Prepared for
Powerlink Queensland
ABN: 82 078 849 233

Appendix E

Matters of National Environmental Significance (MNES) Report

June-2022
Genex Kidston Connection Project - Preliminary Documentation (2021/9060)

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Matters of National Environmental Significance

Preliminary Documentation (2021/9060)

18-May-2022
Powerlink Kidston Connection Project

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Delivering a better world

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Preliminary Documentation (2021/9060)

Client: Powerlink Queensland

ABN: 82 078 849 233

Prepared by

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18-May-2022

Job No.: 60577456

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Table of Contents

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 kilovolt (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 186 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 an assessment of Matters of National Environmental Significance (MNES) for the Project. This assessment will support the Preliminary Documentation (PD) assessment of the Project under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

1.2 Project Area

The Project Area defines the area in which all permanent Project infrastructure will be constructed. It 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 (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. Outside of the Project Area, fifteen small temporary work areas occur that will contain ancillary infrastructure required for construction only.

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 (Figure 1).

The Project Area is predominately co-located with 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 Corridor Section Report, including location of an existing mining interests, the optimal path through large escarpments, landholder feedback and environmental and social factors.

1.3 Study Area

The assessment of potential presence and extent of MNES has been completed for an area larger than the Project Area, referred to as the Study Area (Figure 1). The Study Area is largely centred on the

proposed transmission line location and in these areas is approximately 300 m wide. The Study Area also includes a larger area in the far east where the switching station will occur, as well as all temporary ancillary infrastructure sites. In total the Study Area covers approximately 5,933 ha.

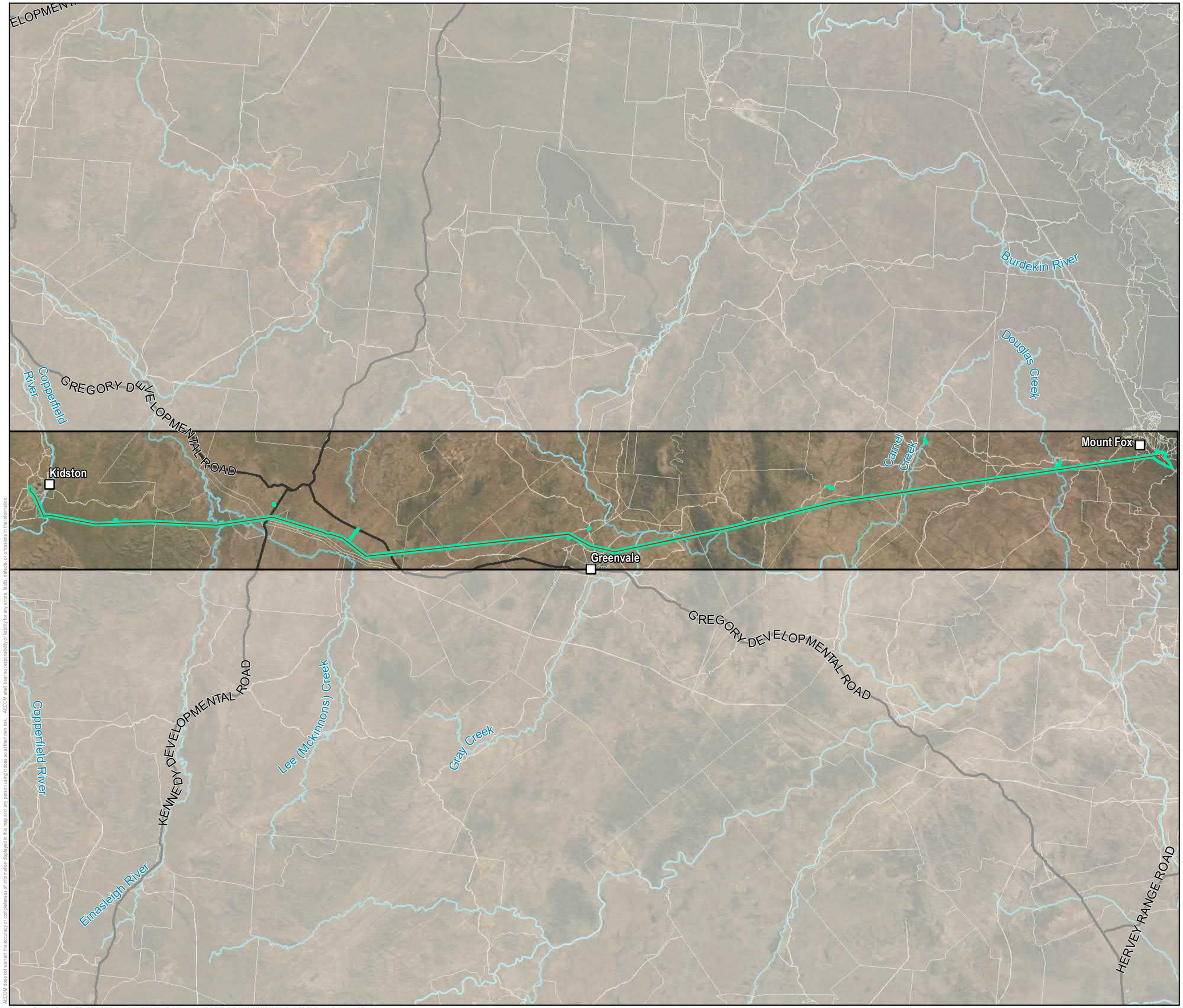
Given the largely narrow and linear nature of both the Project Area and Study Area, subsequent figures have been spilt into six zones so greater detail can be displayed. Figure 2 provides an overview of the six zones relevant to the Study Area and Project Area.

1.4 Scope of work

The purpose of this assessment is to describe the MNES values of the Study Area protected under the EPBC Act, assess the impacts of the Project on these values, and present measures to avoid, minimise or mitigate potential impacts.

This MNES assessment included the following tasks:

- Conduct a desktop review of available literature and previous studies in the vicinity of the Study Area, and conduct database searches for known or potentially occurring MNES
- Undertake ecological surveys to:
    - document condition, extent and value of vegetation communities, habitat types and other ecological values within the Study Area
    - target potentially occurring threatened ecological communities (TECs), flora and fauna listed under the EPBC Act to determine presence
    - identify habitat resources for known and potentially occurring threatened flora, fauna and migratory species
- Analyse field-based data in conjunction with aerial imagery to determine the likely extent of vegetation communities, habitat types and associated MNES values across the Study Area
- Undertake a likelihood of occurrence assessment to confirm known, likely or potentially present MNES within the Study Area
- Complete an impact assessment for identified or potentially occurring MNES values, inclusive of recommended mitigation and management measures
- Determine the significance of identified potential impacts in accordance with the Commonwealth Significant Impact Guidelines Policy Statement 1.1 (Department of the Environment, 2013) and quantify the potential for any significant impacts
- Identify potential offset requirements, if required.



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Kilometers

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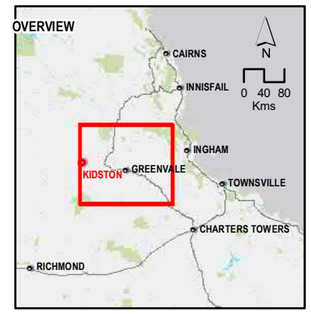
Legend

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



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PROJECT AREA & STUDY AREA

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Figure F1

A3 size

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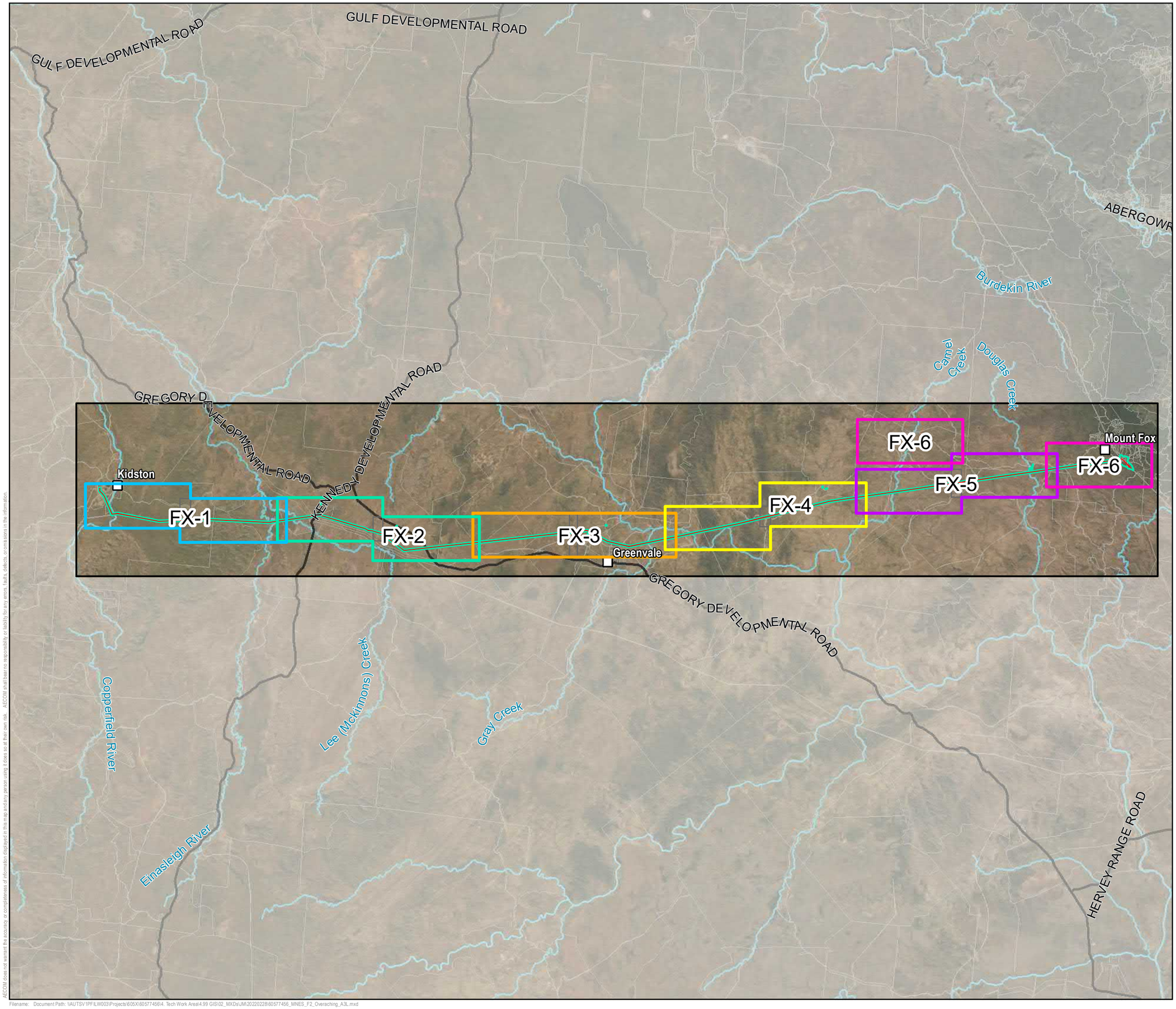

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Kilometers

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Figure F2

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2.0 Project Description

The Project includes the construction and operation of up to 186 km of single circuit transmission line and a switching station predominantly within the Project Area, which covers a total area of approximately 1,124 ha. Project components that may occur outside of the Project Area include the ancillary infrastructure which are discussed further in Section 2.1.4.

The Project Footprint covers approximately 690 ha, and represents the extent of direct impacts (i.e. vegetation clearing) for all Project elements (Figure 3.1 to 3.5). This area represents worst-case scenario clearing; calculated by increasing predicted clearing areas by an additional 1%. This contingency allowance has been incorporated to account for possible variation in construction methodology. Parts of the Project Area where contingency has not been allowed are discussed in Section 6.5.

A summary of the key components of the construction, operation and decommissioning and rehabilitation phases of the Project is provided in the sections below.

2.1 Construction

Construction is expected to commence in mid-2022 and will occur for approximately 18 months. Construction is anticipated to occur Monday to Saturday, between 6:30am and 6:30pm, and possibly on Sundays too (subject to further assessment and approval). However Contractors may adopt working rosters to manage efficiency and fatigue such as 10 days on, 4 days off (10/4 roster), or 3 weeks on 1, week off (3/1 roster).

2.1.1 Materials and Resources

Other than the infrastructure components, key materials required for the construction of the Project include power and fuel, concrete batching, quarry materials and water. Further information regarding these materials is provided below:

- Water is required for dust suppression and development of access tracks during construction and will be sourced from local dams and bores in consultation with landholders, and only at locations where supplies are abundant. Extraction of water from local rivers and creeks will be undertaken in accordance with the requirements under the *Water Act 2000*, if required.
- Access to quarry materials during construction is required for access tracks, waterway crossings, erosion and sediment controls, foundations as well as ongoing maintenance. These materials include, but are not limited to, rock, gravel, sand and soils. Where available these materials will be source from local registered quarries and / or local landowners.
- Several concrete batching plants are anticipated to be required for construction of the Project. Concrete batching plants will likely be located at the Mount Fox, Greenvale and Conjuboy. The Project will also require access to quarry materials during construction including, but not limited to, rock, gravel, sand and soils. Where available these materials will be source from local registered quarries.
- Generators are required to power site offices and will also be required at the switching station location for power generation. Either diesel or unleaded petrol will be required for generators, machinery and vehicles. Fuel storage and refuelling activities will occur only in a controlled and designated location.

2.1.2 Transmission line

Construction of the transmission line will include the completion of the following activities:

- Site preparation, including site set out, pre-clearance surveys and vegetation clearing
- Establishment of accommodation camps, laydowns and offices
- Installation of gates, grids, cleandown bays and access tracks
- Tower site benching
- Foundation excavation and installation

- Structure assembly and erection
    - Assembly of prefabricated components is usually completed adjacent to the final site. A large mobile crane will be used to erect the towers in sections.
- Conductor and earth wire stringing, generally via helicopter
    - Stringing will be completed in sections of varying length of up to 10 km between termination structures, depending on constraints, terrain, and access.
    - Specialised equipment including a powerful winch (puller), a braking device (tensioner) and pulleys (stringing sheaves) will be required. Designated 'brake and winch' sites are typically 50 m x 50 m.
- Site rehabilitation, including the replacement of topography, topsoil, and fences where disturbed.
    - Reinstatement of all disturbed areas will be undertaken progressively during construction, where practicable. The short-term goal of reinstatement is the stabilisation of soils to provide a suitable matrix for vegetation establishment to aid in preventing erosion.

Further information about the transmission line construction activities most relevant to the assessment of potential impacts on MNES including vegetation clearing, foundation installation (excavation) and watercourse crossings is provided below.

2.1.2.1 Vegetation clearing

Vegetation clearing will be required to meet Powerlink's safety, reliability and operational requirements for the transmission line. Clearing for the Project will be carried out in accordance with the requirements specified in the relevant Powerlink standards and operating procedures as well as the Project Environmental Management Plan (EMP).

The siting of permanent transmission line infrastructure components within Project Area has been carefully considered in the context of environmentally sensitive areas including known MNES habitat. The primary purpose of this exercise was to maximise opportunities to reduce the clearing of vegetation and direct impacts on MNES habitat. Of the approximately 1,116 ha covered by the transmission-line portion of the Project Area, approximately 59% will be cleared for construction of the Project (662 ha).

Clearing will most likely be completed by bulldozer, often fitted with a 'stick rake' or 'tree spear' to push over larger trees or use of a mega-mulcher. Timber of commercial value may be recovered just prior to clearing. Depending on land use, landholder requirements, environmental constraints and maintenance requirements, cleared vegetation may be dealt with in the following ways:

- chipped or mulched on site and used for easement revegetation
- stacked and windrowed - any stacked and windrowed vegetation must be placed in a manner which does not concentrate overland flow or create erosion
- stacked and burnt - any burning of cleared vegetation may only occur in accordance with a permit from the Fire Brigade and so as not to create any additional hazard to the surrounding environment or transmission line.

2.1.2.2 Foundation installation

Construction of tower foundations usually consists of the following steps:

- setting out, to mark the location of the excavation
- excavation/boring
- leg stub/base set up
- placement of reinforcing steel/concreting
- concreting of excavated foundations
- installation of earthing.

Excavation of bored foundations may be by truck mounted auger, backhoe or track mounted excavator. Although dependent upon the geology of the surrounding soil, foundations are typically excavated to approximately 8–12 m. Backfilling of mass concrete foundations is completed using the excavated material if suitable, or imported fill. Surplus material is spread evenly about the site or removed, depending on quantity and suitability.

2.1.2.3 Watercourse crossings

Where the transmission line crosses watercourses, previously cleared tracks for existing crossings will be preferentially used to minimise new watercourse crossings. Where new crossings are required, the construction methodology will be dependent upon the size of the watercourse and will be in line with acceptable development requirements of waterway barrier works.

The construction of bed-level crossings typically involves 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 to150 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
- installation of geomaterials.

2.1.3 Switching station

Construction of the switching station will require the following field activities:

- Site preparation including infrastructure siting, pre-clearance surveys, vegetation clearing, earthworks and fencing
- Civil works including the installation of security fencing, drainage, roads, cable trenches, station earthing, and foundations
    - Drainage works include drains, pits and culverts to control stormwater flow.
    - All roads into the compound will be either gravelled or bitumen sealed to prevent erosion.
    - Underground cable trenching within the switching station includes cable trenches, cable pits and conduits as required for multicore cables.
    - Copper electrical earthing mat will be installed across the site at a depth of approximately 600 mm.
    - Isolated concrete plinths and foundations will be installed (bored or excavated as required). Other foundation requirements such as those for the control and communications buildings are normally completed at this time.
- Structure construction
    - Aerial, gantry and support structures
    - Control/communications building
    - Amenities building
    - Storage shed
- Erection of landing beams, conductors and busbars
- Site rehabilitation.

2.1.3.1 Vegetation clearing and earthworks

The proposed switching station site is located at the eastern end of the transmission line. Of the total 690 ha that will be cleared for the Project Footprint, approximately 14.1 ha of this will comprise the switching station footprint and associated infrastructure including roads, a helicopter pad and bushfire breaks.

Earthworks, usually by a cut and fill process to bench the pad will be required at all these areas to ensure the surface is level. Earthworks for the site comprises compacted fill approximately 1 m above surrounding ground level. Fill may be required to be imported to meet specification requirements. A 100 mm thick platform road base surface will be laid as part of initial earthworks. This will extend up to 3 m outside the future compound fence alignment all around the site, excluding the future roads.

2.1.4 Ancillary infrastructure

The following section provides an overview of the temporary ancillary infrastructure required for the construction of the transmission line and switching station detailed in Section 2.1.2 and Section 2.1.3 respectively.

Temporary infrastructure requirements include:

- Access tracks connected to and within proposed transmission line infrastructure
- Seven (7) Temporary Work Areas
- Seven (7) sites for Water Sourcing and Extraction
- A site office, concrete batching plant and laydown area (switching station site only)

Temporary ancillary infrastructure has been strategically sited within or directly adjacent to the Project Area where possible. However, approximately fifteen small areas (maximum combined area of approximately 11 ha) occur outside the Project Area, up to distances of 7 km away. The locations of ancillary infrastructure sites that do not occur within the Project Area are shown on Figure 3.1 to 3.6. At each site, vegetation clearing will be required for set up and installation.

2.2 Operation and maintenance

Following the construction and commissioning of the transmission line and switching station, the amount of activity on site will decrease substantially. The switching station is designed to be monitored and controlled remotely. Temporary ancillary infrastructure will no longer be required and will be decommissioned as described in Section 2.3.

During operation, maintenance staff will carry out scheduled inspections of the line, easement and access tracks every two to four years, depending on the risk of vegetation growth. These inspections (patrols) are either by vehicle or helicopter. Maintenance staff will also carry out routine inspections of the switching station and detailed maintenance of all plant and equipment at regular intervals. Additional inspections at any Project location may be required as a result of equipment failure, damage, modifications and upgrades.

A summary of the primary activities to be conducted as part of the operation and maintenance phase is detailed below.

2.2.1 Transmission line maintenance

2.2.1.1 Easements

Inspection of the easements is carried out on each scheduled line patrol, with the main aim being to record the type, density and height of vegetation regrowth. Additional matters of interest include new under–crossings (e.g. distribution powerlines) or other activity or construction within the easement, which may affect operation or maintenance of the line.

Powerlink's policy is for the landholder to be contacted prior to any vegetation control work on a property and the landholder's agreement obtained regarding the treatment method to be employed. Easement vegetation management is important to ensure the safe operation of the transmission line and will be undertaken in accordance with Powerlink's standards and procedures.

Three techniques for vegetation management are employed:

- mechanical
- hand clearing
- chemical (herbicides).

The technique adopted for each area takes into account a number of issues such as landholder requirements, type of regrowth, terrain and the local environmental conditions. Mechanical clearing is usually by a tractor driven slasher or similar vehicle, and is suitable for shrubs and smaller trees. It is limited to relatively flat and accessible terrain due to the type of vehicle used.

Hand clearing is labour intensive but allows the vegetation clearing to be quite selective and ensures that disturbance to non-target species is minimised. Hand clearing can be employed in areas where vehicle access is not available. Lopping of larger trees is also an option near urban or in visually sensitive areas.

Chemical treatment may also be used for selective treatment of incompatible vegetation while minimising ground disturbance. The method may be through stump injection, cut stump or overall spray technique and is mostly suitable for regrowth vegetation.

2.2.1.2 Access tracks

Maintenance of access tracks is required to ensure that vehicle access to structure sites is available for inspections and structure maintenance. The work will aim to minimise disturbance to natural groundcover, thus reducing erosion potential and subsequent maintenance requirements. Maintenance of access provided by others is undertaken in consultation with the appropriate authority.

2.2.2 Switching station maintenance

During the routine inspections, the switching station infrastructure and items of plant will be inspected for signs of unusual wear, corrosion or damage. Faults and defects will be reported to maintenance staff who will rectify any problems identified.

Switching station equipment is designed with a service life in excess of 40 years with refurbishment scheduled every 15 years and is very reliable under most conditions. Apart from the detailed visual inspections that maintenance staff undertake, routine maintenance will be carried out periodically depending on the type and make of the item of plant concerned.

Vegetation regrowth control within the switching station compound and under the incoming power supply transmission lines will be undertaken to maintain electrical safety clearances between the conductors and vegetation.

2.3 Decommissioning and rehabilitation

Typically, the operational life of a transmission line and switching station is 50 years and 40 years respectively.

At the transmission line end of life, it may:

- be replaced with a transmission line designed for the revised environmental constraints and electrical system requirements at the time
- if the line was no longer required, it would be de-energised, dismantled, removed and the easement may be surrendered to the property owner.

At the switching station end of life, it is likely replacement or refurbishment work would occur to bring the equipment to the required level of performance and reliability. If the switching station is considered no longer necessary, it would be removed and remediation works undertaken.

Prior to decommissioning, a Decommissioning Management Plan which provides detail regarding the proposed decommissioning works, environmental risks associated with decommissioning and management and mitigation measures will be prepared. This plan will utilise environmental management strategies, practices and technologies current at the time of decommissioning to comply with or exceed regulatory requirements and to appropriately manage environmental issues which may be associated with decommissioning of the switching station and or transmission line.

ABOVE SHEET- 01

BELOW SHEET- 02

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Legend

- Project Area
- Guybal Munjan Switching Station
- Ancillary Sites
- Project Footprint
- Study Area

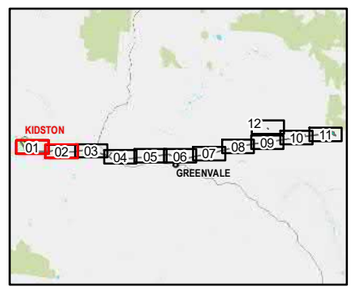

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Figure F3.1

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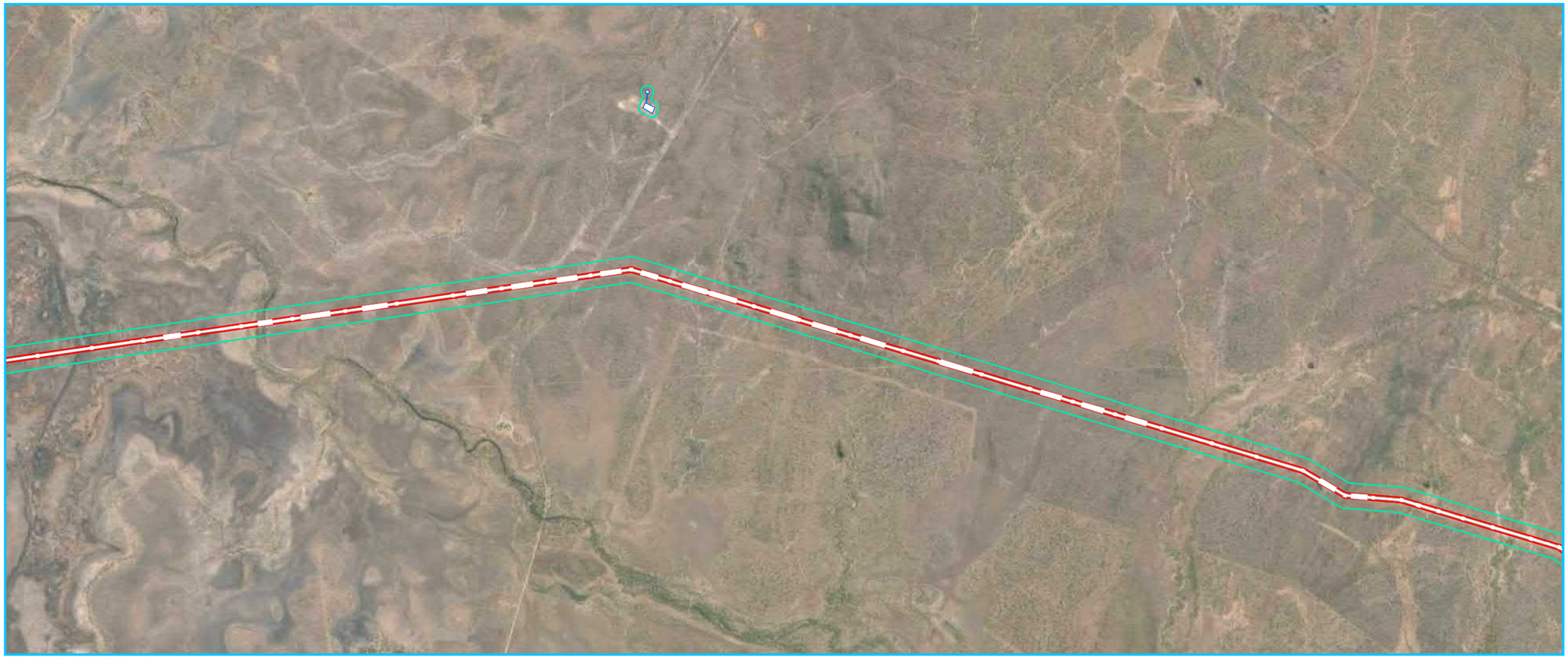

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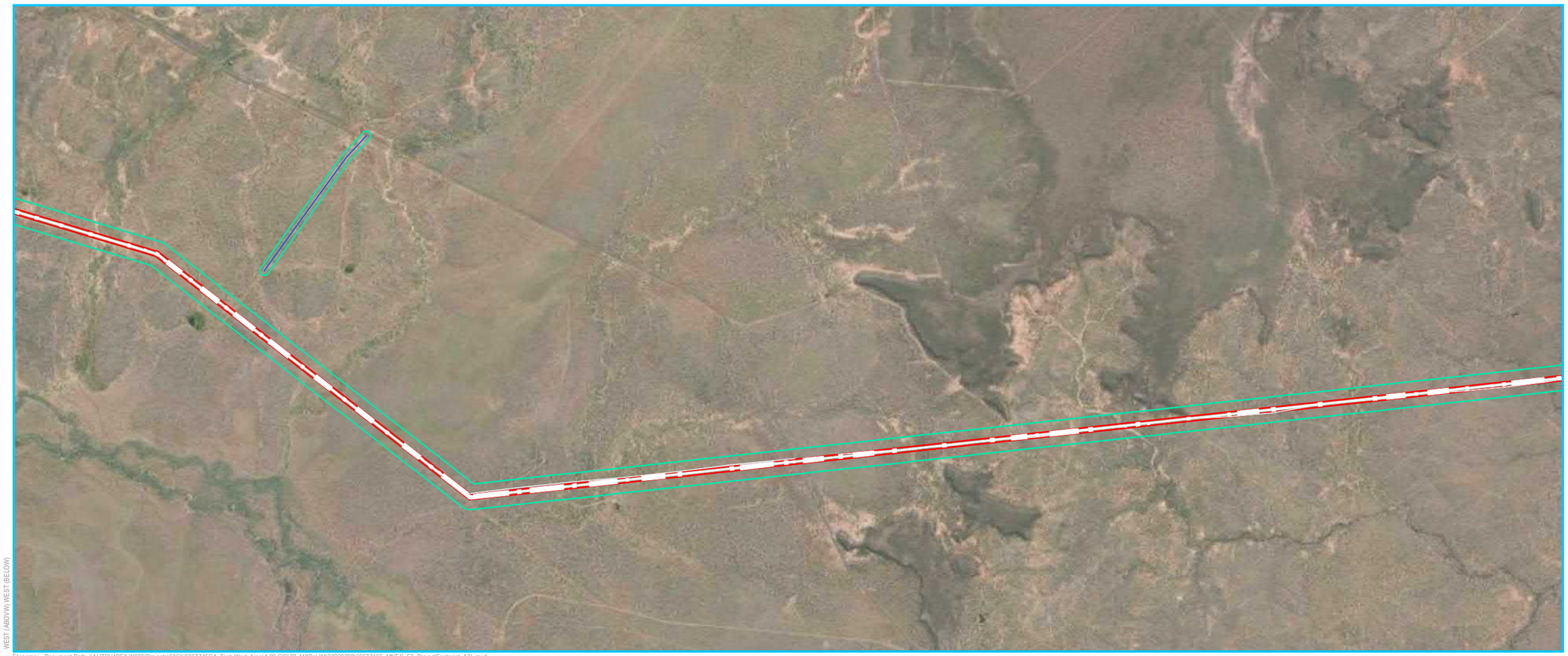

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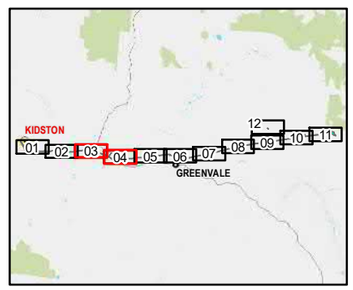

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Figure F3.2

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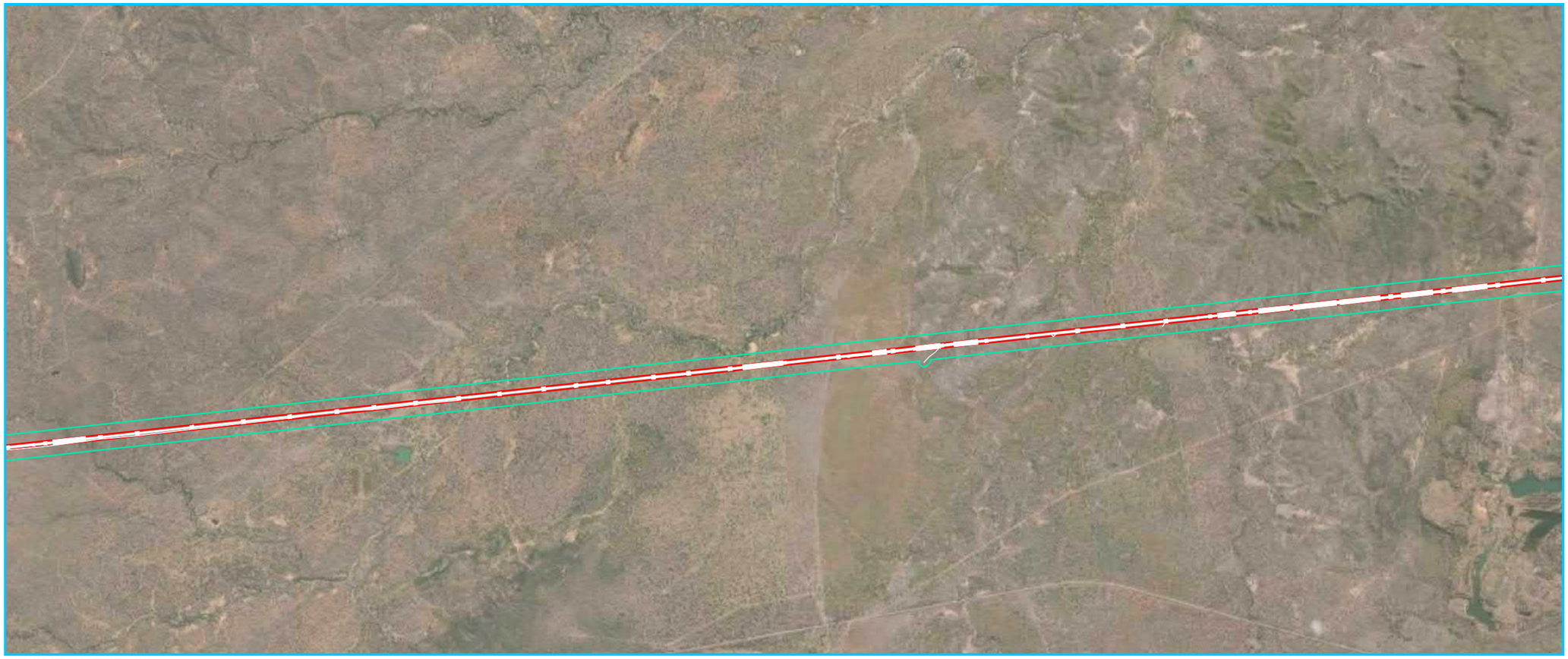

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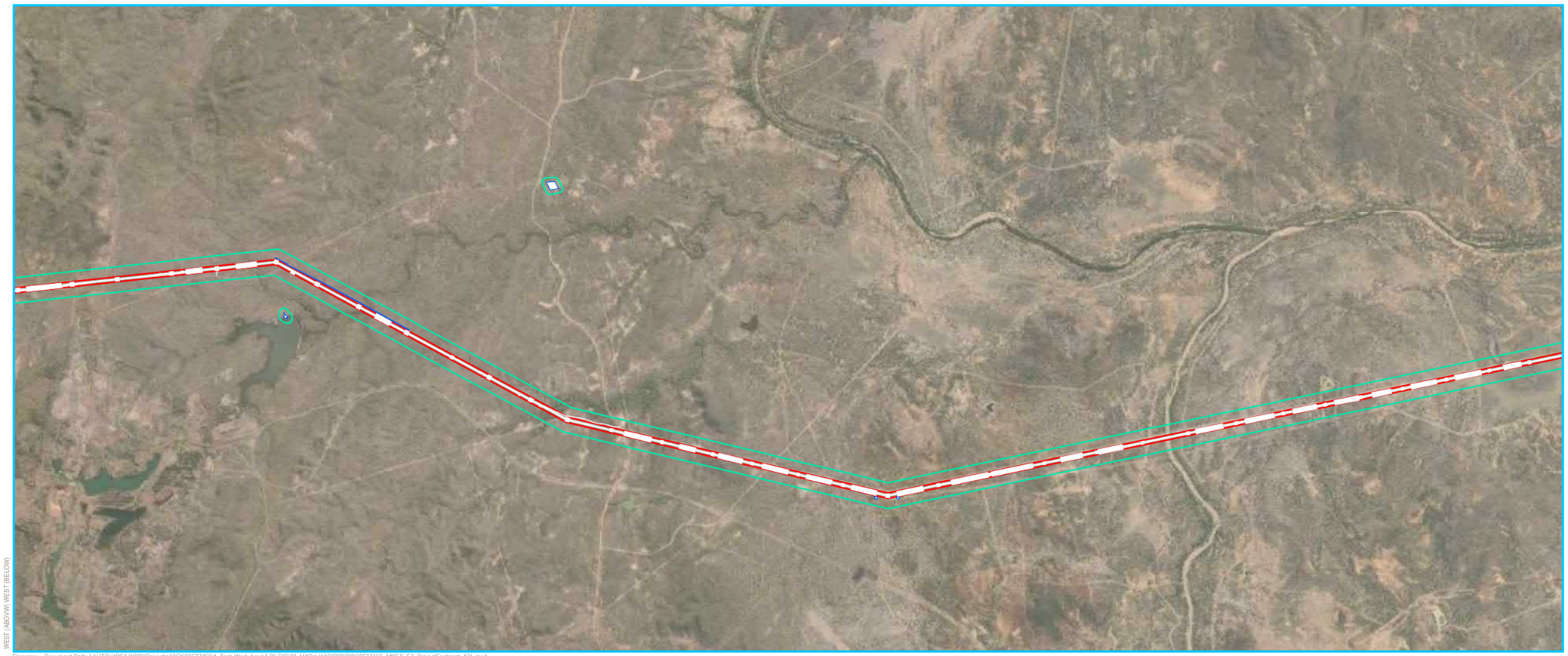

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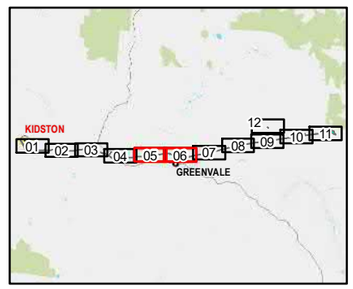

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ABOVE SHEET- 07

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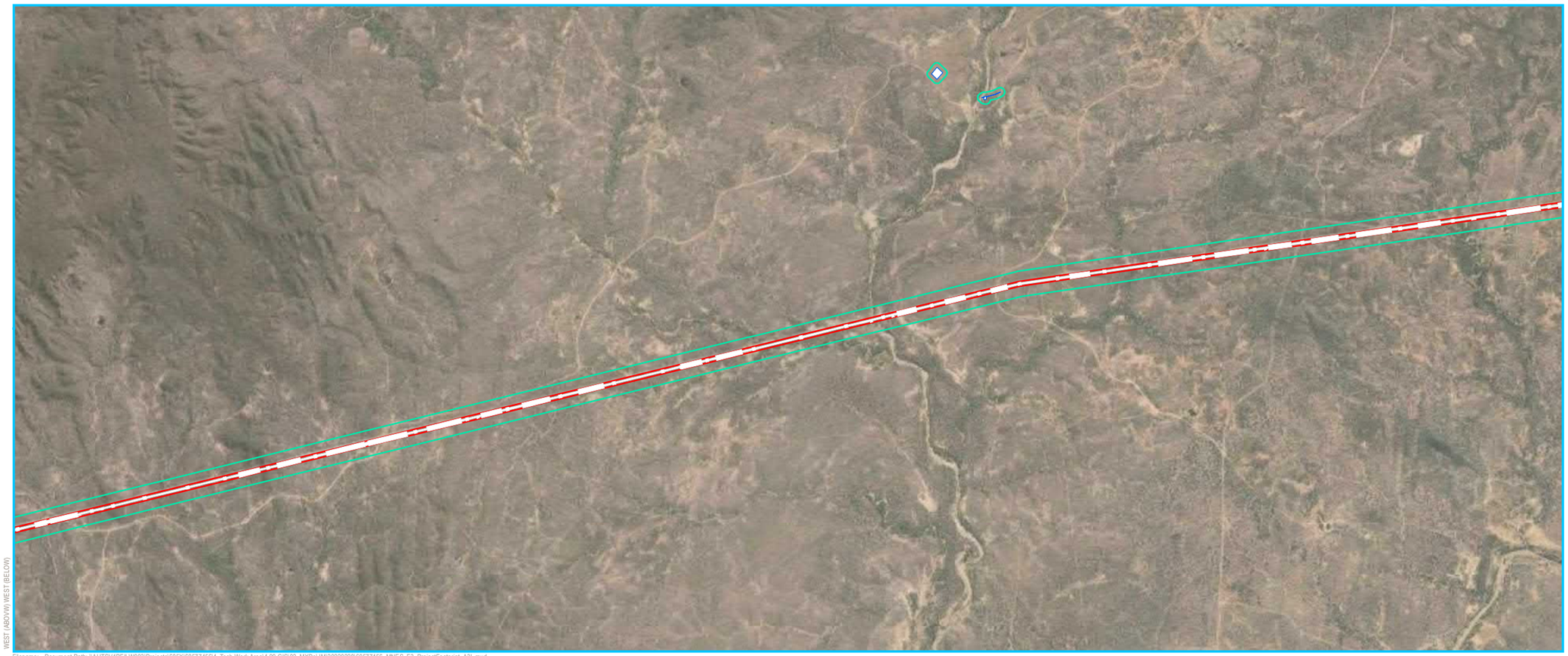

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Coordinate System: GDA 1994 MGA Zone 55
Projection: Transverse Mercator

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Legend

- Project Area
- Guybal Munjan Switching Station
- Ancillary Sites
- Project Footprint
- Study Area

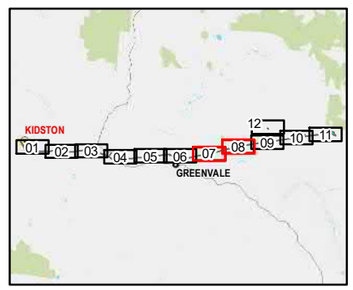

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Figure F3.4

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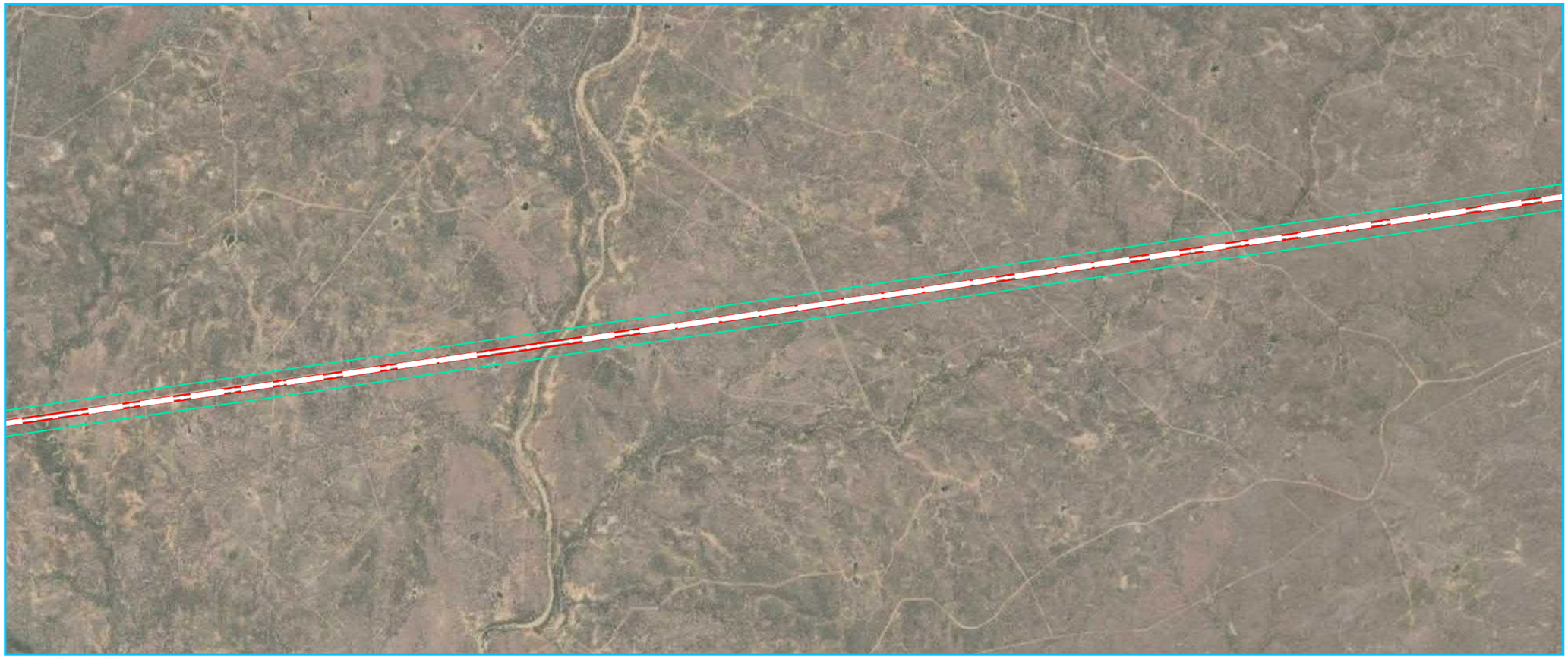

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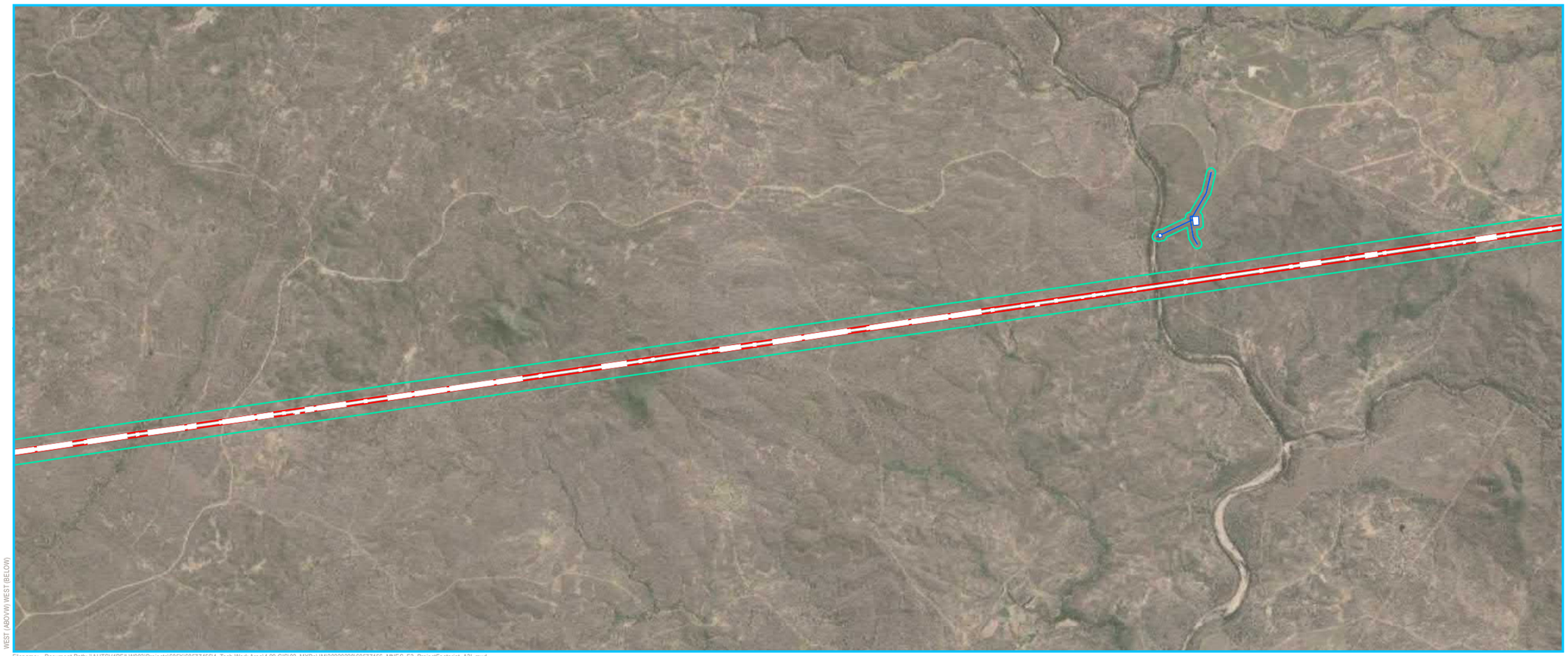

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Coordinate System: GDA 1994 MGA Zone 55
Projection: Transverse Mercator

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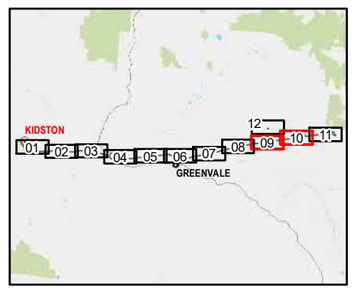
Legend

- Project Area
- Guybal Munjan Switching Station
- Ancillary Sites
- Project Footprint
- Study Area



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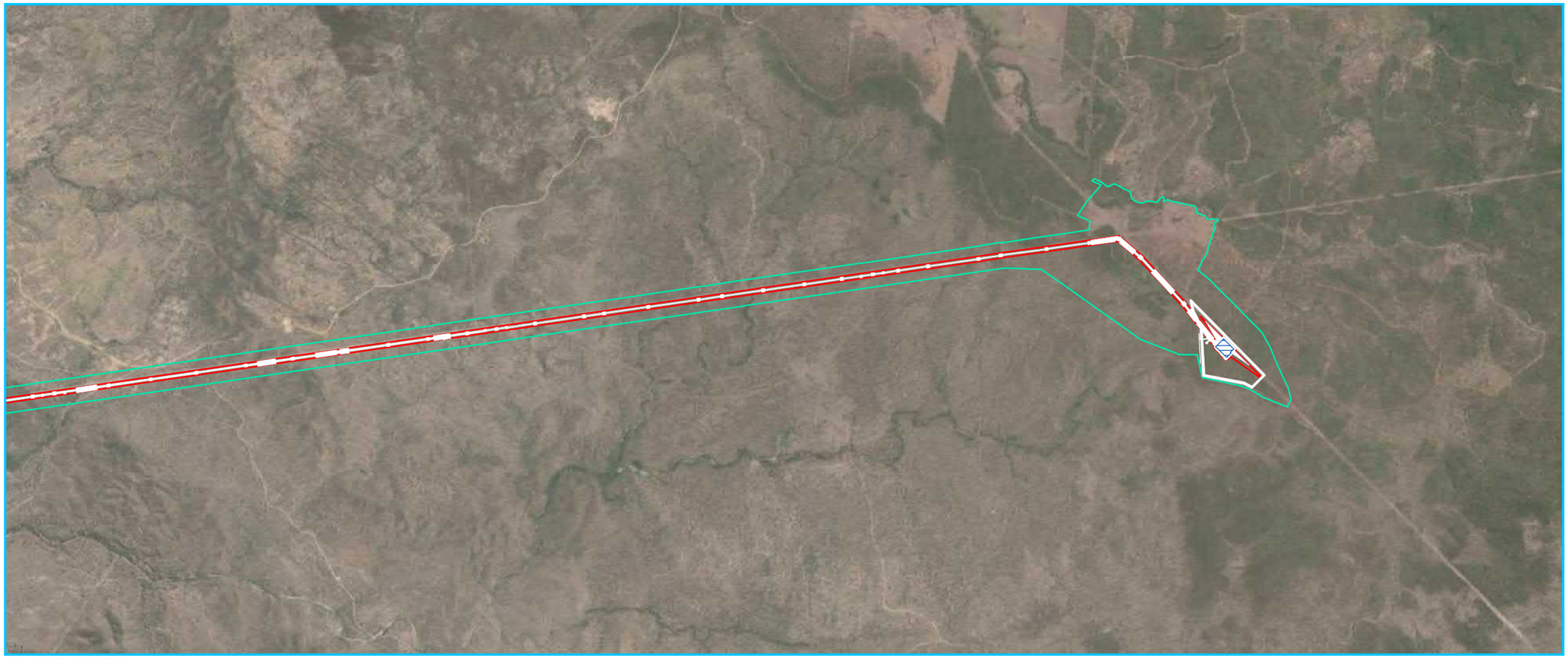

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Coordinate System: GDA 1994 MGA Zone 55
Projection: Transverse Mercator

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

- Project Area
- Guybal Munjan Switching Station
- Ancillary Sites
- Project Footprint
- Study Area

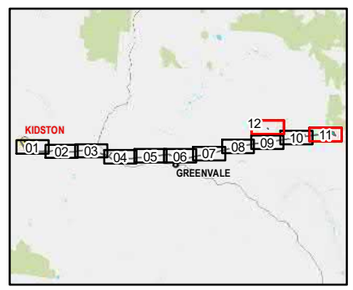

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Figure F3.6

A3 size

3.0 Regulatory Framework

3.1 Environment Protection and Biodiversity Conservation Act 1999

The EPBC Act is administered by the Department of Agriculture, Water and the Environment (DAWE) and establishes a process for environmental assessment and approval of proposed actions that have, will have or are likely to have a significant impact on MNES or on Commonwealth land. MNES protected under the EPBC Act include:

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

3.1.1 EPBC Referral

Under the EPBC Act, a referral to the DAWE is required if the Project has the potential to cause a 'significant impact' on MNES. In relation to listed threatened and migratory species, an action will require approval if the action has, will have, or is likely to have a significant impact on a species listed in any of the following categories:

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

Additionally, an action will require approval if the action has, will have, or is likely to have a significant impact on an ecological community listed in any of the following categories:

- Critically Endangered, or
- Endangered.

A 'significant impact' is an impact which is important, notable, or of consequence, having regard to its context or intensity. Whether or not an action is likely to have a significant impact depends upon the sensitivity, value, and quality of the environment, which is impacted, and upon the intensity, duration, magnitude and geographic extent of the impacts.

As identified in Section 1.4, the purpose of this report is to identify the occurrence of MNES within the Project Area and assess the impacts of the Project on these MNES against the EPBC Act Significant Impact Guideline Policy Statement 1.1 (Department of the Environment, 2013).

In September 2021, Powerlink referred the Project to DAWE for a decision under section 75 of the EPBC Act on whether the action constituted a 'controlled action', requiring assessment and approval under the EPBC Act. DAWE determined the action was a controlled action on 3 November 2021 due to the following controlling provisions:

- Listed threatened species and communities (section 18 & 18A)

This MNES report describes and assesses all relevant potential impacts (direct and indirect) of the action on listed threatened species and communities and describes avoidance, mitigation and management measures for these impacts. It also assesses potential impacts of the proposed action on migratory species and demonstrates that the action is unlikely to significantly impact these species, consistent with the referral decision.

4.0 Assessment Methodology

4.1 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. Following referral of the Project in late 2021, the Protected Matters Search Tool (PMST) was run again in February 2022 as per preliminary documentation requirements.

The following information sources were reviewed as part of this assessment:

- DAWE EPBC Act 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, 2021c) (Appendix A)
- 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, 2021) (Appendix A)
- Atlas of Living Australia (ALA) 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
- The DoR Regional Ecosystem (RE) mapping (version 12)
- 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 (DES, 2020c)
- DES Protected Plants Flora Survey Trigger Map to identify the high risk areas for threatened plants (DES, 2022)
- Historical aerial imagery (Q Imagery, 2021).

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

Table 1 Data source search parameters

Data source	Search coordinates	Search buffers
EPBC Act Protected Matters Search Tool	-18.85865 145.8408, -18.84665 145.82897, -18.90942 145.34547, -18.94298 145.19505, -18.97672 145.01533, -18.96826 144.97921, -18.95092 144.94672, -18.97857 144.64424, -18.9522 144.60926, -18.94668 144.58572, -18.92133 144.50593, -18.93132 144.42604, -18.92578 144.32136, -18.92722 144.24131, -18.91413 144.17307, -18.91529 144.164 & -18.87455 144.14419.	20 km
WildNet	The bounds of the Project Area	20 km
All other mapping		1 km

4.2 Previous ecological assessments

4.2.1 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 - 2 April 2020 and 6 - 9 October 2020.

4.2.2 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).

4.2.3 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.

4.3 Field surveys

AECOM ecologists have conducted eight field surveys from 2017 to 2021 across the Study Area and within areas of representative habitat nearby. The broad purpose of each field survey and the dates that they were conducted are listed below:

- 13 November – 19 November 2017 – Flora and fauna
- 28 May – 4 June 2018 – Flora only
- 11 June – 19 June 2018 – Fauna only
- 12 July – 16 July 2018 – Flora and fauna
- 7 August 2018 – Flora and fauna
- 20 July – 26 July 2021 – Targeted northern quoll survey
- 23 August – 29 August 2021 – Flora and fauna within lot and plans 5234/SP275834 and 1/OC64
- 6 December – 12 December 2021 – Targeted survey for yakka skink, ghost bat and the black-throated finch.

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

4.3.1 Flora methodology

4.3.1.1 Vegetation community assessment

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

As per the Queensland Herbarium methodology (V. Neldner et al., 2017), tertiary level site assessments were undertaken within a 10 m 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 (V. 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) (Queensland Herbarium, 2021). 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.

Across the field surveys a total of 177 sites including 81 tertiary transects and 96 quaternary sites were undertaken within the Study Area (Figure 4.1 to 4.5).

4.3.1.2 TEC assessments

The desktop assessment identified two potentially occurring TECs:

- Broad leaf tea-tree (*Melaleuca viridiflora*) woodlands in high rainfall coastal north Queensland TEC
- Lowland tropical rainforest of the Wet Tropics.

Field assessment of both aforementioned TECs was completed by first determining the presence of key diagnostic features followed by condition thresholds, as detailed in the communities respective Listing and/or Conservation Advice.

The field assessment criteria for the Broad leaf tea-tree (*Melaleuca viridiflora*) woodlands in high rainfall coastal north Queensland TEC (Broad leaf tea-tree TEC) is detailed in Table 2 below. As specified in the Listing Advice (Threatened Species Scientific Committee, 2012b), the following REs 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.

The field assessment criteria for the Lowland tropical rainforest of the Wet Tropics TEC (Lowland rainforest TEC) is detailed in Table 3 below. It is noted in the Approved Conservation Advice (Department of Agriculture Water and the Environment, 2021a) that there will be ‘atypical’ occurrences of the ecological community due to environmental variables including climate. As a result, qualifiers such as "typically" and “commonly” are used in the descriptions of key diagnostic characteristics. If qualified characteristics are not met, the ecological community could still occur in a patch, given the

description of the vegetation is consistent with that in the Approved Conservation Advice and the weight of evidence for other diagnostic characteristics.

A total of 34 REs correspond to the Lowland rainforest TEC, the majority of which occur within the Wet Tropics bioregion.

Table 3 Lowland rainforest TEC field assessment criteria

Criteria	Description
Key diagnostic characteristics	• It occurs in the Wet Tropics Bioregion or the Starke Coastal Lowlands subregion in the Cape York Peninsula Bioregion; • It occurs principally on fertile soils, which may be derived from alluvium, basalt, metamorphic and granite substrates; • It typically occurs in an area with high long-term mean annual rainfall (>1300 mm to > 3500 mm per annum). Although significant rain may fall throughout the year, there is a marked concentration of rain in the months December to March, with over 60% of mean annual rainfall occurring in that period; • It is typically confined to land east of the coastal ranges and below 80 – 100 m above sea level (asl), with the main area of former distribution being predominantly between 0 – 40 m asl. However, it can also be found up to approximately 300 – 350 m asl where substrate and other conditions support the ecological community, for example on the relatively gentle slopes of the fertile basaltic lava flows in the East Palmerston and Mena Creek areas west of Innisfail; • Canopy features including: an uneven canopy averaging 20 – 40 m in height (Tracey 1982); long-undisturbed canopies have a lower crown cover than upland or littoral rainforests; in general, trees are tall (at least 25 m) evergreen (occasionally semi-deciduous), sometimes with well-developed buttresses; and most canopy trees are mesophylls (i.e. have a leaf or leaflet blade length 12.5 – 25 cm); • Is structurally simple (where one or two growth forms dominate) or structurally complex (where there are a large range of growth forms prominent, but none tending to dominate to the exclusion of others). Growth forms which contribute to structural complexity include palm trees, trees with well-developed plank buttresses, vines and robust lianas, vascular epiphytes (e.g. ferns and orchids), climbing aroids (e.g. Rhaphidophora, Pothos, Epipremnum), rattans (*Calamus sp.*), and gingers (Tracey 1982); • The floristic composition is very diverse and characterised by a high species diversity of plants with predominantly large leaves, including a high representation of the families Myrtaceae, especially Syzygium (noting eucalypts and *Melaleuca spp.* are typically are absent or in relatively low abundance), and Lauraceae. Rarely, stands are dominated by a single species, such as Backhousia; • Typically, there is an absence or relatively low abundance of species from the genera Eucalyptus, Corymbia, Melaleuca and Casuarina; • Typically, a well-developed sub-canopy tree layer is present as well as a sparse shrub/sapling layer. In well-developed forests, overlap between layers means they may be difficult to delineate; • Within individual stands, variation in site factors results in conspicuous structural differences such as the increase or dominance of palms (feather palms (Archontophoenix) or fan palms (Licuala)) on sites with impeded drainage. The fan palm and feather palm mesophyll rainforests are distinctive types of the ecological community.
Condition thresholds	Patch size: • ≥ 0.5 ha; OR • 0.1 ha and is contiguous with a larger area, or areas, of native vegetation totalling at least 5 ha. tree canopy must be present with a canopy cover of at least 15%; AND Tree canopy layer: • If patch size is ≥ 5 ha, trees must be present • If patch size is 2 – 5 ha, cover of native tree species is ≥ 30% AND/OR Tree species richness ≥ 10 species.

Criteria	Description
	• If patch size is 0.1 ha and < 2 ha, cover of native tree species is ≥ 50% AND/OR tree species richness must be ≥ 20 species.

4.3.1.3 Targeted flora searches

Targeted searches for threatened flora species identified in the desktop assessment were undertaken in areas of potentially suitable habitat confirmed during vegetation community assessments across the Study Area. In addition, protected plants searches were undertaken within high risk areas identified on the Queensland flora survey trigger map (including areas near Mt Fox). Protected plant searches were undertaken in accordance with *Flora Survey Guidelines – Protected Plants, Nature Conservation Act 1992* which involved timed meander searches that included walking through the study area, visiting the full range of potential habitats and searching for threatened flora species.

4.3.1.4 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.

4.3.1.5 Nomenclature

Taxonomic nomenclature used for the description of floral species is according to Census of the Queensland Flora 2020 (Brown, G.K. & Bostock, 2020). 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).

4.3.2 Terrestrial fauna methodology

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

- Habitat assessments
- Active searches
- Scat and sign searches
- Microchiropteran bat call detection (using both active and passive Anabat recorders)
- Camera traps
- Elliott traps and hair funnels
- Spotlighting and call playback
- Visual and auditory identification of birds
- Microhabitat transects (in search of potential yakka skink burrows/colonies)
- Incidental observations.

Further information regarding each of these methods and survey effort is detailed in Table 4 below. At every fauna habitat assessment site, active searches, scat and sign searches and bird censusing was conducted.

The survey sites associated with baseline flora and fauna surveys are displayed on Figure 4.1 to 4.6. Survey sites completed in July 2021 as part of the targeted northern quoll survey are displayed on Figure 5.1 to 5.6. Survey sites completed in December 2021 as part of the targeted assessment of black-throated finch (southern), yakka skink and ghost bat are displayed on Figure 6.1 to 6.6.

