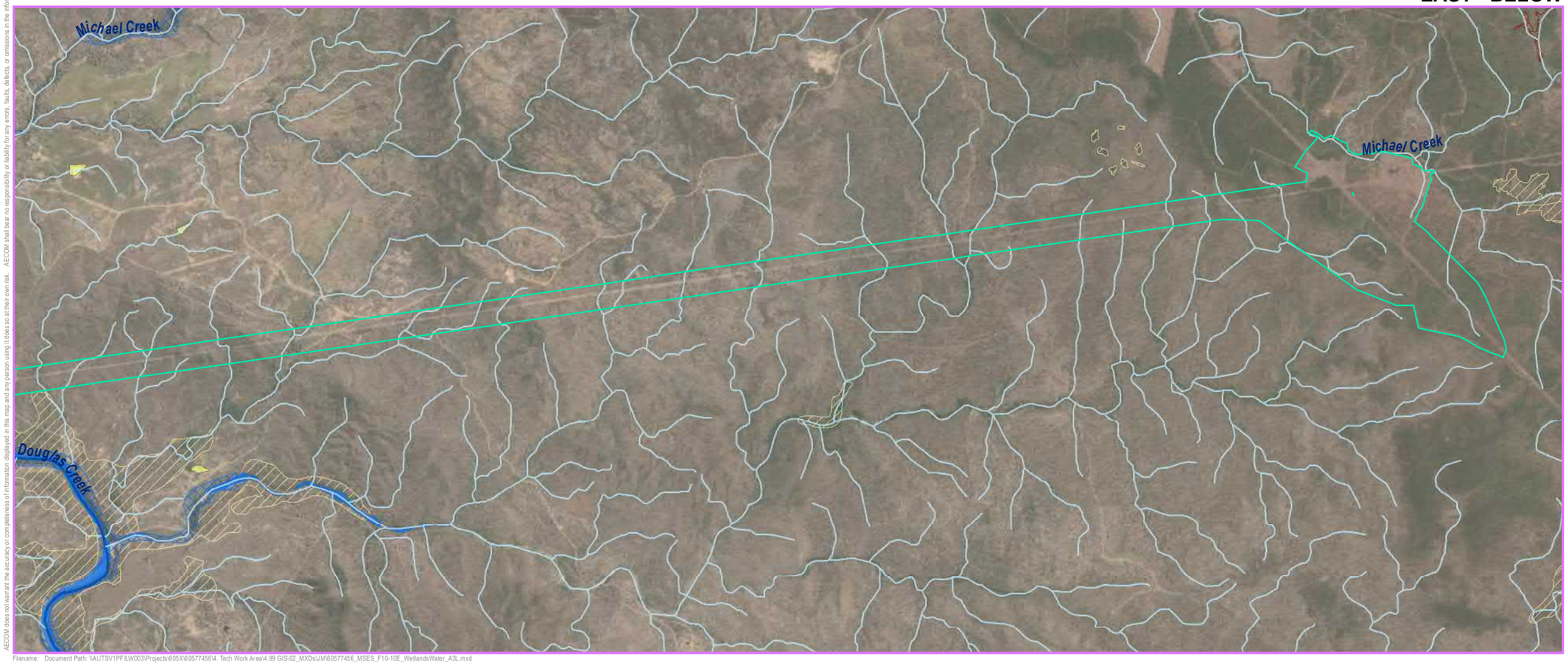

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Meters

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Legend

- Study Area

VM Act Watercourses

- Major
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Queensland Wetland Areas Mapping

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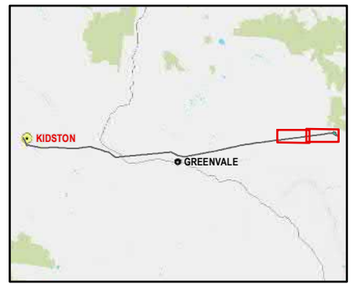

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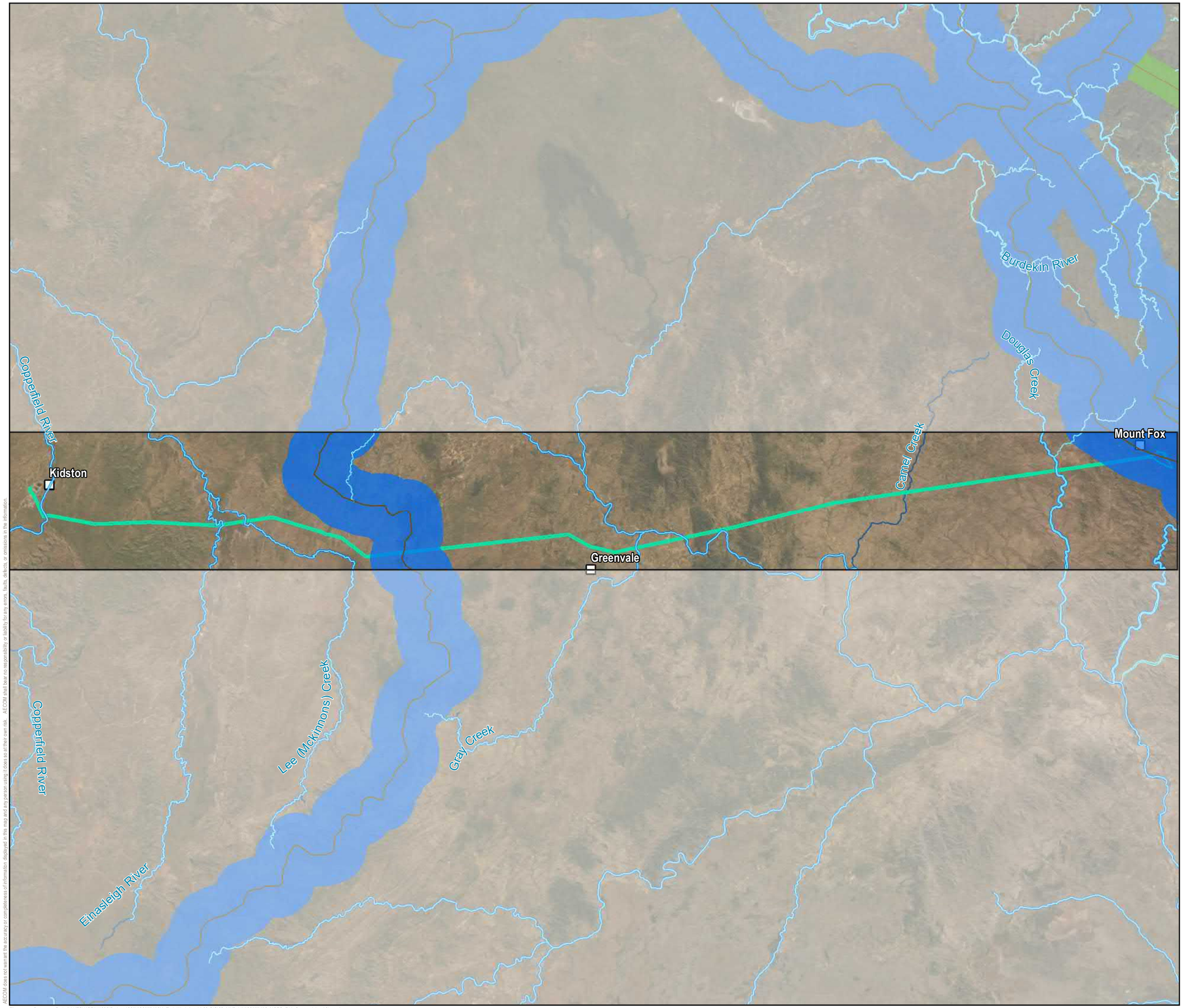

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Projection: Transverse Mercator

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Meters

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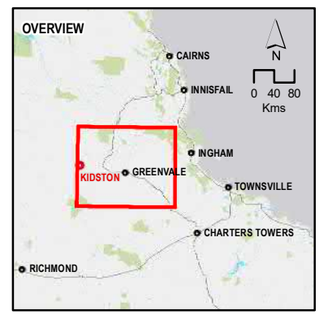
Legend

- Study Area
- Places
- Major Watercourses
- Regional Context Area

Statewide Ecological Corridors

- Regional significance
- State significance
- Statewide Corridors - Terrestrial centrelines
- Statewide Corridors - Riparian centrelines



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STATE ECOLOGICAL CORRIDORS

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CREATED BY:	JR
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VERSION:	2

Figure F10

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Appendix B

PMST and WildNet Reports

Australian Government

Department of Agriculture, Water and the Environment

EPBC Act Protected Matters Report

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

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

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

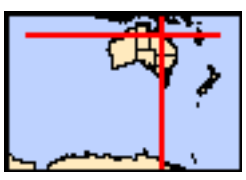
Report created: 09/06/21 14:24:37

Summary
Details
- Matters of NES
- Other Matters Protected by the EPBC Act
- Extra Information

Caveat
Acknowledgements

Coordinates

Buffer: 20.0Km



Summary

Matters of National Environmental Significance

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

World Heritage Properties:	1
National Heritage Places:	2
Wetlands of International Importance:	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	1
Listed Threatened Species:	46
Listed Migratory Species:	20

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:	25
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:	6
Regional Forest Agreements:	None
Invasive Species:	30
Nationally Important Wetlands:	1
Key Ecological Features (Marine)	None

Details

Matters of National Environmental Significance

World Heritage Properties		[Resource Information]
Name	State	Status
Wet Tropics of Queensland	QLD	Declared property

National Heritage Properties		[Resource Information]
Name	State	Status
Natural		
Wet Tropics of Queensland	QLD	Listed place
Indigenous		
Wet Tropics World Heritage Area (Indigenous Values)	QLD	Within listed place

Listed Threatened Ecological Communities		[Resource Information]

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

Name	Status	Type of Presence
Broad leaf tea-tree (Melaleuca viridiflora) woodlands in high rainfall coastal north Queensland	Endangered	Community likely to occur within area

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
Casuarius casuarius johnsonii		
Southern Cassowary, Australian Cassowary, Double-wattled Cassowary [25986]	Endangered	Species or species habitat known to occur within area
Erythrotriorchis radiatus		
Red Goshawk [942]	Vulnerable	Species or species habitat likely to occur within area
Erythrura gouldiae		
Gouldian Finch [413]	Endangered	Species or species habitat likely to occur within area
Falco hypoleucos		
Grey Falcon [929]	Vulnerable	Species or species habitat likely to occur within area
Hirundapus caudacutus		
White-throated Needletail [682]	Vulnerable	Species or species habitat likely to occur within area
Neochmia ruficauda ruficauda		
Star Finch (eastern), Star Finch (southern) [26027]	Endangered	Species or species habitat likely to occur within area
Numenius madagascariensis		
Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Poephila cincta cincta		
Southern Black-throated Finch [64447]	Endangered	Species or species

Name	Status	Type of Presence
		habitat likely to occur within area
Rostratula australis Australian Painted Snipe [77037]	Endangered	Species or species habitat likely to occur within area
Turnix olivii Buff-breasted Button-quail [59293]	Endangered	Species or species habitat likely to occur within area
Tyto novaehollandiae kimberli Masked Owl (northern) [26048]	Vulnerable	Species or species habitat likely to occur within area
Fish		
Stiphodon semoni Opal Cling Goby [83909]	Critically Endangered	Species or species habitat may occur within area
Frogs		
Litoria dayi Australian Lace-lid, Lace-eyed Tree Frog, Day's Big-eyed Treefrog [86707]	Vulnerable	Species or species habitat likely to occur within area
Pseudophryne covacevichae Magnificent Brood Frog [64385]	Vulnerable	Species or species habitat may occur within area
Mammals		
Bettongia tropica Northern Bettong [214]	Endangered	Species or species habitat may occur within area
Dasyurus hallucatus Northern Quoll, Digul [Gogo-Yimidir], Wijingadda [Dambimangari], Wiminji [Martu] [331]	Endangered	Species or species habitat likely to occur within area
Dasyurus maculatus gracilis Spotted-tailed Quoll (North Queensland), Yarri [64475]	Endangered	Species or species habitat likely to occur within area
Hipposideros semoni Semon's Leaf-nosed Bat, Greater Wart-nosed Horseshoe-bat [180]	Vulnerable	Species or species habitat may occur within area
Macroderma gigas Ghost Bat [174]	Vulnerable	Breeding likely to occur within area
Mesembriomys gouldii rattoides Black-footed Tree-rat (north Queensland), Shaggy Rabbit-rat [87620]	Vulnerable	Species or species habitat likely to occur within area
Petauroides volans Greater Glider [254]	Vulnerable	Species or species habitat likely to occur within area
Petaurus gracilis Mahogany Glider [26775]	Endangered	Species or species habitat known to occur within area
Petrogale sharmani Mount Claro Rock Wallaby, Sharman's Rock Wallaby [59281]	Vulnerable	Species or species habitat known to 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 known to occur within area
Pteropus conspicillatus Spectacled Flying-fox [185]	Endangered	Species or species habitat may occur within area

Name	Status	Type of Presence
Pteropus poliocephalus Grey-headed Flying-fox [186]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Rhinolophus robertsi Large-eared Horseshoe Bat, Greater Large-eared Horseshoe Bat [87639]	Vulnerable	Species or species habitat likely to occur within area
Saccolaimus saccolaimus nudicluniatus Bare-rumped Sheath-tailed Bat, Bare-rumped Sheathtail Bat [66889]	Vulnerable	Species or species habitat likely to occur within area
Plants		
Acacia crombiei Pink Gidgee [10927]	Vulnerable	Species or species habitat may occur within area
Bulbophyllum globuliforme Miniature Moss-orchid, Hoop Pine Orchid [6649]	Vulnerable	Species or species habitat likely to occur within area
Corymbia leptoloma Yellowjacket [64101]	Vulnerable	Species or species habitat known to occur within area
Cycas cairnsiana a cycad [5780]	Vulnerable	Species or species habitat likely to occur within area
Cycas platyphylla a cycad [55796]	Vulnerable	Species or species habitat likely to occur within area
Dichanthium setosum bluegrass [14159]	Vulnerable	Species or species habitat known to occur within area
Lindsaea pulchella var. blanda [20842]	Vulnerable	Species or species habitat likely to occur within area
Marsdenia brevifolia [64585]	Vulnerable	Species or species habitat likely to occur within area
Myrmecodia beccarii Ant Plant [11852]	Vulnerable	Species or species habitat likely to occur within area
Phaius australis Lesser Swamp-orchid [5872]	Endangered	Species or species habitat likely to occur within area
Phaius pictus [22564]	Vulnerable	Species or species habitat likely to occur within area
Phalaenopsis amabilis subsp. rosenstromii Native Moth Orchid [87535]	Endangered	Species or species habitat may occur within area
Tephrosia leveillei [16946]	Vulnerable	Species or species habitat known to occur within area
Zeuxine polygonoides Velvet Jewel Orchid [46794]	Vulnerable	Species or species habitat may occur within area
Reptiles		
Delma mitella Atherton Delma, Legless Lizard [25931]	Vulnerable	Species or species habitat likely to occur

Name	Status	Type of Presence within area
[Egernia rugosa](#) Yakka Skink [1420]	Vulnerable	Species or species habitat likely to occur within area
Sharks		
[Pristis pristis](#) Freshwater Sawfish, Largetooth Sawfish, River Sawfish, Leichhardt's Sawfish, Northern Sawfish [60756]	Vulnerable	Species or species habitat likely to occur within area

Listed Migratory Species [Resource Information]

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

Name	Threatened	Type of Presence
Migratory Marine Birds		
[Apus pacificus](#) Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Migratory Marine Species		
[Crocodylus porosus](#) Salt-water Crocodile, Estuarine Crocodile [1774]		Species or species habitat likely to occur within area
[Pristis pristis](#) Freshwater Sawfish, Largetooth Sawfish, River Sawfish, Leichhardt's Sawfish, Northern Sawfish [60756]	Vulnerable	Species or species habitat likely to occur within area
Migratory Terrestrial Species		
[Cuculus optatus](#) Oriental Cuckoo, Horsfield's Cuckoo [86651]		Species or species habitat known to occur within area
[Hirundapus caudacutus](#) White-throated Needletail [682]	Vulnerable	Species or species habitat likely to occur within area
[Hirundo rustica](#) Barn Swallow [662]		Species or species habitat may occur within area
[Monarcha melanopsis](#) Black-faced Monarch [609]		Species or species habitat likely to occur within area
[Monarcha trivirgatus](#) Spectacled Monarch [610]		Species or species habitat known to 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 likely to occur within area
[Myiagra cyanoleuca](#) Satin Flycatcher [612]		Species or species habitat known to occur within area
[Rhipidura rufifrons](#) Rufous Fantail [592]		Species or species habitat known to occur within area
Migratory Wetlands Species		
[Actitis hypoleucos](#) Common Sandpiper [59309]		Species or species habitat may occur within area
[Calidris acuminata](#) Sharp-tailed Sandpiper [874]		Species or species

Name	Threatened	Type of Presence
		habitat likely to 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 likely to occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Pandion haliaetus Osprey [952]		Species or species habitat likely to occur within area
Tringa nebularia Common Greenshank, Greenshank [832]		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 may occur within area
Anseranas semipalmata Magpie Goose [978]		Species or species habitat may occur within area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardea ibis Cattle Egret [59542]		Species or species habitat may occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat likely to 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 likely to occur within area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Species or species habitat likely to occur

Name	Threatened	Type of Presence within area
[Haliaeetus leucogaster](#) White-bellied Sea-Eagle [943]		Species or species habitat likely to occur within area
[Hirundapus caudacutus](#) White-throated Needletail [682]	Vulnerable	Species or species habitat likely to occur within area
[Hirundo rustica](#) Barn Swallow [662]		Species or species habitat may occur within area
[Merops ornatus](#) Rainbow Bee-eater [670]		Species or species habitat may occur within area
[Monarcha melanopsis](#) Black-faced Monarch [609]		Species or species habitat likely to occur within area
[Monarcha trivirgatus](#) Spectacled Monarch [610]		Species or species habitat known to 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 likely to occur within area
[Myiagra cyanoleuca](#) Satin Flycatcher [612]		Species or species habitat known to occur within area
[Numenius madagascariensis](#) Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
[Pandion haliaetus](#) Osprey [952]		Species or species habitat likely to occur within area
[Rhipidura rufifrons](#) Rufous Fantail [592]		Species or species habitat known to occur within area
[Rostratula benghalensis (sensu lato)](#) Painted Snipe [889]	Endangered*	Species or species habitat likely to occur within area
[Tringa nebularia](#) Common Greenshank, Greenshank [832]		Species or species habitat may occur within area
Reptiles		
[Crocodylus johnstoni](#) Freshwater Crocodile, Johnston's Crocodile, Johnstone's Crocodile [1773]		Species or species habitat may occur within area
[Crocodylus porosus](#) Salt-water Crocodile, Estuarine Crocodile [1774]		Species or species habitat likely to occur within area

Extra Information

State and Territory Reserves [Resource Information]

Name	State
Girringun	QLD
Girringun	QLD
Liefway	QLD
Messmate	QLD
Newcastle Range-The Oaks	QLD
Range View	QLD

Invasive Species [Resource Information]

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

Name	Status	Type of Presence
Birds		
Acridotheres tristis Common Myna, Indian Myna [387]		Species or species habitat likely to occur within area
Columba livia Rock Pigeon, Rock Dove, Domestic Pigeon [803]		Species or species habitat likely to occur within area
Lonchura punctulata Nutmeg Mannikin [399]		Species or species habitat likely to occur within area
Passer domesticus House Sparrow [405]		Species or species habitat likely to occur within area
Streptopelia chinensis Spotted Turtle-Dove [780]		Species or species habitat likely to occur within area
Sturnus vulgaris Common Starling [389]		Species or species habitat likely to occur within area
Frogs		
Rhinella marina Cane Toad [83218]		Species or species habitat known to occur within area
Mammals		
Bos taurus Domestic Cattle [16]		Species or species habitat likely to occur within area

Name	Status	Type of Presence
Canis lupus familiaris Domestic Dog [82654]		Species or species habitat likely to occur within area
Equus caballus Horse [5]		Species or species habitat likely to occur within area
Felis catus Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
Feral deer Feral deer species in Australia [85733]		Species or species habitat likely to occur within area
Mus musculus House Mouse [120]		Species or species habitat likely to occur within area
Oryctolagus cuniculus Rabbit, European Rabbit [128]		Species or species habitat likely to occur within area
Rattus rattus Black Rat, Ship Rat [84]		Species or species habitat likely to occur within area
Sus scrofa Pig [6]		Species or species habitat likely to occur within area
Vulpes vulpes Red Fox, Fox [18]		Species or species habitat likely to occur within area
Plants		
Acacia nilotica subsp. indica Prickly Acacia [6196]		Species or species habitat may occur within area
Andropogon gayanus Gamba Grass [66895]		Species or species habitat likely to occur within area
Annona glabra Pond Apple, Pond-apple Tree, Alligator Apple, Bullock's Heart, Cherimoya, Monkey Apple, Bobwood, Corkwood [6311]		Species or species habitat likely to occur within area
Cenchrus ciliaris Buffel-grass, Black Buffel-grass [20213]		Species or species habitat may occur within area
Cryptostegia grandiflora Rubber Vine, Rubbervine, India Rubber Vine, India Rubbervine, Palay Rubbervine, Purple Allamanda [18913]		Species or species habitat likely to occur within area
Eichhornia crassipes Water Hyacinth, Water Orchid, Nile Lily [13466]		Species or species habitat likely to occur within area
Hymenachne amplexicaulis Hymenachne, Olive Hymenachne, Water Stargrass, West Indian Grass, West Indian Marsh Grass [31754]		Species or species habitat likely to occur within area
Jatropha gossypifolia Cotton-leaved Physic-Nut, Bellyache Bush, Cotton-leaf Physic Nut, Cotton-leaf Jatropha, Black Physic Nut [7507]		Species or species habitat likely to occur within area
Lantana camara Lantana, Common Lantana, Kamara Lantana, Large-leaf Lantana, Pink Flowered Lantana, Red Flowered Lantana, Red-Flowered Sage, White		Species or species habitat likely to occur within area

Name	Status	Type of Presence
Sage, Wild Sage [10892]		
Parkinsonia aculeata		
Parkinsonia, Jerusalem Thorn, Jelly Bean Tree, Horse Bean [12301]		Species or species habitat likely to occur within area
Parthenium hysterophorus		
Parthenium Weed, Bitter Weed, Carrot Grass, False Ragweed [19566]		Species or species habitat likely to occur within area
Salvinia molesta		
Salvinia, Giant Salvinia, Aquarium Watermoss, Kariba Weed [13665]		Species or species habitat likely to occur within area
Reptiles		
Ramphotyphlops braminus		
Flowerpot Blind Snake, Brahminy Blind Snake, Cacing Besi [1258]		Species or species habitat likely to occur within area

Nationally Important Wetlands	[Resource Information]
Name	State
Poison Lake	QLD

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

-18.8979 144.1263,-18.9272 144.2418,-18.9317 144.4221,-18.921 144.5059,-18.9521 144.609,-18.9783 144.6442,-18.9506 144.9464,-18.9768 145.0159,-18.8478 145.8204,-18.8576 145.8443

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.

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WildNet Records
Conservation Significant Species List

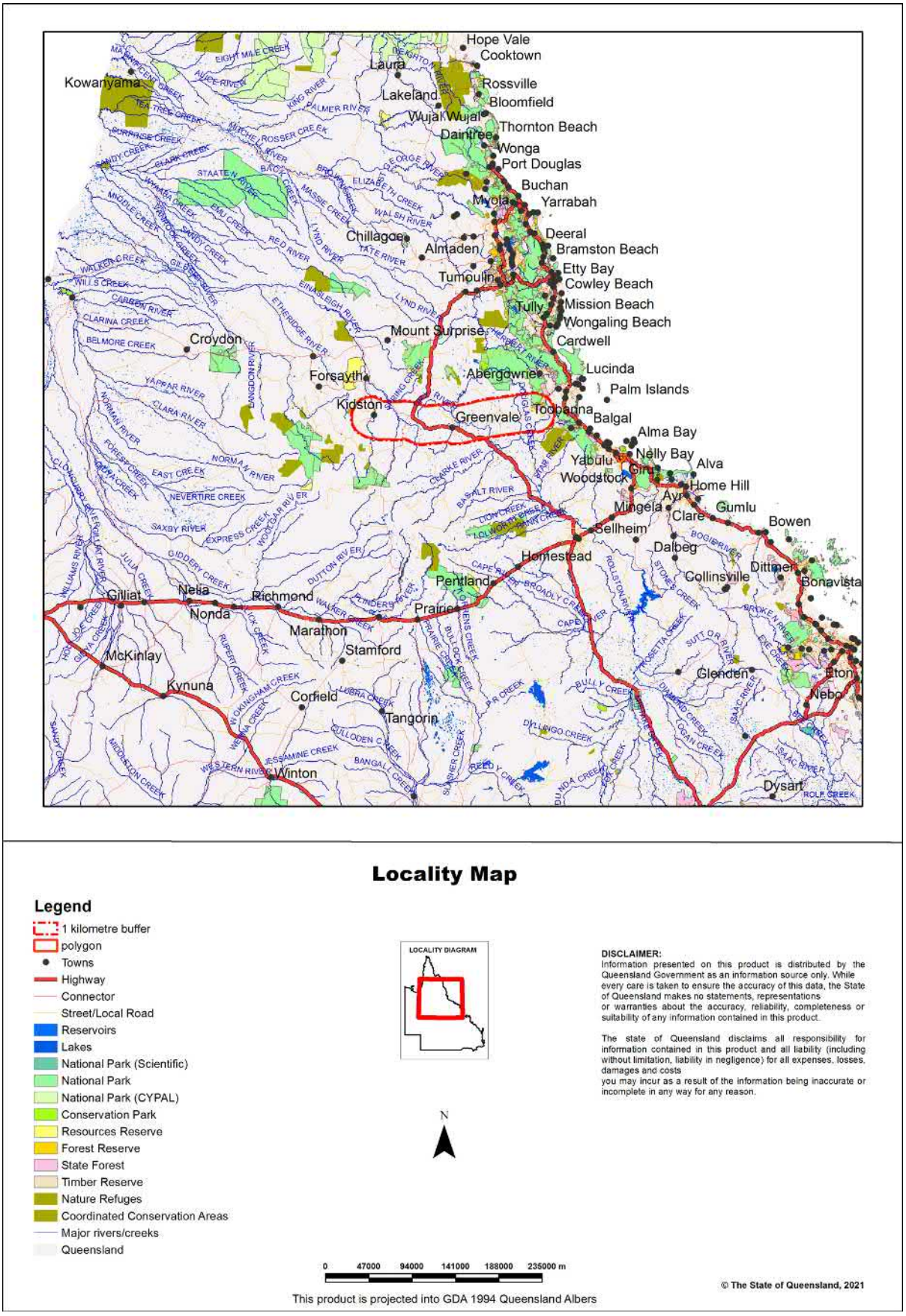
For the selected area of interest 870337.39ha

Current as at 05/08/2021

PowerlinkKidston-20kmbuffer

Queensland Government

Map 1. Locality Map



Summary Information

The following table provides an overview of the area of interest .

Table 1. Area of interest details

Size (ha)	870,337.39
Local Government(s)	Charters Towers Regional, Etheridge Shire, Hinchinbrook Shire
Bioregion(s)	Einasleigh Uplands, Wet Tropics
Subregion(s)	Undara - Toomba Basalts, Kidston, Paluma - Seaview, Herbert, Broken River
Catchment(s)	Herbert, Gilbert, Burdekin

Protected Area(s)

The following estates and/or reserves are located in the area of interest:

Girringun National Park

Lannercost State Forest

World Heritage Area(s)

The following World Heritage Areas are located in the area of interest:

Wet Tropics of Queensland

Ramsar Area(s)

No Ramsar Areas are located within the area of interest.

Conservation Significant Species List

Introduction

This report is derived from a spatial layer generated from the WildNet database managed by the Department of Environment and Science. The layer which is generated weekly contains the WildNet wildlife records that are not classed as erroneous or duplicate, that have a location precision equal to or less than 10000 metres and do not have a count of zero.

Conservation significant species are species listed:

- as threatened or near threatened under the Nature Conservation Act 1992;
- as threatened under the *Environment Protection and Biodiversity Conservation Act 1999* or
- migratory species protected under the following international agreements:
  - Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention)
  - China-Australia Migratory Bird Agreement
  - Japan-Australia Migratory Bird Agreement
  - Republic of Korea-Australia Migratory Bird Agreement

The WildNet dataset is constantly being enhanced and the taxonomic and status information revised. If a species is not listed in this report, it does not mean it doesn't occur there and listed species may also no longer inhabit the area. It is recommended that you also access other internal and external data sources for species information in your area of interest (Refer Links and Support).

Table 2 lists the species recorded within the area of interest and its one kilometre buffer.

Table 2. Conservation significant species recorded within the area of interest and its one kilometre buffer

Taxon Id	Kingdom	Class	Family	Scientific Name	Common Name	NCA	EPBC	Specimens	Records	Last record
1965	Animalia	Aves	Apodidae	*Apus pacificus*	fork-tailed swift	SL	None	0	1	24/01/2013

Taxon Id	Kingdom	Class	Family	Scientific Name	Common Name	NCA	EPBC	Specimens	Records	Last record
1971	Animalia	Aves	Apodidae	*Hirundapus caudacutus*	white-throated needletail	V	V	0	1	21/02/2000
1087	Animalia	Aves	Casuariidae	*Casuarius casuarius johnsonii (southern population)*	southern cassowary (southern population)	E	E	0	3	18/02/2011
1785	Animalia	Aves	Columbidae	*Geophaps scripta scripta*	squatter pigeon (southern subspecies)	V	V	0	1	21/05/1976
1736	Animalia	Aves	Cuculidae	*Cuculus optatus*	oriental cuckoo	SL	None	0	1	31/03/1999
1376	Animalia	Aves	Estrildidae	*Erythrura gouldiae*	Gouldian finch	E	E	0	3	31/12/1984
1365	Animalia	Aves	Estrildidae	*Poephila cincta cincta*	black-throated finch (white-rumped subspecies)	E	E	0	9	31/12/1976
1896	Animalia	Aves	Laridae	*Hydroprogne caspia*	Caspian tern	SL	None	0	1	01/10/2005
1595	Animalia	Aves	Monarchidae	*Monarcha melanopsis*	black-faced monarch	SL	None	0	20	31/05/2001
1597	Animalia	Aves	Monarchidae	*Symposiachrus trivirgatus*	spectacled monarch	SL	None	0	32	31/05/2001
1578	Animalia	Aves	Rhipiduridae	*Rhipidura rufifrons*	rufous fantail	SL	None	0	10	31/05/2001
1874	Animalia	Aves	Scolopacidae	*Calidris acuminata*	sharp-tailed sandpiper	SL	None	0	1	24/01/2013
1880	Animalia	Aves	Scolopacidae	*Calidris ruficollis*	red-necked stint	SL	None	0	1	01/10/2005
1825	Animalia	Aves	Threskiornithidae	*Plegadis falcinellus*	glossy ibis	SL	None	0	1	24/01/2013
1097	Animalia	Aves	Tytonidae	*Tyto novaehollandiae kimberli*	masked owl (northern subspecies)	V	V	0	1	14/07/2020
892	Animalia	Mammalia	Macropodidae	*Petrogale sharmani*	Sharman's rock-wallaby	V	V	32	37	31/12/1988
762	Animalia	Mammalia	Muridae	*Mesembriomys gouldii*	black-footed tree-rat	C	V	0	1	31/12/1986
878	Animalia	Mammalia	Petauridae	*Petaurus gracilis*	mahogany glider	E	E	0	30	25/08/2005
860	Animalia	Mammalia	Phascolarctidae	*Phascolarctos cinereus*	koala	V	V	0	5	24/09/2003
2456	Animalia	Mammalia	Pseudocheiridae	*Petauroides minor*	northern greater glider	V	V	2	4	05/01/2001
986	Animalia	Mammalia	Pteropodidae	*Pteropus conspicillatus*	spectacled flying-fox	E	E	1	1	01/05/1974
969	Animalia	Mammalia	Rhinolophidae	*Rhinolophus philippinensis*	greater large-eared horseshoe bat	E	V	0	1	17/01/2003
838	Animalia	Mammalia	Tachyglossidae	*Tachyglossus aculeatus*	short-beaked echidna	SL	None	0	11	03/12/2013
13606	Plantae	Equisetopsida	Apiaceae	*Oenanthe javanica*	None	NT	None	1	1	02/09/2004
10046	Plantae	Equisetopsida	Asteraceae	*Glossocardia orthochaeta*	None	E	None	1	1	05/04/2001
30720	Plantae	Equisetopsida	Byttneriaceae	*Commersonia reticulata*	None	V	None	1	1	10/07/2020
12077	Plantae	Equisetopsida	Cycadaceae	*Cycas cairnsiana*	None	V	V	6	6	19/05/2019

Taxon Id	Kingdom	Class	Family	Scientific Name	Common Name	NCA	EPBC	Specimens	Records	Last record
21785	Plantae	Equisetopsida	Mimosaceae	*Acacia tingoorensis*	None	V	None	4	4	31/10/2004
6448	Plantae	Equisetopsida	Myrtaceae	*Corymbia leptoloma*	None	V	V	1	1	28/03/2002
8377	Plantae	Equisetopsida	Myrtaceae	*Leptospermum pallidum*	None	NT	None	11	11	01/03/2021
26539	Plantae	Equisetopsida	Orchidaceae	*Corybas cerasinus*	None	NT	None	2	2	05/05/1955
28611	Plantae	Equisetopsida	Poaceae	*Lepturus minutus*	None	V	None	1	1	19/03/1993
12867	Plantae	Equisetopsida	Sapindaceae	*Arytera dictyoneura*	None	NT	None	1	1	12/05/2003

Taxon Id: Unique identifier of the taxon from the WildNet database.

NCA: Queensland conservation status of the taxon under the *Nature Conservation Act 1992* (Least Concern (C), Critically Endangered (CR), Endangered (E), Extinct (EX), Near Threatened (NT), Extinct in the Wild (PE), Special Least Concern (SL), and Vulnerable (V)).

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

Specimens: The number of specimen-backed records of the taxon.

Records: The total number of records of the taxon.

Last record: Date of latest record of the taxon.

Links and Support

Other sites that deliver species information from the WildNet database include:

- Species profile search - access species information approved for publication including species names, statuses, notes, images, distribution maps and records
- Species lists - generate species lists for Queensland protected areas, forestry areas, local governments and areas defined using coordinates
- Biomaps - view biodiversity information, including WildNet records approved for publication, and generate reports
- Queensland Globe - view spatial information, including WildNet records approved for publication
- Old wildlife data API - access WildNet species information approved for publication such as notes, images and records etc.
- Wetland*Maps* - view species records, survey locations etc. approved for publication
- Wetland*Summary* - view wildlife statistics, species lists for a range of area types, and access WildNet species profiles
- WildNet wildlife records - published - Queensland - spatial layer of WildNet records approved for publication generated weekly
- Generalised distribution and densities of Queensland wildlife - Queensland species distributions and densities generalised to a 10 km grid resolution
- Conservation status of Queensland wildlife - access current lists of priority species for Queensland including nomenclature and status information
- Queensland Confidential Species - the list of species flagged as confidential in the WildNet database.

Please direct queries about this report to the WildNet Team.

Other useful sites for accessing Queensland biodiversity data include:

- Useful wildlife resources
- Queensland Government Data
- Atlas of Living Australia (ALA)
- Online Zoological Collections of Australian Museums (OZCAM)
- Australia's Virtual Herbarium (AVH)
- Protected Matters Search Tool

Disclaimer

Appendix C

Mapped Regional Ecosystems (Queensland Herbarium)

Appendix C Queensland Herbarium Regional Ecosystems

Table 19 Project Area REs – State mapped (DES Queensland Herbarium) and field validated

RE ID	Short Description[1]	VM Act Status[2]	BDStatus[3]	Mapped by DES	Field validated
7.12.29	*Corymbia intermedia* and/or *Lophostemon suaveolens* open forest to woodland +/- areas of *Allocasuarina littoralis* and *A. torulosa* on uplands on granites and rhyolites.	LC	NCAP	No	Yes
7.5.29a	*Corymbia intermedia, Eucalyptus tereticornis, E. drepanophylla* open forest to low open forest and woodland with *Allocasuarina torulosa, A. littoralis, Lophostemon suaveolens, Acacia cincinnata, A. flavescens, Banksia aquilonia* and *Xanthorrhoea johnsonii.* Uplands, on granite and rhyolite.	LC	NCAP	Yes	No
7.5.4a	*Corymbia intermedia +/- Eucalyptus tereticornis* woodland and open forest with *Allocasuarina torulosa, A. littoralis, Lophostemon suaveolens, Acacia flavescens, Banksia aquilonia* and *Xanthorrhoea johnsonii.* Weathered soils and laterite of a remnant surface.	OC	OC	Yes	No
7.5.4f	*Corymbia intermedia*, *Allocasuarina torulosa*, *Lophostemon suaveolens* open forest and woodland. Deep weathered soils of basalt origin.	OC	OC	Yes	No
7.8.18	*Corymbia intermedia* (pink bloodwood) and/or *Lophostemon suaveolens* (swamp mahogany) +/- *Allocasuarina torulosa* (forest sheoak) open forest to woodland. Basalt.	OC	OC	No	Yes
7.8.18a	*Corymbia intermedia, Eucalyptus tereticornis, Eucalyptus granitica* open forest to woodland with *Allocasuarina torulosa, Allocasuarina littoralis, Lophostemon suaveolens, Acacia cincinnata, Acacia flavescens, Banksia aquilonia* and *Xanthorrhoea johnsonii.* Basalt.	OC	OC	Yes	No
9.3.1	*Eucalyptus camaldulensis* and/or *Eucalyptus tereticornis* +/- *Melaleuca* spp. +/- *Casuarina cunninghamiana* fringing woodland on channels and levees.	LC	OC	Yes	Yes
9.3.3	*Corymbia spp*. and *Eucalyptus spp.* dominated mixed woodland on alluvial flats, levees and plains.	LC	OC	No	Yes
9.3.3a	Woodland to low open woodland of *Eucalyptus leptophleba* +/- *Eucalyptus platyphylla* +/- *Corymbia confertiflora* +/- *Eucalyptus crebra* or *Eucalyptus cullenii* +/- *Corymbia clarksoniana* on alluvial plains and terraces.	LC	OC	Yes	Yes
9.3.5	*Eucalyptus brownii* +/- *Eucalyptus* spp. +/- *Corymbia* spp. open woodland on alluvial plains.	LC	OC	Yes	Yes
9.3.6a	Woodland to open woodland of *Eucalyptus platyphylla* +/- *Corymbia clarksoniana* +/- *Corymbia tessellaris* +/- *Eucalyptus tereticornis* on alluvial plains.	LC	NCAP	Yes	Yes

RE ID	Short Description[1]	VM Act Status[2]	BDStatus[3]	Mapped by DES	Field validated
9.3.10b	Low open forest to open forest of *Melaleuca bracteata* +/- *Lysiphyllum carronii* along creek lines in basalt.	LC	NCAP	Yes	No
9.3.12a	Sandy river beds sometimes with patches of ephemeral grassland, herbland or sedgeland, which can include *Heteropogon contortus*, *Bothriochloa* spp., and *Ammannia multiflora*. Sandy river beds, riverine wetland or fringing riverine wetland.	LC	OC	Yes	No
9.3.13	*Melaleuca* spp., *Eucalyptus camaldulensis* and *Casuarina cunninghamiana* fringing open forest on streams and channels.	LC	OC	Yes	Yes
9.3.16	*Eucalyptus tereticornis* and/or *Eucalyptus platyphylla* and/or *Corymbia clarksoniana* woodland on alluvial flats, levees and plains.	LC	OC	Yes	Yes
9.3.20	*Eucalyptus microneura* +/- *Corymbia* spp. +/- *Eucalyptus leptophleba* woodland on alluvial plains.	LC	NCAP	Yes	Yes
9.3.22a	Open woodland to woodland of *Eucalyptus crebra*, *Corymbia clarksoniana* and/or *Corymbia dallachiana* +/- *Eucalyptus platyphylla* +/- *Eucalyptus brownii* +/- *Eucalyptus* spp. on levees, terraces and banks of larger rivers and on flat to very gentle slopes associated with drainage lines.	LC	OC	Yes	Yes
9.3.23	*Acacia tephrina* open forest on alluvial clay plains.	OC	OC	Yes	No
9.3.24	*Melaleuca viridiflora* and/or *Melaleuca citrolens* low woodland +/- *Corymbia* spp. emergents on alluvial deposits.	LC	NCAP	Yes	No
9.3.25	*Dichanthium* spp., and/or *Astrebla* spp. +/- *Iseilema* spp. grassland on alluvial deposits derived from basalt soils.	LC	OC	Yes	Yes
9.3.26	Mixed grassland to open grassland including *Eragrostis* sp., *Aristida* sp., *Enneapogon* sp., *Iseilema* sp., *Chloris* sp., or *Dichanthium* sp. on non-basalt derived alluvial deposits.	LC	OC	Yes	No
9.5.3	*Eucalyptus crebra* or *Eucalyptus drepanophylla* and *Corymbia clarksoniana* woodland on sand plains.	LC	NCAP	Yes	Yes
9.5.11	*Eucalyptus persistens* +/- *Eucalyptus crebra* woodland on flats on Tertiary remnant plains.	LC	NCAP	Yes	Yes
9.7.1	*Eucalyptus persistens* woodland on lateritised and deeply weathered surfaces on undulating terrain.	LC	NCAP	No	Yes
9.7.1a	Woodland to open woodland of *Eucalyptus persistens* +/- *Eucalyptus crebra* +/- *Corymbia erythrophloia* +/- *Corymbia dallachiana*. Occurs on pediments below scarps of lateritised Tertiary plateaus and on deeply weathered profiles on rolling hills.	LC	NCAP	Yes	No

RE ID	Short Description[1]	VM Act Status[2]	BDStatus[3]	Mapped by DES	Field validated
9.7.1b	Low open forest of *Melaleuca uncinata* +/- emergents of *Eucalyptus persistens* and/or *Eucalyptus moluccana* and/or *Acacia shirleyi*. Occurs on pediments below scarps of lateritised Tertiary plateaus and on deeply weathered profiles on rolling hills.	LC	NCAP	Yes	No
9.7.1c	Woodland to low open woodland of *Eucalyptus persistens* and/or *Eucalyptus exserta* +/- *Eucalyptus crebra* +/- *Acacia shirleyi* +/- *Callitris intratropica* on deeply weathered granite hills.	LC	NCAP	Yes	No
9.7.2	*Acacia shirleyi* low woodland on mesas and lateritised surfaces.	LC	NCAP	No	Yes
9.7.2a	Woodland to low-woodland of *Acacia shirleyi* with only scattered *Corymbia trachyphloia* +/- *Corymbia lamprophylla* +/- *Eucalyptus persistens* +/- *Acacia leptostachya* +/- *Eucalyptus exserta* +/- *Corymbia* spp. on lateritised mesa slopes and tops, breakaways, scree slopes and remnant colluvium.	LC	NCAP	Yes	No
9.7.2b	Woodland to low open woodland of *Eucalyptus exserta* +/- a mix of subdominant to codominant species including *Acacia shirleyi*, *Corymbia lamprophylla*, *Corymbia peltata* and *Callitris intratropica*. Occurs on rolling hills.	LC	NCAP	Yes	No
9.7.3c	Woodland to open woodland of *Eucalyptus crebra* +/- *Corymbia erythrophloia* +/- *Corymbia dallachiana* +/- *Corymbia confertiflora* on low rolling hills.	LC	NCAP	Yes	No
9.7.5	*Corymbia setosa* and/or *Corymbia peltata* low open woodland on lateritised and deeply weathered surfaces.	LC	NCAP	Yes	No
9.8.1	*Eucalyptus crebra* +/- *Corymbia dallachiana* +/- *E. leptophleba* open woodland on plains and rocky rises of basalt geologies.	LC	NCAP	No	Yes
9.8.1a	Open woodland to woodland of *Eucalyptus crebra* +/- *Corymbia erythrophloia* +/- *Corymbia dallachiana* +/- *Corymbia* spp. +/- *Eucalyptus* spp. on basalt plains and rocky basalt plains and hills with varying depths of soil.	LC	NCAP	Yes	No
9.8.1b	Open woodland to woodland of *Eucalyptus leptophleba* +/- *Corymbia erythrophloia* +/- *Corymbia dallachiana* on basalt plains and rocky basalt plains and hills with varying depths of soil.	LC	NCAP	Yes	No
9.8.4	*Eucalyptus crebra* and/or *E. tereticornis* open woodland on basalt plains.	LC	NCAP	No	Yes
9.8.4a	Woodland to open woodland of *Eucalyptus crebra* or *Eucalyptus granitica* +/- *Corymbia intermedia* +/- *Corymbia dallachiana* +/- *Corymbia tessellaris* on basalt plains and rocky basalt plains and hills with varying depths of soil.	LC	NCAP	Yes	No
9.8.11	*Eucalyptus microneura* +/- *Corymbia* spp. +/- *Terminalia* spp. woodland on basalt plains.	LC	NCAP	Yes	No

RE ID	Short Description[1]	VM Act Status[2]	BDStatus[3]	Mapped by DES	Field validated
9.8.13	*Iseilema* spp. and/or *Dichanthium* spp. tussock grassland on basalt plains.	LC	NCAP	Yes	Yes
9.11.1a	Low woodland to low open woodland of *Eucalyptus melanophloia* +/- *Eucalyptus persistens* +/- *Eucalyptus crebra* +/- *Corymbia dallachiana* +/- *Corymbia peltata* +/- *Eucalyptus brownii* +/- *Acacia julifera* on skeletal soils of slopes and crests of undulating rises and low hills of folded metasediments and other metamorphic rocks.	LC	NCAP	Yes	Yes
9.11.2a	Woodland to open woodland of *Eucalyptus crebra* +/- *Corymbia dallachiana* +/- *Corymbia erythrophloia* +/- *Corymbia clarksoniana* +/- *Eucalyptus* spp. +/- *Corymbia* spp. on metamorphic hills and rises.	LC	NCAP	Yes	Yes
9.11.4a	Open forest to open woodland of *Eucalyptus granitica, Corymbia clarksoniana* and/or *Corymbia intermedia*, *Corymbia citriodora* subsp. *citriodora* +/- *Eucalyptus portuensis* +/- *Corymbia dallachiana* +/- *Eucalyptus tereticornis* on metamorphic hills.	LC	NCAP	Yes	No
9.11.5	*Eucalyptus persistens* +/- *Eucalyptus crebra* woodland on low metamorphic hills.	LC	NCAP	Yes	Yes
9.11.15a	Woodland to low open woodland of *Eucalyptus crebra* or *Eucalyptus cullenii* +/- *Corymbia erythrophloia* or *Corymbia pocillum* +/- *Corymbia dallachiana* +/- *Erythrophleum chlorostachys* +/- *Eucalyptus microneura* on low hills and rises with moderately deep soils derived from metamorphic geologies.	LC	NCAP	Yes	Yes
9.11.16	*Eucalyptus crebra* +/- *Corymbia erythrophloia* or *Corymbia pocillum* woodland on steep to rolling hills.	LC	NCAP	Yes	Yes
9.11.23b	Low open woodland to woodland of *Eucalyptus microneura* +/- *Eucalyptus cullenii* or *Eucalyptus crebra* on metamorphic hills.	LC	NCAP	Yes	Yes
9.12.1a	Woodland to low open woodland of *Eucalyptus crebra* +/- *Corymbia dallachiana* +/- *Corymbia erythrophloia* +/- *Corymbia clarksoniana* +/- *Corymbia* spp. *Eucalyptus exilipes* on a variety of landforms from undulating plains to steep hills.	LC	NCAP	Yes	Yes
9.12.2	*Eucalyptus portuensis*, *Corymbia citriodora* subsp. *citriodora*, *Eucalyptus granitica* or *Eucalyptus crebra*, *Corymbia intermedia* or *Corymbia clarksoniana* mixed woodland on steep hills and ranges on igneous hills close to Wet Tropics boundary.	LC	NCAP	Yes	No
9.12.4a	Low woodland to occasionally a low open forest of *Eucalyptus shirleyi* and *Corymbia peltata* +/- *Eucalyptus crebra* +/- *Corymbia* spp. +/- *Acacia leptostachya* predominantly on sandy shallow soils derived from granitic or rhyolite geologies on rolling low hills to hills.	LC	NCAP	Yes	No
9.12.6b	Low open woodland to low woodland of *Eucalyptus microneura* +/- *Corymbia clarksoniana* +/- *Corymbia dallachiana* +/- *Terminalia platyptera* on granitic or rhyolite hills.	LC	NCAP	Yes	No

RE ID	Short Description[1]	VM Act Status[2]	BDStatus[3]	Mapped by DES	Field validated
9.12.10	*Corymbia confertiflora* and *Eucalyptus crebra* +/- *Corymbia clarksoniana* open woodland on rolling igneous hills.	OC	OC	Yes	Yes
9.12.12	*Eucalyptus crebra* and *Corymbia erythrophloia* +/- *Eucalyptus microneura* open woodland on igneous rocks.	LC	NCAP	Yes	Yes
9.12.19	*Eucalyptus crebra* or *Eucalyptus granitica* +/- *Corymbia citriodora* subsp. *citriodora* +/- *Eucalyptus portuensis* mixed woodland on igneous hills.	LC	NCAP	Yes	No
9.12.22	*Eucalyptus drepanophylla*, *Corymbia clarksoniana* or *Corymbia intermedia* and *Corymbia dallachiana* woodland on steep rugged igneous ranges.	LC	NCAP	Yes	No
9.12.26	*Eucalyptus moluccana* +/- *E. crebra* and/or *E. granitica* woodland on igneous rocks.	OC	OC	No	Yes
9.12.32	*Eucalyptus persistens* woodland on rhyolites and granites.	LC	NCAP	No	Yes

[1] Short description as per the Regional Ecosystem Description Database (REDD). Version 12 (March 2021)

[2] Conservation status of the RE under the VM Act.

[3] Biodiversity (BD) status under the EP Act of the RE based on an assessment of the condition of remnant vegetation in addition to the pre-clearing and remnant extent of a regional ecosystem.

Appendix D

Likelihood of Occurrence Assessments

Appendix D Likelihood of Occurrence Assessments

Table 20 Likelihood of Occurrence Assessment - TEC

Value	Status (EPBC Act)	Preferred Habitat	Likelihood of Occurrence
TEC			
Broad leaf tea-tree (*Melaleuca viridiflora*) woodlands in high rainfall coastal north Queensland	Endangered	*Melaleuca viridiflora* (broad leaf tea-tree) woodlands in high rainfall coastal north Queensland ecological community represents occurrences of woodland where *Melaleuca viridiflora* (broad leaf tea-tree) is dominant in the canopy and a diversity of grasses, sedges and forbs occupy the ground layer. The ecological community is restricted to the Wet Tropics and Central Mackay Coast bioregions in Queensland. The ecological community is typically woodland but can have a forest structure in some areas. It generally consists of two clear structural layers: a canopy of *Melaleuca viridiflora* (broad leaf tea-tree) and a diverse ground layer of grasses, sedges and forbs. Epiphytes are often conspicuous in the canopy trees. Shrubs may be present but are generally sparse although some sites have an obvious layer of *Xanthorrhoea* spp. (grass trees) (Threatened Species Scientific Committee, 2012a). In Queensland, this TEC corresponds to the following REs: 7.3.8a, 7.3.8b, 7.3.8c, 7.3.8d, 7.5.4g, 8.3.2a, 8.5.2c and 8.5.6.	**Unlikely** *Melaleuca viridiflora* (broad leaf tea-tree) and the REs corresponding to this TEC were not identified within the Project Area.

Table 21 Likelihood of Occurrence Assessment - Conservation Significant Flora and Fauna

Species	Status (EPBC Act[1], NC Act[2])	Distribution and habitat requirements	Potential habitat utilisation in Project Area			Records (Atlas of Living Australia, 2021)	Likelihood of Occurrence
			Breeding / Roosting / Nesting	Foraging	Dispersal		
Plants							
Pink gidgee *Acacia crombiei*	V, V	Pink gidgee is endemic to central Queensland where it occurs in isolated populations. Populations occur from Muttaburra in the south to Richmond and Hughendon in the north (Department of Agriculture Water and the Environment, 2021c). This species tends to occur in small, isolated populations on basalt soils in the northern extent of its range and on heavier loamy soils at the southern end of its range. As per the species SPRAT, the Project Area intersects a small area of the potential distribution of the species north west of Greenvale.	**Yes - marginal** The field surveys identified only a small portion of basalt plains soils (land zone 8). These areas tended to be heavily impacted by grazing, invasive species and supported few *Acacia* species.			**No** No ALA or WildNet records within 20 km of the Project Area. This species was not recorded during field surveys.	**Unlikely**
Tingoora wattle *Acacia tingoorensis*	-, V	*Acacia tingoorensis* is found near Kingaroy, in the Burnett district of south-eastern Queensland. It is also known from the Ingham area in north-eastern Queensland (Department of Environment and Heritage Protection, 2014). *Acacia tingoorensis* grows in *Eucalyptus* forests on deep red loam soils, gravelly soils and occasionally on shallow sandy soils. It tends to grow at an altitude of 400 – 500 m.	**Yes** Suitable elevated, gravely habitat was detected during the field surveys towards the eastern end of the alignment on the granitic geology (land zone 12). The field surveys thoroughly searched this habitat, including a targeted survey for this species within the high-risk area near Mount Fox. No individuals were found.			**Yes** A small cluster of records from 1986 and 2004 located 3 km north of the Project area at the eastern end of the alignment, on Mount Fox Road (ALA). Four WildNet records within 20 km from 2004 (likely the same ALA records). No other records within 20 km of the Project area. This species was not recorded during field surveys within the Project area.	**Potential**
Arytera dictyoneura	-, NT	*Arytera dictyoneura* has been recorded from scattered locations in northern and southern Queensland. Known from Bulburin State Forest. In northern Queensland the species has been found in semi-evergreen rainforest, on granite boulder slopes/ soil derived from granite (Department of Environment and Science, 2019b). Associated species include *Castanospermum*, *Myristica*, *Dysoxylum* spp., *Flindersia bourjotiana*, *Ilex*, *Drypetes*, *Buckinghamia* and *Alstonia scholaris*; rainforest of *Ficus variegata*, *Paraserianthes*, *Alstonia*, *Buckinghamia* and *Litsea fawcettiana* and rainforest with a canopy of *Argyrodendron polyandrum*, *Toona*, *Castanospermum*, *Alstonia*, *Paraserianthes* and *Canarium australianum*. The species was rare in these areas. In southern Queensland the species occurs in closed forest (complex notophyll vine forest) on basalt derived soils. Associated vegetation includes *Argyrodendron trifoliolatum* and *Archidendropsis thozetiana*.	**No** Semi-evergreen rainforest habitat does not occur within the Project Area.			**No** No ALA records within 20 km of the Project Area. Nearest records are > 50 km to the north-east and south-east. However, a single WildNet record is located within 20 km from 2003. This species was not recorded during field surveys.	**Unlikely**

Species	Status (EPBC Act[1], NC Act[2])	Distribution and habitat requirements	Potential habitat utilisation in Project Area			Records (Atlas of Living Australia, 2021)	Likelihood of Occurrence
			Breeding / Roosting / Nesting	Foraging	Dispersal		
Miniature moss-orchid *Bulbophyllum globuliforme*	V, NT	The Miniature moss-orchid is endemic to eastern Australia. The species is recorded from near Paluma, north-east Queensland and south to the McPherson Range on the Queensland/New South Wales border (Department of Agriculture Water and the Environment, 2021c). The Project Area intersects a small area of the species' mapped distribution south of Conjuboy. A tiny, rhizomatous, epiphytic orchid that has a preference for growing on the bark of the upper branches of emergent *Araucaria cunninghamii* (hoop pine) at altitudes between 500 to 900 m. It prefers cool, moist rainforest and upland subtropical rainforest.	**No** No hoop pines were detected during the flora survey and no areas of rainforest occur within the Project Area.			**No** No ALA or WildNet records within 20 km. The closest known occurrence is 26 km to the south east of the eastern extent of the Project Area near Paluma State Forest (known location of the species).	**Unlikely**
Commersonia reticulata (syn. *Androcalva reticulata*)	-, V	Known from south of Mt Garnet to Townsville in north-east Queensland. It occurs in mixed open forest to woodland commonly including *Corymbia clarksoniana*, *Eucalyptus portuensis*, *E. crebra* and *Corymbia citriodora* on red kandosols on Tertiary surfaces (RE 9.5.5) or mixed open forest including *Eucalyptus portuensis*, *E. crebra, Corymbia clarksoniana* and *C. citriodora* on shallow soils on metamorphic hills and ranges (RE 9.11.4) (Guymer, 2005).	**No** The regional ecosystems analogous with the preferred habitat for *Commersonia reticulata* are not available within the Project Area. Whilst similar habitat may be available that incorporates the land zone and some of the tree species mentioned in the habitat description, it does not match the habitat descriptions for the species.			**Yes** One ALA record within 20 km from 2020, approximately 13 km north of the project Area in the eastern portion. A single WildNet record within 20 km (2020) (likely the same as ALA).	**Unlikely**
Red helmet orchid *Corybas cerasinus*	-, NT	Occurs in north-eastern Queensland with a distribution from Cooktown to the Herbert River near Ingham, and also on Dunk Island (Jones, Hopley and Duffy, 2010). *Corybas cerasinus* has been identified in a number of habitats including: • South of Cooktown on grey, gravelly loams • Beneath a dense understory of grasses and ferns in a *Casurina* woodland on dark, organic soils • Near Mount Roseville in an open eucalypt forest on granite hills that was recently burned • *Allocasuarina torulosa* and *Eucalyptus* species on granite • On black loam soil in an open forest with *Eucalyptus intermedia* and *Allocasuarina torulosa* On steep slopes with an eastern aspect with grey, gravelly loam soils dominated by *Casuarina* and a *Themeda* understory.	**Yes – marginal** *Corybas cerasinus* appears to prefer *Allocasuarina/Casuarina* forests on granitic and basaltic soils. Limited available habitat is available within the Project Area, with the exception of the Mount Fox end of the alignment, where some granitic soils appear.			**No** Two old records adjacent to the Project area in the east (3 km, from 1955) on both ALA and WildNet. However, recent known occurrences of this species do not extend further inland than Mount Garnet.	**Unlikely**

Species	Status (EPBC Act[1], NC Act[2])	Distribution and habitat requirements	Potential habitat utilisation in Project Area			Records (Atlas of Living Australia, 2021)	Likelihood of Occurrence
			Breeding / Roosting / Nesting	Foraging	Dispersal		
Yellowjacket *Corymbia leptoloma*	V, V	*Corymbia leptoloma* is known only from a small area north-west of Townsville, Queensland. The best-known population occurs along the Paluma–Hidden Valley road. This species occurs at the boundary between the Burdekin and Wet Tropics (Queensland) Natural Resource Management Regions. The Project Area occurs outside the species mapped distribution. The species grows in wet sclerophyll forest in association with Turpentine (*Syncarpia glomulifera*), Red Mahogany (*Eucalyptus resinifera*) and Pink Bloodwood (*Corymbia intermedia*) in gullies or on hill slopes (Brooker & Bean, 1991) (Department of the Environment Water Heritage and the Arts, 2008a). It occurs in coarse sandy soils derived from granite.	**No** The Project Area does not occur within the species distribution. Only a small portion of the alignment supported granite derived soils (land zone 12) supporting *Eucalyptus-Corymbia* woodland. No wet sclerophyll forest occurs within the Project Area.			**No** Three known populations occur >10 km east of the Project Area near and within Paluma State Forest. However, ALA records occur only at this location and this is a known location of the species. The WildNet report specifies a single record within 20 km from 2002.	**Unlikely**
Cycas cairnsiana	V, V	*Cycas cairnsiana* is known from three general locations in north-east Queensland: near Mount Surprise; in the upper reaches of the Roberston, Etheridge and Einasleigh River catchments; and near Kidston (Department of Agriculture Water and the Environment, 2021c). The Project Area is located east of the species' mapped distribution. *Cycas cairnsiana* grows on skeletal, heavily grained soils formed by siliceous granites, often among large boulders, or sparse grasslands and sparse and low shrublands in open eucalypt woodlands.	**No** The Project Area occurs outside of the species mapped distribution. There were only a small number of large, rocky boulders recorded during the field surveys. No *Cycas* species were observed during the field surveys, despite searching within these habitat areas.			**No** No ALA records occur within 10 km of the Project Area; however records (multiple years including 2019) occur at a location <15 km at the western extent. Location has been generalised by 10 km. The WildNet report specifies 6 records within 20 km (likely the same as ALA records).	**Unlikely**
Cycas platyphylla	V, V	The main population of *Cycas platyphylla* is known from the Petford district, west of the Atherton Tableland, Queensland. There are three smaller quite disjunct populations recorded from Taravale, Wandovale, and at White Mountains, north of Torrens Creek. The Project Area does not occur within any known locations of the species and only sections occur within the potential distribution. *Cycas platyphylla* occurs in sparse *Eucalyptus sideroxylon* woodland with a grassy understorey, often on rocky slopes in shallow red stony loams (Department of the Environment Water Heritage and the Arts, 2008b).	**No** The primary habitat (*E. sideroxylon* woodland) does not occur within the Project Area. No *Cycas* species were observed during the field surveys, despite searches in Eucalypt woodland on rocky slope habitat.			**No** No ALA or WildNet records occur within 20 km of the Project Area.	**Unlikely**

Species	Status (EPBC Act[1], NC Act[2])	Distribution and habitat requirements	Potential habitat utilisation in Project Area			Records (Atlas of Living Australia, 2021)	Likelihood of Occurrence
			Breeding / Roosting / Nesting	Foraging	Dispersal		
Bluegrass *Dichanthium setosum*	V, -	In Queensland, the species has been reported from the Leichhardt, Morton, North Kennedy and Port Curtis regions (Department of Agriculture Water and the Environment, 2021c). The Project Area occurs within the 'likely' distribution of the species as per SPRAT. *Dichanthium setosum* occurs in heavy cracking clay or alluvial soils, often gilgaied, in brigalow or eucalypt communities in tropical or subtropical climates with marked seasonal drying.	**Yes** Eucalypt woodland and grasslands on basalt occur within the Project Area. *Dichanthium spp*. grasses were recorded within the Project Area.			**Yes** A single ALA record from 2002 occurs within 20 km of the Project Area. The location has been generalised by 10 km. No WildNet records occur within 20 km.	**Potential**
Glossocardia orthochaeta	-, E	Recorded from Kallanda Station in North Kennedy District, 50 km west-south-west of Ingham. Also recorded from Cairns and Cape York. The species is likely to be found on granite rock pavements in partially shaded areas close to minor creeks, perhaps on the ecotone between dry vine or shrub thickets and open grassy woodlands (Pollock, 2002). Gorge lands or deep valleys with moist influence may also be suitable. One specimen was found growing on the edge of very tall open woodland of *Auracaria cunninghamii* with mid-dense shrub layer of *Labichea nitida* and *Acacia leptostachya*, and a thin grassy ground layer of *Digitaria sp. a*nd *Eriachne pallescens* (Pollock, 2002).	**No** Little is known about the species distribution and preferred habitat, however generally suitable habitat is not found in the Project Area.			**Yes** The specimen described by Pollock (2002) was collected 10 km to the south east of the Project Area (Atlas of Living Australia, 2021).	**Unlikely**
Leptospermum pallidum	-, NT	*Leptospermum pallidum* has a highly restricted distribution in Queensland. There are 20 recorded sightings to the southeast of Greenvale on either side of Gregory Highway, including near the Burdekin River. It mostly occurs around the Greenvale area on lateritic jump-ups, cliff edges and skeletal soil. It can also grow near vine thicket communities, on rocky slopes, in associated with *Eucalyptus persistens* and *Triodia* sp. (Bean, 1992).	**Yes** Suitable laterite habitat (Land zone 7) occurs within the Project Area.			**Yes** This species was recorded during the field surveys within 25 m of the Project Area.	**Known**
Lepturus minutus	-, V	*Lepturus minutus* has been collected from semi-deciduous vine thickets around Chillagoe and Forty Mile Scrub National Park and is extremely small in size compared to other species in the *Lepturus* genus (Cape York Natural Resource Management, 2020).	**No** No preferred habitat was recorded during the field surveys for this species.			**Yes** One species record a little more than 10 km to the north of the alignment near Ironstone Mountain (Atlas of Living Australia, 2021), with a single WildNet record within 20 km from 1993.	**Unlikely**

Species	Status (EPBC Act[1], NC Act[2])	Distribution and habitat requirements	Potential habitat utilisation in Project Area			Records (Atlas of Living Australia, 2021)	Likelihood of Occurrence
			Breeding / Roosting / Nesting	Foraging	Dispersal		
Lindsaea pulchella var. blanda	V, EITW	*Lindsaea pulchella var. blanda* is known from a single specimen collected in 1926 in Rockingham. Only the very far eastern extent of the Project Area occurs within the species potential distribution. The species is an epiphyte that tends to grow on mosses on trees and on tree ferns from between 1500 - 2750 m altitude. It is very rarely terrestrial (Department of Agriculture Water and the Environment, 2021c).	**No** No epiphytic mosses or tree ferns were detected during the flora survey.			**No** No ALA or WildNet records occur within 20 km. Rockingham is >100 km north east of the eastern Project Area.	**Unlikely**
Marsdenia brevifolia	V, V	*Marsdenia brevifolia* occurs in north and central Queensland where it is known from near Townsville, Springsure and north of Rockhampton (Department of Agriculture Water and the Environment, 2021c). A single population also occurs at West Point on Magnetic Island. Approximately 35 km of the eastern Project Area occurs within the mapped distribution of the species as per SPRAT. *Marsdenia brevifolia* occurs on serpentine outcrops of crumbly black soils in eucalypt woodlands, often in association with *Eucalyptus fibrosa* or *Corymbia xanthope.* At Hidden Valley near Paluma, plants grow in woodland on granite soils dominated by granite ironbark (*E. granitica*), rustyjacket (*C. leichhardtii*) and white mahogany (*E. acmenoides*).	**Yes** Suitable habitat consisting of *Corymbia leichhardtii* on granitic outcrops occurs at the eastern end of the Project Area.			**No** No ALA or WildNet records occur within 20 km of the Project Area. The nearest record is from 1962, located adjacent to Paluma State Forest approximately 25 km to the south east of the eastern end of the Project Area. However that is a known population and the species' distribution is likely based upon those records.	**Unlikely**
Ant plant *Myrmecodia beccarii*	V, V	*Myrmecodia beccarii* occurs in coastal woodland and mangrove between Cooktown and Ingham in Queensland (Department of Agriculture Water and the Environment, 2021c). The Project Area occurs west of the species mapped distribution. This species occurs in open woodland dominated by *Melaleuca viridiflora* or mangroves.	**No** The Project Area occurs west of the species distribution and no habitat dominated by *Melaleuca viridiflora* or mangroves was confirmed during the field surveys.			**No** No ALA or WildNet records occur within 20 km.	**Unlikely**
Water celery *Oenanthe javanica*	-, NT	This species has a widespread native distribution in temperate Asia and tropical Asia, and is also native to Queensland. It occurs in grassland at forest margins, marshlands, water meadows, lakeshores, river banks, muddy stream banks, shallow water (Atlas of Living Australia, no date). The plant grows wild in moist areas, along streams and on the edges of ponds.	**Yes - marginal** Little is known about the species distribution and preferred habitat, and it is listed as a Back on Track species that is data deficient. Therefore, the Project Area may offer suitable habitat for the species, but given the lack of records it may only be marginally suitable.			**Yes** No ALA records occur within 10 km. A single record is found within 20 km (2004) north of the central portion of the Project Area. A single record occurs in the WildNet list (likely the same as ALA records).	**Unlikely**

Species	Status (EPBC Act[1], NC Act[2])	Distribution and habitat requirements	Potential habitat utilisation in Project Area			Records (Atlas of Living Australia, 2021)	Likelihood of Occurrence
			Breeding / Roosting / Nesting	Foraging	Dispersal		
Lesser swamp-orchid *Phaius australis*	E, E	The lesser swamp orchid is found in the coastal areas of Queensland. It is restricted to the margins of swamps surrounded by dry sclerophyll, swampy rainforest or fringing open forest. In North and Central Queensland, *Phaius australis* tends to be restricted to areas that are permanently wet (Department of Agriculture Water and the Environment, 2021c). Only the far eastern extent of the Project Area occurs within the species distribution.	**No** Suitable swamp or rainforest habitat does not occur within the Project Area. The Project Area is not located in a coastal area.			**Yes** No ALA records occur within 20 km of the Project Area, however a single WildNet record occurs within 20 km (2004). The nearest ALA record is 60 km to the north-east of the Project Area.	**Unlikely**
Phaius pictus	V, V	The forest swamp orchid occurs in North Queensland and tends to have a highly localised distribution, being restricted to rainforest from 0 – 600 m in altitude in sheltered, humid sites among close to permanent sources of water and seepage among forest litter on boulders (Department of Agriculture Water and the Environment, 2021c). The Project Area occurs to the west of the species distribution.	**No** No suitable rainforest habitat occurs within the Project Area.			**No** No WildNet records within 20 km or ALA records within 100 km of the Project Area. ALA records occur only within the wet tropical regions and do not extend further south than Mission Beach.	**Unlikely**
Native moth orchid *Phalaenopsis amabilis subsp. Rosenstromii* (Syn. *Phalaenopsis rosenstromii*)	E, E	*Phalaenopsis rosenstromii* occurs in north-east Queensland, sporadically from the Iron Range in the north and as far south as the Paluma Ranges. This species has been recorded in Daintree National Park, Iron Range National Park and Mt Spec National Park (Threatened Species Scientific Committee, 2008). The Project Area occurs to the west of the species distribution. It is known to grow on trees, rarely on rocks, in humid airy situations on sheltered slopes and in gullies, in deep gorges and close to waterfalls and streams, usually in rainforests at altitudes from 200– 500 m (Jones, 2006).	**No** No suitable rainforest habitat occurs within the Project Area.			**No** No ALA or WildNet records within 20 km of the Project Area. A single historical ALA record (1933) occurs in Ingham, >20 km from the eastern extent of the Project Area.	**Unlikely**

Species	Status (EPBC Act[1], NC Act[2])	Distribution and habitat requirements	Potential habitat utilisation in Project Area			Records (Atlas of Living Australia, 2021)	Likelihood of Occurrence
			Breeding / Roosting / Nesting	Foraging	Dispersal		
Tephrosia leveillei	V, V	This species is currently known from the area between Chillagoe and Forty Mile Scrub, and one location further south near Ravenswood (Department of Agriculture Water and the Environment, 2021c). There are six recorded collections of *Tephrosia leveillei* one of which is from Mt Fox (1949). Approximately 100 km of the Project Area occurs mostly within the potential distribution of the species, except at the far eastern extent (Mt Fox) where it occurs within the 'likely' distribution. *Tephrosia leveillei* is a low growing perennial herb that tends to grow on alluvial plains in association with *Eucalyptus cullenii*, *Corymbia erythrophloia, Erythrophleum chlorostachys* and *Grevillia glauca* as well as in tall open *Eucalyptus* and *Corymbia* forests with a dense understory of *Heteropogon contortus.*	**Yes** Suitable habitat comprising Eucalypt woodlands / forests on alluvial plains with *Heteropogon contortus* understorey occurs within the Project Area.			**Yes** This species is known from the Mt Fox area, which is where the eastern extent of the Project Area occurs. Two ALA records (2004 & 2008) occur ~80 km north, north-west of the Project Area near Mount Surprise however locations may have been generalised. No WildNet records occur within 20 km.	**Potential**
Velvet jewel orchid *Zeuxine polygonoides*	V, V	*Zeuxine polygonoides* occurs in three locations in north-east Queensland between the Paluma Range and the Daintree River, at altitudes of 450 to 600 m, growing on the floor of rainforests (Department of the Environment Water Heritage and the Arts, 2008d). Herbarium specimens have been collected at Mount Formartine, north of Cairns; in the Kirrama Range, inland from Cardwell; and the Cardwell Range, near Cardstone. The Project Area does not occur within a known location of the species. Plants have been collected in notophyll vine forest, growing on tops of granite boulders, on flat rocks and among the rotting wood of a fallen tree.	**No** The Project Area does not contain rainforest or notophyll vine forest habitat. As such, no suitable habitat occurs.			**No** No WildNet records occur within 20 km or ALA records within 50 km of the Project Area.	**Unlikely**
Birds							

Species	Status (EPBC Act[1], NC Act[2])	Distribution and habitat requirements	Potential habitat utilisation in Project Area			Records (Atlas of Living Australia, 2021)	Likelihood of Occurrence
			Breeding / Roosting / Nesting	Foraging	Dispersal		
Australian painted snipe *Rostratula australis*	E, V	This species has been recorded from wetlands in all Australian states, however is most common in eastern Australia, especially the Murray-Darling Basin. Individuals are nomadic, and there is some evidence of partial migration from south-eastern wetlands to coastal central and northern Queensland in autumn and winter (Department of Agriculture Water and the Environment, 2021c). Preferred habitat includes shallow inland wetlands, brackish or freshwater, that are permanently or temporarily inundated. Typical sites include those with rank emergent tussocks of grass, sedges, rushes or reeds, or samphire; often with scattered clumps of lignum Muehlenbeckia or canegrass or sometimes tea-tree (*Melaleuca*). Breeding habitat requirements may be quite specific: shallow wetlands with areas of bare wet mud and both upper and canopy cover nearby. Nest records are all, or nearly all, from or near small islands in freshwater wetlands.	**No** No habitat within the Project Area is suitable for breeding. Farm dams did not contain vegetative islands and often lacked fringing canopy vegetation. Edges often had severe cattle pugging.	**Yes – marginal only** Farm dams may provide stepping-stone foraging opportunities for dispersing individuals. Habitat is considered marginal due to the lack of fringing aquatic vegetation and frequent cattle pugging.		**Yes** No WildNet records occur within 20 km. ALA records from 2015 occur at two locations south east of the Ingham airport. An undated record with high spatial inaccuracy (1km) occurs south of Greenvale approximately 50 km away. Multiple records occur > 65 km to the west near Georgetown.	**Potential**
Black-throated finch (southern) *Poephila cincta cincta*	E, E	The black-throated finch's (southern) primary stronghold is the region surrounding Townsville; however it is also known to occur in scattered locations across central-eastern Queensland (Department of Agriculture Water and the Environment, 2021c). Preferred habitat is grassy open woodland/forest dominated by *Eucalyptus*, *Melaleuca* or *Acacia*, but they are also known from pandanus flats and scrubby plains. They feed on the seed of native grasses from the ground. Three resources are required for the black-throated finch (southern) to persist: water, grass seeds and trees providing suitable habitat. If any of these three resources are not available, the sub-species is unlikely to be present. Perennial grasses which are thought to dominate their diet include: *Urochloa mosambicensis*, *Enteropogon acicularis*, *Panicum decompositum*, *P. effusum*, *Dichanthium sericeum*, *Alloteropsis semialata*, *Eragrostis sororia* and *Themeda triandra*. Additional species eaten by the sub-species include: *Schizachyrium* spp, *Echinopogon* sp, *Sorghum* spp and *Paspalum* sp. (Department of the Environment Water Heritage and the Arts, 2009).	**Yes** REs that the species is known to occur in are found within 400 m of a water resource. These areas are considered to provide suitable breeding habitat.	**Yes** REs that the species is known to inhabit occur within 3 km of potential breeding habitat. Six of the eight preferred foraging grass species are found within the Project Area:	**Yes** All remaining vegetation that occurs within 3 km of potential breeding habitat is considered suitable for dispersal.	**Yes** The WildNet report specifies 9 records within 20 km, with the most recent from 1976. The Project Area also intersects a mapped Important Area, which are based off known records. 'Essential habitat' for this species is mapped by DES in three locations surrounding the Project Area.	**Likely**

Species	Status (EPBC Act[1], NC Act[2])	Distribution and habitat requirements	Potential habitat utilisation in Project Area			Records (Atlas of Living Australia, 2021)	Likelihood of Occurrence
			Breeding / Roosting / Nesting	Foraging	Dispersal		
Buff-breasted button-quail *Turnix olivii*	E, E	The buff-breasted button-quail occurs in north-eastern Queensland. It is one of the least known birds in Australia, and has only been recorded in the Iron Range and near Coen, Cooktown, Musgrave, Mount Molloy, Mareeba, Chillagoe and Ingham. The buff-breasted button-quail occurs in patches of short and sparse grassland, on a terrain of small stones (often on the lower slopes of hills and ridges), and sometimes in open glades amongst *Melaleuca, Acacia, Alphitonia* or *Tristania*, in rainforest or open *Eucalyptus* woodland. It has also been recorded on burnt patches of habitat (Department of Agriculture Water and the Environment, 2021c).	**No** The Project Area is outside the distribution of this species. No suitable habitat is therefore expected to occur within the Project Area.			**No** No ALA or WildNet records within 20 km of the Project Area. No ALA records occur in the wider region.	**Unlikely**
Curlew sandpiper *Calidris ferruginea*	CE & Mi, E	This species is a non-breeding migrant to Australia. While in Australia, curlew sandpipers occur around the coasts and are also quite widespread inland, though in smaller numbers (Department of Agriculture Water and the Environment, 2021c). Curlew sandpipers mainly occur on intertidal mudflats in sheltered coastal areas, such as estuaries, bays, inlets and lagoons, and also around non-tidal swamps, lakes and lagoons near the coast, and ponds in saltworks and sewage farms. They occur in both fresh and brackish waters.	**NA** This species does not breed in Australia.	**Yes – marginal only** Farm dams may provide stepping-stone foraging opportunities for dispersing individuals. Habitat is considerered marginal due to the lack of fringing aquatic vegetation and frequent cattle pugging.		**Yes** No WildNet records occur within 20 km. ALA records occur within the Project Area south west of Conjuboy: one undated with a high spatial uncertainty and the other from 1970 (200 m inaccuracy). Most records occur along the coast.	**Potential**
Eastern curlew *Numenius madagascariensis*	CE & Mi, E	Within Australia, the eastern curlew has a primarily coastal distribution, they are rarely recorded inland (Department of Agriculture Water and the Environment, 2021c). During the non-breeding season in Australia, the eastern curlew is most commonly associated with sheltered coasts, especially estuaries, bays, harbours, inlets and coastal lagoons, with large intertidal mudflats or sandflats, often with beds of seagrass (*Zosteraceae*). Occasionally, the species occurs on ocean beaches (often near estuaries), and coral reefs, rock platforms, or rocky islets.	**NA** This species does not breed in Australia.	**No** Habitat within the Project Area is not tidal and does not contain sandflats or mudlats.	**No** This species is primarily coastal and moves north and south, rather than inland.	**No** No ALA or WildNet records occur within 20 km of the Project Area. ALA records in the region are concentrated along the coastline which is the primary movement corridor for the species.	**Unlikely**