Table 4 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	20 – 26 July 2021	23 – 29 August 2021	6 – 12 Dec 2021	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	20 sites	18 sites	138 sites	**273 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.								
Scat and sign search	Koala and other mammals, reptiles, 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	13 person-hours	12 person-hours	92 person-hours	**469 person-hours**
Microhabitat transects	Yakka skink	In areas of potential yakka skink habitat, 30 min walking transects were completed by two people in search of required microhabitat (i.e. large fallen logs) as well as potential burrow sites.	-	-	-	-	-	-	8 person-hours	**8 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 and call playback	Nocturnal birds, arboreal mammals and reptiles	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. During spotlighting events, threatened species calls were played for koala and masked owl (northern), with ecologists listening for at least 10 minutes for a return call from nearby individuals.	-	Four nights with a total of 32 person-hours	-	-	-	-	Four nights with a total of 32 person-hours	**64 person-hours**
Camera traps	Northern quoll, Sharman's rock wallaby, yakka skink and other medium to large terrestrial mammals	In June 2018 and July 2021, camera traps were deployed within areas of complex rocky 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. Golden syrup was used on one property due to biosecurity concerns with honey. Some camera traps targeting northern quoll were baited with an entire can of sardines. In December 2021, two of the five camera traps deployed were used to target the only potential yakka skink burrows identified during the walking transects and active searches. These traps were not baited. Remaining cameras were in rocky habitat as per previous surveys.	-	5 cameras over 5 nights with a total of 61 trap nights	-	-	41 cameras over 13 to 32 nights each with a total of approx. 820 trap nights	-	5 cameras over an average of four nights each with a total of 20 trap nights	**901 trap nights**

Method	Target fauna	Description	Survey effort							
			13 – 19 Nov 2017	11 – 19 June 2018	12 – 16 July 2018	7 Aug 2018	20 – 26 July 2021	23 – 29 August 2021	6 – 12 Dec 2021	Total
		Analysis of still photos captured on cameras was undertaken by qualified ecologists. Captured images of fauna were identified to species level where possible.								
Elliott traps and hair funnels	Northern quoll and other medium to large terrestrial mammals	Elliott B traps (large metal box traps) were placed in groups of ten in suitable northern quoll habitat (areas of complex rocky sandstone with high relief). A total of four lines of Elliott traps were deployed over four nights in July 2021. Hair funnels were placed in groups of 20, or as singles associated with camera traps that were placed in suitable habitat such as creek lines.	-	-	-	-	4 groups of 10 Elliott B traps over 4 nights with a total of 160 trap nights. 2 groups of 20 hair funnels over 14 nights with a total of 560 trap nights	-	-	**160 trap nights for Elliott B** **560 trap nights for hair funnels**
Echolocation call detection (active and passive)	Microbats	Passive: Four Songmeter SM2Bat+ ultrasonic bat call detectors were used across six sites within the Study Area in 2017 and 2018. Detectors were placed in the vicinity of foraging sites such as vegetation corridors, flyways, over watercourses and adjacent to artificial waterbodies (dams) in representative potential, likely and known habitat. In 2021, two Anabat swift bat call detectors were deployed across two potential ghost bat roost sites (abandoned mine shafts) within the Study Area. Active: A single Anabat Walkabout (handheld bat call detector) with directional microphone was used during spotlighting in December 2021 within the Study Area, and in locations near potential abandoned mine shafts, to target the ghost bat. All data recorded on the bat recorders was 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).	4 nights including 4 passive Songmeter SM2 devices	22 nights including 4 passive Songmeter SM2 devices	-	-	-	-	12 nights including 2 passive anabat swifts and 1 active handheld anabat walkabout	**38 nights**

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Meters

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Legend

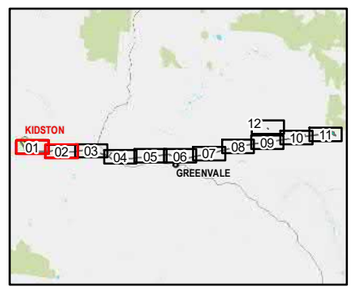
- Study Area
- Observations (flora or fauna)

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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VERSION: 1

Figure
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ABOVE SHEET- 03

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Fauna Assessments

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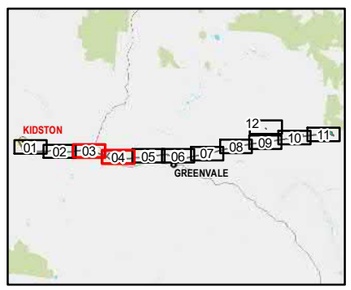

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ABOVE SHEET- 05

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Legend

- Study Area
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Flora

- Tertiary sites
- Quaternary sites

Fauna

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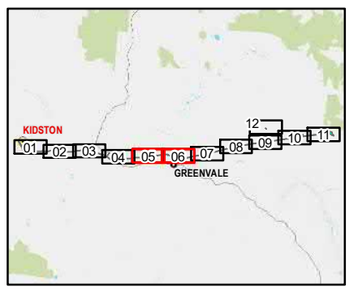

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Flora Assessments

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Fauna Assessments

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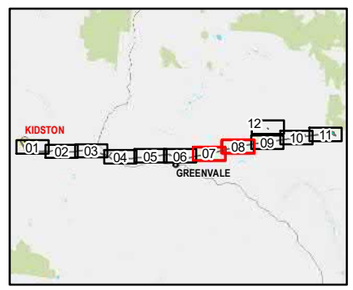

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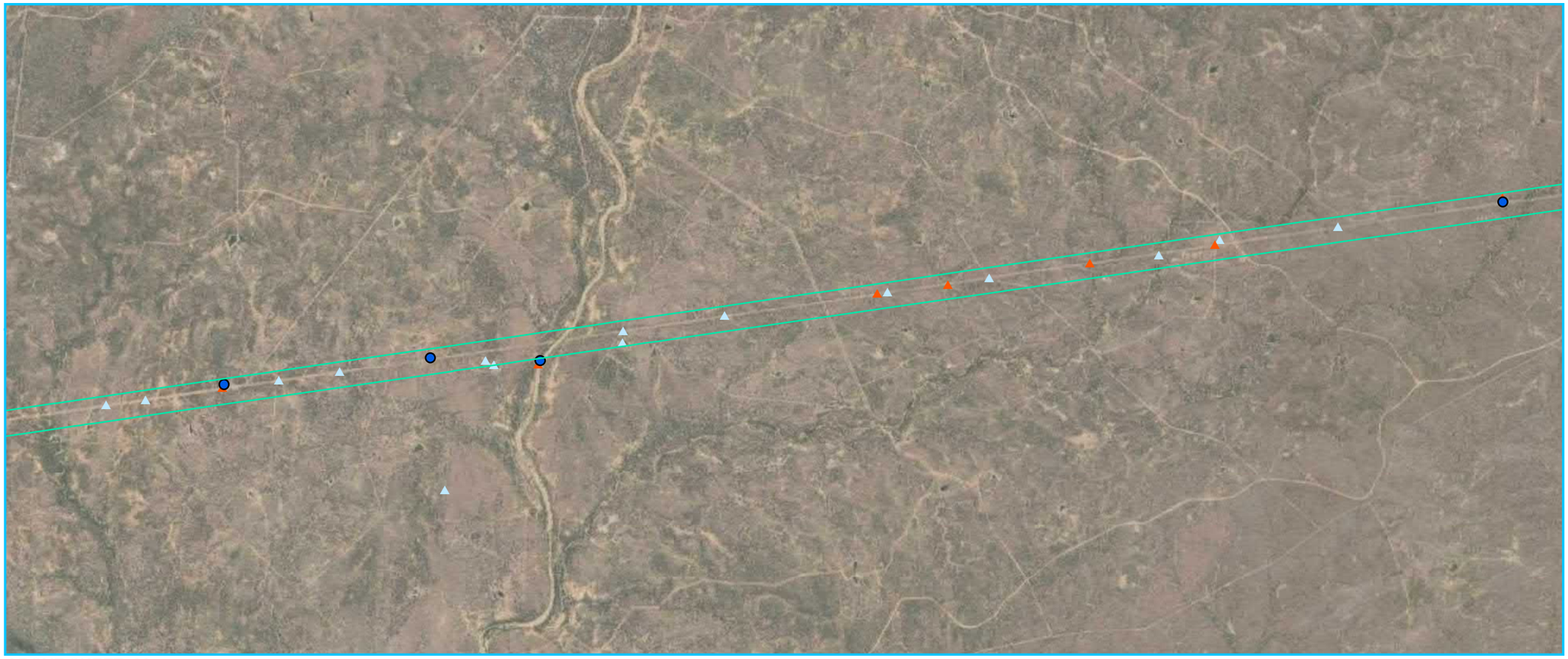

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Projection: Transverse Mercator

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Meters

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Legend

- Study Area
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Flora

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Fauna

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- Anabat sites
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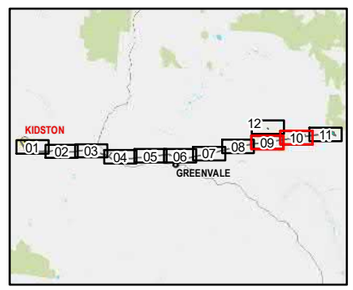

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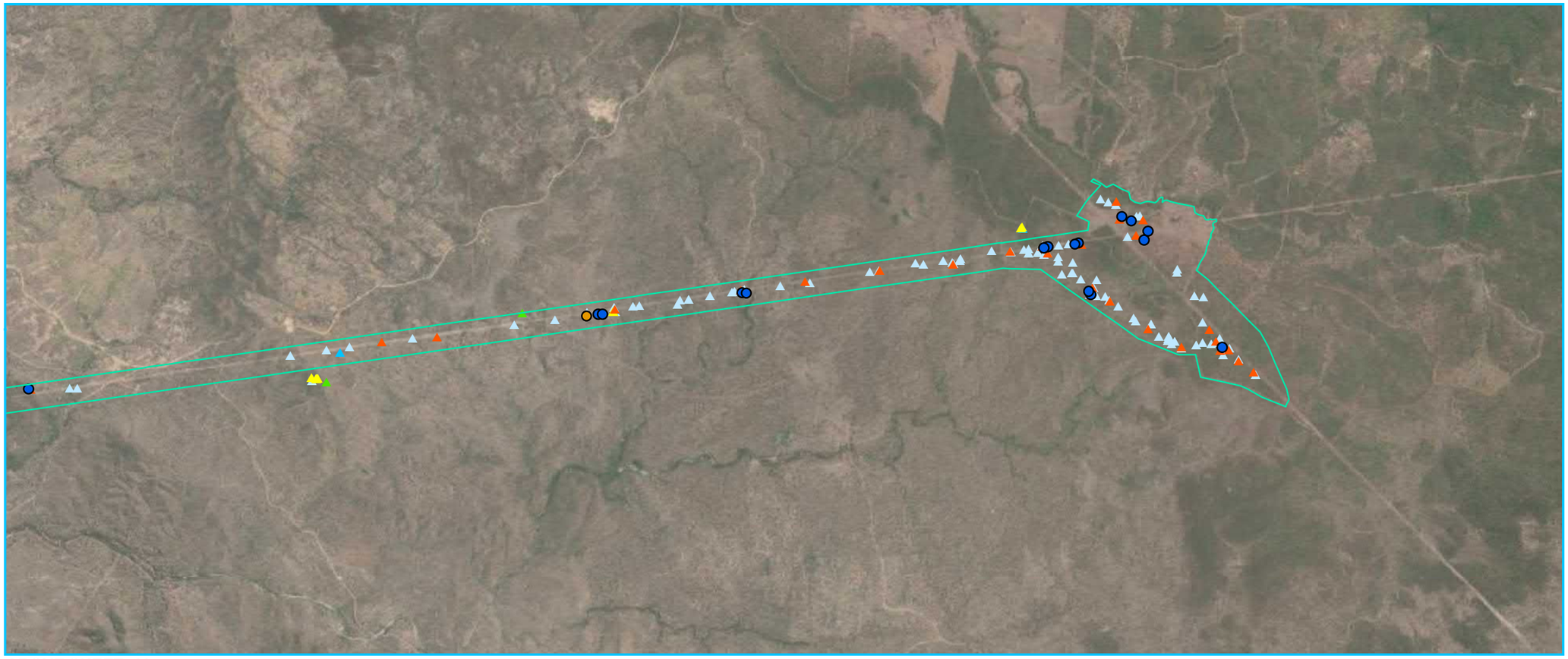

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Legend

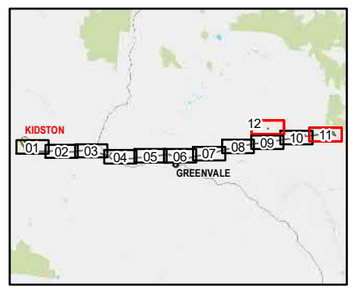
- Study Area
- Observations (flora or fauna)

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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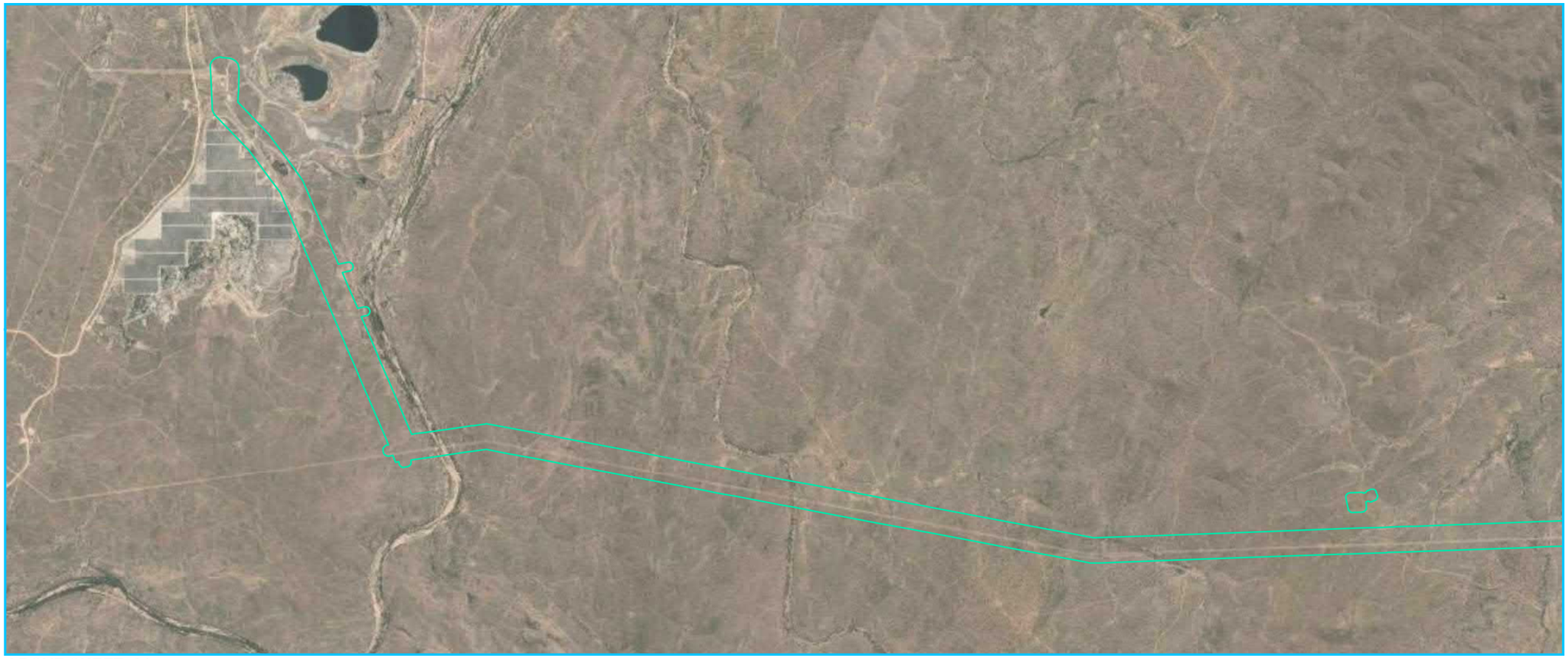

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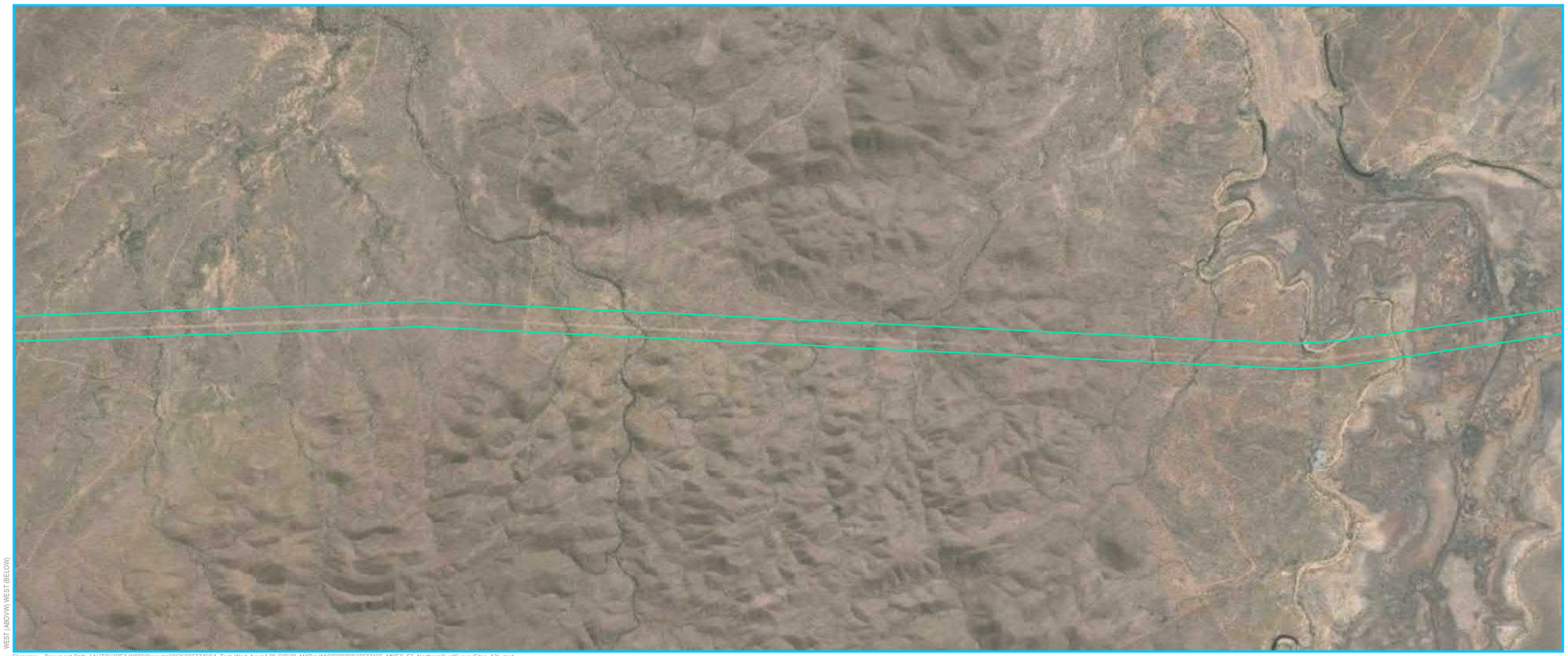

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Projection: Transverse Mercator

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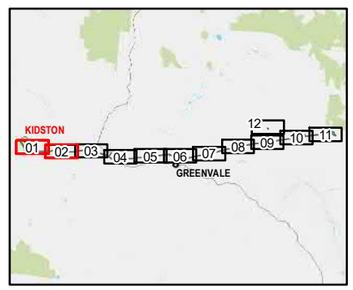
Legend

- Study Area
- Habitat assessment site

Trap site type

- Camera trap
- Elliot trap
- Hair tube and camera traps
- Hair tube



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TARGETED NORTHERN QUOLL SURVEY SITES (2021)

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Figure F5.1

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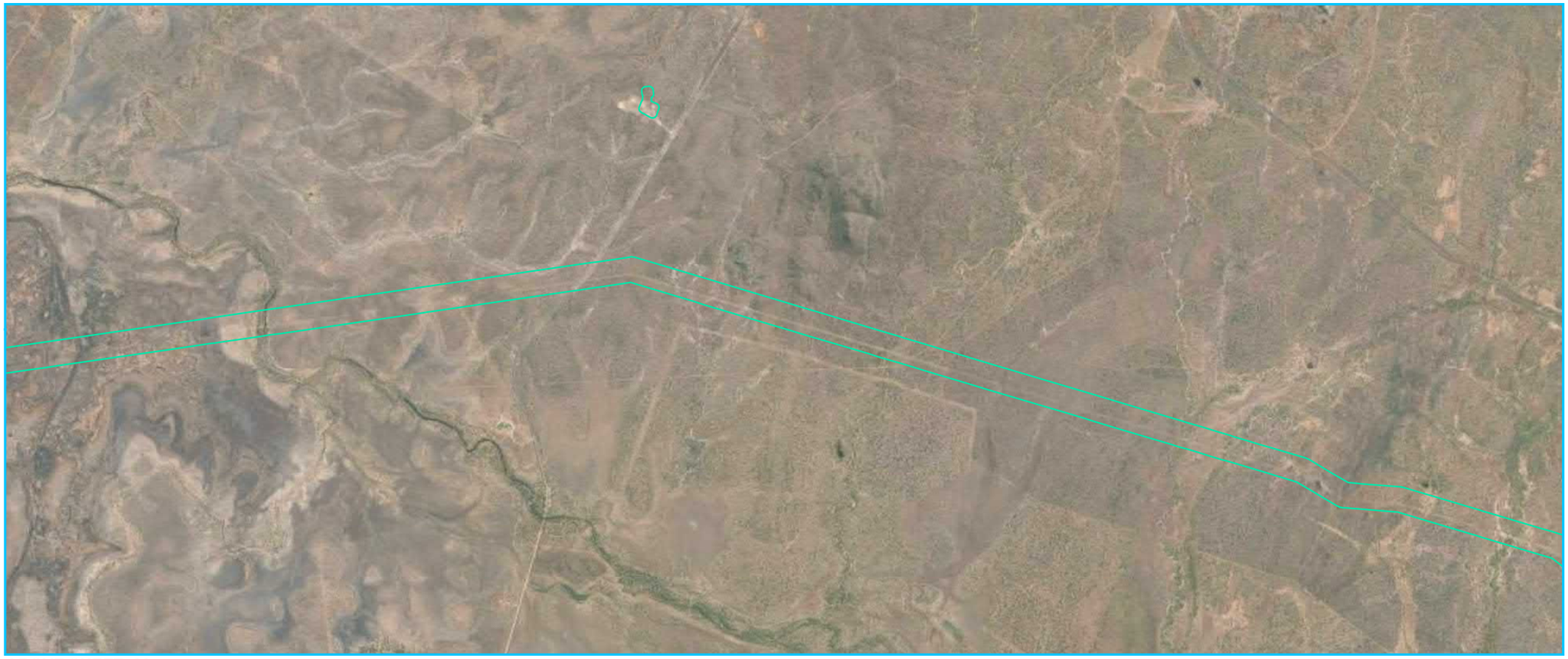

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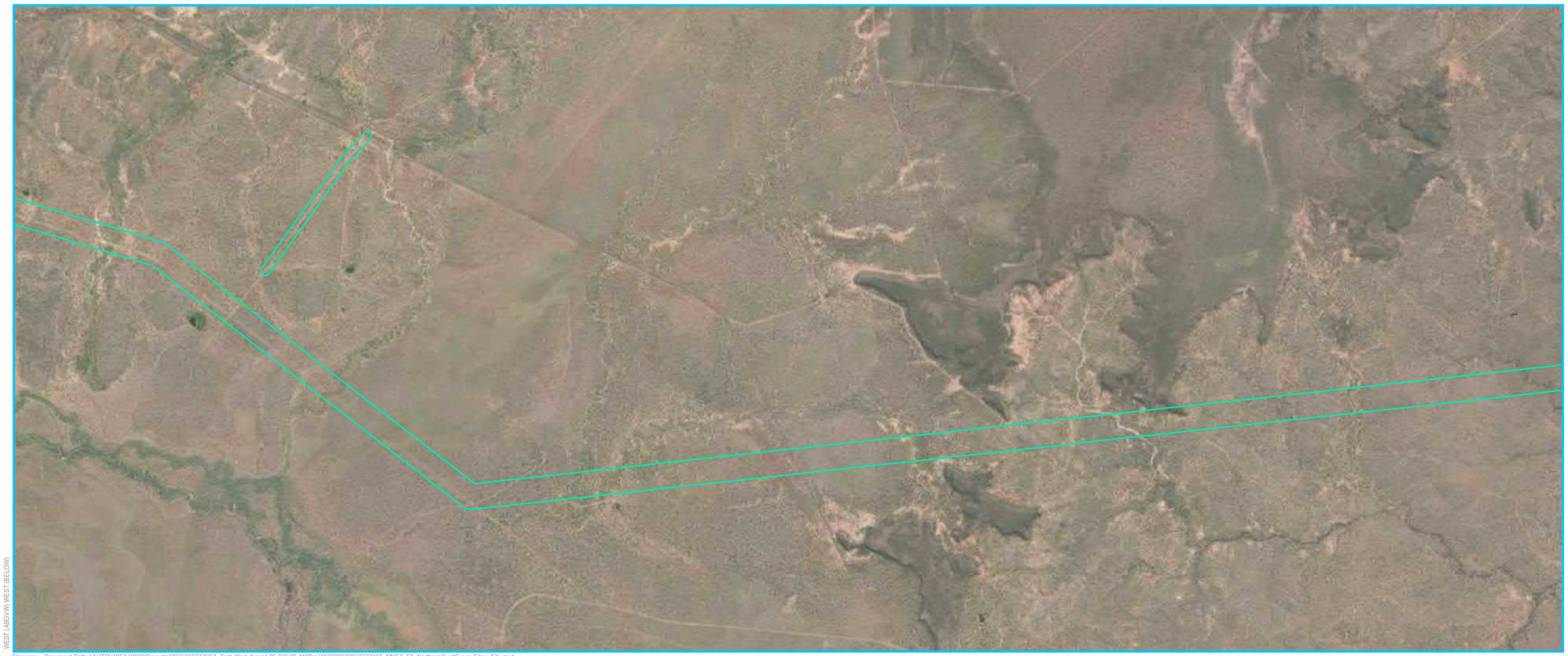

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Projection: Transverse Mercator

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Legend

- Study Area
- Habitat assessment site

Trap site type

- Camera trap
- Elliot trap
- Hair tube and camera traps
- Hair tube

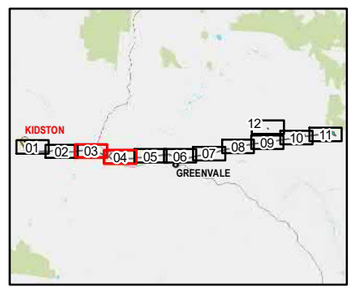

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Figure F5.2

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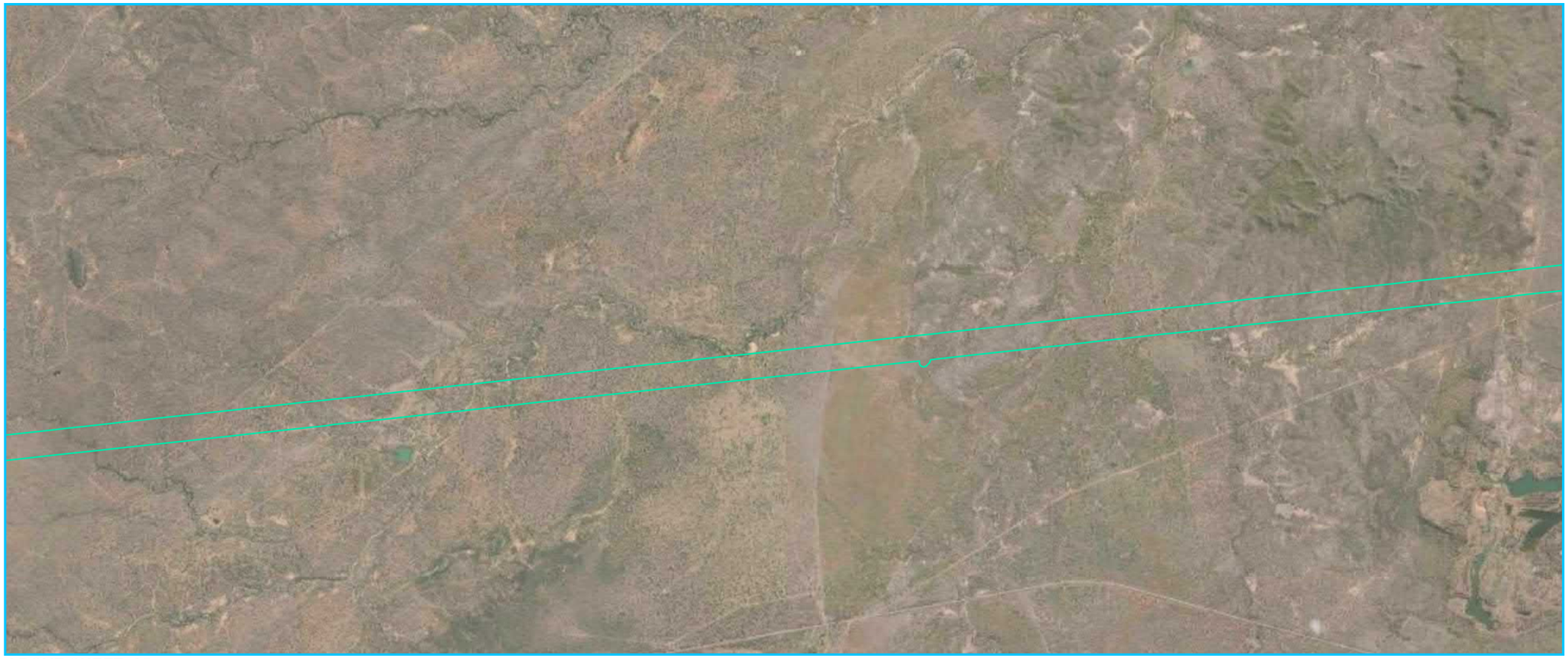

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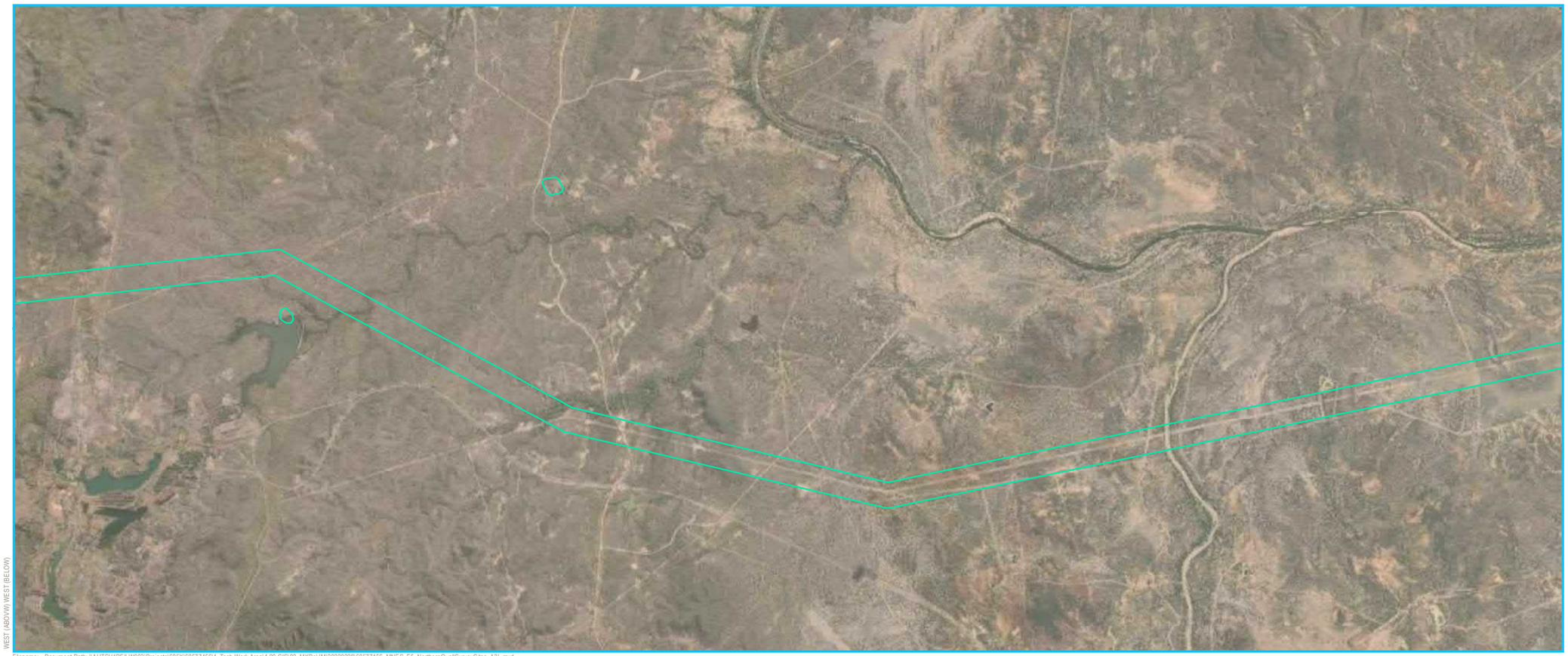

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Legend

- Study Area
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Trap site type

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- Elliot trap
- Hair tube and camera traps
- Hair tube

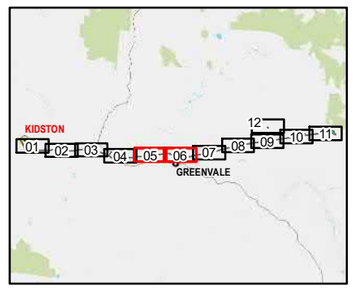

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Figure F5.3

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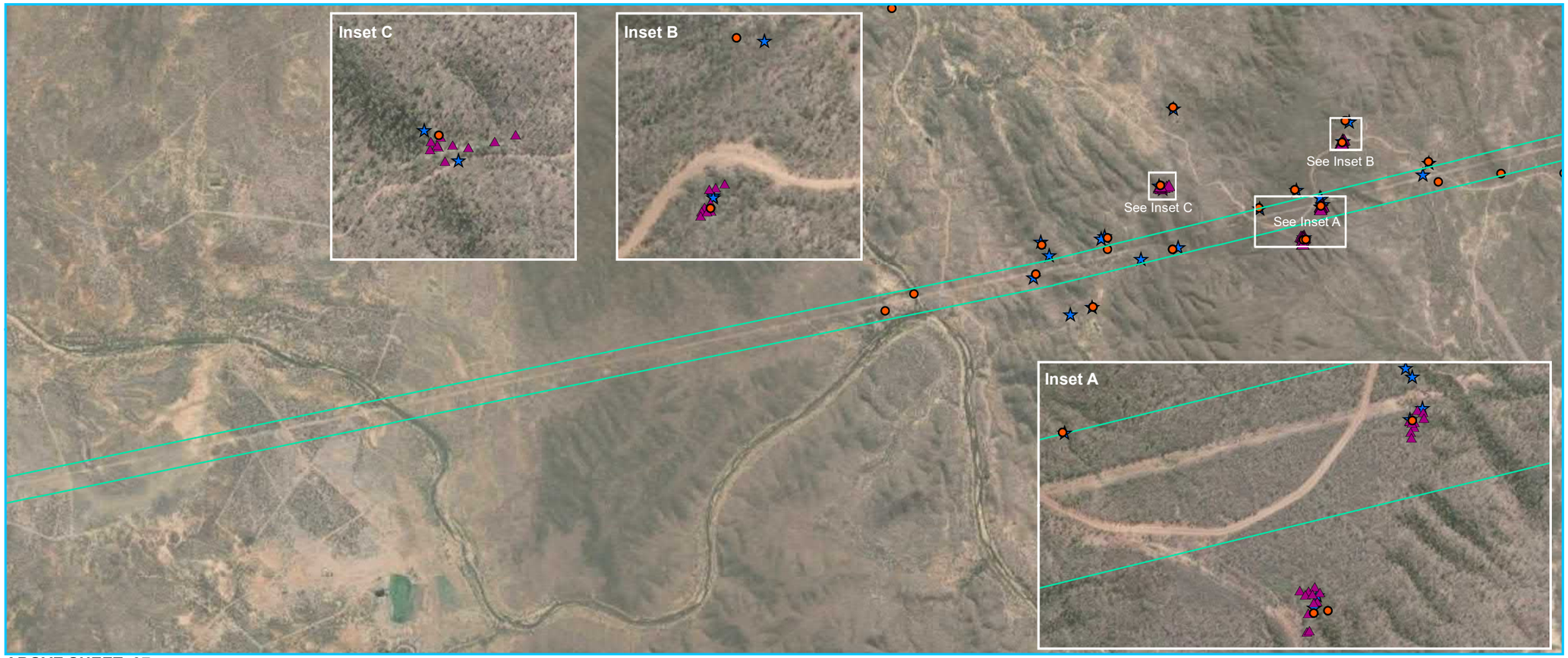

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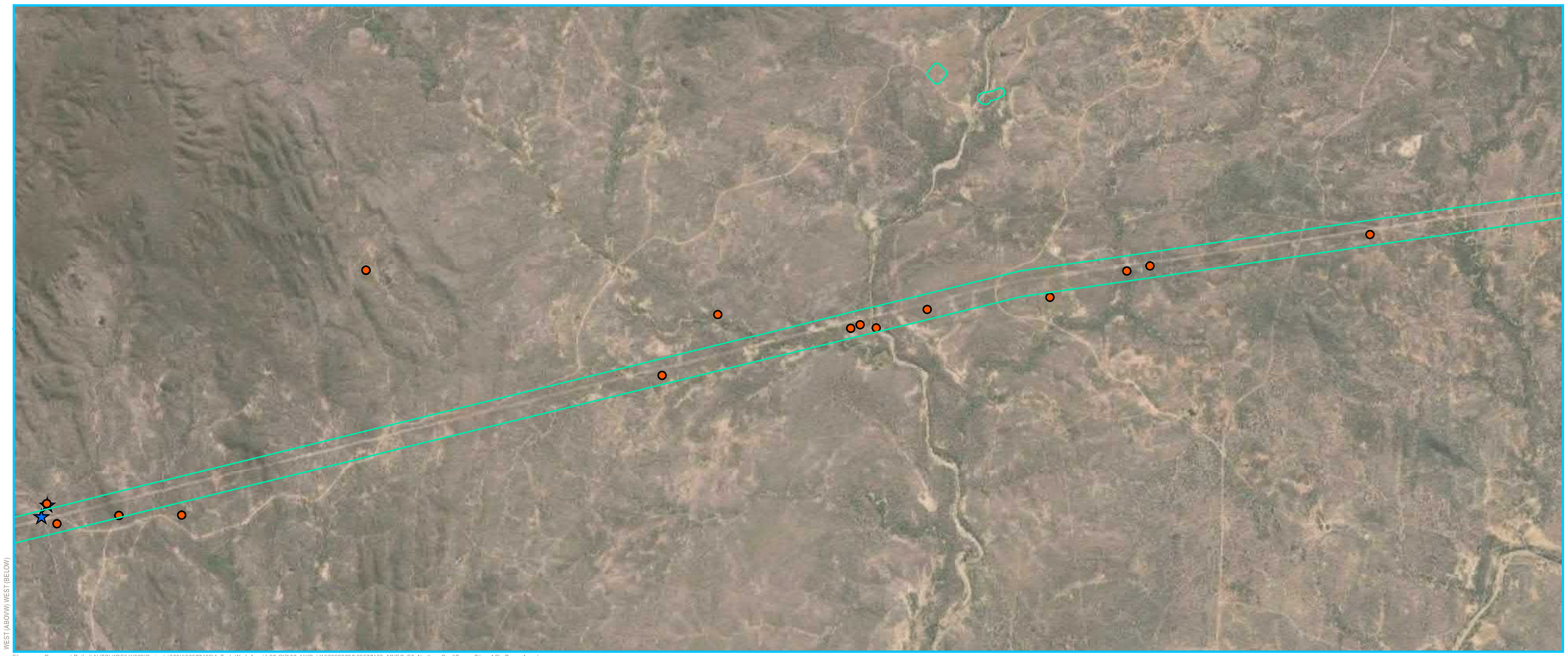

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Coordinate System: GDA 1994 MGA Zone 55
Projection: Transverse Mercator

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Meters

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Legend

- Study Area
- Habitat assessment site

Trap site type

- Elliot trap
- Hair tube and camera traps
- Hair tube
- Camera trap

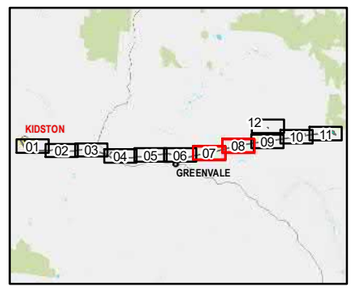

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Figure F5.4

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See Inset A

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Projection: Transverse Mercator

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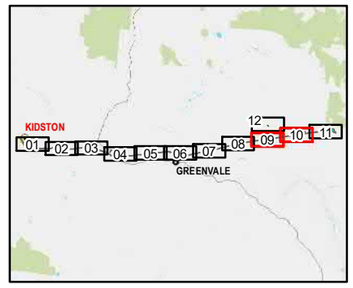
Legend

- Study Area
- Habitat assessment site

Trap site type

- Hair tube and camera trap
- Hair tube
- Camera trap



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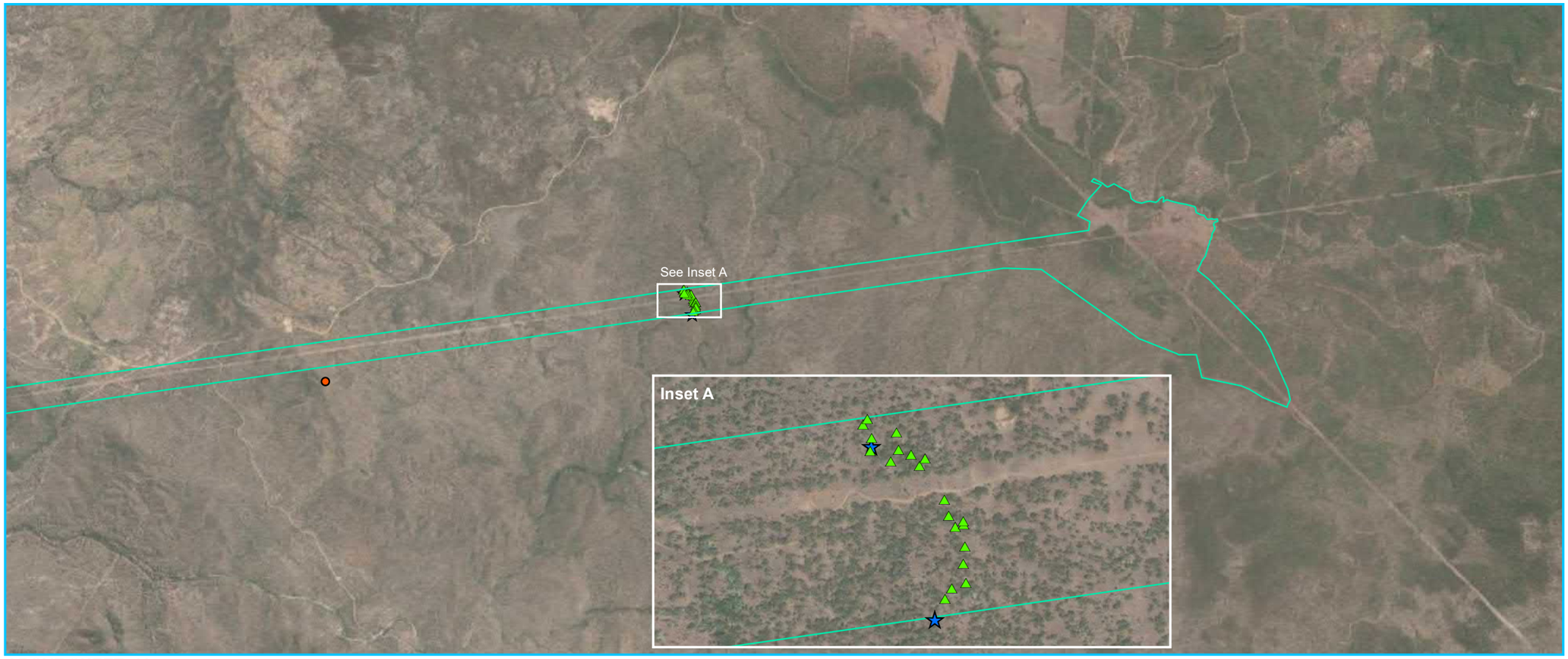
VERSION: 1

Figure F5.5

A3 size



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Legend

- Study Area
- Habitat assessment site

Trap site type

- Hair tube
- Camera trap

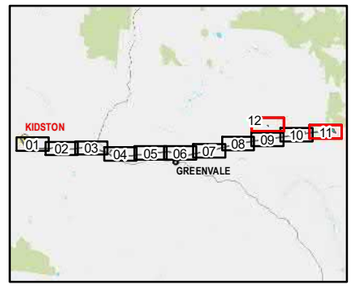

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Figure F5.6

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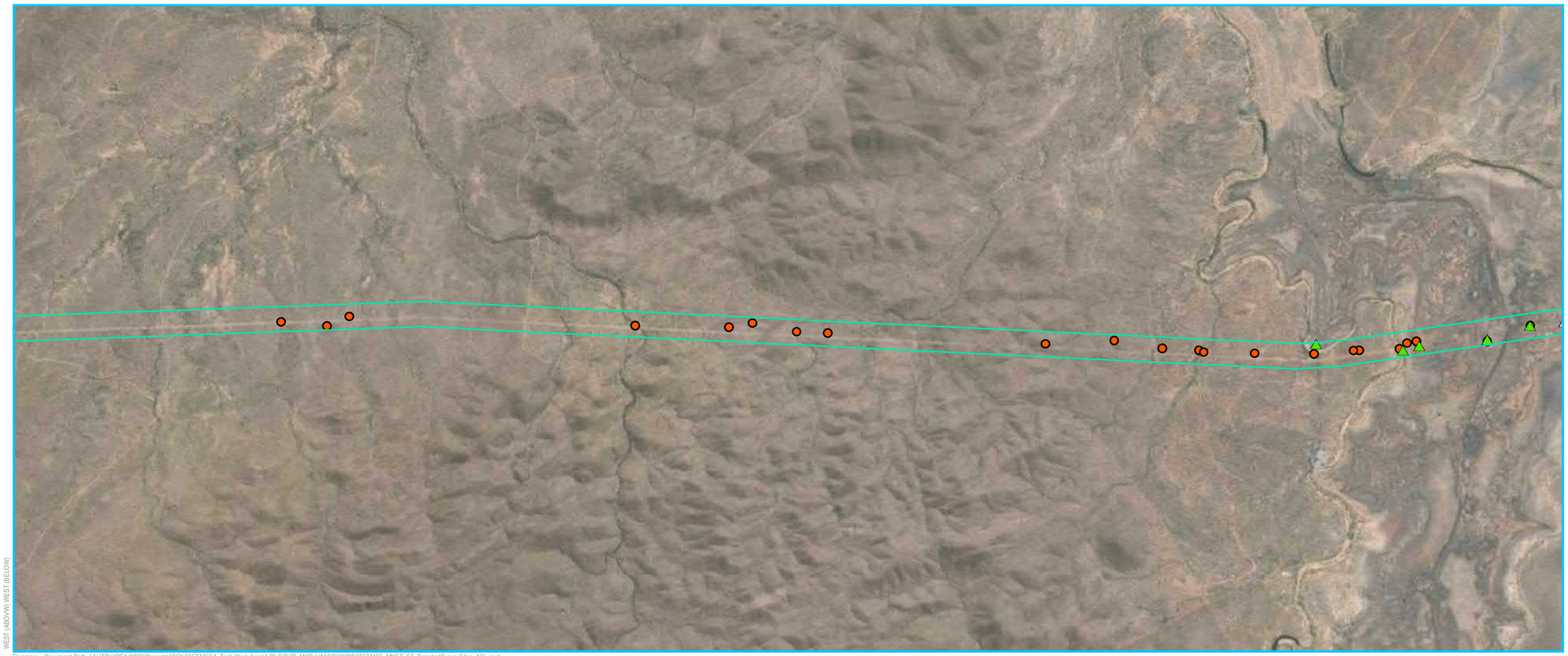

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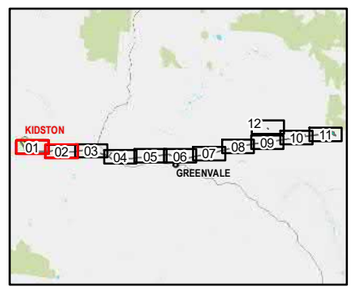
Legend

- Study Area
- Habitat assessment site
- Anabat site
- Spotlighting site
- Observations
- BTF habitat assessment site



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PROJECT ID: 60577456
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Figure F6.1

A3 size

ABOVE SHEET- 03

BELOW SHEET- 04

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Legend

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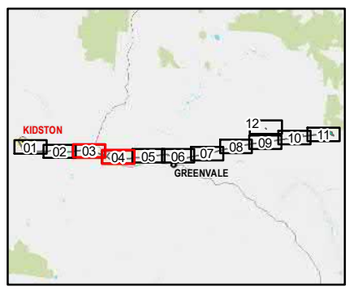
- Spotlighting site
- Observations
- BTF habitat assessment site



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VERSION: 1

Figure F6.2

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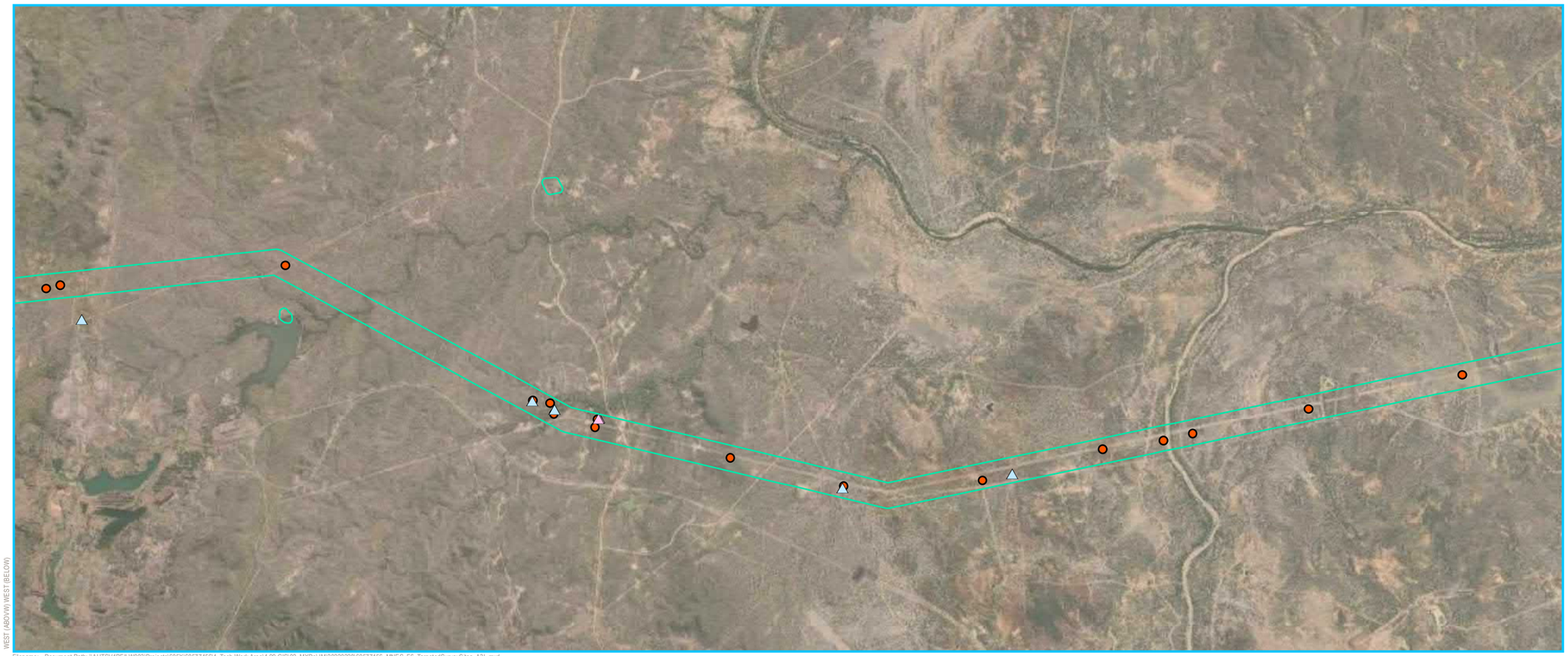

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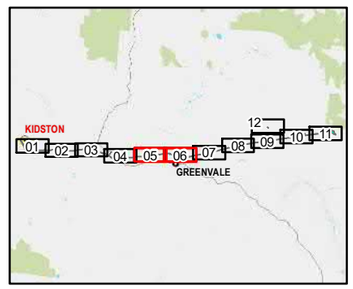

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Figure F6.3

A3 size

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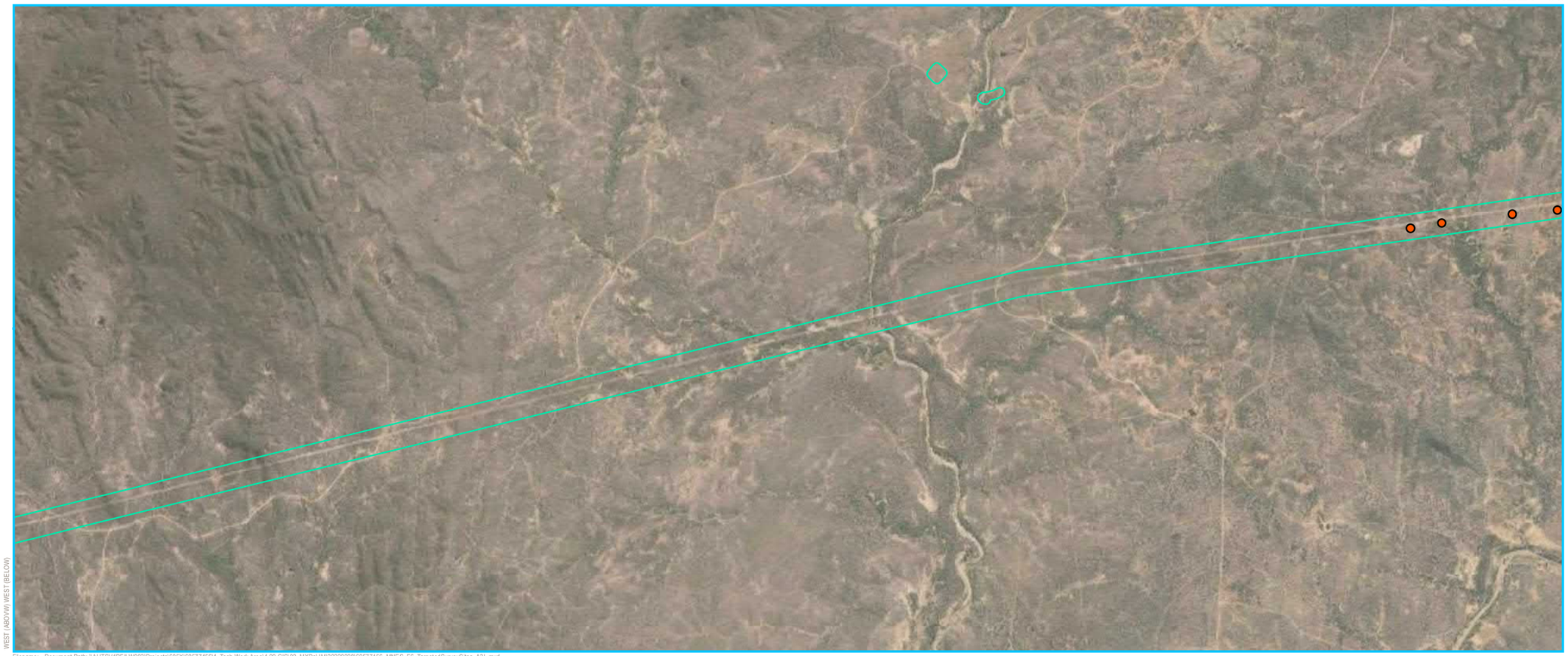

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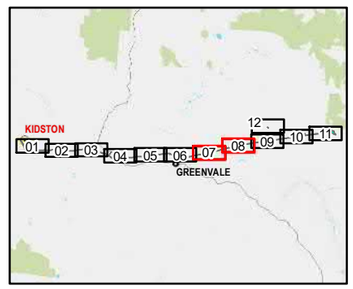

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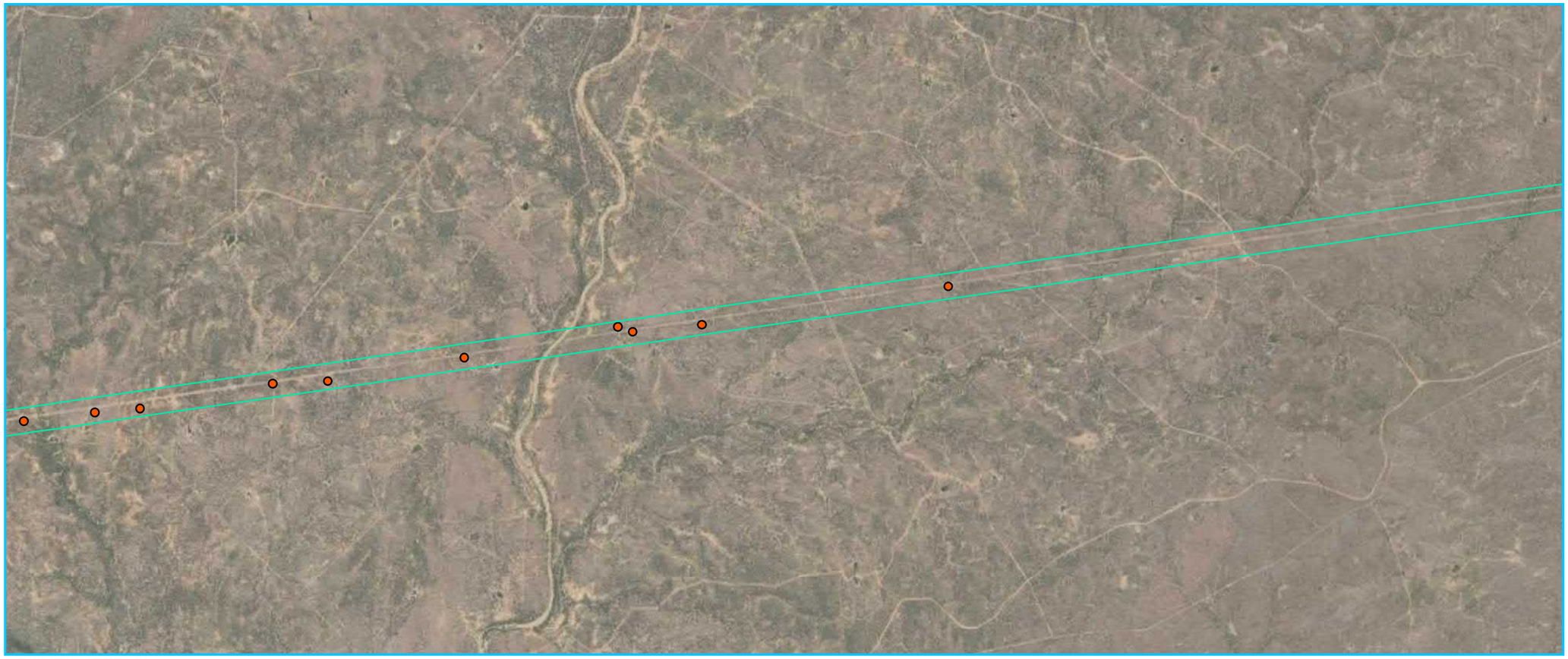
Figure F6.4

A3 size



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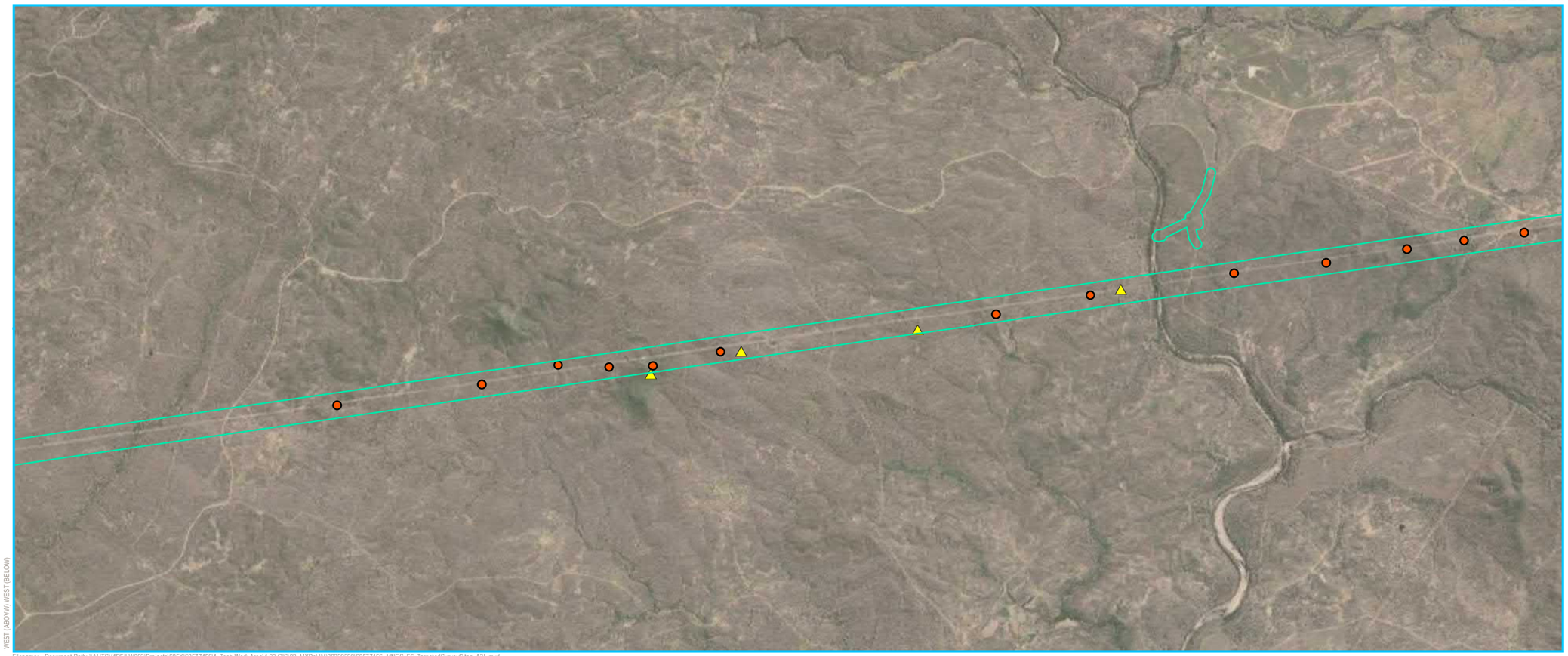

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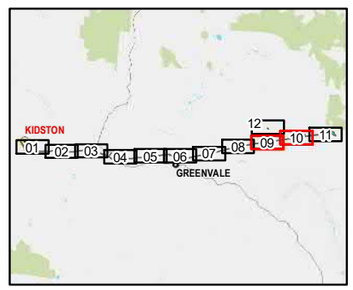

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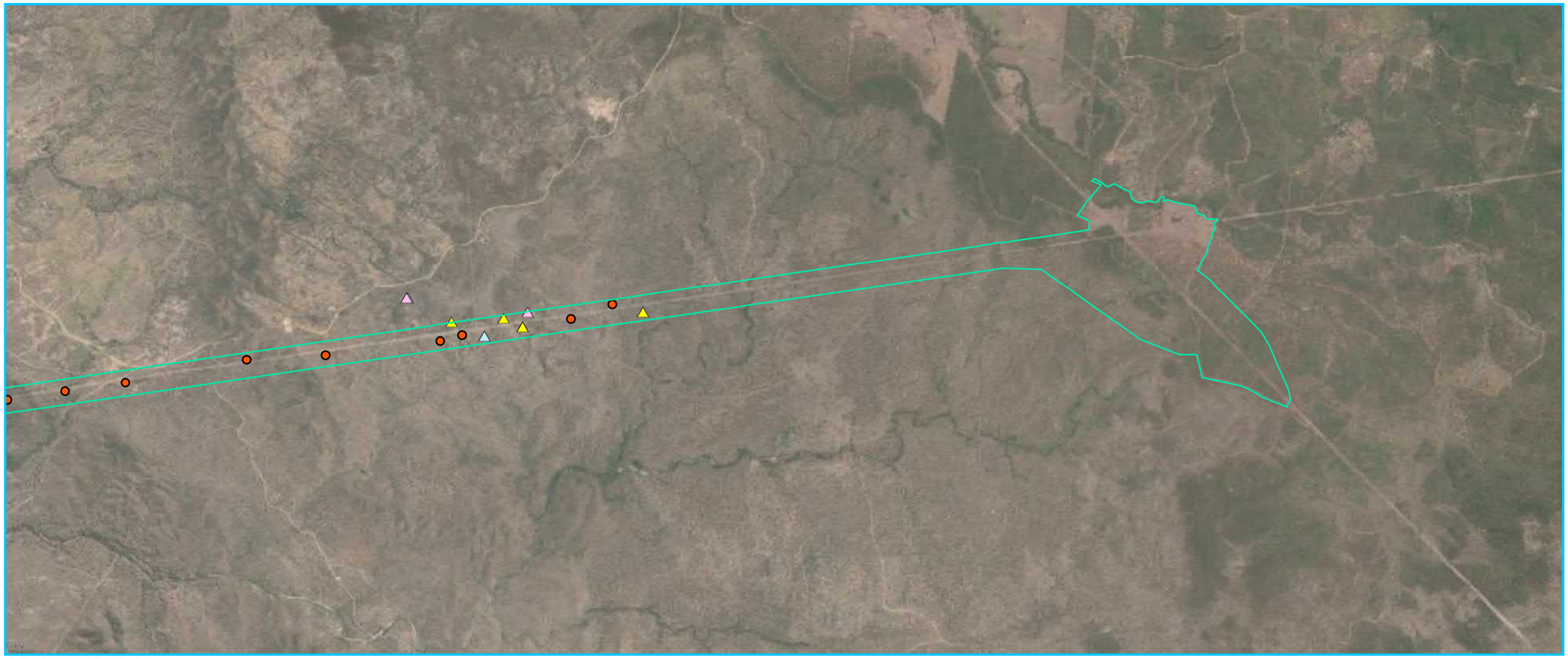
Figure F6.5

A3 size



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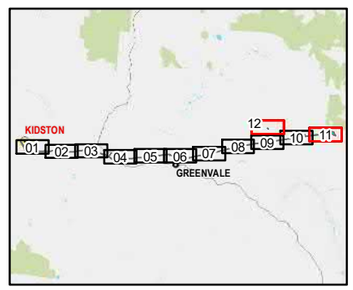

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Figure F6.6

A3 size

4.3.3 Survey effort

The desktop assessment identified a number of threatened and migratory fauna species as either being 'likely' or having 'potential' to occur within the Study Area and surrounds. These species were the subject of targeted survey effort and are identified in Table 5, along with the relevant guideline survey effort and actual survey effort employed for each species. Species not targeted during the field survey are species that either have no suitable habitat within the Study Area or do not have a distribution that overlays the Study Area. These species included:

- Buff-breasted button quail (*Turnix olivii*), painted honeyeater (*Grantiella picta*), grey-headed flying-fox (*Pteropus poliocephalus*), mahogany glider (*Petaurus gracilis*) Northern bettong (*Bettongia tropica*) and spotted-tailed quoll (*Dasyurus maculatus gracilis*) as the Study Area is outside of the species' distribution
- Eastern curlew (*Numenius madagascariensis*) due to reliable records being restricted to the coast (i.e no records within 35 km of the eastern extent)
- Gouldian finch (*Erythrura gouldiae*) due to the lack of reliable records within a 300 km radius of the Study Area
- Southern cassowary (*Casuarius casuarius johnsonii*) due to the lack of suitable rainforest habitat within the Study Area
- Bare-rumped shealth-tailed bat (*Saccolaimus saccolaimus nudicluniatus*) as the Study Area does not occur within a lowland coastal area and no records within 40 km
- Black-footed tree-rat (*Mesembriomys gouldii rattoides*) due to the lack of reliable records within 150 km of the Study Area
- Large-eared horseshoe (*Rhinolophus philippinensis*) due to the lack of suitable rainforest and gallery habitat within the Study Area
- Semon's leaf-nosed bat (*Hipposideros semoni*) as the Study Area does not occur within a coastal location and no records occur within 100 km
- Migratory and threatened wetland wader species due to the inland location and general lack of suitable mudflat foraging habitat.

Whilst these species were not targeted, other survey techniques employed for the target species would have been suitable at detecting presence, particularly for the migratory or threatened bird species.

The fauna surveys were undertaken in accordance with:

- Survey guidelines for Australia's threatened reptiles (Department of Sustainability, Environment, Water, 2011b)
- Survey guidelines for Australia's threatened birds (Department of the Environment Water Heritage and the Arts, 2010b)
- Survey guidelines for Australia's threatened mammals (Department of Sustainability, Environment, Water, Population and Communities, 2011)
- Survey guidelines for Australia's threatened bats (Department of the Environment Water Heritage and the Arts, 2010a)
- Draft referral guidelines for the nationally listed Brigalow Belt reptiles (Department of Sustainability Environment Water Population and Communities, 2011a)
- Referral guideline for 14 birds listed as migratory species under the EPBC Act (Department of the Environment, 2015b)
- Industry guidelines for avoiding, assessing and mitigating impacts on EPBC Act listed migratory shorebird species (Department of the Environment and Energy, 2017)
- Queensland Government's Terrestrial Fauna Survey Guidelines for Queensland (T.J. Eyre et al., 2018)

- Species-specific survey guidelines, such as the survey guidelines for the koala (Department of the Environment, 2014) and northern quoll (Department of the Environment, 2016b).

Guidelines listed above provide a recommended standardised method of collecting ecological data, generally across smaller sized project sites (i.e. < 50 ha). They are broad guidelines and do not factor in quality of habitat and other site-specific information that may influence presence and the suitable level of survey effort that is practical to implement. For example, undertaking separate surveys across the migratory period of the common greenshank (*Tringa nebularia*) for an inland environment with minimal suitable habitat and is likely to only support occasional individual visitors of the species.

Survey effort completed for the Project has met the relevant survey guidelines as detailed below in Table 5. For some species, survey guidelines have only partially been met due to their impracticality at the Project scale, however effort is still considered sufficient due to the nature of the Project Area (in this instance, linear) and the adoption of other techniques such as habitat assessments where presence of suitable habitat resources has been used as a surrogate for presence. In Table 5 below this has been categorised as ‘requirements partially met however effort sufficient’. ‘Requirements partially met’ indicates that while effort has been spent to detect the species and determine habitat suitability and utilisation, additional effort or different survey techniques may still be required.

During the 2017 and 2018 field surveys, one property (lot and plans 5234/SP275834 and 1/OC64) that the Study Area overlays was only surveyed where public land (i.e. road reserves) intersects due to landholder restrictions. However, access to this property was gained in 2021 and field surveys were subsequently conducted. As such, all properties within the Study Area were assessed during at least one of the field surveys between 2017 and 2021.

Fifteen small areas (maximum combined area of approximately 11 ha) associated with temporary ancillary infrastructure were added to the Project Footprint extent in early 2022. As the field program had been completed at this time, no field validated data is available for these areas. However, as discussed in Section 4.5 and 4.7.1, worst-case potential impacts on MNES in these ancillary areas have been included in the assessment and survey effort for the overall Project is considered sufficient.

Table 5 Survey guideline requirements and survey effort undertaken per MNES

Species	Relevant guidelines	Survey guideline requirements	Effort undertaken	Requirements met?
Birds				
Black-throated finch (southern) (*Poephila cincta cincta*)	Survey guidelines for Australia's threatened birds (Department of the Environment Water Heritage and the Arts, 2010b). Background paper to the Significant impact guidelines for the endangered black-throated finch (southern) (Department of the Environment Water Heritage and the Arts, 2009b).	**Survey techniques** The survey guidelines for Australia's threatened birds recommends the following survey methods and effort for the black-throated finch (southern): • Land-based area searches: 10 hours over 5 days. • Target searches: 6 hours over 2 days. The significant impact guidelines for the endangered black-throated finch recommends the following survey methods and effort: • Nest searches • Wet and dry season waterhole watching: at least three hours after first light on two separate occasions • Target searches in woodland: one hour/ha with maximum of 10 hours per search area. **Seasonal considerations** As a rough guide, surveys are recommended between November and February in areas south of latitude 23º and March to May north of 23º.	Over 42 survey days between 2017 and 2021: • A total of 469-person hours of birding including targeted searches in woodland (i.e. mapped areas of potential habitat) • Targeted habitat assessments were conducted for the species throughout the duration of the field surveys including at waterholes and dams. Per habitat assessment site, nest searches were also completed.	**Requirements partially met however effort sufficient** A combination of key survey techniques including targeted searches in woodland and nest searches, as recommended by the survey guidelines were employed to determine utilisation and areas of potential habitat for the species. Birding hours spent are above the required effort and occurred across a total period of 42 days and multiple seasons which is substantially greater than required. Targeted habitat assessments were also conducted across a range of suitable habitat types to supplement the search effort. Furthermore, the Study Area does not wholly occur within the species mapped distribution and is also outside the known post-1998 sites. Based on this and the linear nature of the Project Area, survey effort is considered sufficient.
Curlew sandpiper (*Calidris ferruginea*)	Industry guidelines for avoiding, assessing and mitigating impacts on EPBC Act listed migratory shorebird species (Department of the Environment and Energy, 2017).	**Survey techniques** The survey guidelines recommend the following methods and survey effort for each of the 37 migratory shorebirds that migrate annually to Australia, including the curlew sandpiper: • Bird surveys in suitable habitat: - 1 x survey in December - 2 x surveys in January - 1 x survey in February	Over 42 survey days between 2017 and 2021: • Waterholes and dams were visually surveyed throughout the surveys. • Targeted habitat assessments were conducted for the	**Requirements met** Bird surveying has been completed during all surveys. At least two of the seven surveys have occurred during the period in which curlew sandpiper occurs within Australia (late August to March), with one survey occurring close to this period. To supplement the search effort targeted habitat assessments were conducted

Species	Relevant guidelines	Survey guideline requirements	Effort undertaken	Requirements met?
		Surveys should be conducted during the day and consist of area searches or line transects in suitable habitat (i.e. wetland or other waterbodies and their surrounding vegetation (Department of Agriculture Water and the Environment, 2022). **Seasonal considerations** As per the SPRAT description of curlew sandpiper migration times to Australia, surveys should be conducted for the curlew sandpiper between late August and March, when the species arrive and depart in Australia.	species throughout the duration of the field surveys.	throughout all surveys. The Study Area does not contain core habitat for this species given its inland location and lack of intertidal mudflat habitat. Based on this and the linear nature of the Project Area, survey effort is considered sufficient.
Squatter pigeon (southern) (*Geophaps scripta scripta*)	Survey guidelines for Australia's threatened birds (Department of the Environment Water Heritage and the Arts, 2010b).	**Survey techniques** The survey guidelines for Australia's threatened birds recommends the following survey methods and effort for the squatter pigeon (southern): • Road driving during day (driving transects). • Active searches: 15 hours over 3 days in areas <50 ha. • Flushing surveys: 10 hours over 3 days in areas <50 ha. • Waterhole searches: Survey effort not specified. **Seasonal considerations** No evidence of long-distance seasonal movements or seasonal considerations required.	Over 42 survey days between 2017 and 2021: • A minimum of 84 hours of driving transects • A total of 469-person hours of birding including active searches • Waterholes and dams were visually surveyed throughout the surveys. • Targeted habitat assessments were conducted for the species throughout the duration of the field surveys.	**Requirements met** Survey effort undertaken exceeds the minimum survey requirements for the species. Although the field survey program did not include all recommended survey techniques, the species was recorded within the Study Area. Targeted habitat assessments were conducted across a range of suitable habitat types to supplement the search effort. Overall, given the linear nature of the Project Area survey effort is considered sufficient.
Red goshawk (*Erythrotriorchis radiatus*)	Survey guidelines for Australia's threatened birds	**Survey techniques**	Over 42 survey days between 2017 and 2021:	**Requirements met** Survey effort undertaken exceeds the minimum survey requirements for the

Species	Relevant guidelines	Survey guideline requirements	Effort undertaken	Requirements met?
	(Department of the Environment Water Heritage and the Arts, 2010b).	The survey guidelines for Australia's threatened birds recommends the following survey method and effort for the red goshawk: • Area searches: 80 hours over 10 days. • Search in groups of tall trees and in trees along riverbanks for nests. Red goshawks are very secretive, so scanning for nests is the most effective way to detect the species presence. **Seasonal considerations** No evidence of long-distance seasonal movements or seasonal considerations required.	• A total of 469-person hours of birding including active searches • Targeted habitat assessments were conducted for the species throughout the duration of the field surveys.	species. Audio and visual surveys for birds were conducted throughout the field surveys, including those seen while travelling along roads and tracks. Searches were also completed in riparian habitats where potential nesting trees as well as possible raptor nests were identified. Targeted habitat assessments were conducted across a range of suitable habitat types to supplement the search effort.
Australian painted snipe (*Rostratula australis*)	Survey guidelines for Australia's threatened birds (Department of the Environment Water Heritage and the Arts, 2010b).	**Survey techniques** The survey guidelines for Australia's threatened birds recommends the following survey method and effort for the Australian painted snipe: • Area searches or transects through suitable wetlands (for sites of less than 50 ha when wetland holds water but is not flooded): 10 hours over 3 days. • Targeted stationary observations at dawn and dusk within suitable wetlands: 10 hours over 5 days. • Spotlight shortly after dusk: Survey effort not specified. Difficult to detect even when present. **Seasonal considerations** The movements of the Australian painted snipe are poorly known, and it may be a migratory species. There are no seasonal considerations for targeted surveys for this species.	Over 42 survey days between 2017 and 2021: • Waterholes and dams were visually surveyed throughout surveying. • Targeted habitat assessments were conducted for the species throughout the duration of the field surveys.	**Requirements partially met however effort sufficient** Targeted habitat assessments and birding was completed at waterholes and dams throughout the field surveys at various times during the day. Spotlighting and stationary observations were not conducted in potential habitat areas due to the marginal nature of the habitat and the frequent use by cattle. Potential habitat for this species is limited within the Study Area. Based on this, and the linear nature of the Project Area, survey effort is considered sufficient.