Species	Status (EPBC Act[1], NC Act[2])	Distribution and habitat requirements	Potential habitat utilisation in Project Area			Records (Atlas of Living Australia, 2021)	Likelihood of Occurrence
			Breeding / Roosting / Nesting	Foraging	Dispersal		
Gouldian finch *Erythrura gouldiae*	E, E	This species is found in northern Australia from Cape York Peninsula through north-west Queensland and the north of the Northern Territory to the Kimberley Region of Western Australia (Department of Agriculture Water and the Environment, 2021c). The gouldian finch inhabits open woodlands that are dominated by *Eucalyptus* trees and support a ground cover of *Sorghum* and other grasses. The critical components of suitable core habitat for the gouldian finch appear to be the presence of favoured annual and perennial grasses (especially *Sorghum*), a nearby source of surface water and, in the breeding season, unburnt hollow-bearing *Eucalyptus* trees. When breeding they use small patches of open woodland, usually on ridges dominated by cavity bearing trees such as white northern gum (*Eucalyptus brevifolia*) in the west and Territory salmon gum (*E. tintinnans*) in the east.	**Yes - marginal** The Project Area contains habitat with hollow-bearing eucalypts within 4 km of perennial water. However tree species present are not the same as the species is known to utlise in the east (*E. tintinnans*).	**Yes - marginal** The Project Area is generally dominated by native perennial grasses however *Sorghum spp.* has not been recorded.	**Yes** This species is highly mobile and could disperse easily across all vegetation of the Project Area.	**No** The WildNet report specifies 3 records within 20 km, with the most recent from 1984. This species has undergone severe declines in Queensland and is now very rarely observed in the wild. Reliable and recent records are now only known from the Cairns area. One undated ALA record with very high spatial uncertainty occurs within 50 km of the Project Area, east of Einasleigh.	**Unlikely**
Grey falcon *Falco hypoleucos*	V, V	The grey falcon is endemic to mainland Australia, occurring in arid and semi-arid regions including the Murray-Darling Basin, Eyre Basin, central Australia and Western Australia. The species occurs at low densities across its range and is reported to be absent from the Cape York Peninsula, as well as areas east of the Great Dividing Range in Queensland and New South Wales (Threatened Species Scientific Committee, 2020). The grey falcon occurs in timbered lowland plains, particularly *Acacia* shrublands that are crossed by tree-lined water courses. It has also been observed foraging in treeless areas, tussock grassland and open woodland (Threatened Species Scientific Committee, 2020). At night, roosting may occur on areas of bare ground (Schoenjahn, 2018). When breeding this species utilises the disused nests of other raptors or corvids. Nests that occur in the tallest trees along watercourses, particularly *Eucalyptus camaldulensis* and *E. coolabah*, are preferred. However, like other falcons this species may also nest in telecommunication towers.	**Yes** The Project Area contains riparian Eucalypt woodland habitat suitable for nesting. Raptor nests were occasionally recorded in this habitat during the field survey.	**Yes** The Project Area contains a variety of vegetation communities including open woodlands, *Acacia sp.* dominated woodlands and grasslands that are likely to be suitable for foraging.	**Yes** This species is highly mobile. Vegetation communities that are suitable for foraging are also considered suitable for dispersal.	**Yes** No WildNet records occur within 20 km. Two undated ALA records with high spatial uncertainty occur within 50 km of the Project Area: one is located north of Conjuboy and the other north of the Valley of Lagoons. This species is known to be rare and occur at low densities throughout its distribution.	**Potential**

Species	Status (EPBC Act[1], NC Act[2])	Distribution and habitat requirements	Potential habitat utilisation in Project Area			Records (Atlas of Living Australia, 2021)	Likelihood of Occurrence
			Breeding / Roosting / Nesting	Foraging	Dispersal		
Masked owl (northern) *Tyto novaehollandiae kimberli*	V, V	The masked owl is known to use a range of habitat types in Queensland including riparian woodland, rainforest, open forests, *Melaleuca* swamps and mangrove edges. In Queensland, there are historical records of the masked owl from the Normanton region, and from Pascoe, Archer, Chester and Watson Rivers on Cape York Peninsula. It occurs along the southern rim of the Gulf of Carpentaria, Cape York Peninsula and south to Atherton Tablelands and the Einasleigh-Burdekin divide (Department of Agriculture Water and the Environment, 2021c).	**Yes** Habitat that has medium to large hollows suitable for nesting occurs within the Project Area.	**Yes** The Project Area contains a variety of vegetation communities suitable for foraging including riparian woodland and open forests.	**Yes** This species is highly mobile. Vegetation communities that are suitable for foraging are also considered suitable for dispersal.	**Yes** The WildNet report specifies one record within 20 km, dated 14/07/2020. ALA records occur at three locations east of the Project Area within 50 km: Ingham (dated 1770), Paluma State Forest north (dated 1998) and south (also dated 1998).	**Likely**
Red goshawk *Erythrotriorchis radiatus*	V, E	In northern Queensland, red goshawks are mainly associated with extensive, uncleared, mosaics of native vegetation, especially riparian vegetation, open forest and woodland that contain a mix of eucalypt, ironbark and bloodwood species. Permanent water (watercourses and wetlands) is usually present in close proximity, with tall emergent trees used for nesting. The red goshawk is thought to have a very large home range covering between 50 and 220 square kilometres. Sparsely distributed across coastal and sub-coastal Australia, from the western Kimberly to northern New South Wales. Appears to have been a contraction in range in recent years. Occasionally recorded from gorge country in central Australia and western Queensland (Department of Agriculture Water and the Environment, 2021c).	**Yes** Within the Project Area, only the 'Open Eucalyptus, Casurina and Melaleuca riparian woodland habitat' contained trees ~ 25 m tall near permanent water. These trees are considered some of the tallest in the landscape and are thus potentially suitable for nesting.	**Yes** Areas of contiguous open forest and woodland containing a mix of eucalypt, ironbark and bloodwood species occur within the Project Area and are suitable for foraging.	**Yes** Areas of native vegetation dominated by Eucalypts that are >10 km from water are considered suitable for dispersal only.	**Yes** No WildNet records within 20 km. ALA records occur at four locations north east and east of the Project Area within 50 km. The most recent is from 1989. Three of the four locations are coastal, between Ingham and Crystal Creek. This species is capable of flying large distances and has a large home range.	**Potential**

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			Breeding / Roosting / Nesting	Foraging	Dispersal		
Southern cassowary *Casuarius casuarius johnsonii*	E, V	The cassowary is the only member of the cassowary family in Australia and occurs in three populations in north Queensland. In the Wet Tropics it is distributed widely from Cooktown to just north of Townsville. Core habitat is coastal lowlands between Ingham and Mossman, and uplands in the southern Atherton Tablelands and other ranges (Department of Agriculture Water and the Environment, 2021c). Only the very far eastern Project Area extent occurs within the mapped distribution of the species. While cassowaries live in and depend on tropical rainforest they will also utilise a mosaic of associated habitats when these are available as intermittent food sources and as connecting habitat between more suitable sites (Crome & Moore, 1990). Associated habitats utilised include mangroves, melaleuca, eucalypt woodlands, swamps and swamp forests. Cassowaries rely upon a year-round supply of fleshy fruit and these associated habitats can provide crucial food resources at certain times of year.	**No** No rainforest habitat occurs within the Project Area. Habitat modelling referred to in the species' Recovery Plan indicates no essential or core habitat occurs within the Project Area.	**No** No rainforest habitat or habitat containing large fruiting trees occurs within the Project Area. This species is highly mobile and considered unlikely to utilise the habitat within the Project Area for dispersal given only the eastern extent occurs within the species distribution.		**No** The WildNet report specifies 3 records within 20 km. No ALA records occur within 10 km of the Project Area. Records of the species exist in the denser forest / rainforest to the east of Mount Fox and to the north near Girringun National Park.	**Unlikely**
Squatter pigeon (southern) *Geophaps scripta scripta*	V, V	This sub-species is now largely (if not wholly) restricted to Queensland, from the New South Wales border, north to the Burdekin River, west to Charleville and Longreach, and east to the coast to Townsville and Proserpine (Department of Agriculture Water and the Environment, 2021c). The squatter pigeon occurs in dry grassy woodland and open forest, mostly in sandy and gravel areas (land zone 5 and 7) close to water. Breeding and foraging habitat is centralised around water resources such as dams and creeks (1-3 km). This sub-species is ground-dwelling that inhabits the grassy understorey of open eucalypt woodland, as well as sown grasslands with scattered remnant trees, disturbed areas (such as roads, railways, settlements and stockyards), scrubland, and *Acacia* regrowth.	**Yes** This species forms a nest in a scrape in the ground. All vegetation on suitable land zones (3, 5 and 7) within 1 km of permanent water are considered to be suitable for breeding.	**Yes** All vegetation on suitable land zones (3, 5 and 7) that is >1 km from permanent water but < 3 km occurs within the Project Area. These areas are suitable for foraging.	**Yes** Vegetation within the Project Area that is not suitable for breeding or foraging is considered suitable for dispersal.	**Yes** This species was recorded within the Project Area during the field surveys. The WildNet report specifies one record within 20 km, dated 1976.	**Known**

Species	Status (EPBC Act[1], NC Act[2])	Distribution and habitat requirements	Potential habitat utilisation in Project Area			Records (Atlas of Living Australia, 2021)	Likelihood of Occurrence
			Breeding / Roosting / Nesting	Foraging	Dispersal		
White-throated needletail *Hirundapus caudacutus*	V & Mi, SLC	The white-throated needletail is found across a range of habitats, more often over wooded areas, where it is almost exclusively aerial, though does roost in tree hollows and the foliage canopy. It forages for insects on the wing; flying anywhere between "cloud level" and "ground level" and readily forms mixed feeding flocks with other aerial insectivores. This species is widespread in eastern and south-eastern Australia. In eastern Australia, it is recorded in all coastal regions of Queensland and New South Wales, extending inland to the western slopes of the Great Divide and occasionally onto the adjacent inland plains (Department of Agriculture Water and the Environment, 2021c).	**Yes** The Project Area contains remnant vegetation on steep escarpment and hills that is likely to provide suitable roosting habitat.	**Yes** This species is predominantly aerial and feeds on the wing. Movements are generally in response to foraging resources and as such all remaining areas of the Project Area are considered suitable for foraging and dispersal.		**Yes** An ALA record from 2000 occurs within 2 kms of the Project Area, east of the Valley of Lagoons. The WildNet report also identified a single record from 2000 within 20 km. Multiple scattered records occur within 50 km particularly at the eastern end of the Project Area.	**Likely**
Mammals							
Bare-rumped sheath-tailed bat *Saccolaimus saccolaimus nudicluniatus*	V, E	In Queensland, the bare-rumped sheath-tailed bat occurs from Ayr to the Iron Range, including Magnetic and possibly Prince of Wales Islands. Most records are near-coastal, but one record in the Northern Territory occurs 150 km inland (Department of Agriculture Water and the Environment, 2021c). As per the species' SPRAT, the Project Area occurs within the species' potential distribution, which is highly patchy. The bare-rumped sheath-tailed bat occurs mostly in lowland areas, typically in a range of woodland, forest and open environments, and possibly rainforest. Little is known of the roosting ecology of this species and all located roosts are from incidental records. All confirmed roosting records are from deep tree hollows in the Poplar Gum, Darwin Woollybutt (*Eucalyptus miniata*) and Darwin Stringybark (*E. tetrodonta*).	**No** While tree hollows which do occur within the Project Area, the tree species' bearing are not preferred. The Project Area is not coastal and as such no lowland habitat is present.	**No** Woodland, forest and open environments occur within the Project Area however at elevations ranging from 400m to 800m. As such, no habitat within the Project Area is considered suitable for foraging or dispersal.		**No** No WildNet records occur within 20 km or ALA records within 40 km of the Project Area. The nearest record occurs ~45 km to the north east of the eastern Project Area, near Girrigun National Park closer to the coast.	**Unlikely** Bat call analysis completed by Greg Ford did not identify this species as an occurrence within the Project Area.

Species	Status (EPBC Act[1], NC Act[2])	Distribution and habitat requirements	Potential habitat utilisation in Project Area			Records (Atlas of Living Australia, 2021)	Likelihood of Occurrence
			Breeding / Roosting / Nesting	Foraging	Dispersal		
Black-footed tree-rat *Mesembriomys gouldii rattoides*	V, -	The distribution of the black-footed tree rat (north Queensland) is poorly known. It has been recorded mostly around Mareeba, but there are records sparsely across Cape York Peninsula (Department of Agriculture Water and the Environment, 2021c). As per the species' SPRAT, the Project Area occurs within the species' potential distribution. This species mostly occurs in eucalypt forests and woodlands, especially where hollows are relatively plentiful. It dens mostly in tree hollows, but occasionally in dense foliage (notably of Pandanus) and in buildings. The diet comprises mostly fruits (including of the tough *P. spiralis*) and seeds, but also includes some invertebrates, flowers and grass.	**Yes - marginal** The Project Area does not contain areas of Pandanus however some hollow-bearing Eucalypts do occur.	**Yes – marginal** The Project Area does not support a variety of fruiting trees or Pandanus, however native grass and invertebrates are common.	**Yes** This species does not have specific requirements for dispersal habitat and as such all eucalypt forests and woodlands are likely to be suitable.	**No** No ALA records occur within >50 km of the Project Area. All recent records of this species occur approximately 200 km north. The WildNet report identified one record within 20 km dated 1986.	**Unlikely**
Chestnut dunnart *Sminthopsis archeri*	-, NT	The chestnut dunnart was thought to be restricted to southern Papua New Guinea and Cape York, until it was recorded in woodlands approximately 200 km west of Townsville at Blackbraes National Park (Wilson and Reeder, 2005). This species is known from open woodland to tall open forest and heathlands, but is thought to prefer stringybark woodlands on red earths, although little is known about its ecology and few surveys have been undertaken throughout its potential distribution across northern Queensland and the Northern Territory. The latest specimen, from Blackbraes National Park, was taken in bloodwood and ironbark eucalypt woodland on granite soils.	**Yes – marginal** Bloodwood and ironbark eucalypt woodland on granite occurs within the Project Area which may be suitable for the species. Given the poorly understood ecology of this species within Einasleigh Uplands and that the Project Area supports similar woodland to that described in Blackbraes National Park (more than 70 km to the south of the Project Area), the species is a potential occurrence, particularly in the granite derived woodlands.			**No** No ALA or WildNet records occur within 20 km of the Project Area.	**Potential**

Species	Status (EPBC Act[1], NC Act[2])	Distribution and habitat requirements	Potential habitat utilisation in Project Area			Records (Atlas of Living Australia, 2021)	Likelihood of Occurrence
			Breeding / Roosting / Nesting	Foraging	Dispersal		
Ghost bat *Macroderma gigas*	V, E	The species' current range is discontinuous, with geographically disjunct colonies occurring in the Pilbara, Kimberley, Northern Territory, the Gulf of Carpentaria, coastal and near coastal eastern Queensland from Cape York to near Rockhampton, and western Queensland (Department of Agriculture Water and the Environment, 2021c). The Project Area occurs within the 'likely' distribution of the species as per its SPRAT. The ghost bat currently occupies habitats ranging from the arid Pilbara to tropical savanna woodlands and rainforests. During the daytime they roost in caves, rock crevices and old mines. Roost areas used permanently are generally deep natural caves or disused mines with a relatively stable temperature of 23°−28°C and a moderate to high relative humidity of 50−100%. One study found that foraging areas were centred, on average, 1.9 km from the daytime roost.	**Yes** No caves or large rock crevices suitable for roosting occur within the Project Area However, a number of 'abandoned mines' occur in the local area as per the DoR 'Mineral resource sites' layer and may contain mine shafts suitable for roosting.	**Yes** The Project Area contains a variety of vegetation communities within 2 km of suitable roosting habitat that are likely to be suitable for foraging and dispersal of the species.		**Yes** No WildNet records occur within 20 km. No ALA records occur within 50 km of the Project Area, however scattered records occur within 80 km to the south east (near Hervey Range), to the south west (near Blackbraes National Park) and to the north near Mount Surprise and Undara Volcanic National Park.	**Potential**
Greater glider *Petauroides volans* *Northern greater glider* *Petauroides minor*	V, V	The species is currently undergoing a taxonomic split, whereby the subspecies *P. volans minor* will be considered *P. minor*, the northern greater glider (McGregor *et al.*, 2020; Department of Agriculture Water and the Environment, 2021a). The northern greater glider occurs in the wet-dry tropical region of north eastern Australia, with a distribution from slightly south of Townsville northwards to the Windsor Tableland. This distribution is very patchy, with some isolated subpopulations, for example in the Gregory Range/Gilbert Plateau west of Townsville, and Blackbraes National Park (Department of Agriculture Water and the Environment, 2021a). During the day, this species spends most of its time denning in hollowed trees, with each animal inhabiting up to twenty different dens within its home range. It is primarily folivorous, with a diet mostly comprising the leaves and flowers of Myrtaceae (e.g. eucalypt) trees. The greater glider is typically found in highest abundance in taller, montane, moist eucalypt forests with relatively old trees and abundant hollows.	**Yes** Trees bearing medium or large hollows were recorded during the field surveys, primarily in the 'Open Eucalyptus, Casuarina and Melaleuca riparian woodland' habitat. Abundance was generally moderate and is therefore considered suitable for breeding.	**Yes** The Project Area contains woodlands and forests dominated by *Eucalyptus sp.* in both remnant and HVR condition in proximity to potential breeding habitat; these vegetation communities are suitable for foraging.	**Yes** Habitat within the Project Area is highly connected with gaps between patches of vegetation rarely > 120 m. All potential foraging habitat is also considered suitable for dispersal.	**Yes** This species was recorded within the Project Area during the field surveys. The WildNet report specifies four records within 20 km; the most recent from 2001.	**Known**

Species	Status (EPBC Act[1], NC Act[2])	Distribution and habitat requirements	Potential habitat utilisation in Project Area			Records (Atlas of Living Australia, 2021)	Likelihood of Occurrence
			Breeding / Roosting / Nesting	Foraging	Dispersal		
Grey-headed flying-fox *Pteropus poliocephalus*	V, -	Grey-headed flying-foxes occupy the coastal lowlands and slopes of south-eastern Australia from Bundaberg to Geelong and are usually found at altitudes < 200 m. Areas of repeated occupation extend inland to the tablelands and western slopes in northern New South Wales and the tablelands in southern Queensland (Department of Agriculture Water and the Environment, 2021c). Only the far eastern extent of the Project Area occurs within the mapped distribution of the species, according to SPRAT. This species 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, *Melaleuca* swamps and *Banksia* woodlands. The primary food source is blossom from *Eucalyptus* and related genera but in some areas it also utilises a wide range of rainforest fruits.	**No** No flying-fox roosts were recorded during the field survey, and the nearest occurs >30 km east in Ingham. As such, the Project Area does not contain potential roosting habitat.	**No** Although vegetation communities within the Project Area may provide suitable foraging resources, the Project Area occurs at elevations > 400 m and is largely outside the species' distribution. This species is also expected to forage and disperse in the vicinity of a roost, however no potential roosting habitat occurs. As such, no habitat suitable for foraging and dispersal occurs within the Project Area.		**No** No WildNet records occur within 20 km or ALA records within 50 km. The closest known mixed colony flying-fox roost is at Ingham (>35 km east of the most eastern extent of the Project Area).	**Unlikely**
Koala *Phascolarctos cinereus*	V, V	In north Queensland, the koala's distribution extends inland from the east coast: from the Wet Tropics bioregion, into the Einasleigh Uplands bioregion in the north of the state (Department of Agriculture Water and the Environment, 2021c). The northern limit of the distribution of the koala in Queensland has contracted to the south, from approximately Cooktown to inland of Cairns, since the late 1960s. Koalas inhabit a range of temperate, sub-tropical and tropical forest, woodland and semi-arid communities. Koalas eat a variety of eucalypt leaves and a few other related tree species, including *Lophostemon*, *Melaleuca* and *Corymbia* species. Koalas are found in higher densities where food trees are growing on more fertile soils and along watercourses. They do, however, remain in areas where their habitat has been partially cleared and in urban areas. Koala does not have specific breeding habitat requirements.	**Yes - Refuge** The Project Area contains remnant woodlands and forests dominated by *Eucalyptus spp.* in connected patches > 500 ha in the landscape. These areas are considered to provide suitable refuge habitat.	**Yes** Other areas of remnant or HVR vegetation that is dominated by *Eucalyptus spp.* but not highly connected are considered suitable for foraging.	**Yes** The Project Area also contains vegetation in remnant, HVR or non-remnant condition that are not dominated by *Eucalyptus spp.* but still contain occasional individuals. These areas are likely to be used primarily for dispersal between areas of higher quality foraging habitat.	**Yes** This species was not observed during the field survey however scats collected were identified by Barbara Triggs as 'probable' koala. Anecdotal information from on-site personnel and local residents also confirmed sightings near Kidston, along the Copperfield River and on lot and plans 1/CLK23 and 6/WU50. The WildNet report specifies 5 records occur within 20 km; the most recent from 2003.	**Likely**

Species	Status (EPBC Act[1], NC Act[2])	Distribution and habitat requirements	Potential habitat utilisation in Project Area			Records (Atlas of Living Australia, 2021)	Likelihood of Occurrence
			Breeding / Roosting / Nesting	Foraging	Dispersal		
Large-eared horseshoe bat *Rhinolophus philippinensis*	V, E	The large-eared horseshoe bat occurs only in northern Queensland, from the Iron Range southwards to Townsville and west to the karst regions of Chillagoe and Mitchell-Palmer (Department of Agriculture Water and the Environment, 2021c). The primary habitat of the large-eared horseshoe bat is rainforests. Daytime roosting habitat for this species includes caves and underground mines located in rainforest, and open eucalypt forest and woodland. At night, they forage mainly in open forest and wattle-dominated ridges in rainforest. In open forest and woodland, they prefer to forage amongst the thicker vegetation in gullies and along creeks, though they have been observed at the edge of grassy clearings in rainforest and road edges.	**No** The Project Area does not contain caves or underground mines located in rainforest.	**No** The Project Area lacks the preferred habitat of rainforest and gallery forest-lined creeks.		**No** No ALA records occur within 50 km of the Project Area. The WildNet report identified one record within 20 km of the Project Area. However all records occur within tropical habitat.	**Unlikely** Bat call analysis completed by Greg Ford did not identify this species as an occurrence within the Project Area.
Mahogany glider *Petaurus gracilis*	E, E	The mahogany glider prefers open forests as the habitat allows for uninterrupted gliding paths between trees (Department of Agriculture Water and the Environment, 2021c). Den-tree species usually include *Eucalyptus platyphylla*, *E. tereticornis*, *Corymbia intermedia* and *C. clarksoniana* (Parson and Latch, 2007). More than 20 tree and shrub species provide nectar, pollen and sap that the mahogany glider eats, including eucalypts, bloodwoods, melaleucas, acacia, *Albizia procera*, and Xanthorrhoea flower spikes (Parson and Latch, 2007). The species is only found in a narrow 122 km long strip of the southern Wet Tropics of north Queensland. The Project Area is located approximately 8 km to the west of this area and is therefore outside of the species' range.	**No** As the Project Area does not occur within the species' distribution, no suitable habitat occurs. Only 1% of the Project Area occurs within the Wet Tropics bioregion.			**No** No ALA records occur within 20 km of the Project Area. The WildNet report specifies 30 records occurs within 20 km however these are likely to all occur east of the Project Area where the species is known to occur. This species was not recorded during the field survey.	**Unlikely**

Species	Status (EPBC Act[1], NC Act[2])	Distribution and habitat requirements	Potential habitat utilisation in Project Area			Records (Atlas of Living Australia, 2021)	Likelihood of Occurrence
			Breeding / Roosting / Nesting	Foraging	Dispersal		
Northern quoll *Dasyurus hallucatus*	E, -	In Queensland, the northern quoll is known to occur as far south as Gracemere and Mount Morgan, south of Rockhampton, as far north as Weipa in Queensland and extends as far west into central Queensland to the vicinity of Carnarvon Range National Park (Department of Agriculture Water and the Environment, 2021c). This species occupies a diversity of habitats across its range which includes rocky areas, eucalypt forest and woodlands, rainforests, sandy lowlands and beaches, shrubland, grasslands and desert. Northern quoll are also known to occupy non rocky lowland habitats such as beachscrub communities in central Queensland. Habitat generally encompasses some form of rocky area for denning purposes with surrounding vegetated habitats used for foraging and dispersal. Eucalypt forest or woodland habitats usually have a high structural diversity containing large diameter trees, termite mounds or hollow logs for denning purposes.	**Yes** The Project Area contains rocky outcrops suitable for denning as well as eucalypt forest and woodland with occasional large fallen logs.	**Yes** The Project Area contains remnant patches of forest and woodland vegetation that are within 1 km of suitable denning habitat. These areas provide connectivity between denning habitat and landscape features such as water sources and are considered suitable for the foraging and dispersal of this species.		**Yes** No WildNet records occur within 20 km. However, a record from 1997 occurs within 50 km of the Project Area, located south east in Paluma National Park. Another record occurs approximately 70 km north near Undara Volcanic National Park. This species was not recorded during the field survey.	**Likely**
Northern bettong *Bettongia tropica*	E, E	The northern bettong is endemic to the Wet Tropics bioregion in north Queensland. It has a small, fragmented distribution and only occurs within a thin strip of sclerophyll forest along the western margin of rainforest in the ecotone between savanna woodland and rainforest. It is known to occur in the following locations: the western side of Lamb Range, the western edge of the Mt Carbine Tableland, Mt Windsor Tableland and Coane Range (Paluma). The Project Area does not occur within the species distribution or intersect a known location. Habitat includes a range of eucalypt forest types, from tall and wet forest dominated by *Eucalyptus grandis* and tall forest dominated by *Eucalyptus resinifera,* abutting the rainforest, to medium height and drier woodlands dominated by *Corymbia citriodora* and *Eucalyptus platyphylla* (Department of Agriculture Water and the Environment, 2021c).	**No** As the Project Area does not occur within the species' distribution, no suitable habitat occurs.			**No** No ALA or WildNet records occur within 20 km of the Project Area. ALA records do occur to the south east in Paluma Range National Park however this is within the species' distribution.	**Unlikely**

Species	Status (EPBC Act[1], NC Act[2])	Distribution and habitat requirements	Potential habitat utilisation in Project Area			Records (Atlas of Living Australia, 2021)	Likelihood of Occurrence
			Breeding / Roosting / Nesting	Foraging	Dispersal		
Semon's leaf-nosed bat *Hipposideros semoni*	V, E	The known broad-scale distribution for Semon's leaf-nosed bat includes coastal Queensland from Cape York to just south of Cooktown (Department of Agriculture Water and the Environment, 2021c). The eastern extent of the Project Area occurs within the 'potential' distribution of the species. It is found in tropical rainforest, monsoon forest, wet sclerophyll forest and open savannah woodland. Dense vegetation is required for foraging. Roosting may occur in tree hollows, deserted buildings in rainforest, road culverts and shallow caves amongst granite boulders or in fissures.	**Yes** Rocky outcrops with large boulders occur within the Project Area and may be suitable for roosting.	**Yes - marginal** Habitat within the Project Area may be considered open savannah woodland, which is suitable for the foraging and dispersal of the species. However, areas of dense vegetation were limited and habitat is considered marginal as a result.		**No** No ALA or WildNet records within 20 km. This species is known from coastal areas and the closest ALA records are approximately 375 km north of the Project Area.	**Unlikely**
Sharman's rock-wallaby *Petrogale sharmani*	V, V	The range of Sharman's rock-wallaby is limited. It is known from only about 20 colonies scattered within a 2,000 km^2 area of the Seaview and Coane Ranges, west of Ingham in north-eastern Queensland (Department of Agriculture Water and the Environment, 2021c). The species occurs in a variety of rocky habitats (including rocky outcrops, boulder piles, gorges, cliff lines and rocky slopes) within open forests or grassy woodlands. It shelters during the day in rocky refuges or dense vegetation, emerging at dusk to feed (Eldridge, 2012).	**Yes** During the field survey this species was observed utilising rocky outcrops with large boulders. These areas are likely suitable for breeding and refuge.	**Yes** All remnant and HVR vegetation on igneous or granitic substrates that occurs between or east of breeding habitat (within the species' distribution) is considered to provide suitable foraging and dispersal habitat.		**Yes** This species was recorded within the Project Area during the field surveys. The WildNet report specifies 37 records within 20 km, with the most recent from 1988.	**Known**
Short-beaked echidna *Tachyglossus aculeatus*	-, SLC	The short-beaked echidna is found throughout Australia, including Tasmania (WetlandInfo, 2018). The short-beaked echidna lives in forests and woodlands, heath, grasslands and arid environments. This species can live anywhere with a good supply of food, and regularly feast on ants and termites.	**Yes** Due to the generalist habitat requirements for the short-beaked echidna, the Project Area provides suitable habitat for breeding, foraging and dispersal.			**Yes** This species was recorded within the Project Area during the field surveys.	**Known**

Species	Status (EPBC Act[1], NC Act[2])	Distribution and habitat requirements	Potential habitat utilisation in Project Area			Records (Atlas of Living Australia, 2021)	Likelihood of Occurrence
			Breeding / Roosting / Nesting	Foraging	Dispersal		
Spectacled flying-fox *Pteropus conspicillatus*	E, V	The spectacled flying-fox occurs in north-eastern Queensland, north of Cardwell with past records from Brisbane and Chillagoe. It is restricted to tropical rainforest areas, most specifically, the species occurs between Ingham and Cooktown, and between the McIlwrait and Iron Ranges of Cape York (Department of Agriculture Water and the Environment, 2021c). Only the far eastern extent of the Project Area falls within the mapped distribution of the species. This species was long assumed to feed primarily on rainforest species but individuals regularly feed on a wide variety of non-rainforest species, including eucalypts (*Eucalyptus spp.*, *Corymbia spp.*) in tall open forests adjoining rainforest communities and in tropical woodland and savanna ecosystems. The species may travel up to 50 km in one night to feed (Threatened Species Scientific Committee, 2019).	**No** Suitable breeding habitat in the form of wet, closed forest was not identified during the field surveys, nor were any flying-fox roosts.	**Yes** The Project Area contains vegetation that adjoins rainforest communities in the wider area. Vegetation is generally dominated by *Eucalyptus spp.* and is therefore considered suitable for foraging. This species is highly mobile and is expected to utilise potential foraging habitat to disperse within the landscape.		**Yes** A 1974 ALA record occurs 11 km south of the Project Area near the Gregory Highway. The WildNet report specifies one record occurs within 20 km also from 1974 (likely the same). Another ALA record (2007) occurs within 40 km to the south east. The closest known roost is at Ingham (~40 km east of the Project Area). This species was not recorded during the field surveys.	**Potential**
Spotted-tailed quoll *Dasyurus maculatus gracilis*	E, E	The spotted-tailed quoll is mostly confined to the relatively cool, wet and climatically equable upland closed-forests (mostly above 900 m altitude) that occur in the upper catchments of rivers draining east and west of the Eastern Escarpment in the Wet Tropics bioregion of north-eastern Queensland. Historically, this subspecies occurred from the Paluma Range near Townsville north to near Cooktown, however is now thought to be confined to two extant populations: one centred on the Windsor and Carbine Tablelands, Thornton Peak, Mount Finnegan and the other centred on the Atherton Tablelands and associated mountain ranges (Department of Agriculture Water and the Environment, 2021c). The population in the Paluma Range (Mt Spec region) is possibly extinct, with no records since the early 1940s despite high levels of visitation and human occupancy of that region. The Project Area occurs directly west of the species distribution.	**No** The Project Area does not occur within the mapped distribution of the species. Furthermore, no closed forest occurs within the Project Area that would be suitable for the species.			**No** No WildNet records occur within 20 km or ALA records within 30 km of the Project Area. The nearest ALA records are dated 1920 and 1984 and occur approximately 45 km to the south east in Paluma Range National Park. This species was not recorded during the field survey.	**Unlikely**
Reptiles							

Species	Status (EPBC Act[1], NC Act[2])	Distribution and habitat requirements	Potential habitat utilisation in Project Area			Records (Atlas of Living Australia, 2021)	Likelihood of Occurrence
			Breeding / Roosting / Nesting	Foraging	Dispersal		
Atherton delma *Delma mitella*	V, NT	This species has a highly restricted distribution, found only on the eastern side of the Atherton Tableland in north-eastern Queensland, from Atherton to south of Ingham. Specimens have been collected near Herberton and Ravenshoe. It occurs in tall open forests and rainforest interfaces (Department of the Environment Water Heritage and the Arts, 2008c).	**No** The Project Area does not occur within the mapped distribution of the species. Furthermore, no rainforest interfaces occur within the Project Area that would be suitable for the species.			**No** No WildNet or ALA records occur within 20 km. The nearest ALA records occur approximately 30 km to the south east in Paluma State Forest, which is within the species known distribution.	**Unlikely**
Common death adder *Acanthophis antarcticus*	-, NT	This species occurs from the Gulf region of the Northern Territory across to central and eastern Queensland and New South Wales, and through to the southern parts of South Australia and Western Australia (Department of Environment and Heritage Protection, 2017). This species occurs from the Gulf region of the Northern Territory across to central and eastern Queensland and New South Wales, and through to the southern parts of South Australia and Western Australia (Department of Environment and Heritage Protection, 2017).	**Yes** Due to the generalist habitat requirements for the common death adder, the Project Area provides suitable habitat for breeding, foraging and dispersal.			**No** Spatially and temporally valid records do not occur surrounding the Project Area (ALA).	**Potential**
Yakka skink *Egernia rugosa*	V, 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, Mulga Lands, South-east Queensland, Einasleigh Uplands, Wet Tropics and Cape York Peninsula Biogeographical Regions (Department of Agriculture Water and the Environment, 2021c). The Project Area occurs within the 'potential' range of the species. Habitat requirements are poorly known; however, this species is known from rocky outcrops, sand plain areas and dense ground vegetation, in association with open dry sclerophyll forest (ironbark) or woodland, brigalow forest and open shrubland. Colonies have been found in large hollow logs, cavities or burrows under large fallen trees, tree stumps, logs, stick-raked piles, large rocks and rock piles, dense ground-covering vegetation, and deeply eroded gullies, tunnels and sinkholes (Department of Sustainability Environment Water Population and Communities, 2011). The core habitat of this species is within the Mulga Lands and Brigalow Belt South Bioregions.	**Yes** The Project Area contains rocky areas within open dry sclerophyll forest or woodland on land zones 3, 5 and 7. These areas were found to commonly contain microhabitat features including large fallen logs during the field survey.	**NA**		**Yes** No WildNet records occur within 20 km or ALA records within 50 km of the Project Area. The nearest records are from 2003 and occur at Blackbraes National Park, approximately 70 km to the south west. However, the location of these records have been generalised by 10 km to protect the species and as such may occur closer.	**Potential**

Species	Status (EPBC Act[1], NC Act[2])	Distribution and habitat requirements	Potential habitat utilisation in Project Area			Records (Atlas of Living Australia, 2021)	Likelihood of Occurrence
			Breeding / Roosting / Nesting	Foraging	Dispersal		
Amphibians							
Australian lace-lid *Litoria dayi*	V, E	The Australian lace-lid frog occurs throughout the Wet Tropics Bioregion from Paluma to Cooktown, northern Queensland, at altitudes between 0 and 1200 m c Only the far eastern extent of the Project Area occur within the species' distribution. This frog is a rainforest species, endemic to the Wet Tropics bioregion. It is associated with rainforests and rainforest margins. In montane areas the species prefers fast-flowing rocky streams although they also frequent slower watercourses where ample vegetation exists along the margins.	**No** The Project Area does not contain rainforest or montane habitat suitable to the species.			**No** No WildNet records occur within 20 km. An ALA record (1990) occurs within 5 km of the Project Area however it specifies it is from Birthday Creek, which is located within Paluma National Park east of the Project Area. All other ALA records occur >20 km to the north east and south east in National Park.	**Unlikely**
Magnificent brood frog *Pseudophryne covacevichae*	V, V	This species is known only from a small area near Ravenshoe, north Queensland. They breed in around seepage areas in open eucalypt forests (Threatened Species Scientific Committee, 2017). The dominant plant species include *Eucalyptus acmenoides* (Yellow Stringybark), *E. citriodora* (lemon scented gum), *E. intermedia* (pink bloodwood), *E. leichhardtii* (yellow jacket), *E. reducta* (stringybark), *E. resinifera* (red mahogany) and *Syncarpia glomulifera* (turpentine). The understorey of these forests is comprised of kangaroo grass (*Themeda triandra*), grass trees (*Xanthorrhoea sp*.)., sedges (*Gahnia sp.*), swamp box (*Lophostemon suaveolens*) and she-oaks (*Allocasuarina littoralis* and *A. torulosa*). Most seepage areas support tussocks of kangaroo grass. All records of the frog have been on the rhyolites of the Glen Gordon Volcanics with altitudes above 800 m. Seepage areas on the steeper slopes of the volcanics are potential sites for the frog. It is not known what habitat the frogs use over the dry season.	**Yes – marginal** Eucalypt woodland and open forest on rhyolite hills occurs within the Project Area, however these areas are not dominated by the canopy species known to be associated with the species. A number of low order drainage lines traverse the Project Area.			**No** No WildNet records occur within 20 km or ALA records within >50 km of the Project Area. All ALA records occur near Ravenshoe, the known location for the species more than 100 km to north.	**Unlikely**
Fish							

Species	Status (EPBC Act[1], NC Act[2])	Distribution and habitat requirements	Potential habitat utilisation in Project Area			Records (Atlas of Living Australia, 2021)	Likelihood of Occurrence
			Breeding / Roosting / Nesting	Foraging	Dispersal		
Opal Cling Goby *Stiphodon semoni*	CE, LC	In Australia, the Opal Cling Goby is confined to a limited number of rainforest streams in far north-east Queensland that have significant flow. Locations where the species has been found include Cooper Creek north of the Daintree River, Pauls Pocket Creek north of the Mulgrave and Russell Rivers, and Harvey Creek that drains into the Mulgrave River and Russell River estuary (Department of Agriculture Water and the Environment, 2021c).	**No** The Project Area does not contain streams within rainforest habitat. The Project Area does not occur within the species' mapped distribution as per its SPRAT profile.			**No** No WildNet records occur within 20 km or ALA records within >50 km of the Project Area.	**Unlikely**
Sharks							
Freshwater sawfish *Pristis pristis*	V & Mi, LC	The freshwater sawfish may potentially occur in all large rivers of northern Australia from the Fitzroy River, Western Australia, to the western side of Cape York Peninsula, Queensland. It is mainly confined to the main channels of large rivers. In Queensland, the species is known from the Fitzroy River, Gilbert River, Mitchell River, Norman River and Leichhardt River. In northern Australia, this species appears to be confined to freshwater drainages and the upper reaches of estuaries, occasionally being found as far as 400 km from the sea. Juveniles and sub-adult freshwater sawfish predominantly occur in rivers and estuaries, while large mature animals tend to occur more often in coastal and offshore waters up to 25 m depth (Department of Agriculture Water and the Environment, 2021c). The preferred habitat of this species is mud bottoms of river embayments and estuaries.	**Yes - marginal** The Burdekin River is a major watercourse that is intersected by the Project Area. However this watercourse and others in the area have sandy substrates, not muddy as is preferred by the species.			**No** No ALA records occur within 100 km of the Project Area. No WildNet records occur within 20 km of the Project Area.	**Unlikely**

[1]CE=Critically Endangered; E=Endangered; V=Vulnerable, Mi=Migratory

[2] E=Endangered; V=Vulnerable; NT=Near threatened; SLC=Special Least Concern, LC=Least Concern

Table 22 Likelihood of occurrence assessment - Migratory species

Species	Status (EPBC Act[1], NC Act[2])	Distribution and habitat requirements	Potential habitat utilisation within Project Area			Records	Likelihood of Occurrence
			Breeding / Roosting / Nesting	Foraging	Dispersal		
Marine Reptiles							

Species	Status (EPBC Act[1], NC Act[2])	Distribution and habitat requirements	Potential habitat utilisation within Project Area			Records	Likelihood of Occurrence
			Breeding / Roosting / Nesting	Foraging	Dispersal		
Saltwater crocodile *Crocodylus porosus*	Mi, V	In Queensland the saltwater crocodile inhabits reef, coastal and inland waterways from Gladstone on the east coast, throughout the Cape York Peninsula and west to the Queensland-Northern Territory border. A seven-year survey recorded 6,444 sightings of the species in the waterways of the Southern Gulf Plains, Northern Gulf Plains, north-west and north-east Cape York Peninsula, Lakefield National Park, East Coast Plains, the Burdekin River catchment and the Fitzroy River catchment (Department of Agriculture Water and the Environment, 2021c). They mostly occurs in tidal rivers, coastal floodplains and channels, billabongs and swamps up to 150 km inland from the coast. Preferred nesting habitat includes elevated, isolated freshwater swamps that do not experience the influence of tidal movements.	**No** No freshwater swamps occur within the Project Area. Therefore no potential breeding habitat occurs.	**Yes - marginal** The Project Area occurs inland at elevations from 400 to 800 m AHD. However, five major watercourses including the Burdekin River intersect the Project Area and may provide suitable habitat for foraging and dispersal.		**No** No ALA records occur within 20 km of the Project Area. A number of records occur within 50 km however these occur along the coast or near the Herbert River.	**Unlikely**
Marine Birds							
Fork-tailed swift *Apus pacificus*	Mi, SLC	This species is a non-breeding migrant to all Australian states and territories. In north-east Queensland it is generally recorded east of the Great Dividing Range from Cooktown and south to Townsville (Department of Agriculture Water and the Environment, 2021c). The fork-tailed swift is almost exclusively aerial, flying from less than 1 m to at least 300 m above ground and probably much higher. This species mostly occur over dry or open habitats, including riparian woodland and tea-tree swamps, low scrub, heathland or saltmarsh. They are also found at treeless grassland and sandplains covered with spinifex, open farmland and inland and coastal sand-dunes.	**NA** This species does not breed in Australia and is likely to roost aerially.	**Yes** As this species is predominantly aerial it is expected to fly above all vegetation within the Project Area to forage and disperse across the landscape.		**Yes** Two ALA records from 2013 occur within 10 km of the Project Area at Greenvale. A large number of records occur within 50 km, largely along the coast. The WildNet report identified one record from 2013 within 20 km.	**Likely**
Terrestrial Birds							
Oriental cuckoo *Cuculus optatus*	Mi, SLC	The species uses a range of vegetated habitats such as monsoon rainforest, wet sclerophyll forest, open woodlands and appears quite often along edges of forests, or ecotones between forest types. The oriental cuckoo is a regular migrant to Australia, where it spends the non-breeding season (Sept- May) in coastal regions across northern and eastern Australia as well as offshore islands (Department of the Environment, 2015).	**NA** This species does not breed in Australia.	**Yes** The Project Area contains a range of open woodlands and forests that may be used by the species for foraging and dispersal.		**Yes** Three locations within 10 km of the eastern Project Area have ALA records. At two, records are undated and have a high degree of spatial uncertainty. The third occurs at Mount Fox (1999). The WildNet report identified one 1999 record within 20 km (likely the same Mount Fox record).	**Likely**
Barn swallow *Hirundo rustica*	Mi, SLC	In Australia, the barn swallow is recorded in open country in coastal lowlands, often near water, towns and cities. Birds are often sighted perched on overhead wires, and also in or over freshwater wetlands, paperbark *Melaleuca* woodland, mesophyll shrub thickets and tussock grassland. The barn swallow usually occurs in northern Australia, on Cocos-Keeling Island, Christmas Island, Ashmore Reef, and patchily along the north coast of the mainland from the Pilbara region, Western Australia, to Fraser Island in Queensland (Department of the Environment, 2015).	**No** The Project Area does not occur in a coastal lowland. As per the distribution map in the *Referral guideline for 14 birds listed as migratory species under the EPBC Act*, only vagrant individuals are expected to occur at inland locations. As such, no suitable habitat occurs within the Project Area.			**No** No ALA or WildNet records occur within 20 km of the Project Area. All records within 50 km occur along the coastline.	**Unlikely**

Species	Status (EPBC Act[1], NC Act[2])	Distribution and habitat requirements	Potential habitat utilisation within Project Area			Records	Likelihood of Occurrence
			Breeding / Roosting / Nesting	Foraging	Dispersal		
Black-faced monarch *Monarcha melanopsis*	Mi, SLC	This species is found primarily along the east coast of Australia. In Queensland, the black-faced monarch is widespread from the islands of the Torres Strait and on Cape York Peninsula, south along the coasts (occasionally including offshore islands) and the eastern slopes of the Great Divide, to the New South Wales border (Department of the Environment, 2015). The black-faced monarch is a wet forest specialist, occurring mainly in rainforests and riparian vegetation. Other areas in which the black-faced monarch may be found include: gullies in mountain areas or coastal foothills, softwood scrub dominated by Brigalow (*Acacia harpophylla)*, coastal scrub dominated by Coast Banksia (*Banksia integrifolia*) and Southern Mahogany (*Eucalyptus botryiodes*), occasionally among mangroves and sometimes in suburban parks and gardens. Breeding occurs in rainforest habitat, with nests generally near the top of trees with large leaves, in the tops of small saplings, or in lower shrubs. It feeds mostly in rainforest but also in open eucalypt forest.	**No** No rainforest habitat required for the breeding of this species occurs within the Project Area	**Yes – marginal** Although rainforest habitat (the preferred foraging habitat) does not occur within the Project Area, open eucalypt forest is present and may be used by the species to forage and disperse to areas of more suitable habitat. Given the species distribution suitable habitat is limited to the far eastern extent of the Project Area.		**Yes** ALA records occur at three locations within 10 km of the eastern Project Area. At two locations records are undated and high degree of spatial uncertainty. The third occurs at Mount Fox and is from 2000. The WildNet report identifies 20 records within 20 km of the Project Area.	**Potential**
Spectacled monarch *Monarcha trivirgatus (Syn. Symposiachrus trivirgatus)*	Mi, SLC	The spectacled monarch is found in coastal north-eastern and eastern Australia, including coastal islands, from Cape York, Queensland to Port Stephens, New South Wales (Department of the Environment, 2015). Only the eastern Project Area occurs within the species distribution. This species occupies dense vegetation, mainly in rainforest but also in moist or wet sclerophyll forest and occasionally in other densely vegetated habitats such as mangroves, drier forest, woodlands, parks and gardens.	**Yes – marginal** No rainforest or dense vegetation occurs within the Project Area however dry forest and woodland is present. This habitat is potentially suitable for breeding (as there are no specific requirements for breeding habitat), foraging and dispersal of this species where it occurs within the species' distribution (the eastern Project Area). There is no clear differentiation in habitat utilisation by this species.			**Yes** Two ALA records from 2008 and 2020 occur within 10 km of the Project Area near Mount Fox. The WildNet report identifies 32 records within 20 km of the Project Area.	**Potential**
Grey wagtail *Motacilla cinerea*	Mi, SLC	The grey wagtail is a rare non-breeding visitor to northern Australia, generally arriving during the last 10 days of October and departing around March (Department of the Environment, 2015). The species has a strong association with water. In their normal breeding range, grey wagtails are found across a variety of wetlands, especially watercourses, but also on the banks of lakes and marshes, as well as artificial wetlands such as sewage farms, reservoirs and fishponds. This association with water extends into non-breeding habitats with all confirmed Australian records being associated with water; especially creeks, rivers and waterfalls.	**NA** This species does not breed in northern Australia.	**Yes** A number of minor and major watercourses traverse the Project Area. The Project Area also contains a number of farm dams. These areas may be suitable for the foraging and dispersal of the species.		**No** No WildNet records occur within 20 km or ALA records within 10 km of the Project Area. All records of the grey wagtail are in coastal areas and this species is a scarce visitor to northern Australia.	**Unlikely**

Species	Status (EPBC Act[1], NC Act[2])	Distribution and habitat requirements	Potential habitat utilisation within Project Area			Records	Likelihood of Occurrence
			Breeding / Roosting / Nesting	Foraging	Dispersal		
Yellow wagtail *Motacilla flava*	Mi, SLC	The yellow wagtail is a regular wet season visitor to northern Australia. In Queensland this species is a regular visitor from Mossman south to Townsville. The species is a vagrant further south and on Heron Island (Department of the Environment, 2015). Habitat requirements for the yellow wagtail are highly variable, but typically include open grassy flats near water. Habitats include open areas with low vegetation such as grasslands, airstrips, pastures, sports fields; damp open areas such as muddy or grassy edges of wetlands, rivers, irrigated farmland, dams, waterholes; sewage farms, sometimes utilise tidal mudflats and edges of mangroves. Roosts in mangroves and other dense vegetation.	**No** The Project Area does not contain dense vegetation or mangroves.	**Yes** The Project Area contains farms dams as well as native and non-native grasslands that may be suitable for this species.		**No** No WildNet records occur within 20 km or ALA records within 30 km of the Project Area. All records in the wider area occur in coastal locations.	**Unlikely**
Satin flycatcher *Myiagra cyanoleuca*	Mi, SLC	This species occurs along the east coast of Australia. In Queensland, this species is widespread but scattered in the east, being recorded on passage on a few islands in the western Torres Strait. Satin flycatchers are also found extensively along the Great Dividing Range (Department of the Environment, 2015). Only the eastern Project Area occurs within the species distribution. Satin flycatchers are eucalypt forest and woodland inhabitants. During the non-breeding period, some individuals winter in northern Queensland around Innisfail and farther north around Atherton; however their movements are described as erratic. Wintering birds in northern Queensland will use rainforest - gallery forests interfaces, and birds have been recorded wintering in mangroves and paperbark swamps. Breeding occurs in south-eastern Australia.	**NA** This species does not breed in northern Queensland.	**Yes** The Project Area is dominated by connected Eucalypt forest and woodlands which are likely to be suitable for the foraging and dispersal of this species. However only habitat within the eastern Project Area, that is within the species' distribution is potentially suitable.		**Yes** No ALA or WildNet records occur within 20 km of the Project Area. However, scattered records occur in the surrounding area (<50 km) particularly towards Mount Fox.	**Potential**
Rufous fantail *Rhipidura rufifrons*	Mi, SLC	The rufous fantail is found in northern and eastern coastal Australia, being more common in the north. This species migrates to south-east Australia in October-April to breed, mostly in or on the coastal side of the Great Dividing Range (Department of the Environment, 2015). Only the eastern Project Area occurs within the species distribution. The rufous fantail mainly inhabits wet sclerophyll forests, often in gullies dominated by eucalypts, usually with a dense shrubby understorey often including ferns. When on passage, they are sometimes recorded in drier sclerophyll forests and woodlands, including Spotted Gum (*Eucalyptus maculata*), Yellow Box (*E. melliodora*), ironbarks or stringybarks, often with a shrubby or heath understorey. 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.).	**NA** This species breeds in south-east Australia.	**Yes - marginal** The Project Area does not contain the preferred wet sclerophyll forest or rainforest habitat. However dry sclerophyll forest and woodlands does occur and may be used by the species for temporary foraging and dispersal.		**Yes** ALA records occur at seven locations within 15 km of the Project Area, east of Greenvale. Most records are undated however one near Mount Fox is from 2013. The WildNet report identifies 10 records within 20 km of the Project Area.	**Potential**
Wetland Birds							

Species	Status (EPBC Act[1], NC Act[2])	Distribution and habitat requirements	Potential habitat utilisation within Project Area			Records	Likelihood of Occurrence
			Breeding / Roosting / Nesting	Foraging	Dispersal		
Common sandpiper *Actitis hypoleucos*	Mi, SLC	Found along all coastlines of Australia and in many areas inland, the common sandpiper is widespread in small numbers. The population when in Australia is concentrated in northern and western Australia (Department of Agriculture Water and the Environment, 2021c). In Queensland, two areas of national importance occur: south-eastern gulf of Carpentaria and Cairns foreshore. This species does not breed in Australia. The common sandpiper is known to occur in a range of wetland environments, both coastal and inland. They have been recorded in estuaries and deltas of streams, as well as on banks farther upstream; around lakes, pools, billabongs, reservoirs, dams and claypans, and occasionally piers and jetties. Generally the species forages in shallow water and on bare soft mud at the edges of wetlands; often where obstacles project from substrate, e.g. rocks or mangrove roots. Birds sometimes venture into grassy areas adjoining wetlands.	**NA** This species does not breed in Australia.	**Yes - marginal** This species is known to utilise dams. Freshwater farm dams occur within the Project Area however are considered to provide only marginal habitat due to the lack of muddy margins and frequent cattle use and pugging. Farm dams are generally highly isolated.		**Yes** No ALA or WildNet records occur within 20 km of the Project Area. Most records in the local region are concentrated along the coast, however scattered inland records do also occur.	**Potential**
Sharp-tailed sandpiper *Calidris acuminata*	Mi, SLC	This species is a non-breeding migrant to all Australian states and territories. In Queensland, the sharp-tailed sandpiper is recorded in most regions, being widespread along much of the coast and are very sparsely scattered inland, particularly in central and south-western regions. Many inland records are of birds on passage (Department of Agriculture Water and the Environment, 2021c). In Australasia, the sharp-tailed sandpiper prefers muddy edges of shallow fresh or brackish wetlands, with inundated or emergent sedges, grass, saltmarsh or other low vegetation. This includes lagoons, swamps, lakes and pools near the coast, and dams, waterholes, soaks, bore drains and bore swamps, saltpans and hypersaline salt lakes inland.	**NA** This species does not breed in Australia.	**Yes - marginal** This species is known to utilise dams. Freshwater farm dams occur within the Project Area however are considered to provide only marginal habitat due to the frequent cattle use and pugging. Fringing vegetation is limited in most areas; where present it is grass.		**Yes** A 2013 ALA record occurs within 1km of the Project Area near Greenvale. Details of the record specify 'Stenhouse Dam' as the location however spatial uncertainty is unknown. The WildNet report also identifies a single 2013 record within 20 km. Three ALA records (most recent from 2002) occur within 40 km at Reedybrook Camp Reserve.	**Potential**
Pectoral sandpiper *Calidris melanotos*	Mi, SLC	This species is a non-breeding migrant to all Australian states and territories. In Queensland, most records for the pectoral sandpiper occur around Cairns. There are scattered records elsewhere, mainly from east of the Great Divide between Townsville and Yeppoon. Records also exist in the south-east of the state as well as a few inland records at Mount Isa, Longreach and Oakley (Department of Agriculture Water and the Environment, 2021c). This species is usually found in coastal or near coastal habitat but very occasionally found further inland. It prefers wetlands that have open fringing mudflats and low, emergent or fringing vegetation, such as grass or samphire.	**NA** This species does not breed in Australia.	**No** This species is not known to utilise dams. Habitat within the Project Area is not coastal or near coastal. Farm dams within the Project Area are considered unsuitable due to the lack of open fringing mudflats, grass fringing the water and the frequent cattle use.		**No** No WildNet records occur within 20 km or ALA records within 50 km of the Project Area. Records predominately occur in coastal areas at Cairns and Townsville.	**Unlikely**

Species	Status (EPBC Act[1], NC Act[2])	Distribution and habitat requirements	Potential habitat utilisation within Project Area			Records	Likelihood of Occurrence
			Breeding / Roosting / Nesting	Foraging	Dispersal		
Red-necked stint *Calidris ruficollis*	Mi, SLC	The red-necked stint is a non-breeding migrant to Australia. It is distributed along most of the Australian coastline with large densities on the Victorian and Tasmanian coasts. It is also found inland in all states when conditions are suitable (Department of Agriculture Water and the Environment, 2021c). In Australasia, this species is mostly found in coastal areas, including in sheltered inlets, bays, lagoons and estuaries with intertidal mudflats, often near spits, islets and banks and, sometimes, on protected sandy or coralline shores. They also occur in saltworks and sewage farms; saltmarsh; ephemeral or permanent shallow wetlands near the coast or inland, including lagoons, lakes, swamps, riverbanks, waterholes, bore drains, dams, soaks and pools in saltflats. They sometimes use flooded paddocks or damp grasslands. They have occasionally been recorded on dry gibber plains, with little or no perennial vegetation (Higgins & Davies 1996). Roosting occurs on sheltered beaches, spits, banks or islets, of sand, mud, coral or shingle, sometimes in saltmarsh or other vegetation.	**NA** This species does not breed in Australia. Roosting occurs in coastal habitats which are not present within the Project Area.	**Yes - marginal** This species is known to utilise dams. Freshwater farm dams occur within the Project Area however are considered to provide only marginal habitat due to the lack of muddy margins and frequent cattle use. Fringing vegetation is limited in most areas; where present it is grass.		**Yes** The WildNet report identifies one record within 20 km of the Project Area from 2005. No ALA records occur within 20 km however records do occur to the north within 40 km at Reedybrook Camp Reserve (the most recent from 2002).	**Potential**
Latham's snipe *Gallinago hardwickii*	Mi, SLC	Latham's snipe is a non-breeding visitor to south-eastern Australia and is a passage migrant through northern Australia. This species has been recorded along the east coast of Australia from Cape York Peninsula through to south-eastern South Australia. In Queensland, the range extends inland over the eastern tablelands in south-eastern Queensland (Department of Agriculture Water and the Environment, 2021c). In Australia, this species occurs in permanent and ephemeral wetlands up to 2000 m above sea-level. They usually inhabit open, freshwater wetlands with low, dense vegetation (e.g. swamps, flooded grasslands or heathlands, around bogs and other water bodies).	**NA** This species does not breed in Australia.	**No** Freshwater farm dams occur within the Project Area however are considered unsuitable due to the lack of dense fringing vegetation and muddy margins. This species is a passage migrant through northern Australia and is unlikely to stop within the Project Area given the limited extent of potential habitat.		**No** No ALA or WildNet records occur within 20 km of the Project Area. Inland records do occur within 50 km of the Project Area however all are undated or from 1979 or prior. Coastal records are more recent (2012 & 2014).	**Unlikely**

Species	Status (EPBC Act[1], NC Act[2])	Distribution and habitat requirements	Potential habitat utilisation within Project Area			Records	Likelihood of Occurrence
			Breeding / Roosting / Nesting	Foraging	Dispersal		
Caspian tern *Hydroprogne caspia*	Mi, SLC	The caspian tern is found in North America, Europe, Africa, Asia, Australia and New Zealand. Within Australia, it has a widespread occurrence and can be found in both coastal and inland habitats. In Queensland the species has been recorded in the western districts, especially the Lake Eyre Drainage Basin, north-west to the Gulf Country north of Mt Isa and Cloncurry, there are also scattered records for central Queensland (Department of Agriculture Water and the Environment, 2021c). It is mostly found in sheltered coastal embayments (harbours, lagoons, inlets, bays, estuaries and river deltas) and those with sandy or muddy margins are preferred. They also occur on near-coastal or inland terrestrial wetlands that are either fresh or saline, especially lakes (including ephemeral lakes), waterholes, reservoirs, rivers and creeks. They also use artificial wetlands, including reservoirs, sewage ponds and saltworks. The caspian tern breeds on variable types of sites including low islands, cays, spits, banks, ridges, beaches of sand or shell, terrestrial wetlands and stony or rocky islets or banks. Nests may be in the open, or among low or sparse vegetation, including herbfield, tussocks, samphire or other prostrate sand-binding plants. In northern Australia, there is no apparent fixed breeding season, with eggs recorded in March and May to November.	**No** Farm dams within the Project Area are considered unsuitable for nesting due to the high level of cattle use on the margins and banks.	**Yes** Rivers and creeks of varying size intersect the Project Area. Freshwater farm dams also occur within the Project Area however are considered to provide only marginal habitat due to their small size and frequent cattle use.		**Yes** The WildNet report identifies one record within 20 km of the Project Area from 2005. No ALA records occur within 20 km however records do occur to the north within 40 km at Reedybrook Camp Reserve (the most recent from 2012).	**Potential**
Osprey *Pandion haliaetus*	Mi, SLC	Ospreys occur in littoral and coastal habitats and terrestrial wetlands of tropical and temperate Australia. They are mostly found in coastal areas but occasionally travel inland along major rivers, particularly in northern Australia. They require extensive areas of open fresh, brackish or saline water for foraging. The breeding range of the osprey extends around the northern coast of Australia (including many offshore islands) from Albany in Western Australia to Lake Macquarie in New South Wales; with a second isolated breeding population on the coast of South Australia, extending from Head of Bight east to Cape Spencer and Kangaroo Island (Department of Agriculture Water and the Environment, 2021c). Nests are constructed in a variety of natural and artificial sites including in dead or partly dead trees or bushes; on cliffs, rocks, rock stacks or islets; on the ground on rocky headlands, coral cays, deserted beaches, sandhills or saltmarshes; and on artificial nest platforms, pylons, jetties, lighthouses, navigation towers, cranes, exposed shipwrecks and offshore drilling rigs.	**No** Habitat within the Project Area is considered unlikely to be suitable for the nesting of this species.	**Yes - marginal** The Project Area does not contain coastal habitats or large terrestrial wetlands. However, major watercourses including the Burdekin River intersect the Project Area and may be used occasionally by osprey individuals.		**No** No WildNet records occur within 20km or ALA records within 50 km of the Project Area. The nearest record occurs approximately 70 km to the south east near Townsville.	**Unlikely**

Species	Status (EPBC Act[1], NC Act[2])	Distribution and habitat requirements	Potential habitat utilisation within Project Area			Records	Likelihood of Occurrence
			Breeding / Roosting / Nesting	Foraging	Dispersal		
Common greenshank *Tringa nebularia*	Mi, SLC	The common greenshank does not breed in Australia, however, the species occurs in all types of wetlands and has the widest distribution of any shorebird in Australia. In Queensland, this species is widespread in the Gulf country and eastern Gulf of Carpentaria. It has been recorded in most coastal regions, possibly with a gap between north Cape York Peninsula and Cooktown. Inland, there have been a few records south of a line from near Dalby to Mount Guide, and sparsely scattered records elsewhere (Department of Agriculture Water and the Environment, 2021c). It is found in a wide variety of inland wetlands and sheltered coastal habitats of varying salinity. Habitats include embayments, harbours, river estuaries, deltas and lagoons and are recorded less often in round tidal pools, rock-flats and rock platforms. The species uses both permanent and ephemeral terrestrial wetlands, including swamps, lakes, dams, rivers, creeks, billabongs, waterholes and inundated floodplains, claypans and saltflats. It will also use artificial wetlands, including sewage farms and saltworks dams, inundated rice crops and bores. The edges of the wetlands used are generally of mud or clay, occasionally of sand, and may be bare or with emergent or fringing vegetation, including short sedges and saltmarsh, mangroves, thickets of rushes, and dead or live trees.	**NA** This species does not breed in Australia.	**Yes - marginal** This species is known to utlise dams. Freshwater farm dams and watercourses occur within the Project Area and may be used as a temporary foraging resource for dispersing individuals. However habitat is considered marginal due to the frequent cattle use.		**Yes** Most ALA records are along the coast; however there are scattered records further inland surrounding the Project Area, including a record from 2003 within 2 km on Mount Fox Road. No WildNet records occur within 20 km.	**Potential**
Glossy ibis *Plegadis falcinellus*	Mi, SLC	Within Australia, the glossy ibis is generally located east of the Kimberley in Western Australia and Eyre Peninsula in South Australia. The species moves in response to good rainfalls, expanding its range, however the core breeding areas used are within the Murray-Darling Basin region of NSW and Victoria, the Macquarie Marshes in New South Wales, and in southern Queensland. The glossy ibis often moves north in autumn, returning south to the main breeding areas in spring and summer (Department of Agriculture Water and the Environment, 2021c). Preferred habitat for foraging and breeding are fresh water marshes at the edges of lakes and rivers, lagoons, flood-plains, wet meadows, swamps, reservoirs, sewage ponds, rice-fields and cultivated areas under irrigation. The species is occasionally found in coastal locations such as estuaries, deltas, saltmarshes and coastal lagoons.	**No** This species does not breed in north Queensland.	**Yes - marginal** Freshwater farm dams and watercourses occur within the Project Area and may be used as a temporary foraging resource for dispersing individuals. However habitat is considered marginal due to the frequent cattle use.		**Yes** This species was recorded at Murray's Lagoon within the Project Area. ALA records occur at five locations within 5 km of the Project Area with the most recent from 2013. The WildNet report identifies one record (2013) within 20 km.	**Known**

[1]CE=Critically Endangered; E=Endangered; V=Vulnerable, Mi=Migratory

[2] E=Endangered; V=Vulnerable; NT=Near threatened; SLC=Special Least Concern, LC=Least Concern

Appendix E

Flora Species List

Appendix E Flora Species List

Table 23 Flora Species List

Family	Species
ACANTHACEAE	*Brunoniella acaulis*
	Brunoniella australis
	Rostellularia adscendens
ADIANTACEAE	*Cheilanthes sieberi*
AMARANTHACEAE	*Achyranthes aspera*
	*Gomphrena celosioides**
ANACARDIACEAE	*Euroschinus falcata*
	Pleiogynium timorense
APOCYNACEAE	*Alternanthera sp.*
	Alyxia spicata
	Cajanus scarabaeoides
	*Calotropis gigantean**
	*Calotropis procera**
	Carissa lanceolata
	Carissa ovata
	*Cryptostegia grandiflora**
	Wrightia saligna
ARALIACEAE	*Schefflera actinophylla*
ASTERACEAE	*Acanthospermum hispidum**
	Apowollastonia spilanthoides
	*Bidens pilosa**
	Chrysocephalum apiculatum
	Cyanthillium cinereum
	*Emilia sonchifolia**
	Olearia sp.
	*Parthenium hysterophorus**
	Peripleura hispidula
	*Praxelis clematidea**
	Pterocaulon sphacelatum
	*Tridax procumbens**
	*Xanthium occidentale**
	Xerochrysum bracteatum
BIGNONIACEAE	*Dolichandrone heterophylla*
BYTTNERIACEAE	*Waltheria indica*

Family	Species
CAESALPINIACEAE	*Cassia brewsteri*
	*Chamaecrista absus**
	Chamaecrista concinna
	Chamaecrista mimosoides
	Chamaecrista rotundifolia var. *rotundifolia**
	Erythrophleum chlorostachys
	Lysiphyllum cunninghamii
	Lysiphyllum hookeri
CAPPARACEAE	*Capparis arborea*
	Capparis lasiantha
CASUARINACEAE	*Allocasuarina torulosa*
	Casuarina cunninghamiana
CELASTRACEAE	*Denhamia cunninghamii*
	Denhamia disperma
	Denhamia oleaster
CHENOPODIACEAE	*Enchylaena tomentosa*
CONVOLVULACEAE	*Argyreia nervosa**
	Bonamia media
	Evolvulus alsinoides
	Jacquemontia browniana
	Polymeria longifolia
	Polymeria pusilla
CYPERACEAE	*Abildgaardia sp.*
	Bulbostylis barbata
	Cyperus gracilis
	Cyperus sp.
	Eleocharis plana
	Fimbristylis dichotoma
	Scleria brownii
EBENACEAE	*Diospyros humilis*
ERYTHROXYLACEAE	*Erythroxylum australe*
	Erythroxylum ellipticum
EUPHORBIACEAE	*Euphorbia drummondii*
	*Euphorbia hirta**
FABACEAE	*Crotalaria brevis*
	Crotalaria calycina

Family	Species
	Crotalaria medicaginea
	Desmodium gangeticum
	Desmodium muelleri
	Desmodium rhytidophyllum
	Desmodium varians
	Erythrina vespertilio
	Flemingia parviflora
	Galactia muelleri
	Galactia tenuiflora
	Glycine clandestina
	Glycine tomentella
	Hardenbergia violacea
	Hovea longipes
	Hovea tholiformis
	Indigofera hirsuta
	Indigofera linifolia
	Indigofera linnaei
	Indigofera pratensis
	Pycnospora lutescens
	Rhynchosia minima
	Solanum sp.
	*Stylosanthes humilis**
	*Stylosanthes scabra**
	Tephrosia filipes
	Tephrosia sp.
	Uraria lagopodioides
	Vigna lanceolata
	Zornia dyctiocarpa
	Zornia muriculata
	Zornia muelleriana
GOODENIACEAE	*Goodenia hederacea*
HEMEROCALLIDACEAE	*Dianella caerulea*
LAMIACEAE	*Ajuga australis*
	Clerodendrum floribundum
	Ocimum tenuiflorum
LAURACEAE	*Cassytha pubescens*

Family	Species
	Cassytha filiformis
LAXMANNIACEAE	*Eustrephus latifolius*
	Lomandra glauca
	Lomandra longifolia
	Lomandra multiflora
LOBELIACEAE	*Lobelia concolor*
LORANTHACEAE	*Amyema miquelii*
MALVACEAE	*Hibiscus meraukensis*
	*Malvastrum americanum**
	*Sida acuta**
	*Sida cordifolia**
	Sida fibulifera
	Sida hackettiana
MARSILEACEAE	*Marsilea hirsuta*
MIMOSACEAE	*Acacia calyculata*
	Acacia colei
	Acacia decora
	Acacia disparrima
	Acacia disparrima subsp. *calidestris*
	Acacia excelsa
	Acacia flavescens
	Acacia gonoclada
	Acacia hammondii
	Acacia holosericea
	Acacia hyaloneura
	Acacia implexa
	Acacia lazaridis
	Acacia leptocarpa
	Acacia leptostachya
	Acacia melanoxylon
	Acacia shirleyi
	Acacia umbellata
	Acacia victoriae
	Archidendropsis basaltica
	*Mimosa pudica**
	Neptunia gracilis

Family	Species
	*Vachellia bidwillii**
	*Vachellia farnesiana**
MORACEAE	*Ficus obliqua*
	Ficus opposita
MYRTACEAE	*Corymbia clarksoniana*
	Corymbia confertiflora
	Corymbia dallachiana
	Corymbia erythrophloia
	Corymbia intermedia
	Corymbia lamprophylla
	Corymbia leichhardtii
	Corymbia tessellaris
	Corymbia torelliana
	Corymbia setosa
	Eucalyptus brownii
	Eucalyptus camaldulensis
	Eucalyptus crebra
	Eucalyptus exilipes
	Eucalyptus howittiana
	Eucalyptus leptophleba
	Eucalyptus microneura
	Eucalyptus moluccana
	Eucalyptus persistens
	Eucalyptus platyphylla
	Eucalyptus portuensis
	Eucalyptus shirleyi
	Eucalyptus tereticornis
	Leptospermum pallidum
	Lophostemon grandiflorus
	Lophostemon suaveolens
	Melaleuca bracteata
	Melaleuca citrolens
	Melaleuca fluviatilis
	Melaleuca leucadendra
	Melaleuca nervosa
	Melaleuca trichostachya

Family	Species
OLEACEAE	*Jasminum didymum*
	Jasminum simplicifolium
ONAGRACEAE	*Ludwigia octovalvis*
ORCHIDACEAE	*Cymbidium canaliculatum*
	Dipodium variegatum
PAPAVERACEAE	*Argemone ochroleuca* subsp. *ochroleuca**
PASSIFLORACEAE	*Passiflora foetida**
	*Passiflora suberosa**
PENTAPETACEAE	*Melhania oblongifolia*
PHYLLANTHACEAE	*Breynia oblongifolia*
	Flueggea virosa
	Phyllanthus collinus
	Phyllanthus fuernrohrii
	Phyllanthus virgatus
PICRODENDRACEAE	*Petalostigma banksii*
	Petalostigma pubescens
PITTOSPORACEAE	*Bursaria incana*
	Bursaria spinosa
	Bursaria tenuifolia
	Pittosporum angustifolium
POACEAE	*Alloteropsis semialata*
	Aristida calycina
	Aristida latifolia
	Arundinella nepalensis
	Bothriochloa bladhii
	Bothriochloa decipiens
	*Bothriochloa pertusa**
	*Cenchrus ciliaris**
	Chloris pectinata
	Chrysopogon fallax
	Cleistochloa sclerachne
	Cymbopogon bombycinus
	Cymbopogon obtectus
	*Cynodon dactylon**
	*Dichanthium aristatum**
	Dichanthium fecundum

Family	Species
	Dichanthium sericeum
	Digitaria parviflora
	Enneapogon lindleyanus
	Enneapogon polyphyllus
	Enteropogon sp.
	Entolasia stricta
	Eragrostis elongata
	*Eragrostis pilosa**
	Eragrostis schultzii
	Eriachne mucronata
	Eriochloa crebra
	Heteropogon contortus
	Heteropogon triticeus
	Imperata cylindrica
	*Megathyrsus maximus**
	*Melinis repens**
	Panicum decompositum
	Panicum effusum
	Paspalidium rarum
	Perotis rara
	Schizachyrium fragile
	Sporobolus australasicus
	Themeda avenacea
	*Themeda quadrivalvis**
	Themeda triandra
	Triodia mitchellii
	Triodia pungens
	*Urochloa mosambicensis**
	*Urochloa mutica**
POLYGONACEAE	*Persicaria attenuata*
PORTULACACEAE	*Portulaca oleracea*
PROTEACEAE	*Grevillea glauca*
	Grevillea mimosoides
	Grevillea parallela
	Grevillea striata
	Grevillea wickhamii

Family	Species
	Hakea arborescens
	Hakea lorea
	Persoonia falcata
PUTRANJIVACEAE	*Drypetes deplanchei*
RHAMNACEAE	*Alphitonia excelsa*
	Alphitonia pomaderroides
RUBIACEAE	*Coelospermum reticulatum*
	Gardenia vilhelmii
	Larsenaikia ochreata
	Spermacoce brachystema
	*Spermacoce latifolia**
	Timonius timon
RUTACEAE	*Flindersia dissosperma*
	Geijera parviflora
	Geijera salicifolia
SANTALACEAE	*Exocarpos latifolius*
	Santalum lanceolatum
SAPINDACEAE	*Atalaya hemiglauca*
	Cupaniopsis anacardioides
	Dodonaea physocarpa
	Dodonaea viscosa
SCROPHULARIACEAE	*Eremophila mitchellii*
	Myoporum acuminatum
SPARRMANNIACEAE	*Corchorus aestuans*
	Grewia retusifolia
STERCULIACEAE	*Brachychiton diversifolius*
	Brachychiton populneus
VERBENACEAE	*Lantana camara**
VIOLACEAE	*Hybanthus stellarioides*
VITACEAE	*Cayratia trifolia*
	Clematicissus opaca

* Invasive species

Appendix F

Fauna Species List

Appendix F Fauna Species List

Table 24 Fauna Species List

Common Name	Scientific Name	Incidental Sighting	Habitat Type							
			1	2	3	4	5	6	7	8 & 9
Birds										
Australian owlet-nightjar	*Aegotheles cristatus*			✓						
Azure kingfisher	*Alcedo azurea*			✓						
Chestnut teal	*Anas castanea*									✓
Grey teal	*Anas gracilis*									✓
Pacific black duck	*Anas superciliosa*									✓
Australasian darter	*Anhinga novaehollandiae*									✓
Australasian pipit	*Anthus novaeseelandiae*	✓								
Intermediate egret	*Ardea intermedia*									✓
Eastern great egret	*Ardea modesta*									✓
White-necked heron	*Ardea pacifica*	✓		✓						✓
Australian bustard	*Ardeotis australis*	✓	✓							
White-breasted woodswallow	*Artamus leucorynchus*	✓								
Red-winged parrot	*Aprosmictus erythropterus*	✓	✓	✓				✓		
Wedge-tailed eagle	*Aquila audax*		✓					✓		

Common Name	Scientific Name	Incidental Sighting	Habitat Type							
			1	2	3	4	5	6	7	8 & 9
Hardhead	*Aythya australis*									✓
Cattle egret	*Bubulcus ibis*									✓
Sulphur-crested cockatoo	*Cacatua galerita*	✓	✓	✓						✓
Fan-tailed cuckoo	*Cacomantis flabelliformis*			✓						
Red-tailed black-cockatoo	*Calyptorhynchus banksii*	✓						✓		
Pheasant coucal	*Centropus phasianinus*	✓	✓	✓			✓	✓	✓	
Horsfield's bronze-cuckoo	*Chalcites basalis*			✓						
Australian wood duck	*Chenonetta jubata*									✓
Great bowerbird	*Chlamydera nuchalis*	✓	✓				✓			
Brown treecreeper	*Climacteris picumnus*		✓				✓			
Black-faced cuckoo-shrike	*Coracina novaehollandiae*	✓	✓					✓	✓	
White-bellied cuckoo-shrike	*Coracina papuensis*	✓		✓						
White-throated treecreeper	*Cormobates leucophaea*			✓						
Little crow	*Corvus bennetti*	✓								
Australian raven	*Corvus coronoides*			✓						
Torresian crow	*Corvus orru*	✓	✓	✓			✓	✓	✓	✓
Brown quail	*Coturnix ypsilophora*	✓								
Grey butcherbird	*Cracticus torquatus*	✓	✓	✓		✓	✓	✓		✓

Common Name	Scientific Name	Incidental Sighting	Habitat Type							
			1	2	3	4	5	6	7	8 & 9
Pied butcherbird	*Cracticus nigrogularis*	✓	✓	✓				✓	✓	✓
Australian magpie	*Cracticus tibicen*	✓		✓		✓	✓	✓	✓	
Black swan	*Cygnus atratus*									✓
Laughing kookaburra	*Dacelo novaeguineae*		✓	✓		✓	✓	✓		
Blue-winged kookaburra	*Dacelo leachii*	✓					✓	✓		
Varied sittella	*Daphoenositta chrysoptera*								✓	
Plumed whistling duck	*Dendrocygna eytoni*									✓
Mistletoebird	*Dicaeum hirundinaceum*			✓						
Emu	*Dromaius novaehollandiae novaehollandiae*	✓	✓	✓				✓	✓	
Little egret	*Egretta garzetta*									✓
White-faced heron	*Egretta novaehollandiae*									✓
Black-fronted dotterel	*Elseyornis melanops*									✓
Blue-faced honeyeater	*Entomyzon cyanotis*	✓	✓	✓				✓		
Galah	*Eolophus roseicapillus*	✓	✓	✓				✓		✓
Eastern yellow robin	*Eopsaltria australis*						✓			
Red-kneed dotterel	*Erythrogonys cinctus*									✓
Pacific koel	*Eudynamys orientalis*		✓					✓		
Dollarbird	*Eurystomus orientalis*						✓			

Common Name	Scientific Name	Incidental Sighting	Habitat Type							
			1	2	3	4	5	6	7	8 & 9
Brown falcon	*Falco berigora*	✓								
Nankeen kestrel	*Falco cenchroides*	✓								
Australian hobby	*Falco longipennis*									✓
Eurasian coot	*Fulica atra*	✓								✓
Peaceful dove	*Geopelia striata*	✓		✓			✓	✓		
Squatter pigeon (northern)	*Geophaps scripta peninsulae*	✓								✓
Squatter pigeon (southern)	*Geophaps scripta scripta*	✓							✓	
White-throated gerygone	*Gerygone olivacea*		✓	✓				✓	✓	
Magpie-lark	*Grallina cyanoleuca*	✓		✓			✓			✓
Brolga	*Grus rubicunda*									✓
White-bellied sea-eagle	*Haliaeetus leucogaster*			✓						
Whistling kite	*Haliastur sphenurus*	✓	✓	✓						✓
Black-winged stilt	*Himantopus himantopus*									✓
Comb-crested jacana	*Irediparra gallinacea*									✓
Brown honeyeater	*Lichmera indistincta*	✓		✓		✓	✓	✓	✓	✓
Pink-eared duck	*Malacorhynchus membranaceus*									✓
Red-backed fairywren	*Malurus melanocephalus*	✓								
Yellow-throated miner	*Manorina flavigula*			✓						

Common Name	Scientific Name	Incidental Sighting	Habitat Type							
			1	2	3	4	5	6	7	8 & 9
Noisy miner	*Manorina melanocephala*	✓	✓	✓		✓	✓	✓	✓	
Lewin's honeyeater	*Meliphaga lewinii*	✓					✓			
White-throated honeyeater	*Melithreptus albogularis*		✓	✓			✓	✓	✓	
Rainbow bee-eater	*Merops ornatus*			✓		✓				
Little pied cormorant	*Microcarbo melanoleucos*									✓
Black kite	*Milvus migrans*	✓	✓	✓						✓
Leaden flycatcher	*Myiagra rubecula*		✓	✓						
Scarlet honeyeater	*Myzomela sanguinolenta*			✓			✓			✓
Red-browed finch	*Neochmia temporalis*						✓			
Cotton pygmy-goose	*Nettapus coromandelianus*									✓
Southern boobook	*Ninox novaeseelandiae*					✓				
Helmeted guineafowl	*Numida meleagris**	✓								
Nankeen night-heron	*Nycticorax caledonicus*									✓
Crested pigeon	*Ocyphaps lophotes*	✓	✓					✓		
Rufous whistler	*Pachycephala rufiventris*			✓			✓	✓		
Striated pardalote	*Pardalotus striatus*		✓	✓	✓	✓	✓	✓	✓	✓
Australian pelican	*Pelecanus conspicillatus*									✓
Tree martin	*Petrochelidon nigricans*	✓							✓	