Species	Relevant guidelines	Survey guideline requirements	Effort undertaken	Requirements met?
Grey falcon (*Falco hypoleucos*)	No species-specific guideline available. In the absence of a species' guideline, the Terrestrial Vertebrate Fauna Survey Guidelines for Queensland (Eyre, T.J., et. al. 2014) for diurnal birds applies.	**Survey techniques** Per survey period, at least 6 x 5-10 minute area searches within 100 x 100m survey site. **Seasonal considerations** Nil.	Over 42 survey days between 2017 and 2021: • A total of 469-person hours of birding including active searches • Targeted habitat assessments were conducted for the species throughout the duration of the field surveys.	**Requirements met** Significant survey effort has been undertaken for the species.
Masked owl (northern) (*Tyto novaehollandiae Kimberli*)	Survey guidelines for Australia's threatened birds (Department of the Environment Water Heritage and the Arts, 2010b).	**Survey techniques** The survey guidelines for Australia's threatened birds recommends the following survey method and effort for the masked owl (northern): • Broadcast (playback) surveys in suitable habitat (preferably in the lead-up to the breeding season); 8 hours over 4 days. Difficult to detect even when present due to their cryptic and quiet nature. **Seasonal considerations** The timing of the breeding season is not well known but likely March to October. Surveys should aim to be conducted prior to this period when individuals are noisiest.	• A total of 64 person-hours of spotlighting and call playback spilt across the June 2018 and December 2021 surveys • Targeted habitat assessments were conducted for the species throughout the duration of the field surveys.	**Requirements met** This species and potential prey species were actively searched for during the 64 person-hours of spotlighting conducted, including along tracks. Although one of the two spotlighting surveys occurred outside of the preferred seasonal timeframe (June 2018), effort from the December 2021 survey alone exceeds what is recommended. Targeted habitat assessments were also conducted across a range of suitable habitat types to supplement the search effort. Given the linear nature of the Project Area, survey effort is considered sufficient.

Species	Relevant guidelines	Survey guideline requirements	Effort undertaken	Requirements met?
White-throated needletail (*Hirundapus caudacutus*)	Referral guideline for 14 birds listed as migratory species under the EPBC Act (Department of the Environment, 2015b).	**Survey techniques** Observations should be made as late as possible in the evening of birds coming into roost in tall trees along ridge tops. Survey effort not specified. **Seasonal considerations** Surveys should be conducted October to March.	Over 42 survey days between 2017 and 2021: • A total of 469-person hours of birding including active searches • Targeted habitat assessments were conducted for the species throughout the duration of the field surveys.	**Requirements met** Significant survey effort has been undertaken for the species and it is predominantly aerial so rarely seen roosting. Two surveys have been conducted (November 2017 and December 2021) within the appropriate seasonal timeframe. Given the linear nature of the Project Area, survey effort is considered sufficient.
Migratory Birds				
Common greenshank (*Tringa nebularia*) and sharp-tailed sandpiper (*Calidris acuminata*)	Industry guidelines for avoiding, assessing and mitigating impacts on EPBC Act listed migratory shorebird species (Department of the Environment and Energy, 2017).	**Survey techniques** The survey guidelines recommend the following methods and survey effort for the common greenshank: • Bird surveys in suitable habitat: - 1 x survey in December - 2 x surveys in January - 1 x survey in February Surveys should be conducted during the day and consist of area searches or line transects in suitable habitat (i.e. wetland or other waterbodies and their surrounding vegetation (Department of Agriculture Water and the Environment, 2022). **Seasonal considerations** Surveys should be conducted between August and March when the species' generally arrive and depart in Australia.	Over 42 survey days between 2017 and 2021: • Waterholes and dams were visually surveyed throughout the surveys. • Targeted habitat assessments were conducted for the species throughout the duration of the field surveys.	**Requirements partially met however effort sufficient** Potential habitat for this species is limited within the Project Area. While birding was completed at these locations it occurred at various times throughout the day. Area searches or line transects were not necessary due to the lack or complete absence of fringing aquatic vegetation. Bird surveying has been completed during the correct seasonal timeframe at least three times. Furthermore, potential habitat within the Study Area is limited and marginal due to frequent cattle use. Targeted habitat assessments were also conducted during all surveys to supplement the search effort. The Study Area does not contain core habitat for this species given it's inland location. Based on this and the linear

Species	Relevant guidelines	Survey guideline requirements	Effort undertaken	Requirements met?
				nature of the Project Area survey effort is considered sufficient.
Oriental cuckoo and five migrant flycatchers during breeding season and migration	Referral guideline for 14 birds listed as migratory species under the EPBC Act (Department of the Environment, 2015b).	**Survey techniques** The referral guideline for 14 birds listed as migratory species under the EPBC Act prescribes the following survey methods: • Within the non-breeding areas of the oriental cuckoo and the potential breeding habitat of the five flycatchers: - 2 ha survey in 20 minutes over sufficient survey plots to estimate a density, and hence the population size across the proposed development area. - Standardised timed periods. **Seasonal considerations** Surveys should be conducted during the appropriate survey period: • Oriental cuckoo: September to May. • Satin flycatcher: spring or autumn. • Rufous fantail: spring or autumn. During the migration season, surveys in a northerly location should be undertaken during spring (five migrant flycatchers only).	Over 42 survey days between 2017 and 2021: • A total of 469-person hours of birding • Targeted habitat assessments were conducted for the species throughout the duration of the field surveys.	**Requirements met** The survey effort exceeds the recommended survey effort for the species. Surveys were conducted in June, July and August (winter) as well as November and December (summer), indicating timing may have only been appropriate for the oriental cuckoo. However, targeted habitat assessments were conducted during all field surveys across a range of suitable habitat types to supplement the search effort.
Mammals				
Ghost bat (*Macroderma gigas*)	Queensland Targeted Species Survey Guidelines – Ghost Bat (Hourigan, 2011)	**Survey techniques** The survey guidelines for the ghost bat recommend: • Attended bat recorders: - Walking transects with a hand-held bat detector and spotlight. - 8 detector hours over 4 nights. • Harp traps and mist nets (optional):	• Roost searches: undertaken whilst conducting habitat assessments. Shallow caves, rocky overhangs and abandoned mine sites were	**Requirements partially met but effort considered sufficient** Field surveys did not include the use of harp or mist nets. However, spotlighting was completed in areas of representative habitat across the Study Area during the June 2018 and December 2021 surveys. In the later survey, an attended (active)

Species	Relevant guidelines	Survey guideline requirements	Effort undertaken	Requirements met?
		- A minimum of 8 trap nights over 4 nights, plus 8 mist net hours over 4 nights (optional). • Roost searches: - 2 hours per survey day. **Seasonal considerations** Ghost bats vary seasonally in the use of roosts, with individuals congregating in maternity roosts from September to April and dispersing in small groups over winter. Surveys targeting this species should be carried out between September and April, as the species may be easier to detect when individuals are more aggregated. However, as ghost bats have the potential to be present in a wider range of areas during the winter months, surveys may need to be repeated between June and August, particularly if maternity roosts are not present within the Study Area.	identified and investigated. • Spotlighting using attended bat recorders; 8 detector hours over 4 nights in December 2021. • Unattended bat recorders at potential roost sites for a total 8 detector nights in December 2021. • Targeted habitat assessments were conducted for the species throughout the duration of the field surveys.	bat recorder was also employed for four nights as recommended. Searches for suitable roost sites were also completed as part of the habitat assessments during every field survey. During the December 2021 survey, ecologists targeted mapped abandoned mine sites to determine roost suitability. Although noted to be shallow, unattended bat recorders were deployed at the entrance of the only abandoned mine sites that were confirmed to contain a mine shaft (total of 2 sites). Furthermore, the Study Area does not occur in the wider region of any of the species known breeding sites. Based on this and the linear nature of the Project Area, survey effort is considered sufficient.
Spectacled flying-fox (*Pteropus conspicillatus*)	Survey guidelines for Australia's threatened bats (Department of the Environment Water Heritage and the Arts, 2010a).	**Survey techniques** The survey guidelines for Australia's threatened bats recommend a survey approach including key techniques and effort to detect the spectacled flying-fox: • Day survey including visual searches for day roosts and night feeding sites: 6 hrs per 50 ha • Spotlighting walking transects in potential habitat (night survey): 5 hrs per 50ha/night. In addition, a daytime habitat assessment is recommended to determine the presence and abundance of food trees. **Seasonal considerations**	• A total of 64 person-hours of spotlighting and call playback spilt across the June 2018 and December 2021 surveys • Targeted habitat assessments were conducted for the species throughout the duration of the	**Requirements met** A combination of the key survey techniques as recommended by the survey guidelines were employed to determine utilisation in areas of potential habitat. Roost searches were completed as part of the habitat assessments during every field survey however none were identified. Spotlighting was completed in areas of potential habitat across the Study Area during the June 2018 and December

Species	Relevant guidelines	Survey guideline requirements	Effort undertaken	Requirements met?
		Nil. Occupation of camps is highly seasonal. Camp movements are dependant upon seasonal fruiting and flowering of food plants.	field surveys including roost searches.	2021 surveys. Due to the linear nature of the Project Area and lack of preferred rainforest habitat, survey effort is considered sufficient.
Greater glider (*Petauroides volans*)	Species-specific guidelines for survey for the greater glider are not currently available. However, the species is readily detectable by spotlighting (D. B. Lindenmayer et al., 2001). Terrestrial Vertebrate Fauna Survey Guidelines for Queensland (T.J. Eyre et al., 2018) were utilised in the absence of species-specific guidelines.	**Survey techniques** In the absence of species-specific survey guidelines, Eyre *et al.* (2018) was used to determine suitable survey techniques. Survey methods include: • Spotlighting transects (100 m x 100 m) per 30-person minutes. Survey effort not specified. **Seasonal considerations** The greater glider is known to have high site fidelity with relatively small home ranges. There are no seasonal considerations for this species.	• A total of 64 person-hours of spotlighting and call playback spilt across the June 2018 and December 2021 surveys • Targeted habitat assessments were conducted for the species throughout the duration of the field surveys.	**Requirements met** The primary technique for detecting this species (spotlighting) was conducted in the June 2018 and December 2021 surveys. Spotlighting was concentrated in eucalypt woodlands along or adjacent to watercourses with a high abundance of hollow-bearing trees. Recommended survey effort for the greater glider is not specified, however effort conducted is considered suitable for detecting the species given the linear nature of the Project Area.
Koala (*Phascolarctos cinereus*)	Survey guidelines for Australia's threatened mammals (Department of Sustainability, Environment, Water, Population	**Survey techniques** The EPBC Act referral guidelines for the vulnerable koala do not prescribe specific survey effort requirements due to the high level of variation of this species across its distribution. Although both this document and the survey guidelines for Australia's threatened mammals recommend the following key survey techniques: • Spotlighting with call playback: Survey effort determined on a case-by-case basis.	• Scat collection and analysis • Remote cameras: a total of 901 camera trap nights over June 2018, July and December 2021	**Requirements met** A combination of the key survey techniques as recommended by the survey guidelines were employed to determine utilisation in areas of habitat critical to the species. Spotlighting and remote camera trapping was completed in areas of representative habitat across the Study Area during the June 2018 and

Species	Relevant guidelines	Survey guideline requirements	Effort undertaken	Requirements met?
	and Communities, 2011). EPBC Act referral guidelines for the vulnerable koala (Department of the Environment, 2014).	• Remote camera: Survey effort determined on a case-by-case basis. • SATs (Phillips & Callaghan, 2011): Sampling of a minimum of 30 koala food trees within suitable habitat. Survey effort determined on a case-by-case basis. **Seasonal considerations** Optimal time period for direct observation surveys is between August and January, as this is when koala activity is generally at its peak and resident breeding females with back-young are most easily observed. Direct observation surveys conducted outside of this period must take into account the potential for lower koala activity (reduced detectability) and other relevant seasonal considerations. Presence/absence surveys in the inland context, conducted during dry periods, should be centred on riparian areas, upper/mid-slope areas and other dry-period refugia in order to maximise detectability.	• A total of 64 person-hours of spotlighting and call playback spilt across the June 2018 and December 2021 surveys • Targeted habitat assessments and searches for other signs (i.e. scratches) were conducted for the species throughout the duration of the field surveys.	December 2021 surveys. Although SAT assessments were not strictly conducted, scat searches were completed as part of the habitat assessments during every field survey and resulted in the collection of a number of potential koala scats. Due to the linear nature of the Project Area, survey effort is considered sufficient.
Sharman's rock wallaby (*Petrogale sharmani*)	Survey guidelines for Australia's threatened mammals (Department of Sustainability, Environment, Water, Population and Communities, 2011).	**Survey techniques** Although specific techniques or effort for the Sharman's rock wallaby are not detailed in the survey guidelines for Australia's threatened mammals, they are detailed for medium-sized species including rock wallabies. In areas of potential habitat survey techniques may include: • Daytime searches for signs of activity including scats, tracks or remains • Stationary observations • Soft cage traps • Camera traps **Seasonal considerations**	• Remote cameras: approximately 145 camera trap nights over June 2018, July and December 2021 in areas of potential Sharman's habitat • Targeted habitat assessments were conducted for the species throughout the duration of the field surveys. At	**Requirements met** A combination of the key survey techniques as recommended by the survey guidelines were utilised including daytime searches, stationary observations and camera traps. Scat searches were also completed on rocky ledges and in boulder piles. No survey effort for this species is specified, however effort conducted is considered suitable given the range of techniques utilised and the linear nature of the Project Area.

Species	Relevant guidelines	Survey guideline requirements	Effort undertaken	Requirements met?
		Surveys should not be conducted in hot weather or during summer as per the survey guidelines for Australia's threatened mammals.	these sites active searches were completed as well as some stationary observations in suitable habitat.	

Species	Relevant guidelines	Survey guideline requirements	Effort undertaken	Requirements met?
Northern quoll (*Dasyurus hallucatus*)	Survey guidelines for Australia's threatened mammals (Department of Sustainability, Environment, Water, Population and Communities, 2011). EPBC Act referral guideline for the endangered northern quoll *Dasyurus hallucatus* (Department of the Environment, 2016).	**Survey techniques** The survey guidelines for Australia's threatened mammals recommends a range of survey methods to detect the northern quoll. The EPBC Act referral guidelines for the endangered northern quoll do not prescribe specific survey effort requirements due to the variation of this species' ecology and population sizes across it's distribution. However, this guideline does make survey recommendations for Queensland which include: • An initial reconnaissance survey at anytime of the year utilising: - Camera traps targeted to habitat critical to the survival of the species, and scat searches. Transects of 10 camera traps spaced at least 100 m intervals for four nights is recommended. - Supplementary methods including latrine searches, detection dogs and / or hair tubes in conjunction with camera traps • Targeted survey (if impacting habitat critical to the survival) including: - Wire cage traps or Elliot traps (medium or large); or - A more refined camera trap survey **Seasonal considerations** Camera traps can be used at any time of the year, however preferably when individuals are likely to be active and more detectable. Targeted cage or Elliot trapping programmes should be undertaken between April and September to avoid disturbance to females with pouch young.	• Remote cameras: a minimum of 881 camera trap nights in potential habitat critical to the survival of the species over June 2018, July and December 2021 • July 2021 survey also included Elliot B traps (160 trap nights) and hair funnels (560 trap nights) • Targeted habitat assessments were conducted for the species throughout the duration of the field surveys.	**Requirements met** A reconnaissance survey using an array of camera traps was completed in June 2018 to determine utilisation in areas of potential 'habitat critical to the survival of the species'. A more refined camera trap survey as recommended by the referral guidelines was completed in July 2021, and alone included approximately 820 camera trap nights. An additional three camera traps were deployed in rocky habitat in December 2021. Camera traps are the key recommended technique for Queensland and were primarily deployed in months which should coincide with good activity levels due to the commencement of the species' breeding period (i.e. June and July). The July 2021 survey also included other targeted survey methods including Elliot traps and hair funnels.
Reptiles				

Species	Relevant guidelines	Survey guideline requirements	Effort undertaken	Requirements met?
Yakka skink (*Egernia rugosa*)	Draft referral guidelines for nationally listed Brigalow Belt reptiles (Department of Sustainability Environment Water Population and Communities, 2011a). Targeted species survey guidelines – yakka skink (Ferguson & Mathieson, 2014). Survey guidelines for Australia's threatened reptiles (Department of Sustainability, Environment, Water, 2011b).	**Survey techniques** The EPBC Act draft referral guidelines for nationally listed Brigalow Belt reptiles prescribes the following survey methods and effort for the yakka skink: • One-off diurnal search: - Active searches of microhabitat for 1.5 hours in each hectare of suitable habitat. - A minimum of 3 days with 1 repeat (6 days). • Transects: - Survey effort not specified. • Spotlighting in gilgais, wetlands, riparian habitats and the surrounding environment: - 1.5 person hours per hectare, over a minimum of 3 nights. • Elliot traps (only around colonies): - Used for confirmation only around burrows or colony sites. - Cat food used as bait. • Camera traps (only around colonies): - 12 camera trap nights per colony over 4 nights. • Funnel traps (only around colonies): - 60 trap nights per colony over 4 nights. The referral guideline states that if the targeted species is not detected using all of the recommended survey techniques, at least one replicate survey should be conducted. **Seasonal considerations** Seasonal activity patterns are not well known, however peak activity times are thought to be late spring and summer. Surveys are recommended to be undertaken late September to late March.	• Approximately 53 hours of active searching including 16 hours in 2017 and 2018, and 37 hours across 2021 • A minimum of 8 person-hours of walking transect searches in potential habitat during December 2021 • 32 person-hours of spotlighting in December 2021, however it is noted many riparian habitats surveyed were unsuitable due to loose sandy substrate • 8 camera trap nights at two potential burrow sites in December 2021 • Targeted habitat assessments were conducted for the species throughout the duration of the field surveys.	**Requirements met** Active searches were completed in conjunction with targeted habitat assessments during all field surveys across a range of suitable habitat types. In August and December 2021, a significantly more targeted effort was undertaken. All potential yakka skink habitat was re-surveyed which included habitat assessments, active searches, microhabitat transects and camera traps. Elliott and cage traps were not employed as no colony sites or latrines were identified. Spotlighting was also conducted in December 2021 and targeted to riparian habitats as recommended. However many of these areas were found to be unsuitable for the species due to the sandy substrate. Survey effort undertaken in November 2017 and December 2021 fall within the recommended seasonal timeframes. Given the linear nature of the Project Area, the number of recommended survey methods employed and lack of colony sites identified, survey effort is considered sufficient.

4.4 Likelihood of occurrence

A likelihood of occurrence assessment for MNES communities and species 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.

4.5 MNES mapping

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 MNES values known or having the potential to occur within the Study Area was undertaken.

Where available, information from publicly available databases were used as a basis to develop the ‘habitat definitions’ and associated ‘modelling rules’, 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 habitat definition. These habitat definitions and modelling rules (used only where field data was absent) are detailed in Table 21 of Appendix C.

4.6 Impact assessment

MNES known, likely or having potential to occur within the Study Area were subject to a two-step process to assess the potential for significant impacts as outlined in Figure 7 below. The purpose of the two-step approach was to focus in on the key MNES values relevant to potential Project impacts and determine significant impacts.

The first step was a risk assessment, which involved reviewing the nature and magnitude, as well as likely consequences of potential Project impacts. The findings of the risk assessment determined the MNES’ vulnerability to potential impacts, and whether further assessment via the significant impact assessment process was necessary to determine potential significant impacts.

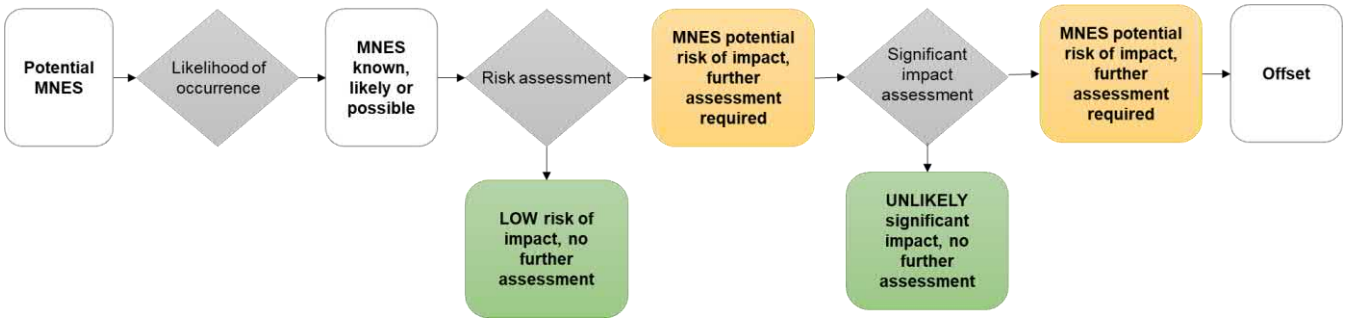


Figure 7 Impact assessment process for potential, likely or known MNES

4.6.1 Risk assessment

A risk assessment framework was implemented to understand which MNES values may be at risk of potential significant impacts as a result of the Project. Potential direct and indirect Project impacts on MNES within the Study Area were assessed by determining the worst-case scenario consequences and the likelihood of such anticipated consequences actually occurring. The combination of these factors were evaluated via a risk matrix to identify the associated level of Project risk to the MNES.

To determine the anticipated consequence, the nature and magnitude of potential Project impacts were assessed against three consequence levels which contained multiple criteria. The context of the specific MNES' ecology such as community or species' distribution, habitat preferences including breeding habitat and movement patterns was considered. For MNES with referral guidance documents, any terminology, area thresholds and recommendations detailed within were considered foremost. Knowledge gaps and known threats were also reviewed. To assign a consequence level of one or two, all criteria associated with that level must be met, otherwise a level three is automatically assigned. Only one of the criteria in consequence level three needs to be met in order for that level to be assigned.

MNES that are evaluated via the risk matrix with a 'potential' risk rating triggered further assessment whilst MNES with a 'low' risk rating required no further assessment. The risk assessment framework, including likelihood and consequence criteria for specific MNES is outlined in Appendix D.

4.6.2 Significant impact assessment

For all MNES evaluated with a 'potential' risk rating as a result of the assessment process described in Section 4.7.1, significant impact assessments were undertaken in accordance with the *EPBC Act Policy Statement 1.1 Significant Impact Guidelines: Matters of National Environmental Significance* (Department of the Environment, 2013). The approach and specific significant impact criteria utilised is outline in Appendix E.

4.7 Limitations

4.7.1 Approach

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.

In early 2022 the Project Footprint was refined based on additional Project information including construction methodologies. It was identified that ancillary infrastructure including laydown areas, access tracks and water access points would be required at a number of locations in the wider area to support construction. Although ancillary infrastructure will be temporary, vegetation clearing is required at each location. While the majority of the ancillary infrastructure sites occur within or very close to the Project Area, a number occur >5 km away (up to a maximum distance of 7 km from the Project Area). Field data collected from the Project Area and adjacent areas has allowed for the vegetation and habitat mapping of these areas to be refined, however it must be noted that these areas were not field assessed specifically.

To address these limitations, a precautionary approach has been applied. Where potential suitable habitat for MNES, or REs (remnant or HVR condition) analogous to a potential TEC has been identified, presence has been assumed and therefore included in the impact assessment.

4.7.2 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.

5.0 Ecological Values

5.1 Regional context

5.1.1 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 & 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'.

5.1.2 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, 2020). The geology units that dominate the Study Area (4 of the 23) are described in Table 6 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 6 Major surface geology units mapped within the Study 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, abundant leucogranite and pegmatite veins.	Metamorphic rock	Far west	20

Unit Name	Map Symbology	Age	Lithology Summary	Dominant Rock Type	Project Area	
					General location	Coverage (%)
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 Study Area based on the available surface geology mapping. Six land zones (Table 7) have been identified and are broadly consistent with the surface geology mapping. Definitions are consistent with (Wilson & Taylor, 2012).

Table 7 Land zones and associated surface geologies present within the Study 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, 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.

5.1.3 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 Study Area is located east in the township of Ingham (station number 032078). Of the survey periods, recorded maximum and minimum daily temperatures were higher than expected in November 2017 and July 2021. The lowest minimum daily temperatures were recorded in the May to June 2018 period. Maximum daily temperatures were similar across May to July 2018 and measured within expected temperature range in August and December 2021 (Table 8).

Annual mean rainfall is 2171.5 mm. However, this BOM station is expected to measure substantially greater rainfall than what is likely to be received across the Study Area as it is located close to the coast. Recorded rainfall data from 2017 to 2021 indicates that field surveys have occurred during prolonged dry conditions, with recorded rainfall leading up to and during summer measuring well below average; expected mean rainfall conditions measuring between 35 - 209 mm.

Table 8 Survey climatic conditions

	Survey period							
Parameter	13-19 Nov 2017	28 May – 4 June 2018	11-19 June 2018	12-16 July 2018	7 August 2018	20-26 July 2021	23-29 August 2021	6-21 December 2021
Maximum daily temperature (°C)	34.4 – 37.6	27.1 – 30.0	25.3 – 31.3	28.5 – 30.0	30.5	25.9 – 30.1	25.1 – 29.8	31.9 – 35.1
Minimum daily temperature (°C)	20.0 – 23.0	4.4– 15.2	10.1 – 16.0	7.6 – 11.3	19.9	13.9 – 15.4	14.2 – 18.5	21.1 – 23.6
Daily rainfall (mm)	2.03	0	0	0	0	1.2	2.4	1.7

5.2 Land use

The dominant land use within the Study Area is agricultural land, characterised by pastoral or grazing properties for livestock production (predominantly beef cattle) and to a lesser extent broadacre cropping. No identifiable signs of intensive animal industries, or aquiculture were recorded during field surveys. Based on this it has been assumed these land uses are not present.

A number of mining leases also occur in the local area, including at the old Kidston mine at the western Study Area and near the township of Greenvale. However, at the time of this report no active mining operations occur at any of these locations.

5.3 Vegetation communities

The DoR RE mapping (Version 12.0) 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 (Table 20 of Appendix B). 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 is shown on Figure 8.1 to 8.6.

Results of the field survey confirmed the presence of eighteen (18) of the 47 mapped REs as well as seventeen additional REs not previously mapped (Table 20 of Appendix B) within the Study Area. 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). Seventeen different BVGs are represented by the vegetation of the Study Area (Table 9).

The extent, condition and dominant species of each field validated vegetation community is described below in Table 10 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 Figure 9.1 to 9.6.

Table 9 Field validated REs, BVGs 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	7.8.18	OC	OC
		7.8.7	OC	E
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
Eucalyptus platyphylla or *Eucalyptus crebra* woodlands on floodplains	16c	9.3.6a	LC	NCAP
		9.3.16	LC	OC
		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
Low woodland dominated *by Melaleuca viridiflora* and or *Melaleuca citrolens* on depositional plains.	21a	9.3.24	LC	NCAP

Vegetation Community	BVG	Relevant REs	VM Act Status[1]	BD Status[2]
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 10 Vegetation communities within the Study Area

Vegetation Community	REs	Description	Study Area (ha)	Image
Closed to open forest of *Corymbia intermedia* and *Eucalyptus tereticornis* on coastal ranges	7.8.7 & 7.8.18	Forest complex of *Corymbia intermedia, Corymbia spp.* and or *Eucalyptus tereticornis* up to 28 m on basalt-derived soils. The canopy is generally mid-dense to dense, with 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*.	184.84	
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**.	48.88	

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.	18.72	-
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 *Corymbia 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.	81.83	
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 *Corymbia dallachiana* may be sub-dominant in the canopy. A very sparse sub-canopy up to 15 m is generally present and contains *Corymbia erythrophloia*, *C. 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*.*	294.84	-

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 mosambecensis**, *Bothriochloa pertusa** and *Emilia sonchifolia**. Recorded native ground species were limited to *Dichanthium aristatum* and *Grewia retusifolia*.	130.64	
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.	7.20	-
Low woodland dominated *by Melaleuca viridiflora* and or	9.3.24	This community was not encountered during the field survey but is expected to occur within one of the ancillary infrastructure	0.98	-

Vegetation Community	REs	Description	Study Area (ha)	Image
Melaleuca citrolens on depositional plains		sites based on state RE mapping. The following RE description has been taken from the REDD database. Low woodland to low open woodland of *Melaleuca viridiflora* and/or *M. citrolens* with *Eucalyptus spp.* and *Corymbia spp.* emergents. There is no shrub layer but isolated juveniles of the canopy species, *Petalostigma banksii* and *Gardenia vilhelmii* can occur. There is a dense grassy ground layer dominated by *Schizachyrium fragile*, *Aristida spp.* and *Heteropogon spp.*. Occurs in shallow gully lines and drainage depressions in rolling granite or rhyolite hills.		
Tussock grassland dominated by *Dichanthium spp.* on 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.	13.98	

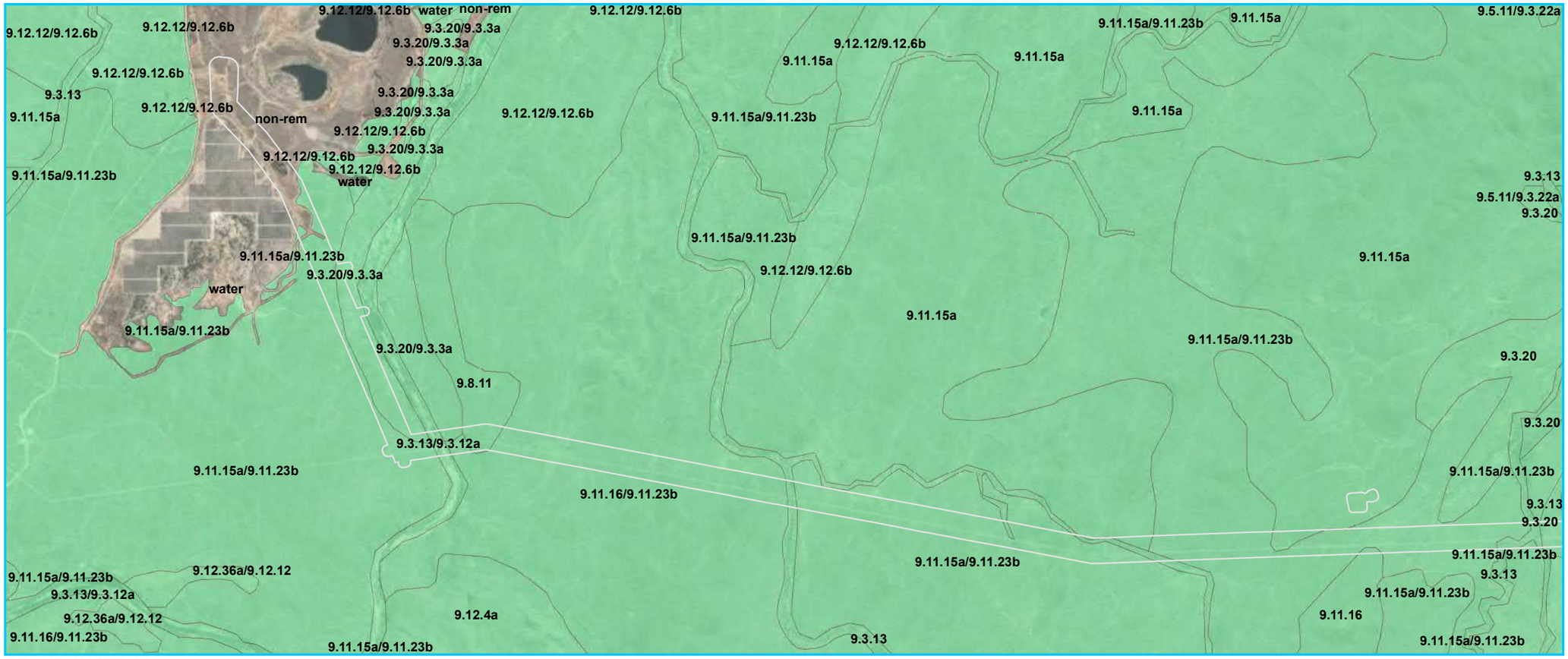
Vegetation Community	REs	Description	Study Area (ha)	Image
Eucalyptus crebra woodland on colluvial plains	9.5.3	Woodland dominated by *Eucalyptus crebra* up to 18 m on clay loam colluvial plains. Occasional *Corymbia dallachiana* also occur in the canopy. A sparse sub-canopy up to 10 m tall is sometimes 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*.	393.69	
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.	53.29	

Vegetation Community	REs	Description	Study Area (ha)	Image
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 tenuiflor* and *Waltheria indica* are also occasionally present in this layer.	197.24	
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) or *E. shirleyi* with occasional *Corymbia dallachiana* (Dallachy's gum) and sometimes other *Corymbia spp.*. 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.	227.12	

Vegetation Community	REs	Description	Study Area (ha)	Image
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 australae*, *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*.	1,187.96	
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.	2,089.99	

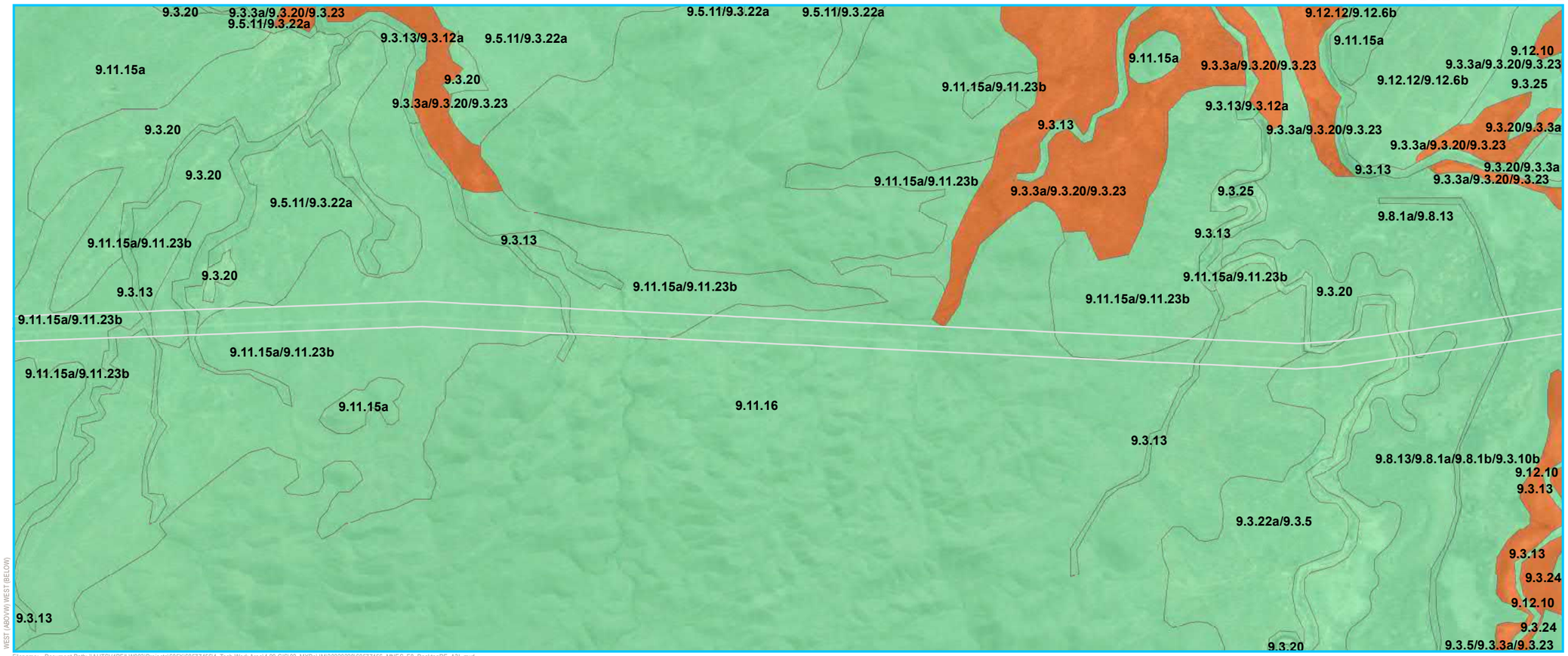
Vegetation Community	REs	Description	Study Area (ha)	Image
Eucalyptus microneura woodland on rolling metamorphic hills	9.11.23b	Woodland of *Eucalyptus microneura* up to 12 m on metamorphic hills. Both the sub-canopy and shrub layer are absent. The ground layer comprises a native grassland dominated 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.	177.48	
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**.	26.96	-

Vegetation Community	REs	Description	Study Area (ha)	Image
Non-remnant vegetation (including cleared pasture)	-	Historically cleared areas dominated by a mixture of native and exotic grasses occur across the Study Area, predominantly in association with the existing powerline, the old kidston mine in the far west and agricultural practices. Ground cover is highly variable, ranging from very sparse where scald and tunnel erosion is high to dense where cattle access had been restricted. In some areas, a shrub layer is present comprising *Calotropis procera** or dense patches of *Lantana camara**. Where this occurs the growth of grasses and forbs is heavily restricted. Individual *Corymbia sp.* and *Eucalyptus sp.* trees occur sporadically near homesteads and cattle stock yards only. Vegetation was determined to lack any demonstrable ecological function due to the high level of ongoing disturbance and isolation in the landscape.	788.88	



ABOVE SHEET- 01

BELOW SHEET- 02



WEST (ABOVE) WEST (BELOW)

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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

Queensland DoR RE Mapping

- Category A or B containing endangered
- Category A or B containing of concern
- Category A or B that is of least concern
- Category C or R containing endangered
- Category C or R containing of concern
- Category C or R that is of least concern

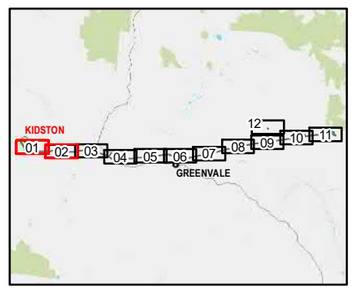

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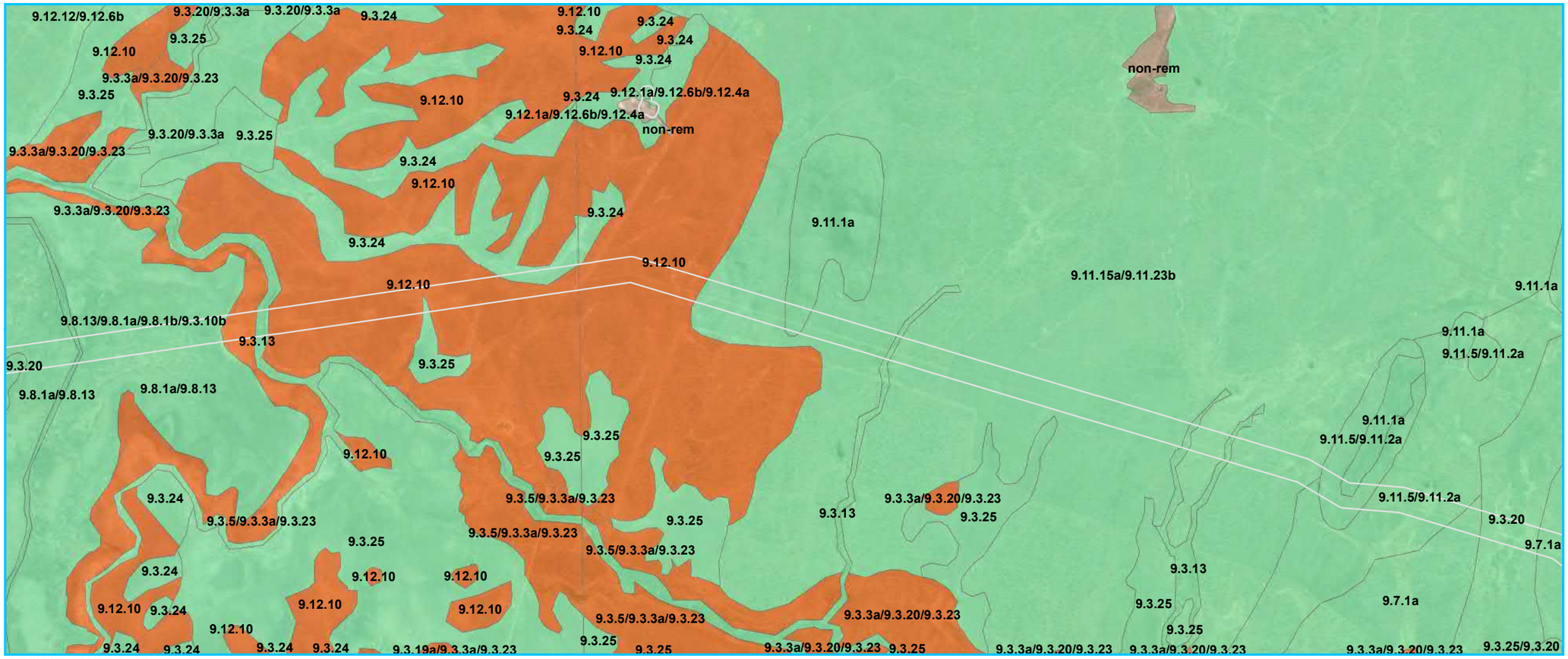
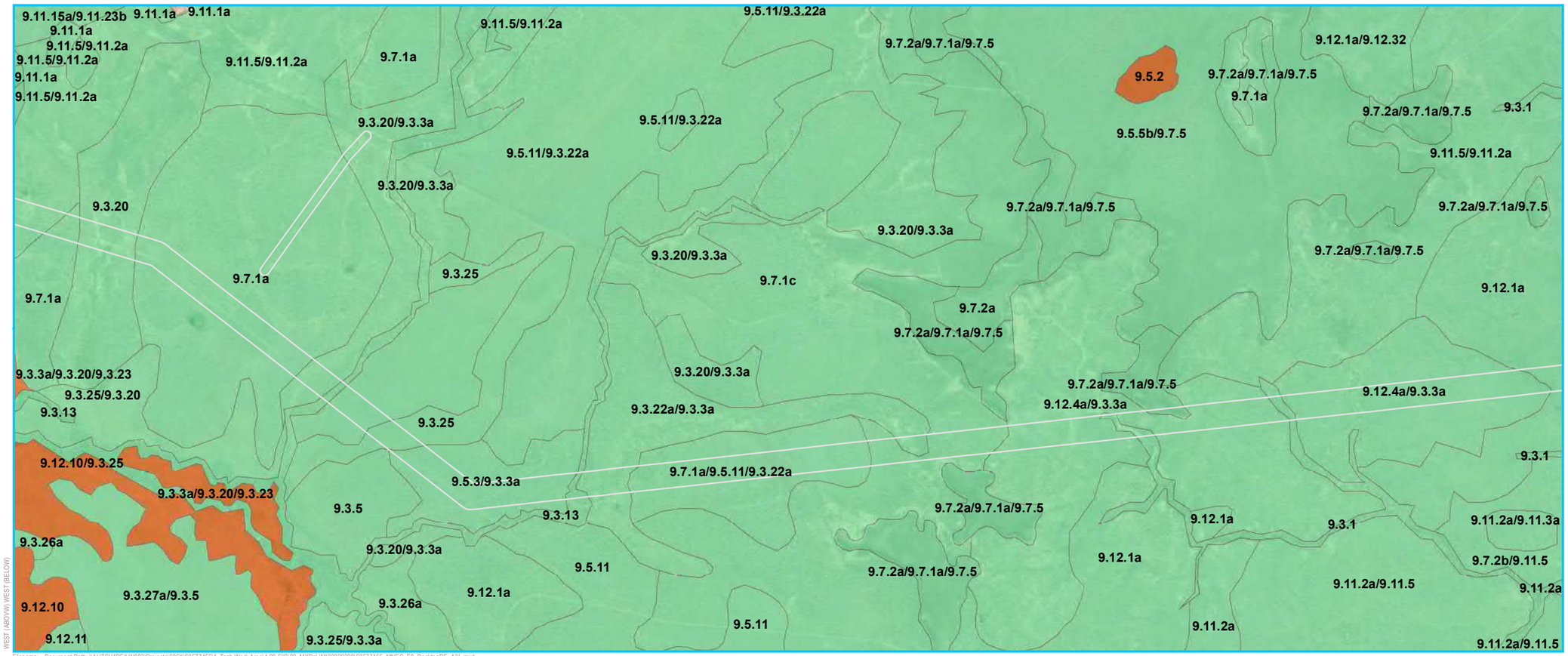
Figure F8.1

A3 size



ABOVE SHEET- 03

BELOW SHEET- 04



WEST (ABOVE) WEST (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

Queensland DoR RE Mapping

- Category A or B containing endangered
- Category A or B containing of concern
- Category A or B that is of least concern
- Category C or R containing endangered
- Category C or R containing of concern
- Category C or R that is of least concern

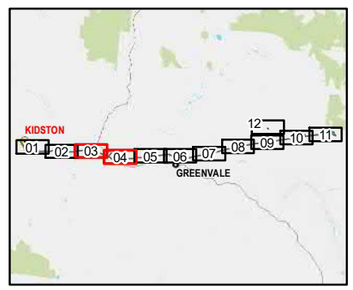

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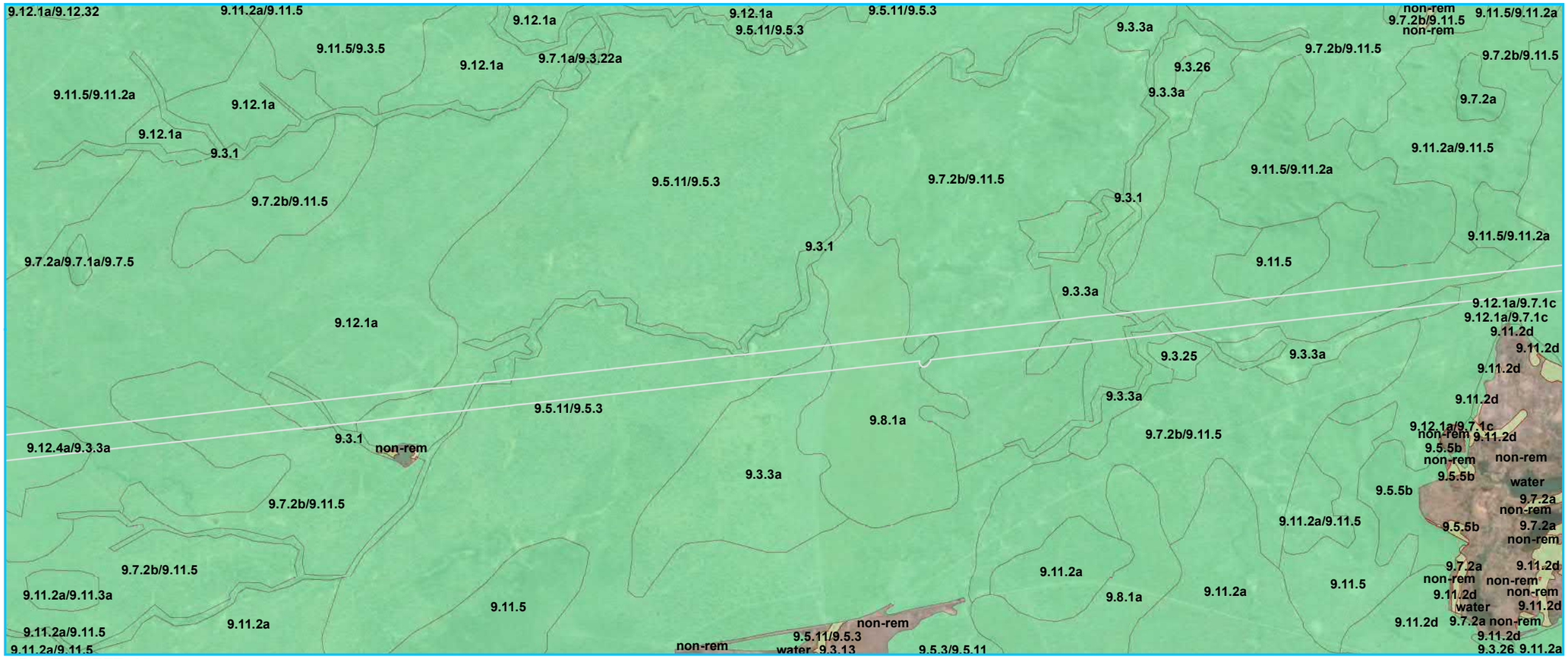
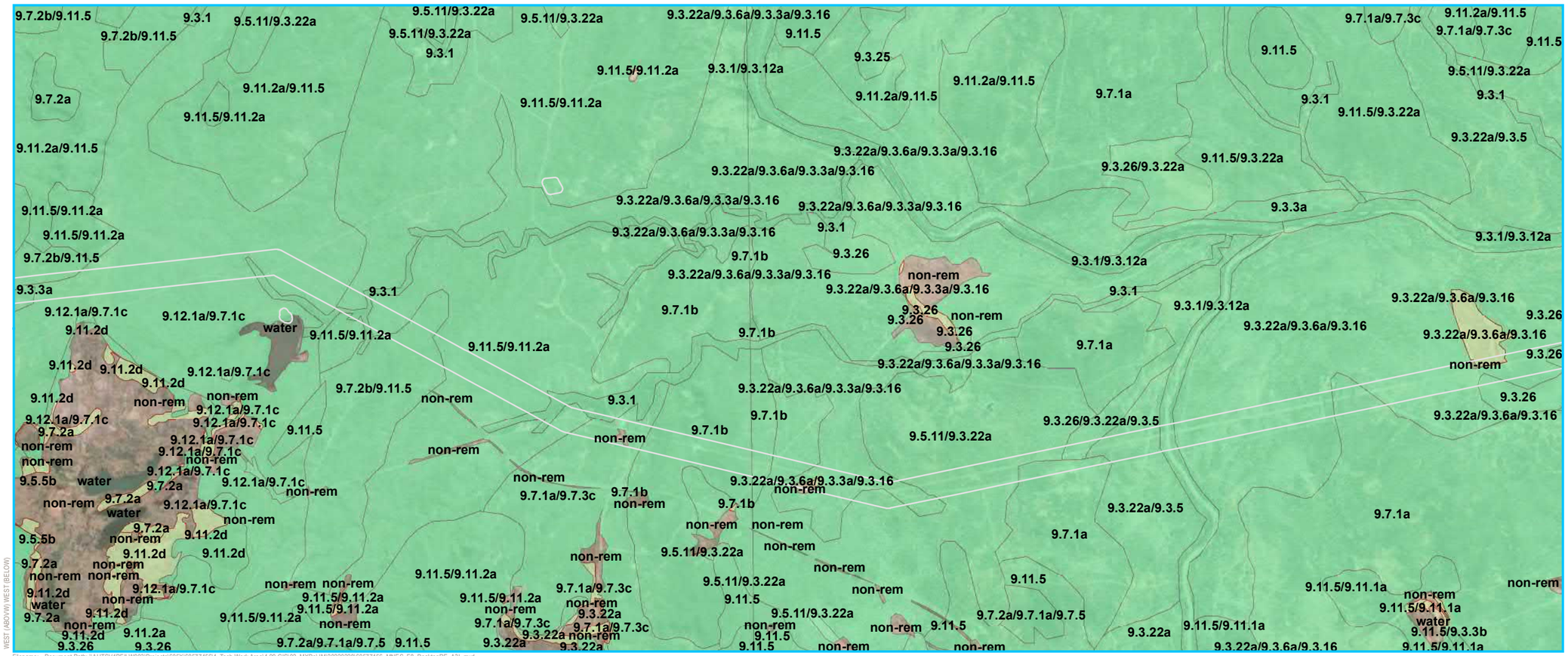
Figure F8.2

A3 size



ABOVE SHEET- 05

BELOW SHEET- 06



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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 containing endangered
- Category A or B containing of concern
- Category A or B that is of least concern
- Category C or R containing endangered
- Category C or R containing of concern
- Category C or R that is of least concern

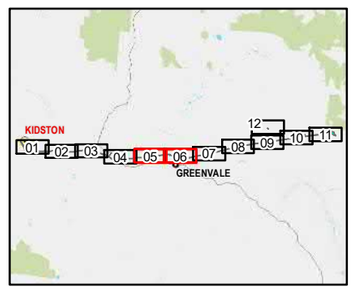

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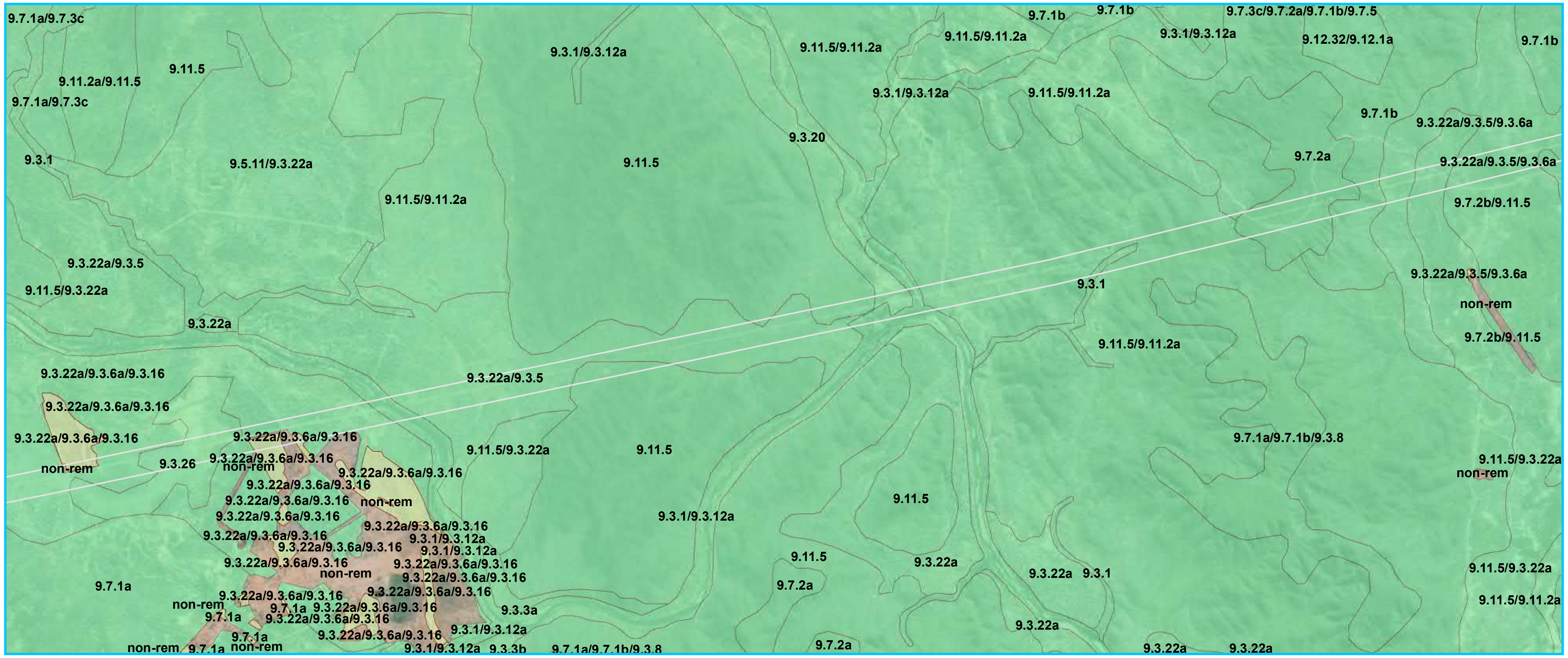
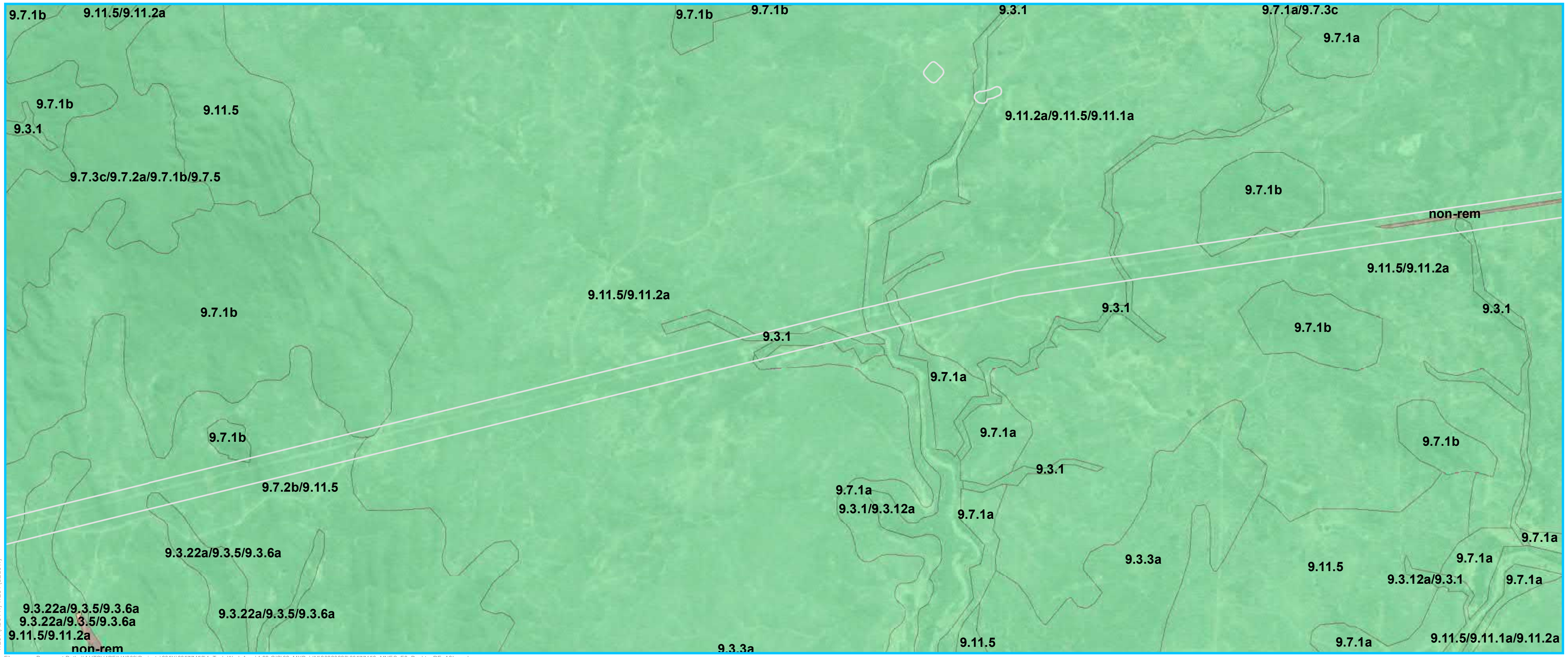
Figure F8.3

A3 size



ABOVE SHEET- 07

BELOW SHEET- 08



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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 containing endangered
- Category A or B containing of concern
- Category A or B that is of least concern
- Category C or R containing endangered
- Category C or R containing of concern
- Category C or R that is of least concern

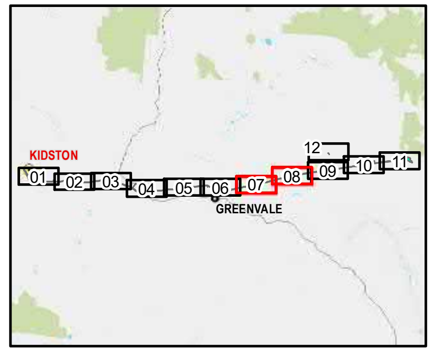

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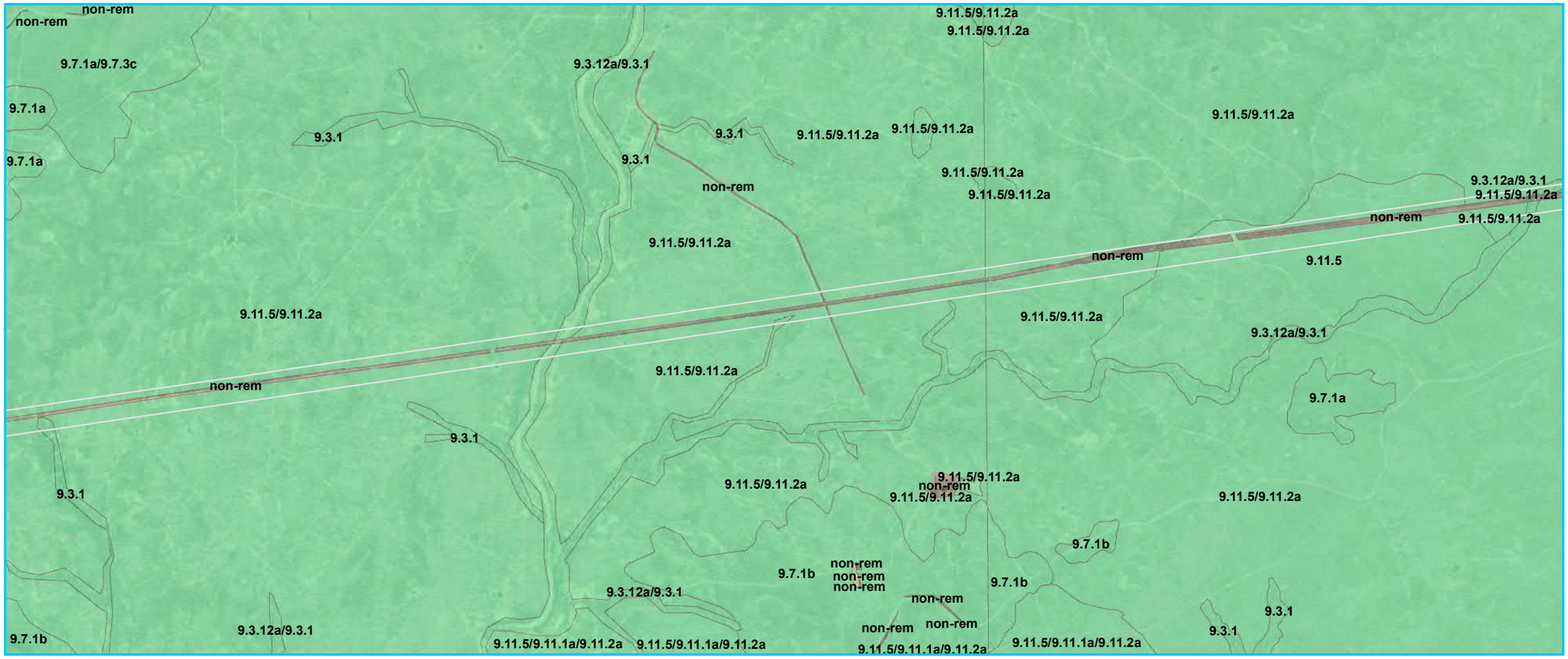
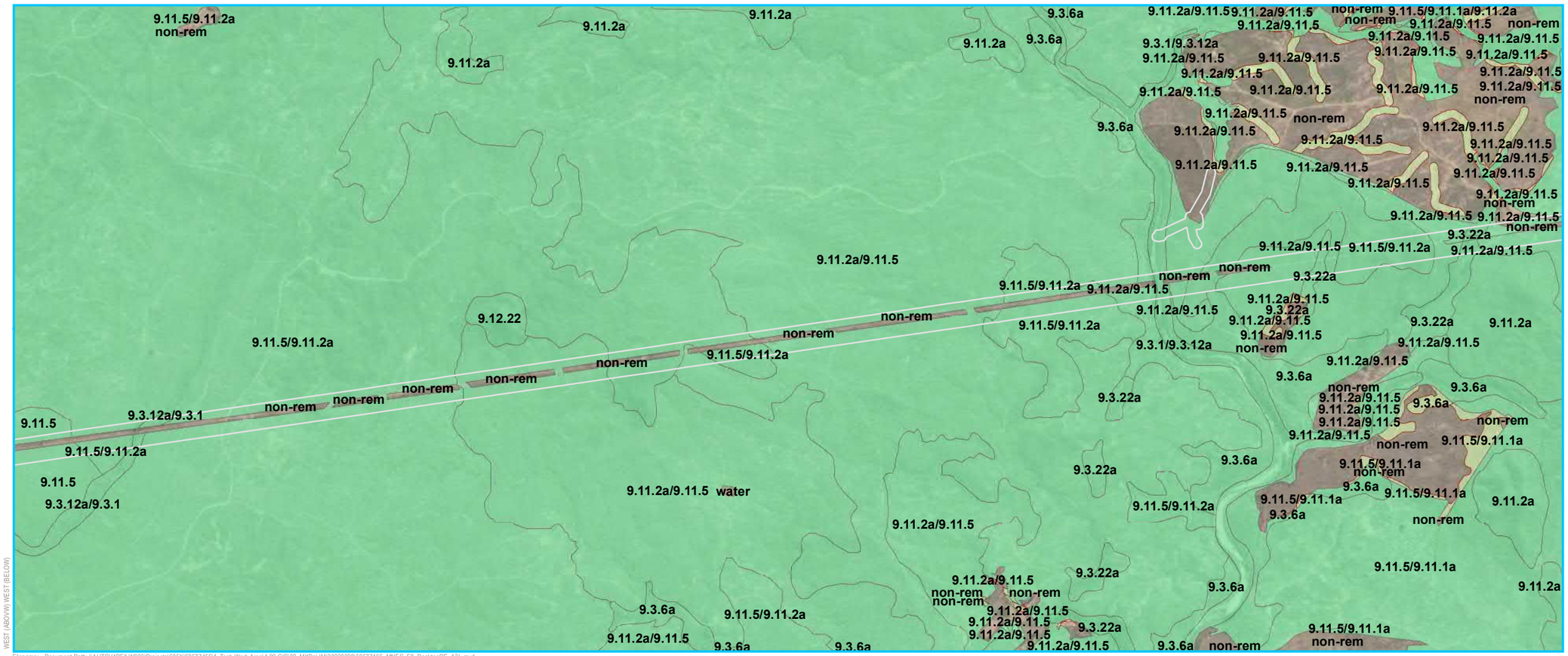
Figure F8.4

A3 size



ABOVE SHEET- 09

BELOW SHEET- 10



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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 containing endangered
- Category A or B containing of concern
- Category A or B that is of least concern
- Category C or R containing endangered
- Category C or R containing of concern
- Category C or R that is of least concern

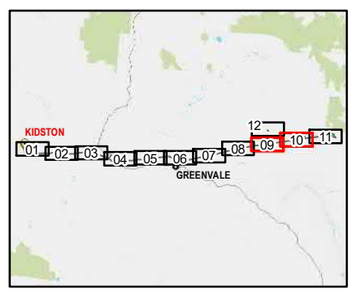

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Figure F8.5

A3 size

WEST (ABOVE) WEST (BELOW)

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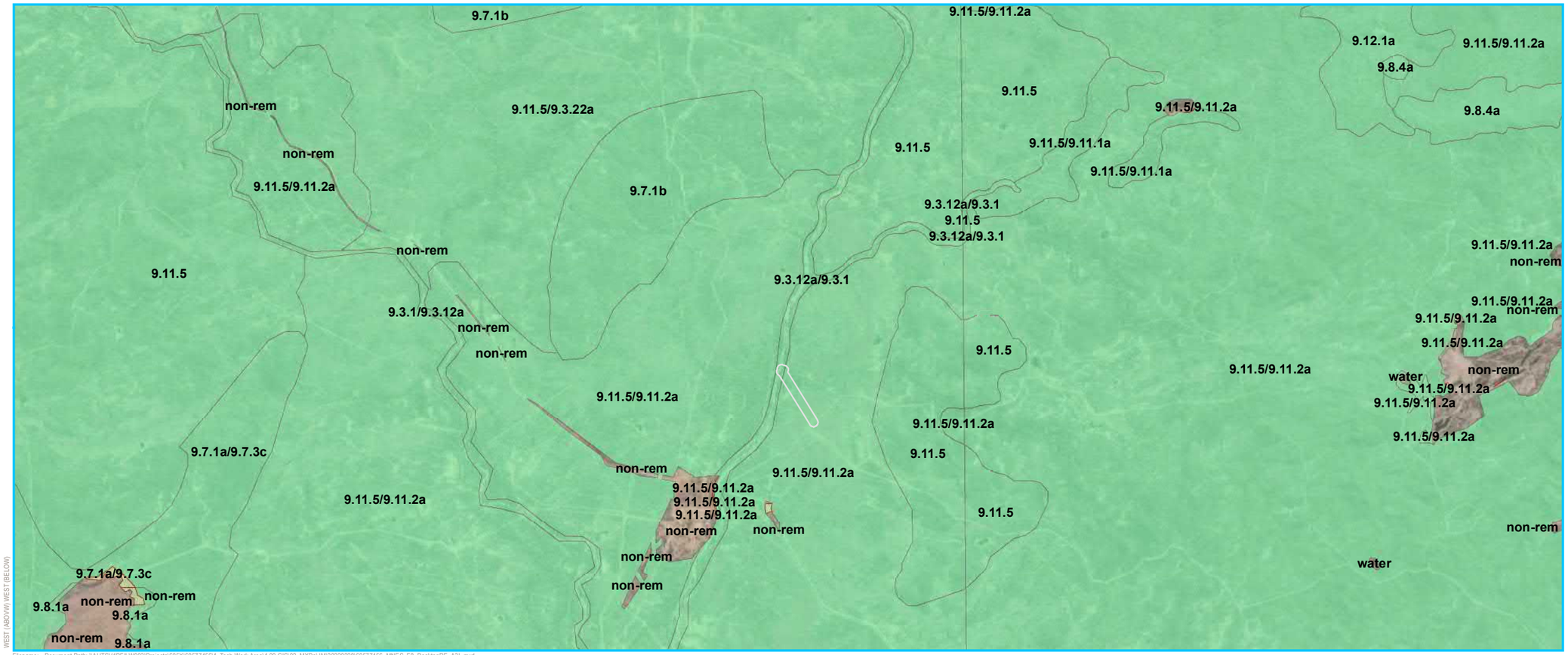
ABOVE SHEET- 11

BELOW SHEET- 12

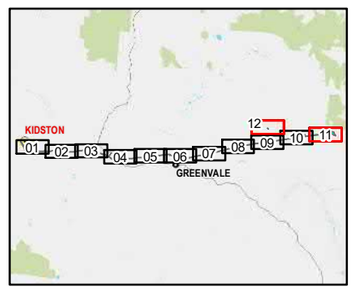


Legend

- Study Area

Queensland DoR RE Mapping

- Category A or B containing endangered
- Category A or B containing of concern
- Category A or B that is of least concern
- Category C or R containing endangered
- Category C or R containing of concern
- Category C or R that is of least concern



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VERSION: 1

Figure F8.6

A3 size

WEST (ABOVE) WEST (BELOW)

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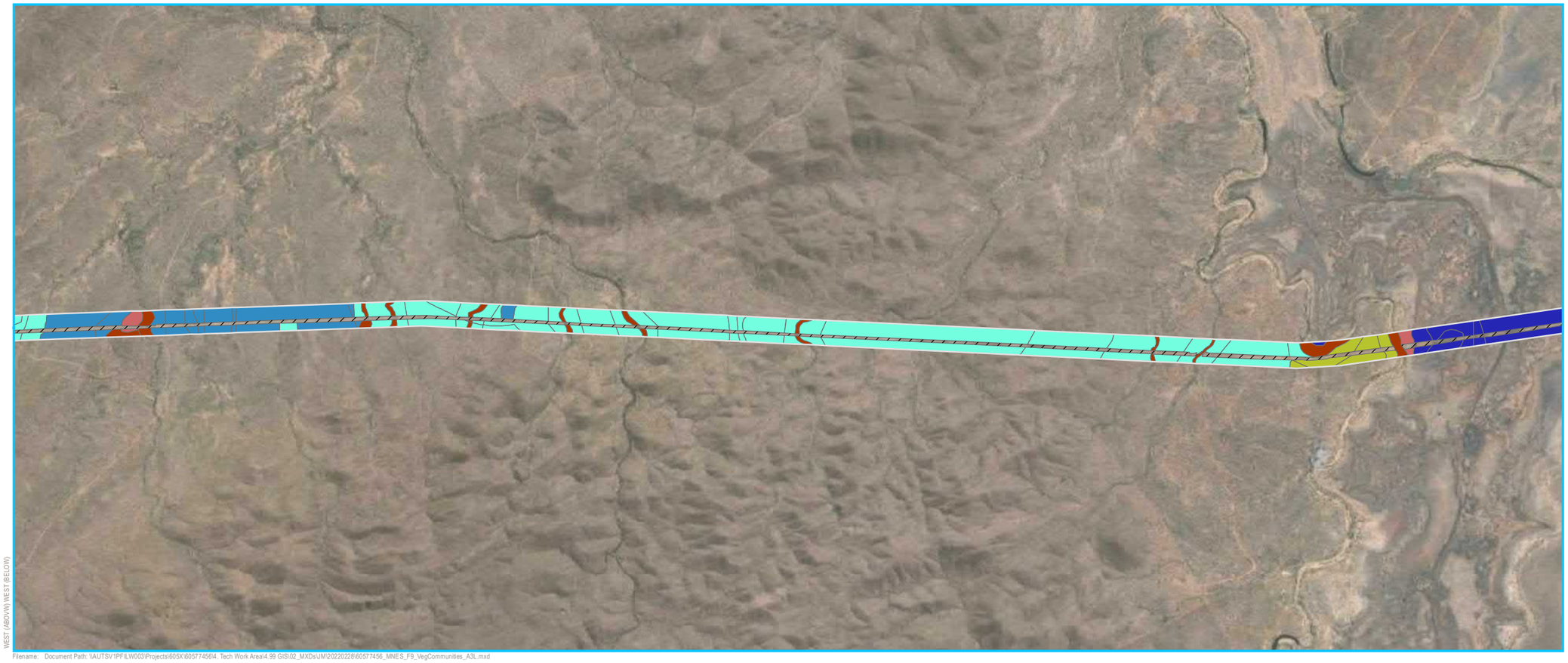
ABOVE SHEET- 01

BELOW SHEET- 02



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N

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

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

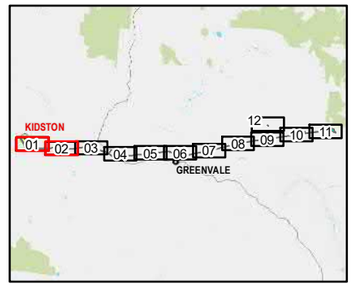
1:55,000 (when printed at A3)

Legend

- Study Area

Field verified 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* 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
- Low woodland dominated by *Melaleuca viridiflora* and or *Melaleuca citrolens* on depositional plains
- *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
- Cleared areas and farm dams



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VEGETATION COMMUNITIES

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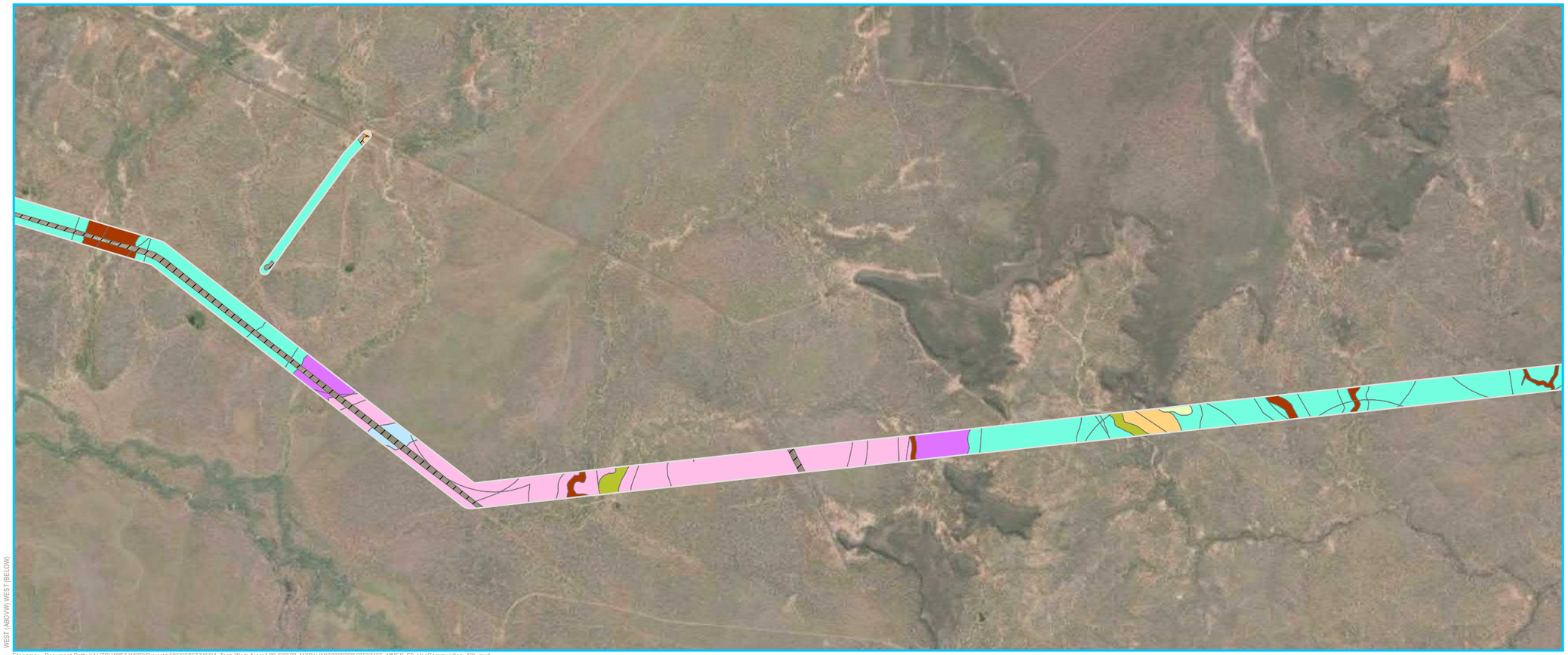
VERSION: 1

Figure F9.1

A3 size

ABOVE SHEET- 03

BELOW SHEET- 04



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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

Field verified 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* 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
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- *Eucalyptus brownii* woodland on alluvium
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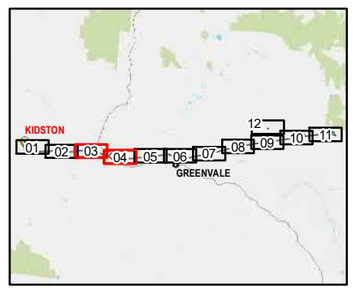
- *Acacia shirleyi* low open forest on laterite
- Tussock grassland dominated by *Dichanthium spp.* on undulating downs or clay plains
- Cleared areas and farm dams



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Powerlink Kidston Connection Project

VEGETATION COMMUNITIES

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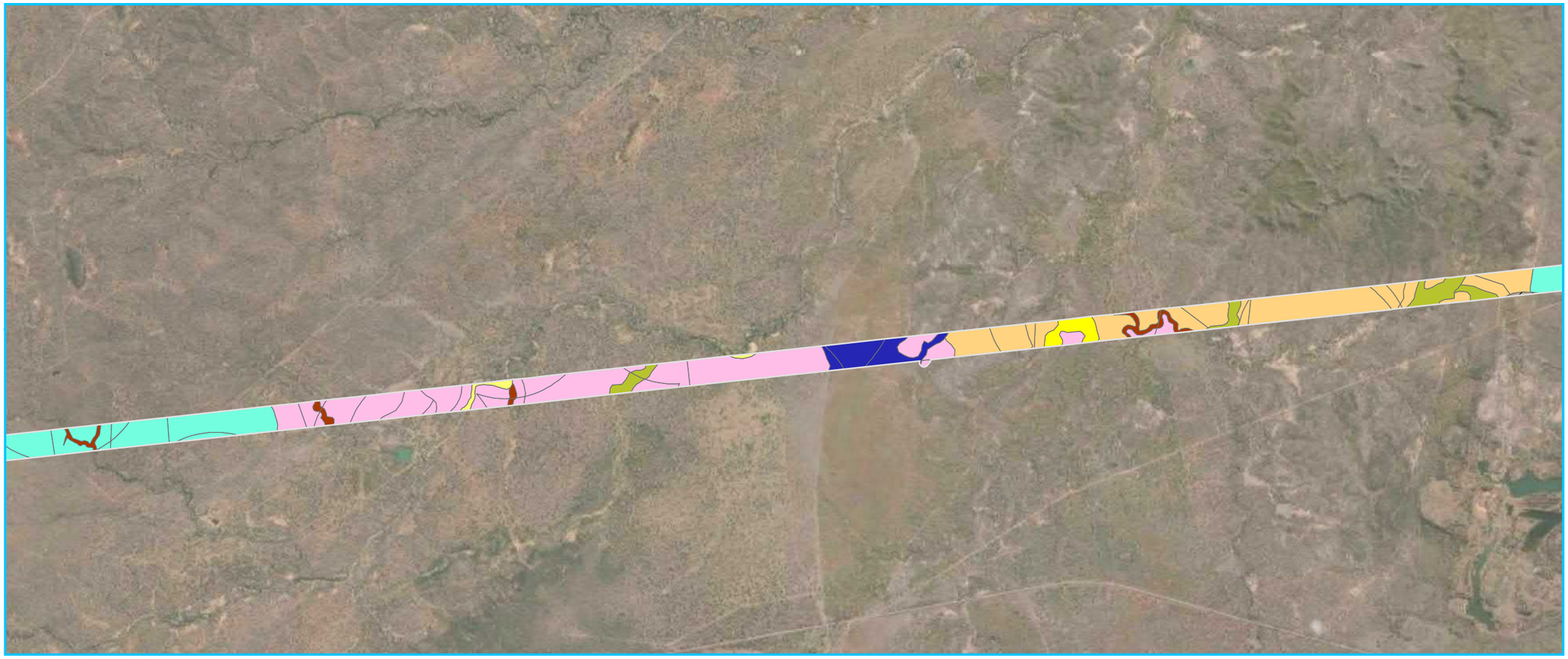
VERSION: 1

Figure F9.2

A3 size



ABOVE SHEET- 05

BELOW SHEET- 06

WEST (ABOVE) WEST (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

Field verified 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* on rolling metamorphic hills
- Open forests and woodlands of *Eucalyptus crebra* and *Eucalyptus sp.* on granitic and metamorphic ranges
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- *Acacia shirleyi* low open forest on laterite
- Tussock grassland dominated by *Dichanthium spp.* on undulating downs or clay plains
- Cleared areas and farm dams

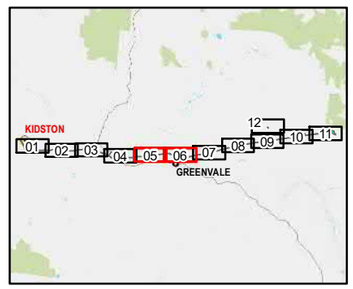

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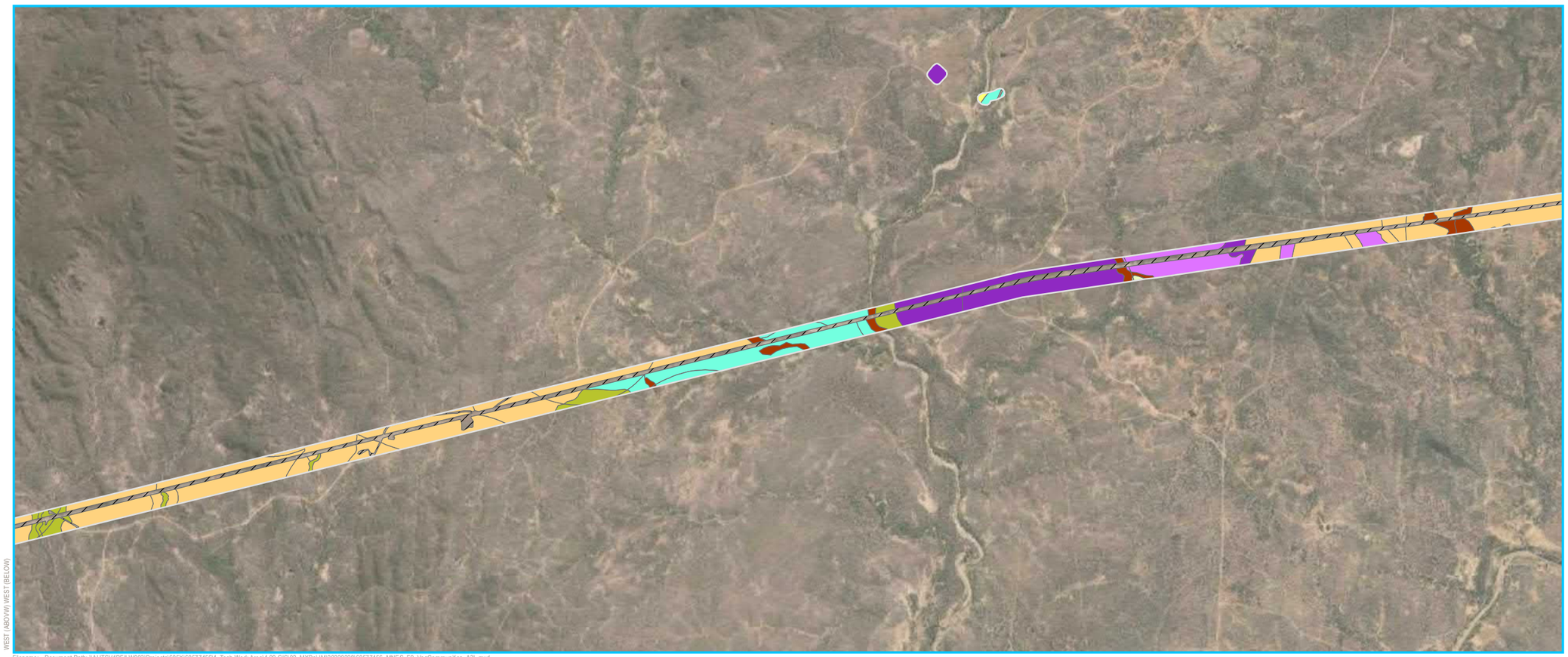
Figure F9.3

A3 size

ABOVE SHEET- 07

BELOW SHEET- 08



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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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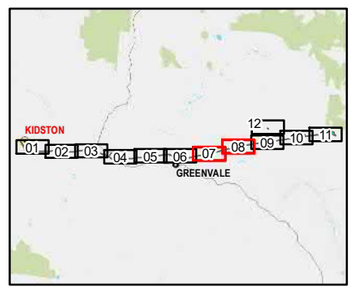
Legend

- Study Area

Field verified 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* 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
- Low woodland dominated by *Melaleuca viridiflora* and or *Melaleuca citrolens* on depositional plains
- *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
- Cleared areas and farm dams



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BELOW SHEET- 10

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Coordinate System: GDA 1994 MGA Zone 55
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0 650 1,300 1,950 2,600
Meters

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Legend

- Study Area

Field verified vegetation communities

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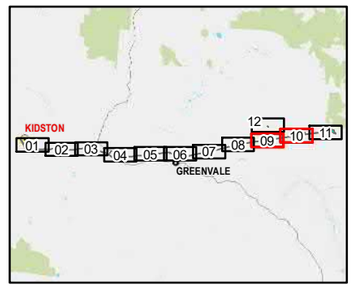
- Cleared areas and farm dams



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BELOW SHEET- 12

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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

Field verified vegetation communities

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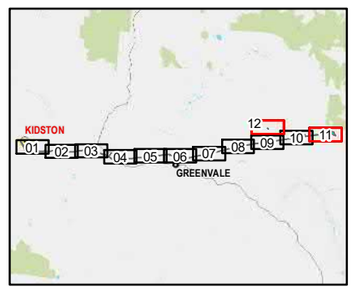

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5.4 Flora diversity

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).

No flora species listed under the EPBC Act were recorded. The full species list is provided in Appendix G.

5.5 Introduced flora species

The field surveys recorded 38 introduced flora species, accounting for 13% of the species observed (Appendix G). 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).

One of the *Cryptostegia grandiflora* specimens 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*.

5.6 Fauna habitat types

Nine dominant habitat types were recorded across the Study Area (Table 11, Figure 10.1 to 10.6). A description of each habitat type is detailed in the subsequent sections below.

Table 11 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, 9.3.24, 9.5.3, 9.5.11	910.41
2	Open *Eucalyptus*, *Casuarina* and *Melaleuca* riparian woodland	9.3.1, 9.3.13	179.52
3	Native grassland	9.3.25, 9.8.13	13.98
4	Low open forest of *Acacia shirleyi* and *Eucalyptus persistens* on laterite	9.7.1, 9.7.2	683.55
5	Open woodland of *Eucalyptus* and *Corymbia* on basalt	7.8.7, 7.8.18, 9.8.1, 9.8.4	382.08
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	2,531.94
7	*Eucalyptus and Corymbia w*oodland on igneous hills and/or granite	9.12.1a, 9.12.10, 9.12.12, 9.12.16, 9.12.26, 9.12.32	434.20
8	Cleared areas	Non-remnant	788.88
9	Farm dams	Non-remnant	7.53

5.6.1 Open woodland of Eucalyptus or Melaleuca on alluvium or sand plains

This habitat occurs on low, gently undulating plains within proximity to watercourses or drainage lines (Plate 1).

Mature koala food trees (*Eucalyptus sp.* and *Corymbia sp.*) form a largely intact canopy. In some locations where water availability is generally higher, trees and stags bearing hollows occasionally to commonly occur. Although large hollows are rare in these areas, 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 hollows were more abundant; these may be utilised by common microbat species or parrots such as the red-winged parrot (*Aprosmictus erythropterus*), rainbow lorikeet (*Trichoglossus moluccanus*) and pale-headed rosella (*Platycercus adscitus*) which were also recorded.

This habitat was generally found to have a low level of structural complexity. 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 or *Themeda triandra* (kangaroo grass). 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, fallen logs of all sizes and small areas of thin leaf litter. The abundance of large fallen logs did vary significantly but overall habitat is generally 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 potentially 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 1 Open eucalypt woodland on alluvial plains habitat

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

This habitat occurs as linear patches along higher-order watercourses (Plate 2). 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 seasonally throughout the year including threatened species such as the squatter pigeon (southern) (*Geophaps scripta scripta*), black-throated finch (southern) (*Poephila cincta cincta*) and where close to rocky terrain, the 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 very 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, except where the community was very narrow and or associated with a highly ephemeral watercourse. Where present, 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 possibly the threatened masked owl (northern) (*Tyto novaehollandiae kimberli*). Where eucalypts dominate, the canopy may also provide foraging opportunities for the threatened spectacled flying-fox (*Pteropus conspicillatus*).

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.

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. Bird species recorded during the field survey include but are not limited to the 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 especially where associated with high stream order watercourses such as the Burdekin River.

Plate 2 Open Eucalyptus, Melaleuca and Casuarina riparian woodland

5.6.3 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. Eucalypt trees are present however very rare. It has been conservatively assumed koala may utilise this habitat for dispersal purposes. Other MNES fauna opportunities are limited to temporary foraging and dispersal for highly mobile species such as the squatter pigeon (southern) and grey falcon.

5.6.4 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* in varying abundances (Plate 3). Where this habitat is analogous to RE 9.7.2, *Acacia shirleyi* dominates with rare *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, habitat for koala may be considered refuge as the canopy is dominated by *E. persistens* with other potential food trees such as *Eucalyptus crebra* and *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 other arboreal mammals are limited to foraging or dispersal.

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 including the red goshawk, grey falcon and masked owl (northern) 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 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 crevices and sandy soils were a notable feature. As rock crevices were generally shallow however habitat is considered marginal for 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, microhabitat features are more prevalent and other features also occur including rare 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 (*Macroderma gigas*), 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 3 Open forest to low open forest of *A. shirleyi* or *E. persistens* on laterite habitat

5.6.5 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 of all sizes were observed during the field survey, and may provide nesting opportunities for hollow-dependent microbats as well as birds such as parrots and owls. Large hollows are however rare and as such habitat is considered unsuitable for the greater glider, but marginally suitable for the nesting of the threatened masked owl (northern). Due to the dominance of eucalypts, canopy vegetation is potentially suitable for the foraging of fruit-bats including the threatened spectacled flying-fox.

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 generally as a result of grazing. Where this habitat occurs in the far west however, 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 large 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 4 below).

Plate 4 Eucalyptus sp. and Corymbia sp. open woodland on basalt habitat

5.6.6 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 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 small to medium fallen logs were also occasionally to commonly recorded, creating shelter and dispersal opportunities for small ground-dwelling mammals and reptiles. Large fallen logs that may provide denning opportunities for the northern quoll were rare. 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. 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.

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. The squatter pigeon (southern) may also utilise this habitat to disperse across the landscape.

Plate 5 Woodland of *Eucalyptus* and *Corymbia* on metamorphic hillslopes

5.6.7 *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 molucanna)*, suitable for 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 greater glider.

The understorey is generally moderately complex, with a variable shrub layer and grassy ground that occasionally contains large granite outcrops with boulders. Other microhabitat features present include common small and medium stones, shallow leaf litter and occasional decorticating bark. Habitat is suitable for a range of common 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, *Delma sp.*, *Lerista sp.* and Tommy roundhead dragon (*Diporiphora australis*).

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 and the masked owl (northern). 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. Despite the rocky terrain, denning opportunities for the northern quoll were uncommon including large hollow logs. 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 grassy ground layer.

Plate 6 *Eucalyptus* and *Corymbia* woodlands on igneous hills

5.6.8 Cleared areas

Relatively small areas of non-remnant vegetation occur across most of the Study Area as a result of historical clearing for existing electrical infrastructure, agriculture and cattle grazing activities. The largest extent of this community is associated with the existing powerline which is directly adjacent to large portions of the Project Area.

Habitat values in this community were limited but included rare individual paddock trees (excluding underneath the existing powerline which is maintained for safety), some sparse shrubby *Acacia spp.* or *Lantana* and an abundance of exotic grass in the ground layer where grazing had been restricted. In some areas bare ground is common as a result of significant scald and tunnel erosion or grazing activity (Plate 7). Where grass cover is high, dispersal opportunities for small mammals and reptiles occur. Small birds such as fairy-wrens may use the shrubs 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 squatter pigeon (southern). Outside of the existing powerline, koala may utilise the habitat to disperse between areas of higher quality habitat due to the presence of rare koala food trees. No potential shelter trees were recorded within this community.

Plate 7 Grazed cleared area

5.6.9 Farm dams

The Queensland DES wetland classification mapping indicates only two lacustrine wetlands (artificial) occur within the Study Area; one located directly adjacent to the Kidston solar farm at the western extent, and the other east of Greenvale Valley Road. However, field surveys confirmed the presence of at least fifteen artificial lacustrine wetlands in the form of farm dams at scattered locations across the Study 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*) and straw-necked ibis (*Threskiornis spinicollis*) were frequently recorded at these locations. The squatter pigeon (northern) (*Geophaps scripta peninsulae*) was also recorded in the grassy area surrounding.

One of the farm dams (Murray's Lagoon) was higher quality (Plate 8). 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 was also present. Pugging at the water's edge is an indicator of possible sedimentation and reduced water quality.

All farm dams within the Study Area are conservatively considered to provide some foraging and dispersal opportunities for wetland birds while on passage to higher quality habitat. This includes migratory species and the threatened Australian painted snipe (*Rostratula australis*) and curlew sandpiper (*Calidris ferruginea*).

Plate 8 Farm dam habitat – Murray lagoon left

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Legend

- Study Area
- Squatter pigeon (southern) record (AECOM)
- Greater glider record (AECOM)
- Short-beaked echidna record (AECOM)
- Sharman's rock-wallaby record (AECOM)

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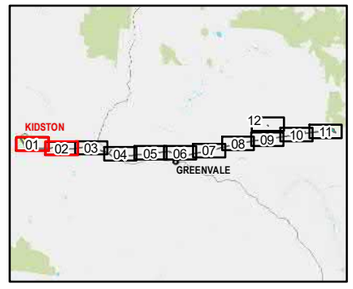

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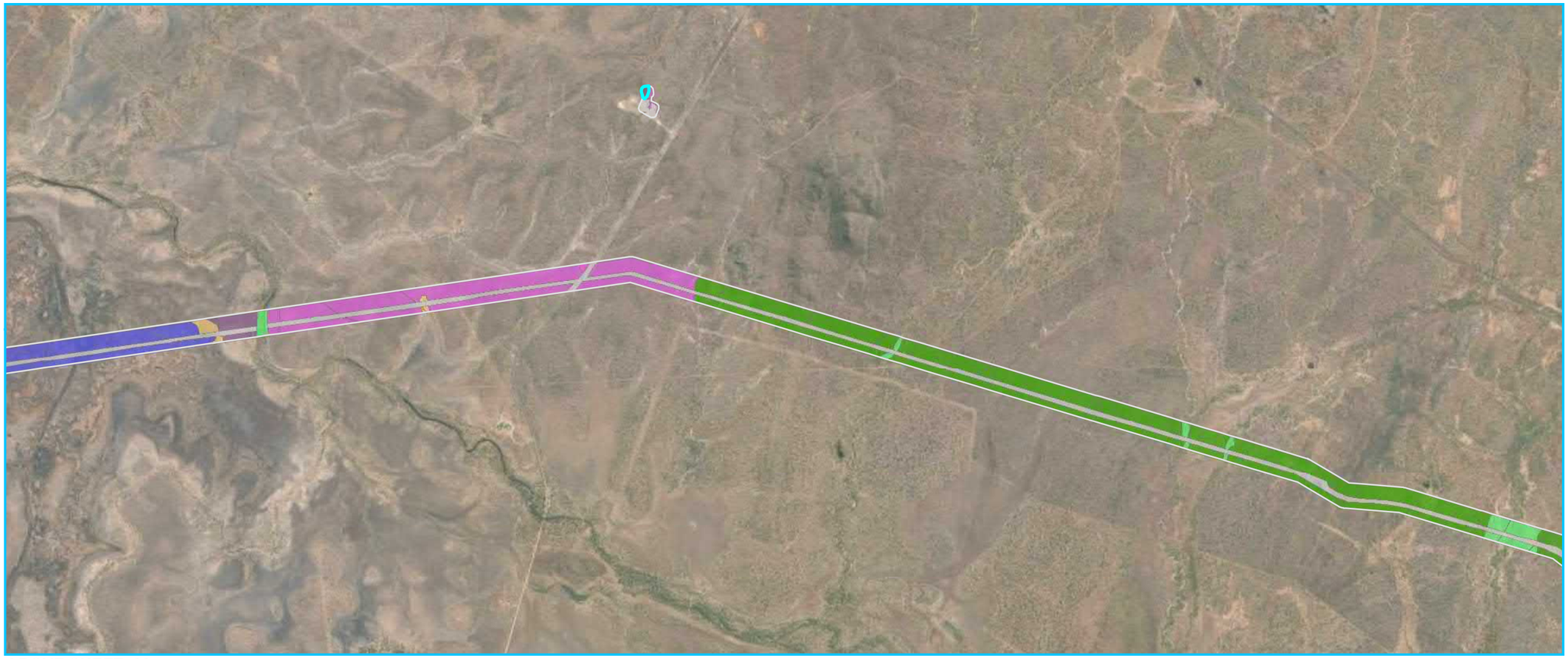

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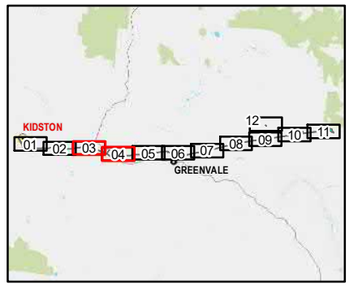

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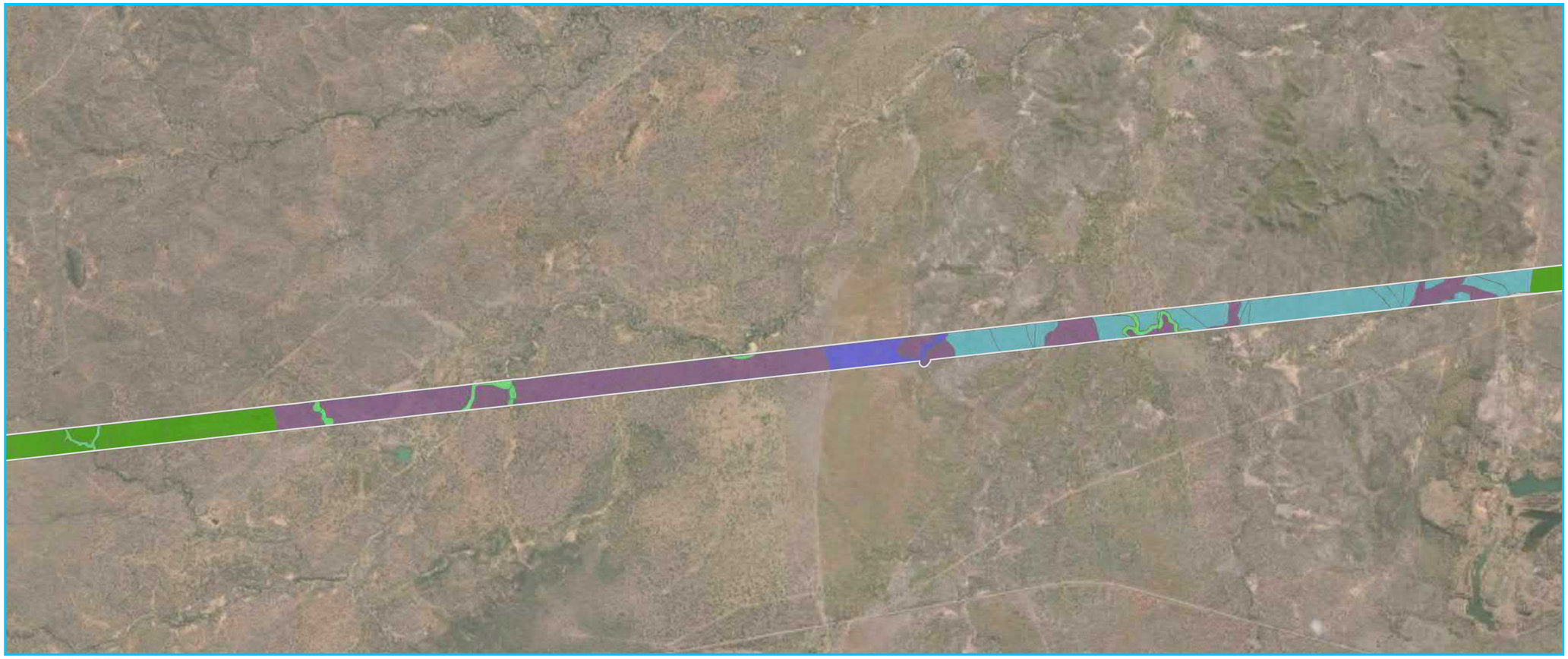

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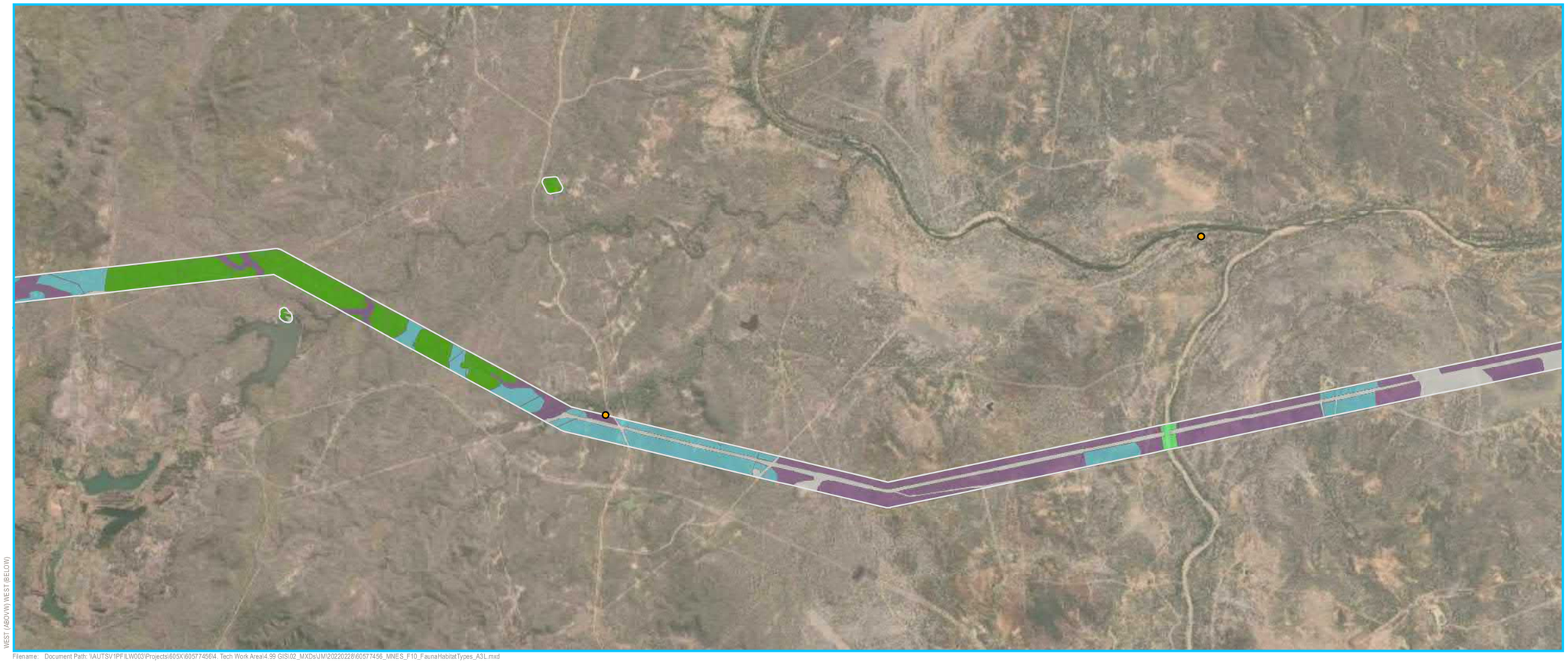

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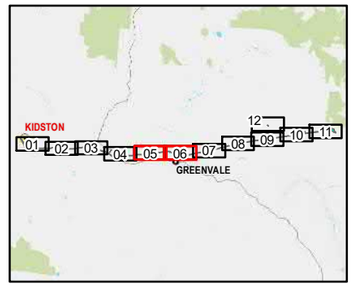

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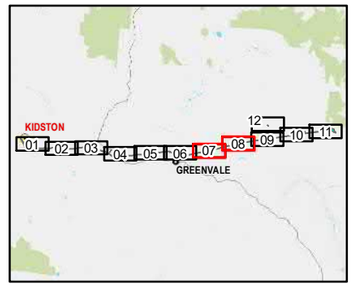

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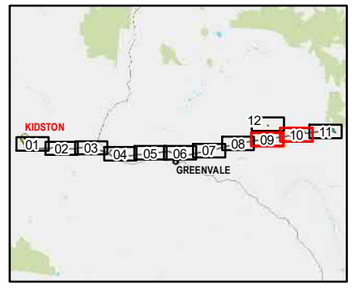

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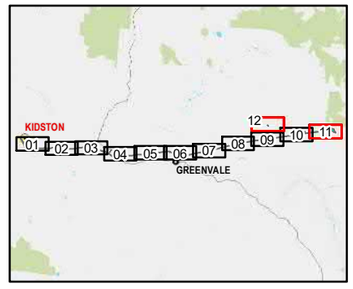

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5.7 Fauna diversity

The field surveys recorded 174 fauna species, comprising 118 bird, 38 mammal, 14 reptile, 2 amphibian and 2 fish species (see Appendix G for the species list).

Three threatened fauna species were recorded during the field surveys:

- Squatter pigeon (southern), listed as Vulnerable under the EPBC Act and the NC Act (Figure 19.2 & 19.6)
- Greater glider, listed as Vulnerable under the EPBC Act and the NC Ac (Figure 22.3 & 22.5)
- Sharman's rock-wallaby, listed as Vulnerable under the EPBC Act and the NC Act (Figure 25.1 to 25.6).

5.7.1 Birds

Birds were the primary fauna group observed throughout the survey program, with a total of 118 species recorded. Records were primarily collected via active birding, however many species were also captured on camera traps investigating the bait or drinking from nearby pooling water (Plate 9).

Honeyeaters were especially common, with nine species recorded including the blue-faced honeyeater (*Entomyzon cyanotis*), brown honeyeater, scarlet honeyeater, brown-backed honeyeater, white-throated honeyeater, Lewin's honeyeater, yellow-throated miner (*Manorina flavigula*), little friarbird (*Philemon citreogularis*) and noisy friarbird. Parrot species were generally less abundant but included the pale-headed rosella, rainbow lorikeet, scaly-breasted lorikeet (*Trichoglossus chlorolepidotus*) and red-winged parrot.

Other more disturbance tolerant bird species were also frequently recorded across the Survey Area, including the apostlebird, pied butcherbird, Australian magpie (*Gymnorhina tibicen*), magpie lark (*Grallina cyanoleuca*), Torresian crow (*Corvus orru*) and crested pigeon (*Ocyphaps lophotes*).

Plate 9 Blue-faced honeyeater and red-winged parrot

Raptors were occasionally recorded within the Survey Area and surrounds, primarily seen flying overhead or perched in canopy trees near farm dams or along tracks. Eight species were recorded including the wedge-tailed eagle (*Aquila audax*), pacific baza (*Aviceda subcristata*), brown falcon (*Falco berigora*), nankeen kestrel (*Falco cenchroides*), Australian hobby (*Falco longipennis*), white-bellied sea eagle, whistling kite (*Haliastur sphenurus*) and black kite (*Milvus migrans*). The squatter pigeon (southern), which is listed Vulnerable under the EPBC Act and NC Act was also recorded in close proximity to a track, likely foraging within the grassy verge.

A range of waterbird species are supported by the presence of ephemeral and permanent watercourses, as well as multiple farm dams. Species such as the pacific black duck, grey teal, straw-necked ibis, cattle egret (*Bubulcus ibis*), white-faced heron (*Egretta novaehollandiae*) and Australian wood duck (*Chenonetta jubata*) were frequently recorded across all the different water sources, while others such as the eastern great egret, black swan (*Cygnus atratus*), red-kneed dotterel (*Erythrogonys cinctus*), black-fronted dotterel were rare occurrences and located only at the higher quality waterbodies. In particular, a single glossy ibis, which is listed Migratory under the EPBC Act, was recorded at Murray's Lagoon in 2017.

5.7.2 Mammals

Excluding introduced species, a total of thirty-two mammal species were recorded during the field surveys. Survey methods used to detect mammals included daytime observations, camera traps, spotlighting and microchipterian call detection

Microbat species, which were recorded during three of the surveys (November 2017, June 2018 and December 2021) primarily using unattended call detectors across the Study Area comprise almost 57% of total native mammal diversity. A total of eighteen microbat species were positively identified via call analysis by Greg Ford of Balance! Environmental. Unresolved calls were attributed to a previously confirmed genus or species. During December 2021, the unattended call detectors were deployed at sites determined to have the greatest potential to be roost sites of the threatened ghost bat. However, as stated in the Balance! Environmental bat call analysis report, "[t]here was no evidence of *M. gigas* echolocation or social calls in any of the manually reviewed data".

Macropods were the most commonly observed mammal, generally seen foraging in the grassy understorey of the woodlands and forests of the Survey Area and along intersecting tracks. Macropods were also frequently captured on the camera traps. In the far eastern Study Area, the threatened Sharman's rock wallaby was recorded using both of these methods. Multiple individuals were sighted sitting on large granite boulder piles across 2018 (Plate 10) and 2021. A female with a joey in her pouch was recorded via a camera trap in 2018, and visually sighted in 2021, indicating that the population has been consistently breeding. Other macropod species recorded across the Survey Area include the rufous bettong, eastern grey kangaroo, whiptail wallaby, common wallaroo, swamp wallaby and the red-necked wallaby (*Macropus rufogriseus*).

Plate 10 Sharman's rock wallabies observed 2018

Only two arboreal mammals were recorded: the common brushtail possum (*Trichosurus vulpecula*) which was primarily recorded on camera traps (Plate 11) and the threatened greater glider which was observed while spotlighting. A total of three individual greater gliders were sighted across 2018 and 2021. In 2018, one individual was recorded along a small unnamed creek and the other individual was recorded along the Burdekin River where it meets Gray Creek. In 2021, a single greater glider was recorded along Camel Creek in the eastern Study Area. Although the koala was not sighted during field surveys, indirect evidence of the species was recorded including scats in 2018 and occasional to common scratch marks on the trunks of select trees (generally large *Eucalyptus camaldulensis* or *Corymbia dallachiana*) in 2021.

One mammal recorded, the short-beaked echidna (*Tachyglossus aculeatus*) is listed Special Least Concern under the NC Act however not listed under the EPBC Act. This species was commonly captured on the camera traps, including a ‘echidna train’ at one site comprising three individuals. This suggests a healthy, breeding population is present. Other small ground-dwelling mammal species recorded include the northern brown bandicoot (*Isoodon macrourus*). Despite the 901 camera trap nights, 160 Elliot B trap nights and 560 hair funnel trap nights, no evidence of the threatened northern quoll was recorded.

Plate 11 Common brushtail possum captured via camera trap

5.7.3 Reptiles and amphibians

Reptiles and amphibians were generally uncommon across the Study Area. In total, fourteen reptile species and two amphibian species were recorded during the field surveys, primarily via active searches and incidental observations. Recorded reptile species included two geckos, three snakes, two lizards and six skinks. Of these, skinks were the most frequently encountered moving among the grass and microhabitat of the ground layer in woodlands. The black-headed monitor (*Varanus tristis*) was recorded on a camera trap in the low woodland to forest of *Acacia shirleyi* and *Eucalyptus persistens* on laterite habitat and observed incidentally crossing a track.

The two amphibians recorded were the green tree frog and the exotic cane toad both recorded while spotlighting in creek lines and adjacent riparian communities. Cane toad eggs were also commonly recorded in the farm dams.

5.8 Introduced fauna species

The field surveys recorded eight 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*
- Black rat (*Rattus rattus*)
- Cane toad (*Rhinella marina*)
- Helmeted guineafowl (*Numida meleagris*).

Other introduced fauna likely to occur within the Study Area include:

- European fox (*Vulpes vulpes*)
- House mouse (*Mus musculus*).

5.9 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 5.6.9.

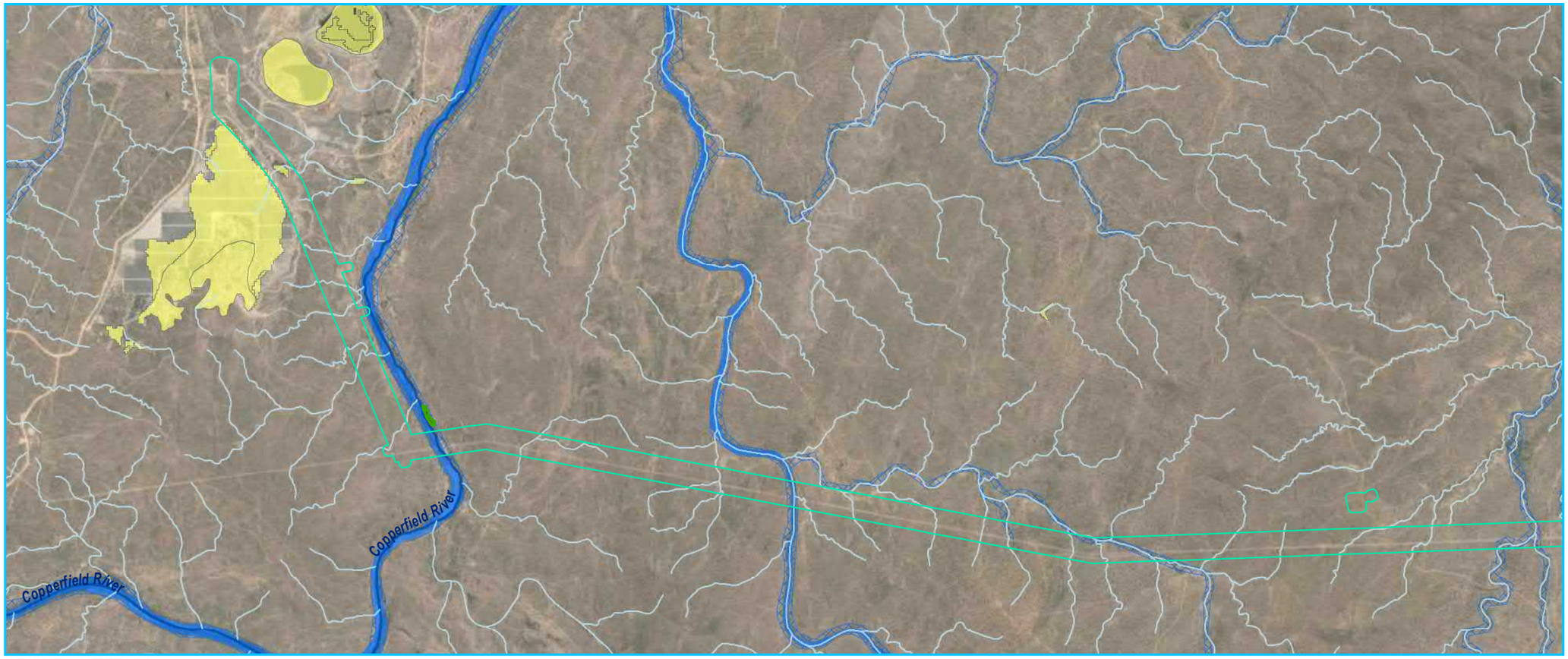
No waterbodies within the wider Study Area or Project Area are mapped VM Act wetlands or HES wetlands. However, VM Act wetland areas occur within 1 km north and south of the Study Area between the Einasleigh River and Lee (McKinnons) Creek. Wetlands and watercourses within the Project Area are shown on Figure 11.1 to 11.6.

5.10 Landscape connectivity

A review of DES BPA corridor mapping identified State significant ecological corridors occur within the Study Area (see Figure 12.1 to 12.6). 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 a 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, approximately 37,100 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.



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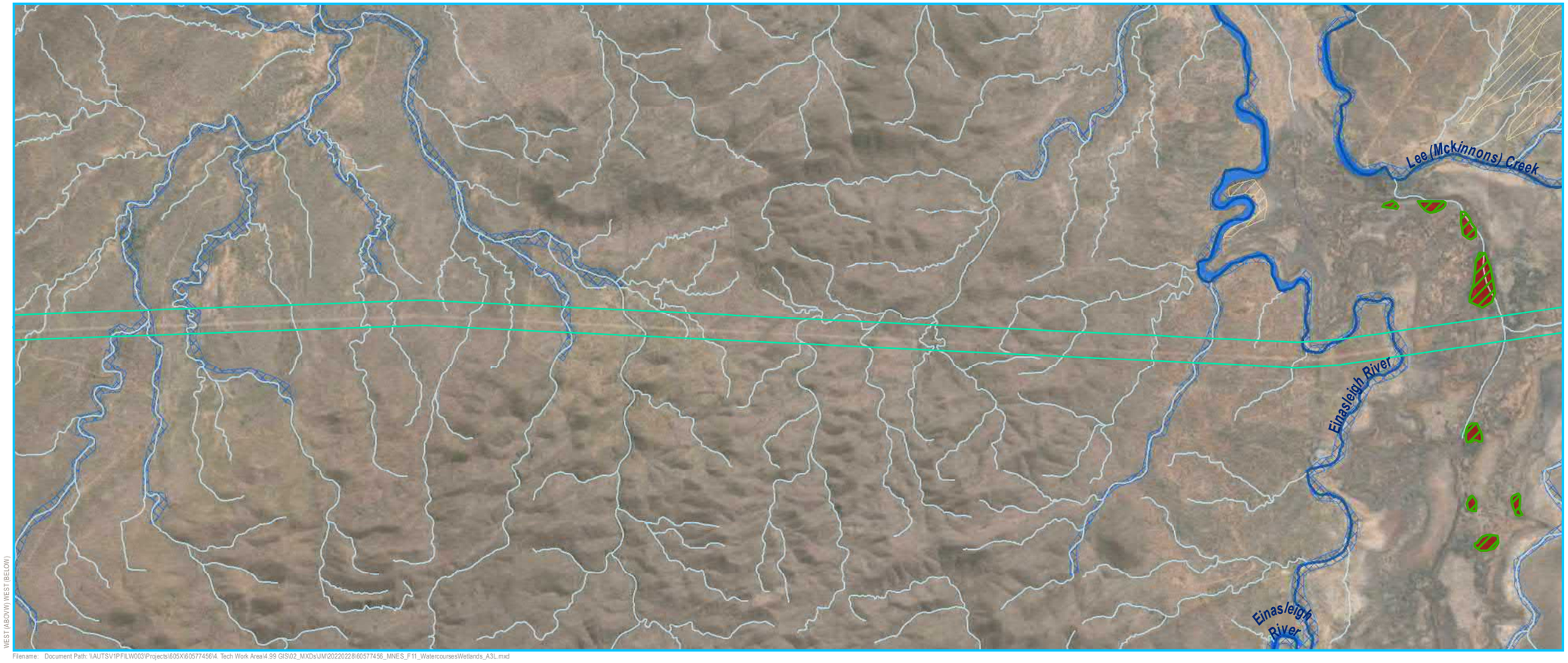

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Legend

- 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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- Palustrine wetland (RE based)
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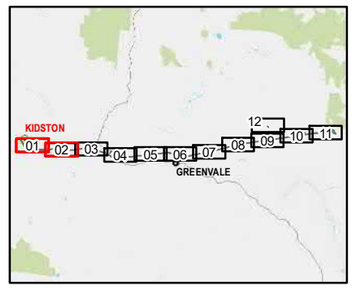

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Figure
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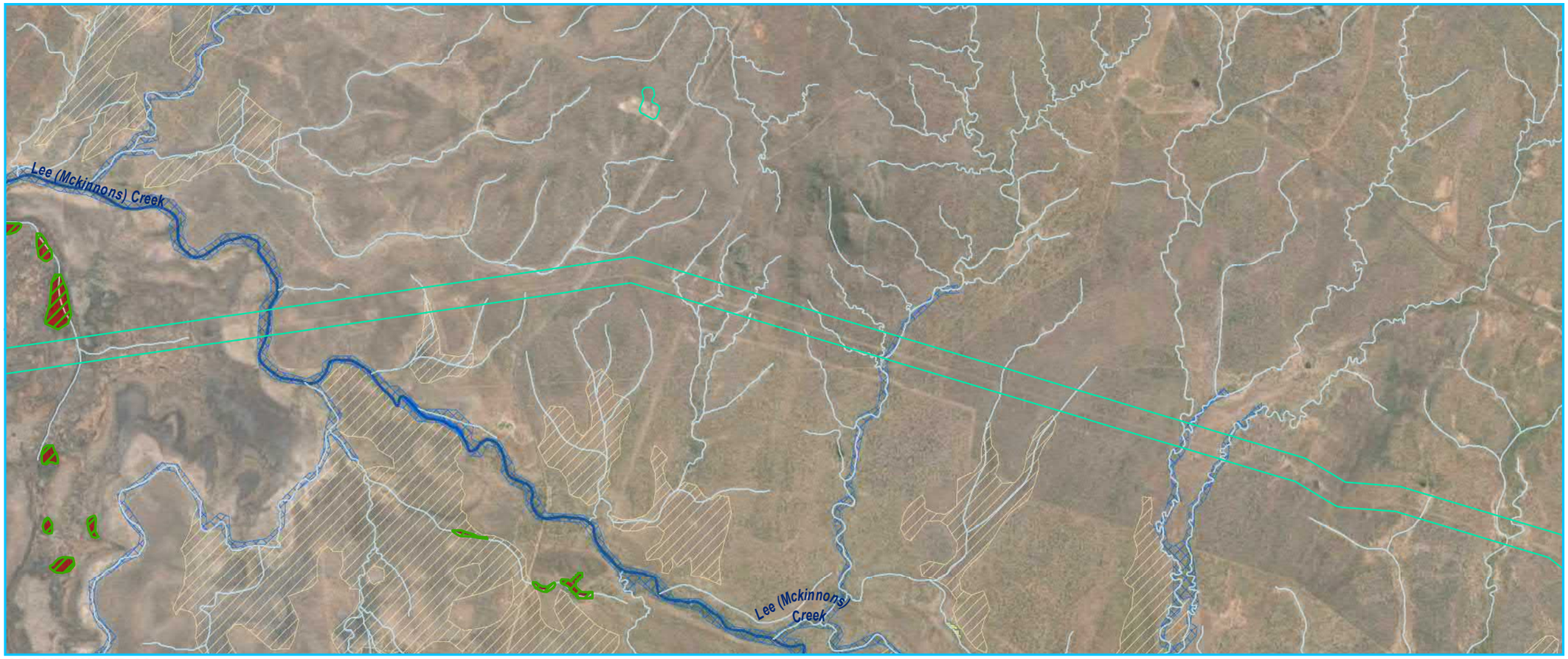

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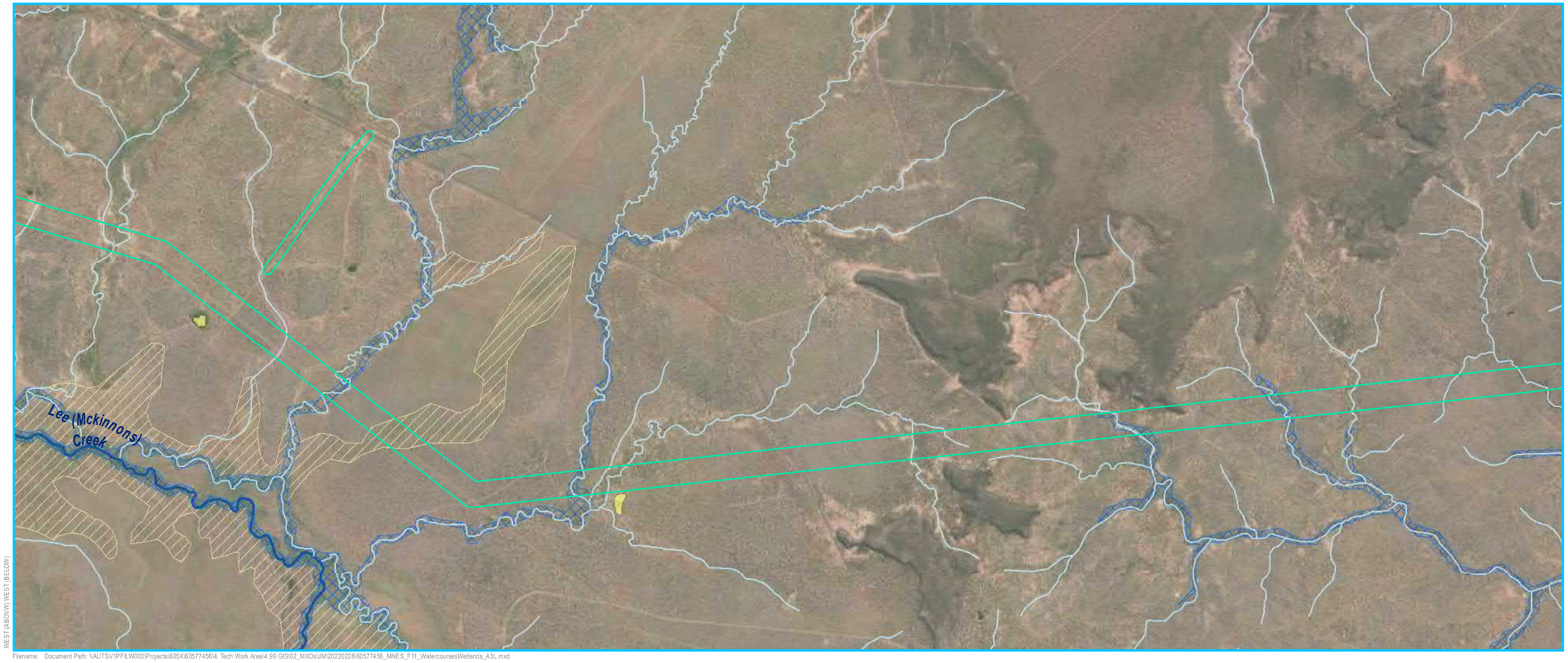

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- Study Area
- VM Act Wetlands

VM Act Watercourses

- Major
- Minor

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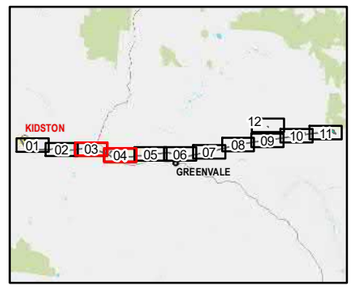

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WEST (ABOVE) WEST (BELOW)

Burdekin River

Gray Creek

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Meters

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- Study Area
- VM Act Wetlands

VM Act Watercourses

- Minor

Queensland Wetland Areas Mapping

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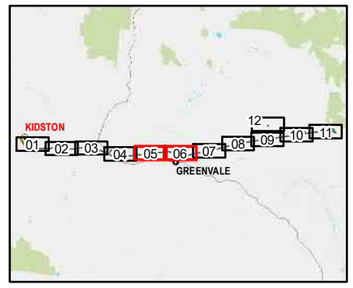

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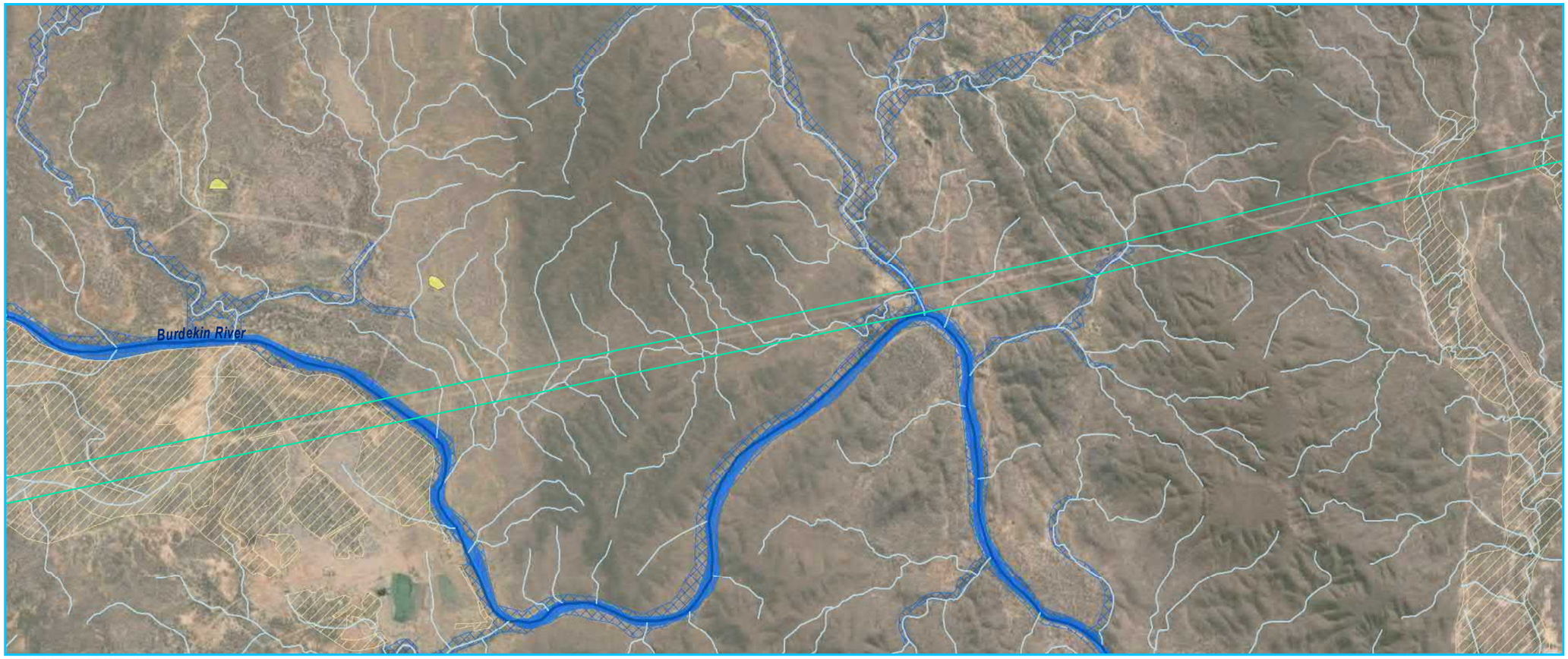

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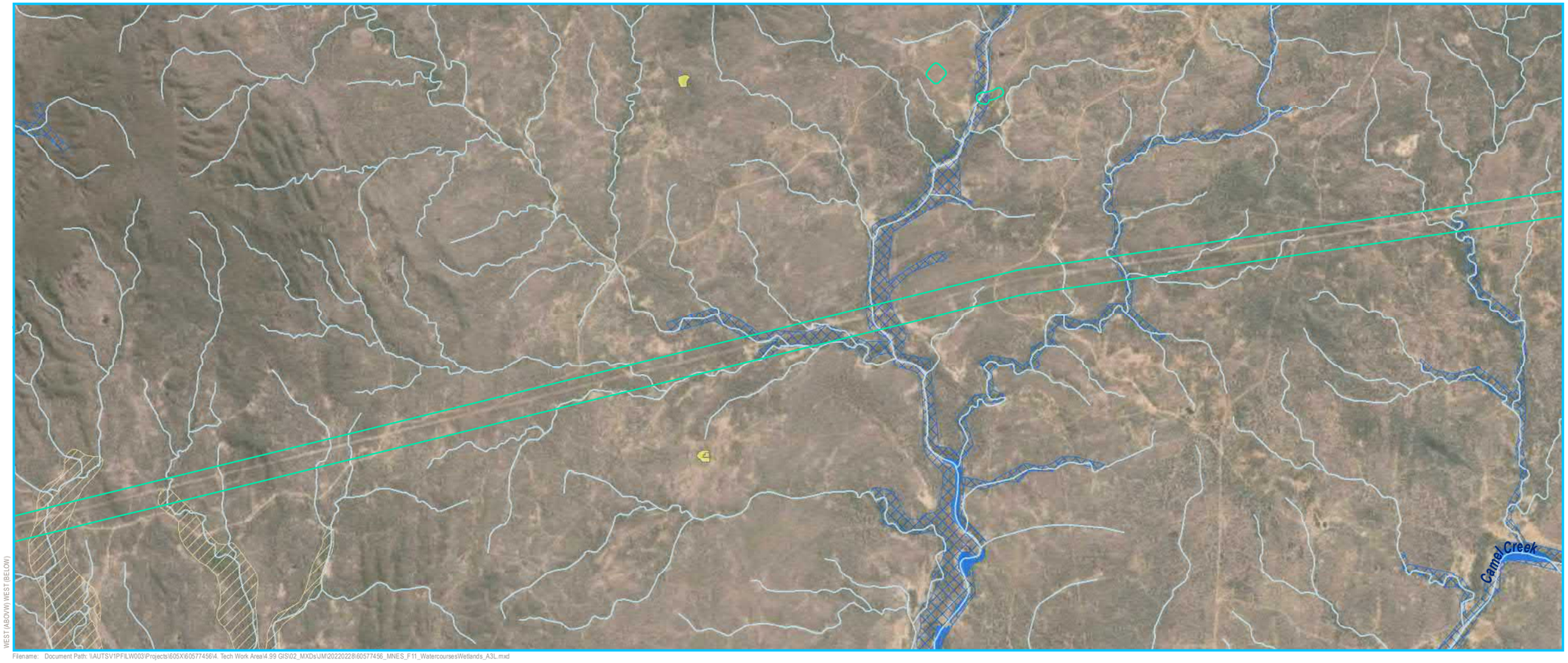

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Legend

- Study Area

VM Act Watercourses

- Major
- Minor

Queensland Wetland Areas Mapping

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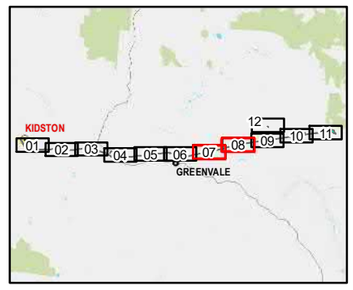

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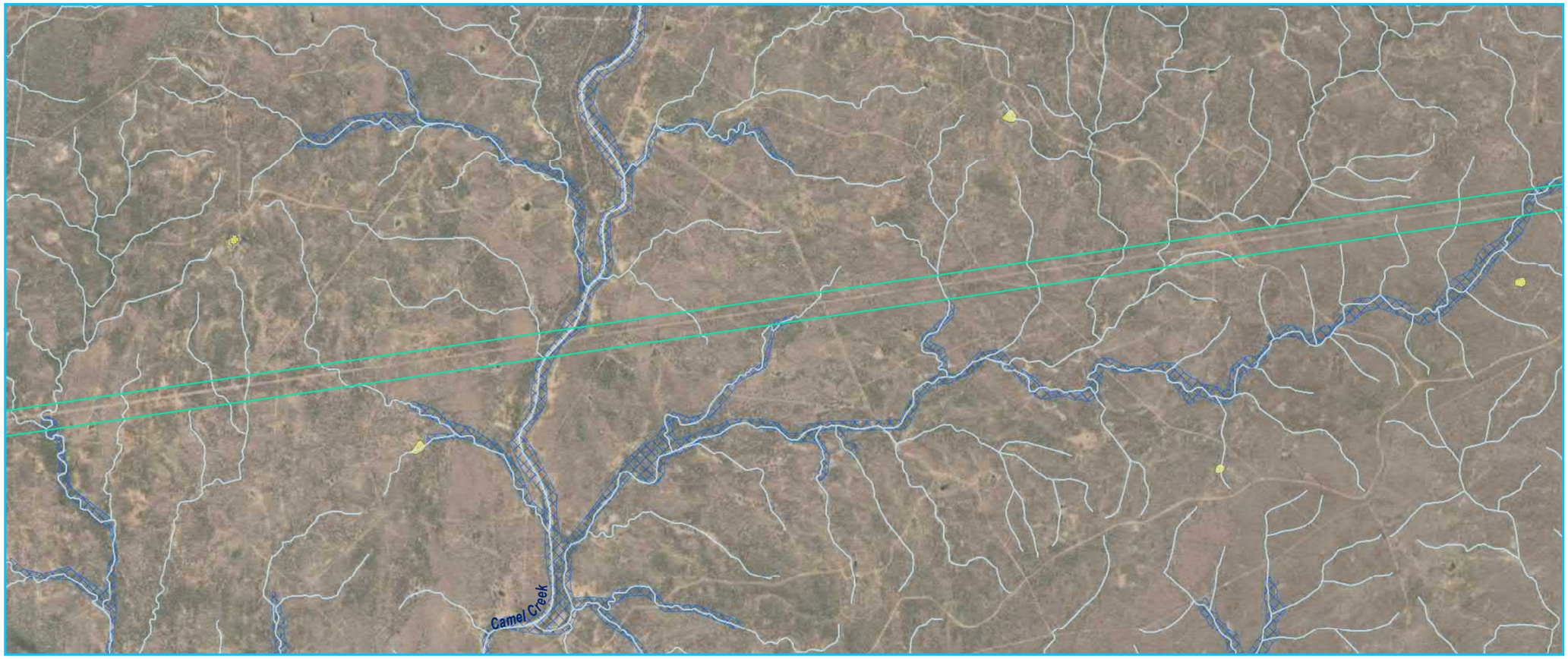