Common Name	Scientific Name	Incidental Sighting	Habitat Type							
			1	2	3	4	5	6	7	8 & 9
Pied cormorant	*Phalacrocorax varius*									✓
Little black cormorant	*Phalacrocorax sulcirostris*									✓
Common bronzewing	*Phaps chalcoptera*	✓								
Little friarbird	*Philemon citreogularis*	✓	✓	✓		✓		✓		
Noisy friarbird	*Philemon corniculatus*	✓	✓	✓		✓		✓		✓
Pale-headed rosella	*Platycercus adscitus*	✓	✓	✓				✓	✓	✓
Glossy ibis	*Plegadis falcinellus*									✓
Tawny frogmouth	*Podargus strigoides*			✓					✓	
Grey-crowned babbler	*Pomatostomus temporalis*		✓	✓						
Purple swamphen	*Porphyrio porphyrio*									✓
Brown-backed honeyeater	*Ramsayornis modestus*			✓						
Grey fantail	*Rhipidura albiscapa*		✓	✓		✓	✓	✓	✓	
Willie wagtail	*Rhipidura leucophrys*	✓		✓				✓		✓
Channel-billed cuckoo	*Scythrops novaehollandiae*						✓	✓		
Weebill	*Smicrornis brevirostris*		✓					✓		
Freckled duck	*Stictonetta naevosa*									✓
Pied currawong	*Strepera graculina*	✓		✓		✓	✓	✓	✓	✓
Apostlebird	*Struthidea cinerea*	✓		✓						

Common Name	Scientific Name	Incidental Sighting	Habitat Type							
			1	2	3	4	5	6	7	8 & 9
Australasian grebe	*Tachybaptus novaehollandiae*									✓
Double-barred finch	*Taeniopygia bichenovii*		✓	✓						
Zebra finch	*Taeniopygia guttata*					✓				
Straw-necked ibis	*Threskiornis spinicollis*									✓
Sacred kingfisher	*Todiramphus sanctus*			✓						
Scaly-breasted lorikeet	*Trichoglossus chlorolepidotus*	✓								
Rainbow lorikeet	*Trichoglossus moluccanus*	✓	✓	✓			✓	✓	✓	
Forest kingfisher	*Todiramphus macleayii*			✓				✓	✓	
Grey-tailed tattler	*Tringa brevipes*									✓
Eastern barn owl	*Tyto javanica*			✓						
Masked lapwing	*Vanellus miles miles*	✓								✓
Fishes										
Spangled perch	*Leiopotherapon unicolor*	✓								
Sea mullet	*Mugil cephalus*	✓								
Mammals										
Rufous bettong	*Aepyprymnus rufescens*	✓		✓						✓
White-striped free-tailed bat	*Austronomus australis*		✓	✓						
Chital	*Axis axis**	✓								

Common Name	Scientific Name	Incidental Sighting	Habitat Type							
			1	2	3	4	5	6	7	8 & 9
Wild dog/dingo	*Canis lupus**	✓	✓	✓		✓		✓		
Northern freetail bat	*Chaerephon jobensis*		✓	✓				✓	✓	✓
Gould's wattled bat	*Chalinolobus gouldii*		✓	✓				✓	✓	✓
Chocolate wattled bat	*Chalinolobus morio*									✓
Hoary wattled bat	*Chalinolobus nigrogriseus*									✓
Bat species	*Chalinolobus nigrogriseus/Scotorepens* spp.		✓	✓				✓	✓	
Feral cat	*Felis catus**	✓	✓							
Northern brown bandicoot	*Isoodon macrourus*			✓						
Agile wallaby	*Macropus agilis*	✓						✓		
Antilopine wallaroo	*Macropus antilopinus*	✓								
Eastern grey kangaroo	*Macropus giganteus*	✓	✓	✓			✓	✓	✓	
Whiptail wallaby	*Macropus parryi*	✓							✓	
Common wallaroo	*Macropus robustus*	✓		✓			✓	✓	✓	✓
Red-necked wallaby	*Macropus rufogriseus*	✓								
Red kangaroo	*Macropus rufus*	✓								
Little bent-wing bat	*Miniopterus australis*		✓	✓				✓	✓	✓
Australasian bent-wing bat	*Miniopterus orianae*		✓	✓				✓	✓	
Eastern bent-wing bat	*Miniopterus schreibersii oceanensis*									✓

Common Name	Scientific Name	Incidental Sighting	Habitat Type							
			1	2	3	4	5	6	7	8 & 9
Nyctophilus species	*Nyctophilus* spp.			✓						✓
European rabbit	*Oryctolagus cuniculus**	✓	✓			✓		✓	✓	✓
Northern free-tailed bat	*Ozimops lumsdenae*		✓	✓				✓	✓	✓
Eastern free-tailed bat	*Ozimops ridei*		✓	✓				✓	✓	✓
Greater glider	*Petauroides volans*		✓							
Sharman's rock-wallaby	*Petrogale sharmani*								✓	
Smaller horseshoe bat	*Rhinolophus megaphyllus*								✓	
Yellow-bellied sheathtail bat	*Saccolaimus flaviventris*		✓					✓	✓	✓
Inland broad-nosed bat	*Scotorepens balstoni*									✓
Scotorepens species	*Scotorepens greyi/Scotorepens sanborni*									✓
Feral pig	*Sus scrofa**		✓	✓	✓			✓		✓
Short-beaked echidna	*Tachyglossus aculeatus*		✓			✓	✓	✓	✓	✓
Common brushtail possum	*Trichosurus vulpecular*		✓	✓				✓	✓	
Eastern cave bat	*Vespadelus troughtoni*		✓					✓	✓	
Swamp wallaby	*Wallabia bicolor*	✓	✓	✓						
Reptiles										
Brown tree snake	*Boiga irregularis*					✓				
Lined rainbow-skink	*Carlia jarnoldae*								✓	

Common Name	Scientific Name	Incidental Sighting	Habitat Type							
			1	2	3	4	5	6	7	8 & 9
Shaded-litter rainbow-skink	*Carlia munda*							✓	✓	
Lively rainbow-skink	*Carlia vivax*		✓							
Elegant snake-eyed skink	*Cryptoblepharus pulcher*							✓		
Yellow-faced whipsnake	*Demansia psammophis*	✓								
Tommy-round head	*Diporiphora australis*	✓						✓	✓	
Bynoe's gecko	*Heteronotia binoei*					✓		✓	✓	
Eastern brown snake	*Pseudonaja textilis*	✓								
Amphibians										
Cane toad	*Bufo marinus**	✓	✓	✓						
Green tree frog	*Litoria caerulea*								✓	

* Invasive species

Appendix G

Habitat Mapping Rules and Figures

Appendix G MSES Habitat Mapping Rules and Figures

Table 25 MSES habitat mapping rules and areas

Species	Likelihood	Habitat Category	Mapping Rules	Area within Study Area (ha)
Flora				
Tingoora wattle (*Acacia tingoorensis*)	Potential	Potential habitat	Eucalypt communities on old loamy and sandy plans or granite (land zone 5 or 12)	932.84
Leptospermum pallidum	Known	Known habitat	Known habitat was mapped where individuals were found during the field survey.	3.01
		Potential habitat	Low open forest of *Acacia shirleyi* and *Eucalyptus persistens* on laterite (REs 9.7.1, 9.7.2).	890.72
Fauna				
Chestnut dunnart (*Sminthopsis archeri*)	Potential	Breeding/ foraging / dispersal	Ironbark and eucalypt communities on granite (land zone 12).	528.07
Common death adder (*Acanthophis antarcticus*)	Potential	Breeding / foraging	Vegetation with potential for dense leaf litter.	5102.30
Short-beaked echidna (*Tachyglossus aculeatus*)	Known	Breeding / foraging / dispersal	Not mapped – this is a generalist species that may utilise all habitat within the Study Area.	5850.98

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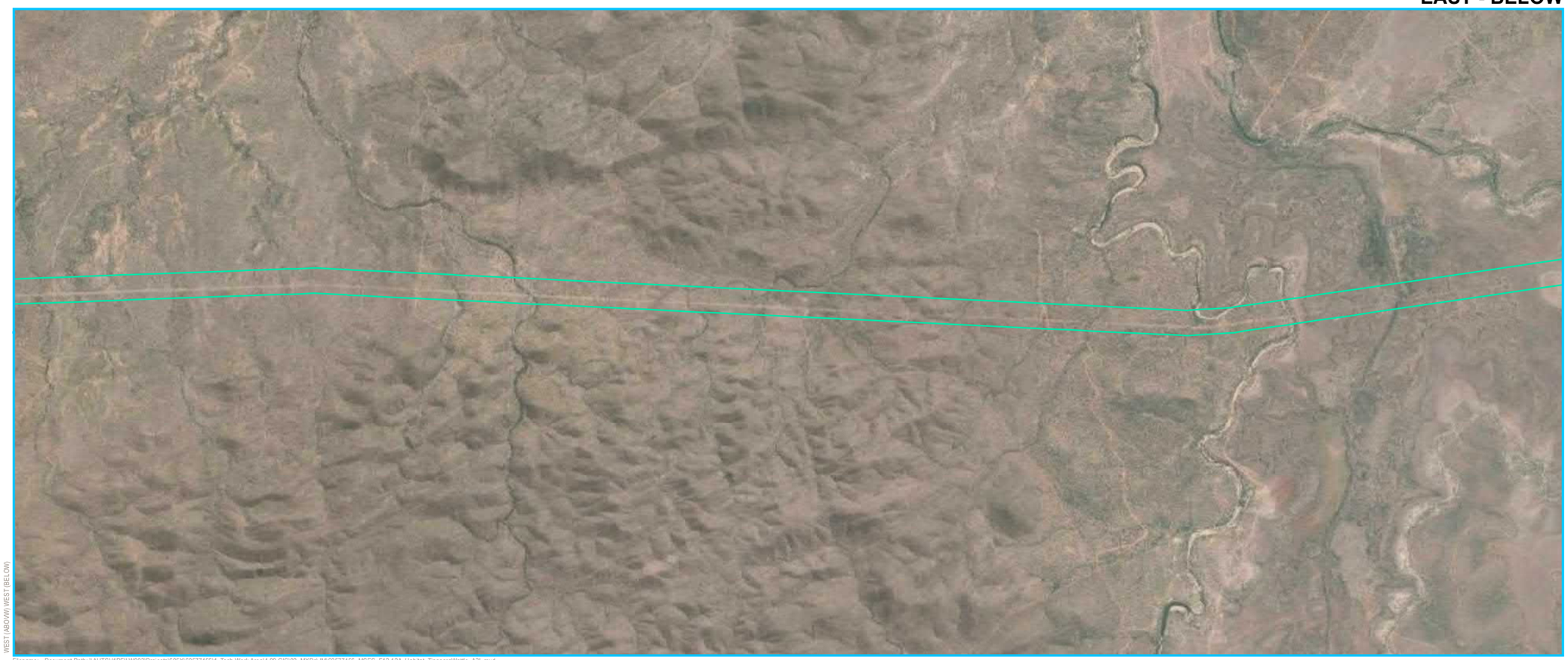

EAST - BELOW

WEST (ABOVE) WEST (BELOW)

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Coordinate System: GDA 1994 MGA Zone 55
Projection: Transverse Mercator

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Meters

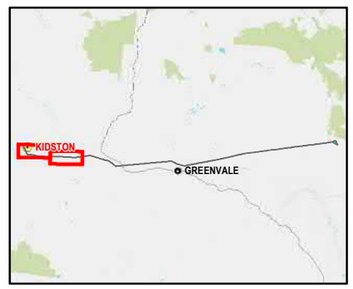
1:55,000 (when printed at A3)

Legend

- Study Area

Tingoora wattle

- Potential habitat



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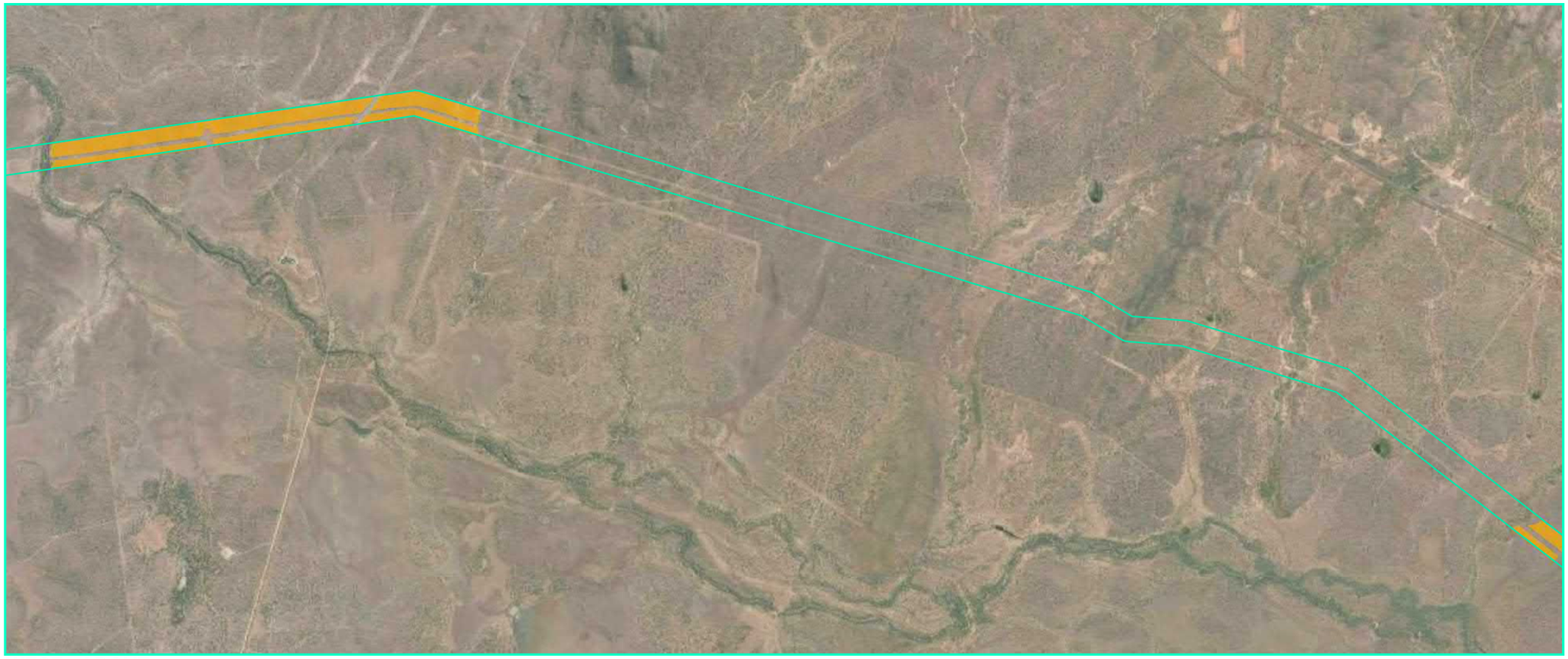
POTENTIAL HABITAT FOR TINGOORA WATTLE

PROJECT ID: 60577456
CREATED BY: JR
LAST MODIFIED: KB - 11/10/2021
VERSION: 1

Figure
F11.1

A3 size



WEST - ABOVE

EAST - BELOW

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Coordinate System: GDA 1994 MGA Zone 55
Projection: Transverse Mercator

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Meters

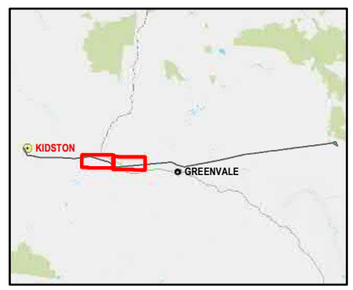
1:55,000 (when printed at A3)

Legend

Study Area

Tingoora wattle

Potential habitat



Data sources:
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POTENTIAL HABITAT FOR TINGOORA WATTLE

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LAST MODIFIED: KB - 13/09/2021
VERSION: 1

Figure
F11.2

A3 size

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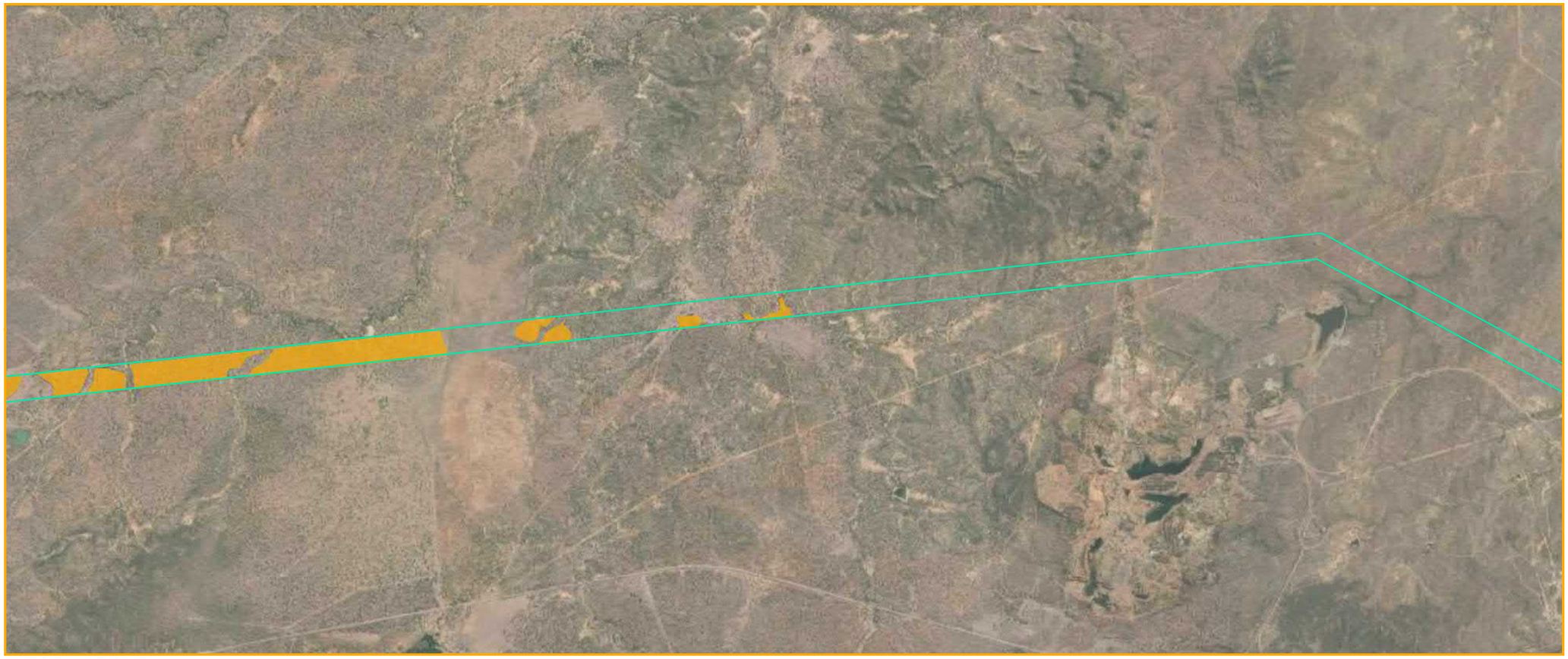

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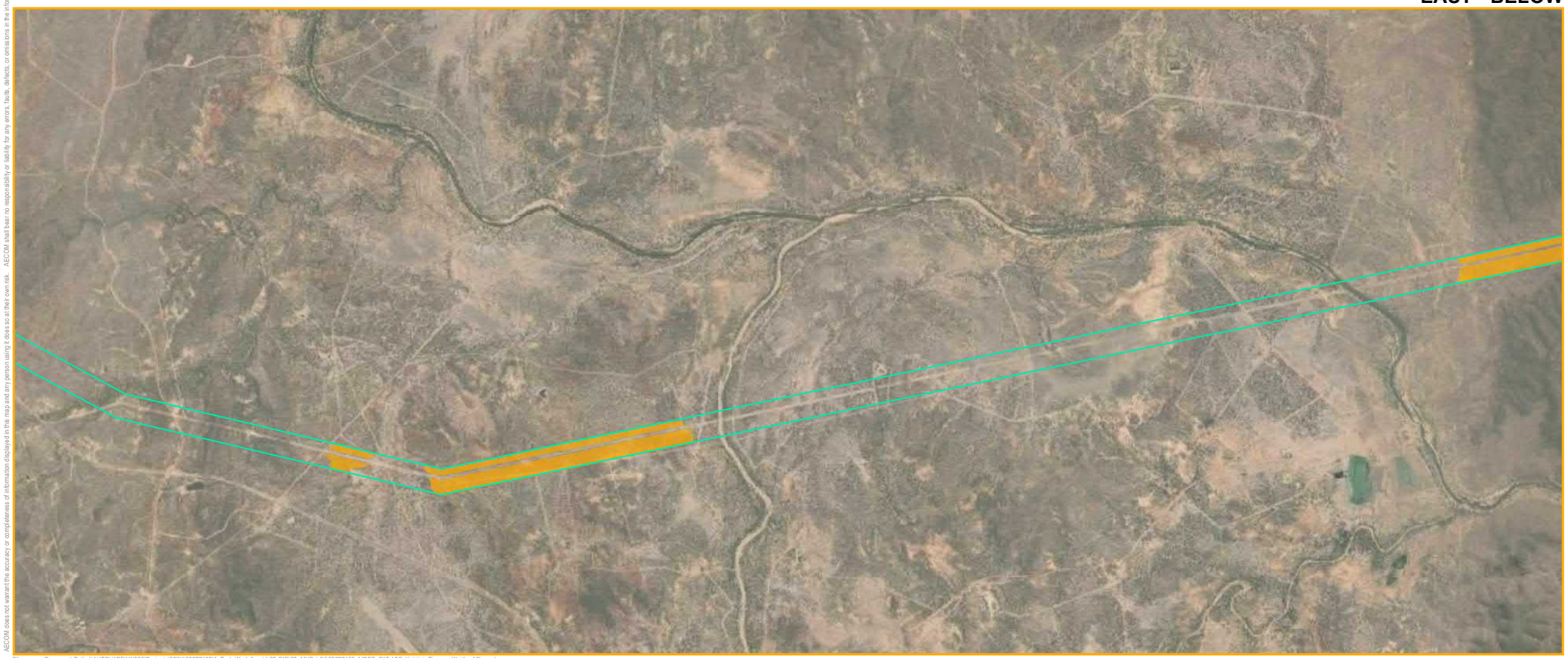

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Projection: Transverse Mercator

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Meters

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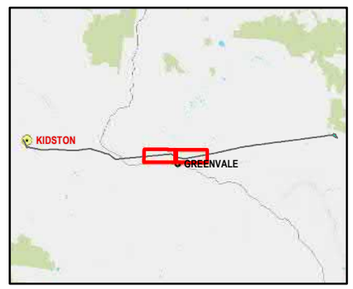
Legend

Study Area

Tingoora wattle

Potential habitat



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POTENTIAL HABITAT FOR TINGOORA WATTLE

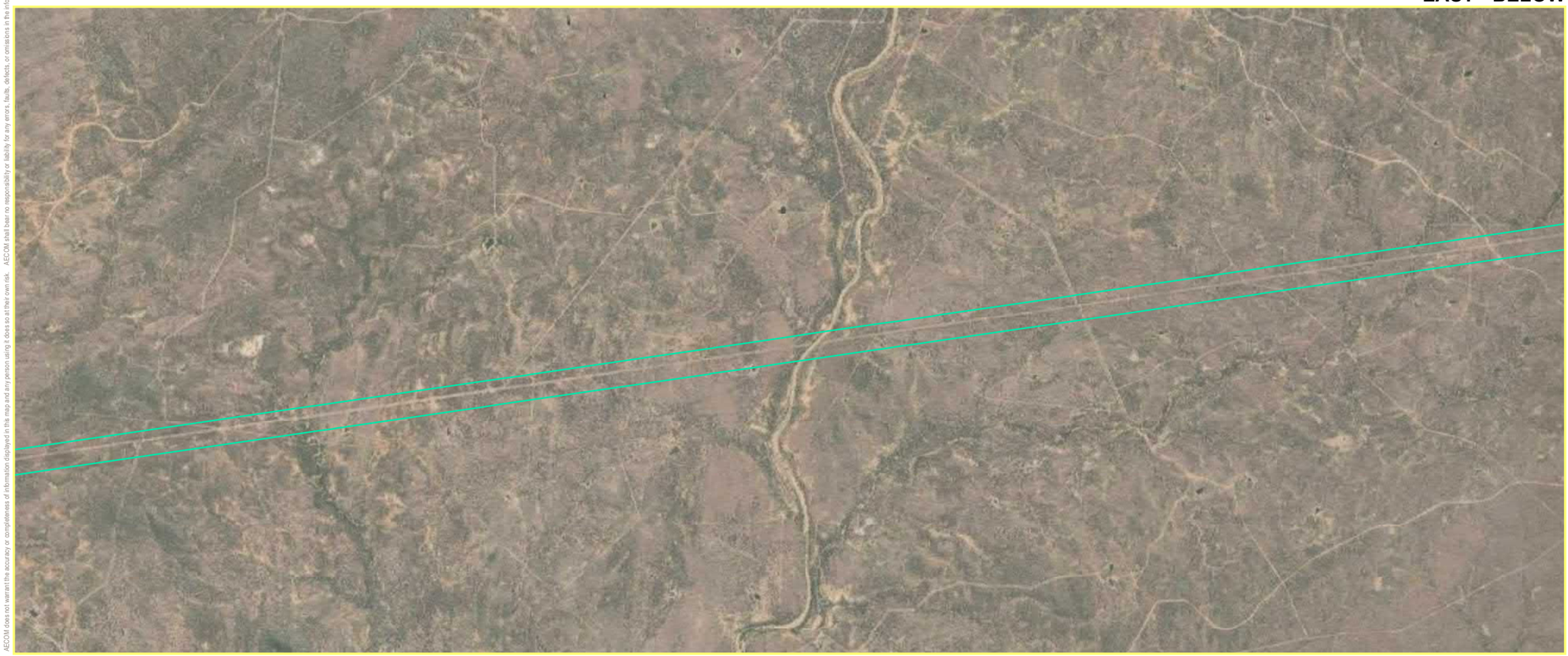
PROJECT ID: 60577456
CREATED BY: JR
LAST MODIFIED: KB - 11/10/2021
VERSION: 1

Figure
F11.3

A3 size

WEST - ABOVE

EAST - BELOW



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Coordinate System: GDA 1994 MGA Zone 55
Projection: Transverse Mercator

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Meters

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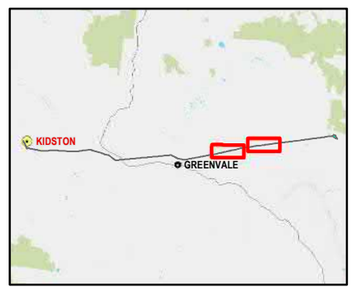
Legend

Study Area

Tingoora wattle

Potential habitat



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POTENTIAL HABITAT FOR TINGOORA WATTLE

PROJECT ID: 60577456
CREATED BY: JR
LAST MODIFIED: KB - 11/10/2021
VERSION: 1

Figure
F11.4

A3 size

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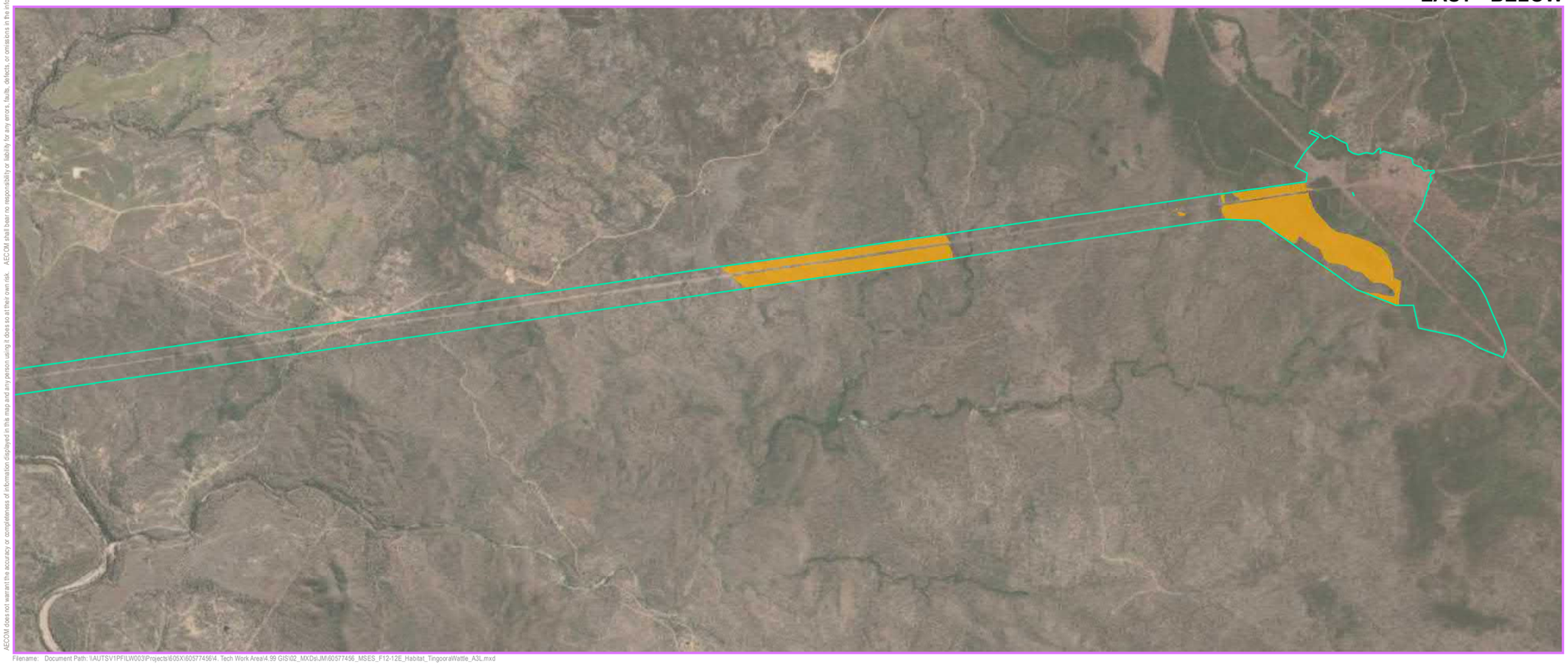

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Coordinate System: GDA 1994 MGA Zone 55
Projection: Transverse Mercator

0 650 1,300 1,950 2,600
Meters

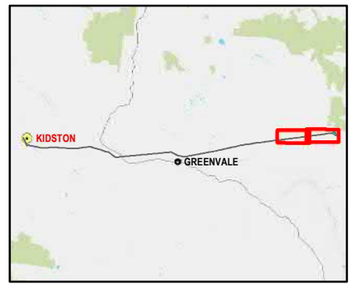
1:55,000 (when printed at A3)

Legend

Study

Tingoora wattle

Potential habitat



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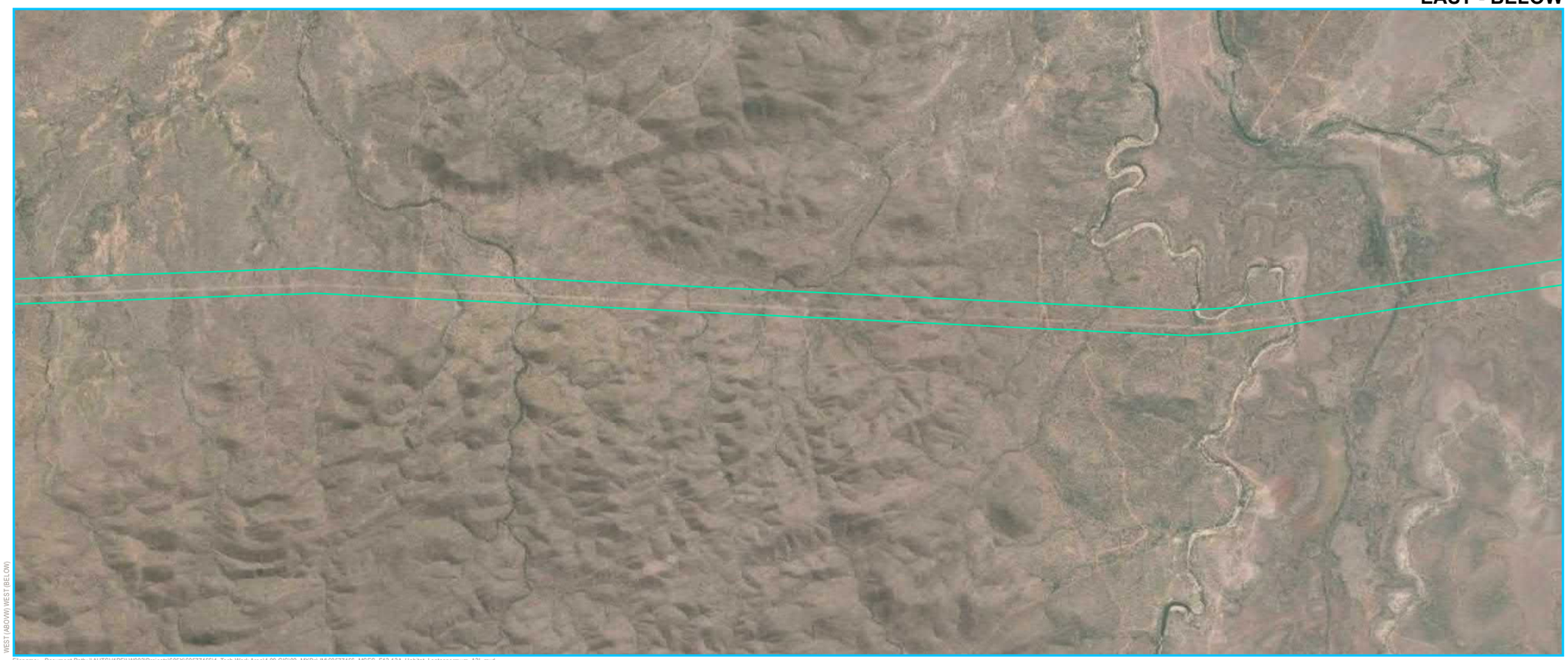
POTENTIAL HABITAT FOR TINGOORA WATTLE

PROJECT ID: 60577456
CREATED BY: JR
LAST MODIFIED: KB - 11/10/2021
VERSION: 1

Figure
F11.5

A3 size

WEST - ABOVE



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Filename: Document Path: \\AUTSV1PFILW003\Projects\605X\60577456\4. Tech Work Area\4.99 GIS\02_MXDs\JM\60577456_MSES_F13-13A_Habitat_Leptospermum_A3L.mxd

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Coordinate System: GDA 1994 MGA Zone 55
Projection: Transverse Mercator

0 650 1,300 1,950 2,600
Meters

1:55,000 (when printed at A3)

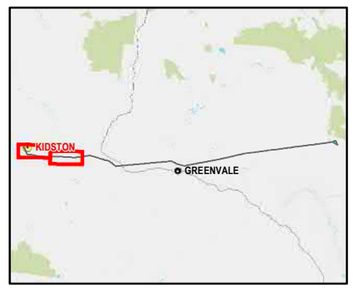
Legend

Study Area

Leptospermum pallidum

Known habitat

Potential habitat



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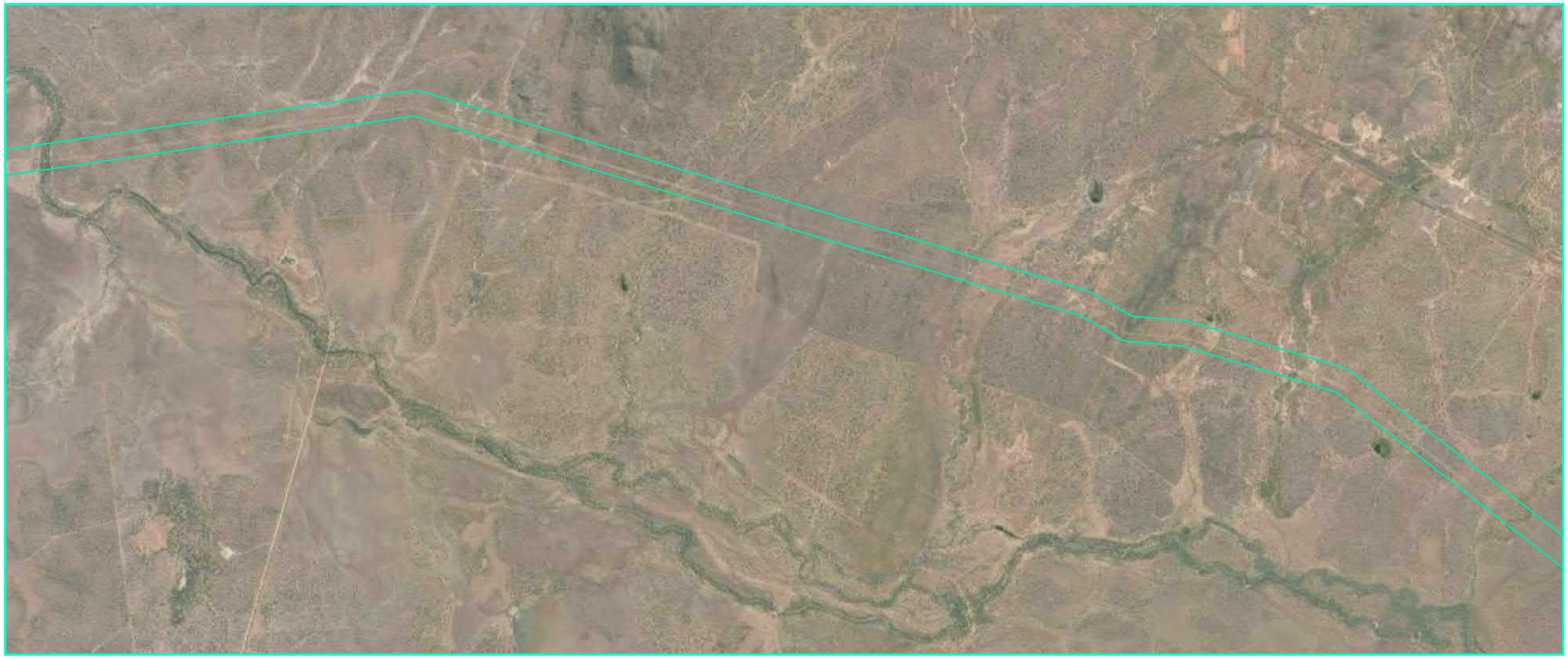
POTENTIAL HABITAT FOR LEPTOSPERMUM PALLIDUM

PROJECT ID: 60577456
CREATED BY: JR
LAST MODIFIED: KB - 11/10/2021
VERSION: 1

Figure
F12.1

A3 size



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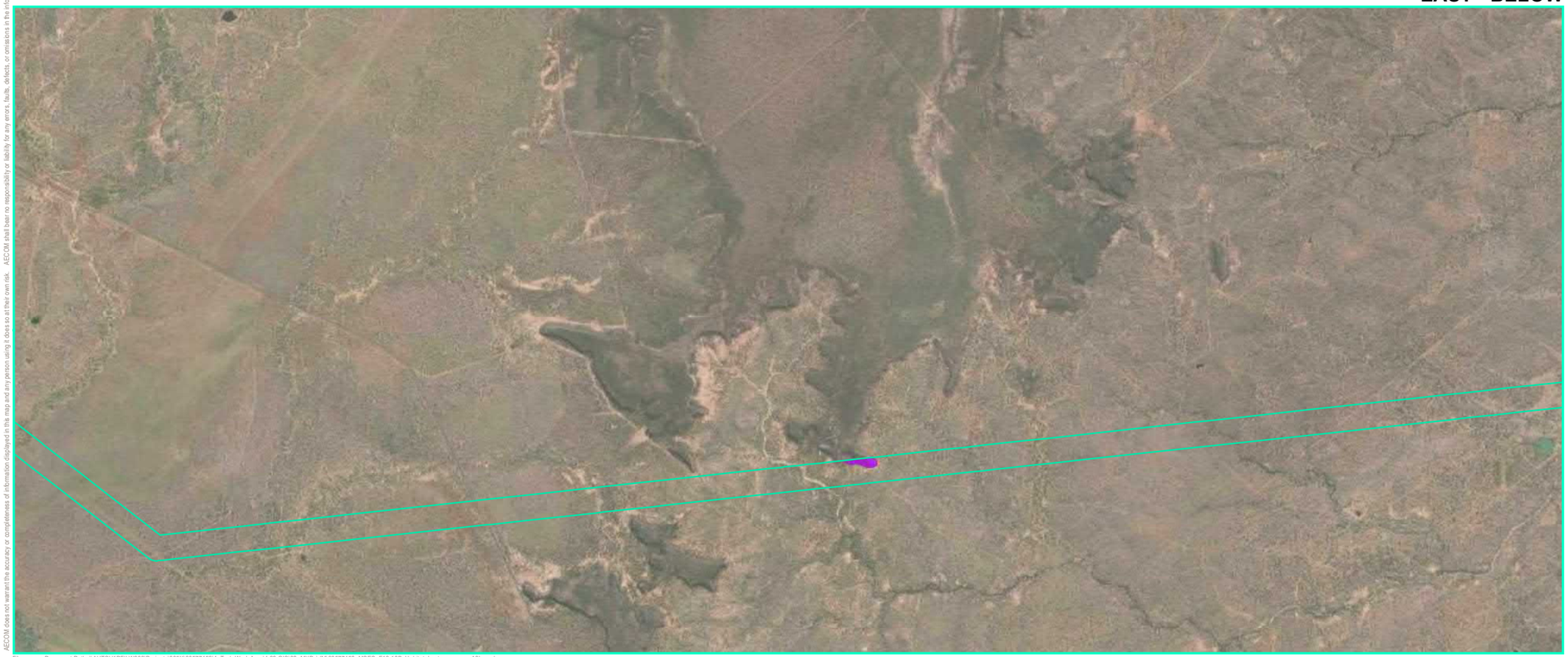

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Projection: Transverse Mercator

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Meters

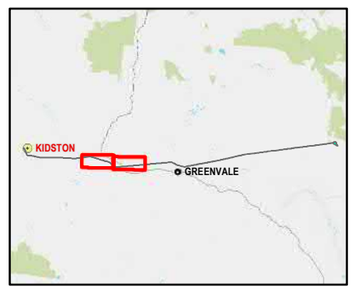
1:55,000 (when printed at A3)

Legend

- Study Area

Leptospermum pallidum

- Known habitat
- Potential habitat



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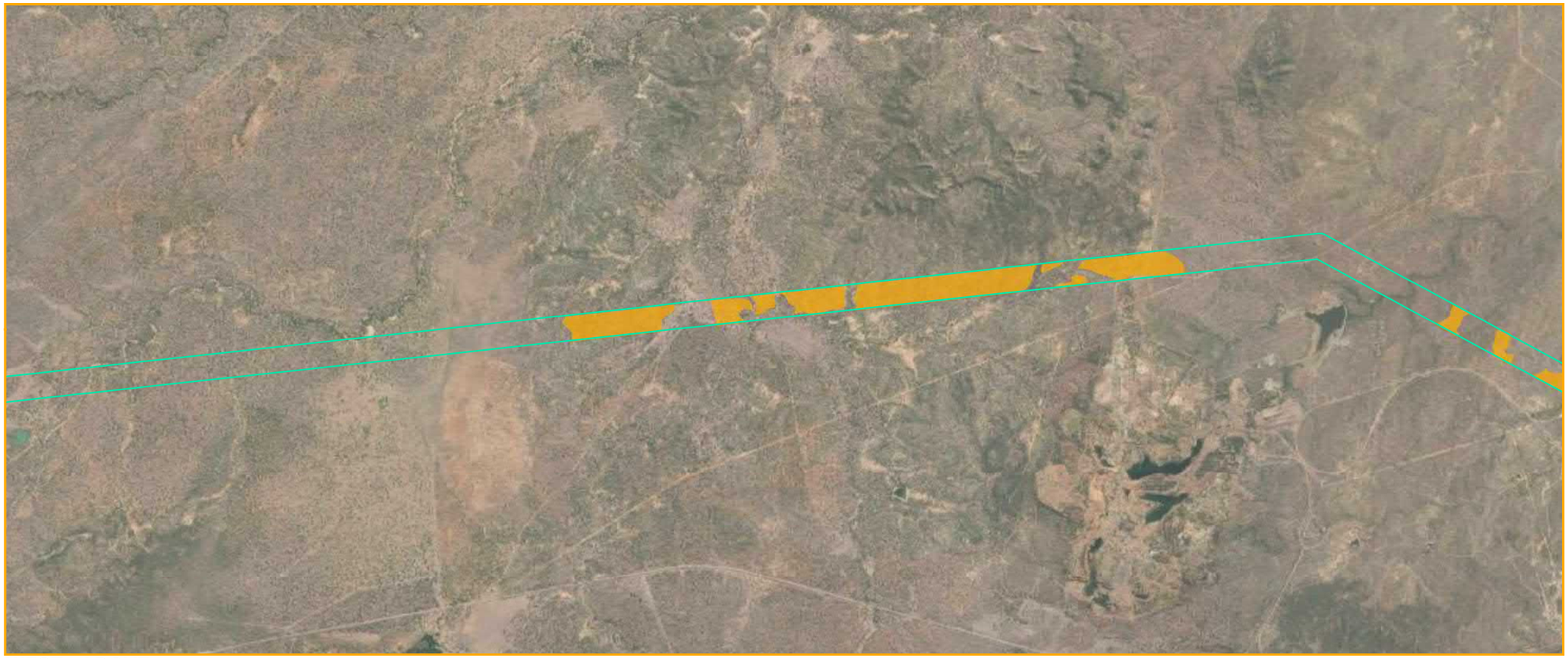
POTENTIAL HABITAT FOR LEPTOSPERMUM PALLIDUM

PROJECT ID: 60577456
CREATED BY: JR
LAST MODIFIED: KB - 11/10/2021
VERSION: 1

Figure
F12.2

A3 size

Filename: Document Path: \\AUTSV1PFILW003\Projects\605X\60577456\4. Tech Work Area\4.99 GIS\02_MXDs\JM\60577456_MSES_F13-13B_Habitat_Leptospermum_A3L.mxd



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Coordinate System: GDA 1994 MGA Zone 55
Projection: Transverse Mercator

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Meters

1:55,000 (when printed at A3)

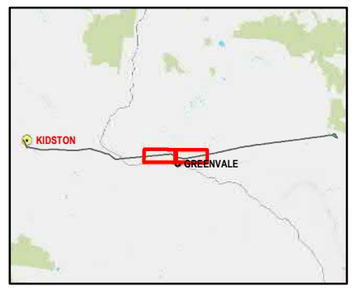
Legend

Study Area

Leptospermum pallidum

Known habitat

Potential habitat



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PROJECT ID: 60577456
CREATED BY: JR
LAST MODIFIED: KB - 11/10/2021
VERSION: 1

Figure
F12.3

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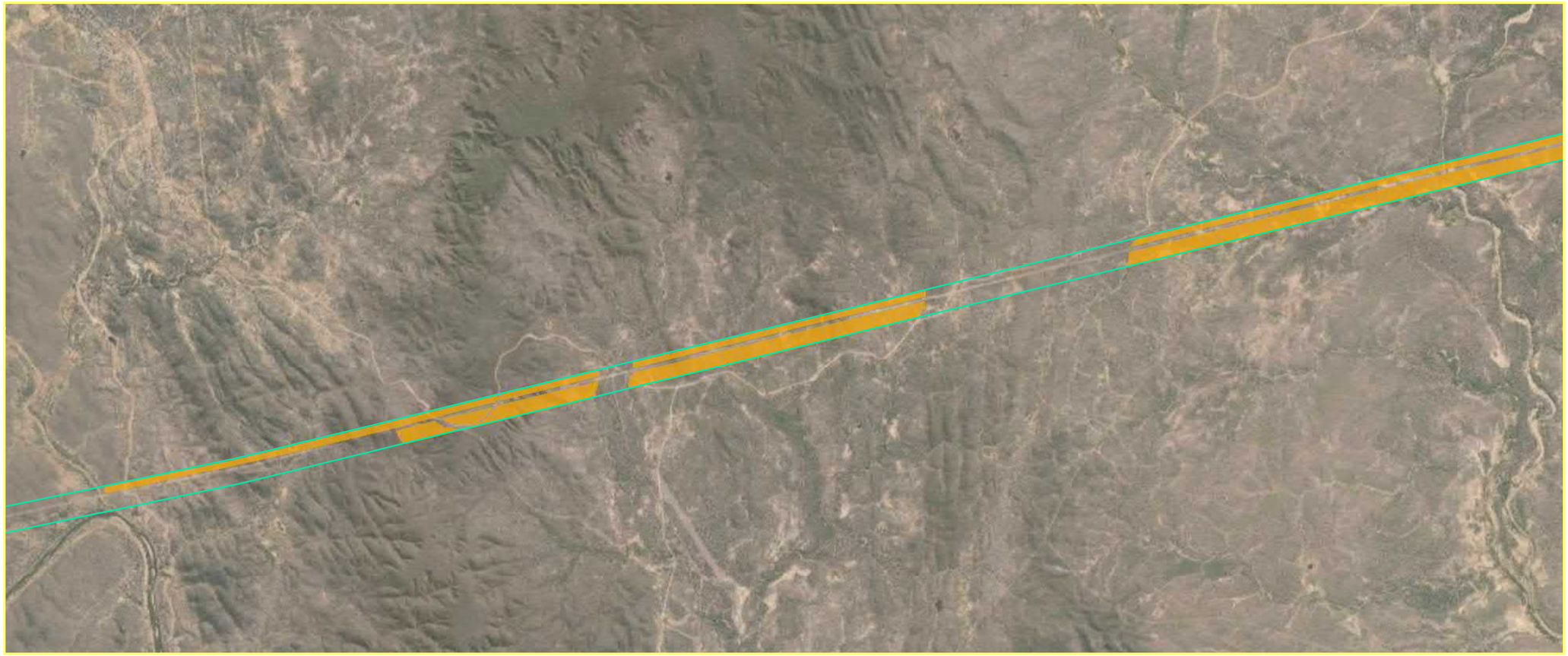

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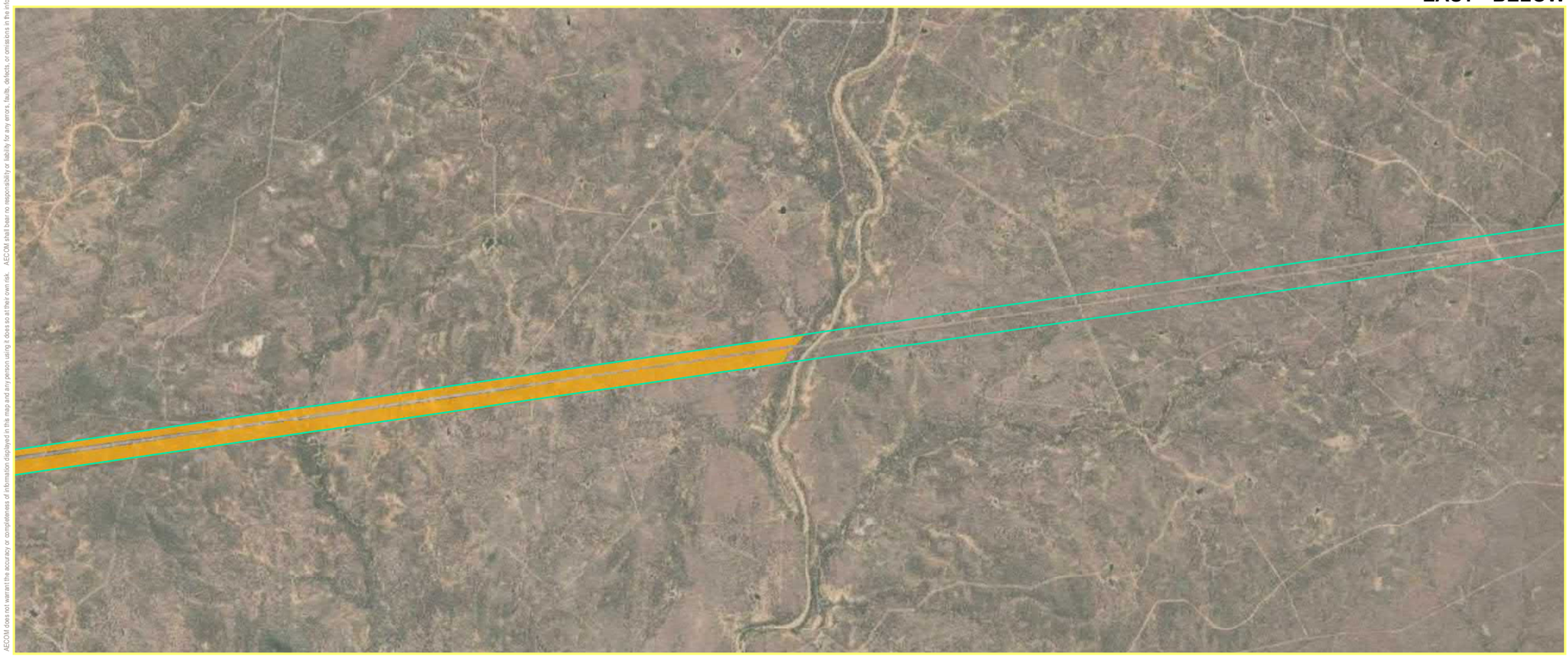

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Projection: Transverse Mercator

0 650 1,300 1,950 2,600

Meters

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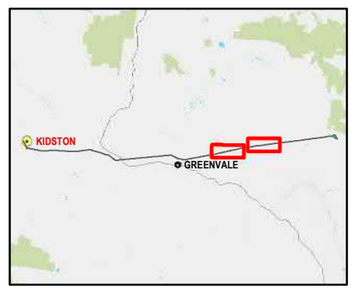
Legend

Study Area

Leptospermum pallidum

Known habitat

Potential habitat



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POTENTIAL HABITAT FOR LEPTOSPERMUM PALLIDUM

PROJECT ID: 60577456
CREATED BY: JR
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VERSION: 1

Figure
F12.4

A3 size

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WEST - ABOVE

EAST - BELOW

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Coordinate System: GDA 1994 MGA Zone 55
Projection: Transverse Mercator

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Meters

1:55,000 (when printed at A3)

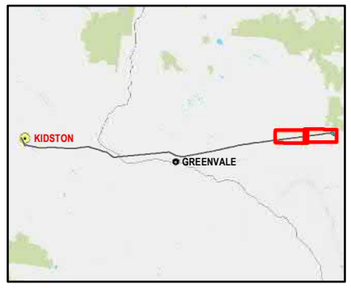
Legend

Study Area

Leptospermum pallidum

Known habitat

Potential habitat



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POTENTIAL HABITAT FOR LEPTOSPERMUM PALLIDUM

PROJECT ID: 60577456
CREATED BY: JR
LAST MODIFIED: KB - 11/10/2021
VERSION: 1

Figure
F12.5

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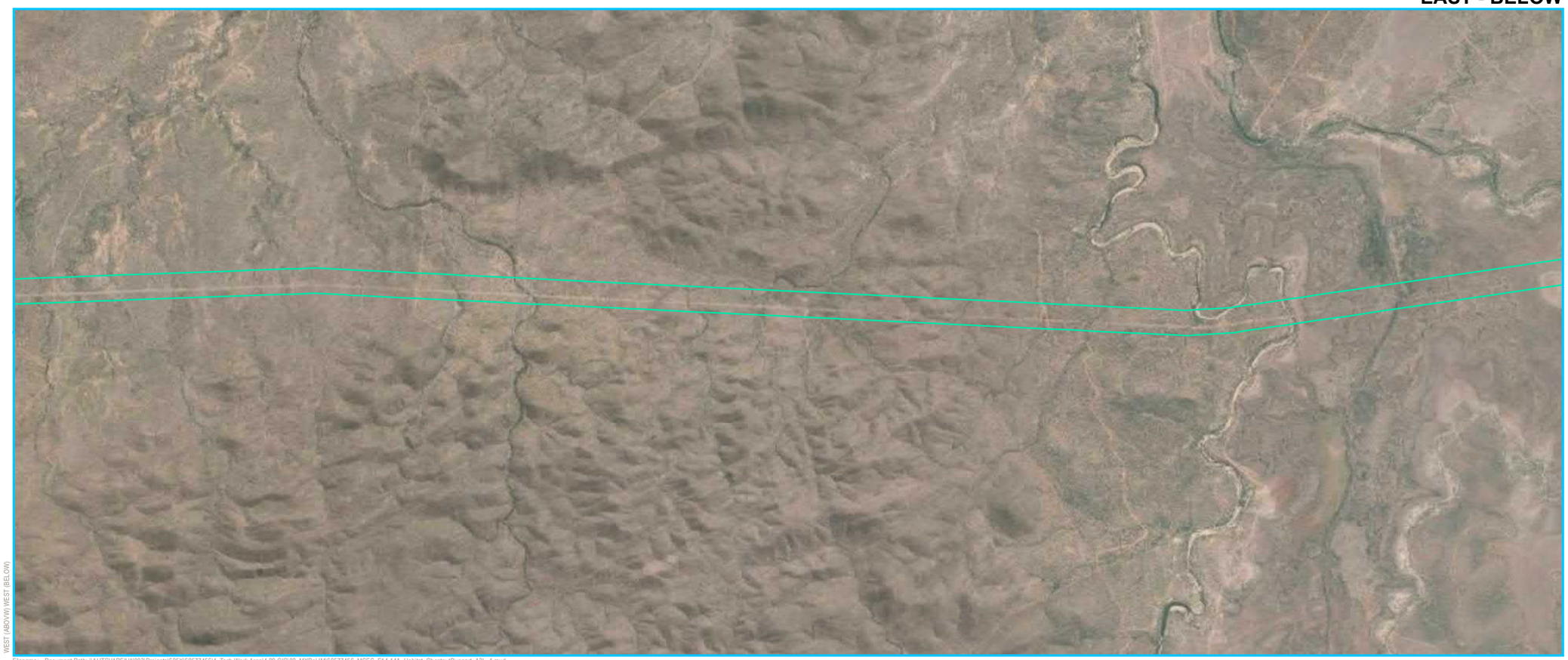

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Coordinate System: GDA 1994 MGA Zone 55
Projection: Transverse Mercator

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Meters

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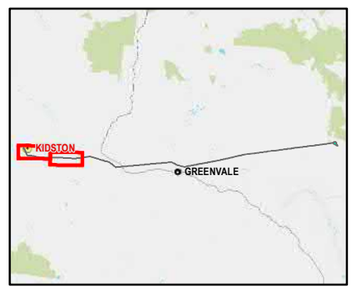
Legend

Study Area

Chestnut Dunnart

Potential breeding, foraging and dispersal habitat



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POTENTIAL HABITAT FOR CHESTNUT DUNNART

PROJECT ID: 60577456
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LAST MODIFIED: KB - 10/12/2021
VERSION: 1

Figure
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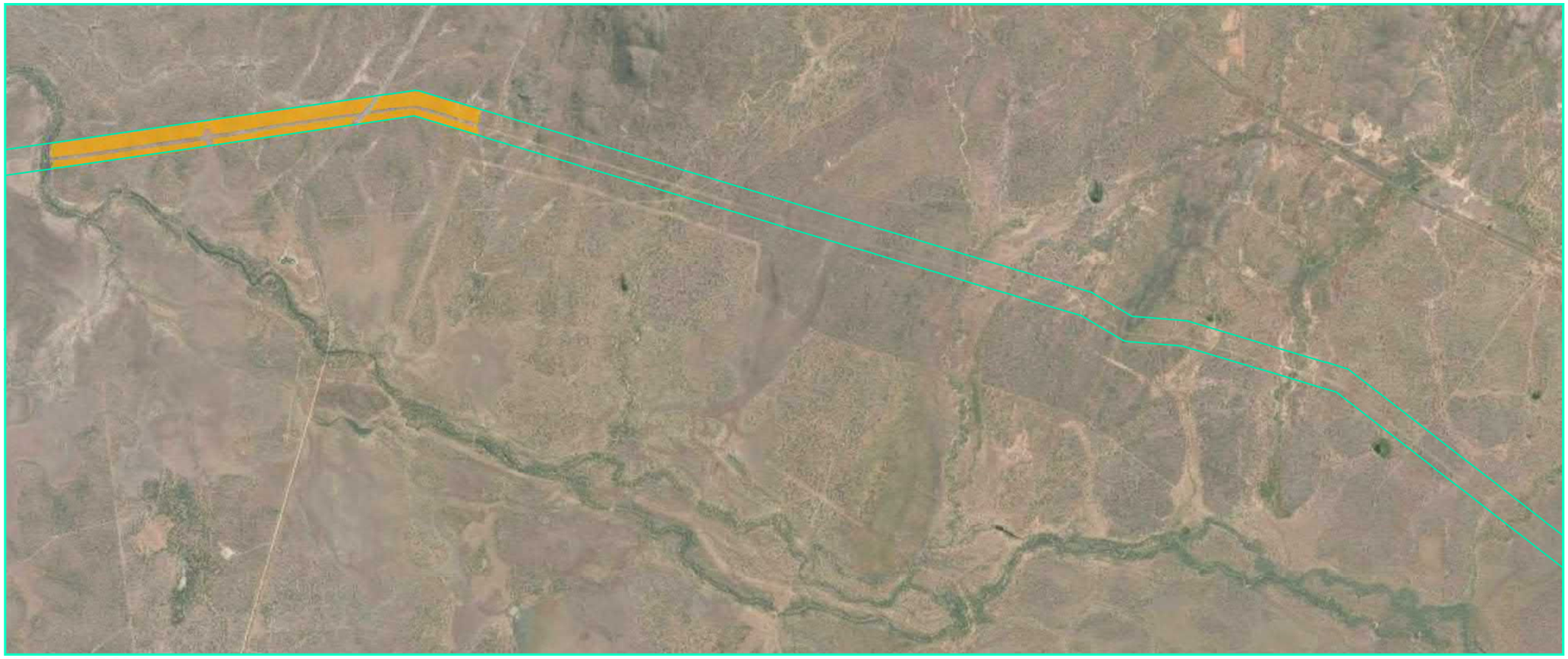

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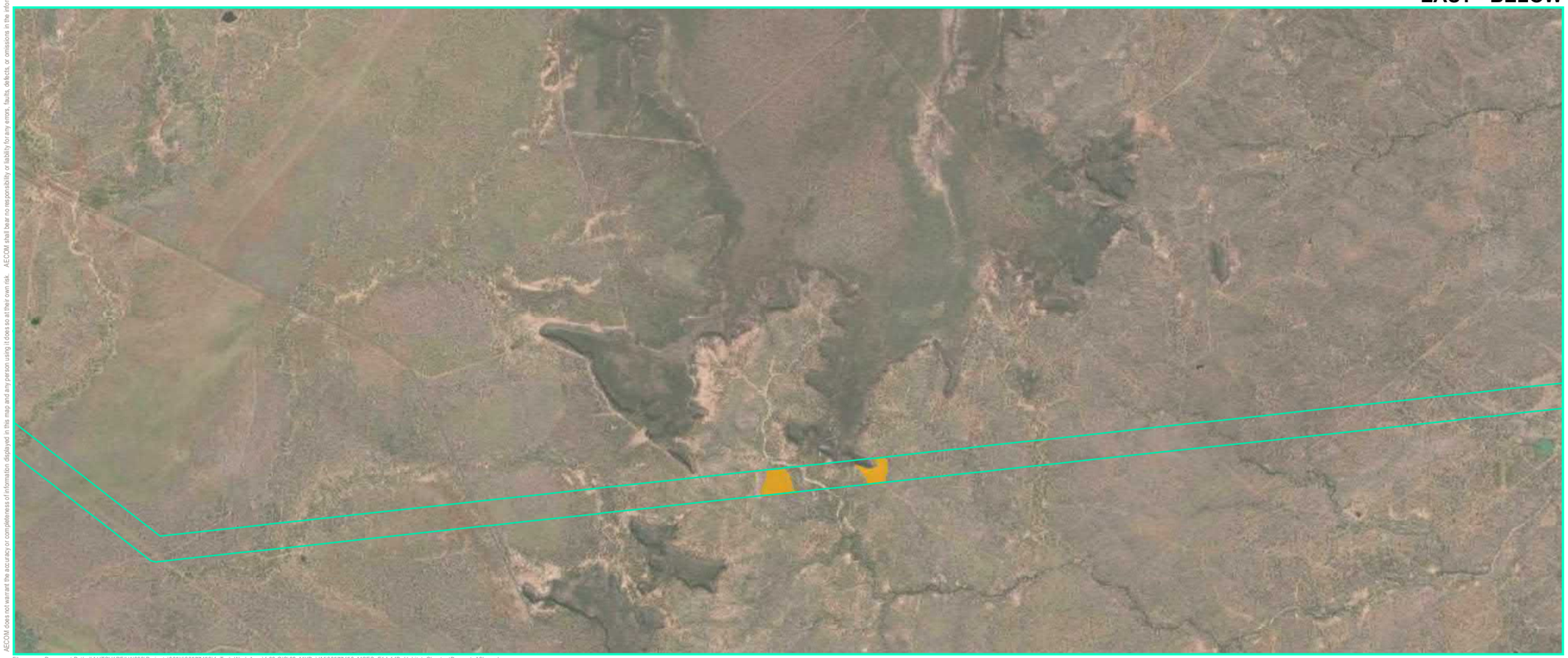

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Coordinate System: GDA 1994 MGA Zone 55
Projection: Transverse Mercator

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Meters

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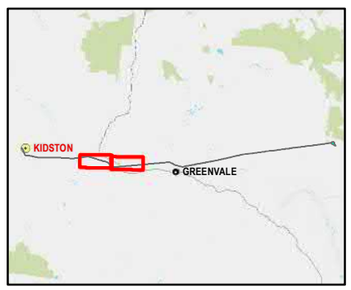
Legend

Study Area

Chestnut Dunnart

Potential breeding, foraging and dispersal habitat



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POTENTIAL HABITAT FOR CHESTNUT DUNNART

PROJECT ID: 60577456
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LAST MODIFIED: KB - 10/12/2021
VERSION: 1

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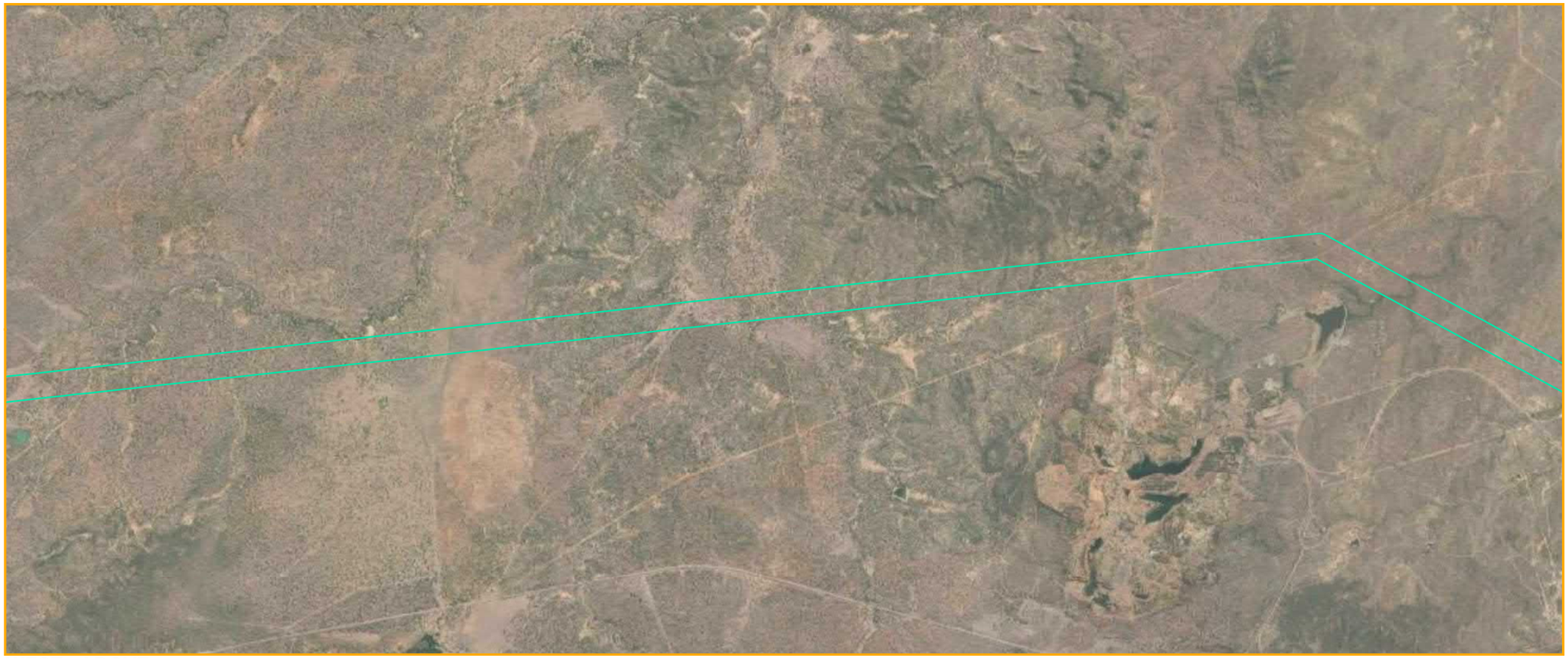
F13.2

A3 size

Filename: Document Path: \\AUTSV1PFIL\W003\Projects\605X\60577456\4. Tech Work Area\4.99 GIS\02_MXDs\JM\60577456_MSES_F14-14B_Habitat_ChestnutDunnart_A3L.mxd



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EAST - BELOW

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Coordinate System: GDA 1994 MGA Zone 55
Projection: Transverse Mercator

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Meters

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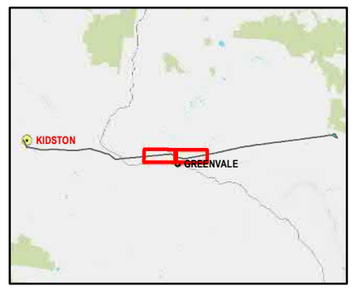
Legend

Study Area

Chestnut Dunnart

Potential breeding, foraging and dispersal habitat



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POTENTIAL HABITAT FOR CHESTNUT DUNNART

PROJECT ID: 60577456
CREATED BY: JR
LAST MODIFIED: KB - 10/12/2021
VERSION: 1

Figure

F13.3

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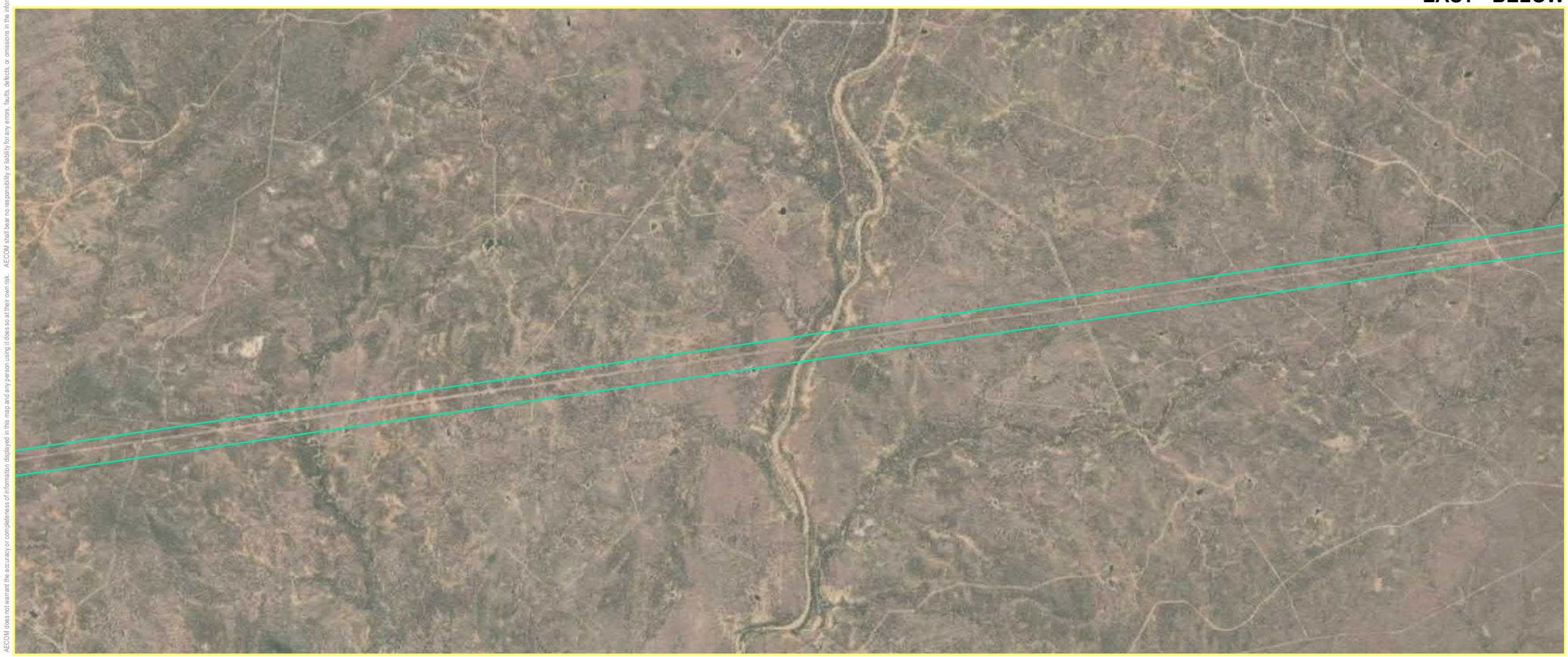
EAST - BELOW



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Coordinate System: GDA 1994 MGA Zone 55
Projection: Transverse Mercator

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Meters

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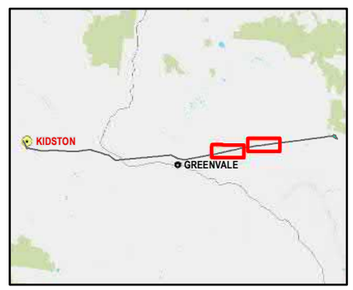
Legend

Study Area

Chestnut Dunnart

Potential breeding, foraging and dispersal habitat



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POTENTIAL HABITAT FOR CHESTNUT DUNNART

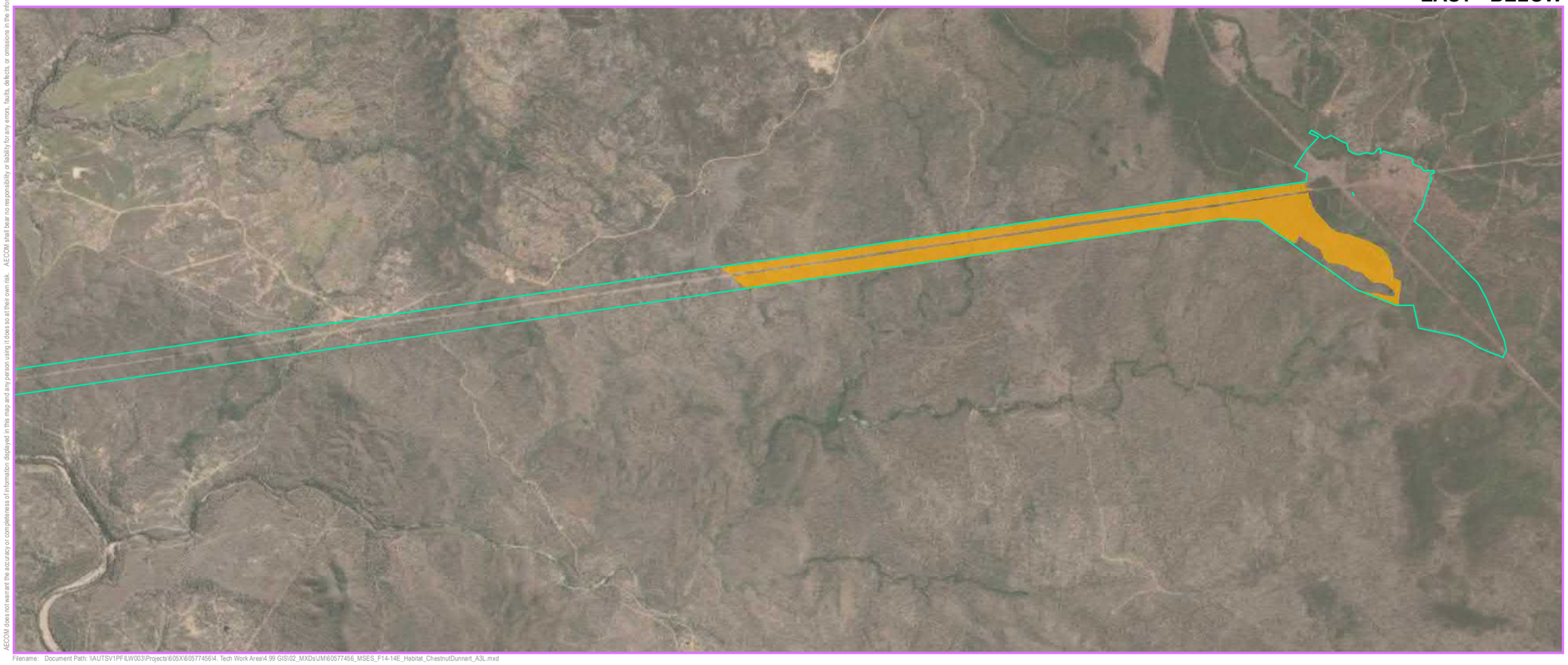
PROJECT ID: 60577456
CREATED BY: JR
LAST MODIFIED: KB - 10/12/2021
VERSION: 1

Figure
F13.4

A3 size

WEST - ABOVE

EAST - BELOW



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Coordinate System: GDA 1994 MGA Zone 55
Projection: Transverse Mercator

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Meters

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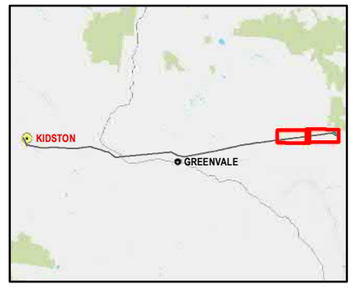
Legend

Study Area

Chestnut Dunnart

Potential breeding, foraging and dispersal habitat



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POTENTIAL HABITAT FOR CHESTNUT DUNNART

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VERSION: 1

Figure
F13.5

A3 size

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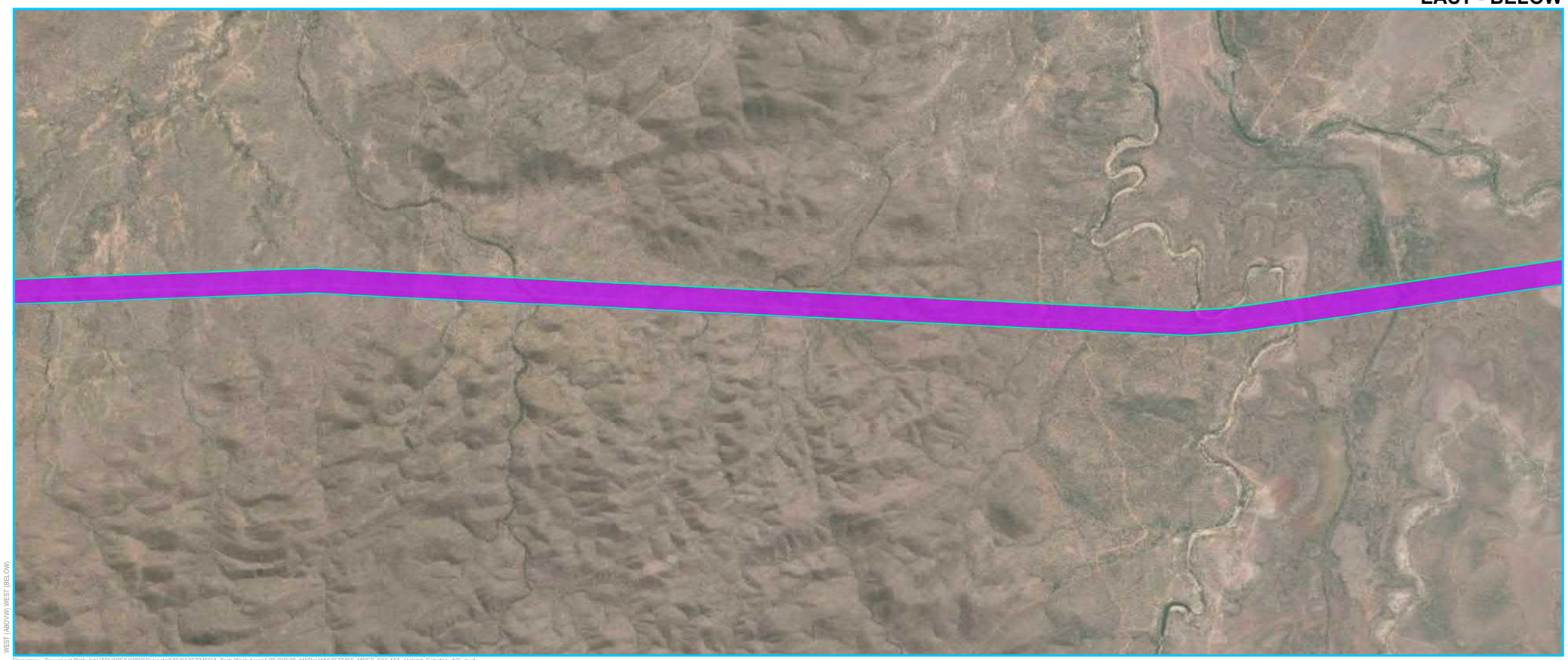