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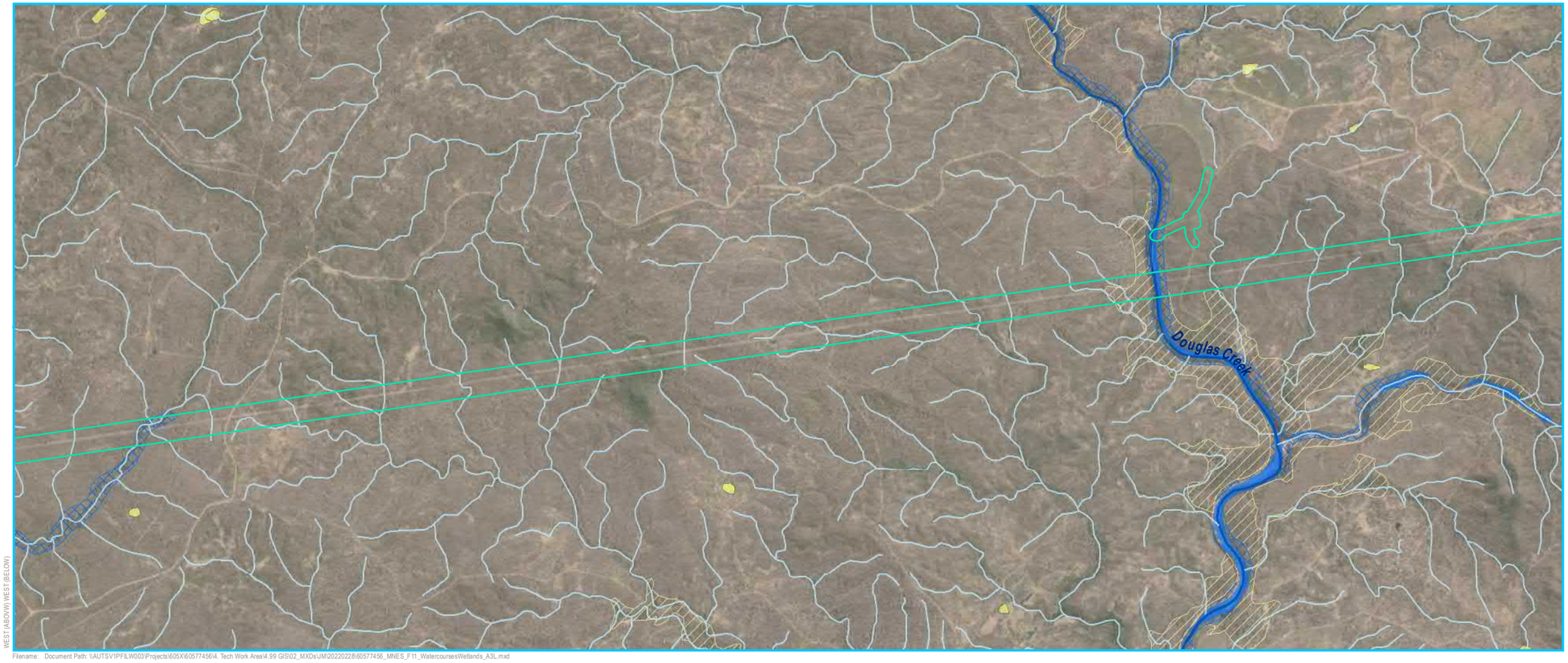

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- Study Area

VM Act Watercourses

- Minor

Queensland Wetland Areas Mapping

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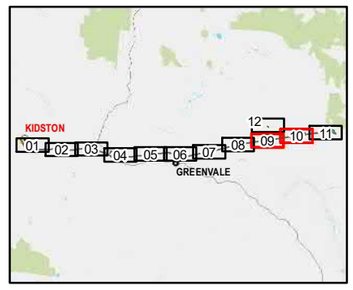

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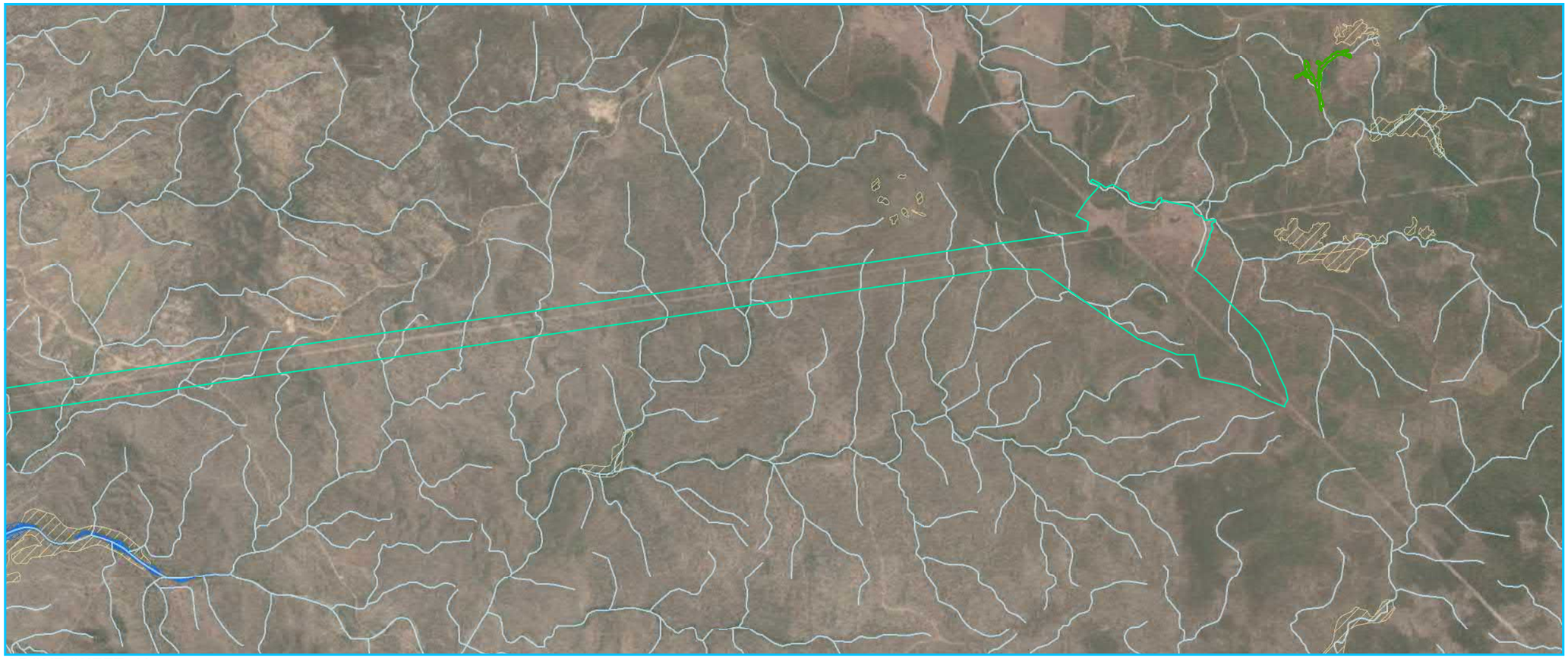

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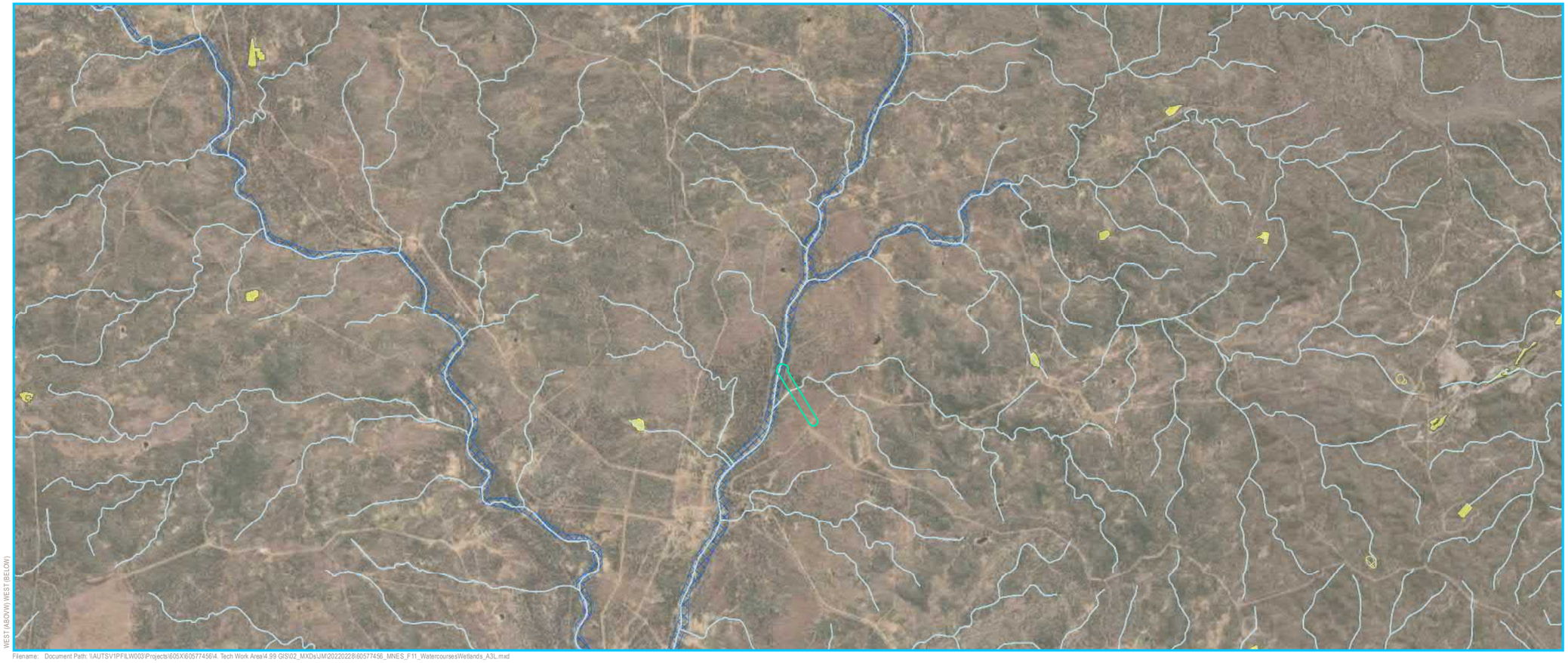

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- Study Area
- VM Act Wetlands

VM Act Watercourses

- Minor

Queensland Wetland Areas Mapping

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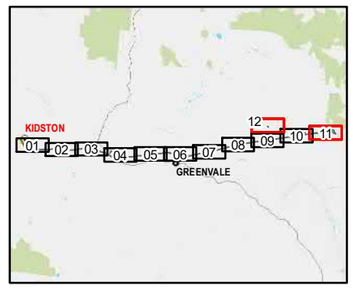

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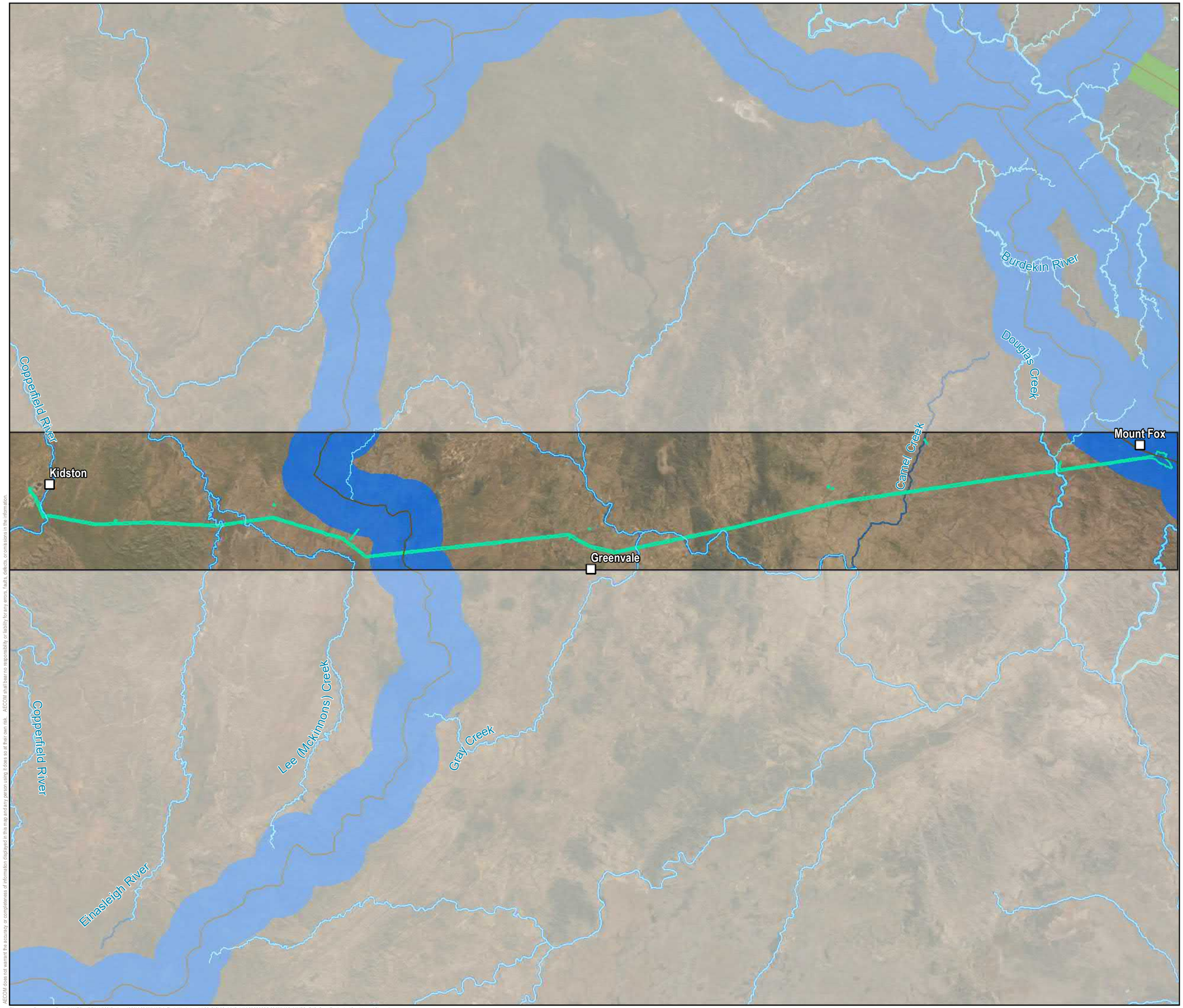

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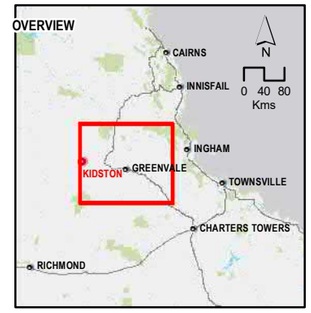
Legend

- Study Area
- 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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Figure F12

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6.0 MNES Likelihood of Occurrence

6.1 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.

6.2 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.

6.3 Wetlands of international importance (RAMSAR)

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

6.4 Great Barrier Reef Marine Park

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

6.5 Commonwealth marine area

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

6.6 Listed threatened ecological communities

The PMST report generated for the Project indicated that two EPBC Act listed TECs potentially occur within the Study Area: Broad-leaf tea-tree TEC and Lowland rainforest TEC.

The field survey program did not detect the presence of any rainforest community within the Study Area, including any that may be consistent with the description outlined in the Lowland rainforest Approved Conservation Advice (Department of Agriculture Water and the Environment, 2021a). Furthermore, <1% of the Study Area occurs within the Wet Tropics bioregion. Based on this, the Lowland rainforest TEC is considered unlikely to occur.

As detailed in the Broad-leaf tea-tree TEC Listing Advice (Threatened Species Scientific Committee, 2012b), 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.

6.7 Listed threatened species

The PMST report identified forty (40) threatened species as potentially occurring within the Study Area and surrounds. Of the 40 threatened species, three fauna species were confirmed during the field survey program:

- Squatter pigeon (southern), listed as Vulnerable under the EPBC Act
  - Two small groups (two to six individuals) were observed in 2018 adjacent to the Study 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 2018 within 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.
  - In 2021, multiple individuals were also visually observed and captured via camera trap in the far eastern Study Area. Whilst the majority of records occurred within the same area of RE 9.12.1a, additional records were also collected at Silica Hill (RE 9.12.32).

- Greater glider, listed as Vulnerable under the EPBC Act and the NC Act
    - Two individuals were recorded in 2018 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.
    - One individual was recorded in 2021 during spotlighting along Camel Creek, adjacent to the Study Area within RE 9.3.1.

No EPBC Act listed flora species were recorded during any 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 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 within the Study Area as well as field records and the proximity of publicly available records.

The assessment determined two threatened flora and twelve threatened fauna species as 'potential' or 'likely' to occur within the Study Area. A total of fourteen (14) flora and 16 threatened fauna species were found to be unlikely occurrences. These species and the broad reason for this determination is as follows:

- The Study Area does not occur within the species distribution: yellowjacket (*Corymbia leptoloma*), *Cycas cairnsiana, Myrmecodia beccarii,* buff-breasted button quail, grey-headed flying-fox, mahogany glider, Northern bettong, spotted-tailed quoll, opal cling goby and Atherton delma.
- The species is predominantly coastal or found in lowland areas and no records occur within 20 km: eastern curlew, bare-rumped sheath-tailed bat and the Semon's leaf-nosed bat.
- The Study Area does not contain suitable habitat and / or no reliable records for the species occur nearby: pink gidgee (*Acacia crombiei*), miniature moss-orchid (*Bulbophyllum globuliforme*), *Cycas platyphylla, Dichanthium queenslandicum*, *Lindsaea pulchella var. blanda*, lesser swamp-orchid (*Phaius australis*), *Phaius pictus, Marsdenia brevifolia*, native moth orchid (*Phalaenopsis amabilis subsp. Rosenstromii*), velvet jewel orchid (*Zeuxine polygonoides*), Gouldian finch, southern cassowary, large-eared horseshoe bat, black-footed tree-rat, magnificent brood frog and Australian lace-lid.

The detailed likelihood of occurrence assessment is detailed in Table 12 below and includes justification of the assessment outcome per value. Potential habitat for known, likely or potential species as well as confirmed records of the three threatened species identified during the field survey within the Study Area are shown on Figure 13.1 to Figure 27.6.

Table 12 Threatened species likelihood of occurrence

Species	Status (EPBC Act[1], NC Act[2])	Distribution and habitat requirements	Potential habitat utilisation in Project Area			Records	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, 2022). 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 Study 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 Study Area. This species was not recorded during field surveys.	**Unlikely**
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, 2022). The Study 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 Study 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 Study Area near Paluma State Forest (known location of the species).	**Unlikely**

Species	Status (EPBC Act[1], NC Act[2])	Distribution and habitat requirements	Potential habitat utilisation in Project Area			Records	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 Study 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 Study 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 Study Area.			**No** Three known populations occur >10 km east of the Study 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.	**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, 2022). The Study 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 Study 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 Study 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 ALA records).	**Unlikely**

Species	Status (EPBC Act[1], NC Act[2])	Distribution and habitat requirements	Potential habitat utilisation in Project Area			Records	Likelihood of Occurrence
			Breeding / Roosting / Nesting	Foraging	Dispersal		
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 Study 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 Study 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 Study Area.	**Unlikely**
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, 2022). The Study 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 Study Area. *Dichanthium spp*. grasses were recorded within the Study Area.			**Yes** A single ALA record from 2002 occurs within 20 km of the Study Area. The location has been generalised by 10 km. No WildNet records occur within 20 km.	**Potential**

Species	Status (EPBC Act[1], NC Act[2])	Distribution and habitat requirements	Potential habitat utilisation in Project Area			Records	Likelihood of Occurrence
			Breeding / Roosting / Nesting	Foraging	Dispersal		
King bluegrass *Dichanthium queenslandicum*	E, V	King blue-grass is endemic to central and southern Queensland where it occurs in three disjunct populations: 1) Hughenden district (one record); 2) from Nebo to Monto and west to Clermont and Rolleston; and 3) Dalby district, Darling Downs (Queensland Herbarium, 2009) (Threatened Species Scientific Committee, 2013). This species has been recorded within the Einasleigh Uplands bioregion, however only a very small portion of the western Study Area occurs within the species mapped distribution as per SPRAT. King bluegrass occurs on black cracking clay in tussock grasslands mainly in association with other species of blue grasses (*Dichanthium spp.* and *Bothriochloa spp.*) but also with other grasses restricted to this soil type.	**Yes** Native grasslands on basalt occur within the Study Area. *Dichanthium spp*. grasses were recorded within this community.			**No** No ALA or WildNet records occur within 20 km of the Study Area. The nearest record (ALA) is >45 km to the south near the Burdekin River and is undated.	**Unlikely**
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 Study 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, 2022).	**No** No epiphytic mosses or tree ferns were detected during the field survey program.			**No** No ALA or WildNet records occur within 20 km. Rockingham is >100 km north east of the eastern Study Area.	**Unlikely**

Species	Status (EPBC Act[1], NC Act[2])	Distribution and habitat requirements	Potential habitat utilisation in Project Area			Records	Likelihood of Occurrence
			Breeding / Roosting / Nesting	Foraging	Dispersal		
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, 2022). A single population also occurs at West Point on Magnetic Island. Approximately 35 km of the eastern Study 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 Study Area.			**No** No ALA or WildNet records occur within 20 km of the Study 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 Study Area. However that is a known population and the species' distribution is likely based upon those records.	**Unlikely**
Myrmecodia beccarii Ant plant		*Myrmecodia beccarii* occurs in coastal woodland and mangrove between Cooktown and Ingham in Queensland (Department of Agriculture Water and the Environment, 2022). The Study Area occurs west of the species mapped distribution. This species occurs in open woodland dominated by *Melaleuca viridiflora* or mangroves.	**No** The Study 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 of the Study Area.	**Unlikely**

Species	Status (EPBC Act[1], NC Act[2])	Distribution and habitat requirements	Potential habitat utilisation in Project Area			Records	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, 2022). Only the far eastern extent of the Study Area occurs within the species distribution.	**No** Suitable swamp or rainforest habitat does not occur within the Study Area. The Study Area is not located in a coastal area.			**No** No ALA or WildNet records occur within 20 km of the Study Area. The nearest ALA record is 60 km to the north-east of the Study 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, 2022). The Study Area occurs to the west of the species distribution.	**No** No suitable rainforest habitat occurs within the Study Area.			**No** No WildNet records within 20 km or ALA records within 100 km of the Study Area. ALA records occur only within the wet tropical regions and do not extend further south than Mission Beach.	**Unlikely**

Species	Status (EPBC Act[1], NC Act[2])	Distribution and habitat requirements	Potential habitat utilisation in Project Area			Records	Likelihood of Occurrence
			Breeding / Roosting / Nesting	Foraging	Dispersal		
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, 2008b). The Study 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 Study Area.			**No** No ALA or WildNet records within 20 km of the Study Area. A single historical ALA record (1933) occurs in Ingham, >20 km from the eastern extent of the Study Area.	**Unlikely**
Granite nightshade *Solanum graniticum*	E, E	*Solanum graniticum* occurs in central and northern Queensland and is naturally very rare. It is known only from four locations: Gloucester Island, Cape Gloucester on the adjacent mainland north of Proserpine, Eungella Dam west of Mackay and Mount Zero-Taravale Sanctuary north west of Townsville. The Study Area does not occur within the mapped distribution of the species as per SPRAT. *Solanum graniticum* occurs in eucalypt woodland on hillsides in shallow soils derived from granite and granodiorite. In most cases *Eucalyptus drepanophylla* is present and in many instances a dominant component of the vegetation. Little is known on the ecological requirements and life history traits of this species however and further research is needed (Threatened Species Scientific Committee, 2021).	**Yes** The Study Area contains eucalypt woodland on granite hillsides, however *Eucalyptus drepanophylla* is not present.			**No** No ALA or WildNet records occur within 20 km of the Study Area. The nearest record (ALA) is >35 km to the south east in Mount Zero – Taravale reserve where the species is known to occur.	**Unlikely**

Species	Status (EPBC Act[1], NC Act[2])	Distribution and habitat requirements	Potential habitat utilisation in Project Area			Records	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, 2022). There are six recorded collections of *Tephrosia leveillei* one of which is from Mt Fox (1949). Approximately 100 km of the Study 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 Study Area.			**Yes** This species is known from the Mt Fox area, which is where the eastern extent of the Study Area occurs. Two ALA records (2004 & 2008) occur ~80 km north, north-west of the Study 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, 2008e). 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 Study 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 Study 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 Study Area.	**Unlikely**

Species	Status (EPBC Act[1], NC Act[2])	Distribution and habitat requirements	Potential habitat utilisation in Project Area			Records	Likelihood of Occurrence
			Breeding / Roosting / Nesting	Foraging	Dispersal		
Birds							
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, 2022). 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 Study 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 small size of the dams, 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 (1 km) occurs south of Greenvale approximately 50 km away. Multiple records occur > 65 km to the west near Georgetown.	**Potential**

Species	Status (EPBC Act[1], NC Act[2])	Distribution and habitat requirements	Potential habitat utilisation in Project Area			Records	Likelihood of Occurrence
			Breeding / Roosting / Nesting	Foraging	Dispersal		
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, 2022). 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, 2009b).	**Yes** The Study Area contains REs that the species is known to occur in. At one location this habitat contains potential nesting trees, foraging grasses and occurs within 400 m of a water resource (the Copperfield River).	**Yes** REs that the species is known to inhabit occur within 3 km of the one area of potential breeding habitat and contain foraging grasses although in low abundance. Six of the eight preferred foraging grass species have been recorded within the Study Area but are rare.	**Yes** All remaining vegetation that occurs within 3 km of the one area of potential breeding habitat is considered suitable for dispersal.	**Yes** The WildNet report specifies 9 records occur within 20 km of the Study Area, with the most recent from 1976. The far eastern Study Area also intersects a mapped Important Area, which are based off known records post-1995. 'Essential habitat' for this species is mapped by DES in three locations surrounding the Study Area. However, field validated habitat within the Study Area is very limited and foraging grasses were generally rare.	**Potential**

Species	Status (EPBC Act[1], NC Act[2])	Distribution and habitat requirements	Potential habitat utilisation in Project Area			Records	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, 2022).	**No** The Study Area is outside the distribution of this species. No suitable habitat is therefore expected to occur within the Study Area.			**No** No ALA or WildNet records within 20 km of the Study 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, 2022). 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 considered marginal due to the small size of the dams, the lack of fringing aquatic vegetation and frequent cattle pugging.		**Yes** No WildNet records occur within 20 km. ALA records occur within the Study 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**

Species	Status (EPBC Act[1], NC Act[2])	Distribution and habitat requirements	Potential habitat utilisation in Project Area			Records	Likelihood of Occurrence
			Breeding / Roosting / Nesting	Foraging	Dispersal		
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, 2022). 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 Study Area is not coastal or tidal and does not contain sandflats or mudflats.	**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 Study 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	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, 2022). 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** Only one perennial watercourse intersects the Study Area: the Burdekin River. Habitat containing hollow-bearing eucalypts does occur within 4 km of the Burdekin River. However tree species present are not the same as the species is known to utilise in the east (*E. tintinnans*).	**Yes - marginal** The Study 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 Study 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 Study Area, east of Einasleigh.	**Unlikely**

Species	Status (EPBC Act[1], NC Act[2])	Distribution and habitat requirements	Potential habitat utilisation in Project Area			Records	Likelihood of Occurrence
			Breeding / Roosting / Nesting	Foraging	Dispersal		
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 Study Area contains riparian eucalypt woodland habitat suitable for nesting. Raptor nests were occasionally recorded in this habitat during the field survey program.	**Yes** The Study 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 Study 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	Likelihood of Occurrence
			Breeding / Roosting / Nesting	Foraging	Dispersal		
Masked owl (northern) *Tyto novaehollandiae kimberli*	V, V	The masked owl (northern) is known to use a range of habitat types in Queensland including riparian woodland, rainforest, open forests, *Melaleuca* swamps and mangrove edges. It feeds primarily on small to medium sized mammals and requires large trees with large hollows for nesting. Nesting usually occurs within patches of closed forest (Garnett & Crowley, 2000). 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, 2022).	**Yes - marginal** No vegetation communities that have a 'closed forest' structure occur within the Study Area. There are however areas of remnant woodland and forest that contains medium to large hollows suitable for nesting.	**Yes** The Study Area contains a variety of vegetation communities suitable for foraging including riparian woodland and open forests. As this species is highly mobile, habitat that is suitable for foraging is 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**

Species	Status (EPBC Act[1], NC Act[2])	Distribution and habitat requirements	Potential habitat utilisation in Project Area			Records	Likelihood of Occurrence
			Breeding / Roosting / Nesting	Foraging	Dispersal		
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. The red goshawk breeds solitarily, in forested or wooded areas, within one km of permanent water, and in a large (over 20 m tall) tree. 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, 2022).	**Yes** Within the Study Area, only areas of the 'Open Eucalyptus, Casuarina 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 Study 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 Study 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**

Species	Status (EPBC Act[1], NC Act[2])	Distribution and habitat requirements	Potential habitat utilisation in Project Area			Records	Likelihood of Occurrence
			Breeding / Roosting / Nesting	Foraging	Dispersal		
Southern cassowary *Casuarius casuarius johnsonii*	E, V	The southern 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, 2022). Only the very far eastern Study 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 Study Area. Habitat modelling referred to in the species' Recovery Plan indicates no essential or core habitat occurs within the Study Area.	**No** No rainforest habitat or habitat containing large fruiting trees occurs within the Study Area. This species is highly mobile and considered unlikely to utilise the habitat within the Study 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 Study 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**

Species	Status (EPBC Act[1], NC Act[2])	Distribution and habitat requirements	Potential habitat utilisation in Project Area			Records	Likelihood of Occurrence
			Breeding / Roosting / Nesting	Foraging	Dispersal		
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, 2022). The squatter pigeon (southern) 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 suitable for breeding.	**Yes** The Study Area contains vegetation on suitable land zones (3, 5 and 7) that is >1 km from permanent water but < 3 km which is suitable for foraging.	**Yes** All remaining vegetation within the Study Area that is not suitable for breeding or foraging is considered suitable for dispersal.	**Yes** This species was recorded within the Study Area during the field survey program. 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	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, 2022).	**Yes** The Study 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 Study Area are considered suitable for foraging and dispersal.		**Yes** An ALA record from 2000 occurs within 2 kms of the Study 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 Study Area.	**Likely**

Species	Status (EPBC Act[1], NC Act[2])	Distribution and habitat requirements	Potential habitat utilisation in Project Area			Records	Likelihood of Occurrence
			Breeding / Roosting / Nesting	Foraging	Dispersal		
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, 2022). 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 Study Area, the tree species' bearing are not the preferred. The Study Area is not coastal and as such no lowland habitat is present.	**No** Woodland, forest and open environments occur within the Study Area however at elevations ranging from 400 m to 800 m. As such, no habitat within the Study Area is considered suitable for foraging or dispersal.		**No** No WildNet records occur within 20 km or ALA records within 40 km of the Study Area. The nearest record occurs ~45 km to the north east of the eastern Study Area, near Girringun National Park closer to the coast.	**Unlikely** Bat call analysis completed by Greg Ford did not identify this species as an occurrence within the Study Area.

Species	Status (EPBC Act[1], NC Act[2])	Distribution and habitat requirements	Potential habitat utilisation in Project Area			Records	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, 2022). As per the species' SPRAT, the Study 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 Study Area does not contain areas of Pandanus however some woodlands and forests contain hollow-bearing eucalypts.	**Yes – marginal** The Study 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 Study Area. All recent records of this species occur approximately 200 km north. The WildNet report identified one record within 20 km dated 1986.	**Unlikely**

Species	Status (EPBC Act[1], NC Act[2])	Distribution and habitat requirements	Potential habitat utilisation in Project Area			Records	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, 2022). The Study 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. Ghost bats disperse widely when not breeding, but concentrate in a relatively few roost sites when breeding. During the daytime they roost in caves, rock crevices and old mines. Most breeding sites appear to require multiple entranced caves (Threatened Species Scientific Committee, 2016a). 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.	**No** No caves or large rock crevices suitable for roosting occur within the Study Area. A number of 'abandoned mines' occur in the local area as per the DoR 'Mineral resource sites', however these were investigated in targeted ghost bat surveys and none were found to contain mine shafts suitable for roosting.	**No** As no potential breeding habitat occurs, foraging habitat is also considered absent as this species stays within proximity of roost sites while foraging.	**Yes** During the non-breeding season ghost bats disperse widely and may utilise all vegetation within the Study Area for dispersal.	**Yes** No WildNet records occur within 20 km. No ALA records occur within 50 km of the Study 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**

Species	Status (EPBC Act[1], NC Act[2])	Distribution and habitat requirements	Potential habitat utilisation in Project Area			Records	Likelihood of Occurrence
			Breeding / Roosting / Nesting	Foraging	Dispersal		
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 (Department of Agriculture Water and the Environment, 2021b; McGregor et al., 2020). 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, 2021b). 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 Study Area contains connected, tall eucalypt woodlands and forests in close proximity to potential breeding habitat; these vegetation communities are suitable for foraging.	**Yes** Habitat within the Study 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 Study 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	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, 2022). 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 program, and the nearest occurs >30 km east in Ingham. As such, the Study Area does not contain potential roosting habitat.	**No** Although vegetation communities within the Study Area may provide suitable foraging resources, the Study 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 Study 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 Study 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, 2022). 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.	**Yes - Refuge** The Study Area contains remnant eucalypt woodlands and forests dominated by on alluvial substrates or	**Yes** Potential foraging habitat within the Study Area includes other areas of vegetation (remnant or	**Yes** The Study Area also contains vegetation (any condition) that is not dominated by	**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	**Likely**

Species	Status (EPBC Act[1], NC Act[2])	Distribution and habitat requirements	Potential habitat utilisation in Project Area			Records	Likelihood of Occurrence
			Breeding / Roosting / Nesting	Foraging	Dispersal		
		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.	in connected patches > 500 ha in the landscape. These areas are considered to provide suitable refuge habitat.	HVR condition) that contain suitable koala foraging species but do not meet refuge requirements .	*Eucalyptus spp.* but still contains rare to occasional food trees . These areas are likely to be used to disperse between areas of foraging/refuge habitat.	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.	

Species	Status (EPBC Act[1], NC Act[2])	Distribution and habitat requirements	Potential habitat utilisation in Project Area			Records	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, 2022). 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 Study Area does not contain caves or underground mines located in rainforest.	**No** The Study Area lacks the preferred habitat of rainforest and gallery forest-lined creeks.		**No** No ALA records occur within 50 km of the Study Area. The WildNet report identified one record within 20 km of the Study 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 Study Area.

Species	Status (EPBC Act[1], NC Act[2])	Distribution and habitat requirements	Potential habitat utilisation in Project Area			Records	Likelihood of Occurrence
			Breeding / Roosting / Nesting	Foraging	Dispersal		
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, 2022). Den-tree species usually include *Eucalyptus platyphylla*, *E. tereticornis*, *Corymbia intermedia* and *C. clarksoniana* (Parson & 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 & Latch, 2007). The species is only found in a narrow 122 km long strip of the southern Wet Tropics of north Queensland. The Study Area is located approximately 8 km to the west of this area and is therefore outside of the species' range.	**No** As the Study Area does not occur within the species' distribution, no suitable habitat occurs. Only 1% of the Study Area occurs within the Wet Tropics bioregion.			**No** No ALA records occur within 20 km of the Study Area. The WildNet report specifies 30 records occurs within 20 km however these are likely to all occur east of the Study Area where the species is known to occur. This species was not recorded during the field survey program.	**Unlikely**

Species	Status (EPBC Act[1], NC Act[2])	Distribution and habitat requirements	Potential habitat utilisation in Project Area			Records	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, 2022). 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 - marginal** The Study Area contains rocky areas including boulder outcrops as well as relatively complex eucalypt forest and woodland. However, the targeted northern quoll survey found denning opportunities across these areas to be very low.	**Yes - marginal** The Study Area contains patches of mature forest and woodland vegetation that are within 1 km of marginal denning habitat. These areas may provide connectivity between denning habitat and landscape features such as water sources and are thus considered suitable for foraging and dispersal.		**Yes** No WildNet records occur within 20 km. However, a record from 1997 occurs within 50 km of the Study 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 program including during the targeted northern quoll survey.	**Potential**

Species	Status (EPBC Act[1], NC Act[2])	Distribution and habitat requirements	Potential habitat utilisation in Project Area			Records	Likelihood of Occurrence
			Breeding / Roosting / Nesting	Foraging	Dispersal		
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 Study 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, 2022).	**No** As the Study Area does not occur within the species' distribution, no suitable habitat occurs.			**No** No ALA or WildNet records occur within 20 km of the Study 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	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, 2022). The eastern extent of the Study 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 Study Area and may be suitable for roosting.	**Yes - marginal** Habitat within the Study 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 Study 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, 2022). 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** This species was observed utilising rocky outcrops with large boulders piles within the Study Area during the field program. These areas are likely suitable for breeding and refuge.	**Yes** All woodlands and forests on rocky substrates (land zone 11 or 12) that occur between or east of breeding habitat (within the species' modelled distribution) are considered to provide suitable foraging and dispersal habitat.		**Yes** This species was recorded within the Study Area during the field survey program. The WildNet report specifies 37 records within 20 km, with the most recent from 1988.	**Known**

Species	Status (EPBC Act[1], NC Act[2])	Distribution and habitat requirements	Potential habitat utilisation in Project Area			Records	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, 2022). Only the far eastern extent of the Study 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, 2019b).	**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 Study 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 Study Area near the Gregory Highway. The WildNet report specifies one record occurs within 20 km also from 1974 (likely the same record). Another ALA record (2007) occurs within 40 km to the south east. The closest known roost is at Ingham (~40 km east of the Study Area). This species was not recorded during the field surveys.	**Potential**

Species	Status (EPBC Act[1], NC Act[2])	Distribution and habitat requirements	Potential habitat utilisation in Project Area			Records	Likelihood of Occurrence
			Breeding / Roosting / Nesting	Foraging	Dispersal		
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, 2022). 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 Study Area occurs directly west of the species distribution.	**No** The Study Area does not occur within the mapped distribution of the species. Furthermore, no closed forest occurs within the Study Area that would be suitable for the species.			**No** No WildNet records occur within 20 km or ALA records within 30 km of the Study 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 surveys.	**Unlikely**

Species	Status (EPBC Act[1], NC Act[2])	Distribution and habitat requirements	Potential habitat utilisation in Project Area			Records	Likelihood of Occurrence
			Breeding / Roosting / Nesting	Foraging	Dispersal		
Reptiles							
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 Study Area does not occur within the mapped distribution of the species. Furthermore, no rainforest interfaces occur within the Study 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**
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, 2022). The Study 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	**Yes - marginal** The Study Area contains rocky areas within open dry sclerophyll forest or woodland on land zones 3, 5 and 7. However, the targeted survey found these areas generally contained a low abundance of burrowing opportunities and/or microhabitat features including large fallen logs.	**NA**		**Yes** No WildNet records occur within 20 km or ALA records within 50 km of the Study 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	Likelihood of Occurrence
			Breeding / Roosting / Nesting	Foraging	Dispersal		
		piles, dense ground-covering vegetation, and deeply eroded gullies, tunnels and sinkholes (Department of Sustainability Environment Water Population and Communities, 2011a). The core habitat of this species is within the Mulga Lands and Brigalow Belt South Bioregions.					
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 Study 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 Study 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 Study Area however it specifies it is from Birthday Creek, which is located within Paluma National Park east of the Study Area. All other ALA records occur >20 km to the north east and south east in National Park.	**Unlikely**

Species	Status (EPBC Act[1], NC Act[2])	Distribution and habitat requirements	Potential habitat utilisation in Project Area			Records	Likelihood of Occurrence
			Breeding / Roosting / Nesting	Foraging	Dispersal		
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*). All records of the frog have been on the rhyolites of the Glen Gordon Volcanics with altitudes above 800 m. 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 Study 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 Study Area.			**No** No WildNet records occur within 20 km or ALA records within >50 km of the Study Area. All ALA records occur near Ravenshoe, the known location for the species more than 100 km to north.	**Unlikely**
Fish							
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, 2022).	**No** The Study Area does not contain streams within rainforest habitat. The Study 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 Study Area.	**Unlikely**

6.8 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 eight migratory species were found to be unlikely occurrences. These species and the reason for this determination is as follows:

- Yellow wagtail (*Motacilla flava*): no records occur within the area surrounding the Study Area. Only small numbers of this species visit Australia, and while some marginal habitat does occur within the Study Area it is unlikely to be preferential to migrating individuals.
- Pectoral sandpiper (*Calidris melanotos*) and Latham's snipe (*Gallinago hardwickii*): no records occur within the area surrounding the Study Area and the species are not known to utilise 'dams' as per SPRAT. Farm dams that occur within the Study Area are limited and considered unsuitable due to the lack of required habitat features (i.e. dense fringing vegetation and or mud flats) and frequent cattle use.
- Barn swallow (*Hirundo rustica*), grey wagtail (*Motacilla cinerea*), osprey (*Pandion haliaetus*) and salt-water crocodile (*Crocodylus porosus*): no records occur within the area surrounding the Study Area. This species is typically found along the Queensland coastline and the Study Area is approximately 50 km from the coast.

The detailed likelihood of occurrence assessment is detailed in Table 13 below. Potential migratory bird habitat as well as the confirmed record of glossy ibis identified during the field survey within the Study Area are displayed on Figure 28.1 to Figure 32.5.

Table 13 Migratory species likelihood of occurrence assessment

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							
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, 2022). 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 Study Area. Therefore no potential breeding habitat occurs.	**Yes - marginal** The Study 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 Study Area. Multiple records occur within 50 km however these occur along the coast or near the Herbert River.	**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		
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, 2022). 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 Study Area to forage and disperse across the landscape.		**Yes** Two 2013 ALA records occur within 10 km of the Study Area at Greenvale. A large number of records occur within 50 km, mostly along the coast. The WildNet report identified one 2013 record within 20 km.	**Likely**

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		
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, 2015b).	**NA** This species does not breed in Australia.	**Yes** The Study Area contains a range of open woodlands and forests that may be used by the species for foraging and dispersal.		**Yes** ALA records occur at 3 locations within 10 km of the eastern Study Area. 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**

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		
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, 2015b).	**No** The Study 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 Study Area.			**No** No ALA or WildNet records occur within 20 km of the Study 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, 2015b). 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 Study Area	**Yes – marginal** Although rainforest habitat (the preferred foraging habitat) does not occur within the Study 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 Study Area.		**Yes** ALA records occur at 3 locations within 10 km of the eastern Study Area. Two records are undated and have a high degree of spatial uncertainty. The third occurs at Mount Fox and is from 2000. The WildNet report identifies 20 records within 20 km.	**Potential**

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		
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, 2015b). 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 Study 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 Study Area). There is no clear differentiation in habitat utilisation by this species.			**Yes** Two ALA records (2008 & 2020) occur within 10 km of the Study Area near Mount Fox. The WildNet report identifies 32 records within 20 km.	**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, 2015b). 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 Study Area. The Study 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 Study 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, 2015b). Habitat requirements for the species 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 Study Area does not contain dense vegetation or mangroves.	**Yes** The Study 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 Study Area. All records in the wider area occur in coastal locations.	**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		
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, 2015b). Only the eastern Study 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 Study 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 Study Area, that is within the species' distribution is potentially suitable.		**Yes** No ALA or WildNet records occur within 20 km of the Study Area. However, scattered records occur in the surrounding area (<50 km) particularly towards Mount Fox.	**Potential**

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		
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, 2015b). Only the eastern Study 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 Study 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 7 locations within 15 km of the Study 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 Study Area.	**Potential**

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		
Wetland Birds							
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, 2022). 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 Study 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 and small in size.		**Yes** No ALA or WildNet records occur within 20 km of the Study Area. Most records in the local region are concentrated along the coast, however scattered inland records do also occur.	**Potential**

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		
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, 2022). 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 Study 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 1 km of the Study 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**

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		
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, 2022). 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 Study Area is not coastal or near coastal. Farm dams within the Study 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 Study 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, 2022). 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 Study Area.	**Yes - marginal** This species is known to utilise dams. Freshwater farm dams occur within the Study 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 Study 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**

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		
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, 2022). 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 Study 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 Study Area given the limited extent of potential habitat.		**No** No ALA or WildNet records occur within 20 km of the Study Area. Inland records do occur within 50 km 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, 2022). It is mostly found in sheltered coastal embayments 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.	**No** Farm dams within the Study 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 Study 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 Study 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**

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		
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, 2022). 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 Study Area is considered unlikely to be suitable for the nesting of this species.	**Yes - marginal** The Study Area does not contain coastal habitats or large terrestrial wetlands. However, major watercourses including the Burdekin River intersect the Study Area and may be used occasionally by osprey individuals.		**No** No WildNet records occur within 20km or ALA records within 50 km of the Study 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, 2022). 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 utilise dams. Freshwater farm dams and watercourses occur within the Study Area and may be used as a temporary foraging resource for dispersing individuals. However habitat is considered marginal due to the frequent cattle use and small size.		**Yes** Most ALA records are along the coast; however there are scattered records further inland surrounding the Study Area, including a record from 2003 within 2 km on Mount Fox Road. No WildNet records occur within 20 km.	**Potential**

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		
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, 2022). Preferred habitat for foraging and breeding are freshwater 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 Study Area and may be used as a temporary foraging resource for dispersing individuals. However habitat is considered marginal due to the frequent cattle use and small size.		**Yes** This species was recorded at Murray's Lagoon within the Study Area. ALA records occur at 5 locations within 5 km of the Study Area with the most recent from 2013. The WildNet report identifies one record (2013) within 20 km.	**Known**

6.9 Nuclear actions

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

6.10 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.

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 MNES values are outlined in Section 8.0.

7.1 Construction phase

The greatest risk of potential impact on MNES 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. The duration of the impact will be limited to the construction period. 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

The worst-case scenario extent of clearing impacts to each potential, likely or known MNES are detailed in Table 14. Direct impact areas have been increased by 1% for all values except Sharman's rock wallaby (i.e. no contingency allowed in these areas of potential habitat) to allow for any variation in construction methodology that may be required within the Project Area (see Section 2.1). Clearing will only be completed strictly as needed and will be minimised wherever possible and practical.

As it is possible the contingency clearing allowance will not be used, it is noted that the impact areas detailed in in Table 14 may be an over-estimation for most values. This is further supported by the fact that the areas of potential Sharman's rock wallaby habitat (where no contingency has been allowed) also provide potential habitat for a number of other MNES values.

For MNES 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 Study Area have been field validated however a conservative and precautionary approach has been implemented in the mapping of potential MNES.

As construction will occur in phases, direct impacts will be limited to a relatively small area within the Study Area at a time. The staging will increase the frequency of direct impacts to values; however it will substantially reduce the duration of the overall permanent impact by gradually and progressively undertaking the clearing. Given this, direct impacts are considered to be predictable and known.

Table 14 Direct impacts on MNES

MNES	Likelihood of Occurrence	Potential habitat utilisation	Maximum direct impact area (ha)
Flora			
Blue grass	Potential	-	37.82
Tephrosia leveillei	Potential	-	62.86
Fauna			
Black-throated finch (southern)	Potential	Nesting	0.07
		Foraging	0.75
		Dispersal	20.32
Curlew sandpiper	Potential	Foraging and dispersal	7.03
Australian painted snipe			
Red goshawk	Potential	Nesting	5.14
		Foraging and dispersal	610.44
Grey falcon	Potential	Nesting	62.86
		Foraging and dispersal	553.04
Masked owl (northern)	Likely	Nesting (marginal)	48.20
		Foraging and dispersal	567.70
White-throated needletail	Likely	Roosting and foraging	57.97
		Foraging and dispersal	631.91
Squatter pigeon (southern)	Known	Breeding	195.18
		Foraging	44.81
		Dispersal	450.07
Sharman's rock wallaby	Known	Breeding	6.29
		Foraging and dispersal	10.80
Northern quoll	Potential	Breeding and denning (marginal)	68.00
		Foraging and dispersal (marginal)	40.41
Koala	Likely	Refuge	585.78
		Foraging	16.99
		Dispersal	23.24
Greater glider	Known	Breeding and foraging	27.27
		Foraging and dispersal	40.64
Ghost bat	Potential	Dispersal only	615.89
Spectacled flying-fox	Potential	Foraging and dispersal	54.01
Yakka skink	Potential	Breeding and foraging	40.46

MNES	Likelihood of Occurrence	Potential habitat utilisation	Maximum direct impact area (ha)
		Breeding and foraging (marginal)	12.48
Migratory species			
Fork-tailed swift	Likely	Foraging and dispersal	689.88
Oriental cuckoo	Likely	Foraging and dispersal	614.56
Black-faced monarch	Potential	Foraging and dispersal (marginal)	235.78
Spectacled monarch	Potential	Breeding, foraging and dispersal (marginal)	323.57
Satin flycatcher	Potential	Foraging and dispersal	235.78
Rufous fantail	Potential	Foraging and dispersal	322.57
Caspian tern	Potential	Foraging and dispersal	5.30
Red-necked stint	Potential	Foraging and dispersal	7.03
Common sandpiper	Potential		
Sharp-tailed sandpiper	Potential		
Common greenshank	Potential		
Glossy ibis	Known		

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.

MNES that are considered most susceptible to fragmentation impacts as a result of the construction of the Project include yakka skink, greater glider and Sharman's rock wallaby. Sharman's rock wallabies are very timid in nature and easily disturbed; cleared areas between or within areas of suitable habitat may be no longer used due to their exposed nature and the increased risk of predation. Both the greater glider and yakka skink are considered to have a low dispersal ability. Gaps between areas of suitable habitat may restrict movement of individuals and access to required habitat resources.

The maximum clearing widths for infrastructure largely reflect the Project Area width (60 m) and as such fragmentation impacts to koala, northern quoll, threatened birds and bats are considered low. All of these species are either highly mobile, adapted to fragmented landscapes or are 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 MNES 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.

MNES that are most susceptible to fauna mortality as a result of construction of the Project include yakka skink, Sharman's rock wallaby, greater glider, koala and squatter pigeon (southern).

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 in the form of habitat degradation. 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 Study 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.
- Increased risk of contamination associated with activities such as refuelling or storage of chemicals.
- 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 plants may have potential impacts on vegetation if excessive levels are sustained over extended periods. When dust settles on plant foliage, it can reduce the amount of light penetration on the leaf surface, block and damage stomata, and slow rates of gas exchange and water loss. Diminished ability to photosynthesise due to physical effects may result in reduced growth rates of vegetation and decreases in floral vigour and overall community health. The potential effects of dust deposition on vegetation are determined by a number of factors including:
    - the characteristics of leaf surfaces, such as surface roughness, influencing the rate of dust deposition on vegetation
    - concentration and size of dust particles in the ambient air and its associated deposition rates
    - local meteorological conditions and the degree of penetration of dust into vegetation.
- Increased noise and light levels affecting foraging and breeding behaviour for some fauna species or resulting in complete avoidance and displacement from habitats. Fauna will generally move away from noise and light sources as these may be perceived as a threat. Acclimatisation by some species is likely to occur over the medium to long term and many of the species identified in the Study Area are known to occur in areas subject to noise, light and general activity.
- 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.

All MNES are susceptible to these indirect impacts to some degree; however, some are known to be more susceptible than others, or have been identified as key threatening processes for the MNES. The susceptibility of the specific MNES values identified within the Study Area to the potential indirect impacts is outlined in Table 15.

Table 15 MNES at risk of indirect impacts associated with the construction phase of the Project

Indirect Impact	Relevant MNES	Potential Impact	Frequency	Duration	Magnitude
Weed and pest incursion	Blue grass (*Dichanthium setosum*)	Encroachment of exotic pasture grass could lead to increased competition for resources (sunlight, water etc) with blue grass individuals within the retained areas of potential habitat. Although the Project is highly unlikely to lead to increased pest animal populations, increased access by ungulates such as feral pigs, horses and cattle, could lead to overgrazing and reduced recruiting potential.	Infrequent / periodic - fluctuate seasonally and with land management practices or breaches in general construction protocols (weed washdowns, etc).	Temporary – outbreaks addressed via general land management obligations under State laws.	Localised, but could extend to the broader Study Area. Magnitude also considered low given existing condition of habitat is already impacted by weeds and pests.
	Black-throated finch (southern)	Although preferred foraging grasses are generally in low abundances across the Study Area, encroachment of exotic pasture grass could lead to a decline in these native grasses (and thus a decline in foraging habitat quality) due to increased competition for resources (sunlight, water etc) within the retained areas of potential habitat.			
	Sharman's rock wallaby	Predation by feral cats is a recognised threat to this species as per the Conservation Advice. Increased feral cat presence may lead to higher mortalities due to the species ground-dwelling nature. However, findings of the field survey indicate that the feral cat population is already high in the area. Furthermore, the Project Area has been co-located with an area that may already provide a conduit for pest movement. Therefore, it is considered unlikely the Project will to lead to a notable increase in pest populations.			
	Squatter pigeon (southern) and grey falcon	Potential habitat within the Study Area includes breeding/nesting, foraging and dispersal. The squatter pigeon (southern) is completely ground dwelling and the grey falcon may roost on areas of bare ground at night. As such, individuals utilising the Study Area will be highly susceptible to an increase in pest predator species such as feral cats and foxes. However, as detailed above feral cat population levels are high and the Project Area has been co-located with an area that may already provide a conduit for pest movement. Therefore, it is considered unlikely the Project will to lead to a notable increase in pest populations.			
	Australian painted snipe, curlew	Quality and availability of foraging resources are directly related to condition of aquatic habitat and therefore increased weed incursion could impact on species habitat in the Study Area. Heavy and ongoing			

Indirect Impact	Relevant MNES	Potential Impact	Frequency	Duration	Magnitude
	sandpiper and other wetland migratory birds	cattle use however has already significantly reduced the quality of foraging resources. Wetland bird species are also high susceptible to predation due to their ground roosting habits. However, the Project Area has been co-located with an area that may already provide a conduit for pest movement. Therefore, it is considered unlikely the Project will to lead to a notable increase in pest populations.			
	Northern quoll	Any potential increase in cane toad populations or pest predator species as a result of the Project could threaten any potential northern quoll populations within the Study Area. Cane toads were recorded during the field survey and are likely to be common in the area. Furthermore, the Study Area is generally dominated by free-draining soils and as such it is considered unlikely the Project will lead to increased areas of inundation which would be suitable for the cane toad.			
	Koala	Any potential increase in wild dog populations as a result of the Project could threaten any potential koala populations within the Study Area. However, as above it is considered highly unlikely the Project will lead to a notable increase in pest populations due to the presence of an existing conduit for movement.			
	Yakka skink	Although targeted surveys did not find any evidence of presence, it is possible that a very small number of individuals utilising the potential habitat of the Study Area. Such individuals will be highly susceptible to an increase in pest predator species such as feral cats, cane toads and foxes. As above, it is considered highly unlikely the Project will lead to a notable increase in pest populations.			
Erosion, sedimentation and reduced water quality	Australian painted snipe, curlew sandpiper and other wetland migratory bird species	Quality and availability of foraging resources are directly related to condition of aquatic habitat and therefore any reduction in water quality could impact on species habitat in the Study Area. Water quality of farm dams is anticipated to be of low quality due to heavy and ongoing cattle use.	Infrequent / periodic - fluctuate seasonally and with land management practices or breaches in general construction protocols.	Temporary – limited to once off incident or rectified through seasonal inundation diluting to background levels given the ephemeral nature	Localised / low – will only effect immediate area. Most habitat within the Study Area is already highly impacted by erosion and
Soil and water contamination					

Indirect Impact	Relevant MNES	Potential Impact	Frequency	Duration	Magnitude
Altered hydrology		Quality and availability of foraging resources are directly related to condition of aquatic habitat and therefore alteration to hydrology could impact on species habitat in the Study Area. Although water extraction will occur as a part of the construction phase of the Project, this will only occur at select locations where water availability is high and continual (i.e. flowing).		of most watercourses and waterbodies.	reduced water quality.
Elevated dust	*Tephrosia leveillei*	Although there are no known threats to this species, deposition of dust as a result of the Project could threaten the health and viability of potentially present individuals.	Infrequent – associated with breaches in general construction protocols.	Temporary – Potential impacts rectified through active management or through natural processes such as rainfall.	Localised / low – will only effect immediate area.
Noise and light disturbance	Australian painted snipe, curlew sandpiper and other wetland migratory birds	Most species are known to be easily startled. Noisy activities directly adjacent to potential habitat within the Study Area may disturb foraging individuals.	Occasional – minimal night or dusk work however foundation work during construction in rocky terrain may result in loud bursts of noise.	Temporary – minimal night and dusk work, significant excavation work likely required only within a portion of the Project Area and generally limited to tower locations.	Localised – restricted to confined worksite within Project Area.
	Greater glider, northern quoll and Sharman's rock wallaby	Increased lighting within or adjacent to potential habitat within the Study Area could increase predation of the species by visual predators or could alter foraging and breeding behaviours. Construction noise during the day may disturb denning or sheltering individuals and negatively affect circadian rhythms. The Sharman's rock wallaby may be highly susceptible to disturbance and stress-related impacts including abandonment of joeys.			
	Yakka skink	This species is easily startled and increased noise levels may impact on important functional requirements such as basking.			

7.2 Operation and maintenance phase

Potential impacts on MNES 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 as detailed in Section 2.2. Ancillary infrastructure will no longer be required once construction has finished.

Maintenance will involve vegetation clearing (predominantly ground slashing of regrowth canopy vegetation as needed) 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 MNES 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 MNES resulting in injury or mortality. These potential impacts will be mitigated through the implementation of the Project's 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.

Operation of the Project may also lead to an increased risk of fauna mortality as a result of electrocution. Of the known and potentially occurring MNES values, only one is known to be susceptible to transmission line collision: the spectacled flying-fox. The spectacled flying-fox is highly mobile and has complex and irregular movement patterns primarily determined by seasonal nectar flows. Spectacled flying-fox mortality rates as a result of electrocution are not well known however it is reported to be 'low' level threat to the species as per it's Conservation Advice (Threatened Species Scientific Committee, 2019b).

Mortality as a result of collision is also a known threat to the ghost bat, however this is restricted to fences as the species generally flies at much lower heights. Collision with transmission lines is not a known risk to the greater glider. Nonetheless, design of the Project Footprint has sought to maximise the use of high points in the landscape to allow large line spans and less vegetation clearing. Given the average tower height in the proposed transmission line is 60 m, it is considered highly unlikely that towers and connecting lines will be low enough to obstruct gliding. However, it is noted that the Project will occur adjacent to a lower, existing powerline which may obstruct gliding in select areas where gliding is required over a larger distance. Retention of riparian vegetation will ensure preferential movement corridors remain in the local area.

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 MNES 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 MNES 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 MNES.
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 MNES even with the implementation of the above principles.

Sections 8.1 and 8.2 describe how impacts on MNES will be avoided and minimised for the Project and Section 8.3 describes the 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 MNES 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 MNES 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 MNES 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.

Where possible, structures will be 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.

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 MNES values and sensitive environments.

Using the MNES habitat modelling (see Section 4.5), constraints mapping was developed to prioritise areas for footprint avoidance or minimisation. Constraint mapping considered both the sensitivity of MNES values to significant impacts, and the opportunities and feasibility to effectively manage risk of significant impacts through avoidance and minimisation.

The Project Area was spilt into four different constraint categories: very high, high, moderate and low. Areas of 'very high' constraint were determined to most value from footprint reduction, followed by 'high' and so on. The following items provide a summary of key constraints categorisations.

- Potential habitat for the Sharman's rock wallaby defined the extent of the 'very high' constraint area, as the species' is considered to be highly sensitive to potential significant impacts (has a very restricted distribution) and suitable habitat occurs only within a portion of the Project Area.
- Potential habitat areas for the northern quoll, black-throated finch (southern), Australian painted snipe and greater glider (breeding and foraging habitat) occur as patches across the Project Area and were deemed a high constraint.
- Although the koala and it's associated habitat is also considered to have a high sensitivity, these areas were not considered very high or high constraint areas in the context of footprint reduction activities. This is primarily due to the species' broad habitat requirements resulting in a very large availability within the Project Area or the surrounding local area or both. Therefore avoidance across the entirety of the Project Area would not be feasible.

Powerlink have gone through an extensive impact minimisation process to achieve approximately 40% reduction in direct impacts to MNES habitat. Although no MNES values could be completely avoided by the Project footprint, a significant reduction in direct impacts was gained for almost all values (Table 16). 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 indicative clearing areas were 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 generally a 40 x 40 or 50 x 50 metre pad to be cleared, with the exception of two tower sites which require a larger footprint for safety and constructability purposes.

Table 16 presents the direct impact reduction achieved through the optimised Project Footprint.

Table 16 Direct impact reduction following development of the optimised footprint

MNES	Likelihood of Occurrence	Potential habitat and utilisation	Area (ha) of potential habitat to be directly impacted		
			Original scenario - Full clearance of Project Area	Current scenario - Optimised footprint	Reduction in impacts (%)
Flora					
Blue grass	Potential	-	57.53	37.82	34
Tephrosia leveillei	Potential	-	106.60	62.86	41
Fauna					
Black-throated finch (southern)	Potential	Nesting	0.18	0.07	61
		Foraging	1.34	0.74	24
		Dispersal	35.3	20.12	43
Curlew sandpiper	Potential	Foraging and dispersal (marginal)	14.75	7.03	52
Australian painted snipe					
Red goshawk	Potential	Nesting	10.98	5.14	53
		Foraging and dispersal	953.86	610.44	36
Grey falcon	Potential	Nesting	66.15	62.86	41
		Foraging and dispersal	858.23	553.04	36
Masked owl (northern)	Likely	Nesting (marginal)	66.15	48.20	27
		Foraging and dispersal	898.69	567.70	37
White-throated needletail	Likely	Roosting and foraging	104.24	57.97	44
		Foraging and dispersal	1019.26	632.08	38
Squatter pigeon (southern)	Known	Nesting	309.23	195.18	37

MNES	Likelihood of Occurrence	Potential habitat and utilisation	Area (ha) of potential habitat to be directly impacted		
			Original scenario - Full clearance of Project Area	Current scenario - Optimised footprint	Reduction in impacts (%)
		Foraging	67.37	44.81	33
		Dispersal	746.9	450.07	40
Sharman's rock wallaby	Known	Breeding	19.07	6.29[A]	67
		Foraging and dispersal	21.2	10.80[A]	49
Northern quoll	Potential	Breeding and refuge (marginal)	135.28	68.00	50
		Foraging and dispersal (marginal)	72.87	40.41	45
Koala	Likely	Refuge	926.15	585.78	37
		Foraging	17.65	16.99	4
		Dispersal	30.14	23.24	23
Greater glider	Known	Breeding	46.22	27.27	41
		Foraging and dispersal	69.99	40.64	42
Ghost bat	Potential	Foraging and dispersal	964.84	615.89	36
Spectacled flying-fox	Potential	Foraging and dispersal	95.87	54.01	44
Yakka skink	Potential	Breeding and foraging	63.77	40.46	37
		Breeding and foraging (marginal)	17.08	12.48	27
Migratory species					
Fork-tailed swift	Likely	Foraging and dispersal	1123.50	690.05	39
Oriental cuckoo	Likely	Foraging and dispersal	962.11	614.56	36
Black-faced monarch	Potential	Foraging and dispersal (marginal)	339.82	235.78	31

MNES	Likelihood of Occurrence	Potential habitat and utilisation	Area (ha) of potential habitat to be directly impacted		
			Original scenario - Full clearance of Project Area	Current scenario - Optimised footprint	Reduction in impacts (%)
Satin flycatcher	Potential	Foraging and dispersal	483.81	323.57	33
Spectacled monarch	Potential	Breeding, foraging and dispersal (marginal)	339.82	235.78	31
Rufous fantail	Potential	Foraging and dispersal (marginal)	481.46	322.57	33
Caspian tern	Potential	Foraging and dispersal	10.64	5.30	50
Red-necked stint	Potential	Foraging and dispersal (marginal)	14.75	7.03	52
Common sandpiper	Potential				
Sharp-tailed sandpiper	Potential				
Common greenshank	Potential				
Glossy ibis	Known				

[A]: As detailed in Section 7.1.1, no clearing contingency has been allowed in areas of Sharman's rock wallaby habitat due to the species' highly sensitive nature. For all other MNES values, the Project Footprint impact area is inclusive of a 1% contingency to account for potential variation in construction methodology.

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 14 represent a maximum area. Direct impacts to MNES will be minimised where possible including through micro-siting.

8.3 Mitigate

To mitigate potential impacts to potentially occurring MNES values, an EMP has been developed for the Project. At present, only general mitigation and management measures relevant to MNES 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 MNES 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 MNES 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 suitably qualified spotter catcher present.
- In areas of MNES, 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 MNES will be avoided where possible. Where night works are required, lights will be directed to minimise light spill into adjacent habitats.
- 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.
- Wash 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 MNES are detailed in Table 17 below.

Table 17 Species-specific mitigation measures

MNES	Mitigation measure
Blue grass *Tephrosia levellei*	• Any populations will be identified, and the extent mapped during pre-clearance surveys. Confirmation of population avoidance will be completed during final scouting. The siting of infrastructure will avoid areas of known occurrence as a priority. • Clearing works will maintain a sufficient vegetation buffer where possible around identified locations of threatened flora to maintain suitable micro-climatic conditions. • Siting of infrastructure will 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.
Black-throated finch (southern)	• Pre-clearance surveys by a spotter-catcher will be undertaken in mapped habitat areas and near water sources to ensure any potential nests are located and their location demarcated. A sufficient buffer distance will be implemented to avoid potential disturbance and displacement until the nests have been vacated.
Sharman's rock wallaby	• Vegetation clearing required in areas of potential Sharman's rock wallaby habitat will be completed via hand clearing (chainsaw) where possible. This will only be completed where the hand-clearing method reduces the time required in areas of potential habitat. • Large boulders that must be removed for construction of the Project will be reinstated or relocated to adjacent areas of potential Sharman's rock wallaby habitat where possible. • All project activities will aim to cease at least one hour prior to dusk in areas of potential Sharman's rock wallaby habitat. This will ensure disturbance to foraging individuals will be kept to a minimum.
Koala	• Clearing must be carried out in a way that ensures any koala present have time to move out of the clearing site without human intervention. Koalas will not be forcibly relocated at any time.
Red goshawk and grey falcon	• Retain tall trees that contain potential raptor nests (even if abandoned), especially where located along watercourses where possible.
Ghost bat	• Where pits, voids or trenches are required, include appropriate cover to prevent extended water retention in these spaces and/or subsequent breeding opportunities for cane toads.
Ground-dwelling MNES 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.

MNES	Mitigation measure
Greater glider and masked owl	• All hollow-bearing trees will be inspected by a fauna spotter-catcher prior to clearing to identify any denning or nesting individuals.
Northern quoll	• Large hollow logs that must be removed from areas of potential northern quoll habitat will be retained and relocated to adjacent or nearby areas of suitable northern quoll habitat. • Where pits, voids or trenches are required, include appropriate cover to prevent extended water retention in these spaces and/or subsequent breeding opportunities for cane toads.
Yakka skink	• Large hollow logs that must be removed from areas of potential yakka skink habitat will be retained and relocated to adjacent or nearby areas of suitable yakka skink habitat. • Survey works conducted prior to clearing will include colony searches in areas of potential yakka skink habitat.
Australian painted snipe and wetland migratory birds	• Prior to construction works commencing, the spotter catcher will confirm the presence of any migratory birds that may be disturbed by the activity. • Water extraction will be conducted at an alternative location within the Project Area should an Australian painted snipe or migratory wetland bird be identified utilising the habitat. • Water extraction activities will be strictly controlled and monitored in liaison with the landholder to ensure no waterbodies are reduced to unusually low levels. Per waterbody, a single access point will be utilised for water extraction to minimise areas of disturbance and allow potentially occurring individuals to avoid the same area during construction. Existing access points to dams will be used preferentially over the creation of new ones.

9.0 Significant Impact Assessment

Potential impacts have been considered for MNES that have either been identified within the Study Area or assessed as potentially present. MNES subject to further impact assessment are summarised in Table 18 below.

Table 18 MNES subject to or discounted from Project impact considerations

MNES	Likelihood of occurrence	EPBC Act Status
CONSIDERED IN IMPACT ASSESSMENT PROCESS		
Blue grass	Potential	Vulnerable
Tephrosia leveillei	Potential	Vulnerable
Red goshawk	Potential	Vulnerable
Squatter pigeon (southern)	Known	Vulnerable
Black-throated finch (southern)	Potential	Endangered
Australian painted snipe	Potential	Endangered
Masked owl (northern)	Likely	Vulnerable
Grey falcon	Potential	Vulnerable
White-throated needletail	Likely	Vulnerable / Migratory
Curlew sandpiper	Potential	Critically Endangered
Koala	Likely	Vulnerable
Greater glider	Known	Vulnerable
Northern quoll	Potential	Endangered
Sharman's rock-wallaby	Known	Vulnerable
Ghost bat	Potential	Vulnerable
Spectacled flying-fox	Potential	Vulnerable
Yakka skink	Potential	Vulnerable
Fork-tailed swift	Likely	Migratory
Oriental cuckoo	Likely	Migratory
Black-faced monarch	Potential	Migratory
Spectacled monarch	Potential	Migratory
Satin flycatcher	Potential	Migratory
Rufous fantail	Potential	Migratory
Common sandpiper	Potential	Migratory
Sharp-tailed sandpiper	Potential	Migratory
Common greenshank	Potential	Migratory
Red-necked stint	Potential	Migratory
Caspian tern	Potential	Migratory
Glossy ibis	Known	Migratory

MNES identified as unlikely to occur within the Study Area have not been further considered. This includes the following:

- Broad leaf tea-tree (*Melaleuca viridiflora*) woodlands in high rainfall coastal north Queensland TEC
- Lowland tropical rainforest of the Wet Tropics TEC
- Threatened species:
  - *Acacia crombiei*
  - *Bulbophyllum globuliforme*
  - *Cajanus mareebensis*
  - *Corymbia leptoloma*
  - *Cycas cairnsiana*
  - *Cycas platyphylla*
  - *Dichanthium queenslandicum*
  - *Lindsaea pulchella var. blanda*
  - *Marsdenia brevifolia*
  - *Myrmecodia beccarii*
  - *Phaius australis*
  - *Phaius pictus*
  - *Phalaenopsis amabilis subsp. Rosenstromii*
  - *Solanum graniticum*
  - *Zeuxine polygonoides*
  - Buff-breasted button-quail
  - Eastern curlew
  - Gouldian finch
  - Southern cassowary
  - Spotted-tail quoll
  - Northern bettong
  - Black-footed tree rat
  - Mahogany glider
  - Semon’s leaf-nosed bat
  - Grey-headed flying-fox
  - Large-eared horseshoe bat
  - Bare-rumped sheath-tailed bat
  - Australian lace-lid
  - Magnificent brood frog
  - Opal cling goby
  - Freshwater sawfish
- Migratory species:
  - Salt-water crocodile
  - Barn swallow
  - Grey wagtail
  - Yellow wagtail
  - Pectoral sandpiper
  - Latham's snipe
  - Osprey.