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Coordinate System: GDA 1994 MGA Zone 55
Projection: Transverse Mercator

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Meters

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Legend

Study Area

Short-beaked Echidna

Known breeding, foraging and dispersal habitat

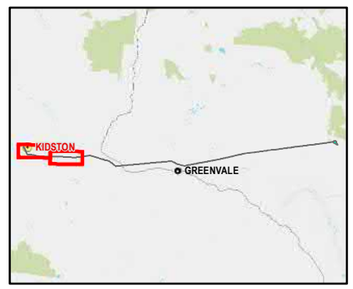

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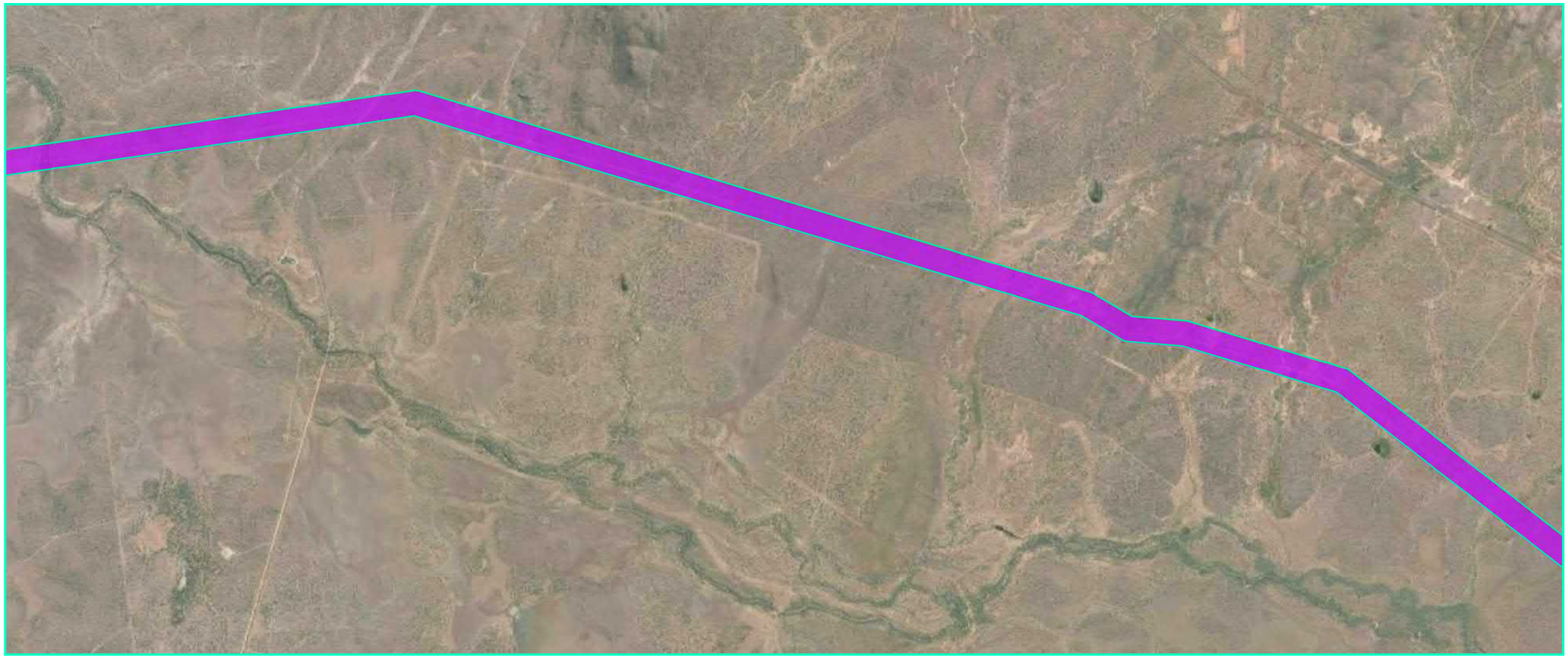
Figure F14.1

A3 size



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Coordinate System: GDA 1994 MGA Zone 55
Projection: Transverse Mercator

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Meters

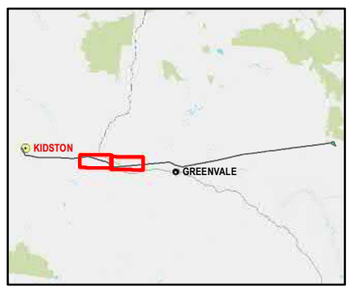
1:55,000 (when printed at A3)

Legend

Study Area

Short-beaked Echidna

Known breeding, foraging and dispersal habitat



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POTENTIAL HABITAT FOR SHORT-BEAKED ECHIDNA

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Figure
F14.2

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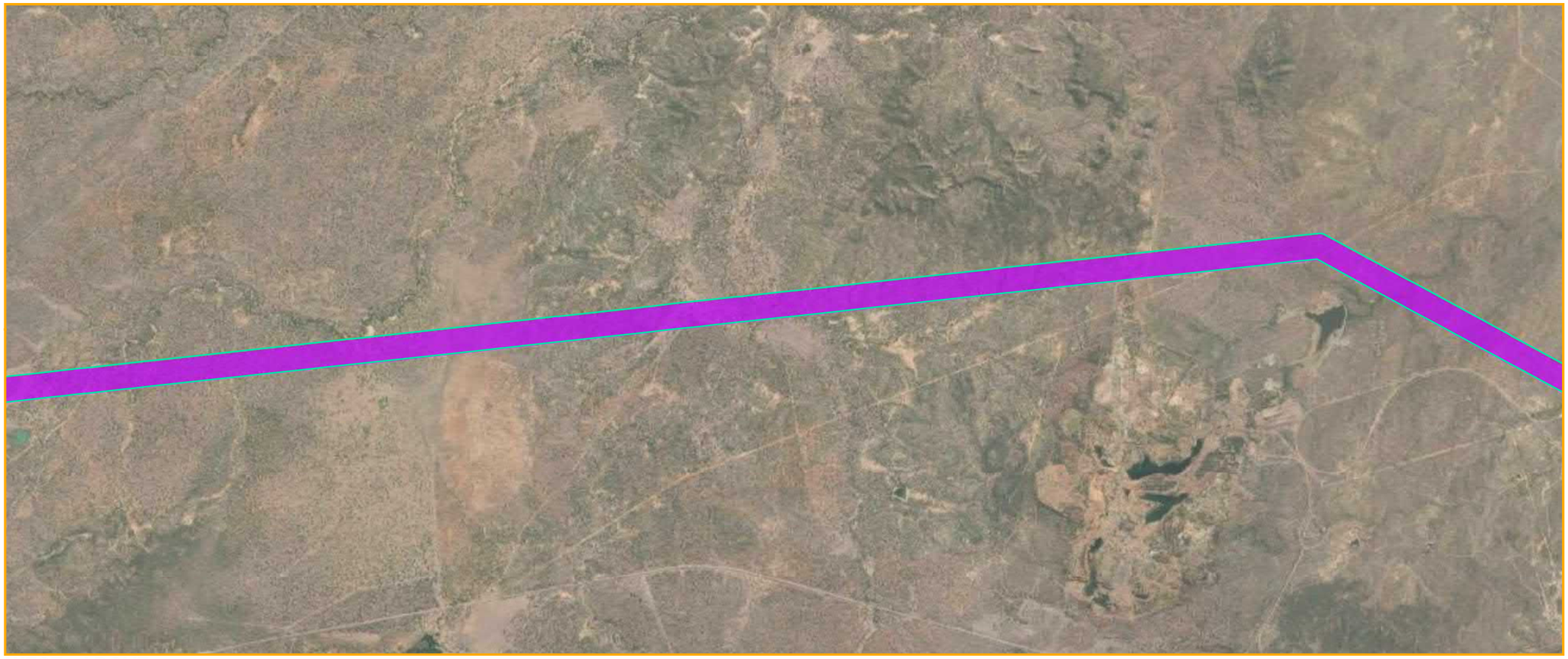

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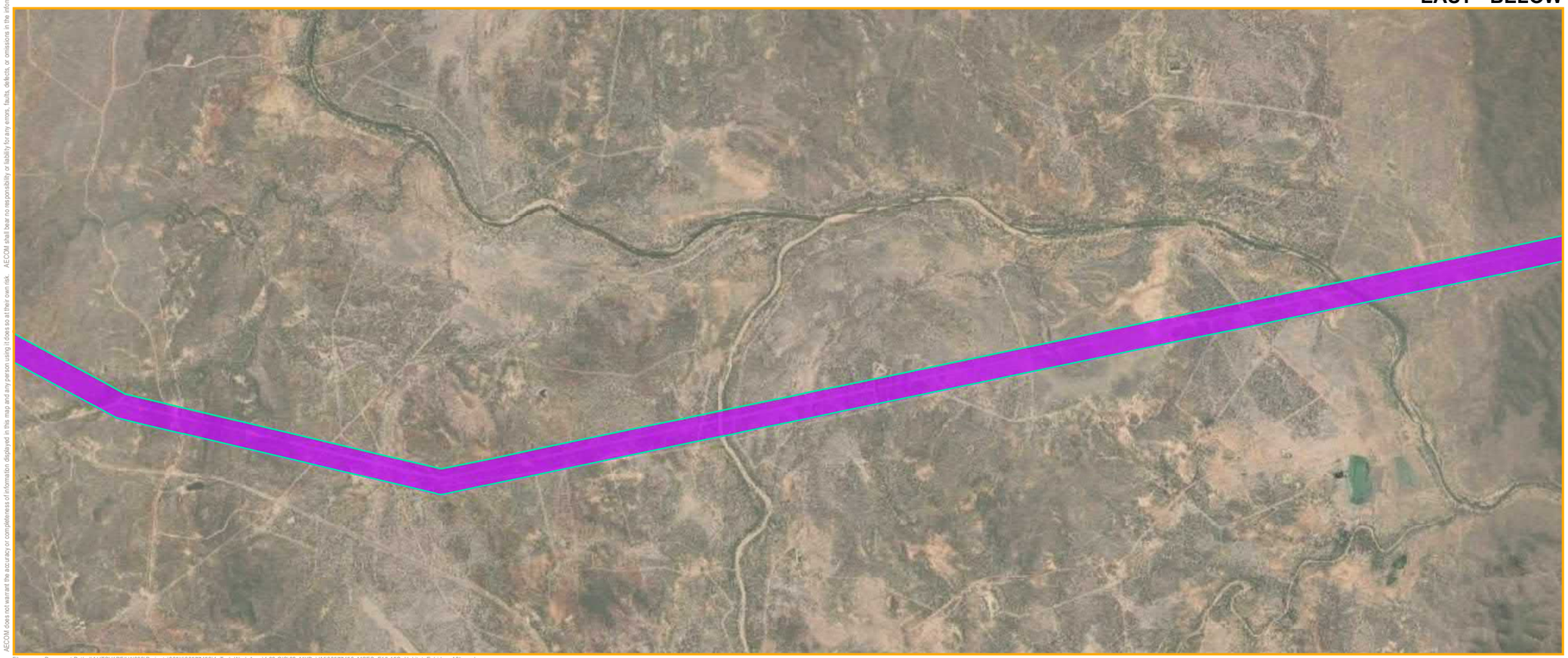

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Coordinate System: GDA 1994 MGA Zone 55
Projection: Transverse Mercator

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Meters

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Legend

Study Area

Short-beaked Echidna

Known breeding, foraging and dispersal habitat

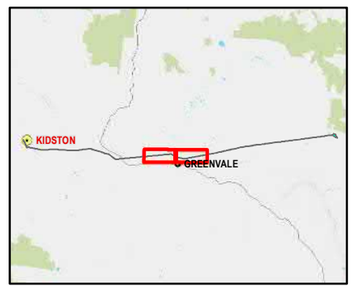

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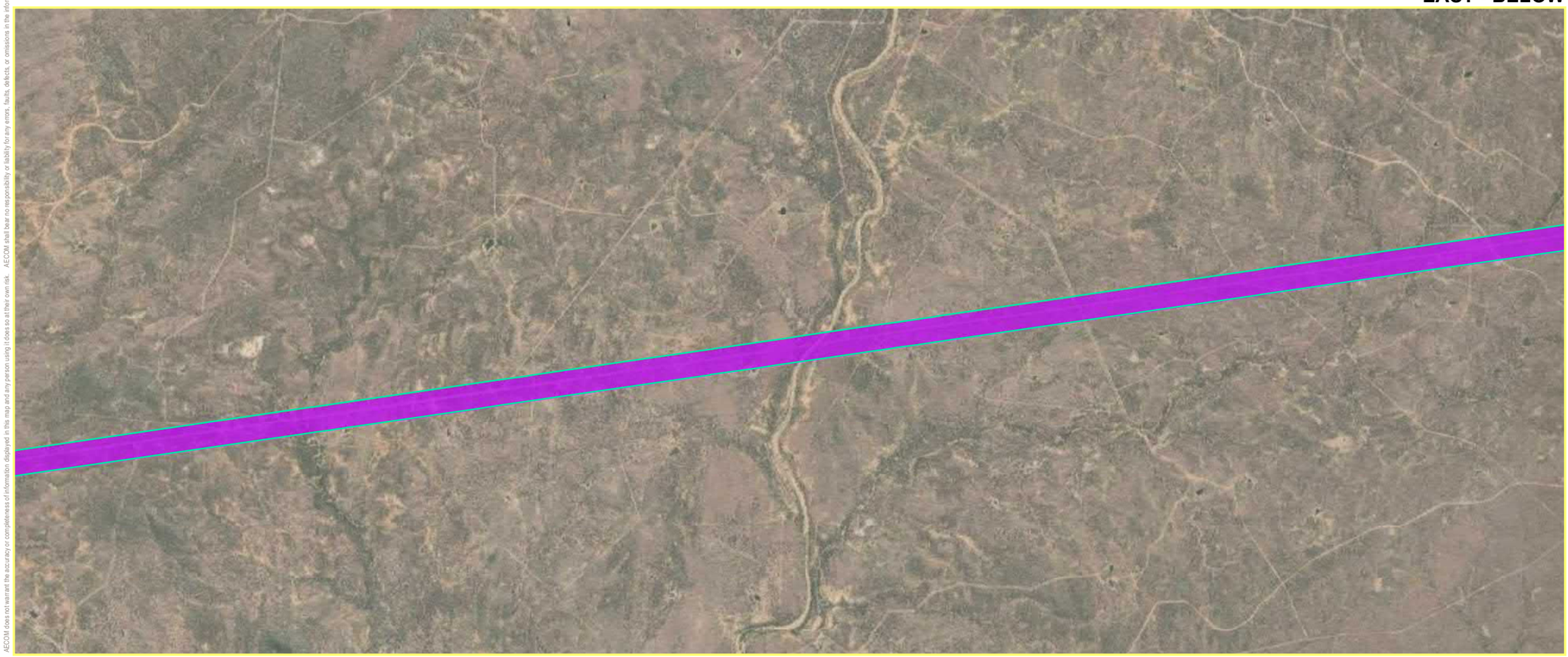
Figure
F14.3

A3 size

WEST - ABOVE

EAST - BELOW



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Coordinate System: GDA 1994 MGA Zone 55
Projection: Transverse Mercator

0 650 1,300 1,950 2,600

Meters

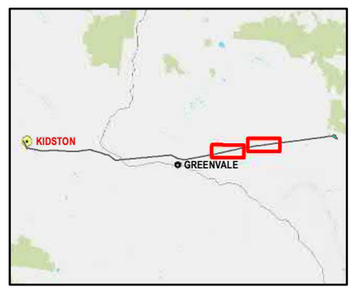
1:55,000 (when printed at A3)

Legend

Study Area

Short-beaked Echidna

Known breeding, foraging and dispersal habitat



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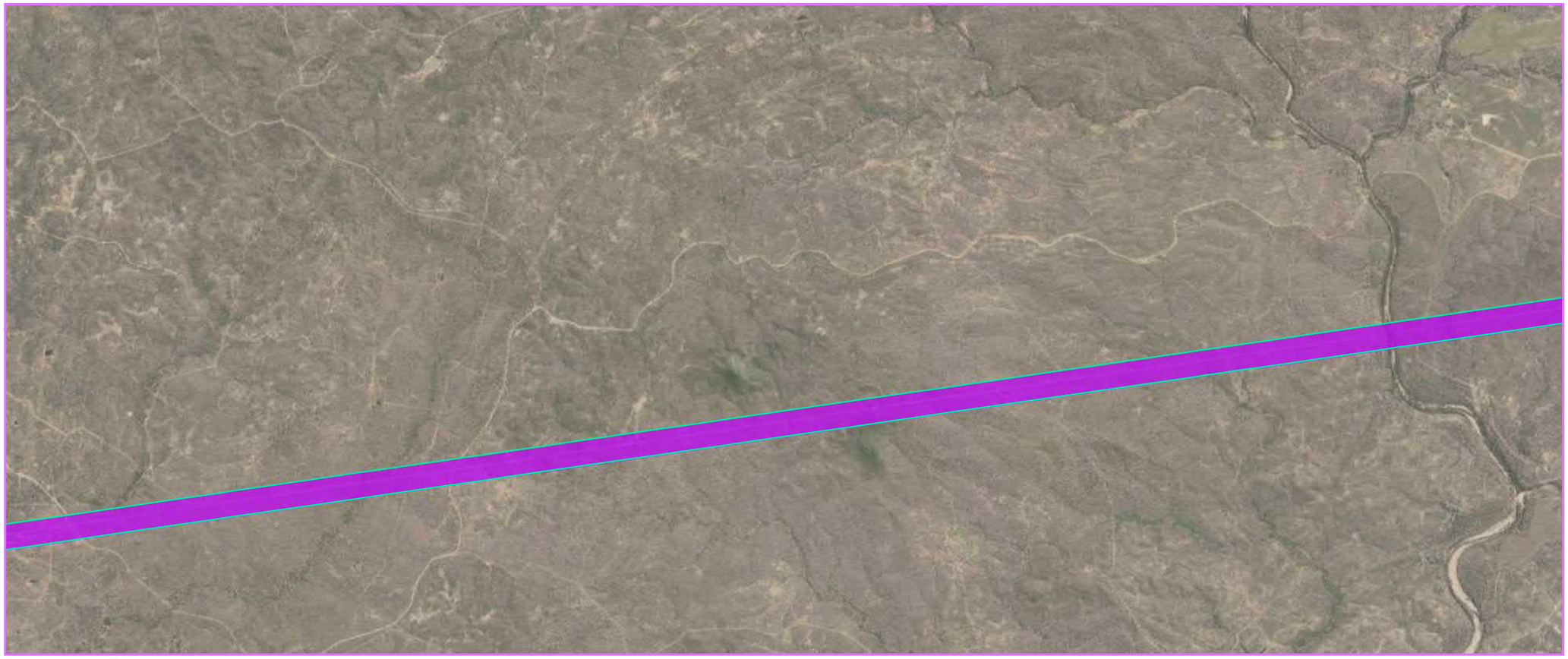

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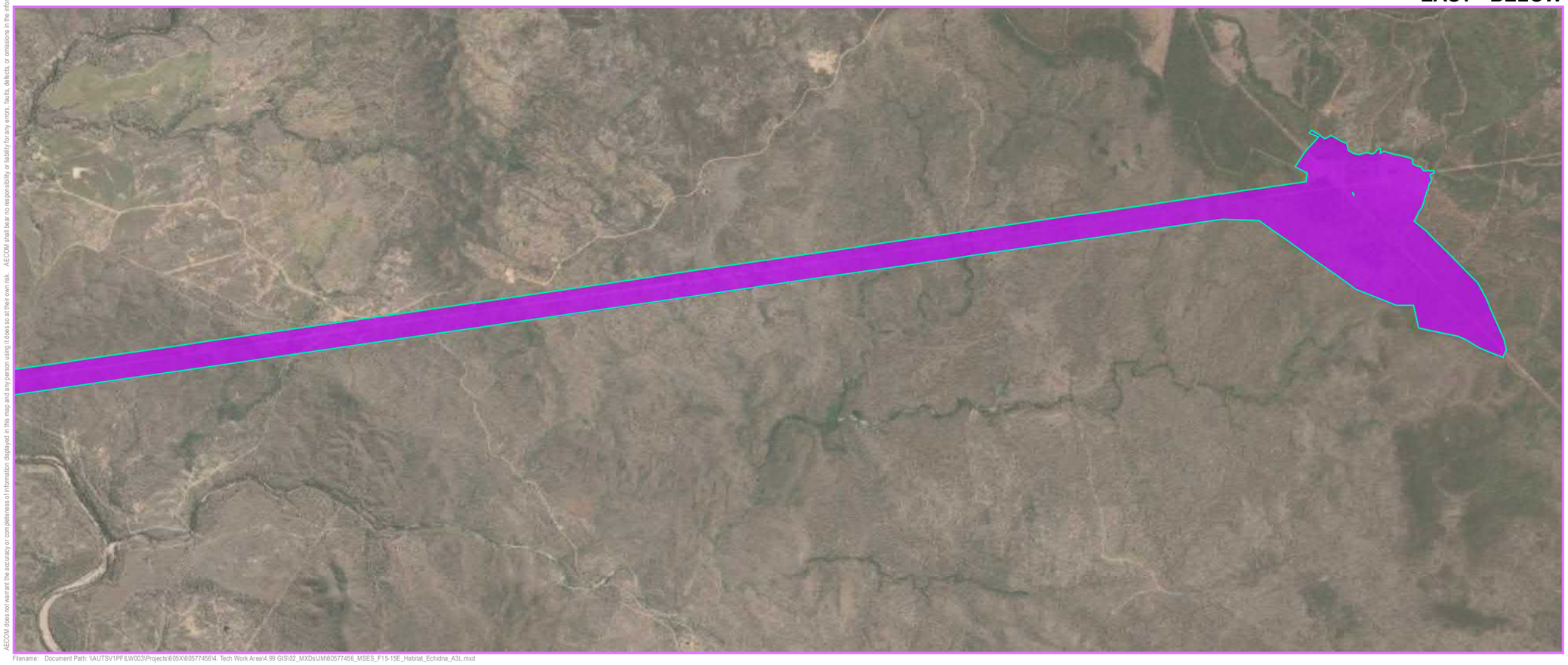

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Coordinate System: GDA 1994 MGA Zone 55
Projection: Transverse Mercator

0 650 1,300 1,950 2,600
Meters

1:55,000 (when printed at A3)

Legend

Study Area

Short-beaked Echidna

Known breeding, foraging and dispersal habitat

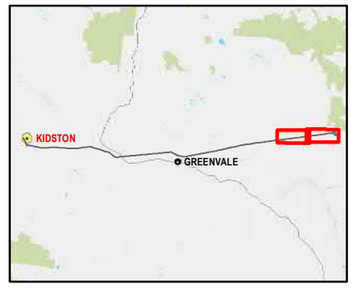

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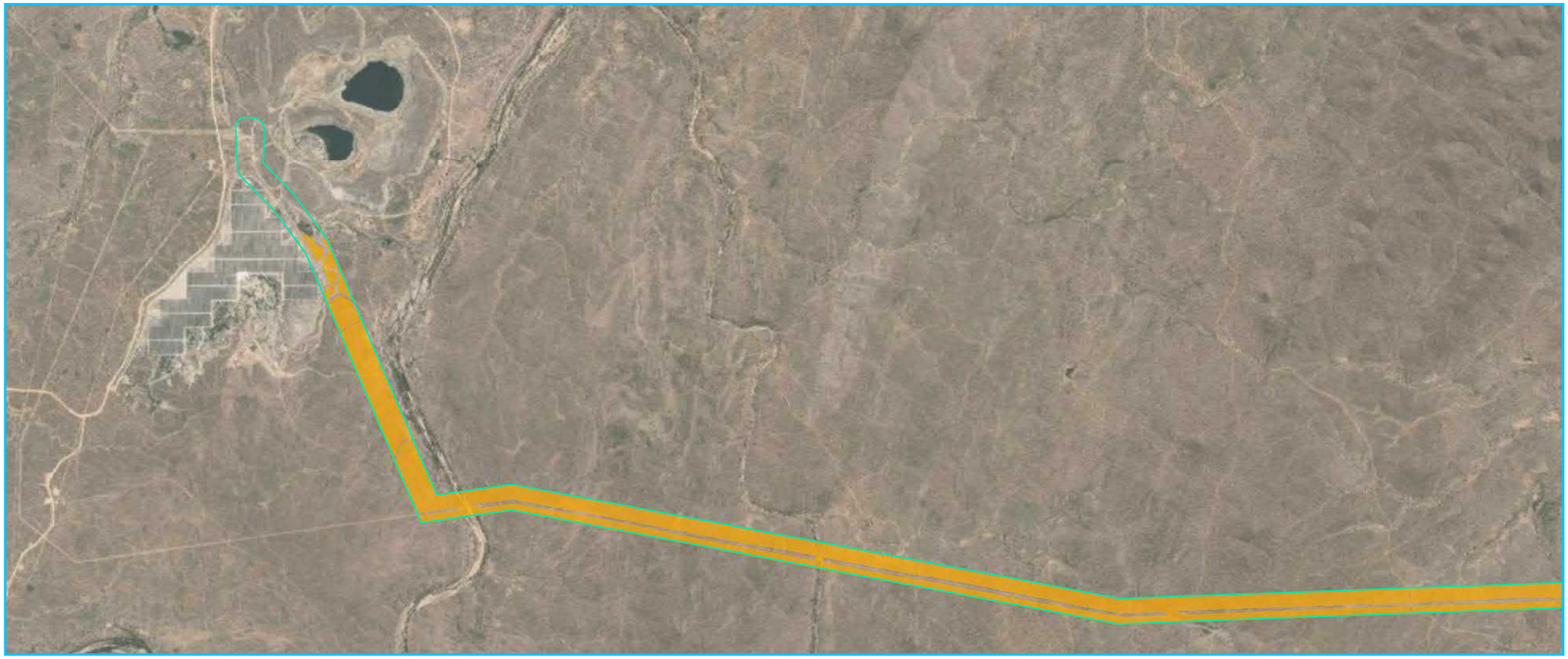
Figure
F14.5

A3 size



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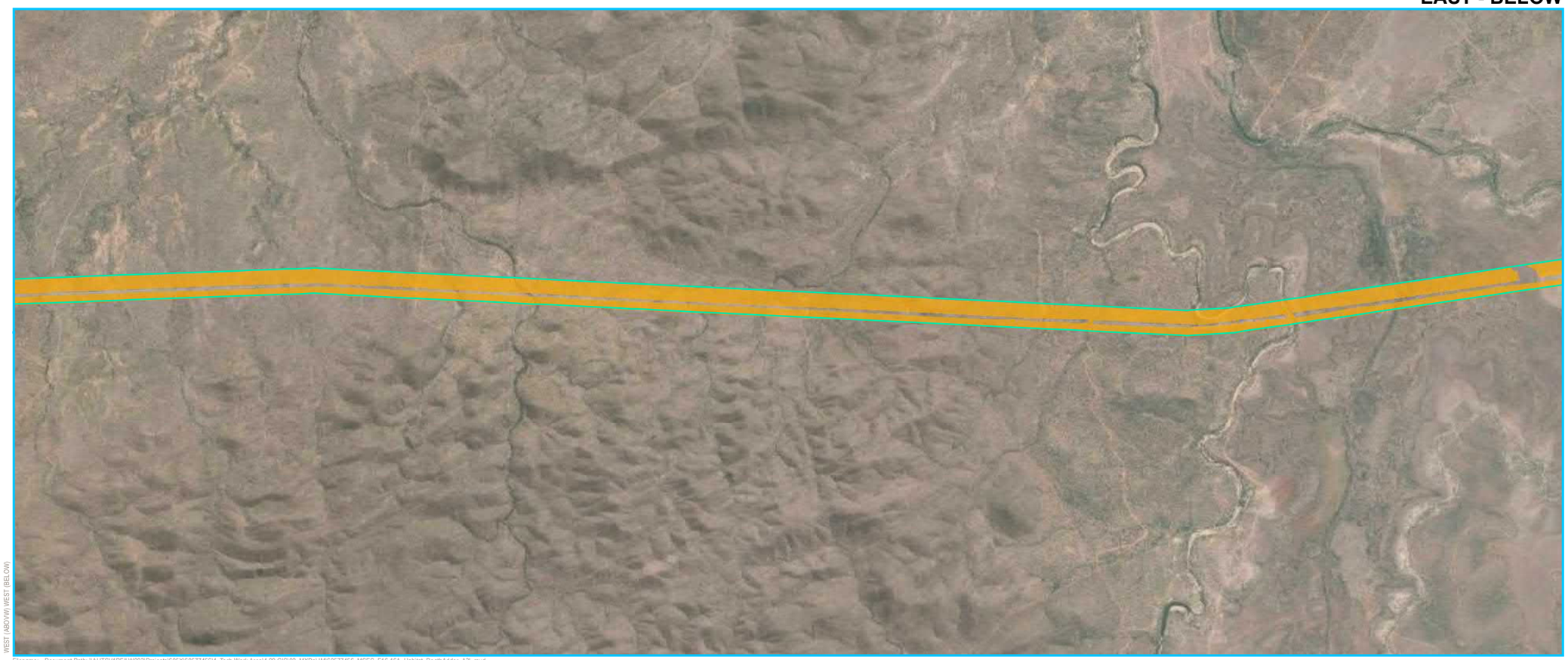

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Coordinate System: GDA 1994 MGA Zone 55
Projection: Transverse Mercator

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Meters

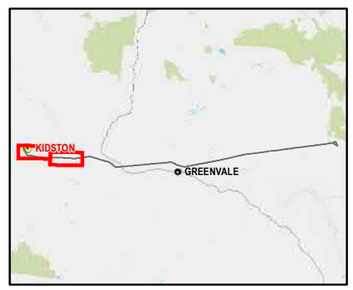
1:55,000 (when printed at A3)

Legend

Study Area

Death Adder

Potential breeding and foraging habitat



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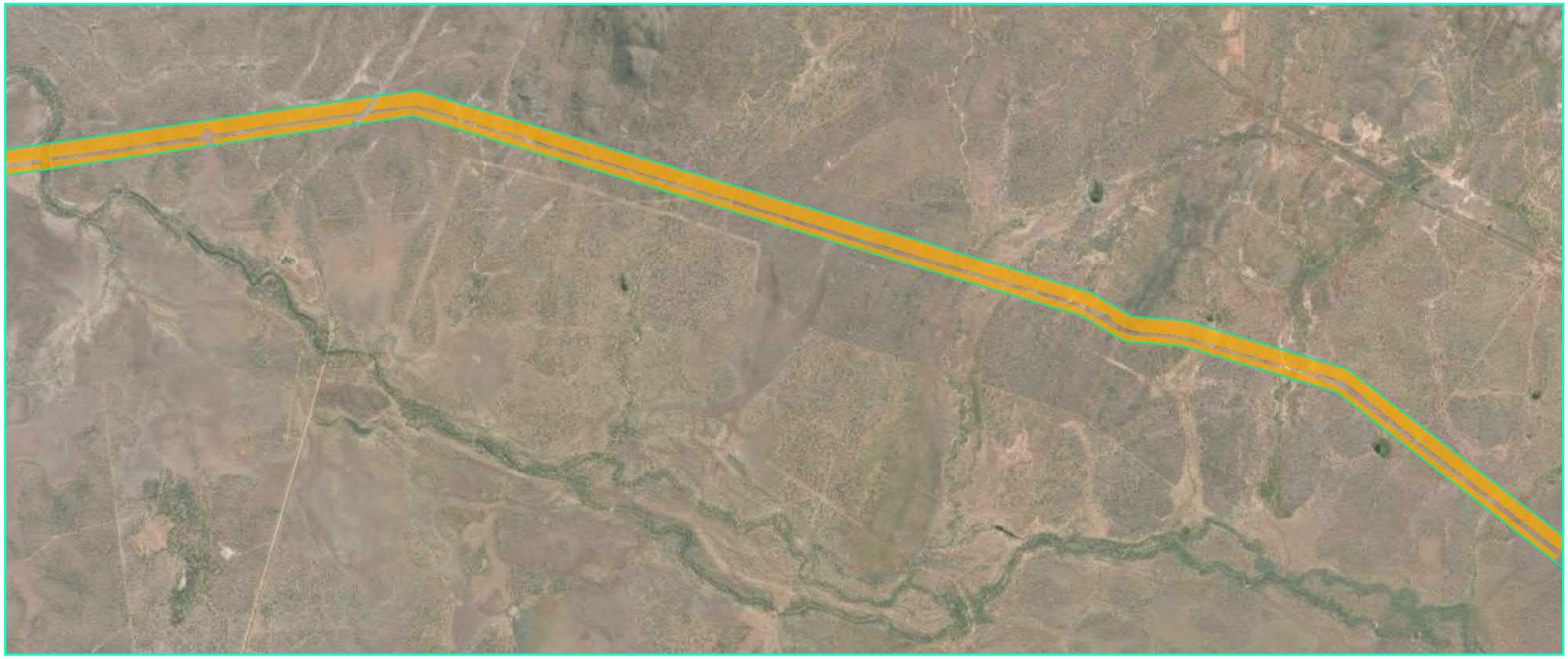

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Coordinate System: GDA 1994 MGA Zone 55
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Meters

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Legend

Study Area

Death Adder

Potential breeding and foraging habitat

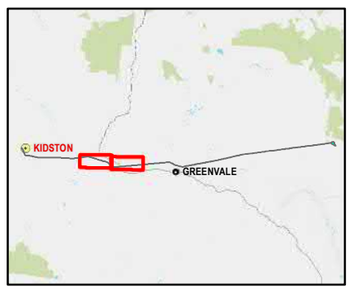

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Figure
F15.2

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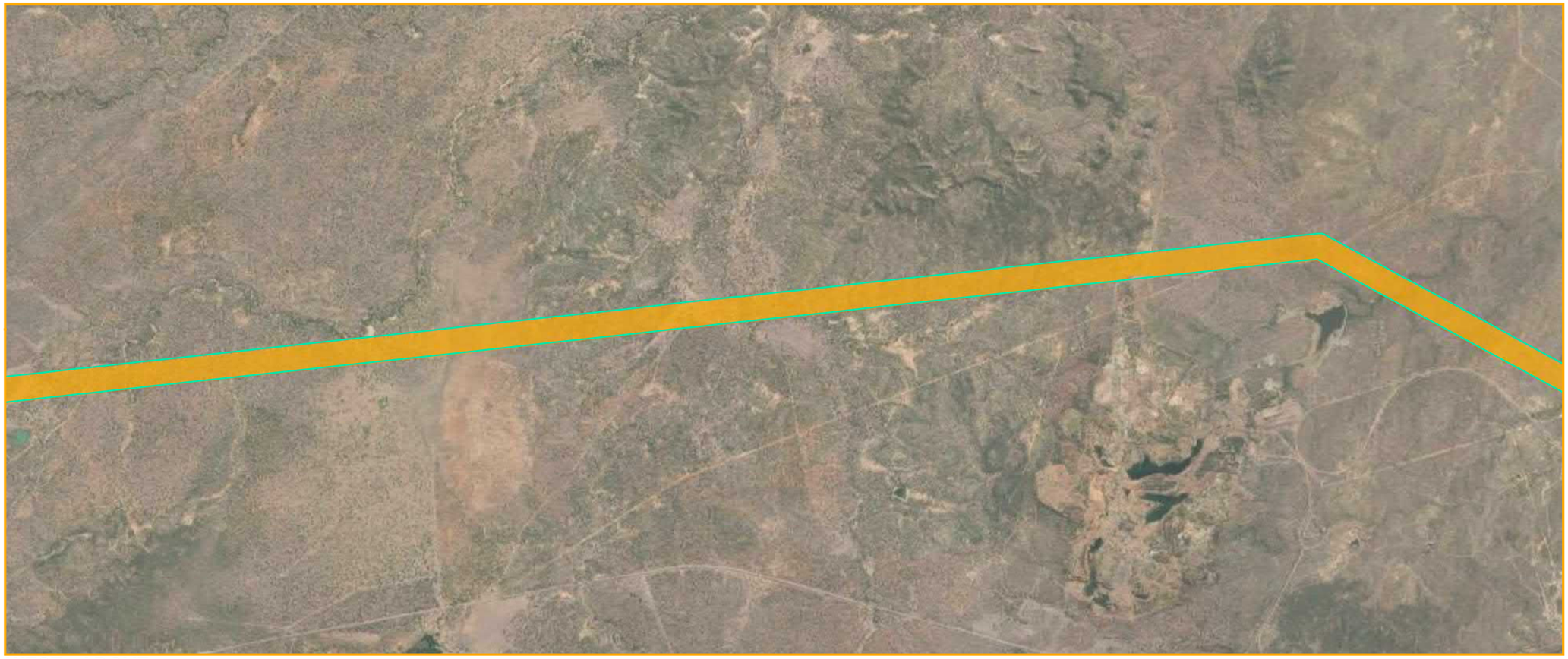

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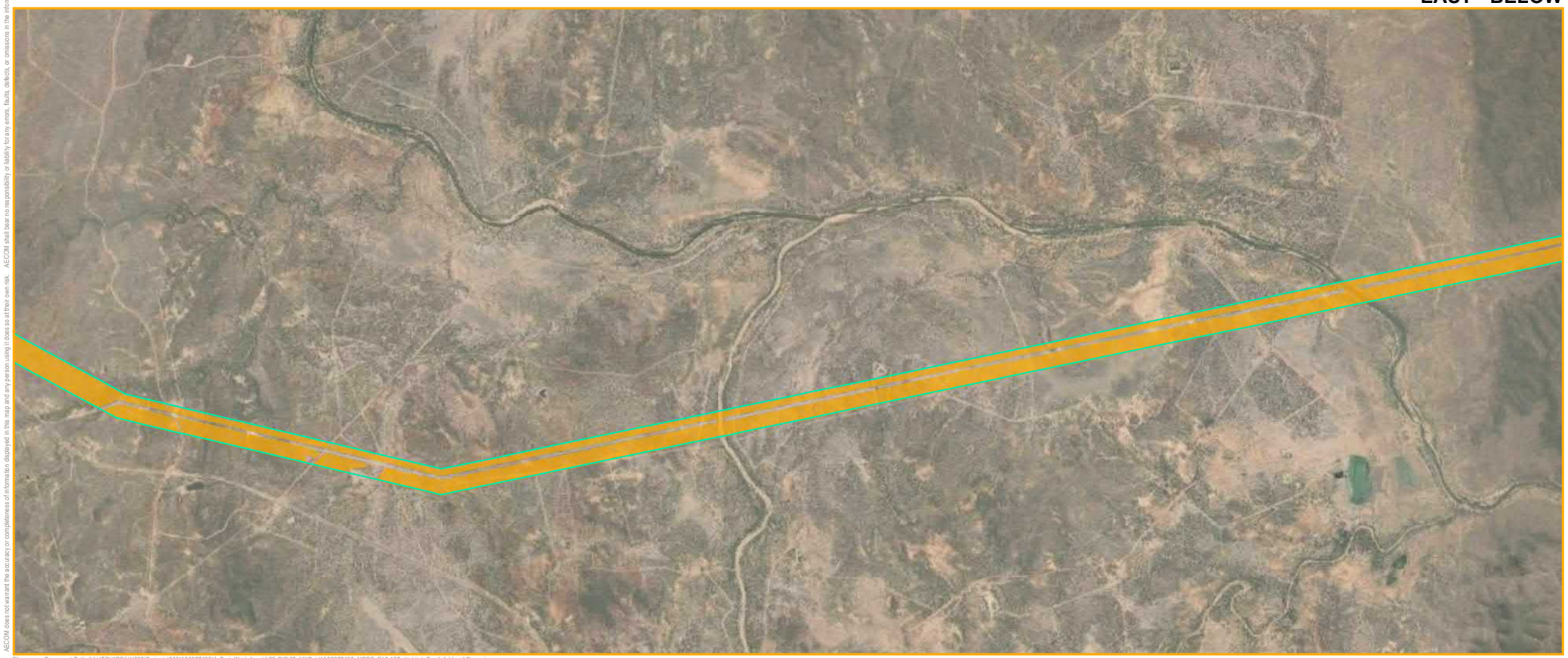