9.1 Initial risk assessment

As detailed in Section 7.0, MNES values within the Project Area may be directly or indirectly impacted by the development of the Project. However the overall risk to MNES values, that is the risk of Project impacts constituting an impact which is “important, notable, or of consequence, having regard to its context or intensity”, will differ based on a combination of factors including the community or species’ ecological characteristics and the likely consequence of such impacts. As such, an initial risk assessment was undertaken in accordance with the developed risk framework (Appendix D) and the approach detailed in Section 4.6.1, to identify MNES that are at low risk of potential Project impacts and MNES that are at potential risk and require further assessment. This process was first undertaken in the 2021 assessment that was used to support the referral of the Project. For some values, the field data that was available at the time indicated uncertainty in the nature of potential impacts. In early 2021, the findings of the risk assessment determined that eight threatened species require further assessment against the significant impact assessment criteria:

- Black-throated finch (southern)
- Northern quoll
- Sharman’s rock wallaby
- Greater glider
- Koala
- Ghost bat
- Spectacled flying-fox
- Yakka skink.

The risk assessment detailed in the subsequent section (Table 19) has been updated to reflect the findings of targeted field surveys undertaken in 2021. Although for some species the risk ratings have been reduced full significant impact assessments have still been provided.

Significant impact assessments are discussed in Section 9.2 and detailed in full in Appendix E.

Table 19 Initial risk assessment

MNES	Habitat, Threats and Regional Context	Nature and Extent of Potential Impacts	Consequence	Likelihood	Risk Rating
Critically Endangered and Endangered species					
Australian painted snipe	The Australian painted snipe is a wading bird found in shallow terrestrial freshwater (occasionally brackish) wetlands, including temporary and permanent lakes, swamps and claypans generally across eastern Australia. Important areas for this species in the past have included the Murray-Darling Basin (particularly the Riverina of Victoria and New South Wales), Queensland Channel Country, Fitzroy Basin of Central Queensland, south-eastern South Australia and adjacent parts of Victoria. Within Queensland, records are most common in coastal areas however also occur at scattered locations inland. This species requires suitable wetland areas even in drought conditions and will move to suitable habitat if necessary. Nest records are nearly all from or near small islands in freshwater wetlands, provided that these islands are a combination of very shallow water, exposed mud, dense low cover and sometimes some tall dense cover (Department of Agriculture Water and the Environment, 2022). The main identified threat to the Australian painted snipe is the loss and degradation of wetlands, through drainage and the diversion of water for agriculture and reservoirs. Grazing and associated trampling of wetland vegetation by cattle and/or sheep is a threat to the species, particularly in arid regions where grazing tends to become concentrated around wetlands in the dry season.	This species is considered a potential occurrence within the Study Area due to the presence of suitable foraging and dispersal habitat. However, potential habitat is marginal as it is limited to watercourses and small farm dams that are frequently accessed by cattle and generally lack rank emergent fringing vegetation. Additionally, no public records (ALA or WildNet) occur within 40 km of the Study Area and as such it is likely that only a small number of dispersing individuals would utilise potential habitat on a transitory basis. Furthermore, areas of higher quality potential habitat occur in the wider area including State significant wetlands, which are more likely to be utilised. Within the Study Area a total of 80.06 ha potential habitat occurs (Figure 14). No areas of potential habitat are considered to comprise habitat critical to the survival of the species (wetlands providing potential breeding or foraging and roosting habitat) due to the degraded nature and inland location. A maximum of 7.03 ha of potential habitat will be directly impacted via vegetation clearing and some water extraction activities may be required. Water extraction activities will only occur where supplies are abundant. No substantial or permanent impacts on the hydrology will occur and therefore the continuation of current habitat quality and extent is anticipated. The Project will not create a barrier that may hinder access to potential habitat. As construction will occur in phases along the linear	2	Highly unlikely	**Low risk**

MNES	Habitat, Threats and Regional Context	Nature and Extent of Potential Impacts	Consequence	Likelihood	Risk Rating
		Project Area, it is highly unlikely all areas of potential habitat will be disturbed at one time allowing for individuals to move to avoid disturbed areas. Indirect impacts such as increased erosion, sedimentation and contamination will be managed as per Section 8.3. Other indirect impacts such increased dust, light and noise will be temporary and localised.			
Black-throated finch (southern)	The southern subspecies of black-throated finch occurs within two locations. In the Townsville region the species is considered locally common at sites around Townsville and Charters Towers. It also occurs at scattered sites in central-eastern Queensland, between Aramac and Great Basalt Wall National Park (Department of Agriculture Water and the Environment, 2022). No reliable estimates of population size are available. Based on this, recovery efforts should aim to conserve all existing populations. The black-throated finch (southern) occurs mainly in grassy, open woodlands and forests, typically dominated by *Eucalyptus*, *Corymbia* and *Melaleuca*, and occasionally in tussock grasslands or freshwater wetlands, often along or near watercourses or in the vicinity of water. As per the EPBC Act policy statement 3.13 *Significant impact guidelines for the endangered black-throated finch (southern)*, 'important areas' have been mapped for this species using confirmed records of the species. A significant impact on the species is likely if an action threatens to disrupt access to or availability of one or more of the three key resources (water, seeding	This species is considered a potential occurrence within the Study Area due to the presence of suitable habitat, an 'important area' in the east and records within 20 km. This species was not recorded during the field survey nor was any evidence of nesting. As per the EPBC Act policy statement 3.13 *Significant impact guidelines for the endangered black-throated finch (southern)* however, due to the presence of an 'important area' within the Study Area the species is assumed present. A total of 190.31 ha of potential habitat occurs within the Study Area which includes 0.20 ha of breeding, 16.25 ha of foraging and 173.86 ha of dispersal (Figure 15). All potential habitat is conservatively considered habitat critical to the survival of the species. Vegetation clearing required for the construction of the Project will result in direct impacts to 0.07 ha of potential breeding habitat, 2.26 ha of foraging habitat and 18.82 ha of dispersal habitat. As per the significant impact guideline for the species, the loss of key habitat resources (including nesting trees) and habitat critical to the survival of the species may result in a significant impact. Further investigation is therefore required.	3	Possible	**Potential risk, further assessment required**

MNES	Habitat, Threats and Regional Context	Nature and Extent of Potential Impacts	Consequence	Likelihood	Risk Rating
	grasses and nesting trees). Declines of black-throated finches (southern) have been linked to the degradation of habitat by pastoralism and the continued clearance of woodland habitats. Other threats to the species include altered fire regimes, degradation of habitat by weeds, illegal trapping, and predation by feral animals (Department of Agriculture Water and the Environment, 2022).				
Curlew sandpiper	The curlew sandpiper is a non-breeding migrant to Australia; the visiting population is estimated to be 115,000 individuals. In Australia, curlew sandpipers occur around the coasts and are also quite widespread inland though in smaller numbers. After a stopover in northern Australia migration continues on a direct route to south-east Australia, the first birds arriving in late August, but the majority not until September. Some birds are also thought to move through the Gulf of Carpentaria to east and south-east Australia, with records from coastal Queensland and NSW. Birds may return to the same non-breeding sites each year. They 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 are also recorded inland, though less often, including around ephemeral and permanent lakes, dams, waterholes and bore drains, usually with bare edges of mud or sand. Foraging occurs on mudflats and nearby shallow water, while roosting occurs generally on bare dry shingle, shell or sand	This species is considered a potential occurrence within the Study Area due to the presence of suitable foraging and dispersal habitat and two ALA records south west of Conjuboy (undated and 1970). However, potential habitat is marginal as it is limited to watercourses and small farm dams that are frequently accessed by cattle and generally lack mudflats. Only small numbers of this species occur inland. Furthermore, areas of higher quality potential habitat occur in the wider area including State significant wetlands, which are more likely to be utilised. Based on this and the low quality of potential habitat, only vagrant individuals are expected to utilise potential habitat on a transitory basis. Within the Study Area a total of 80.06 ha potential habitat occurs (Figure 14). No areas of potential habitat are considered to comprise habitat critical to the survival of the species due to the degraded nature and inland location. A maximum of 7.03 ha of potential habitat will be directly impacted via vegetation clearing and some water extraction activities may be required. Water extraction activities will only occur where supplies are abundant. No substantial or permanent impacts on	2	Highly unlikely	**Low risk**

MNES	Habitat, Threats and Regional Context	Nature and Extent of Potential Impacts	Consequence	Likelihood	Risk Rating
	beaches, sandspits and islets in or around coastal or near-coastal lagoons and other wetlands. The main threat to the curlew sandpiper, namely habitat loss due to land reclamation, occurs outside of Australia. In non-breeding grounds in Australia, this species mostly occurs in populated areas and is therefore vulnerable to habitat alteration. Other threats to curlew sandpiper include fragmentation of feeding sites, human and dog disturbance at feeding and roosting sites, and pollution (Department of Agriculture Water and the Environment, 2022).	the hydrology will occur and therefore the continuation of current habitat quality and extent is anticipated. The Project will not create a barrier that may hinder access potential habitat. As construction will occur in phases along the linear Project Area, it is highly unlikely all areas of potential habitat will be disturbed at one time allowing for individuals to move to avoid disturbed areas. Indirect impacts such as increased erosion, sedimentation and contamination will be managed as per Section 8.3. Other indirect impacts such increased dust, light and noise will be temporary and localised.			
Northern quoll	This species has a discontinuous distribution across northern Australia. In Queensland, populations have persisted despite the presence of cane toads in upland rocky areas and several coastal sites. As per the DES WetlandInfo website, northern quoll is known to occur within Girringun National Park which occurs north east of the Study Area. Although northern quolls can be found in a variety of habitat across their range, habitat critical to the survival of the species is considered offshore islands, rocky habitats and structurally diverse woodland or forest areas containing large diameter trees, termite mounds or hollow logs. Populations important for the long-term survival of the northern quoll (important populations) include high density quoll populations, which occur in refuge-rich habitat critical to the survival of the species, including where cane toads are present.	This species is considered a potential occurrence within the Study Area due to the presence of marginal suitable habitat and a record (1997) within 50 km. The Study Area also occurs within both the 'likely' and 'potential' area of the species' distribution as identified in the *EPBC Act referral guideline for the endangered northern quoll*. No evidence of this species including potential scats or signs were recorded during the reconnaissance or targeted field surveys. The targeted survey conducted in July 2021 included the recommended methodologies and effort is sufficient as per the species' referral guidelines (see Section 4.3.3). Furthermore, cane toads were commonly recorded. Based on this, it is considered that any individuals present within the Study Area do not comprise a 'population important for the long-term survival of the northern quoll', as it is not a high-density population, a population that occurs within a habitat free of cane toads or a population subject to ongoing conservation or research actions.	2	Unlikely	**Low risk**

MNES	Habitat, Threats and Regional Context	Nature and Extent of Potential Impacts	Consequence	Likelihood	Risk Rating
	As specified by the *EPBC Act referral guideline for the northern quoll*, actions which are likely to have a significant impact on the northern quoll are those that: result in the loss of critical habitat, decrease the size of an important population and therefore interfere with the recovery of the species, introduce inappropriate fire regimes or grazing activities, fragment an important population or result in invasive species or increases of them that are harmful to the northern quoll becoming established in its habitat, namely cane toads, feral cats, red foxes or exotic grasses which increase fire risk (Department of Sustainability, Environment, Water, 2011a).	A total of 1,104.81 ha of potential habitat occurs within the Study Area, including 739.46 ha of marginal denning and foraging habitat and 365.35 ha of marginal foraging and dispersal habitat (Figure 24). All potential habitat is considered marginal due to the lack of structural diversity and complexity as well as potential denning sites. Although habitat is functionally connected to protected areas in the wider region such as Girringun National Park, higher quality habitat is likely to be common in the region especially to the north. Given this and the findings of the targeted field survey, no habitat within the Study Area is considered habitat critical to the survival of the species. Vegetation clearing required for the construction of the Project will result in direct impacts to 68.0 ha of marginal denning and foraging habitat and 40.41 ha of marginal foraging and dispersal habitat. Construction of the Project will be phased to ensure individuals have time to relocate. Given the narrow, linear nature of the Project Area and the species' high mobility, fragmentation impacts are expected to be minor. Furthermore, potential indirect impacts associated with fire, grazing or invasive species will be actively managed via the Project's EMP. Based on the list of actions detailed in the referral guideline that are *unlikely* to result in a significant impact on the northern quoll, the potential for significant impacts on species as a result of the Project are considered low. However, in line with the previous assessment produced to support the referral, a full			

MNES	Habitat, Threats and Regional Context	Nature and Extent of Potential Impacts	Consequence	Likelihood	Risk Rating
		assessment against the significant impact guidelines has been completed.			
Spectacled flying-fox	The spectacled flying-fox occurs in north-eastern QLD, north of Cardwell with past records from Brisbane and Chillagoe. It is distributed between Ingham and Cooktown, and between the McIlwrait and Iron Ranges of Cape York. 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 *National recovery plan for the spectacled flying-fox* defines habitat critical to the survival of the species and includes foraging habitats as well as suitable roosting habitat. The species undergoes complex and irregular movement patterns which are determined by seasonal nectar flow (Threatened Species Scientific Committee, 2019b). Given that the species has the potential to travel large distances and is not isolated or restricted by geographical barriers, there is significant movement of animals between populations. Although the majority of individuals roost in colonies, some roost solitarily or in small groups and the composition of camps is constantly changing as individuals switch camps or abandon camps for others (DAWE, 2021). Hence, discrete populations are difficult to define, and no important populations are recognised.	This species is considered a potential occurrence within the Study Area due to the presence of suitable foraging and dispersal habitat and records nearby including one from 1974 approximately 11 km to the south. This species was not recorded during the field survey. No flying-fox camps were identified within the Study Area and the closest is located in Ingham, approximately 35 km to the east. A total of 651.45 ha of potential habitat occurs within the Study Area (Figure 26.1 to 26.6). As per the definition in the *National recovery plan for the spectacled flying*-fox, all potential habitat within the Study Area is considered habitat critical to the survival of the species as it is suitable for foraging. Vegetation clearing required for the construction of the Project will result in direct impacts to 54.01 ha of potential foraging and dispersal habitat. This species may also have an increased risk of mortality during the operation phase of the Project as it is known to collide with transmission lines. Based on this, further investigation is required to determine potential significant impacts.	3	Possible	**Potential risk, further assessment required**

MNES	Habitat, Threats and Regional Context	Nature and Extent of Potential Impacts	Consequence	Likelihood	Risk Rating
	Identified threats to the spectacled flying fox include habitat loss through land-clearing, paralysis caused by the Australian paralysis tick (*Ixodes holocyclus*), disturbance of maternity camps during the breeding season resulting in the juvenile mortality, competition with other flying-foxes for resources, heart stress and cyclones (Department of Agriculture Water and the Environment, 2022). Collision with man-made structures including transmission lines is also considered a known threat to the species although is considered 'minor'.				
Vulnerable Species					
Blue grass *Dichanthium setosum*	This species is distributed along the east coast of Australia, from south of Cooktown in far north Queensland to Maitland and Dubbo in New South Wales. In Queensland the species has been reported from the Leichhardt, Morton, North Kennedy and Port Curtis regions. *Dichanthium setosum* is associated with heavy basaltic black soils and red-brown loams with clay subsoil often with *Eucalyptus spp.*, native grasses and forbs. It is often found in moderately disturbed areas such as cleared woodland, grassy roadside remnants and highly disturbed pasture including in the northern tablelands, where the habitat has been variously grazed, nutrient-enriched and water-enriched (Department of Agriculture Water and the Environment, 2022). A warm season perennial, the species commences growing in spring, flowers in summers and becomes dormant in late autumn. Important	This species is considered a potential occurrence within the Study Area due to the presence of suitable habitat and a record from 2002 within 20 km. This species was not recorded during the field surveys however cattle grazing activities may have reduced detectability. A total of 287.32 ha potential habitat occurs within the Study Area (Figure 13). As habitat critical to the survival of the species is not defined, all potential habitat is conservatively considered to be critical. Vegetation clearing required for construction of the Project will result in direct impacts to approximately 37.82 ha of potential habitat. However, habitat is already degraded as a result on ongoing cattle grazing and agricultural practises including pasture improvement and fires, indicating that any population present is likely already impacted. These land practices, which are recognised key threats to the species, are likely to continue regardless of the	2	Unlikely	**Low risk**

MNES	Habitat, Threats and Regional Context	Nature and Extent of Potential Impacts	Consequence	Likelihood	Risk Rating
	populations and habitat critical to the survival of the species are not defined. Known threats to the species include heavy grazing by domestic stock, clearing of habitat for pasture improvement and cropping, frequent fires/ altered fire regimes, invasion by introduced grasses and road widening.	Project. Additional surveys will be completed prior to clearing to determine the presence and extent of any individuals or populations within the footprint. If necessary, Project infrastructure may be micro-sited to ensure no direct impacts to known individuals or populations occur. Potential indirect impacts from the Project include weed incursion, creation of edge effects, elevated dust and erosion leading to loss of individuals and reduced seeding. These potential impacts will be managed as per Section 8.3.			
Tephrosia leveillei	This species is currently known from the area between Chillagoe and Forty Mile Scrub, and one location further south near Ravenswood. 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. The species extent of occurrence is approximately 400 km². *Tephrosia leveillei* is known from *Eucalyptus cullenii* woodland on alluvial plains with *Corymbia erythrophloia*, *Erythrophleum chlorostachys* and *Grevillea glauca*, and in tall open forest of *Eucalyptus* and *Corymbia* species over dense *Heteropogon contortus* on red sand. Little is known about this species; important populations and habitat critical to the survival of the species are not defined. There are currently no known threats for *Tephrosia leveillei* (Department of the Environment Water Heritage and the Arts, 2008d).	This species is considered a potential occurrence within the Study Area due to the presence of suitable habitat. Although no records occur within 50 km, this species is known from the Mt Fox area which occurs at the eastern extent of the Study Area. This species was not recorded during the field surveys, however cattle grazing activities may have reduced detectability. A total of 583.10 ha potential habitat occurs within the Study Area (Figure 13). Given the habitat requirements of the species are not well known, all potential habitat is considered habitat critical to the survival of the species. Vegetation clearing required for construction of the Project will result in direct impacts to approximately 62.86 ha of potential habitat. However, additional surveys will be completed prior to clearing to determine the presence and extent of any individuals or populations within the footprint. If necessary, Project infrastructure may be micro-sited to ensure no direct impacts to known individuals or populations occur. Potential indirect impacts from the Project include weed incursion, creation of edge effects, elevated dust and erosion leading to loss of	2	Unlikely	**Low risk**

MNES	Habitat, Threats and Regional Context	Nature and Extent of Potential Impacts	Consequence	Likelihood	Risk Rating
		individuals and reduced seeding. These potential impacts will be managed as per Section 8.3.			
Red goshawk	The red goshawk is very sparsely dispersed across approximately 15% of coastal and sub-coastal Australia, from western Kimberley Division to north-eastern New South Wales. It inhabits coastal and sub-coastal tall open forests and woodlands, tropical savannas traversed by wooded or forested rivers, and the edges of rainforests. The area of occupancy has been estimated at 200,000km^2 with low reliability. Nesting habitat usually comprises a tall stand of trees (average 31 m) within 1 km of permanent water, often adjacent to rivers or clearings. They are believed to stay within their nesting territory year around, the species is thought to have a very large home range covering between 50 and 220 square kilometres (Department of Agriculture Water and the Environment, 2022). Habitat critical for red goshawk survival needs to contain all known sites for nesting, food resources, water, shelter, essential travel routes, dispersal, buffer areas, and sites needed for the future recovery (Department of Environment and Resource Management, 2012). Important populations are not defined; there is limited population information and available data is considered unreliable. However, it is suggested that breeding range is continuous and that the species can be described as consisting of one large population. As such, any individuals would be considered part of an important population.	This species is considered a potential occurrence within the Study Area due to the presence of suitable habitat and ALA records within 50 km. As the species was not recorded during any of the field surveys and is known to have a large distribution and home range, only a very small number of individuals are expected to utilise the Study Area at any time. Nonetheless, any individuals within the Study Area are considered an important population. Within the Study Area a total of 5,130.55 ha of suitable habitat occurs including 5,071.49 ha of foraging and dispersal habitat and 59.06 ha of nesting habitat (Figure 18). Due to the mosaic of vegetation types and the presence of essential features such as water and food resources, all potential habitat is considered habitat critical to the survival of the species. Suitable habitat of equal or greater quality is likely to be common in the local area. A total of 610.44 ha of foraging and dispersal habitat and 5.14 ha of nesting habitat will be directly impacted via vegetation clearing required for the construction of the Project. However, no known nesting sites occur and any potential nesting sites (i.e large trees with raptor nests) will be demarcated and avoided prior to construction. Based on the small number of individuals likely to utilise potential habitat, the linear nature of the Project Area and the vast areas of suitable habitat within the local area, these impacts are expected to be low and inconsequential to the success of the species. As this species is highly mobile and construction works	2	Unlikely	**Low risk**

MNES	Habitat, Threats and Regional Context	Nature and Extent of Potential Impacts	Consequence	Likelihood	Risk Rating
	The main identified threats to the species include habitat loss, fragmentation, disturbance of nest sites, threats to prey and information/education gaps (Threatened Species Scientific Committee, 2015a).	will be completed in phases, areas of disturbance can be temporarily avoided. Habitat fragmentation impacts have been minimised by co-locating the Project Area with an existing transmission line. Threats to prey (birds) are unlikely to be increased beyond current levels with the implementation of mitigation measures detailed in Section 8.3.			
Grey falcon	The grey falcon is widely distributed across the arid and semi-arid regions of Australia including the Murray-Darling Basin, Eyre Basin, central Australia and Western Australia (extent of occurrence estimated at 6.1 million km^2). Across this distribution the species occurs at low densities. Current population estimates indicate <1000 individuals remain. The grey falcon primarily occurs where annual rainfall is less than 500 mm, except when wet years are followed by drought when the species becomes more widespread. It occurs in timbered lowland plains, particularly *Acacia* shrublands that are crossed by tree-lined water courses. It also frequents 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. Important populations and habitat critical to the survival of the species are not defined. Threats to	This species is considered a potential occurrence within the Study Area due to the presence of suitable habitat and two potentially unreliable records within 50 km. As the species was not recorded during any of the field surveys and is known to have a very large distribution and occur at low densities, only a very small number of individuals are expected to utilise the Study Area at any time. Nonetheless, any individuals within the Study Area are considered an important population. Within the Study Area, a total of 5,135.67 ha of potential habitat occurs comprising 583.10 ha of nesting habitat and 4,552.57 ha of foraging and dispersal habitat (Figure 16). All potential habitat including nesting habitat is degraded by existing cattle grazing activities (a known threat to the species). Conservatively, potential nesting habitat is still assumed to be habitat critical to the survival of the species. However, suitable habitat of equal or greater quality is likely to be common in the local area. Vegetation clearing required for the construction of the Project will result in direct impacts to 62.86 ha of nesting habitat and 553.04 ha of foraging and dispersal habitat. Based on the small number of individuals likely to utilise the Project Area, the linear nature of the Project Area	2	Unlikely	**Low risk**

MNES	Habitat, Threats and Regional Context	Nature and Extent of Potential Impacts	Consequence	Likelihood	Risk Rating
	the grey falcon are not well established, however very high priority likely threats include predation by cats, increased temperatures due to climate change and habitat loss / fragmentation as a result of grazing exotic herbivores (Threatened Species Scientific Committee, 2020).	and the vast areas of suitable habitat within the local area, these impacts are expected to be low and inconsequential to the success of the species. Potential nesting sites (i.e. tall trees with potential raptor nests) will also be demarcated and avoided prior to construction. As this species is highly mobile and construction works will be completed in phases, areas of disturbance can be temporarily avoided. Habitat fragmentation impacts have been minimised by co-locating the Project Area with an existing transmission line. Pest species populations (namely cats, which are a known threat to the species) are unlikely to be increased beyond current levels with the implementation of mitigation measures detailed in Section 8.3.			
Masked owl (northern)	The distribution of the masked owl (northern) is very poorly known and three subpopulations have been suggested: Kimberley, Northern Territory (NT) and Cape York. In Queensland it occurs along the southern rim of the Gulf of Carpentaria, Cape York Peninsula and south to Atherton Tablelands and the Einasleigh-Burdekin divide. The extent of occurrence of the species is estimated to be 1’800’000 km² while the area of occupancy is estimated to be 18’000 km² (Department of Agriculture Water and the Environment, 2022). The masked owl has large home ranges, and has been recorded from riparian forest, rainforest, open forest, *Melaleuca* swamps and the edges of mangroves as well as along the margins of sugar cane fields. Large trees with large hollows are required for nesting, and nesting usually occurs within ‘closed forest’ as per SPRAT.	This species is considered a potential occurrence within the Study Area due to the presence of suitable habitat and a recent (2020) record within 20 km. As the species was not recorded during any of the field surveys and is known to have a large distribution and home ranges, only a small number of individuals are expected to utilise the Study Area at any time. Nonetheless, any individuals within the Study Area are considered an important population. Within the Study Area a total of 5,135.67 ha of potential suitable habitat occurs including 4,699.36 ha of foraging and dispersal habitat and 436.31 ha of marginal nesting habitat (Figure 17). Potential nesting habitat is considered marginal as no areas comprise ‘closed forest’ and large hollows were rare. No potential habitat within the Study Area is considered critical to the survival of the species.	2	Unlikely	**Low risk**

MNES	Habitat, Threats and Regional Context	Nature and Extent of Potential Impacts	Consequence	Likelihood	Risk Rating
	Important populations and habitat critical to the survival of the species are not defined. The reason for the decline and low density of masked owls in northern Australia is unclear. The subspecies has been affected by broad-scale changes to the environment of northern Australia caused by altered fire regimes, grazing by livestock and feral animals, and the invasion of woodlands by exotic plants, particularly introduced pasture grasses. However, it is reported that most likely cause of declines is a shortage of food as small and medium-sized endemic mammals are becoming increasingly uncommon across northern Australia.	Furthermore, suitable habitat of equal or greater quality is likely to be common in the local area. Vegetation clearing required for the construction of the Project will result in direct impacts to 48.20 ha of marginal nesting habitat and 567.70 ha of foraging and dispersal habitat. Based on the small number of individuals likely to utilise the Project Area, the linear nature of the Project Area and the vast areas of suitable habitat within the local area, these impacts are expected to be low and inconsequential to the success of the species. All hollow-bearing trees will be inspected by a fauna spotter-catcher prior to clearing to identify any sheltering or nesting individuals. As this species is highly mobile and construction works will be completed in phases, areas of disturbance can be temporarily avoided. The presence of exotic and invasive flora and fauna species are unlikely to be increased beyond current levels with the implementation of mitigation measures detailed in Section 8.3.			
Squatter pigeon (southern)	The squatter pigeon (southern) is a ground-dwelling bird that inhabits the grassy understorey of open woodland, as well as sown grasslands with scattered remnant trees, disturbed areas, scrubland, and *Acacia* regrowth. The species distribution extends from the Burdekin-Lynd Divide in central Queensland, south to West Wyalong in northern NSW. As per the species SPRAT, the known distribution is estimated to occur within the latitudes, 17° to 30° S, and the longitudes, 141° to 153° 30' E. The extent of occurrence estimated to be 440,000 km^2 and the area of occupancy to be 10,000 km^2.	This subspecies as well as the northern were recorded in low numbers within the Study Area during the field survey program. As the Study Area does not occur within the mapped distribution of the species, these recorded occurrences are considered vagrant individuals and as per the definition of important populations on the species' SPRAT, do not constitute an important population. Within the Study Area a total 5,932.07 ha of potential suitable habitat occurs including 1,545.39 ha of breeding habitat, 365.15 ha of foraging habitat and 4,021.53 ha of dispersal habitat (Figure 19).	2	Unlikely	**Low risk**

MNES	Habitat, Threats and Regional Context	Nature and Extent of Potential Impacts	Consequence	Likelihood	Risk Rating
	Important populations of squatter pigeon (southern) have been defined as per the SPRAT: • Populations occurring in the Condamine River catchment and Darling Downs of southern Queensland • The populations known to occur in the Warwick-Inglewood-Texas region of southern Queensland, and • Any populations potentially occurring in northern New South Wales. As such, any individuals within the Project Area are not considered an important population. In Queensland, foraging and breeding habitat is known to be associated with the soil landscapes of Land Zone 5 and 7 (Department of Agriculture Water and the Environment, 2022). Breeding habitat is within 1 km of suitable waterbodies, whereas foraging can occur up to 3 km from such waterbodies. Habitat critical to the survival of the species is not defined. The main identified threats to the species include ongoing clearance of habitat for farming or development purposes; grazing of habitat by livestock and feral herbivores; and predation, especially by feral cats (*Felis catus*) and foxes (*Vulpes vulpes*).	Habitat is not considered habitat critical to the survival of the species as it does not occur within the sub-species' distribution. Additionally, suitable habitat of equal or greater quality is likely to be common in the local area. Vegetation clearing required for the construction of the Project will result in direct impacts to 195.18 ha of breeding habitat, 44.81 ha of foraging habitat and 450.07 ha of dispersal habitat. Based on the low number of individuals utilising the Project Area, the linear nature of the Project Area and the vast areas of suitable habitat within the local area, these impacts are expected to be low and inconsequential to the success of the species. Furthermore, this species is known to utilise and persist in disturbed areas. As this species is ground-dwelling, indirect impacts such as an increased pest presence and traffic within the Project Area may lead to greater mortalities. Increased traffic within the Project Area will be temporary (primarily during construction) and pest levels are unlikely to be exacerbated beyond current levels. Potential indirect impacts will be low and managed via the mitigation measures detailed in Section 8.3.			
White-throated needletail	The white-throated needletail breeds in the northern hemisphere and migrates in the austral summer months to Australia. While in Australia, this species is widespread and predominately aerial. There is no current accurate population estimate, however the global population is estimated at greater than 10,000 birds (Higgins,	This species may potentially occur in the airspace above the Study Area and multiple records occur within 50 km. A total of 5,932.07 ha of potential suitable habitat occurs within the Study Area (Figure 20). Of this total potential habitat, 497.72 ha is considered to comprise important habitat (suitable for roosting and foraging). As important	2	Highly unlikely	**Low risk**

MNES	Habitat, Threats and Regional Context	Nature and Extent of Potential Impacts	Consequence	Likelihood	Risk Rating
	1999). Important populations are not defined, however important habitat includes large tracts of native vegetation, particularly forest. The species usually roosts in tall trees on cliffs or steep slopes that have vantage points, amongst dense foliage in the canopy or in hollows. In Australia, white-throated needletails almost always forage aerially, at heights up to 'cloud level', though usually much lower. They often forage in areas of updraughts, such as ridges, cliffs or sand-dunes, or in the smoke of bushfires or occasionally in whirlwinds. Identified threats to this species whilst in Australia include habitat loss and fragmentation, mortality due to collision with wind turbines and overhead wires, poisoning and pesticides. However it is stated that as this affects only a few individuals, it is not a threat to the species overall.	habitat for the species occurs, any individuals within the Study Area are considered an important population. However, as this species has a very large distribution across Australia and is constantly moving, only small numbers are expected to utilise the Study Area at one time. Vegetation clearing required for the construction of the Project will result in direct impacts to 57.97 ha of important habitat as well as 631.91 ha of foraging and dispersal habitat. However, as this species is predominately aerial, is widespread within Australia and has broad habitat requirements, impacts are unlikely to affect the persistence of the species. In addition, it is likely vast areas of important habitat occur within the wider local area. All other key threats to this species are unlikely to be increased beyond current levels with the implementation of mitigation measures detailed in Section 8.3.			
Sharman's rock wallaby	The range of Sharman's rock-wallaby is highly limited, being 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. The extent of occurrence is estimated at 944 km^2 and the area of occupancy estimated to be at least 24 km^2. 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. It breeds continually throughout the year.	This species was recorded within the Study Area during the field survey program using two different methods (daytime visual observations and camera traps). A female with a joey was recorded in both 2018 via camera trap and in 2021 via observation. This indicates a breeding population utilises the Study Area which, given the species restricted distribution, are considered to constitute an important population. A total 260.04 ha of suitable habitat occurs within the Study Area including 146.19 ha of breeding habitat and 113.85 ha of foraging and dispersal habitat (Figure 25.1 to 25.6). All suitable habitat	3	Possible	**Potential risk, further assessment required**

MNES	Habitat, Threats and Regional Context	Nature and Extent of Potential Impacts	Consequence	Likelihood	Risk Rating
	Important populations and habitat critical to the survival of the species are not defined. The total population size of Sharman's rock-wallaby is small, estimated at fewer than 800 mature individuals. However, one study considered it may be 'common' within it's range. Threats to Sharman's rock wallaby include habitat degradation and habitat depletion due to livestock and non-native herbivores, predation by feral cats, competition with other native species and inappropriate fire regimes (Threatened Species Scientific Committee, 2016b).	within the Study Area is considered habitat critical to the survival of the species. Vegetation clearing required for the construction of the Project will result in direct impacts to 6.29 ha of breeding habitat and 10.80 ha of foraging and dispersal habitat. Given the species' highly limited distribution, further investigation into potential significant impacts is required as the reduction in available critical habitat may be notable in the regional context.			
Greater glider	The greater glider occurs in eucalypt forests and woodlands within eastern Australia from the Windsor Tableland in north Queensland through to central Victoria. The species' distribution is discontinuous, with the area from south of Cooktown to Townsville in north Queensland disconnected to the remaining extent (Department of Agriculture Water and the Environment, 2022). The species is typically found in highest abundance in taller, montane, moist eucalypt forests with relatively old trees and abundant hollows. During the day it shelters in tree hollows, with a particular selection for large hollows in large, old trees. Habitat critical to the survival of the species is not defined however is considered to comprise large contiguous tracts of suitable habitat that may support a source population. As there are no reliable estimates of population size or population trends, important populations are not defined either.	This species was recorded in low numbers (three individuals) during the field survey program within the riparian vegetation associated with three different creeks that intersect the Study Area. As the species' distribution in the northern extent is disconnected, any individuals within the Study Area are considered an important population as they may be genetically distinct. A total of 652.94 ha of suitable habitat occurs within the Study Area, including 401.47 ha of foraging and dispersal habitat and 251.47 ha of breeding and foraging habitat (Figure 22). Breeding and foraging habitat is conservatively considered habitat critical to the survival of the species. However, suitable habitat of equal or greater quality especially along watercourses is likely to be common in the local area. A total of 27.27 ha of breeding and foraging habitat, as well as 40.64 ha of foraging and dispersal habitat will be directly impacted via vegetation clearing for	3	Possible	**Potential risk, further assessment required**

MNES	Habitat, Threats and Regional Context	Nature and Extent of Potential Impacts	Consequence	Likelihood	Risk Rating
	In Queensland especially, the abundance of greater gliders is continuing to decline largely due to the removal of hollow-bearing trees during logging and repeated prescribed burning. Other key threats to the species include habitat fragmentation due to the species low dispersal ability, climate change and hyper predation by owls (Threatened Species Scientific Committee, 2016b).	construction of the Project. Removal of this habitat is expected to have only a low impact as only a small number of individuals are likely to utilise these areas and there will be a large availability of equally suitable habitat remaining in the local area. However, as this species is known to be susceptible to habitat fragmentation and have a low dispersal ability, potential for significant impact as a result of direct and indirect impacts (including the potential for the Project to act as a barrier to movement) requires further investigation.			
Ghost bat	The ghost bat's 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. They occupy habitats ranging from the arid Pilbara to tropical savanna woodlands and rainforests. Maternity roost areas used permanently are generally deep natural caves or disused mines (Department of Agriculture Water and the Environment, 2022). Most of the colony disperses (up to 150 km) from maternity roosts during the non-breeding season in the cooler months. During this time, they use large numbers of caves, rock shelters, overhangs, vertical cracks, and mines as day roosts. One study indicated ghost bats forage an average of 1.9 km from day roosts, over an area of 61 ha, generally returning to the same areas each night. Important populations and habitat critical to the survival of the species are not defined. The key	This species is considered a potential occurrence within the Study Area due to the presence of suitable habitat and scattered records in the wider region. Findings from the analysis of calls recorded using unattended and attended bat call detectors found no evidence of the species within the Study Area. Any individuals that may occur within the Study Area are not considered to comprise an important population due to the position of the Study Area within the species range (relatively central) and functional connectivity with known populations. Within the Study Area a total of 5,135.67 ha potential habitat occurs, all of which is considered suitable for dispersal only (Figure 21). Abandoned mine sites which were previously considered to potentially contain roosting habitat were investigated in December 2021 and found to be unsuitable. No other potential roost sites were identified in the Study Area or adjacent properties despite searches. As the species does not forage large distances from its roost sites, no potential foraging habitat occurs within the Study Area either. As it is only suitable for	2	Unlikely	**Low risk**

MNES	Habitat, Threats and Regional Context	Nature and Extent of Potential Impacts	Consequence	Likelihood	Risk Rating
	threat to the ghost bat is habitat loss and degradation due to mining activities. The species' slow reproductive rate, and the lack of suitable habitat that restricts its movement, makes it vulnerable to threats and localised extinctions. Other threats to ghost bat include disturbance of breeding sites, modification of foraging habitat, collision with fences, poisoning by cane toads and competition for prey with feral animal.	dispersal purposes, potential habitat within the Study Area it is not considered habitat critical to the survival of the species. Furthermore, suitable habitat of equal or greater quality is likely to be common in the local area. Vegetation clearing required for the construction of the Project will result in direct impacts to 615.89 ha of potential dispersal habitat. Due to the transitory, non-breeding nature of any individuals utilising this habitat, both direct and indirect impacts are expected to be very low. Construction will occur in phases and allow any individuals present to avoid active areas. All other key threats to this species are unlikely to be increased beyond current levels with the implementation of mitigation measures detailed in Section 8.3. However, in line with the previous assessment produced to support the referral, a full assessment against the significant impact guidelines has been completed.			
Koala	The koala has a large distribution across eastern Australia and occurs within a variety of vegetation types, particularly those that contain koala food trees. To ensure potential significant impacts on the koala are appropriately assessed, the *EPBC Act referral guidelines for the vulnerable koala* were developed (Department of the Environment, 2014). Habitat critical to the survival of the species is defined using the habitat assessment tool specific to the geographical context. The Project occurs within the inland context. Key habitat types identified as important to species recovery are riparian corridors and large contiguous tracts of vegetation that buffer and provide connectivity to	This species is considered likely to occur within the Study Area based on the presence of suitable habitat, records within 20 km and recorded evidence of presence (scats and scratches) during the field survey program. Any individuals present within the Study Area are considered to comprise an important population. A total of 5,218.11 ha of suitable habitat occurs within the Study Area, including 4,904.36 ha of potential refuge habitat, 118.31 ha of potential foraging habitat and 195.44 ha of potential dispersal habitat (Figure 23). Assessment against the habitat quality tool indicates the presence of habitat critical	3	Possible	**Potential risk, further assessment required**

MNES	Habitat, Threats and Regional Context	Nature and Extent of Potential Impacts	Consequence	Likelihood	Risk Rating
	riparian corridors – all dominated by Koala food trees. Important populations are not defined for this species. Known threats to this species include habitat loss, fragmentation, collision with vehicles and predation by dogs.	to the survival of the species within the Study Area. Direct impacts via vegetation clearing for construction of the Project will occur to 585.78 ha of potential refuge habitat, 16.99 ha of potential foraging habitat and 23.24 ha of potential dispersal habitat. The referral guidance indicates the clearing of 20 ha of potential koala habitat that is critical to the survival of the species as a potential high risk of significant impacts. As such, further assessment is required given clearing impacts are above this threshold level.			
Yakka skink	The yakka skink has a patchy distribution within Queensland. The core habitat of this species is within the Mulga Lands and Brigalow Belt South Bioregions. However, the Project Area covers both potential and likely mapped habitat areas identified in the *Draft Referral guidelines for the nationally listed Brigalow Belt reptiles*. It occurs within open dry sclerophyll forest or woodland, often taking refuge among dense ground vegetation, large hollow logs, cavities in soil-bound root systems of fallen trees and beneath rocks. They are extremely secretive and seldom venture far from shelter sites, where they retreat to at the first sign of disturbance (Threatened Species Scientific Committee, 2008a). The *Draft Referral guidelines for the nationally listed Brigalow Belt reptiles* defines important habitat for this species as “any contiguous patch of suitable habitat, particularly remnant vegetation, where a colony is known or identified and any microhabitat where colonies are likely to be found”.	This species is considered a potential occurrence within the Study Area based on the presence of suitable habitat. No records occur within 50 km however the species distribution is known to be patchy in the northern extent. No evidence of this species including colonies were recorded during the field surveys, including the targeted survey completed in August and December 2021. A total of 380.84 ha of potential habitat occurs within the Study Area, including 78.91 ha of marginal breeding and foraging habitat and 301.93 ha of breeding and foraging habitat (Figure 27). All areas of potential habitat within the Study Area were rigorously searched in December 2021 to determine if any colonies were potentially present. Survey effort is considered in line with the referral guidelines for the brigalow belt reptiles. Based on this, potential habitat within the Study Area is not considered important habitat as it is not likely a colony occurs within. Based on the lack of important habitat, any individuals within the Study Area do not constitute an important population.	2	Unlikely	**Low risk**

MNES	Habitat, Threats and Regional Context	Nature and Extent of Potential Impacts	Consequence	Likelihood	Risk Rating
	The main threat to the yakka skink is habitat reduction and degradation. Other recognised threats include inappropriate roadside management, including road widening and removal of microhabitat, such as rocks, logs, dense leaf litter and fallen bark, threatens the species with habitat loss and degradation. Feral animal impacts include predation by Foxes (*Vulpes vulpes*) and Feral Cats (*Felis catus*) and ripping of rabbit warrens. This species is not highly mobile, has a low fecundity and exhibits a high site-fidelity. Due to existing levels of habitat fragmentation, this species is susceptible to localised extinctions (Department of Agriculture Water and the Environment, 2022).	Direct impacts via vegetation clearing for the Project will occur to 40.46 ha of breeding and foraging habitat, and to 12.48 ha of marginal breeding and foraging habitat. The *Draft Referral guidelines for the nationally listed Brigalow Belt reptiles* states that "the removal of any microhabitat features within 200 m of a colony" results in a high risk of significant impacts on the species. This is considered unlikely to occur based on the findings of the December 2021 field survey, and as such direct impacts on the species are considered unlikely to be significant. However, in line with the previous assessment produced to support the referral, a full assessment against the significant impact guidelines has been completed.			
Migratory Species					
Fork-tailed swift	The fork-tailed swift is almost exclusively aerial, recorded generally east of the Great Dividing Range from Cooktown to the New South Wales border, but extends further west in southern Queensland (Department of Agriculture Water and the Environment, 2022). This species mostly occurs over dry or open habitats, including riparian woodland and tea-tree swamps, low scrub, heathland or saltmarsh. The *Referral guideline for 14 birds listed as migratory species under the EPBC Act*, defines important habitat for the species as "Non-breeding habitat only: Found across a range of habitats, from inland open plains to wooded areas, where it is exclusively aerial."	This species may potentially occur in the airspace above the Study Area due to the presence of suitable habitat. This species was not recorded during the Project field surveys, nor during the ecology surveys completed for other projects in the region (see Section 4.2). A total of 5,932.07 ha of potential suitable habitat occurs within the Study Area (Figure 28). All potential habitat is considered important habitat as it meets the definition specified in the *Referral guideline for 14 birds listed as migratory species under the EPBC Act*. Direct impacts will occur to 689.88 ha of foraging and dispersal habitat via vegetation clearing. Given this species is predominately aerial and is widespread within Australia, impacts are unlikely to affect the persistence of the species. The Project will not	2	Highly unlikely	**Low risk**

MNES	Habitat, Threats and Regional Context	Nature and Extent of Potential Impacts	Consequence	Likelihood	Risk Rating
	The fork-tailed swift does not breed in Australia. As per the species SPRAT profile, there are no significant threats to the species in Australia. Potential threats include habitat destruction and predation by feral animals.	create a barrier to movement. All other key threats to this species are unlikely to be increased beyond current levels with the implementation of mitigation measures detailed in Section 8.3.			
Oriental cuckoo	The oriental cuckoo is a non-breeding migrant that occurs in coastal regions across northern and eastern Australia from September to May. While in Australia, the species inhabits 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 (Department of the Environment, 2015a). The *Referral guideline for 14 birds listed as migratory species under the EPBC Act*, defines important habitat for the species as "monsoonal rainforest, vine thickets, wet sclerophyll forest or open *Casuarina, Acacia* or *Eucalyptus* woodlands. Frequently at edges or ecotones between habitat types". Based on estimates of population sizes within Europe, the global population may be greater than 20 million. An ecologically significant proportion of the population is 1000 individuals (0.1% threshold). The lower area threshold for impacts on important habitat is 25,000 ha. There is no information regarding known threats to this species while in Australia.	This species potentially occurs within the Study Area based on the presence of suitable habitat and records at three locations within 10 km. This species was not recorded during the field survey program, nor during ecology surveys completed for other projects in the region (see Section 4.2). A total of 5,122.56 ha of potential habitat occurs within the Study Area (Figure 29). All potential habitat is suitable for foraging and dispersal only as this species does not breed in Australia. It is also highly likely to be common within the local area surrounding the Study Area. Potential habitat does meet the definition of important habitat for the species but does not meet the area requirements to be considered nationally or internationally significant habitat and is unlikely to support an ecologically significant proportion of the population as defined under the *Referral guideline for 14 birds listed as migratory species under the EPBC Act*. A total of 614.56 ha of potential habitat will be directly impacted via vegetation clearing. This area is well below the clearing threshold for significant impacts as defined by the referral guidelines. This species is highly mobile and unlikely to be sensitive to potential indirect impacts associated with the Project, nonetheless these will be managed as detailed in Section 8.3.	2	Highly unlikely	**Low risk**

MNES	Habitat, Threats and Regional Context	Nature and Extent of Potential Impacts	Consequence	Likelihood	Risk Rating
Black-faced monarch	The black-faced monarch breeds in eastern coastal Australia during summer and migrates to spend the non-breeding winter period in Papua New Guinea or northern Australia. This species mainly inhabits rainforests and riparian vegetation. In wet sclerophyll forest, the species mostly frequents sheltered gullies and slopes with a dense understorey of ferns and / or shrubs. The *Referral guideline for 14 birds listed as migratory species under the EPBC Act*, defines important habitat for the species as "wet forest specialist, found mainly in rainforest and wet sclerophyll forest, especially in sheltered gullies and slopes with a dense understorey of ferns and/or shrubs" (Department of the Environment, 2015b). An ecologically significant proportion of the population is 47 individuals (0.1% threshold). The lower area threshold for impacts on important habitat is 260 ha. Known threats to this species include black rats and invasive vines (e.g. rubber vine) in riparian habitats.	This species potentially occurs within the Study Area based on the presence of potentially suitable habitat and records at three locations within 10 km. Given the species primarily coastal distribution, suitable habitat is limited to the far eastern extent of the Study Area. A total of 1,927.03 ha of potential habitat occurs within the Study Area (Figure 29), all of which is considered marginal as it is not rainforest or wet sclerophyll. As such, potential habitat does not meet the definition of important habitat as per the *Referral guideline for 14 birds listed as migratory species under the EPBC Act.* Potential habitat is suitable for foraging and dispersal only as this species does not breed in north Australia. It is also highly likely to be common within the local area surrounding the Study Area. As habitat does not meet the definition of 'important habitat', the area requirements to be considered nationally or internationally significant habitat are not relevant, and habitat is unlikely to support an ecologically significant proportion of the population. A total of 235.78 ha of potential habitat will be directly impacted via vegetation clearing. However, as this habitat is not 'important habitat' clearing thresholds for significant impacts as defined by the referral guidelines are not applicable. This species is highly mobile and unlikely to be sensitive to potential indirect impacts associated with the Project due to the existing presence of rubber vine and black rats. Nonetheless, these will be managed as detailed in Section 8.3.	2	Unlikely	**Low risk**
Spectacled monarch	In Queensland, the spectacled monarch occurs on islands in Torres Strait where it is migratory and	This species potentially occurs within the Study Area based on the presence of potentially suitable	2	Unlikely	**Low risk**

MNES	Habitat, Threats and Regional Context	Nature and Extent of Potential Impacts	Consequence	Likelihood	Risk Rating
	on Cape York Peninsula where considered resident or partly migratory. Widespread along east coast including off shore islands and on east slopes of Great Dividing Range from Cooktown to the New South Wales border. 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 (Department of Agriculture Water and the Environment, 2022). The *Referral guideline for 14 birds listed as migratory species under the EPBC Act*, defines important habitat for the species as "dense vegetation, mainly in rainforest but also in moist forest or wet sclerophyll and occasionally in other dense vegetation such as mangroves, drier forest and woodlands.". This document also states that the spectacled monarch (as well as the black-winged monarch) is likely to be most susceptible to significant impacts due to the population size and limited distribution. An ecologically significant proportion of the population is 650 individuals (0.1% threshold) or 330 for the wet tropics spectacled monarch. The lower area threshold for impacts on important habitat is 210 ha or 110 ha for the wet tropics spectacled monarch. Known threats to this species include black rats and invasive vines (e.g. rubber vine) in riparian habitats.	habitat and recent records at two locations within 10 km near Mt Fox. A total of 1,927.03 ha of potential breeding, foraging and dispersal habitat occurs within the Study Area (Figure 30), however is considered marginal as it is very rarely characterised as 'dense' and where dense vegetation does occur it is sporadic patches of *Lantana*. Given this, potential habitat within the Study Area does not meet the definition of important habitat as per the *Referral guideline for 14 birds listed as migratory species under the EPBC Act*. Due to the broad habitat requirements, suitable habitat is highly likely to be common within the local area surrounding the Study Area. The extent of habitat present within the Study Area would meet the area requirements to be considered nationally significant habitat as defined under the *Referral guideline for 14 birds listed as migratory species under the EPBC Act*. However, it is unlikely that this habitat supports an ecologically significant proportion of the population. Direct impacts via vegetation clearing will occur to approximately 235.78 ha of potential habitat however as habitat is not considered 'important' the referral impact thresholds do not apply. This species is highly mobile and unlikely to be sensitive to potential indirect impacts associated with the Project due to the existing presence of rubber vine and black rats. Nonetheless, these will be managed as detailed in Section 8.3.			
Satin flycatcher	The satin flycatcher occurs from Cape York to eastern South Australia, and migrates north-south	This species potentially occurs within the Study Area based on the presence of suitable habitat and	2	Unlikely	**Low risk**

MNES	Habitat, Threats and Regional Context	Nature and Extent of Potential Impacts	Consequence	Likelihood	Risk Rating
	during summer. It is a breeding summer migrant to the southeast and Tasmania. Within Queensland, this species has a scattered but widespread distribution occurring mostly in coastal regions but also on the Great Dividing Range types (Department of the Environment, 2015a). The *Referral guideline for 14 birds listed as migratory species under the EPBC Act*, defines important habitat for the species as "Eucalypt forest and woodlands, at high elevations when breeding. They are particularly common in tall wet sclerophyll forest, often in gullies or along water courses. In woodlands they prefer open, grassy woodland types. During migration, habitat preferences expand, with the species recorded in most wooded habitats except rainforests. Wintering birds in northern Qld will use rainforest - gallery forests interfaces, and birds have been recorded wintering in mangroves and paperbark swamps". An ecologically significant proportion of the population is 1,700 individuals (0.1% threshold). The lower area threshold for impacts on important habitat is 440 ha. Known threats to this species include the clearing and logging of forests in south-eastern Australia, as well as black rats and invasive vines (e.g. rubber vine) in riparian habitats.	records within 50 km. A total of 2,600.63 ha of potential habitat occurs within the Study Area (Figure 30). All potential habitat is suitable for foraging and dispersal only as this species does not breed in Queensland. Potential habitat does meet the definition of important habitat for the species but does not meet the area requirements to be considered nationally or internationally significant habitat and is unlikely to support an ecologically significant proportion of the population as defined under the *Referral guideline for 14 birds listed as migratory species under the EPBC Act*. A total of 323.57 ha of potential habitat will be directly impacted via vegetation clearing required for the Project. This area is below the clearing threshold for significant impacts as defined by the referral guidelines. This species is highly mobile and unlikely to be sensitive to potential indirect impacts associated with the Project, nonetheless these will be managed as detailed in Section 8.3.			
Rufous fantail	The rufous fantail occurs in coastal and near coastal districts of northern and eastern Australia. One of the two subspecies (*Rhipidura rufifrons intermedia*) has breeding populations occurring on and east of the Great Divide, from about the NSW-	This species is likely to occur within the Study Area based on the presence of suitable habitat and records at ten locations within 20 km. A total of 2,589.39 ha of potential habitat occurs within the Study Area (Figure 29). However, all potential	2	Unlikely	**Low risk**

MNES	Habitat, Threats and Regional Context	Nature and Extent of Potential Impacts	Consequence	Likelihood	Risk Rating
	Queensland border, north to the Cairns-Atherton region, Queensland. This species mainly inhabits wet sclerophyll forests, often in gullies dominated by eucalypts usually with a dense shrubby understorey including ferns. The *Referral guideline for 14 birds listed as migratory species under the EPBC Act*, defines important habitat for the species as "Moist, dense habitats, including mangroves, rainforest, riparian forests and thickets, and wet eucalypt forests with a dense understorey. When on passage a wider range of habitats are used including dry eucalypt forests and woodlands and Brigalow shrublands". Movement patterns are not fully understood, but some populations of the species in east Australia are migratory. An ecologically significant proportion of the population is 4,800 individuals (0.1% threshold). The lower area threshold for impacts on important habitat is 750 ha. Known threats to this species include habitat fragmentation and loss of moist forest breeding habitat, the black rat, and invasive vines (e.g. rubber vine) in riparian habitat. However, in Australia this species is considered common and secure as there has been no evidence of population decline.	habitat is considered marginal as it is generally very dry and open. Potential habitat is considered suitable for foraging and dispersal only as this species does not breed in north Queensland. Given a wider range of habitats are used while on passage as per the definition of important habitat, potential habitat is considered to meet the definition. The extent of habitat present within the Study Area would meet the area requirements to be considered nationally significant habitat as defined under the *Referral guideline for 14 birds listed as migratory species under the EPBC Act*. However, this potential habitat is highly likely to be common within the local area surrounding the Study Area. It is unlikely that this habitat supports an ecologically significant proportion of the population and habitat will be used by foraging and dispersing individuals only. A total of 322.57 ha of potential habitat will be directly impacted via vegetation clearing required for the Project. This area is below the clearing threshold for significant impacts and no impacts to breeding habitat will occur. Furthermore, this species is considered common and secure in Australia. It is highly mobile and unlikely to be sensitive to potential indirect impacts associated with the Project due to the existing presence of rubber vine and black rats. Nonetheless, these will be managed as detailed in Section 8.3.			
Red-necked stint	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. In	The red-necked stint, common greenshank, common sandpiper and sharp-tailed sandpiper are considered potential occurrences within the Study Area due to the presence of suitable habitat and records in the wider area. Watercourses field-	1	Highly unlikely	**Low risk**

MNES	Habitat, Threats and Regional Context	Nature and Extent of Potential Impacts	Consequence	Likelihood	Risk Rating
	north Australia, adults start arriving from the third week of August and most arrive before the end of September. It 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. Occasionally they have been recorded on exposed or ocean beaches, and sometimes on stony or rocky shores, reefs or shoals. 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. Within Australia there a number of recognised threats to the red-necked stint including habitat loss and degradation, disturbance (largely from recreational activities) and direct mortality.	validated to be suitable as well as all farm dams are conservatively assumed to provide potential habitat. A total of 80.06 ha of potential habitat occurs within the Study Area (Figure 31). Habitat is considered marginal due to the very small size of the farm dams, ephemeral nature of the watercourses and the moderate to high cattle activity at most water sources across the area. Potential habitat is considered suitable for foraging and dispersal only due to the inland location of the Study Area, which is outside of known breeding areas of all four species. Based on each species large distribution and migration patterns, only a small number of dispersing vagrant individuals are expected to utilise potential habitat of the Study Area at any time. Up to 7.03 ha of marginal foraging and dispersal habitat may be cleared for the Project. Water extraction activities may occur at some watercourses during construction, however this is likely to occur mostly during the dry season when each species is likely to have migrated from the Study Area. Water will only be extracted when and where supplies are continual (i.e. flowing) and abundant. No substantial or permanent impacts on the hydrology will occur and therefore the continuation of current habitat quality and extent is anticipated. The Project will not create a barrier that may hinder access to farm dam or watercourse habitat. Indirect impacts such as increased erosion, sedimentation and contamination will be managed as per Section 8.3. Other indirect impacts such increased dust, light and noise will be temporary and localised.			
Common greenshank	The common greenshank occurs in all types of wetlands and has the widest distribution of any shorebird in Australia. In QLD it occurs in the Gulf country and eastern gulf of Carpentaria. Several records occur inland south from near Dalby to Mt Guide. It occurs in sheltered coastal habitats, typically with large mudflats and saltmarsh, mangroves or seagrass. The species uses both permanent and ephemeral terrestrial wetlands, including swamps, lakes, dams, rivers, creeks, billabongs, waterholes and inundated floodplains, claypans and salt-flats. It also occurs in artificial wetlands, including sewage ponds (Department of Agriculture Water and the Environment, 2022).		1	Highly unlikely	**Low risk**

MNES	Habitat, Threats and Regional Context	Nature and Extent of Potential Impacts	Consequence	Likelihood	Risk Rating
	The key threats to migratory shorebirds like the common greenshank is indirect and direct habitat loss. Staging areas used during migration through eastern Asia are being lost and degraded by activities which are reclaiming the mudflats for development. Other threats to the species includes degradation of habitat by increased silt in the water, pollution and weed or pest invasion, and disturbance by people reducing energy reserves required for migration.				
Common sandpiper	The common sandpiper is a non-breeding migrant to Australia, occurring in all states and territories. Migrating individuals arrive in Australia from August onwards in New South Wales and Queensland. The non-breeding movements of the species within Australia are poorly known. The species utilises a wide range of coastal wetlands and some inland wetlands. It has 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. Roost sites are typically on rocks or in roots or branches of vegetation, especially mangroves (Department of Agriculture Water and the Environment, 2022). Known threats to the species include habitat loss, reduction of quality and quantity of water, global warming and disturbance from human activities.		1	Highly unlikely	**Low risk**

MNES	Habitat, Threats and Regional Context	Nature and Extent of Potential Impacts	Consequence	Likelihood	Risk Rating
Sharp-tailed sandpiper	The sharp-tailed sandpiper is a non-breeding migrant to Australia, occurring in all states and territories. In Queensland, they are recorded in most regions, being widespread along much of the coast and are very sparsely scattered inland, particularly in central and south-western regions. Movements occur during the non-breeding period where birds appear to be dispersive, moving to temporary or flooded wetlands and leaving them when they dry. The species 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 saltlakes inland. Roosting occurs at the edges of wetlands, on wet open mud or sand, in shallow water, or in short sparse vegetation, such as grass or saltmarsh (Department of Agriculture Water and the Environment, 2022). In Australia, known threats to the species include the loss of important habitat, habitat degradation and direct mortality as a result of human activities.		1	Highly unlikely	**Low risk**
Caspian tern	Within Australia, the Caspian tern has a widespread occurrence and can be found in both coastal and inland habitat. In Queensland the species is widespread in coastal regions from the southern Gulf of Carpentaria to the Torres Strait, and along the eastern coast. The Project Area does not occur within the mapped distribution.	The Caspian tern is considered a potential occurrence within the Study Area due to the presence of suitable habitat and one WildNet record within 20 km. A total of 54.04 ha of suitable foraging and dispersal habitat occurs within the Study Area (Figure 32). Although this species is primarily coastal it is known to travel inland via creeks and rivers. As such, potential habitat within the Study Area is restricted to higher order watercourses	1	Highly unlikely	**Low risk**

MNES	Habitat, Threats and Regional Context	Nature and Extent of Potential Impacts	Consequence	Likelihood	Risk Rating
	They are 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. Breeding may occur on a variety of sites including low islands, cays, spits, banks, ridges, beaches of sand or shell, terrestrial wetlands and stony or rocky islets or banks (Department of Agriculture Water and the Environment, 2022). Some birds may move from coastal breeding colonies to inland non-breeding areas. They apparently follow watercourses inland, though their occurrence at small lakes indicates that at least some movement occurs overland. This species is mostly vulnerable to threats when it is younger. Known threats include habitat loss and degradation, predation of chicks, human disturbance and trampling of breeding sites by cattle, entaglement with fishing line, contaminants and disease.	(stream order 6 and above) that are likely to have open areas of water suitable for foraging and dispersal. Based on the species large distribution and preference for coastal habitats only a small number of dispersing vagrant individuals are expected to utilise potential habitat of the Study Area at any time. Up to 5.30 ha of potential foraging and dispersal habitat may be cleared for the Project. No substantial or permanent impacts on the hydrology of watercourses that intersect the Study Area will occur and therefore the continuation of current habitat quality and extent is anticipated. The Project will not create a barrier that may hinder access to potential habitat. Indirect impacts such as increased erosion, sedimentation and contamination will be managed as per Section 8.3. Other indirect impacts such increased dust, light and noise will be temporary and localised.			
Glossy ibis	Within Australia, this species is widely distributed generally occurring east of the Kimberley in Western Australia and Eyra Peninsula in South Australia. It moves in response to good rainfalls, expanding its range, however the core breeding areas used are within the Murray-Darling Basin region of New South Wales and Victoria, the Macquarie Marshes in New South Wales, and in southern Queensland. The glossy Ibis often	This species is known to occur at one location (Murray's lagoon) within the Study Area. This location as well as all other farm dams and suitable watercourses are conservatively assumed to provide suitable habitat. However habitat is considered marginal due to the frequent cattle use. A total of 80.06 ha of potential habitat occurs within the Study Area (Figure 31). Potential habitat is considered suitable for foraging only due to the	2	Unlikely	**Low risk**

MNES	Habitat, Threats and Regional Context	Nature and Extent of Potential Impacts	Consequence	Likelihood	Risk Rating
	moves north in autumn, then return south to the main breeding areas in spring and summer (Department of Agriculture Water and the Environment, 2022). Regular migration to locations outside of Australia is also suspected but has not been confirmed. 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 also occasionally found in coastal locations. Wetland destruction or degradation is the major threat to the species. Clearing, grazing, burning, increased salinity, groundwater extraction and invasion by exotic plants and fish species are also threats to the species through habitat modification (Department of Agriculture Water and the Environment, 2022).	northerly location of the Study Area outside of known breeding areas. Based on the species large distribution and migration patterns, only a small number of dispersing vagrant individuals are expected to utilise potential habitat of the Study Area at any time. Up to 7.03 ha of marginal foraging and dispersal habitat may be directly impacted via vegetation clearing. Water extraction activities may occur at some farm dam and watercourses during construction, however this is likely to occur during the dry season when the species is likely to have migrated from the Study Area. Water will only be extracted when and where supplies are continual (i.e. flowing) and abundant. No substantial or permanent impacts on the hydrology will occur and therefore the continuation of current habitat quality and extent is anticipated. The Project will not create a barrier that may hinder access to farm dam habitat. Indirect impacts such as increased erosion, sedimentation and contamination will be managed as per Section 8.3. Other indirect impacts such increased dust, light and noise will be temporary and localised.			

9.2 Significant impact criteria assessment

Significant impact assessments have been undertaken for eight known or potentially occurring MNES values in accordance with the EPBC Act Policy Statement 1.1 Significant Impact Guidelines: Matters of National Environmental Significance (Department of the Environment, 2013). The precautionary principle has been applied when deciding whether or not the Project is likely to have a significant impact on a value.

The significant impact assessments, relevant criteria and supporting documents are detailed in Appendix F. Findings of these assessments determined potential significant impacts on the following three MNES may occur as a result of the Project:

- Sharman's rock wallaby
- Koala
- Greater glider.

10.0 Conclusions

This MNES assessment was developed to support the Preliminary Documentation for the Project for assessment under the EPBC Act. Using a combination of desktop information and field-validated data, the potential presence and extent of MNES values within the Study Area was determined. A total of twenty-seven (27) MNES were considered known, likely or potentially occurring within the Study Area including 2 threatened flora species, 15 threatened fauna species and 12 migratory species.

An impact assessment for known, likely and potentially occurring MNES within the Study Area was completed via a two-step process. The first step involved a risk assessment, to determine if the likely consequences associated with potential impacts to individual MNES warrants further assessment via the significant impact assessment process. To make this determination, potential Project impacts were assessed against likelihood and consequence criteria, with the results applied to a risk matrix to identify risk level and further assessment outcomes (Appendix D). MNES with a 'potential' risk rating triggered further assessment whilst MNES with a 'low' risk rating require no further assessment.

Based on the findings of the risk assessment, significant impact assessments were undertaken in accordance with the EPBC Act Policy Statement 1.1 Significant Impact Guidelines: Matters of National Environmental Significance (Department of the Environment, 2013) for eight MNES values (Appendix E):

- Black-throated finch (southern)
- Northern quoll
- Spectacled flying-fox
- Sharman's rock wallaby
- Koala
- Greater glider
- Ghost bat
- Yakka skink.

As detailed in Section 9.2, the precautionary principle was applied in the assessment of significant impacts. The findings of the assessment indicate that the Project may result in a significant impact on the Sharman's rock wallaby, koala and greater glider. To mitigate residual impacts on these species as a result of the Project, offsets under the EPBC Act may be required. Based on this finding, an offset strategy has been developed to support the PD.

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Appendix A

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.

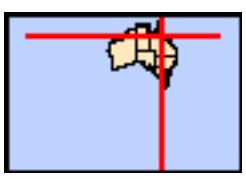
Information on the coverage of this report and qualifications on data supporting this report are contained in the caveat at the end of the report.

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

Report created: 23/02/22 19:24:14

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:	2
Listed Threatened Species:	47
Listed Migratory Species:	19

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
Lowland tropical rainforest of the Wet Tropics	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

Name	Status	Type of Presence
Poephila cincta cincta		
Southern Black-throated Finch [64447]	Endangered	Species or species 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 may 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	Species or species habitat 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]	Endangered	Species or species habitat known to occur within area
Pteropus conspicillatus		
Spectacled Flying-fox [185]	Endangered	Species or species

Name	Status	Type of Presence
		habitat may occur within area
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 queenslandicum King Blue-grass [5481]	Endangered	Species or species habitat may 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
Solanum graniticum Granite Nightshade [84819]	Endangered	Species or species habitat likely to occur within area
Tephrosia leveillei [16946]	Vulnerable	Species or species

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

Listed Migratory Species [Resource Information]

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

Name	Threatened	Type of Presence
Migratory Marine Birds		
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Migratory Marine Species		
Crocodylus porosus Salt-water Crocodile, Estuarine Crocodile [1774]		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

Name	Threatened	Type of Presence
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
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

Name	Threatened	Type of Presence
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Species or species habitat likely to occur within area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat likely to occur within area
Hirundapus caudacutus White-throated Needletail [682]	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.

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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

-18.85865 145.8408,-18.84665 145.82897,-18.90942 145.34547,-18.94298 145.19505,-18.97672 145.01533,-18.96826 144.97921,-18.95092 144.94672,-18.97857 144.64424,-18.9522 144.60926,-18.94668 144.58572,-18.92133 144.50593,-18.93132 144.42604,-18.92578 144.32136,-18.92722 144.24131,-18.91413 144.17307,-18.91529 144.164,-18.87455 144.14419

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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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.

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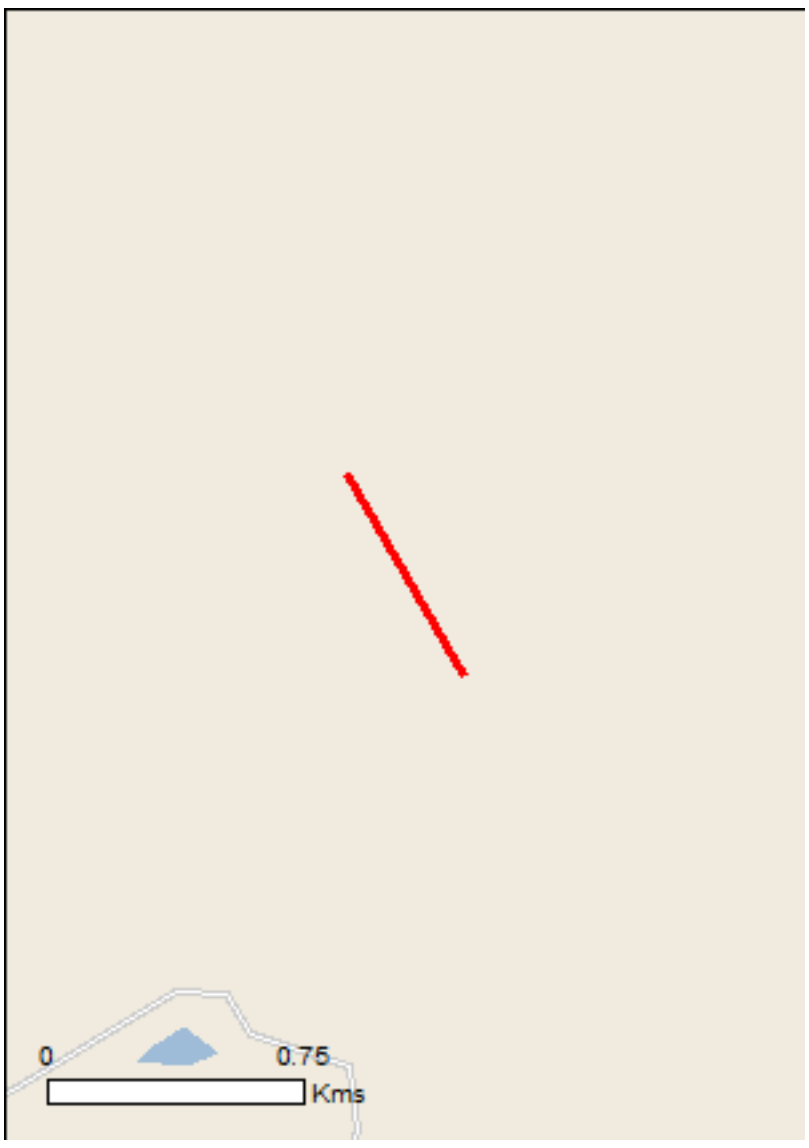
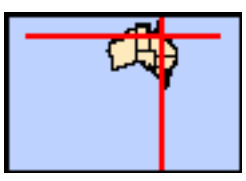


Coordinates

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:	None
National Heritage Places:	None
Wetlands of International Importance:	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	None
Listed Threatened Species:	25
Listed Migratory Species:	18

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:	23
Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	None

Extra Information

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

State and Territory Reserves:	None
Regional Forest Agreements:	None
Invasive Species:	23
Nationally Important Wetlands:	None
Key Ecological Features (Marine)	None

Details

Matters of National Environmental Significance

Listed Threatened Species		[Resource Information]
Name	Status	Type of Presence
Birds		
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Erythrotriorchis radiatus Red Goshawk [942]	Vulnerable	Species or species habitat likely to occur within area
Erythrura gouldiae Gouldian Finch [413]	Endangered	Species or species habitat may occur within area
Falco hypoleucos Grey Falcon [929]	Vulnerable	Species or species habitat may occur within area
Hirundapus caudacutus White-throated Needletail [682]	Vulnerable	Species or species habitat may 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 habitat likely to occur within area
Rostratula australis Australian Painted Snipe [77037]	Endangered	Species or species habitat likely to occur within area
Tyto novaehollandiae kimberli Masked Owl (northern) [26048]	Vulnerable	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 may occur within area
Mammals		
Dasyurus hallucatus Northern Quoll, Digul [Gogo-Yimidir], Wijingadda [Dambimangari], Wiminji [Martu] [331]	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

Name	Status	Type of Presence
Macroderma gigas		
Ghost Bat [174]	Vulnerable	Species or species habitat likely to occur within area
Mesembriomys gouldii rattoides		
Black-footed Tree-rat (north Queensland), Shaggy Rabbit-rat [87620]	Vulnerable	Species or species habitat may occur within area
Petauroides volans		
Greater Glider [254]	Vulnerable	Species or species habitat likely 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]	Endangered	Species or species habitat likely to occur within area
Pteropus conspicillatus		
Spectacled Flying-fox [185]	Endangered	Species or species habitat may 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 may occur within area
Plants		
Cycas platyphylla		
a cycad [55796]	Vulnerable	Species or species habitat may occur within area
Dichanthium setosum		
bluegrass [14159]	Vulnerable	Species or species habitat likely to occur within area
Marsdenia brevifolia		
[64585]	Vulnerable	Species or species habitat may occur within area
Tephrosia leveillei		
[16946]	Vulnerable	Species or species habitat may occur within area
Reptiles		
Egernia rugosa		
Yakka Skink [1420]	Vulnerable	Species or species habitat may occur within area

Listed Migratory Species		[Resource Information]
* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.		
Name	Threatened	Type of Presence
Migratory Marine Birds		
Apus pacificus		
Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Migratory Terrestrial Species		
Cuculus optatus		
Oriental Cuckoo, Horsfield's Cuckoo [86651]		Species or species habitat may occur within area
Hirundapus caudacutus		
White-throated Needletail [682]	Vulnerable	Species or species habitat may occur within area

Name	Threatened	Type of Presence
Hirundo rustica Barn Swallow [662]		Species or species habitat may occur within area
Monarcha melanopsis Black-faced Monarch [609]		Species or species habitat may occur within area
Monarcha trivirgatus Spectacled Monarch [610]		Species or species habitat may occur within area
Motacilla cinerea Grey Wagtail [642]		Species or species habitat may occur within area
Motacilla flava Yellow Wagtail [644]		Species or species habitat likely to occur within area
Myiagra cyanoleuca Satin Flycatcher [612]		Species or species habitat may occur within area
Rhipidura rufifrons Rufous Fantail [592]		Species or species habitat likely 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 habitat may occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Species or species habitat 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 may occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area
Chrysococcyx osculans Black-eared Cuckoo [705]		Species or species habitat may occur within area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Species or species habitat likely to occur within area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat likely to occur within area
Hirundapus caudacutus White-throated Needletail [682]	Vulnerable	Species or species habitat may 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 may occur within area
Monarcha trivirgatus Spectacled Monarch [610]		Species or species habitat may occur within area
Motacilla cinerea Grey Wagtail [642]		Species or species habitat may occur within

Name	Threatened	Type of Presence
		area
Motacilla flava Yellow Wagtail [644]		Species or species habitat likely to occur within area
Myiagra cyanoleuca Satin Flycatcher [612]		Species or species habitat may occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
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Weeds reported here are the 20 species of national significance (WoNS), along with other introduced plants that are considered by the States and Territories to pose a particularly significant threat to biodiversity. The following feral animals are reported: Goat, Red Fox, Cat, Rabbit, Pig, Water Buffalo and Cane Toad. Maps from Landscape Health Project, National Land and Water Resouces Audit, 2001.

Name	Status	Type of Presence
Birds		
Columba livia Rock Pigeon, Rock Dove, Domestic Pigeon [803]		Species or species habitat likely to occur within area
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Streptopelia chinensis Spotted Turtle-Dove [780]		Species or species habitat likely to occur within area
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Name	Status	Type of Presence 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
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Lantana camara Lantana, Common Lantana, Kamara Lantana, Large-leaf Lantana, Pink Flowered Lantana, Red Flowered Lantana, Red-Flowered Sage, White Sage, Wild Sage [10892]		Species or species habitat likely to occur within area
Parkinsonia aculeata Parkinsonia, Jerusalem Thorn, Jelly Bean Tree, Horse Bean [12301]		Species or species habitat likely to occur within area
Parthenium hysterophorus Parthenium Weed, Bitter Weed, Carrot Grass, False Ragweed [19566]		Species or species habitat likely to occur within area

Name	Status	Type of Presence
Salvinia molesta Salvinia, Giant Salvinia, Aquarium Watermoss, Kariba Weed [13665]		Species or species habitat likely to occur within area

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- 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

-18.82571 145.48252,-18.82072 145.47946

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

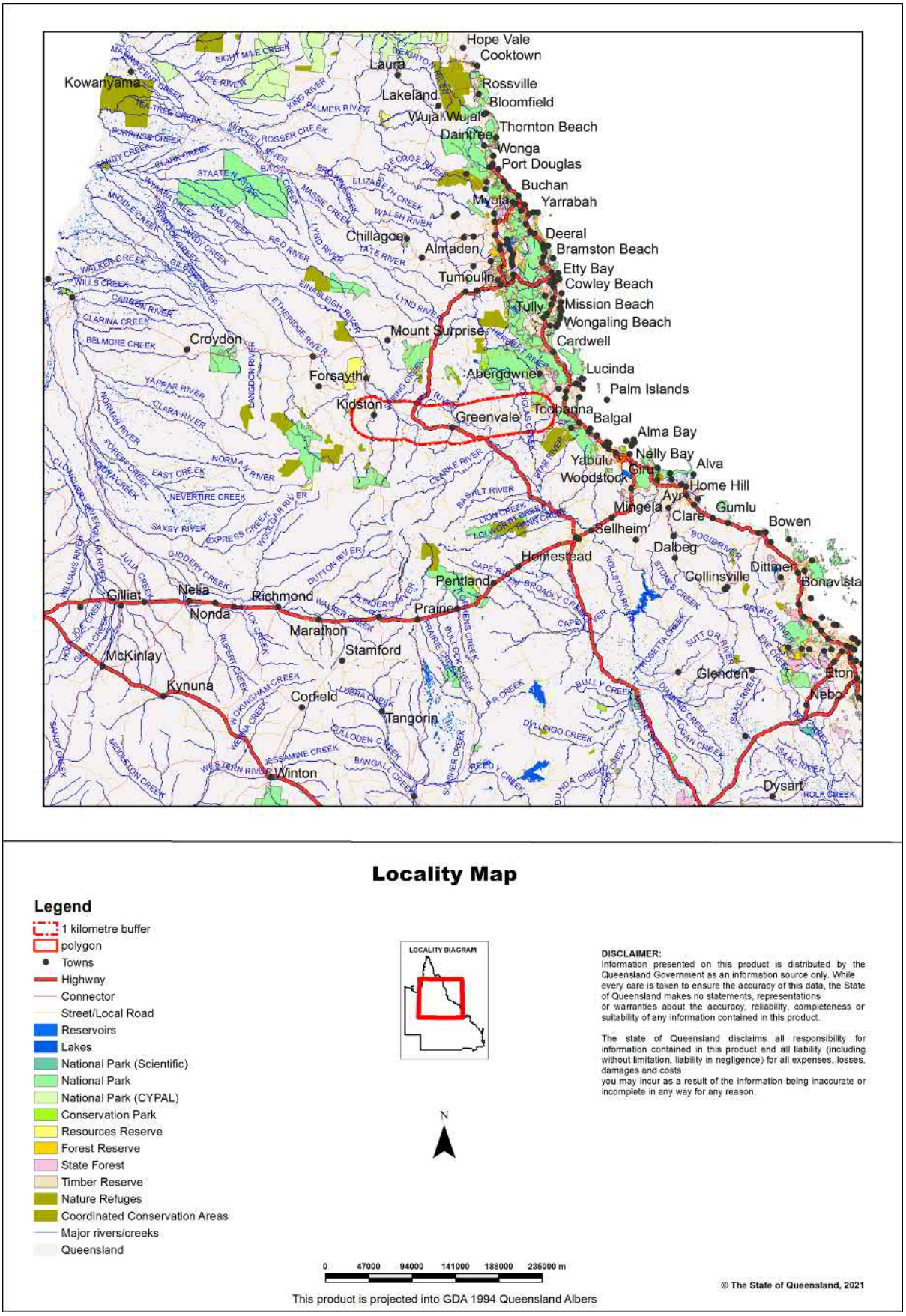
For the selected area of interest 870337.39ha

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 B

Queensland Herbarium REs

Appendix B Queensland Herbarium REs

Table 20 Project Area REs – State mapped and field validated

RE ID	Short Description[1]	VM Act Status[2]	BDStatus[3]	Mapped by DES	Field validated
7.3.43a	*Eucalyptus tereticornis* open forest, tall open forest and woodland including communities ranging from those dominated by *E. tereticornis* to mixtures of that species with *Corymbia intermedia, E. drepanophylla, Lophostemon suaveolens* and *Allocasuarina torulosa.* Uplands on alluvium.	OC	E	Yes	No
7.5.2b	*Eucalyptus portuensis, Corymbia intermedia, E. tereticornis, Lophostemon suaveolens, Syncarpia glomulifera* open forest and woodland. Deep weathered soils of basalt origin.	OC	OC	Yes	No
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
7.8.18c	*Corymbia intermedia, Allocasuarina torulosa, Lophostemon suaveolens* open forest to woodland. Basalt.	OC	OC	Yes	No
7.8.7a	*Eucalyptus tereticornis* open forest, tall open forest and woodland. May also include *Corymbia intermedia, E. drepanophylla, Lophostemon suaveolens and Allocasuarina torulosa.* Uplands and highlands on basaltic krasnozem and prairie soils, of the moist rainfall zone.	OC	E	Yes	No
7.12.29a	*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

RE ID	Short Description[1]	VM Act Status[2]	BDStatus[3]	Mapped by DES	Field validated
7.12.29b	*Corymbia intermedia, Allocasuarina torulosa, Lophostemon suaveolens* open forest and woodland. Uplands, of the moist rainfall zone, on granite and rhyolite.	LC	NCAP	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
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

RE ID	Short Description[1]	VM Act Status[2]	BDStatus[3]	Mapped by DES	Field validated
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
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
9.7.3b					

RE ID	Short Description[1]	VM Act Status[2]	BDStatus[3]	Mapped by DES	Field validated
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
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

RE ID	Short Description[1]	VM Act Status[2]	BDStatus[3]	Mapped by DES	Field validated
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
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 C

MNES Habitat Mapping Rules

Appendix C MNES Habitat Mapping Rules

Table 21 MNES habitat mapping rules and areas

Species	Likelihood	Habitat Category	Habitat Definition	Modelling Approach[1]	Area within Study Area (ha)
Fauna					
Greater glider (*Petauroides volans*)	Known	Breeding / Denning	Highly connected, eucalypt woodland or forest containing 2-4 hollows/ha, medium-large in size (>10cm).	Remnant REs on land zone 3 that are dominated by *Eucalyptus spp.*. Does not include REs 9.3.24 or 9.3.25.	251.47
		Foraging / Dispersal	All other connected eucalypt woodland or forest suitable for gliding, on creek lines or within 120 m of breeding / denning habitat.	Remnant REs comprising eucalypt woodland or forest that occur on creek lines or within 120 m of breeding / denning habitat. Excludes communities with a 'very sparse' structure or 'low' canopy.	401.47
Sharman's rock-wallaby (*Petrogale sharmani*)	Known	Breeding	Vegetation communities that commonly contain rocky outcrops with large boulder piles, within the species distribution.	Remnant RE 9.12.1a and 9.12.23, based on findings of the field survey program.	146.19
		Foraging / Dispersal	Woodlands and forests on rocky substrates that occur between or directly adjacent to potential breeding habitat, within the species distribution.	Remnant and HVR REs on land zone 11 or 12 that occur adjacent to or between potential breeding habitat and within the DES predicted extent of the species habitat.	113.85
Squatter pigeon (southern) (*Geophaps scripta scripta*)	Known	Breeding	Open forest to sparse, open woodland or scrub vegetation on alluvial, old alluvial or laterite substrates in close proximity (<1 km) to permanent water.	REs (remnant or HVR condition) on land zone 3, 5 or 7 that occur within 1 km of permanent water.	1,545.39
		Foraging	Open forest to sparse, open woodland or scrub vegetation on alluvial, old alluvial or laterite substrates in proximity (1-3 km) to permanent water.	REs (remnant or HVR condition) on land zone 3, 5 or 7 that occur 1 to 3 km of permanent water.	365.15

Species	Likelihood	Habitat Category	Habitat Definition	Modelling Approach[1]	Area within Study Area (ha)
		Dispersal	Any forest or woodland occurring between patches of foraging or breeding habitat, and suitable waterbodies; OR woody vegetation (any condition) that facilitates the local movement of the subspecies between patches of foraging habitat, breeding habitat and/or waterbodies.	Remaining vegetation communities (any condition) that are not considered to provide potential breeding or foraging habitat.	4,021.53
Koala (*Phascolarctos cinereus*)	Likely	Refuge	Woodlands and forests dominated by Eucalyptus spp. on alluvial substrates, or woodlands and forests dominated by Eucalyptus spp. that occur as very large patches (>500 ha).	Remnant REs 9.3.3, 9.3.3a, 9.3.5, 9.3.6a, 9.3.13, 9.3.16, 9.3.20, 9.3.22a. Non-alluvial REs in a patch > 500ha including: 7.8.7, 9.5.3, 9.5.11, 9.7.1, 9.8.1, 9.8.4, 9.11.1a, 9.11.2a, 9.11.5, 9.11.15a, 9.11.16, 9.11.23b, 9.12.1a, 9.12.10, 9.12.12, 9.12.16, 9.12.26, 9.12.32.	4,904.36
		Foraging	Eucalypt woodlands and forests that commonly contain koala food trees but are not considered to provide refuge habitat.	REs (remnant or HVR condition) comprising eucalypt or mixed woodlands and forests that do not meet refuge habitat criteria.	118.31
		Dispersal	Any forest or woodland occurring between patches of foraging or breeding habitat, and suitable waterbodies; OR woody vegetation (any condition) that facilitates the local movement of the subspecies between patches of foraging habitat, breeding habitat and/or waterbodies.	Any remaining vegetation community (non-remnant, HVR or remnant condition) that contains occasional or rare koala food trees or shelter trees.	195.44
Black-throated finch (southern) (*Poephila cincta cincta*)	Potential	Breeding	Mapped important areas, or vegetation communities in which the species has been recorded in (1994 or more recent) that contain necessary resources (potential nesting trees and known perennial foraging grasses) and occur in close proximity (< 400m) to water.	Mapped important areas (5 km surrounding a post-1995 record) and areas of REs 9.5.1, 9.5.5, 9.8.1 that occur within 400 m of a water source (including farm dams and watercourses with a stream order of 3 or higher). Potential nesting trees and foraging grasses assumed present.	0.20

Species	Likelihood	Habitat Category	Habitat Definition	Modelling Approach[1]	Area within Study Area (ha)
		Foraging	Mapped important areas, or vegetation communities in which the species has been recorded in since 1994 (any condition) that are connected to potential breeding habitat (within 3 km). Known black-throated finch (southern) perennial foraging grasses are at least occasional within the ground layer.	Mapped important areas (5 km surrounding a post-1995 record) and areas of REs 9.5.1, 9.5.5, 9.8.1 (remnant or HVR) that occur within 3 km of breeding habitat (connected). Foraging grasses assumed present unless patch is close to anthropogenic activity (i.e cattle yard or homestay where native grasses unlikely to persist).	8.37
		Dispersal	All other vegetation communities connected to potential breeding habitat (within 3 km) that is not considered foraging habitat.	All other vegetation communities (remnant or HVR condition) that occur within 3 km of breeding habitat and do not meet foraging habitat criteria.	181.74
Northern quoll (*Dasyurus hallucatus*)	Potential	Breeding / Refuge (marginal)	Rocky habitats or relatively complex woodland or forest areas containing rare to occasional denning opportunities (i.e. large diameter trees, termite mounds or hollow logs) in close proximity to permanent and semi-permanent creek lines (<1 km). Potential habitat is not considered marginal if denning opportunities are common.	Remnant REs comprising woodlands or forests that occur in areas of rugged terrain (as observable in aerial imagery and contour mapping) within 1 km of a watercourse (stream order 3 or higher) or a farm dam.	739.46
		Foraging / Dispersal (marginal)	Mature vegetation communities connected to or in close proximity to (<1 km) breeding / refuge habitat.	Remnant REs within 1 km of breeding / refuge habitat.	365.35
Ghost bat (*Macroderma gigas*)	Potential	Roosting / Breeding	Deep natural caves, rock crevices or disused mines.	DoR abandoned mine sites that have not been field validated. No suitable rock crevices or cave systems identified during field surveys and therefore are considered unlikely to occur.	0
		Foraging	Woodland and forest communities in proximity (<2 km) to potential roosting/breeding habitat.	Remnant or HVR REs (except grassland REs 9.8.13 and 9.3.25) that occur within 2 km of potential roosting / breeding habitat.	0

Species	Likelihood	Habitat Category	Habitat Definition	Modelling Approach[1]	Area within Study Area (ha)
		Dispersal	All vegetation that is not considered roosting / breeding or foraging habitat.	All REs not considered to provide roosting / breeding or foraging habitat.	5,135.67
Red goshawk (*Erythrotriorchis radiatus*)	Potential	Nesting	Tall emergent trees (>25 m) in areas close to permanent water (watercourses or wetlands) within a landscape that supports a mosaic of vegetation types.	REs (remnant condition only) on land zone 3 that occur within 1 km of permanent water.	59.06
		Foraging / Dispersal	Areas that support a mosaic of vegetation types, including eucalypt woodland, open forest, tall open forest, gallery rainforest, swamp sclerophyll forest, rainforest margins and the ecotones between these communities.	All remaining REs in remnant condition within 10 km of permanent water.	5,071.49
Australian painted snipe (*Rostratula australis*)	Potential	Breeding / Foraging	Shallow waterbodies including terrestrial wetlands, swamps, claypans, bore drains and dams with areas of dense vegetative cover; OR grasslands that are frequently inundated or waterlogged.	Watercourses with a stream order of 4 or more, and waterbodies identifiable from aerial imagery that have some fringing vegetation.	80.06
Masked owl (*Tyto novaehollandiae kimberli*)	Potential	Nesting (marginal)	Woodlands and forests with large trees bearing medium-large hollows (>10cm).	Remnant REs 7.8.18, 7.8.7, 9.3.13, 9.3.16, 9.3.20, 9.3.3, 9.3.3a, 9.3.5 & 9.3.6a.	436.31
		Foraging / Dispersal	All other vegetation communities not considered potential breeding habitat including but not limited to riparian forest, rainforest, open forest or woodland, *Melaleuca* swamps and the edges of mangroves, as well as along the margins of sugar cane fields.	All other REs (remnant or HVR condition).	4,699.36
White-throated needletail	Likely	Roosting	Remnant vegetation on steep escarpments or ridgelines.	All REs in remnant condition only that occur on steep inclines or at high elevations as identified in contour mapping.	497.72

Species	Likelihood	Habitat Category	Habitat Definition	Modelling Approach[1]	Area within Study Area (ha)
(*Hirundapus caudacutus*)		Foraging / Dispersal	Woody and non-woody vegetation communities in any condition (aerial species) that is not considered potential roosting habitat. Above waterbodies also suitable.	All areas including water and vegetation in any condition including non-remnant.	5,434.35
Grey falcon (*Falco hypoleucos*)	Potential	Nesting	Vegetation communities located along drainage lines or watercourses that contain tall eucalypt trees and or other potential raptor nests.	Remnant REs 9.3.1, 9.3.3, 9.3.3a, 9.3.5, 9.3.6a, 9.3.13, 9.3.16, 9.3.20, 9.3.22a & 9.3.24.	583.10
		Foraging / dispersal	Timbered lowland plains, particularly acacia shrublands that are crossed by tree-lined watercourses. Also includes treeless areas, tussock grassland and open woodland.	All remaining REs (remnant or HVR condition) not considered breeding habitat.	4,552.57
Curlew sandpiper (*Calidris ferruginea*)	Potential	Foraging/ Dispersal	Watercourses, freshwater wetlands and other waterbodies (including artificial) that have bare edges of mud or sand with shallow water.	Watercourses with a stream order of 4 or more, and waterbodies identifiable from aerial imagery.	80.06
Spectacled flying-fox (*Pteropus conspicillatus*)	Potential	Foraging / Dispersal	Rainforest and adjoining (within 10 km and connected) vegetation communities that contain fruiting or flowering resources including *Eucalyptus spp.* or *Corymbia spp.* trees.	REs (remnant or HVR condition) within 10km of state mapped rainforest / notophyll vine forest.	651.45
Fork-tailed swift (*Apus pacificus*)	Likely	Foraging / Dispersal	Woody and non-woody vegetation communities in any condition (aerial species). Above waterbodies also suitable.	All areas including water and vegetation in any condition including non-remnant.	5,932.07
Oriental cuckoo (*Cuculus optatus*)	Potential	Foraging / Dispersal	A range of woody vegetation communities including monsoonal rainforest, vine thickets, wet sclerophyll forest or open Casuarina, Acacia or Eucalyptus woodlands.	All REs (remnant or HVR condition) excluding grasslands (i.e. RE 9.8.13 and 9.3.25).	5,122.56
Rufous fantail (*Rhipidura rufifrons*)	Potential	Breeding	Moist, dense habitats, including mangroves, rainforest, riparian forests and thickets, and wet eucalypt forests with a dense understorey.	Remnant REs comprising wet sclerophyll, rainforest or riparian forests (excluding communities ground-truthed elsewhere in the Study Area and found to be unsuitable).	2,589.39

Species	Likelihood	Habitat Category	Habitat Definition	Modelling Approach[1]	Area within Study Area (ha)
		Foraging / Dispersal	Dry eucalypt forests and woodlands within the mapped distribution.	All REs (remnant or HVR condition) excluding grassland communities (i.e. except RE 9.8.13 and 9.3.25) within the mapped distribution for the species.	
Black-faced monarch (*Monarcha melanopsis*)	Potential	Foraging / Dispersal (marginal)	Open eucalypt forest and riparian vegetation within the species mapped distribution.	All REs (remnant or HVR condition) excluding grassland communities (i.e. except 9.8.13 and 9.3.25) within the mapped distribution of the species (east of -18.934, 145.235).	1,927.03
Spectacled monarch (*Symposiachrus trivirgatus*)	Potential	Breeding / Foraging / Dispersal (marginal)	Dry forest and woodland within the species mapped distribution.		
Satin flycatcher (*Myiagra cyanoleuca*)	Potential	Foraging / Dispersal	Eucalypt-dominated forests and woodlands as well as *Melaleuca sp.* swamps.	All REs (remnant or HVR condition) excluding grasslands (i.e. RE 9.8.13 and 9.3.25) within the mapped distribution for the species.	2,600.63
Common greenshank (*Tringa nebularia*), glossy ibis (*Plegadis falcinellus*), red-necked stint (*Calidris ruficollis*), common sandpiper (*Actitis hypoleucos*) and sharp-tailed sandpiper (*Calidris acuminata*).	Potential	Foraging / Dispersal	Watercourses, freshwater wetlands and other waterbodies (including artificial) that have bare edges of mud or sand with shallow water.	Watercourses with a stream order of 4 or more, and waterbodies identifiable from aerial imagery.	80.06
Caspian tern (*Hydroprogne caspia*)	Potential	Foraging / Dispersal	Open wetlands, lakes and rivers with sheltered shallow water near the margins.	Watercourses with a stream order of 6 or more, and large waterbodies identifiable from aerial imagery.	54.04

Species	Likelihood	Habitat Category	Habitat Definition	Modelling Approach[1]	Area within Study Area (ha)
Yakka skink (*Egernia rugosa*)	Potential	Breeding / Foraging	Open dry sclerophyll forest or woodland on floodplains (not fringing riparian communities), old alluvial and laterite substrates with common microhabitat / burrow opportunities i.e. large fallen logs. Habitat is considered marginal if it contains microhabitat / burrow opportunities in low levels.	REs (remnant or HVR condition) 9.3.16, 9.3.20, 9.3.22a, 9.3.24, 9.3.25, 9.3.3, 9.3.3a, 9.3.5, 9.3.6a, 9.7.1, 9.7.2, 9.5.3, 9.5.11.	380.84
Flora					
Dichanthium setosum	Potential	Potential habitat	Native grasslands, brigalow and eucalypt communities on basalt substrates.	REs (remnant or HVR condition) 7.8.18, 7.8.7, 9.8.1, 9.8.13, 9.8.4.	583.10
Tephrosia leveillei	Potential	Potential habitat	Woodlands and forests on alluvial plains that contain *Eucalyptus spp.*.	REs (remnant or HVR) 9.3.1, 9.3.3, 9.3.3a, 9.3.5, 9.3.6a, 9.3.13, 9.3.16, 9.3.20, 9.3.22a & 9.3.24.	386.58

[1]: Modelling approach only applied where field validated data is unavailable or cannot be reasonably extrapolated.

Appendix D

Risk Assessment Criteria

Appendix D Risk Assessment Criteria

1. Consequence assessment criteria

Consequence level	Descriptor	
	Threatened species and communities	**Migratory species**
1	• No impacts to threatened species populations, ecological communities, habitat extent and habitat quality; **and** • No increase in threatening processes to threatened species and ecological communities; **and** • Threatened species and ecological communities recovery or persistence is unaffected.	• No impacts to migratory species habitat extent and habitat quality; **and** • No increase in threatening processes to migratory species; **and** • Area of habitat within the Project Area is not nationally or internationally significant **and** • Migratory species recovery or persistence is unaffected.
2	• Impacts to threatened species, ecological communities and associated habitats are of a low magnitude or are short-term; **and** • Increased threatening processes to threatened species and ecological communities can effectively be mitigated by well characterised management measures; **and** • In a regional context, reduction in available habitat is inconsequential; **and** • Species specific referral guidance (if available) indicates a low risk.	• Impact area is below species-specific clearing thresholds (if available); **and** • No impacts to areas supporting an ecologically significant proportion of a population; **and** • Impacts to migratory species important habitat are of a low magnitude or are short-term; **and** • Increased threatening processes to migratory species can effectively be mitigated by well characterised management measures; **and** • In a regional context, reduction in available habitat is inconsequential.
3	• Species has been confirmed within the Project Area or in adjacent properties; however uncertainty on population density, population dynamics and or habitat utilisation occurs; **or** • Population numbers and habitat utilisation within the Project Area may vary temporally and spatially due to dependence on climatic conditions i.e. rainfall events recharging wetlands. Therefore, full extent of potential impacts on threatened species is uncertain; **or** • Impacts to threatened species, ecological communities and associated habitats are of a moderate or high magnitude or are longer-term; **or**	• Multiple individuals were recorded using habitat within the Project Area; • Close to or above species-specific clearing thresholds (if available); **or** • Impacts to areas supporting or close to supporting an ecologically significant proportion of a population; **or** • Impacts to migratory species important habitat are of a moderate or high magnitude or are longer-term; **or** • Increased threatening processes to migratory species require more intensive, longer term management or intervening measures to mitigate impacts; **or** • Receiving environment is more sensitive to impacts or the consequence of the impact is uncertain; **or** • In a regional context, reduction in available habitat is notable.

Consequence level	Descriptor	
	Threatened species and communities	**Migratory species**
	• Increased threatening processes to threatened species and ecological communities require more intensive, longer term management or intervening measures to mitigate impacts; **or** • Receiving environment is more sensitive to impacts or the consequence of the impact is uncertain; **or** • In a regional context, reduction in available habitat is notable; **or** • Species specific referral guidance (if available) indicates a moderate or high risk.	

2. Likelihood criteria

Likelihood level	Descriptor
Highly unlikely	• May only occur in exceptional circumstances • No previous incidence of occurring
Unlikely	• Very low chance of occurring • One rare previous incidence of occurring
Possible	• Might occur in some circumstances • Few previous incidences of occurring

3. Risk assessment matrix and outcome

Likelihood	Severity		
	1	2	3
Highly unlikely	Low risk – no further assessment required (green)	Low risk – no further assessment required (green)	Low risk – no further assessment required (green)
Unlikely	Low risk – no further assessment required (green)	Low risk – no further assessment required (green)	Low risk – no further assessment required (green)
Possible	Low risk – no further assessment required (green)	Low risk – no further assessment required (green)	Potential risk – further assessment required (amber)

Appendix E

Significant Impact Assessments

Appendix E Significant Impact Assessments

The EPBC Act Policy Statement 1.1 Significant Impact Guidelines: Matters of National Environmental Significance (DotE, 2013) provides the framework for the assessment of potential impacts upon MNES as well as a process for determining the level of significance of impacts.

In accordance with the guideline, impacts on MNES are to be assessed utilising the broadest scope of the Project, with consideration to both direct and indirect impacts and proposed measures that may avoid and reduce impacts. Significance is tested through a set criterion stipulated in the guideline, which is tailored to each MNES and for some values, the conservation status of the MNES.

The significant impact criteria utilised in the assessment is outlined in Table 22. Results of the initial risk assessment were utilised to inform the significant impact assessment. Other Commonwealth guidelines used to support the assessment of MNES impacts include:

- EPBC Act Draft Referral guidelines for the nationally listed Brigalow Belt reptiles (Department of Sustainability Environment Water Population and Communities, 2011a)
- Referral guidelines for the 14 birds listed as migratory species under the EPBC Act (Department of the Environment, 2015b)
- EPBC Act Policy Statement 3.21: Industry guidelines for avoiding, assessing and mitigating impacts on EPBC Act listed migratory shorebird species (Department of the Environment and Energy, 2017)
- EPBC Act Policy Statement 3.13: Significant impact guidelines for the endangered black-throated finch (southern) (*Poephila cincta cincta*) (Department of the Environment Water Heritage and the Arts, 2009b)
- EPBC Act referral guideline for the endangered northern quoll *Dasyurus hallucatus* (Department of the Environment, 2016b)
- EPBC Act referral guidelines for the vulnerable koala (combined populations of Queensland, New South Wales and the Australian Capital Territory) (Department of the Environment, 2014).

Additional Commonwealth resources such as threat abatement plans and approved conservation advice statements have been referred to in the impact assessments. These include:

- Threat abatement plan for predation by feral cats (The Commonwealth of Australia, 2015)
- Threat abatement plan for the biological effects, including lethal toxic ingestion, caused by cane toads (Department of Sustainability Environment Water Population and Communities, 2011b)
- Threat abatement plan for predation, habitat degradation, competition and disease transmission by feral pigs (*Sus scrofa*) (Department of the Environment and Energy, 2015)
- Threat abatement plan for disease in natural ecosystems caused by *Phytophthora Cinnamomi* (Department of the Environment Water Heritage and the Arts, 2009c)
- Threat abatement plan for predation by the European red fox (Department of the Environment Water Heritage and the Arts, 2008f)
- Approved Conservation Advice for *Dichanthium setosum* (Department of Environment Water Heritage and the Arts, 2008)
- Approved Conservation Advice for *Tephrosia leveillei* (Department of the Environment Water Heritage and the Arts, 2008d)
- Conservation Advice *Erythrotriorchis radiatus* (red goshawk) (Threatened Species Scientific Committee, 2015a)
- Conservation Advice *Falco hypoleucos* (Grey Falcon) (Threatened Species Scientific Committee, 2020)
- Conservation Advice *Geophaps scripta scripta* (squatter pigeon (southern)) (Threatened Species Scientific Committee, 2015c)

- Conservation Advice *Hirundapus caudacutus* (white-throated needletail) (Threatened Species Scientific Committee, 2019a)
- Conservation Advice *Petrogale sharmani* (Sharman's rock wallaby) (Threatened Species Scientific Committee, 2016c)
- Approved Conservation Advice for *Rostratula australis* (Australian painted snipe) (Department of Sustainability, Environment, Water, 2013)
- Conservation Advice *Tyto novaehollandiae kimberli* (masked owl (northern)) (Threatened Species Scientific Committee, 2015b)
- Conservation Advice *Pteropus conspicillatus* (spectacled flying-fox) (Threatened Species Scientific Committee, 2019b)
- Conservation Advice *Macroderma gigas* (ghost bat) (Threatened Species Scientific Committee, 2016a)
- Conservation Advice *Petauroides volans* (Greater glider) (Threatened Species Scientific Committee, 2016b)
- Approved Conservation Advice for *Phascolarctos cinereus* (combined populations in Queensland, New South Wales and the Australian Capital Territory) (Threatened Species Scientific Committee, 2012a)
- Approved Conservation Advice for *Egernia rugosa* (Yakka Skink) (Threatened Species Scientific Committee, 2008a).

Table 22 Significant impact criteria and key definitions

MNES	Criteria	Key definitions
Critically endangered and endangered species and ecological communities	An action is likely to have a significant impact on a Critically Endangered or Endangered species if there is a real chance or possibility that it will: • Lead to a long-term decrease in the size of a population; • Reduce the area of occupancy of the species; • Fragment an existing population into two or more populations; • Adversely affect **habitat critical to the survival of a species**; • Disrupt the breeding cycle of a population; • Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline; • Result in invasive species that are harmful to a Critically Endangered or Endangered species becoming established in the Endangered or Critically Endangered species' habitat; • Introduce disease that may cause the species to decline; or • Interfere with the recovery of the species.	**'Habitat critical to the survival of a species'** refers to areas that are necessary: • For activities such as foraging, breeding, roosting, or dispersal; • For the long-term maintenance of the species (including the maintenance of species essential to the survival of the species, such as pollinators); • To maintain genetic diversity and long-term evolutionary development, or • For the reintroduction of populations or recovery of the species.
Vulnerable species and ecological communities	An action is likely to have a significant impact on a Vulnerable species if there is a real chance or possibility that it will: • Lead to a long-term decrease in the size of an **important population** of a species; • Reduce the area of occupancy of an important population; • Fragment an existing important population into two or more populations; • Adversely affect **habitat critical to the survival of a species**; • Disrupt the breeding cycle of an **important population**; • Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline; • Result in invasive species that are harmful to a Vulnerable species becoming established in the Vulnerable species' habitat; • Introduce disease that may cause the species to decline; or • Interfere substantially with the recovery of the species.	**'Habitat critical to the survival of a species'** as defined above. An **'important population'** is a population that is necessary for a species' long-term survival and recovery. This may include populations identified as such in recovery plans, and/or that are: • Key source populations either for breeding or dispersal; • Populations that are necessary for maintaining genetic diversity, and/or • Populations that are near the limit of the species range.

MNES	Criteria	Key definitions
Migratory species	An action is likely to have a significant impact on a migratory species if there is a real chance or possibility that it will: • Substantially modify (including by fragmenting, altering fire regimes, altering nutrient cycles or altering hydrological cycles), destroy or isolate an area of **important habitat** for a migratory species; • Result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for the migratory species; or • Seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an **ecologically significant proportion of the population** of a migratory species.	An area of **'important habitat'** for a migratory species is: • Habitat utilised by a migratory species occasionally or periodically within a region that supports an ecologically significant proportion of the population of the species, and/or • Habitat that is of critical importance to the species at particular life-cycle stages, and/or • Habitat utilised by a migratory species which is at the limit of the species range, and/or • Habitat within an area where the species is declining. Listed migratory species cover a broad range of species with different life cycles and population sizes. Therefore, what is an **'ecologically significant proportion'** of the population varies with the species (each circumstance will need to be evaluated). Some factors that should be considered include the species' population status, genetic distinctiveness and species-specific behavioural patterns (for example, site fidelity and dispersal rates).

Listed Endangered species

Black-throated finch (southern) (*Poephila cincta cincta*)

The black-throated finch (southern) is listed Endangered under the EPBC Act.

Distribution

The black-throated finch (southern) historically occurred from far south-eastern Queensland, near the Queensland-New South Wales border, through eastern Queensland north to the divide between the Burdekin and Lynd Rivers. The subspecies is now extinct at most sites south of Burdekin River, and is confined to a very few remaining 'pockets' of suitable habitat.

Since 1998, birds likely to be of the southern subspecies have been recorded at the following sites (Department of Agriculture Water and the Environment, 2022):

- Townsville and its surrounds (Giru, Serpentine Lagoon, Toonpan, and near Ross River Dam)
- Ingham, and sites nearby (near Mutarnee [at Ollera Creek], and near Mount Fox)
- scattered sites in central-eastern Queensland (Great Basalt Wall, Yarrowmere Station, Moonoomoo Station, Doongmabulla Station, Fortuna Station and Aramac).

Habitat requirements

The black-throated finch (southern) occurs mainly in grassy, open woodlands and forests, typically dominated by *Eucalyptus*, *Corymbia* and *Melaleuca*, and occasionally in tussock grasslands or other habitats (for example freshwater wetlands), often along or near watercourses, or in the vicinity of water. Some of the more common species of eucalypts in woodlands and forests frequented by the subspecies include narrow-leaved ironbark (*Eucalyptus crebra*), river red gum (*Eucalyptus camaldulensis*), silver-leaved ironbark (*Eucalyptus melanophloia*), Brown's box (*Eucalyptus brownii*), yellowjacket (*Eucalyptus similis*) and forest red gum (*Eucalyptus tereticornis*).

As detailed in the *Significant Impact Guidelines for the endangered black-throated finch (southern)* (Department of the Environment Water Heritage and the Arts, 2009b), areas of grassy open woodlands and forests must contain three key habitat resources: water sources, grass seeds and trees providing suitable nesting habitat. The presence and configuration between and within these three key resources governs the distribution of the black-throated finch (southern), and any disruption to the connectivity between these resources will have a serious impact on an area’s ability to sustain the subspecies.

This subspecies feed on the seeds of select grasses and herbaceous plants. Preferred foraging grasses are reported to include *Alloteropsis semialata*, *Aristida spp.*, *Chrysopogon fallax*, *Dichanthium sericeum*, *Echinopogon spp.*, *Enteropogon acicularis*, *Eragrostis sororia*, *Eragrostis spp.*, *Eriachne armittii*, *Panicum decompositum*, *Panicum effusum*, *Paspalum spp.*, *Schizachyrium spp.*, *Sorghum spp,*, *Themeda triandra* and *Urochloa mosambicensis** (Department of the Environment Water Heritage and the Arts, 2009a). They obtain most of their food by pecking seeds from the ground. However, they will also reach or jump up to take seeds from low inflorescences, perch on stems to take seeds from inflorescences, perch on grass stems and use their body weight to bring the stems to the ground to feed and reach for inflorescences from perches other than the food plant (Black-throated Finch Recovery Team, 2007a).

Threats

Pastoralism is reported to be one of the main causes for the decline of the black-throated finch (southern). Decline and contraction in the sub-species range has been most severe in the southern extent of the range, where the grazing of grassy, riparian woodlands by sheep and rabbits has degraded the primary habitat. As per the species’ SPRAT, the ongoing clearance of woodland habitats is likely to be increasing the pressure on the sub-species.

Known threats to the black-throated finch (southern) include:

- Clearance and fragmentation of woodlands, riparian habitats and wattle shrublands
- Degradation of habitat by domestic livestock and rabbits, including the alteration of fuel loads, vegetation structure and the availability of food during the wet season

- Alteration of habitat by changes in fire regimes
- Invasion of habitat by exotic weeds, including exotic grasses
- Illegal trapping
- Predation by introduced predators
- Hybridization with the northern subspecies.

Survey effort, timing and coverage

The survey guidelines for Australia's threatened birds (Department of the Environment Water Heritage and the Arts, 2010b) recommends the following survey methods and effort for the black-throated finch (southern):

- Land-based area searches: 10 hours over 5 days.
- Target searches: 6 hours over 2 days.

The *Significant Impact Guidelines for the endangered black-throated finch (southern)* (Department of the Environment Water Heritage and the Arts, 2009b) recommends the following survey methods and effort:

- Nest searches.
- Wet and dry season waterhole watching: at least three hours after first light on two separate occasions.
- Target searches in woodland: one hour/ha with maximum of 10 hours per search area.

A combination of key survey techniques as recommended by the survey guidelines were employed to determine areas of potential habitat for the species and utilisation. Over the 42 days of field surveying conducted between November 2017 and December 2021, a total of 469-person hours of birding was completed which included targeted searches in woodland. Targeted habitat assessments were conducted for the species throughout the duration of the field surveys and included nest searches at each site.

Waterholes and dams were also visually surveyed however 'waterhole watching' was not conducted as per the recommended method in the referral guideline. Almost every watercourse that traverses the Study Area is ephemeral, and many were consistently dry during the field survey program. Although farm dams have been conservatively assumed to provide permanent water, many are likely to be semi-permanent or seasonal due to the dry climate of the region and frequent use by cattle. Therefore water and habitat availability within the Study Area is considered to vary spatially and temporally.

Given the narrow and linear nature of the Project Area, survey effort is considered sufficient.

Occurrence and potential habitat

The Study Area falls within the modelled distribution of the species as well as a mapped 'important area' as identified in the *Significant Impact Guidelines for the endangered black-throated finch (southern)* (Department of the Environment Water Heritage and the Arts, 2009b). As specified by the guidelines, where suitable habitat is validated to exist within mapped important areas, the species should be presumed to be present. However, this area located in the eastern Study Area was not found to contain suitable habitat.

ALA records of the species occur within 20 km of the Study Area. However, the field survey program did not record any individuals or evidence of nesting within the Study Area. Furthermore, field surveys completed within the local area for other environmental impact assessments (see Section 4.2) did not detect the species either. Although not all recommended survey methodologies were employed, survey effort is considered sufficient. This indicates that if the species is present, it occurs in low densities only.

A total of 190.31 ha of potential habitat was identified within the Study Area including nesting, foraging and dispersal habitat (Table 23, Figure 15.1 to 15.6). All potential habitat is limited to the far western Study Area, as this is the only area that was confirmed to contain all three required habitat resources: water, foraging grasses and nesting trees (zones 1 as per Figure 2). Although preferred foraging grasses were present, they were not considered common.

Table 23 Black-throated finch (southern) habitat within the Study Area

Habitat types	RE	Condition	Utilisation	Habitat definition	Study Area total (ha)
5. Open woodland of Eucalyptus and Corymbia on basalt	9.8.1	Remnant	Breeding	Mapped important areas, or vegetation communities in which the species has been recorded in (1994 or more recent) that contain necessary resources (potential nesting trees and known perennial foraging grasses) and occur in close proximity (< 400m) to water.	0.20
			Foraging	Mapped important areas, or vegetation communities in which the species has been recorded in since 1994 (any condition) that are connected to potential breeding habitat (within 3 km). Known black-throated finch (southern) perennial foraging grasses are at least occasional within the ground layer.	8.37
1. Open woodland of Eucalyptus or Melaleuca on alluvium or sand plains, 2. Open Eucalyptus, Casuarina and Melaleuca riparian woodland, 6. Woodland of Eucalyptus and Corymbia on metamorphic hills and 7. Eucalyptus and Corymbia woodland on igneous hill and/or granite	All other REs	Remnant	Dispersal	All other vegetation communities connected to potential breeding habitat (within 3 km) that is not considered foraging habitat.	181.74

Habitat Critical to the Survival of the Species

Although habitat critical to the survival of the black-throated finch (southern) has not been strictly defined, the subspecies is highly reliant on habitat that contains water sources, grass seeds, and trees providing suitable nesting habitat (Department of the Environment Water Heritage and the Arts, 2009b). As all three resources occur within the Study Area at one location (far west), all potential habitat is considered habitat critical to the survival of the species.

Important populations

As this species is listed Endangered under the EPBC Act, ‘important populations’ do not apply.

Potential Impacts and Key Mitigation Measures

Potential impacts of the Project on this species includes loss of nesting, foraging and dispersal habitat, direct mortality, proliferation of weeds or pests and altered fire regime. Direct impacts via vegetation clearing during the construction phase will occur to 0.07 ha of breeding habitat, 2.26 ha of foraging habitat and 18.82 ha of dispersal habitat.

In addition to the general mitigation and management measures outlined in Section 8.3.1 which include weed and pest management as well as sediment and erosion control, the following species-specific mitigation measures will be implemented:

- Pre-clearance surveys by a spotter-catcher will be undertaken in mapped habitat areas and near water sources to ensure any potential nests are detected and demarcated.
- Any identified active nesting colonies within or adjacent to the Project alignment will be avoided during vegetation clearing with a sufficient buffer distance implemented to avoid potential disturbance and displacement until the nests have been vacated.

Significant Impact Assessment

An assessment against the EPBC Act *Significant Impact Guideline 1.1* for this species is provided below in Table 24. The outcome of the assessment against the EPBC Act guidelines was that the Project is **unlikely to result in a significant impact** on the species subject to the implementation of the avoidance, minimisation, mitigation and management measures provided in Section 8.3.

Table 24 Significant impact assessment - black-throated finch (southern)

Criterion – "is there a real chance or possibility that the Project will…"	Assessment
Lead to a long-term decrease in the size of a population?	**No.** As detailed above, this species was not recorded during the field surveys nor has it been recorded in the local area during surveys for other environmental assessments. However due to the presence of an 'important area', suitable habitat and desktop records within 20 km, the species is considered a potential occurrence within the Study Area. A total of 190.31 ha of potential black-throated finch (southern) habitat occurs within the Study Area. The Project will result in the removal of 21.14 ha of potential habitat including 0.07 ha of nesting, 0.75 ha of foraging and 20.32 ha of dispersal. Habitat to be impacted occurs directly adjacent to an existing disturbed linear area (the existing powerline) and is therefore unlikely to be the preferred habitat in the local area. Higher quality habitat is likely to be common in the wider local area surrounding the Study Area. As such, this reduction in potential habitat as a result of the Project is expected to have a low impact as the availability of key resources (water, seeding grasses and nesting trees) in the local area will not be significantly altered. No nests were identified during the field survey and additional field surveys completed prior to clearing will seek to locate and protect where possible any nests found. Indirect impacts include increased activity and noise, increased weed incursion, erosion and sedimentation at waterbodies and potential changes in hydrology due to water extraction activities. However, and as the Project will be constructed in phases, indirect impacts will be localised and temporary. Furthermore, the Project EMP will include mitigation and management measures to control noise, weeds, pests and erosion and sediment control. Therefore, no Project related activities are considered likely to lead to a long-term decrease in the size of a population.
Reduce the area of occupancy of the species?	**No.** The Study Area occurs at the northern extent of the sub-species current estimated distribution. The area of occupancy for black-throated finch is estimated to be 5,000 km². Habitat removal will occur within an identified 'important area' containing verified suitable habitat; a total of 21.14 ha directly impacted. However, direct impacts will occur to a narrow linear area that is adjacent to an area already disturbed. Furthermore, the Project will not create a barrier to movement. As there is likely to be a great availability of potential habitat in the local area surrounding the Project Area, this loss of potential habitat is considered unlikely to affect the persistence of the species in the area. Based on this, it is considered unlikely that the Project will reduce the sub-species' area of occupancy.

Criterion – "is there a real chance or possibility that the Project will…"	Assessment
Fragment an existing population into two or more populations?	**No.** The black-throated finch (southern) is highly mobile. The significant impact guidelines for the species specify that maintaining habitat connectivity via corridors will minimise impacts on the sub-species. Given the linear nature of direct impacts and the footprint optimisation to minimise direct impacts, it is considered highly likely habitat connectivity will be maintained. Furthermore, the Project is not considered to result in the creation of barriers to movement to, between or within habitat. Therefore, it is unlikely that the Project will fragment an existing population into two or more populations.
Adversely affect habitat critical to the survival of a species?	**No.** Habitat critical to the survival of the species has been identified as water sources, grass seeds, and trees providing suitable nesting habitat (Black-throated Finch Recovery Team, 2007b). Potential habitat within the Study Area technically meets this definition. However, habitat has been impacted by cattle grazing and edge effects as it occurs in close proximity to a historically cleared area. Preferred foraging grasses are present however not common. Nonetheless, these are unlikely to decline notably with the implementation of the Project EMP which will include weed management measures. Of the 21.14 ha of potential habitat to be impacted, approximately 0.07 ha comprises potential nesting habitat. No nests were identified during the field survey and additional field surveys completed prior to clearing will seek to locate and protect where possible any nests found. Although individual potential nest trees may be lost as a result of vegetation clearing, this loss will not be 'widespread' or 'indiscriminate'. Potential nest trees are likely to occur abundantly north and south of the Study Area in the areas that fringe the Copperfield River. The presence of water is the third resource required for habitat to be considered critical. Water extraction activities may occur at the Copperfield River however this will only occur when supplies are continual (i.e. there is flow) and abundant. No substantial or permanent impacts on the hydrology will occur and therefore the continuation of current habitat quality and extent is anticipated. Finally, the Project will not create a barrier that may hinder access to potential habitat within the Study Area or adjacent. Based on these reasons, it is considered unlikely that the Project will adversely affect habitat critical to the survival of the species.
Disrupt the breeding cycle of a population?	**No.** Breeding can occur throughout the year under optimal conditions. In the Townsville area, the peak breeding period is during the wet season between February and May (Department of the Environment Water Heritage and the Arts, 2009b). Pre-clearance procedures will be put in place to identify and avoid any nesting colonies within or adjacent to the Project Area to avoid interference with breeding individuals. A maximum of 0.07 ha of nesting habitat will be removed as a result of the Project. This may result in the loss of a very small number of potentially suitable nesting trees. However, suitable nesting habitat is likely to be common in the local area especially in the areas to the north and south where the Copperfield River traverses. Based on this magnitude of clearing and the management of construction activities during the breeding season it is unlikely that the Project will substantially disrupt the breeding cycle of a population.

Criterion – "is there a real chance or possibility that the Project will…"	Assessment
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline?	**No.** The Project will result in the removal of 21.14 ha of potential habitat. Habitat to be impacted occurs directly adjacent to an existing disturbed area and is therefore unlikely to be the preferred habitat in the local area. Co-location of the Project Area with this existing cleared area also ensures remaining potential habitat is not isolated or fragmented in the landscape. Overall, this loss of habitat is not expected to affect the persistence of the species given suitable habitat is likely widely available and all three key resources will continue to occur. Indirect impacts on the species include increased activity and noise, increased weed incursion, erosion and sedimentation at waterbodies and potential changes in hydrology due to water extraction activities. However, as the Project will be constructed in phases, impacts will be localised and temporary and actively managed as per the Project EMP. Therefore, no Project related activities are considered likely to modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.
Result in invasive species that are harmful to a Critically Endangered or Endangered species becoming established in the Endangered or Critically Endangered species' habitat?	**No.** Invasive flora species have been identified on the SPRAT database as a key threat to the subspecies. A draft EMP has been developed for the Project which will be updated as necessary. It outlines measures to mitigate and manage the potential spread of pest flora and fauna species within the Project Area. Species-specific management will be undertaken for identified key weed and pest species at risk of spread through Project activities. Control efforts will be increased in areas particularly sensitive to invasion. With the implementation of the Project EMP it is therefore considered unlikely that the Project will exacerbate invasive species beyond current levels.
Introduce disease that may cause the species to decline?	**No.** Disease has not been identified as a main threat to the species. The draft EMP for the Project details biosecurity measures which will prevent the introduction and spread of disease.
Interfere with the recovery of the species?	**No.** The Recovery Plan for the black-throated finch (southern) identifies the recovery objectives to manage and protect the black-throated finch and its habitat, and to promote the recovery of the southern subspecies (Black-throated Finch Recovery Team, 2007b). The Project does not specifically contravene any of the identified recovery actions, including: • Investigating breeding requirements and threats to key breeding areas • Investigating feeding and other habitat requirements • Documenting sighting • Developing standard survey guidelines • Undertaking targeted surveys • Securing selected sites for conservation • Addressing threats on grazing land • Monitoring management effectiveness • Investigating development of other statutory planning instruments to minimise impacts of urban development on black-throated finch within the Townsville urban fringe • Investigating the potential for captive birds contributing to a re-introduction project • Increasing public awareness.

Northern quoll (*Dasyurus hallucatus*)

The northern quoll is listed Endangered under the EPBC Act.

Distribution

The distribution of the northern quoll is discontinuous across northern Australia with core populations in rocky and / or high rainfall areas (Hill & Ward, 2010). In Queensland, the species is known to occur as far south as Gracemere and Mt 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. In northern Queensland, recent records exist from Mareeba, Mount Carbine, Tolga and around Cooktown.

As detailed on the species' SPRAT, the distribution is highly fragmented in Queensland and surveys by Woinarski and colleagues (2008) indicated severe reductions from the species' former distribution.

Habitat requirements

The northern quoll is nocturnal and 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 habitat generally encompasses some form of rocky area or structurally diverse woodland for denning purposes with surrounding vegetated habitats used for foraging and dispersal. Rocky habitats are usually of high relief, often rugged and dissected but can also include tor fields or caves in low lying areas. Eucalypt forest or woodland habitats usually have a high structural diversity containing large diameter trees, termite mounds or hollow logs for denning purposes.

Northern quolls are opportunistic omnivores, consuming a wide range of prey including beetles, grasshoppers, spiders, scorpions and centipedes. They also eat fruit, nectar, and are known to feed on carrion and human refuse (Threatened Species Scientific Committee, 2005). Vertebrates eaten include 11 species of mammal (e.g. Bandicoots, Sugar gliders, Brush-tail possums and Rats), eight species of birds, reptiles (skinks and snakes) and seven species of frog. They also eat bird eggs and nectar of eucalypt and grevillea flowers. Cane toads are a food item of particular concern because their toxins appear to be a major cause of decline in northern quoll populations.

Threats

The northern quoll has suffered significant decline and range contraction over the last fifty years. Lethal toxic ingestion caused by cane toads is a key threatening process listed under the EPBC Act and is the likely cause of local extinctions at locations such as Cape York. A number of additional threats to the species are also recognised including:

- Removal, degradation and fragmentation of habitat
- Inappropriate fire regimes
- Invasion of weeds; namely gamba grass (*Andropogon gayanus*)
- Feral predators including the feral cat and European red fox
- Parasitism.

A draft National Recovery Plan is in place for the northern quoll, and aims to minimise the rate of decline such that viable populations remain in each of the major regions of distribution into the future.

Survey effort, timing and coverage

The survey guidelines for Australia's threatened mammals (Department of Sustainability, Environment, Water, Population and Communities, 2011) recommends a range of survey methods to detect the northern quoll. The *EPBC Act referral guidelines for the endangered northern quoll Dasyurus hallucatus* (Department of the Environment, 2016a) do not prescribe specific survey effort requirements due to the variation of this species' ecology and population sizes across its distribution. However, this guideline does make survey recommendations for Queensland which include:

- An initial reconnaissance survey at anytime of the year utilising:
    - Camera traps targeted to habitat critical to the survival of the species, and scat searches. Transects of 10 camera traps spaced at least 100 m intervals for four nights is recommended

at any time of the year, however preferably when individuals are likely to be active and more detectable.

- Supplementary methods including latrine searches, detection dogs and / or hair tubes in conjunction with camera traps

- Targeted survey (if impacting habitat critical to the survival) including:
  - Wire cage traps or Elliot traps (medium or large); or
  - A more refined camera trap survey.

In June 2018, a reconnaissance survey was completed over five nights using an array of camera traps to determine utilisation in areas of potential 'habitat critical to the survival of the species' (a total effort of 62 camera trap nights). In July 2021, a targeted survey for the species was completed in areas of potential critical habitat for the species and involved camera traps (a total effort of 820 trap nights), Elliot B traps (a total effort of 160 trap nights) and hair funnels (a total of 560 trap nights). Three additional camera traps were also deployed in rocky habitat areas in December 2021.

Camera traps are the key recommended technique for Queensland and were primarily deployed in June and July, which should coincide with good activity levels due to the commencement of the species' breeding period.

Given the completion of both reconnaissance and targeted surveys in the correct seasonal timeframe, as well as the linear nature of the Project Area, survey effort is considered sufficient.

Occurrence and potential habitat

West of lot and plan 5234/SP275834, the Study Area occurs outside the mapped distribution of the species. Where the Study Area occurs within the mapped distribution, it covers both 'likely' and 'potential' areas as identified in the referral guideline document.

An ALA record of the species from 1997 occurs within 50 km. However, neither the reconnaissance field survey (June 2018) or targeted field survey (July 2021) found any evidence of the species presence within the Study Area. Furthermore, recent surveys completed within the local area for other environmental impact assessments (Section 4.2) did not detect the species either.

A total of 1,104.81 ha of potential habitat was identified within the Study Area including marginal breeding and denning as well as marginal foraging and dispersal habitat (Table 25, Figure 24.1 to 24.6). All potential habitat is considered marginal due to the lack of structural diversity and complexity as well as potential denning sites. Cane toads, wild dogs and feral cats were also frequently recorded within the Study Area during the field survey program, which are a threat to northern quoll populations and impact on the quality of the habitat. Although habitat is functionally connected to protected areas in the wider region such as Girringun National Park, higher quality habitat is likely to be common in the region especially to the north. No potential habitat occurs in the far western extent of the Study Area (zones 1 and 2 as per Figure 2).

Table 25 Northern quoll habitat within the Study Area

Habitat	RE	Condition	Utilisation	Habitat definition	Study Area total (ha)
All except 3. Native grassland, 8. Cleared areas and 9. Farm dams	7.8.18, 9.3.1, 9.3.13, 9.3.22a, 9.5.11, 9.7.2, 9.11.1a, 9.11.2a, 9.11.5, 9.12.1a, 9.12.26	Remnant	Breeding and denning (marginal)	Rocky habitats or relatively complex woodland or forest areas containing rare to occasional denning opportunities (i.e. large diameter trees, termite mounds or hollow logs) in close proximity to permanent and semi-permanent creek lines (<1 km).	739.46
All except 2. Open Eucalyptus,	9.3.6a, 9.3.22a, 9.5.3,	Remnant	Foraging and	Mature vegetation communities connected to or	365.35

Habitat	RE	Condition	Utilisation	Habitat definition	Study Area total (ha)
Casuarina and Melaleuca riparian woodland, 3. Native grassland, 8. Cleared areas and 9. Farm dams	9.5.11, 9.7.1, 9.7.2, 9.8.4, 9.11.2a, 9.11.5, 9.12.1a		dispersal (marginal)	in close proximity to (within <1 km) of breeding / refuge habitat.	

Habitat Critical to the Survival of the Species

Habitat critical to the survival of the northern quoll is defined in the *EPBC Act referral guideline for the endangered northern quoll Dasyurus hallucatus* (Department of the Environment, 2016a) as:

> Habitat within the modelled distribution of the northern quoll which provides shelter for breeding, refuge from fire / or predation and potential poisoning from cane toads. Habitat critical to the survival usually occurs in the form of:
>
> - off shore islands where the northern quoll is known to exist
> - rocky habitats such as ranges, escarpments, mesas, gorges, breakaways, boulder fields, major drainage lines or treed creek lines
> - structurally diverse woodland or forest areas containing large diameter trees, termite mounds or hollow logs.

Dispersal and foraging habitat associated with or connecting *populations important for the long-term survival of the northern quoll* is also considered habitat critical to the survival of the northern quoll'.

Based on this definition and the findings of the targeted field survey, no habitat within the Study Area is considered habitat critical to the survival of the species.

Important populations

The *EPBC Act referral guideline for the endangered northern quoll Dasyurus hallucatus* (Department of the Environment, 2016a) also defines important populations for the long-term survival of the species. These include populations which are:

- high density quoll populations, which occur in refuge-rich habitat critical to the survival of the species, including where cane toads are present
- occurring in habitat that is free of cane toads and unlikely to support cane toads upon arrival i.e. granite habitats in WA, populations surrounded by desert and without permanent water
- subject to ongoing conservation or research actions i.e. populations being monitored by government agencies or universities or subject to reintroductions or translocations.

The Study Area and surrounds are not free of cane toads and the area is not subject to ongoing conservation or research actions. Neither the reconnaissance or targeted field survey found any evidence of the species and survey effort was in line with the referral guideline. Based on this, any population of northern quoll that's may utilise the habitat of the Study Area is considered low density and not an important population.

Potential Impacts and Key Mitigation Measures

Potential impacts on this species as a result of the Project includes loss habitat, direct mortality, proliferation of weeds and an altered fire regime. Vegetation clearing required for the construction of the Project will result in direct impacts to 68.0 ha of marginal breeding and denning habitat and 40.41 ha of marginal foraging and dispersal habitat.

In addition to the general mitigation and management measures outlined in Section 8.3.1 which include weed and pest management as well as sediment and erosion control, the following species-specific mitigation measures will be implemented:

- Hollow logs and felled hollow bearing trees should be relocated to other areas of mapped northern quoll habitat to provide denning resources
- Soils of the Study Area are generally free-draining / highly erodible and therefore unlikely to retain pooling water. Nonetheless, water retaining voids or pits in the design should be avoided where these are not otherwise required for the control of stormwater run-off and erosion and sediment control measures. Where pits, voids or trenches are required, include appropriate cover to prevent extended water retention in these spaces and/or subsequent breeding opportunities for cane toads.

Significant Impact Assessment

An assessment against the *EPBC Act referral guideline for the endangered northern quoll Dasyurus hallucatus* (Department of the Environment, 2016a) is provided in Table 26. The outcome of the assessment against the EPBC Act guidelines was that the Project is **unlikely to result in a significant impact** on the species subject to the implementation of the avoidance, minimisation, mitigation and management measures provided in Section 8.3.

Table 26 Significant impact assessment - northern quoll (*Dasyurus hallucatus*)

EPBC Act Criteria – is there a real possibility that the Project will:	Assessment of Significance
Result in the loss of habitat critical to the survival of the northern quoll.	**No.** This species was not recorded during the field surveys within the Study Area, nor has it been recorded in the local area during surveys for other environmental assessments. The Study Area contains potential habitat that is marginally suitable for both foraging and dispersal as well as breeding and denning. Due to the lack of structural diversity and complexity as well as potential denning sites, and the presence of cane toads, potential habitat is not habitat critical to the survival of the species as defined in the *EPBC Act referral guideline for the endangered northern quoll Dasyurus hallucatus* (Department of the Environment, 2016a). Potential habitat is also considered highly unlikely to support an important population, given the results of the targeted northern quoll survey which was in line with the recommended survey methodology. A maximum of 108.41 ha of potential habitat, all of which is only marginally suitable, will be directly impacted as a result of the Project. However, this habitat occurs directly adjacent to a linear area that has already been disturbed and is maintained. Cattle grazing activities also occur within the area and exotic fauna is common. Suitable habitat is likely to be common in the wider local area surrounding the Study Area, and include higher quality areas such as Mount Claro and Girringun National Park. Based on this, the loss of habitat within the Study Area is expected to have a very low impact and not affect the species persistence in the local area. As potential habitat is not critical to the survival of the species, the Project will not result in the loss of critical habitat.
Decrease the size of a population important for the long-term survival of the northern quoll and therefore interfere with the recovery of the species.	**No.** It is highly unlikely that the habitat within the Study Area supports an important population based on the findings of the targeted survey in July 2021. Whilst approximately 40.41 ha of marginal foraging and dispersal habitat and 68.00 ha of marginal breeding and denning habitat will be directly impacted via vegetation clearing, this loss comprises only a very small percentage of what will remain in the surrounding area. Furthermore, areas of higher quality habitat that occur in the wider area such as Mount Claro and Girringun National Park will not be impacted. The magnitude of clearing is not expected to lead to significant changes to breeding patterns, foraging opportunities or the ability of surrounding important populations to disperse. As such it is considered unlikely that the Project will lead to a long-term decrease in the size of a population.

EPBC Act Criteria – is there a real possibility that the Project will:	Assessment of Significance
Introduce inappropriate fire regimes or grazing activities (i.e. increasing the risk of late dry season high intensity fires to the area) that substantially degrade habitat critical to the survival of the northern quoll or decrease the size of a population important for the long-term survival of the species.	**No.** The Project Area has been co-located with an area that has already been cleared and has cattle grazing activities occurring throughout. Habitat generally lacks structurally complexity as well as potential den sites. As such, potential habitat within the Project Area is already of reduced quality and unlikely to represent the best quality habitat in the local area. Areas cleared for the construction of the Project will be vulnerable to possible weed incursion which has the potential to increase fuel loads for bushfire. However, bushfire risk and weed incursion will be managed through the Project EMP which will cover all Project phases. Grazing activities will not be increased beyond current levels.
Fragment a population important for the long-term survival into two or more populations.	**No.** As state above, the Project Area has been co-located with an existing cleared area that contains electrical infrastructure. Clearing required for the Project will result in the removal of approximately 40.41 ha of marginal foraging and dispersal habitat and 68.00 ha of marginal breeding and refuge habitat. However, as the Project Area is linear and clearing widths will not exceed 60 m (except at two tower locations), habitat fragmentation impacts are expected to be low. Furthermore, the Project will not create any barriers to movement including across the creek and drainage lines which are likely to be the preferred dispersal pathways for any northern quoll in the area. The northern quoll is highly mobile and this reduction in habitat is highly unlikely to reduce the species' ability to disperse within and through the Study Area and surrounds. Based on this and the large areas of suitable habitat that are likely to occur in the surrounding area, it is considered unlikely that the Project will fragment a population into two or more populations.
Result in invasive species or increases of them that are harmful to the northern quoll becoming established in its habitat, namely cane toads, feral cats, red foxes or exotic grasses which increase fire risk. This includes actions which have inadequate quarantine measures in place for movements between the mainland and offshore islands where northern quolls occur.	**No**. Weeds, feral predators and cane toads are all recognised threats to the northern quoll (Department of Agriculture Water and the Environment, 2022). Feral cats, cane toads and wild dogs are currently present within the Survey Area and were recorded during the field survey. However, the extent of exotic grasses is generally low. Given that direct impacts will occur adjacent to a historically cleared linear area that is regularly accessed by cattle, it is unlikely that Project activities will result in the further proliferation of already occurring feral species to the extent that it will significantly increase the risk of harm to northern quoll. However, construction and operational activities if unmanaged, have the potential to introduce exotic grasses and provide opportunities for proliferation and potential spread. The Project EMP will explicitly address the management of weeds and pests during construction and operation of the Project. With the implementation of these management measures, the project is unlikely to result in a significant increase of exotic grasses and altered fire regimes.

Spectacled flying-fox (*Pteropus conspicillatus*)

The spectacled flying-fox is listed Endangered under the EPBC Act.

Distribution

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, 2022). The largest population in Australia is known from the Wet Tropics of Queensland World Heritage Area between Townsville and Cooktown. Only the far eastern extent of the Project Area falls within the mapped distribution of the species.

The extent of occurrence of the spectacled flying-fox has probably changed little since European settlement, although extensive clearing of lowland vegetation, particularly rainforests, has likely reduced its area of occupancy substantially.

Habitat requirements

Like other flying-foxes, the spectacled flying-fox roosts in large aggregations, called camps or colonies, in the exposed branches of canopy trees. As per the *National recovery plan for the spectacled flying-fox* (Department of Environment and Resource Management, 2010), camps of this species primarily occur in the Wet Tropics bioregion and account for over 90% of documented camps. Throughout the year an unknown proportion of animals roost away from camps, either solitarily or in small groups. As detailed on the species SPRAT, one study determined the species roosts within 6.5 km of rainforest, although a roost 16 km from rainforest has also been observed (Department of Agriculture Water and the Environment, 2022). The spectacled flying fox breeds in maternity roosts and has a relatively slow reproductive rate. Female spectacled flying foxes give birth to one pup annually.

The spectacled flying-fox feeds on fruits and blossom, primarily in the canopy vegetation of a wide range of vegetation communities. 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.

Telemetry and resource use results from the Wet Tropics indicate that foraging individuals range widely across the Wet Tropics bioregion and extensively into drier forests, including those to the west of the Wet Tropics Region. The species may travel up to 50 km in one night to feed (Threatened Species Scientific Committee, 2019b). Spectacled flying-foxes are highly mobile and have complex and irregular movement patterns primarily determined by seasonal nectar flows.

Threats

The *National recovery plan for the spectacled flying-fox* (Department of Environment and Resource Management, 2010) details known threats to the species under three severity levels, as detailed below:

Significant threats include:

- Habitat loss
- Illegal killing and incidental mortality of flying foxes in commercial fruit crops
- Harassment by humans
- Natural events (cyclones).

Moderate threats include:

- Increased incidence of tick paralysis.

Minor threats include

- Electrocution on powerlines
- Entanglement in netting and on barbed-wire fences
- Cleft palate syndrome

- Vehicle-related mortality.