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Projection: Transverse Mercator

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Meters

1:55,000 (when printed at A3)

Legend

Study Area

Death Adder

Potential breeding and foraging habitat

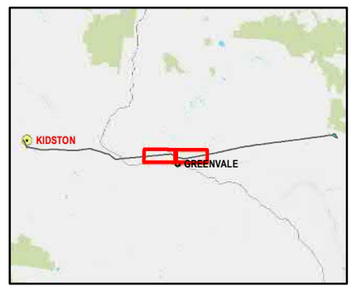

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Figure
F15.3

A3 size

WEST - ABOVE

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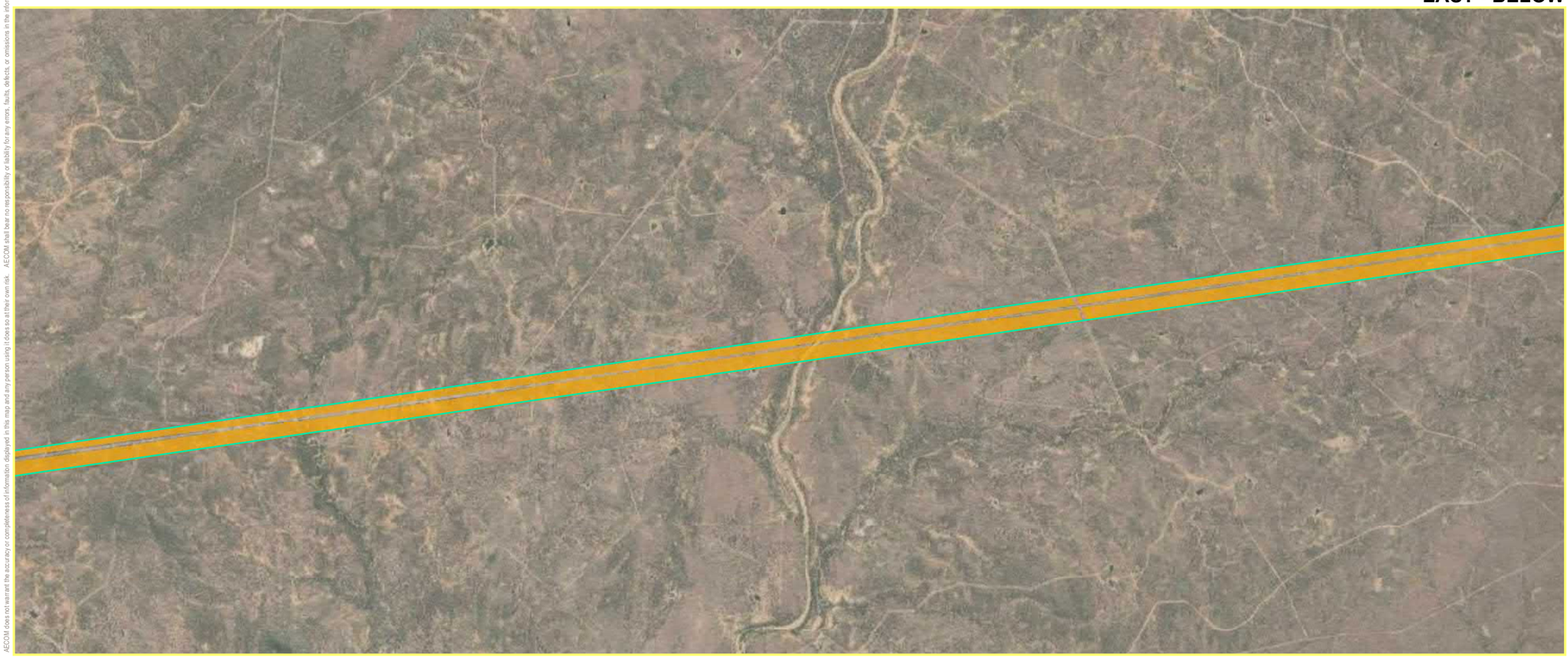

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Coordinate System: GDA 1994 MGA Zone 55
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Meters

1:55,000 (when printed at A3)

Legend

Study Area

Death Adder

Potential breeding and foraging habitat

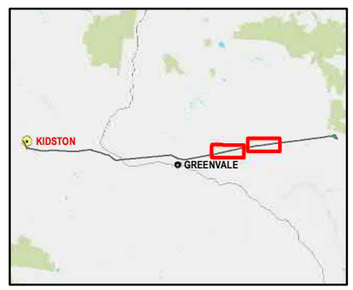

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Figure F15.4

A3 size

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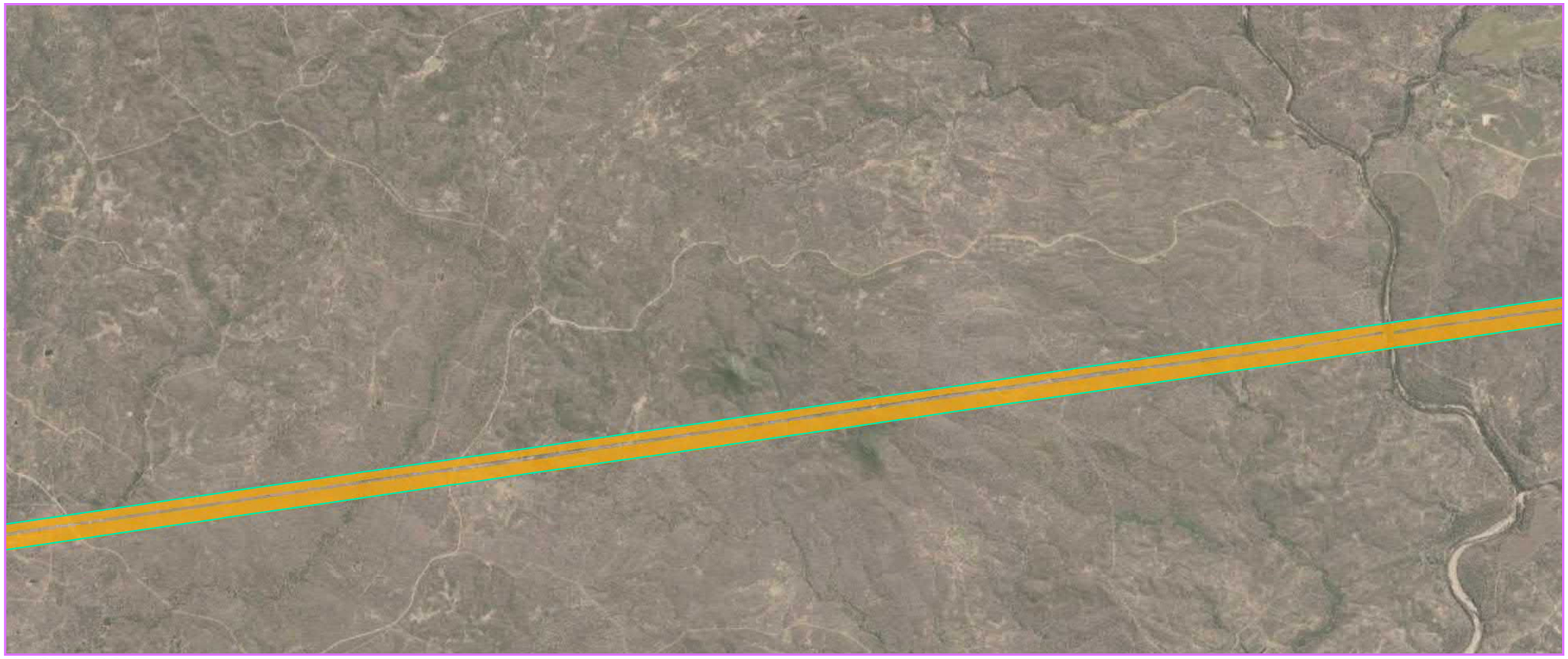

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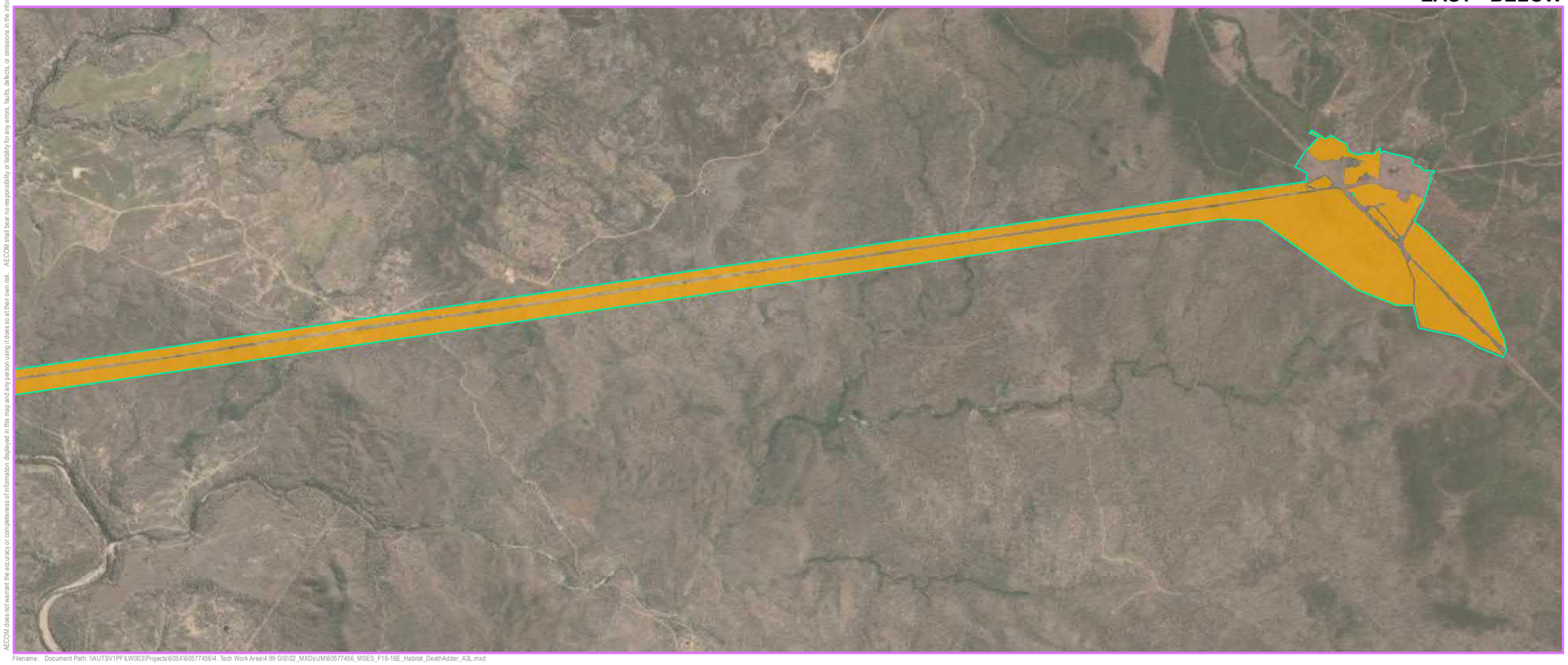

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Coordinate System: GDA 1994 MGA Zone 55
Projection: Transverse Mercator

0 650 1,300 1,950 2,600

Meters

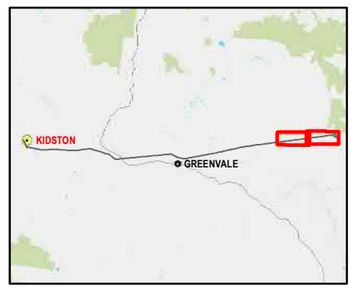
1:55,000 (when printed at A3)

Legend

Study Area

Death Adder

Potential breeding and foraging habitat



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VERSION: 1

Figure
F15.5

A3 size

Appendix H

MSES Significant Residual Impact Assessments

Appendix H MSES Significant Residual Impact Assessments

This section contains assessments to determine the significant residual impact for the Project, utilising the Project Footprint that is considered to represent the maximum impact area. Impacts calculated are likely to be an overestimation, as the footprint in the eastern extent of the project areas is yet to be refined but will likely mimic the remainder of the footprint. For the purposes of this assessment, the Project is categorised as linear infrastructure clearing.

It is important to note that the below assessments are not to be used to determine if the Project requires assessment for potential impacts on MNES protected by the Commonwealth EPBC Act or if an offset would be required under that Act.

Regulated Vegetation

Only a small portion of the State mapped Category B vegetation was ground-truthed to be Of Concern REs. Offsets may be required for the following regulated vegetation:

- Impacts to 'Of Concern' REs under the VM Act
- Impacts to REs within the defined distance of a watercourse defined under the VM Act.

To complete impact assessment to regulated vegetation, the thresholds in Table 26 were implemented.

Table 26 Impact thresholds per RE structure

RE structure category[1]	Impact area threshold (width in metres) (Linear infrastructure clearing)	Impact area threshold (ha) (non-linear infrastructure)
Dense and mid-dense	>10	0.5
Sparse and very sparse	>20	2
Grassland	>25	5

[1]*Refer to the structure category within the REDD*

Of Concern REs

The location of 'Of Concern REs' within the Project Footprint includes a portion to the east near The Crater Road, and a section that intersects with the Kennedy Developmental Road. The SRI assessment for Of Concern REs is presented in Table 27 and indicates that an SRI is anticipated for each 'Of Concern' RE, due to the impact area within the Project Footprint exceeding 5 ha, and/or the maximum clearing width exceeding the appropriate impact threshold. Therefore, the Project is likely to have a significant residual impact to 32.7 ha of MSES regulated vegetation: 'Of Concern' REs.

Table 27 SRI assessment for Of Concern REs

RE	Structure category	Maximum clearing width (m) threshold (Table 26)	Maximum clearing width (m) within Project Footprint	Impact area within Project Footprint (ha)	Impact threshold exceeded?	SRI outcome
7.8.18	Mid-dense	10	188	17.7	Yes	Likely
9.12.10	Very sparse	20	50	13.0	Yes	Likely
9.12.26	Sparse	20	55	2.0	Yes	Likely

REs within the defined distance of a watercourse

The Study Area contains several minor and major watercourse features recognised under the VM Act, with stream orders ranging from one to seven (Appendix A Figure 9). The Burdekin River is the highest order watercourse (stream order 7) within the Project Area; however only traverses a small section north east of Greenvale. The Burdekin River is also the only perennial watercourses that traverses the Study Area, indicating water is present throughout the year. At scattered locations across the Study Area, an additional six major watercourses (stream order 6) intersect including Einasleigh River, Copperfield River, Camel Creek, Douglas Creek, Gray Creek and Lee (McKinnon's) Creek. All aforementioned watercourses although considered 'major' are non-perennial.

Minor watercourses and drainage lines are common across the Study Area and include East Creek, Hopewell Creek, Mannings Flat Creek, Paddys Creek, Perry Creek, Three Mile Creek, Five Mile Creek, Seven Mile Creek, Ten Mile Creek and a number of unnamed tributaries. These watercourses and drainage lines are considered highly ephemeral and were almost all dry at the time of the field survey. Almost all watercourses run in a northerly direction and due to the linear shape of the Study Area this means only small discrete sections are generally intersected.

Due to the permanent removal of vegetation within the defined distance of a stream order 2 or higher with no rehabilitation proposed, the Project is likely to have a significant residual impact to REs within the defined distance of a watercourse.

Essential habitat

Essential habitat intersects the Study Area in two locations; in the east of the alignment near the intersection of Kallanda Road and Lava Plains Mount Fox Road, and to the east of the Gregory Highway. Due to the permanent removal of regulated vegetation considered essential habitat under the VM Act that is wider than 20 metres and results in a greater than 10% permanent reduction in the extent of essential mapped in the Project Area, the Project is likely to have a significant residual impact to essential habitat (Table 28).

Table 28 SRI assessment for Essential Habitat

RE	Structure category	Maximum clearing width (m) threshold (Table 26)	Maximum clearing width (m) within Project Footprint	Impact area within Project Footprint (ha)	Impact threshold exceeded?	SRI outcome
9.11.2a	Sparse	20	60	8.0	Yes	Likely
9.11.2a/ 9.11.5	Sparse					
9.11.5	Sparse					
9.12.12	Very sparse					
9.3.6a	Sparse					

Connectivity areas

The Department of Environment and Science has developed a Landscape Fragmentation and Connectivity (LFC) tool to assist in identifying and quantifying any significant impact on connectivity for an individual impact area. The measure of impact significance is based on how the prescribed activity will change the size and configuration of remnant vegetation areas and the level of fragmentation that will result at the local scale (5 km radius) given regard to the regional scale (20 km radius).

The LFC tool determined that Project related impacts on connectivity areas are not significant (Table 29).

Table 29 LFC tool results for connectivity

Impact Criteria	Assessment
Significance test one	Area of core at the local scale (pre impact): 180344.64 Area of core at the local scale (post impact): 179283.15 Percent change of core at the local scale (post impact): 0.59 percent
Significance test two	The number of core remnant areas occurring on the site: 8 The number of core remnant areas remaining on the site post impact: 8 (Only core polygons greater than or equal to 1 hectare are included)
Result	**This analysis has determined any impact on connectivity areas is NOT significant** (A significant reduction in core remnant at the local scale is False OR a change from core to non-core remnant at the site scale is False)

Protected Wildlife Habitat

Protected wildlife habitat is defined as an area of habitat (e.g. foraging, roosting, nesting or breeding habitat) for an animal or plant that is Endangered or Vulnerable, or a Special Least Concern (non-migratory) animal under the NC Act. As of 9 May 2018, under the *Vegetation Management and Other Legislation Amendment Bill 2018*, the definition of protected wildlife has been extended to include Near Threatened wildlife.

Offsets may be required for the following protected wildlife habitat:

- an area that contains plants that are ‘endangered’, ‘vulnerable’ or ‘near threatened’ wildlife;
- a habitat for an animal that is ‘endangered’, ‘vulnerable’ or ‘near threatened’ wildlife or a special least concern animal (non-migratory), including areas or features used by an animal for foraging, roosting, nesting or breeding.

To avoid duplication of offset conditions between jurisdictions, state and local governments can only impose an offset condition in relation to a prescribed activity if the same or substantially the same impact and the same or substantially the same matter has not been subject to assessment under the EPBC Act. As such, SRI assessments for protected wildlife habitat have only been completed for the known or likely conservation significant species that have not already been assessed under the EPBC Act policy statement ‘Significant Impact Guidelines 1.1 – Matters of National Environmental Significance’ (DotE, 2013b) (refer to MNES report).

SRI assessments have been prepared for the following species:

- Chestnut dunnart
- Short-beaked echidna
- Common death adder

Although two threatened flora species are considered a potential occurrence within the Project Area (Tingoora wattle and *Leptospermum pallidum*), no direct impacts are likely to occur to any individuals as a result of the Project (see Section 7.1.1). As such, an SRI assessment has not been completed for this species. Protected plants will also be assessed as per the Protected plants guideline in a supporting report.

The MNES report identified potential significant impact on the following seven species (that are both MNES and MSES) and these species are also considered to potentially have a significant residual impact as per the criteria provided in the Significant Residual Impact Guidelines (Department of State Development, Infrastructure and Planning, 2014):

- Black-throated finch (southern)
- Sharman’s rock wallaby
- Koala
- Greater glider

- Ghost bat
- Yakka skink
- Satin flycatcher.

Chestnut dunnart (*Sminthopsis archeri*)

The chestnut dunnart is listed as Near Threatened under the NC Act. Significant residual impact assessments are not required for Near Threatened species. Regardless, a discussion on the potential impact for the chestnut dunnart is provided in this section.

The chestnut dunnart is a rarely encountered dasyurid. It was previously thought to be restricted to southern Papua New Guinea and Cape York in Australia, however the discovery of a single individual at Blackbraes National Park in 2003 represented a significant range extension of over 1,000 km (Kutt, Dyck and Christie, 2005).

In Cape York, the species has been previously captured in tall *Eucalyptus tetrodonta*, *Corymbia nesophila*, *Erythrophleum chlorostachys* woodlands on red earth soils, and is also known to inhabit tall heathlands. In Blackbraes National Park, the species was captured in tall (to 20 m) mixed *Eucalyptus* sp., *Corymbia citriodora*, *C. peltata* and *Callitris* sp. woodland with sandy-clay soil of granite origin. Very little is known about the ecology of the chestnut dunnart, including the distribution, population and specific habitat requirements.

Occurrence and Potential Habitat

The habitat within the Study Area is considered marginal for the chestnut dunnart, with the occurrence of bloodwood and ironbark woodland on granite which may be suitable for the species. No ALA or WildNet records occur within 20 km of the Study Area, with the closest record being the single individual captured at Blackbraes National Park in 2003, located more than 70 km to the south (Kutt, Dyck and Christie, 2005). Given the poorly understood ecology of this species within Einasleigh Uplands bioregion, the species is considered a potential occurrence, particularly in the granite derived woodlands.

The extent of potential habitat for the species is displayed in Appendix G. However, this is not considered protected wildlife habitat due to the species being listed as Near Threatened under the NC Act, and therefore the potential habitat impact area is not presented.

Short-beaked echidna (*Tachyglossus aculeatus*)

The short-beaked echidna is listed as Special Least Concern under the NC Act.

The short-beaked echidna is found throughout Australia, including Tasmania. It is Australia's most widespread native animal (The Australian Museum, 2018). No systematic study of the ecology of the short-beaked echidna has been published, but studies of several aspects of their behaviour have been conducted. Individuals are solitary wanderers: they have large, overlapping home ranges (up to 50 ha) and only maintain a fixed shelter or nest site when rearing their young in a burrow (Augee, Gooden and Musser, 2006). They avoid extremes in temperature by sheltering in hollow logs, rock crevices and vegetation. Limited only by an insufficient supply of ants or termites, short-beaked echidnas live in a range of climates and habitats.

This species is not threatened with extinction, but human activities, such as hunting, vehicles, habitat destruction, and the introduction of foreign predatory species and parasites, have reduced its distribution in Australia (The Australian Museum, 2018). This species can live anywhere with a good supply of food, and regularly forages on ants and termites, and are most common in forested areas with abundant, termite-filled, fallen logs.

The solitary short-beaked echidna looks for a mate between May and September; the precise timing of the mating season varies with geographic location. The short-beaked echidna is an egg-laying mammal (monotreme) and lays one egg at a time. The eggs hatch after about 10 days and the young, emerge blind and hairless. Clinging to hairs inside the mother's pouch, the young echidna suckles for two or three months. Once it develops spines and becomes too prickly, the mother removes it from her pouch and builds a burrow for it. It continues to suckle for the next six months (The Australian Museum, 2018).

Occurrence and Potential Habitat

This species was confirmed during the field survey, and is considered known within the Study Area. This is a generalist species that may utilise all habitat within the Study Area.

The extent of potential habitat for the species is summarised in Table 30 and displayed in Appendix G Figure 14.

Table 30 Potential habitat for short-beaked echidna

Habitat description	Potential utilisation	Total area (ha) within the Project Area	Area (ha) within the Project Footprint
This is a generalist species that may utilise all habitat within the Study Area.	Breeding, foraging and dispersal	5851.0	575.0
	Total	**5851.0**	**575.0**

An assessment against the Significant Residual Impact Guideline for this species is provided in Table 31.

Table 31 Significant residual impact assessment for short-beaked echidna

Impact Criteria	Assessment
An action is LIKELY to have a significant residual impact on habitat for an animal that is 'Special Least Concern' wildlife if the action will:	
Lead to a long-term decrease in the size of a local population?	**No.** This species is likely to occur within the Study Area and potentially utilises all vegetation within (a total area of 5851 ha) for breeding, foraging and dispersal. This species is common throughout its distribution and any individuals that occur within the Study Area are considered to constitute a local population. A total of 575.0 ha of potential habitat may be directly impacted by the Project (worst-case scenario). The area of total potential habitat being directly impacted constitutes approximately 9.8% of the available potential habitat within the Study Area. This loss of habitat relative to the amount of habitat that will be retained within the Study Area, as well as the extensive areas of potential habitat in the local area is considered minimal. Where clearing occurs, habitat features suitable for sheltering such as felled trees and logs will be relocated to adjacent habitat areas where practical. To mitigate the death of any short-beaked echidnas during construction, open trenches will be checked for trapped fauna in the morning and at the end of the day by a spotter catcher. As the species is likely to occur in high numbers and the overall reduction in potential habitat is relatively low, and co-located with existing powerline infrastructure where possible, the Project is considered unlikely to lead to a significant reduction in the foraging or breeding success of a local population or a long-term decrease in the size of a local population.

Impact Criteria	Assessment
An action is LIKELY to have a significant residual impact on habitat for an animal that is 'Special Least Concern' wildlife if the action will:	
Reduce the extent of occurrence of the species?	**No.** This species occurs across Australia and is considered common. Approximately 9.8% of the potential habitat within the Study Area will be directly impacted via vegetation clearing (575.0 ha). Considerable high-quality remnant areas are located adjacent to the Study Area. Given this species is relatively mobile, the availability of potential habitat that will remain within the Study Area and the large availability of potential habitat in the wider area, it is unlikely the Project will reduce the extent of occurrence of the species.
Fragment an existing population?	**No.** Discrete sub-populations of short-beaked echidna are not known, and available population information indicates that this species is stable throughout its range. Any individuals present within the Study Area are likely to only constitute a very small portion of the total population. Approximately 9.8% of the potential habitat within the Study Area will be directly impacted via vegetation clearing (575.0 ha). However, as this species is relatively mobile and surface infrastructure that will be constructed for the Project is linear and unlikely to create a barrier to movement, the Project is considered unlikely to fragment an existing population.
Result in genetically distinct populations forming as a result of habitat isolation?	**No.** This species is widely distributed and common. It has broad habitat requirements and as such impacts to potential habitat within the Study Area is unlikely to have population-level impacts. The current levels of habitat connectivity within the Study Area are unlikely to be significantly reduced by the Project. Infrastructure is co-located with an existing powerline for a large portion of the Study Area. During construction, open trenches may trap dispersing individuals however these will be checked in the morning and at the end of the day by a spotter catcher. Once construction is complete the ground surface will be re-instated as soon as possible. This species is relatively mobile and the Project is unlikely to create a barrier to movement between the Study Area and adjacent available habitat. Therefore, the Project is unlikely to result in a genetically distinct population forming as a result of habitat isolation.
Cause disruption to ecologically significant locations (breeding, feeding or nesting sites) of a species?	**No.** Potential habitat suitable for breeding, foraging and dispersal occurs within the Study Area, however there is no information to suggest this habitat is ecologically significant. A total of 575.0 ha of potential habitat will be directly impacted via vegetation clearing, comprising approximately 9.8% of the available potential habitat within the Study Area. Given the relatively small direct loss of potential habitat, the extensive availability of likely high quality habitat in the region, as well as the species' mobility and common occurrence, the Project is considered unlikely to cause disruption to ecologically significant locations of the species.

Common death adder (*Acanthophis antarcticus*)

The common death adder is listed Vulnerable under the NC Act.

The common death adder is a cryptic and sedentary snake with a wide distribution, occurring from the Northern Territory and central Queensland through New South Wales to the southern parts of South Australia and Western Australia. Little population information on the species is available and it is possible they are rare over much of their distribution (Rowland and Ferguson, 2012). The majority of common death adder records in Queensland are from the south-east. It is found in a wide variety of well-drained habitats including rainforests and wet sclerophyll forests, woodland, shrublands, grasslands and coastal heathlands. Preferred habitat contains deep fixed leaf litter (Queensland Department of Environment and Science, 2019).

The common death adder is an ambush predator, and as such spends much of its time lying concealed under loose sand, leaf litter or low foliage. They are known to eat a variety of prey including frogs, lizards, birds and small mammals. They may be diurnal, however are most commonly encountered at night when moving between shelter sites.

Breeding generally occurs in spring however females reproduce only every second year. They produce live young, typically born in February or March, with litter size varying between two and forty-two.

There are two known threats to the species: road kills and death from attempted predation of cane toads. Suspected threats to the species include destruction of habitat (clearing), inappropriate fire regimes, trampling by livestock, predation by feral cats, foxes and pigs, deliberate killing of snakes and death from ingesting poisoned rodents (Queensland Department of Environment and Science, 2019).

Occurrence and Potential Habitat

This species was not confirmed within the Project Area during any field survey. Spatially and temporally valid records do not occur surrounding the Project Area, however this may be a product of the species rarity as well as its cryptic and difficult to detect nature. As such, the species is considered a potential occurrence within the Project Area but is considered likely to only occur in low densities.

Due to the broad definition of suitable habitat for this species, all vegetation that has the potential to contain leaf litter (i.e. woody vegetation communities in remnant or HVR condition) is considered potential habitat.

The extent of potential habitat for the species is summarised in Table 32 and displayed in Appendix G.

Table 32 Potential habitat for common death adder

Habitat description	Potential utilisation	Total area (ha) within the Project Area	Area (ha) within the Project Footprint
Vegetation communities with leaf litter	Breeding and foraging	5102.3	528.05
	Total	**5102.3**	**528.05**

An assessment against the Significant Residual Impact Guideline for this species is provided in Table 33.

Table 33 Significant residual impact assessment for common death adder

Impact Criteria	Assessment
An action is LIKELY to have a significant residual impact on habitat for an animal that is 'Endangered' or 'Vulnerable' or 'Near Threatened' wildlife if the action will:	
Lead to a long-term decrease in the size of a local population?	**No.** This species was not recorded during field surveys however is considered a potential occurrence in low densities. Any individuals that may utilise the Project Area are considered to constitute a local population. All vegetation within the Study Area excluding non-remnant areas and grasslands is considered to provide potential breeding and foraging opportunities (a total area of 5102.3 ha), due to the species broad habitat requirements. A total of 528.05 ha of potential habitat may be directly impacted via vegetation clearing required for the Project. As the Study Area has largely been co-located with an existing cleared and disturbed area (existing transmission line), potential habitat to be impacted is of reduced quality due to edge effects and ongoing cattle grazing. Pest fauna species such as cats, pigs and cane toads are also prevalent across the area. The area of total potential habitat being directly impacted constitutes approximately 10.3% of the available potential habitat within the Study Area. However, potential habitat is likely to occur extensively in the area surrounding the Study Area and include areas of higher quality such as Mount Claro. Potential indirect impacts to areas of remaining habitat will be managed as per the Project's EMP. As the overall reduction in potential habitat is low relative to the amount of habitat that will remain and only a small number of individuals may be directly impacted, the Project is considered unlikely to lead to a significant reduction in the foraging or breeding success of a local population or a long-term decrease in the size of a local population.
Reduce the extent of occurrence of the species?	**No.** This species has a large and continuous distribution. Population data is lacking however it is thought the species may be rare across its distribution. This species has not been recorded and public records in the wider area are uncommon and generally historical. As such, only a small number of individuals are likely to utilise the Study Area at any one time. A total of 528.05 ha of potential habitat may be directly impacted via vegetation clearing. Based on the shape of the Study Area, direct impacts will occur to a narrow linear area which allows for habitat fragmentation impacts to be minimised. Potential habitat is likely to occur extensively in the area surrounding the Study Area and include areas of higher quality such as Mount Claro, and as such the direct loss of habitat for the Project is unlikely to be significant. Based on this, the Project is considered unlikely to reduce the extent of occurrence of the species.

Impact Criteria	Assessment
An action is LIKELY to have a significant residual impact on habitat for an animal that is 'Endangered' or 'Vulnerable' or 'Near Threatened' wildlife if the action will:	
Fragment an existing population?	**No.** As detailed above, this species has a large distribution, and it is considered that all individuals (except those that occur on Magnetic Island) are part of a single population. Population data is lacking however the species is expected to occur in low densities only in northern Queensland. Individuals that may utilise the Project Area are likely to constitute only a small portion of the total population. Although the Project will result in direct impacts to 528.05 ha of potential habitat, it will not create a barrier to movement. This species is known to occur on roads and tracks, and as such any dispersal that may occur already is unlikely to be hindered to the point of population fragmentation.
Result in genetically distinct populations forming as a result of habitat isolation?	**No**. Although the species is not highly mobile, genetically distinct populations are not known. The species is likely rare across its range and as such already occurs at low densities. It has broad breeding and foraging requirements and potential habitat is likely to occur extensively in the wider area and include higher quality areas such as Mount Claro. Potential habitat within the Project Area is already fragmented due to the presence of roads and tracks and an existing transmission line. Additional habitat fragmentation has been minimised by co-locating the Project as much as possible with the existing transmission line and utilising roads and tracks to avoid the creation of new ones. As such, direct impacts to potential habitat as a result of the Project are unlikely to have population-level impacts that result in genetically distinct populations forming.
Result in invasive species that are harmful to an endangered, vulnerable or near-threatened species becoming established in the endangered, vulnerable or near-threatened species' habitat?	**No.** Death from attempted predation of cane toads is a known recognised threat to the species and suspected threats include trampling by livestock and predation by feral cats, foxes and pigs. Field surveys found pest fauna including cane toads, cats and pigs to be prevalent across the Study Area. Cattle grazing also occurs extensively including in areas of potential habitat. Construction and operation of the Project is unlikely to exacerbate pest levels beyond current levels. Nonetheless, a EMP will be implemented which will include measures to contain or eradicate pests. As such, the Project is unlikely to result in the establishment of invasive species that are harmful to the common death adder.
Introduce disease that may cause the population to decline?	**No.** Disease is not considered a potential threat to the species. Nonetheless, the Project EMP will include best practice biosecurity measures to ensure diseases are not introduced that may cause a death adder population to decline.

Impact Criteria	Assessment
An action is LIKELY to have a significant residual impact on habitat for an animal that is 'Endangered' or 'Vulnerable' or 'Near Threatened' wildlife if the action will:	
Interfere with the recovery of the species?	**No.** There is currently no recovery plan for the common death adder nor is one proposed. There are two known threats to the species: road kills and death from attempted predation of cane toads. As detailed above, pest management measures will be implemented to ensure cane toad populations are not exacerbated. The risk of mortality as a result of vehicle or plant strike will also be managed via the Project EMP which will include speed limits. Suspected threats to the species include destruction of habitat (clearing), inappropriate fire regimes, trampling by livestock, predation by feral cats, foxes and pigs, deliberate killing of snakes and death from ingesting poisoned rodents. Although the Project will result in the destruction of potential habitat, habitat to be impacted is disturbed from pests, cattle grazing and edge effects. Clearing will be completed with a suitably qualified fauna spotter present and completed in a sequential manner to allow for fauna to relocate. Given the likely high availability of potential habitat in the wider area and the small number of individuals expected to be impacted, it is considered unlikely the Project will interfere with the recovery of the species.
Cause disruption to ecologically significant locations (breeding, feeding, nesting, migration or resting sites) of a species?	**No.** This species has very broad habitat requirements and potential habitat to be retained will not lose any of its important characteristics such as leaf litter. No ecologically significant locations are expected to be directly impacted by the Project, as potential habitat to be impacted is largely already disturbed by pests, cattle grazing and edge effects. As such, it is considered unlikely the project will cause disruption to ecologically significant locations of the common death adder.

Waterways providing for fish passage

An environmental offset may be required for any part of a waterway that provides for passage of fish (other than that part of a waterway within an urban area) if the construction, installation or modification of waterway barrier works carried out under an authority will limit the passage of fish along a waterway. Barriers to fish passage can restrict and/or isolate fish communities, preventing access to, and benefits of fish habitats otherwise available to them. Poorly designed structures can injure or kill fish moving over or around them, or fish may become stranded and subjected to inappropriate water quality, lack of food, increased predation, crowding or other conditions that impact on their health, wellbeing and productivity.

The Study Area contains several minor and major watercourse features recognised under the VM Act, with stream orders ranging from one to seven (Appendix A Figure 9). The Burdekin River is the highest order watercourse (stream order 7) within the Project Area; however only traverses a small section north east of Greenvale. The Burdekin River is also the only perennial watercourses that traverses the Study Area, indicating water is present throughout the year. At scattered locations across the Study Area, an additional six major watercourses (stream order 6) intersect including Einasleigh River, Copperfield River, Camel Creek, Douglas Creek, Gray Creek and Lee (McKinnon's) Creek. All aforementioned watercourses although considered 'major' are non-perennial.

Minor watercourses and drainage lines are common across the Study Area and include East Creek, Hopewell Creek, Mannings Flat Creek, Paddys Creek, Perry Creek, Three Mile Creek, Five Mile Creek, Seven Mile Creek, Ten Mile Creek and a number of unnamed tributaries. These watercourses and

drainage lines are considered highly ephemeral and were almost all dry at the time of the field survey. Almost all watercourses run in a northerly direction and due to the linear shape of the Study Area this means only small discrete sections are generally intersected.

Where possible, structures are located 50 m from watercourses. Where the transmission line crosses watercourses, previously cleared tracks for existing crossings will be preferentially used to minimise new watercourse crossings to avoid waterway barrier works. Where new crossings are required, the construction methodology will be dependent upon the size of the watercourse, however are generally developed in line with accepted development requirements for operational work that is constructing or raising waterway barrier works (Department of Agriculture and Fisheries, 2018).

The construction of bed-level crossings typically involved the excavation of the crossing bed to an appropriate depth to provide a stable base. The excavation is then lined with a heavy duty geo-fabric, and filled with aggregate using a combination of rock sizes up to 50 mm to lock the rock into place. In some instances where it is not practical to undertake excavation works due to unfavourable soil properties, alternative solutions may be required which may include, but are not limited to installation of bog mats or geomaterials.

The Project is unlikely to have a significant residual impact to waterways providing for fish passage, with justification provided in Table 34.

Table 34 Significant residual impact assessment for fish passage waterways

Impact criteria	Assessment
An action is LIKELY to have a SRI on a waterway providing fish passage if the action will result in:	
a) A permanent modification to the volume, depth, timing, duration or flow frequency of the waterway	**No** The project is not anticipated to require waterway barrier works. However, if any waterway barrier works are required they will be conducted in accordance with the Guide (Department of Agriculture and Fisheries, 2018). No threatened aquatic species are known to the Project Area, and generally aquatic species found are expected to be common and highly connected through waterways. However, a detailed aquatic assessment has not been conducted. Sedimentation of watercourses can impact aquatic ecology by smothering stream beds with fine material, and decreasing bed roughness and reducing habitat diversity. Aquatic weeds can also reduce the habitat quality of watercourses for native fish, and dense growth of aquatic weeds can cause a barrier to fish passage. If any waterway barrier works are required, management and mitigation measures may include: • implementation of sensitive crossing design where practical, • appropriate bed and bank rehabilitation works, • implementation of the Project Environmental Management Plan (EMP) during the construction and operation phases of the Project
b) Permanent modification or fragmentation of fish habitat including but not limited to in stream vegetation, snags and woody debris, substrate, bank or riffle formation necessary for breeding and/or survival of native fish species	
c) The mortality or injury of fish species; **OR**	
d) Works that permanently reduce the level of fish passage provided in a tidal waterway or a waterway identified as a major high risk waterway for waterway barrier works, to a level that would increase stress on fish populations	

Impact criteria	Assessment
	• All vehicles and machinery entering and leaving the Project Area will be subject to strict weed hygiene protocols to control the spread of weeds, including aquatic weeds. As such, areas of fish passage within the Project Footprint are unlikely to be substantially modified or fragmented as a result of the Project. The Project is unlikely to impact a major or high risk waterway for waterway barrier works, however any waterway barrier works are likely to have a short-term impact to major and high risk waterways.