Survey effort, timing and coverage

The survey guidelines for Australia's threatened bats (Department of the Environment Water Heritage and the Arts, 2010a) recommends a survey approach including key techniques and effort to detect the spectacled flying-fox:

- Day survey including visual searches for day roosts and night feeding sites: 6 hrs per 50 ha
- Spotlighting walking transects in potential habitat (night survey): 5 hrs per 50ha/night.

In addition, a daytime habitat assessment is recommended to determine the presence and abundance of food trees.

A total of 42 days of field surveying were conducted between 2017 and 2021 across the Study Area and adjacent areas of representative habitat. Both searches for roosts and night feeding sites as well as spotlighting surveys were employed to determine utilisation in areas of potential habitat. No flying-fox camps or potential roost sites were identified. Spotlighting was completed in areas of representative habitat across the Study Area during the June 2018 and the December 2021 survey (a total of 64-person hours). Due to the linear nature of the Project Area and lack of preferred rainforest habitat within the Study Area, survey effort is considered sufficient.

Occurrence and potential habitat

The spectacled flying-fox was not recorded during the field survey program and no flying-fox camps were located within the Study Area. Furthermore, field surveys completed within the local area for other environmental impact assessments (see Section 4.2) did not detect the species or camps either. This species is considered a potential occurrence within the Study Area due to the presence of suitable habitat and a single ALA record from 1974 approximately 11 km south of the Study Area near the Gregory Highway. Due to the lack of records, the inland location of the Study Area and general absence of large areas of tropical rainforest nearby, the species is assumed to occur in low densities only.

A total of 651.45 ha of potential habitat was identified within the Study Area, comprising vegetation that adjoins rainforest communities in the wider local area (Table 27, Figure 26.1 to 26.6). Potential habitat is limited to the far eastern extent of the Study Area (zone 5 and 6 as per Figure 2). Vegetation is generally dominated by *Eucalyptus spp.* and is therefore considered suitable for foraging and dispersal. As the Study Area does not contain any wet, closed forest or flying-fox camps, no potential breeding habitat is identified.

Table 27 Spectacled flying-fox habitat within the Study Area

Habitat type	RE	Condition	Utilisation	Habitat definition	Study Area total (ha)
5. Open woodland of Eucalyptus and Corymbia on basalt, 6. Woodland of Eucalyptus and Corymbia on metamorphic hills & 7. Eucalyptus and Corymbia woodland on igneous hill and/or granite	All REs within 10 km of state mapped rainforest / notophyll vine forest.	Remnant	Foraging and dispersal	Rainforest and adjoining (within 10 km and connected) vegetation communities that contain fruiting or flowering resources including *Eucalyptus spp.* or *Corymbia spp.* trees.	651.45

Habitat Critical to the Survival of the Species

The *National recovery plan for the spectacled flying-fox* defines habitat critical to the survival of the species and includes all foraging habitats as well as suitable roosting habitat. As such, all potential habitat within the Study Area is considered habitat critical to the survival of the species.

Important Populations

As this species is listed Endangered under the EPBC Act, 'important populations' do not apply.

Potential Impacts and Key Mitigation Measures

Potential impacts on this species as a result of the Project includes loss habitat, direct mortality and an altered fire regime. Vegetation clearing required for the construction of the Project will result in direct impacts to 54.01 ha of foraging and dispersal habitat.

The general mitigation and management measures are outlined in Section 8.3.1 and include weed and pest management as well as sediment and erosion control. These are considered sufficient to manage potential indirect impacts on the species.

Significant Impact Assessment

An assessment against the EPBC Act *Significant Impact Guideline 1.1* for this species is provided below in Table 28. The outcome of the assessment against the EPBC Act guidelines was that the Project is **unlikely to result in a significant impact** on the species subject to the implementation of the avoidance, minimisation, mitigation and management measures provided in Section 8.3.

Table 28 Significant impact assessment - spectacled flying-fox (*Pteropus conspicillatus*)

EPBC Act Criteria – is there a real possibility that the Project will:	Assessment of Significance
Lead to a long-term decrease in the size of a population?	**No.** The spectacled flying-fox 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. Only the far eastern extent of the Project Area falls within the mapped distribution of the species and rainforest does not occur within the Study Area. This species was not recorded during the field surveys and is expected to occur within the Study Area in low densities only. A total of 651.45 ha of potential foraging and dispersal habitat occurs within the Study Area, all of which is considered habitat critical to the survival of the species. Of this potential habitat, approximately 54.01 ha will be directly impacted via vegetation clearing. As the Project Area has been co-located with an already disturbed, linear area, habitat fragmentation impacts are low. Large intact patches of potential habitat will remain following the construction of the Project and are expected to be common in the wider local area surrounding the Study Area. No direct impacts will occur to areas of potential roosting habitat or any flying-fox camps. Indirect impacts include increased activity, light and noise. However, these will be temporary and localised as the Project will be constructed in phases. Furthermore, the Project EMP will include mitigation and management measures to control disturbance including light and noise. While a risk of mortality as a result of electrocution will occur during operation of the Project, the Conservation Advice specifies this risk to be 'low' and it is unlikely to be significantly increased beyond baseline due to the presence of an existing powerline. Therefore, no Project related activities are considered likely to lead to a long-term decrease in the size of a population.

EPBC Act Criteria – is there a real possibility that the Project will:	Assessment of Significance
Reduce the area of occupancy of the species?	**No.** The area of occupancy for the spectacled flying-fox is estimated to be 124 km². However, the Study Area occurs largely outside of the species' distribution. A total of 54.01 ha of potential foraging and dispersal habitat will be removed via vegetation clearing. Direct impacts will occur to a narrow, linear area that is adjacent to an area already disturbed. Furthermore, the Project is considered unlikely to create a barrier to movement due to the presence of an existing powerline directly adjacent. No direct impacts will occur to potential roosting habitat or flying-fox camps As the species is only expected to be present in low densities, and there is likely to be a great availability of potential habitat in the local area surrounding the Study Area, this loss of potential habitat is considered unlikely to affect the persistence of the species in the region. Based on this, it is considered unlikely that the Project will reduce the species area of occupancy.
Fragment an existing population into two or more populations?	**No.** The spectacled flying-fox is highly mobile and has complex and irregular movement patterns primarily determined by seasonal nectar flows. This indicates that regular movement pathways are not used by the species and they may be able to easily change course to avoid threats or barriers. This species has been identified as being potentially susceptible to mortality as a result of electrocution by powerlines. Although the Project will involve the creation of a new transmission line, this infrastructure will be located directly adjacent to an existing transmission line. As such, the risk to the species is considered unlikely to be significantly increased beyond baseline levels. Given the narrow linear nature of direct impacts, it is considered highly likely habitat connectivity will be maintained and movement will be unhindered. Therefore, the Project unlikely to be a barrier to movement to, between or within habitat. Therefore, it is unlikely that the Project will fragment an existing population into two or more populations.
Adversely affect habitat critical to the survival of a species?	**No.** The *National recovery plan for the spectacled flying-fox* defines habitat critical to the survival of the species and includes foraging habitats as well as suitable roosting habitat. As such, all potential habitat within the Study Area is considered habitat critical to the survival of the species. A maximum of 54.01 ha of potential habitat will be impacted via vegetation clearing. However, direct impacts will occur to a narrow, linear area that is adjacent to an area already disturbed. As construction of the Project will occur in stages only a portion of the total potential habitat area may be disturbed at one time. Based on this, and the likely large availability of suitable habitat in the wider local area, this loss of habitat is unlikely to adversely affect habitat critical to the survival of the species.
Disrupt the breeding cycle of a population?	**No.** The spectacled flying fox has a relatively slow reproductive rate. Juveniles are nursed for over five months and, on weaning, congregate in nursery trees in the colony. No flying-fox camps or potential roosting habitat areas were identified within the Study Area during the field surveys and as such no direct impacts will occur to potential breeding sites. Nonetheless, pre-clearance procedures will be put in place to identify and avoid any flying-fox camps although it is unlikely they will occur. Based on this, it is considered unlikely that the Project will substantially disrupt the breeding cycle of a population.

EPBC Act Criteria – is there a real possibility that the Project will:	Assessment of Significance
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline?	**No.** The Project will result in the removal of 54.01 ha potential foraging and dispersal habitat. Habitat to be impacted occurs directly adjacent to an existing disturbed area and is therefore unlikely to be the preferred habitat in the local area. Co-location of the Project Area with this existing cleared area also ensures remaining potential habitat is not isolated or fragmented in the landscape. Overall, this loss of habitat is not expected to affect the persistence of the species given suitable habitat is likely widely available and preferred foraging resources do not occur within the Study Area. Indirect impacts on the species include increased activity and noise and weed incursion potentially resulting in altered fire regimes. However, as the Project will be constructed in phases, impacts will be localised and temporary and actively managed as per the Project EMP. Therefore, no Project related activities are considered likely to modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.
Result in invasive species that are harmful to a Critically Endangered or Endangered species becoming established in the Endangered or Critically Endangered species' habitat?	**No.** Invasive species are not recognised as a key threat to the species and the Project is considered unlikely to exacerbate invasive species beyond current levels. Nonetheless, a draft EMP has been developed for the Project which outlines measures to mitigate and manage the potential spread of pest flora and fauna species within the Project Area. This plan will be updated as necessary.
Introduce disease that may cause the species to decline?	**No.** Australian flying foxes, including the spectacled flying-fox, are identified as natural reservoirs of three zoonotic diseases: a rabies-like disease, Australian Bat Lyssavirus, and two paramyxoviruses, Hendra virus and Menangle virus. The impact of these viruses on the spectacled flying fox population is unknown. The paralysis tick Ixodes holocyclus is responsible for the paralysis and deaths of many spectacled flying foxes on the Atherton Tableland. The Project is highly unlikely to increase the occurrence of zoonotic diseases or paralysis ticks. The EMP for the Project details biosecurity measures which will prevent the introduction and spread of disease during all phases of the Project.
Interfere with the recovery of the species?	**No.** The National recovery plan for the spectacled flying-fox identifies eight recovery objectives to secure the long-term protection of the species through a reduction in the impact of threats and to improve the standard of information available to guide recovery. The Project does not specifically contravene any of the identified recovery objectives/ actions, including: • Research practicable and cost effective flying fox deterrent systems for commercial fruit growers • Identify and protect native foraging habitat critical to the survival of the spectacled flying fox (actions include continue telemetry studies, identify important foraging resources and identify opportunities to protect priority foraging habitats) • Accurately assess the short and long term population size and population trends of the spectacled flying-fox • Improve the public perception of the species and the standard of information available to guide recovery • Increase knowledge of the species roosting requirements and protected important camps

EPBC Act Criteria – is there a real possibility that the Project will:	Assessment of Significance
	• Improve understanding of incidence of tick paralysis and actions to minimise paralysis mortality in flying foxes • Implement strategies to reduce incidence of electrocution and entanglement of spectacled flying-fox • Investigate the causes of birth abnormalities such as cleft palate syndrome.

Listed Vulnerable Species

Sharman's rock wallaby (*Petrogale sharmani*)

Description and status under the EPBC Act

The Sharman's rock wallaby is listed Vulnerable under the EPBC Act.

Sharman's rock-wallaby is a small macropod. It's fur is grey-brown on top and paler sandy brown on the underparts and limbs. The striped tail is sandy brown but darkens to almost black with a slight brush at the tip. It has pale cheek stripes, with a slight mid-dorsal head stripe occasionally present. Females are generally smaller than males.

Distribution

This species has a highly restricted distribution and is confined to an area of around 200,000 ha that occurs west of Ingham in north-eastern Queensland. The total population size is small, estimated at fewer than 800 mature individuals (L. Curtis et al., 2012). There are around 20 known subpopulations, of which 80% are found on Mount Zero-Taravale (managed by the Australian Wildlife Conservancy).

There is currently no evidence of decline in the species population size. One study detailed in the species Conservation Advice states that the species may be 'common' within its range.

Habitat requirements

The Sharman's rock-wallaby 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). This species feeds in the surrounding woodland, although preliminary findings indicate that individuals only move an average distance of 209 m from their shelter site each night to forage, with a maximum distance of 758 m (C. Hayes, personal communication, 2018). They are opportunistic feeders and their diets include grasses, forbs, leaves, fruit, seeds and flowers, with fig species (*Ficus*) being a preferred food species (C. Hayes, personal communication, 2018).

Two distinct habitat features have been identified within the Sharman's rock-wallaby habitat: rocky boulders and vegetation. The rocky boulders provide shelter sites, while the vegetation provides protection from predators while foraging, protection from the sun, and food. As this species tend to only move small distances from their shelter site to forage, and individuals typically return to the same shelter site each night, both habitat features are considered important for the Sharman's rock-wallaby, both within the landscape and at a local scale.

Threats

Known threats to the Sharman's rock wallaby as detailed in the species Conservation Advice include:

- Habitat loss and fragmentation (severe consequence rating)
- Habitat degradation and resource depletion due to livestock and non-native herbivores (severe consequence rating)
- Predation by feral cats (moderate consequence rating)
- Too extensive or intense burning (moderate consequence rating)
- Competition with other native species (minor consequence rating)

Survey effort, timing and coverage

Although specific techniques or effort for the Sharman's rock wallaby are not detailed in the Survey guidelines for Australia's threatened mammals (Department of Sustainability, Environment, Water, Population and Communities, 2011), they are detailed for medium-sized species including rock wallabies. Surveys should not be conducted in hot weather or during summer in areas of potential habitat. Survey techniques may include:

- Daytime searches for signs of activity including scats, tracks or remains
- Stationary observations

- Soft cage traps
- Camera traps.

A total of 42 days of field surveying were conducted between 2017 and 2021 across the Study Area and adjacent areas of representative habitat. As recommended by the survey guidelines, a combination of key survey techniques were utilised across the survey program including daytime searches, stationary observations and camera traps. Scat searches were also completed on rocky ledges and in boulder piles. No survey effort for this species is specified, however effort conducted is considered suitable given the range of techniques utilised and the linear nature of the Project Area.

Occurrence and potential habitat

The Sharman's rock-wallaby was recorded in both 2018 and 2021, within and adjacent to the far eastern Study Area. In 2018, multiple individuals were recorded within RE 9.12.1a on lot and plan 3198/PH2177. In 2021, multiple individuals were also visually observed and captured via camera trap in same general location as seen in 2018. Whilst the majority of records occurred within RE 9.12.1a, additional records were also collected at Silica Hill (RE 9.12.32) in 2021. An adult female with a pouched joey was also recorded on a camera trap in 2018 and visually observed in 2021, indicating that a breeding population is present.

A total of 260.04 ha of potential habitat was identified within the Study Area including 146.19 ha of breeding habitat and 113.85 ha of foraging and dispersal habitat (Table 29, Figure 25.1 to 25.6.1 to 25.6). Potential habitat is limited to the far eastern extent of the Study Area (zone 5 and 6 as per Figure 2).

Table 29 Sharman's rock wallaby habitat within the Study Area

Habitat type	RE	Condition	Utilisation	Habitat definition	Study Area total (ha)
7. Eucalyptus and Corymbia woodlands on igneous hills and/or granite	9.12.1a & 9.12.32	Remnant	Breeding	Vegetation communities that commonly contain rocky outcrops with large boulder piles, within the species distribution.	146.19
5. Open woodland of Eucalyptus and Corymbia on basalt and 7. Eucalyptus and Corymbia woodlands on igneous hills and/or granite	7.8.18, 9.11.1a & 9.12.26	Remnant	Foraging and dispersal	Woodlands and forests on rocky substrates that occur between or directly adjacent to potential breeding habitat, within the species distribution.	113.85

Important population

Important populations are not defined for this species. However, due to the small total population size of this species (less than 800 mature individuals), all colonies are significant to the national population, with only 20 colonies known. Therefore, any individuals within the Study Area are considered an 'important population'.

Habitat critical to the survival of the species

Habitat critical to the survival of the species is not defined for the Sharman's rock wallaby. However, the *EPBC Act Significant Impact Guidelines 1.1* define habitat critical to the survival of a species or ecological community as areas that are necessary:

- for activities such as foraging, breeding, roosting, or dispersal
- for the long-term maintenance of the species or ecological community (including the maintenance of species essential to the survival of the species or ecological community, such as pollinators)

- to maintain genetic diversity and long-term evolutionary development; or
- for the reintroduction of populations or recovery of the species or ecological community.

Potential habitat within the Study Area provides opportunities for breeding, foraging and dispersal and is considered sufficient to sustain an important population. Therefore, all potential habitat within the Study Area is considered habitat critical to the survival of the species.

Potential Project impacts

The Project will result in direct impacts via vegetation clearing to 6.29 ha of breeding habitat and 10.80 ha of foraging and dispersal habitat. Indirect impacts include increased disturbance from activity, light and noise resulting in stress and potentially mortality of individuals.

Vegetation clearance on or within close proximity to the suitable rocky habitat areas may reduce the suitability of that area for habitation (due to changes in microclimate, increased predation risk, and reduced foraging material within the immediate area).

It is likely that any Sharman's rock-wallabies present within the Project Area will vacate during any disturbance, such as the movement of vehicles and machinery, vegetation clearance, tower erection and line stringing activities. Stress has been known to result in the mortality of individuals, and cause females to 'throw' their pouch young. Disturbances which occur over shorter time periods are likely to have reduced impacts, with individuals expected to return to the area upon completion of the works. Disturbance over a long time period however increases the chance of losing breeding females (through stress) which may change the breeding structure and breeding success of the population.

Project avoidance, mitigation and management measures

In addition to the general mitigation and management measures outlined in Section 8.3.1, the following species-specific mitigation measures will be implemented:

- Vegetation clearing required in areas of potential Sharman's rock wallaby habitat will be completed via hand clearing (chainsaw) where possible. This will only be completed where the hand-clearing method reduces the time required (and thus the disturbance) in areas of potential habitat.
- Large boulders that must be removed for construction of the Project should be reinstated or relocated to adjacent areas of potential Sharman' rock wallaby habitat where possible
- All project activities should aim to cease at least one hour prior to dusk in areas of potential Sharman's rock wallaby habitat. This will ensure disturbance to foraging individuals will be kept to a minimum.

Significance assessment

An assessment of the significance of impacts to this species under the Significant Impact Guidelines Policy Statement 1.1 (Department of the Environment, 2013) is provided is provided in Table 30. The outcome of this assessment is that the Project **may** result in a significant impact to the species.

Table 30 Significant impact assessment – Sharman's rock wallaby

EPBC Act Criteria – is there a real possibility that the Proposed Action will:	Assessment of Significance
Lead to a long-term decrease in the size of an important population of a species.	**No.** Multiple Sharman's rock wallabies were recorded within and adjacent to the Study Area across 2018 and 2021. An adult female with a pouched joey was also recorded using a camera trap in 2018 and visually observed in 2021 indicating the population present is breeding. As detailed above, any individuals utilising the Project Area are considered an important population. The extent of suitable habitat for the species is limited to the eastern Study Area in line with the species mapped distribution. Project footprint reduction works have been targeted to this area to ensure impacts on the species are as low as possible. With less clearing required, the construction work-time

EPBC Act Criteria – is there a real possibility that the Proposed Action will:	Assessment of Significance
	required within and adjacent to suitable habitat has also been significantly reduced. Direct impacts via vegetation clearing will occur to a total of 17.09 ha of potential habitat including 6.29 ha of breeding habitat and 10.80 ha of foraging and dispersal. Where possible, clearing in areas of potential habitat will be done via hand (chainsaw) to strictly ensure only required areas are cleared and the use of heavy machinery is limited. Large boulders that must be removed for construction of the Project should be reinstated or relocated to adjacent areas of potential Sharman' rock wallaby habitat where possible. One of the locations where individuals were recorded during the field survey program is close to the existing powerline, indicating that habitat which occurs close to a disturbed area may still be highly functional. Furthermore, no night work will occur and all Project activities will stop one hour prior to dusk in areas of potential habitat to minimise impacts to any foraging individuals. As such, it is considered unlikely the Project could lead to a long-term decrease in the size of an important population of a species.
Reduce the area of occupancy of an important population.	**No.** Although this species has a highly restricted distribution it is possible it is 'common' within its range. The Project Area has been co-located with an historically disturbed area and as such habitat within is likely to be of reduced quality when compared to the surrounding area including locations such as Mount Claro. Narrow and linear vegetation clearing is required for the Project. Footprint minimisation investigations (i.e. design changes to reduce clearing required) were prioritised in areas of potential Sharman's rock wallaby habitat. Through this process direct impacts in areas of potential habitat have been significantly reduced and made narrower (a maximum width of 14 m within the 60 m corridor) than in other parts of the Project Area to minimise habitat fragmentation impacts on this species. As such, the Project is considered highly unlikely to create a barrier to movement for the species. Therefore, it is considered unlikely the Project will reduce the area of occupancy of an important population.
Fragment an existing important population into two or more populations.	**No.** Although timid, the Sharman's rock wallaby is highly mobile. Although activity levels will be high during construction, little to no disturbance will occur during the operation of the Project meaning individuals should return to potential habitat. Additionally, construction of the Project will occur in phases ensuring only one area is disturbed at a time and individuals have time to relocate. Where possible, clearing in areas of potential habitat will be done via hand (chainsaw) to strictly ensure only required areas are cleared and the use of heavy machinery is limited. Large boulders that must be removed for construction of the Project should be reinstated or relocated to adjacent areas of potential Sharman' rock wallaby habitat where possible. To minimise potential disruptions to foraging individuals, all project activities should aim to cease at least one hour prior to dusk in areas of potential habitat. As detailed above, the Project is considered unlikely to result in the creation of barriers to movement to, between or within habitat and is therefore unlikely to fragment an existing important population into two or more populations.
Adversely affect habitat critical to the survival of a species.	**Possibly.** All potential habitat within the Project Area is considered habitat critical to the survival of the species. A total of 17.09 ha of habitat critical to the survival of the species will be directly impacted via vegetation clearing. Although large rocky boulders will be retained, reinstated or relocated where possible,

EPBC Act Criteria – is there a real possibility that the Proposed Action will:	Assessment of Significance
	reconfigured rocky outcrops / boulder piles may no longer be suitable for the species for a variety of reasons. As such, it is considered possible that the Project may adversely affect habitat critical to the survival of the species.
Disrupt the breeding cycle of an important population.	**Possibly.** Breeding has been observed in this species year-round (C. Hayes, personal communication, 2018). Stress related impacts such as mortality and/or abandonment of joeys during construction may occur. This species does not have a defined breeding period. Therefore, construction may occur over multiple breeding cycles. This increases the chance of losing breeding females and joeys, which may temporarily change the breeding structure and breeding success of the population. As such, it is considered possible that the Project will disrupt the breeding cycle of an important population.
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.	**No.** Direct impacts via vegetation clearing will occur to areas of both breeding and foraging and dispersal habitat. Habitat fragmentation impacts are anticipated to be low due to the narrow linear nature of the vegetation clearing. Furthermore, higher quality habitat in the local area such as Mount Claro will be retained. As detailed above, large rocky boulders will be retained, reinstated or relocated where possible. Furthermore, clearing in areas of potential habitat will be done via hand (chainsaw) where possible to strictly ensure only required areas are cleared and the use of heavy machinery is limited. Therefore, it is considered unlikely the Project may possibly modify or reduce the quality of potential habitat to the extent that the species may decline.
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat.	**No.** Invasive flora and fauna species (particularly, feral cats) have been identified on the SPRAT database as a key threat to the species; however it is unlikely that the Project will exacerbate invasive species beyond current levels. The Project EMP will include weed and pest management measures to mitigate and manage the potential spread of pest flora and fauna species. Species-specific management will be undertaken for identified key weed and pest species at risk of spread through Project activities. Control efforts will be increased in areas particularly sensitive to invasion.
Introduce disease that may cause the species to decline.	**No.** Disease has not been identified as a main threat to the species. The Project EMP will include biosecurity measures to prevent the introduction and spread of disease during all phases of the Project.
Interfere with the recovery of the species.	**Possibly.** A recovery plan for the Sharman's rock-wallaby is not considered necessary as the approved Conservation Advice provides sufficient direction to implement priority actions and mitigate against key threats. The threats are poorly resolved, but may include predation by feral cats, habitat degradation due to livestock, inappropriate fire regimes, habitat loss, and competition with other *Petrogale* species. As the Project will result in habitat loss and potential degradation of habitat immediately adjacent to direct impacts, it is possible Project works will interfere with the recovery of the Sharman's rock-wallaby.

Koala (*Phascolarctos cinereus*) – combined populations of Queensland, New South Wales and the Australian Capital Territory)

Description and status under the EPBC Act

The koala is listed as Vulnerable under the EPBC Act.

The koala is a tree-dwelling, medium-sized marsupial with a stocky body, large rounded ears, sharp claws and variable but predominantly grey-coloured fur. It is one of Australia's most distinctive and iconic wildlife species (Threatened Species Scientific Committee, 2012a).

Distribution

With relation to the combined populations of Queensland, New South Wales and the Australian Capital Territory, the range extends from approximately the latitude of Cairns to the New South Wales-Victoria border. Although the species is often more abundant in coastal areas, inland populations do occur. The species' distribution is not continuous within its range with a number of populations isolated by cleared land or unsuitable habitat (Threatened Species Scientific Committee, 2012a).

Habitat requirements

Koalas inhabit a range of temperate, sub-tropical and tropical forest, woodland and semi-arid communities dominated by species from the genus *Eucalyptus* (Martin & Handasyde, 1999). The distribution of koalas is also affected by altitude (limited to <800 m above sea level (ASL)), temperature and, at the western and northern ends of the range, leaf moisture (Munks et al., 1996).

Within central Queensland, koalas have been studied at Tambo (Mitchell Grass Downs bioregion), Springsure and Blair Athol (both in Brigalow Belt North bioregion). Koalas in this region typically occur in low densities and have large home ranges (Ellis et al., 2002).

The koala is heavily reliant on eucalypt leaves, a diet that is extremely energy constraining. As a result, the koala is very inactive and spends around 19 hours per day sleeping (L. K. Curtis & Dennis, 2012). Koalas can live to 15 years of age in the wild (L. K. Curtis & Dennis, 2012) and females can potentially produce one offspring per year. Young are born between October and May and occupy the pouch for six to eight months (L. K. Curtis & Dennis, 2012).

Based on the geographical location of the Project Area and the annual rainfall in the region, the koala habitat is to be assessed with respect to the inland context described in the koala EPBC referral guidelines (Department of the Environment, 2014). Thus, koala habitat is defined as:

- woodlands and forests where koala food trees have reliable access to soil moisture;
- box gum or red gum woodlands on heavier soils in remnant or regrowth vegetation patches particularly riparian zones;
- small, patchy and sparsely distributed woodlands, shrublands and forest in highly modified, agricultural-grazing landscapes or in and around rural towns.

Koala food trees are species of tree whose leaves are consumed by koalas. Koala food trees can generally be considered to be those of the following genus: *Angophora, Corymbia, Eucalyptus, Lophostemon* and *Melaleuca*. It should be noted that 'primary' and 'secondary' food trees (as defined by some resources) are all considered to be 'food trees' for the purposes of assessment using these guidelines.

Threats

The main identified threats to the species are (Threatened Species Scientific Committee, 2012a):

- Loss and fragmentation of habitat
- Vehicle strike
- Disease
- Predation by dogs.

Drought and extreme heat are also known to cause very significant mortality, and post-drought recover may be substantially impaired by the range of other threatening factors (Threatened Species Scientific Committee, 2012a).

Survey effort, timing and coverage

A total of 42 days of field surveying were conducted between 2017 and 2021 across the Study Area and adjacent areas of representative habitat. Habitat assessments were completed during every survey and included the presence and abundance of koala food trees and shelter trees. During the June 2018 and December 2021 surveys, targeted koala surveys were undertaken utilising methodologies outlined in the *EPBC Act Referral Guidelines For The Vulnerable Koala* (Department of the Environment, 2014) including spotlighting with call playback and remote camera trapping in areas of suitable habitat. Remote cameras were also used heavily in July 2018, and although targeting northern quoll still occurred in areas suitable for koala.

Although SAT assessments were not strictly conducted, scat searches were completed as part of the habitat assessments during every field survey and resulted in the collection of a number of potential koala scats. Other signs such as koala scratches on trees were also detected during the field survey program. Due to the linear nature of the Project Area, survey effort is considered sufficient.

Occurrence and potential habitat

Although no koala individuals were recorded, evidence of koala presence was identified during the field surveys including potential scats and scratches on koala food trees. Anecdotal information acquired from on-site personnel and local residents have confirmed the occurrence of an individual koala within the Kidston Solar Farm - Stage 1 site, directly west of the Study Area, as well as two sightings along the Copperfield River. Additionally, anecdotal information provided by landowners of lot and plan 1/CLK23 and lot and plan 6/WU50 noted koala presence within these land parcels. This information strongly suggests that koalas are present in the Study Area, albeit in low-densities.

This finding is considered consistent with current knowledge of the species, with koalas generally thought to occur at low-densities in northern Queensland (<0.2 koalas/ha) as anecdotal reports of koala sightings are uncommon and there are no published estimates of population size or density in the Wet Tropics and Einasleigh Uplands bioregions (Department of Agriculture Water and the Environment, 2022).

The Study Area was determined to contain a total of 5,218.11 ha of potential habitat including 4,904.36 ha of refuge, 118.31 ha of foraging and 195.44 ha of dispersal habitat (Table 31, Figure 23.1 to 23.6). The Study Area is dominated by remnant *Eucalyptus* woodland and open forests with undulating hills and high stream order watercourses. Dominant canopy species include *Eucalyptus crebra* (narrow-leaved ironbark), *Eucalyptus persistens*, *Eucalyptus brownii* (Brown's box), *Eucalyptus camaldulensis* (river red gum), *Eucalyptus microneura* (Georgetown box), *Corymbia dallachiana* (Dallachy's gum), *Corymbia confertiflora* (rough leaf cabbage gum), and *Corymbia erythrophloia* (variable-barked bloodwood). Although in some locations the Cleared areas habitat contains sporadic paddock trees, this is not the case under the existing powerline.

Table 31 Koala habitat within the Study Area

Habitat type/s	RE	Condition	Utilisation	Habitat definition	Study Area total (ha)
All habitat types except 3. Native grassland, 8. Cleared areas and 9. Farm dams	9.3.1, 9.3.3, 9.3.3a, 9.3.5, 9.3.6a, 9.3.13, 9.3.16, 9.3.20, 9.3.22a Plus non-alluvial REs in a patch size > 500ha including: 7.8.7, 9.5.3, 9.5.11, 9.7.1, 9.8.1, 9.8.4, 9.11.1a, 9.11.2a, 9.11.5, 9.11.15a,	Remnant	Refuge	Woodlands and forests dominated by *Eucalyptus spp.* on alluvial substrates, or woodlands and forests dominated by *Eucalyptus spp.* that occur as very large patches (>500 ha).	4,904.36

Habitat type/s	RE	Condition	Utilisation	Habitat definition	Study Area total (ha)
	9.11.16, 9.11.23b, 9.12.1a, 9.12.10, 9.12.12, 9.12.16, 9.12.26, 9.12.32.				
	Remaining REs from the above that are not well connected.	Remnant	Foraging	Eucalypt woodlands and forests that commonly contain koala food trees but are not considered to provide refuge habitat.	118.31
3. Native grassland and 8. Cleared areas	-	Non-remnant	Dispersal	All other vegetation (any condition) that contains scattered koala food trees or shelter trees, that may provide movement opportunities to refuge or foraging habitat.	195.44

Important population

The SPRAT database does not identify 'important populations' of koala (Department of Agriculture Water and the Environment, 2022) and the concept of 'important populations' has not been used in the EPBC Act Referral Guidelines for the Vulnerable Koala (Department of the Environment, 2014). This is due to insufficient information being available to adequately identify and separate the nature of any important populations throughout the species range. This guideline encourages the assessment of significant impacts on the koala to be completed primarily through the assessment of habitat critical to the survival of the koala (Table 32) and the actions that interfere substantially with the recovery of the koala (Table 33). As such, important populations have not been discussed in the significant impact assessment presented in Table 34.

Habitat critical to the survival of the species

Potential significant impacts to koala habitat may occur if habitat that is considered to be *critical to the survival of the koala* is disturbed. In determining if critical habitat is present, the habitat assessment tool was applied to the Project (Table 32 below). The outcome of this assessment in turn supports the significant impact assessment.

Based on this assessment of koala habitat using the Koala Habitat Assessment Tool, the koala habitat scores a nine out of ten. This is above the threshold of five and as such the habitat is considered to be critical to the survival of the koala.

Table 32 Koala habitat assessment tool

Attribute	Ranking	Criteria for inland populations	Score	Notes
Koala occurrence	+2 (high)	Evidence of one or more koalas within the last 5 years.	1	Anecdotal information has confirmed koalas within 2 km of the edge of the impact area within the last 5 years.
	+1 (medium)	**Evidence of one or more koalas within 2 km of the edge of the impact area within the last 10 years.**		
	0 (low)	None of the above.		

Attribute	Ranking	Criteria for inland populations	Score	Notes
Vegetation composition	**+2 (high)**	**Has forest, woodland or shrubland with emerging trees with 2 or more known koala food tree species, OR** **1 food tree species that alone accounts for >50% of the vegetation in the relevant strata.**	2	More than two koala food tree species occur within the Study Area.
	+1 (medium)	Has forest, woodland or shrubland with emerging trees with only 1 species of known koala food tree present.		
	0 (low)	None of the above.		
Habitat connectivity	**+2 (high)**	**Area is part of a contiguous landscape ≥1,000 ha.**	2	The Study Area forms part of a large contiguous landscape of ≥ 500 ha.
	+1 (medium)	Area is part of a contiguous landscape <1,000 ha, but ≥ 500 ha.		
	0 (low)	None of the above.		
Key existing threats	**+2 (high)**	**Little or no evidence of koala mortality from vehicle strike or dog attack at present in areas that score 1 or 2 for koala occurrence.** **Areas which score 0 for koala occurrence and have no dog or vehicle threat present.**	2	No evidence of koala mortality was identified during the field surveys; however the presence of wild dogs has been confirmed within the Study Area and vehicles do traverse the site although not frequently when compared to urbanised areas.
	+1 (medium)	Evidence of infrequent or irregular koala mortality from vehicle strike or dog attack at present in areas that score 1 or 2 for koala occurrence, OR Areas which score 0 for koala occurrence and are likely to have some degree dog or vehicle threat present.		
	0 (low)	Evidence of frequent or regular koala mortality from vehicle strike or dog attack in the study area at present, OR Areas which score 0 for koala occurrence and have a significant dog or vehicle threat present.		
Recovery value	**+2 (high)**	**Habitat is likely to be important for achieving the interim recovery objectives for the relevant context, as outlined in Table 1 of the guideline.**	2	Table 1 of the guideline notes that the Interim Recovery Objectives for coastal populations includes: • Protecting and conserving large, connected areas of koala
	+1 (medium)	Uncertain whether the habitat is important for achieving the interim recovery objectives for the relevant context, as outlined in Table 1 of the guideline.		

Attribute	Ranking	Criteria for inland populations	Score	Notes
	0 (low)	Habitat is unlikely to be important for achieving the interim recovery objectives for the relevant context, as outlined in Table 1 of the guideline.		habitat, particularly large, connected areas that support koalas that are: - of sufficient size to be genetically robust / operate as a viable sub-population OR - free of disease or have a very low incidence of disease OR - breeding. • Maintaining corridors and connective habitat that allow movement of koalas between large areas of habitat. The Study Area maintains the quality, extent and connectivity of large areas of koala habitat.
Total Score			**9**	

Potential Project impacts

A total of 626.01 ha of potential habitat including 585.78 ha of refuge 16.99 ha of foraging and 23.24 ha of dispersal habitat may be cleared as part of the Project. Other Project related potential indirect impacts relevant to the koala includes:

- Pest incursion
- Fauna mortality via strike from moving vehicles and machinery.

Project avoidance, mitigation and management measures

In addition to the general mitigation measures outlined in Section 8.3.1, the following species-specific mitigation measures will be implemented:

- If an individual is found prior to or during clearing activities, it must not be forcibly relocated. Any tree that has a koala present, as well as any tree with its crown overlapping that tree, must not be removed and remain in place until the koala vacates the tree of its own accord.

Significance assessment

Assessing significance of impacts to the koala is a twostep process and involves assessing whether Project impacts will:

1. substantially interfere with the recovery of the species
2. adversely affect habitat critical to the survival of the species

The EPBC Act Referral Guidelines for the Vulnerable Koala (Department of the Environment, 2014) identifies five impacts which are likely to substantially interfere with the recovery of the koala. These have been outlined in Table 33 with a discussion on whether these impacts are likely to occur as a result of the Project. The result of this assessment is that the Project is unlikely to substantially interfere with the recovery of the koala.

Table 33 Impacts which are likely to substantially interfere with the recovery of the koala

Impacts which are likely to substantially interfere with the recovery of the koala	Potential for Impact to occur as a result of the Project
'Increasing koala fatalities in habitat critical to the survival of the koala due to dog attacks to a level that is likely to result in multiple, ongoing mortalities.'	**No.** The dog (*Canis lupus familiaris**) is known to the Study Area and the Project will not result in an increase in the number of dogs to the local area as pest management is included in the EMP. A linear, cleared area already occurs directly adjacent to the Project Area (the existing powerline corridor) which may act as a conduit for movement of dogs. No mechanisms which would facilitate the exacerbation of this species are expected as a result of the Project. The Project is unlikely to result in multiple, ongoing mortalities.
'Increasing koala fatalities in habitat critical to the survival of the koala due to vehicle-strikes to a level that is likely to result in multiple, ongoing mortalities.'	**No.** An increase in vehicle and machinery movement across the Study Area will occur during construction; however, this will be temporary and impacts to fauna will be managed through the adoption of vegetation clearing protocols and construction site restrictions (i.e. speed limits and construction times). Once constructed is complete vehicle traverses should be minimal due to the lack of personnel required for the operation of the Project. Therefore, the Project is not expected to result in multiple, ongoing fatalities to koala due to vehicle strikes.
'Facilitating the introduction or spread of disease or pathogens for example *Chlamydia* or *Phytophthora cinnamomi*, to habitat critical to the survival of the koala, that are likely to significantly reduce the reproductive output of koalas or reduce the carrying capacity of the habitat.'	**No.** The Project is not expected to introduce or exacerbate the spread of disease or pathogens (i.e. *Chlamydia* or *Phytophthora cinnamomi*) that may reduce the reproductive output of koalas or reduce the carrying capacity of the habitat. Symptoms of individuals carrying *Chlamydia* can become overt when subjected to additional stress and such stress may be caused by habitat clearing. However, due to the linear nature of the direct impacts and their co-location with an existing disturbed area that may already be actively avoided, it is not expected to exacerbate this disease on a population scale. Further, the Project is unlikely to lead to new pathways to dispersal into the Study Area for any individuals which may carry the disease. Implementation of biosecurity measures for the Project will ensure best practice site hygiene.
'Creating a barrier to movement to, between or within habitat critical to the survival of the koala that is likely to result in a long-term reduction in genetic fitness or access to habitat critical to the survival of the koala.'	**No.** A maximum of 626.01 ha of potential koala habitat may be cleared as a result of the Project. Fragmentation impacts will be low as the potential habitat to be impacted occurs directly adjacent to a historically cleared linear area (largely the same shape as the Project Area). In the context of the wider landscape, the shape and magnitude of this impact will not create barriers to movement to the koala (i.e. is less than 2 km wide treeless area). Existing access tracks will also be utilised where possible as well as natural or existing breaks in the community as a result of current disturbances.

Impacts which are likely to substantially interfere with the recovery of the koala	Potential for Impact to occur as a result of the Project
'Changing hydrology which degrades habitat critical to the survival of the koala to the extent that the carrying capacity of the habitat is reduced in the long-term.'	**No.** Changes to hydrology can potentially impact the extent of local catchments, run-off characteristics and intensity of flood flows, which can impact on the condition and stability of riparian habitats. No significant works are proposed that will alter drainage across the creeks and rivers within the Project Area. No creek diversions are proposed as part of this Project. Water will only be extracted from local sources were supplies are abundant. Therefore, current environmental flows should not be impacted.

Habitat critical to the survival of the species has been identified for the Study Area based on the outcomes of the habitat assessment tool (score of nine out of ten). Because of this, a full assessment under the Significant Impact Guidelines Policy Statement 1.1 (Department of the Environment, 2013) has been undertaken and is provided in Table 34. The outcome of this assessment is that the Project **may result in a significant impact** on the koala.

Table 34 Significant impact assessment – koala

EPBC Act criteria – is there a real possibility that the Project will:	Assessment of significance
Lead to a long-term decrease in the size of an important population of a species?	**No.** As previously discussed, the concept of important populations of the species is not relevant for the vulnerable koala. The *EPBC Act Referral Guidelines for the Vulnerable Koala* (Department of the Environment, 2014) identifies habitat critical to the survival of the species as important to the long term survival of populations. Due to the lack of recent recorded sightings, it is considered to occur in low densities only. The Project may result in 626.01 ha of koala habitat to be directly impacted via vegetation clearing including 585.78 ha of refuge habitat, 16.99 ha of foraging habitat and 23.24 ha of dispersal habitat. As the Project Area has been largely co-located with an already disturbed, linear area, habitat fragmentation impacts are low. Large intact patches of potential habitat will remain following the construction of the Project and are expected to be common in the wider local area surrounding the Study Area. The koala is highly mobile and known to utilise cleared areas as long as scattered suitable food or shelter trees occur. The Project is unlikely to create a barrier to movement between or within potential habitat. Given this, and the low density of koalas that are expected to be present, it is considered unlikely this amount of clearing will lead to a long-term decrease in any potential koala population present in the region.

EPBC Act criteria – is there a real possibility that the Project will:	Assessment of significance
Reduce the area of occupancy of an important population?	**No.** The extent of suitable habitat available for the species within eastern Australia was significantly reduced following the 2020 bushfires. However, north Queensland was not significantly impacted and potential koala habitat in the local region surrounding the Study Area is common. Koalas are The Project may result in 626.01 ha of potential koala habitat to be cleared including habitat likely to be utilised by the species for refuge, foraging and dispersal purposes. However, direct impacts will occur to a narrow linear area that is not near the limits of the species range. As detailed above, the Project will not create a barrier to movement and habitat fragmentation impacts are likely to be low. Therefore, it is considered unlikely the Project may reduce the area of occupancy for koala.
Fragment an existing important population into two or more populations?	**No.** Koalas are considered highly mobile and are known to cross cleared and disturbed areas to access suitable habitat. To limit habitat fragmentation impacts, the Project Area has been largely co-located with an existing cleared linear area. Given the linear nature of direct impacts and the footprint optimisation to minimise the extent of direct impacts, it is considered highly likely habitat connectivity will be maintained. Furthermore, the Project is considered will not result in the creation of barriers to movement to, between or within habitat. Therefore, it is unlikely that the Project will fragment an existing population into two or more populations.
Adversely affect habitat critical to the survival of a species?	**Possibly.** A maximum of 626.01 ha of habitat critical to the survival of the species will be directly impacted via vegetation clearing. Although significant footprint minimisation work has been done to reduce impacts to potential habitat, direct impacts to potential koala habitat are well above the clearing threshold limit of 20 ha identified in the *EPBC Act Referral Guidelines for the Vulnerable Koala* (Department of the Environment, 2014). As such, it is possible this extent of clearing may adversely affect habitat critical to the survival of the species.
Disrupt the breeding cycle of an important population?	**No.** A maximum of 626.01 ha of potential koala habitat will be cleared for Project. However, suitable habitat for the species is likely to be relatively common in the wider local area due to the likely vast availability of potential habitat. As the Project Area is linear, and clearing will be completed in phases, works are considered unlikely to disrupt the breeding cycle of individual koalas potentially utilising the Project Area. As discussed above, potential fragmentation impacts will not create a barrier, including males dispersing during the breeding season.

EPBC Act criteria – is there a real possibility that the Project will:	Assessment of significance
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline?	**No.** As detailed above, the Project will result in direct impacts to 626.01 ha of potential koala habitat that includes habitat likely to be utilised by the species for refuge, foraging and dispersal purposes. Habitat fragmentation impacts are expected to be low due to the narrow and linear nature of the impacts, meaning connectivity in the landscape should be maintained. This includes dispersal functions, which are important in maintaining viable populations. No significant works are proposed that will alter drainage across the watercourses within the Project Area. Therefore, no changes in the condition and stability of riparian refuge habitats are expected to occur. Mitigation and management measure will also be implemented to reduce risk of habitat degradation from weed and pest incursion, erosion and sedimentation and contamination. Potential habitat is likely to be locally common and indirect impacts to retained habitat will be low. As such, it is considered unlike the Project will modify, destroy, remove, isolate or decrease the availability of habitat to the extent that the species is likely to decline.
Result in invasive species that are harmful to a Vulnerable species becoming established in the Vulnerable species' habitat?	**No.** The primary invasive species which poses a threat to koala is the dog (*Canis lupus familiaris**), and this species is already known to the Study Area. As identified in Table 33, no mechanisms which would facilitate the exacerbation of this species are expected as a result of the Project.
Introduce disease that may cause the species to decline?	**No.** As identified in Table 33, the Project is not expected to introduce or exacerbate the spread of disease or pathogens (i.e. *Chlamydia* or *Phytophthora cinnamomi*) that may reduce the reproductive output of koalas or reduce the carrying capacity of the habitat. Symptoms of individuals carrying *Chlamydia* can become overt when subjected to additional stress. Such stress may be caused by habitat clearing. However, due to the linear and narrow impact nature of the Project within a landscape dominated by koala habitat, it is not expected to exacerbate this disease on a population scale. Further, the Project is unlikely to lead to new pathways to dispersal into the Project Area for any individuals which may carry the disease. Implementation of biosecurity controls measures for the Project will ensure best practice site hygiene.
Interfere substantially with the recovery of the species?	**No.** As identified in Table 33, the Project is unlikely to interfere substantially with the recover of the species.

Greater glider (*Petauroides volans*)

Description and status under the EPBC Act

The greater glider is listed as Vulnerable under the EPBC Act.

The greater glider is the largest gliding possum in Australia, with a head and body length of 35−46 cm and a long furry tail measuring 45−60 cm. Its tail is not prehensile. This species has thick fur that increases its apparent size. The fur is white or cream in colour below and varies from dark grey, dusky brown through to light mottled grey and cream above. It has large furry ears and a short snout.

Distribution

The species is currently undergoing a taxonomic split, whereby the subspecies *P. volans minor* will be considered *P. minor*, the northern greater glider (Department of Agriculture Water and the Environment, 2021b; McGregor et al., 2020). 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, 2021b).

Habitat requirements

The greater glider is an arboreal nocturnal marsupial, largely restricted to eucalypt forests and woodlands. 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. Home ranges of this species are typically relatively small (1 - 4 ha) but are larger in lower productivity forests and more open woodlands (up to 16 ha). They are larger for males than for females, with male home ranges being largely non-overlapping. A study on the greater glider population in the Seven Mile Beach National Park area found that while the species can cover distances up to 100 m, they usually glide less than 30 m and have a steeper trajectory than other species of glider (NSW Scientific Committee, 2016).

Hollows develop extraordinarily slowly in Australian eucalypts, with figures most often quoted as minimum lag times of 150 - 360 years from germination to the beginning of hollow development (Gibbons & Lindenmayer, 2002). A fall in the number of hollows below a minimum critical threshold for greater gliders could cause a decline in any local population and compromise population viability in the longer term if there is not a new cohort of hollow trees available to replace trees lost (David B. Lindenmayer et al., 1997).

Threats

The greater glider is considered to be particularly sensitive to forest clearance and to intensive logging. Notwithstanding relatively small home ranges (1 – 4 ha), but in part because of low dispersal ability, this species may be sensitive to fragmentation, have relatively low persistence in small forest fragments, and disperse poorly across vegetation that is not native forest.

It has been identified that the species requires a Recovery Plan, however one has not yet been developed. Although taxonomically different, the related Mahogany glider (*Petaurus gracilis*) does have a Draft Recovery Plan (Jackson & Diggins, 2020). Neither this document or other published information indicates that mortality as a result of collision with powerlines is a threat to glider species. The draft Recovery Plan does state that “[d]irect observations of Mahogany Gliders have found them able to glide over gaps in their habitat including tracks, roads and powerline corridors, as long as the trees on each side of the gap are tall enough to allow a complete glide and landing.” Based on this, a widening of existing gaps between habitat areas may not significantly impede the species mobility should tall trees remain on either side that facilitate movement.

As per the species Conservation Advice (Threatened Species Scientific Committee, 2016b), all known threats include:

- Habitat loss and fragmentation
- Too intense or frequent fires
- Timber production

- Climate change
- Barbed wire fencing entanglement
- Hyper-predation by owls
- Competition from sulphur-crested cockatoos
- *Phytophthora* root fungus.

Survey effort, timing and coverage

A total of 42 days of field surveying were conducted between 2017 and 2021 across the Study Area; the assessment of habitat including the presence and abundance of hollow-bearing trees occurred throughout. During the June 2018 and December 2021 survey, spotlighting surveys were undertaken in areas of suitable habitat as recommended by Eyre *et al.* (2018). Spotlighting was concentrated in eucalypt woodlands along or adjacent to watercourses with a high abundance of hollow-bearing trees.

No recommended survey effort is specified for this species and species-specific survey guidelines do not exist. Nonetheless, due to the linear nature of the Project Area survey effort is considered sufficient.

Subsequent to the completion of the 42 days of field survey, the Guide to greater glider habitat in Queensland (DES, 2022) was released by the Queensland Department of Environment and Science. This document includes focus on Regional Ecosystems and density of large trees to map habitat for the species. The criteria presented below in Table 35 are generally consistent with the Guide to greater glider habitat in Queensland (DES, 2022) including consideration of suitable Regional Ecosystems and remnant status.

Occurrence and potential habitat

In 2018, two individual greater gliders were recorded while spotlighting adjacent to the Study Area within RE 9.3.6a on lot and plan 5/CLK23, at both a small unnamed creek and the Burdekin River where it meets Gray Creek. A single greater glider was also recorded during spotlighting in December 2021, located along Camel Creek within an area of RE 9.3.1.

The greater glider has also been recorded in the wider region for other proposed developments. 4 Elements Consulting (2020) also recorded the northern greater glider at two locations containing RE 7.5.4 during field surveys within the Mt Fox Energy Park site (see Section 4.2). One individual was located during opportunistic spotlighting in the canopy of a mature *E. tereticornis* and another was found deceased after becoming entangled in a barbed-wire fence directly adjacent to Ewan Road.

A total of 652.94 ha suitable habitat was identified within the Study Area including 251.47 ha of potential breeding and foraging habitat and 401.47 ha of potential foraging and dispersal habitat (Table 35, Figure 22.1 to 22.6). Within the Study Area this species is expected to primarily utilise the riparian zones of the large creeks and rivers and the open woodland of Eucalyptus or Melaleuca on alluvium or sand plains habitat.

Table 35 Greater glider habitat within the Study Area

Habitat type	RE	Condition	Utilisation	Habitat definition	Study Area total (ha)
1. Open woodland of Eucalyptus or Melaleuca on alluvium or sand plains & 2. Open Eucalyptus, Casuarina and Melaleuca riparian woodland	9.3.1, 9.3.3, 9.3.3a, 9.3.5, 9.3.6a, 9.3.13, 9.3.16, 9.3.20 & 9.3.22a	Remnant	Breeding and foraging	Highly connected, eucalypt woodland or forest containing 2-4 hollows/ha, medium-large in size (>10cm).	259.23

Habitat type	RE	Condition	Utilisation	Habitat definition	Study Area total (ha)
All habitats except 4. Native grassland, 8. Cleared areas and 9. Farm dams.	9.3.1, 7.8.18, 9.5.3, 9.7.1, 9.8.1, 9.3.22a, 9.11.2a, 9.11.5, 9.11.15a, 9.11.16, 9.11.23b, 9.12.1a, 9.12.6c, 9.12.10, 9.12.12, 9.12.16, 9.12.26		Foraging and dispersal	All other connected eucalypt woodland or forest suitable for gliding, on creeklines or within 120 m of breeding / denning habitat.	490.37

Important population

The Department of the Environment and Energy's SPRAT database does not identify 'important populations' of the greater glider (Department of Agriculture Water and the Environment, 2022). As the species distribution in the northern extent is discontinuous, it is possible that individuals in this area comprise a genetically distinct population. As such, any individuals within the Study Area are considered an important population.

Habitat critical to the survival of the species

The greater glider generally has a small home range and exhibits high site fidelity as per Tyndale-Biscoe and Smith, (1969). The species has also been known to restrict their home-ranges to the unlogged part of their range after intensive logging. Although habitat critical to the survival of the species is not defined for this species, the *EPBC Act Significant Impact Guidelines 1.1* define habitat critical to the survival of a species or ecological community as areas that are necessary:

- for activities such as foraging, breeding, roosting, or dispersal
- for the long-term maintenance of the species or ecological community (including the maintenance of species essential to the survival of the species or ecological community, such as pollinators)
- to maintain genetic diversity and long-term evolutionary development; or
- for the reintroduction of populations or recovery of the species or ecological community.

Based on this, all potential habitat is considered habitat critical to the survival of the species, as habitat trees present may be necessary for activities such as foraging, breeding and denning.

Potential Project impacts

A total of 67.91 ha of suitable habitat including 27.27 ha of potential breeding and foraging and 40.64 ha of potential foraging and dispersal habitat may be cleared as part of the Project. Other Project related potential indirect impacts relevant to the greater glider includes:

- Habitat fragmentation
- Pest incursion
- Fauna mortality via felling of hollow-bearing trees.

The greater glider can cover distances up to 100 m (Kerle 2001) but usually tend not to glide further than 30 m and have a steeper trajectory than other species of glider (R. Kavanagh pers. comm. August 2013).

Project avoidance, mitigation and management measures

In addition to the general mitigation and management measures outlined in Section 8.3.1, the following species-specific mitigation measures will be implemented:

- All hollow-bearing trees will be inspected by a fauna spotter-catcher prior to clearing to identify any denning or nesting individuals.

Significance assessment

An assessment of the significance of impacts to this species under the Significant Impact Guidelines Policy Statement 1.1 (Department of the Environment, 2013) is provided is provided in Table 36. The outcome of this assessment is that the Project is **may result in a significant impact** on the species.

Table 36 Significant impact assessment – greater glider

EPBC Act Criteria – is there a real possibility that the Proposed Action will:	Assessment of Significance
Lead to a long-term decrease in the size of an important population of a species.	**No.** Three individuals of this species were recorded during the field survey program and this species is also known from the Mt Fox area to the east. It is expected this species occurs within the Study Area in low densities only. However any individuals present are conservatively considered to comprise an important population due to the species discontinuous distribution. A total of 652.94 ha of suitable habitat occurs within the Study Area including 251.47 ha of potential breeding and foraging habitat and 401.47 ha potential foraging and dispersal habitat. Direct impacts via vegetation clearing will occur to 27.27 ha of potential breeding and foraging habitat and 40.64 ha of potential foraging and dispersal habitat. As the Project Area has been predominantly co-located with an existing cleared linear area, habitat fragmentation issues in a north – south direction may occur for this species as cleared widths will be greater than 100 m in some locations. However, it is noted that full Project Area width clearing does not occur extensively. Large intact patches of potential habitat will remain following the construction of the Project and are expected to be common in the wider local area surrounding the Study Area. Indirect impacts include increased activity, light and noise. However, these will be temporary and localised as the Project will be constructed in phases. Indirect impacts will be actively managed during all Project phases as per the EMP. As such, it is considered unlikely the Project may lead to a long-term decrease in the size of an important population.
Reduce the area of occupancy of an important population.	**No.** The area of occupancy for this species has previously been estimated at 16,164 km^2 and the extent of occurrence at 1,586,879 km^2. However, the species is currently undergoing taxonomic revision and the northern extent of the species distribution is disconnected. Vegetation clearing required for the Project will occur to a linear area that runs east-west, and occurs largely adjacent to an area that has already been disturbed. Significant footprint reduction works have been completed to reduce the extent of vegetation clearing. This has also significantly reduced the number of locations that will be cleared to full easement width (60 m). While there are still anticipated to be habitat fragmentation impacts on the species, it is considered unlikely these will reduce the area of occupancy of an important population.
Fragment an existing important population into two or more populations.	**Possibly.** As detailed above, any individuals within the Study Area are considered to comprise an important population. This species is considered to be sensitive to fragmentation due to low dispersal ability and relatively small home ranges (Teresa J. Eyre, 2006), and the greater glider does not disperse across vegetation that is not native forest (due to the high predation risk). As the Project Area is largely co-located with an existing cleared area that also contains electrical infrastructure, the combined easement width may exceed the volplane distance of the species (>100 m) in some areas. Some direct impacts will also occur within riparian vegetation which is likely to provide the

EPBC Act Criteria – is there a real possibility that the Proposed Action will:	Assessment of Significance
	preferred movement pathways for the species. Furthermore, although highly unlikely, the infrastructure may present a barrier to movement in areas where connecting wires may be low enough to obstruct gliding. As such, the local population of greater gliders may be disrupted as dispersal across the easement may be restricted. Therefore, it is possible that the Project will fragment an existing important population into two or more populations.
Adversely affect habitat critical to the survival of a species.	**Possibly.** Tyndale-Biscoe and Smith, (1969) reported that greater gliders exhibit high site tenacity and typically die *in situ* when forests within their home ranges are cleared. Additionally, Kavanagh and Wheeler, (2004) reported that greater gliders restricted their home-ranges to the unlogged part of their range after intensive logging. Due to this high site fidelity, all suitable habitat within the Study Area is considered habitat critical to the survival of the species, as habitat trees present may be necessary for activities such as foraging, breeding and denning. Direct impacts are anticipated to occur to both potential breeding and foraging habitat and potential foraging and dispersal habitat. This removal of habitat may also create a barrier to movement that results in significant fragmentation impacts. Based on this, it is considered possible that the Project will adversely affect habitat critical to the survival of the species.
Disrupt the breeding cycle of an important population.	**Possibly.** Breeding is restricted to a very brief period in February to May, and females give birth to a single young from March to June. Vegetation clearing and construction will be unable to avoid working during this period, however disturbance will be localised to a smaller area and phased. Tree hollows are required for this species to breed, and potential breeding habitat will be directly impacted (a total area of 27.27 ha). The use of fauna spotter catchers, particularly during the breeding period, will ensure that any displaced individuals possibly bearing young are captured and relocated. However, the reduction in suitable hollow-bearing trees available for the species in the local area may result in the disruption of the breeding cycle of an important population.
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.	**No.** Direct impacts via vegetation clearing will occur to 27.27 ha of potential breeding and foraging habitat and 40.64 ha of potential foraging and dispersal habitat. As the Project Area has been predominantly co-located with an existing cleared linear area, habitat to be impacted by the Project is unlikely to be the best quality in the local area due to the existing edge effects impacts. Significant footprint reduction works have also been completed to minimise clearing, which has reduced the number of locations that will be cleared to full easement width (60 m). Although habitat fragmentation issues especially in a north – south direction may occur for this species, large intact patches of potential habitat will remain following the construction of the Project and are expected to be common in the wider local area. Indirect impacts include increased activity, light and noise. However, these will occur during the day only, and will be temporary and localised as the Project will be constructed in phases. Indirect impacts will be actively managed during all Project phases as per the EMP. Current recognised threats to the species are unlikely to be exacerbated by the Project. As such, it is considered unlikely the Project may modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.

EPBC Act Criteria – is there a real possibility that the Proposed Action will:	Assessment of Significance
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat.	**No.** Invasive flora and fauna species have not been identified as a key threat to the species and it is unlikely that the Project will exacerbate invasive species beyond current levels. The Project EMP will include mitigation and management measures to control the potential spread of pest flora and fauna species. Species-specific management will be undertaken for identified key weed and pest species at risk of spread through Project activities. Control efforts will be increased in areas particularly sensitive to invasion.
Introduce disease that may cause the species to decline.	**No.** A threat to this species includes the root fungus *Phytophthora* which is known to impact on the health of eucalypts. This threat is considered 'minor'. It is unlikely that the Project will introduce a disease to the extent that this species would decline. The EMP for the Project will detail the biosecurity measures to prevent the introduction and spread of disease.
Interfere with the recovery of the species.	**No.** The SPRAT profile identifies that a Recovery Plan for the greater glider is required; however no such plan exists at the time of this report. In Queensland, there are no species-specific management actions currently in place for the greater glider. As the Project is unlikely to exacerbate current recognised threats to the species, or introduce these threats in the local area, it is unlikely the Project will interfere with the recovery of the species.

Ghost bat (Macroderma gigas)

Description and status under the EPBC Act

The ghost bat is listed as Vulnerable under the EPBC Act.

The ghost bat is the largest microchiropteran bat in Australia, with a head and body length of 10−13 cm and a forearm length of 10−11 cm. It is Australia's only carnivorous bat. Its fur is light to dark grey above and paler below. It has long ears which are joined together, large eyes, a simple noseleaf and no tail.

Distribution

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, 2022). The Project Area occurs within the 'likely' distribution of the species as per its SPRAT.

In Queensland the population size has been estimated at fewer than 1,000 individuals, and possibly as low as 470−680 individuals excluding the Calvert River/Pungalina population on the Northern Territory/Queensland border. Population estimates of this species surrounding the Study Area include 50 within Blackbraes/Chudleigh and 150 at Girringun-Gugu Badhun West of Ingham/Cardwell.

Habitat requirements

The ghost bat currently occupies habitats ranging from the arid Pilbara to tropical savanna woodlands and rainforests.

From September to April, ghost bats aggregate in maternity roost sites to breed. Across Australia only 14 breeding sites are currently known. Maternity roost sites 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%. Most of the colony disperses (up to 150 km) from maternity roosts during the non-breeding season in the cooler months. During this time, ghost bats use large numbers of caves, rock shelters, overhangs, vertical cracks, and mines as day roosts. Ghost bats are easily disturbed

when roosting. Young may be dislodged by adults in rapid take-offs and may not return to the roost site (Threatened Species Scientific Committee, 2016a).

Radio tracking by Tidemann *et al.*, (1985) revealed ghost bats forages an average of 1.9 km from day roosts, over an area of 61 ha, generally returning to the same areas each night. They are carnivores, with a broad diet comprising small mammals including other bats, birds, reptiles, frogs and large insects. Foraging bats spent most of the time perch hunting from small branches or the main trunk in the mid-to-upper canopy of eucalypts at heights up to 3 m from the ground (Threatened Species Scientific Committee, 2016a).

Threats

As per the species Conservation Advice (Threatened Species Scientific Committee, 2016a), the key threat to the ghost bat is habitat loss and degradation due to mining activities. The species' slow reproductive rate, and the lack of suitable habitat which restricts its movement, renders it vulnerable to threats and localised extinctions.

Known threats to the ghost bat include:

- Habitat loss (destruction of, or disturbance to, roost sites and nearby areas) due to mining
- Disturbance of (human visitation at) breeding sites
- Modification to foraging habitat
- Collision with fences, especially those with barbed wire
- Collapse or reworking of old mine adits
- Contamination by mining residue at roost sites
- Disease
- Poisoning by cane toads
- Competition for prey with foxes and feral cats.

Survey effort, timing and coverage

A total of 42 days of field surveying were conducted between 2017 and 2021 across the Study Area and adjacent areas of representative habitat. Targeted ghost bat surveys were undertaken in December 2021 utilising attended bat recorders which are a recommended methodology outlined in Queensland *Targeted Species Survey Guidelines – Ghost Bat* (Hourigan, 2011). An attended bat recorder was used while spotlighting for four nights. Spotlighting was also completed in areas of representative habitat across the Study Area during the June 2018 survey.

Searches for suitable roost sites were also completed as part of the habitat assessments during every field survey. During the December 2021 survey, ecologists targeted mapped abandoned mine sites to determine roost suitability. Although noted to be shallow, unattended bat recorders were deployed at the entrance of the only abandoned mine sites that were confirmed to contain a mine shaft (total of 2 sites). Given the linear nature of the Project Area, survey effort is considered sufficient.

Occurrence and potential habitat

The ghost bat is considered a potential occurrence within the Study Area due to the presence of suitable habitat and scattered records within 80 km in the region, including at Blackbraes National Park and near Mount Surprise and Undara Volcanic National Park.

The field survey program did not detect any evidence of this species, nor any sites suitable for roosting including caves and abandoned mines. Field surveys completed within the local area for other environmental impact assessments (see Section 4.2) did not detect the species either.

Due to the lack of potential roost sites, and the species preference to forage near roost sites, all potential habitat within the Study Area is considered suitable for dispersal only. A total of 5,135.67 ha of potential dispersal habitat occurs within the Study Area (Table 37, Figure 21.1 to 21.6). As the species has no strict dispersal habitat requirements, all woody vegetation communities are considered potentially suitable.

Table 37 Ghost bat habitat within the Study Area

Habitat type	RE	Condition	Utilisation	Habitat definition	Study Area total (ha)
All habitats except 8. Cleared areas and 9. Farm dams.	All REs	Remnant	Dispersal only	All vegetation that is not considered roosting / breeding or foraging habitat.	5,135.67

Important population

The Department of the Environment and Energy's SPRAT database does not identify 'important populations' of the ghost bat (Department of Agriculture Water and the Environment, 2022). However, genetically distinct populations are known from Mount Etna, Cape Hillsborough, and Camooweal in Queensland, and the Pilbara in Western Australia. Populations within the Northern Territory and far north Queensland are also highly distinct from each other and other population centres.

Any individuals that may occur within the Study Area are not considered to comprise an important population based on the lack of potential roosting habitat, the position of the Study Area within the species range (relatively central) and the functional connectivity with known populations in the wider landscape.

Habitat critical to the survival of the species

There is no species-specific guidelines for determining habitat critical to the survival of ghost bat and at present no recovery plan exists. However, the *EPBC Act Significant Impact Guidelines 1.1* define habitat critical to the survival of a species or ecological community as areas that are necessary:

- for activities such as foraging, breeding, roosting, or dispersal
- for the long-term maintenance of the species or ecological community (including the maintenance of species essential to the survival of the species or ecological community, such as pollinators)
- to maintain genetic diversity and long-term evolutionary development; or
- for the reintroduction of populations or recovery of the species or ecological community.

As potential habitat within the Study Area is suitable for dispersal only, it is not considered habitat critical to the survival of the species.

Potential Project impacts

A total of 615.89 ha of potential dispersal habitat may be cleared as part of the Project. The general mitigation and management measures are outlined in Section 8.3.1 and include weed and pest management as well as sediment and erosion control. These are considered sufficient to manage potential indirect impacts on the species.

Project avoidance, mitigation and management measures

In addition to the general mitigation and management measures outlined in Section 8.3.1, the following species-specific mitigation measures will be implemented:

- Where pits, voids or trenches are required, include appropriate cover to prevent extended water retention in these spaces and/or subsequent breeding opportunities for cane toads.

Significance assessment

An assessment of the significance of impacts to this species under the Significant Impact Guidelines Policy Statement 1.1 (Department of the Environment, 2013) is provided is provided in Table 38. The outcome of this assessment is that the Project is **unlikely to result in a significant impact** on the species.

Table 38 Significant impact assessment – ghost bat

EPBC Act Criteria – is there a real possibility that the Proposed Action will:	Assessment of Significance
Lead to a long-term decrease in the size of an important population of a species.	**No.** Although the ghost bat was not detected during the field survey program it is conservatively considered a potential occurrence within the Study Area. However, any individuals that may occur within the Study Area are not considered to comprise an important population due to the position of the Study Area within the species range (relatively central) and functional connectivity with known populations in the wider landscape. Potential habitat within the Study Area is considered suitable for dispersal only. Previously identified potential roost sites were investigated in December 2021 and determined to be unsuitable. Due to the species habit of only foraging within proximity to roost sites, potential foraging habitat is also considered absent from the Study Area. A total of 615.89 ha of potential dispersal habitat will be directly impacted via vegetation clearing. Large intact patches of potential habitat will remain following the construction of the Project and are expected to be common in the wider local area surrounding the Study Area. Due to its absence within the Study Area, no direct impacts will occur to potential roosting or foraging habitat. This species is highly mobile and not susceptible to mortality as a result of collision with powerlines. Due to the transitory, non-breeding nature of any individuals utilising this habitat, both direct and indirect impacts are expected to be very low. Construction will occur in phases and allow individuals to avoid impacted areas. All other key threats to this species are unlikely to be increased beyond current levels with the implementation of mitigation measures detailed in Section 8.3.
Reduce the area of occupancy of an important population.	**No.** The area of occupancy for the ghost bat is estimated at 1104 km^2 (Threatened Species Scientific Committee, 2016a). As detailed above, any individuals that may occur within the Study Area do not comprise an important population and potential habitat is suitable for dispersal only. A total of 615.89 ha of potential dispersal habitat will be directly impacted via vegetation clearing for the Project. Habitat that will be cleared as a result of the Project is already of reduced quality as it occurs adjacent to a previously cleared linear area, is used for cattle grazing and contains cane toads. Given the likely vast areas of potential habitat of equal or greater quality in the wider area, this loss of habitat is unlikely to affect the persistence of the species. With the implementation of the Project's EMP which includes weed and pest management, potential indirect impacts on the species are anticipated to be very low. Therefore, the Project will not reduce the area of occupancy of an important population.
Fragment an existing important population into two or more populations.	**No.** As detailed above any individuals utilising the Project Area are not considered to comprise an important population. The ghost bat is highly mobile and not known to be susceptible to collision with powerlines. Fragmentation impacts will be low as the potential habitat to be impacted occurs directly adjacent to a historically cleared linear area (largely the same shape as the Project Area), and is unlikely to be used by a large number of individuals or on a regular basis due to the lack of other habitat resources. In the context of the wider landscape, the shape and magnitude of this impact is considered unlikely to create barriers to movement. Therefore, it is considered unlikely the Project will fragment an existing important population into two or more populations.
Adversely affect habitat critical to the survival of a species.	**No.**

EPBC Act Criteria – is there a real possibility that the Proposed Action will:	Assessment of Significance
	All potential habitat is suitable for dispersal only and therefore not considered habitat critical to the survival of the species. The shape and scale of clearing is unlikely to reduce the ecological function of the habitat for the ghost bat as dispersal is known to occur in woodlands with canopy and shrub layer cover that will resemble the Project Area post clearing. Furthermore, there is likely to be a high availability of potential habitat in the wider local area including areas of greater quality. Therefore, the Project is unlikely to adversely affect habitat critical to the survival of the ghost bat.
Disrupt the breeding cycle of an important population.	**No.** Mapped 'abandoned mines' located within or adjacent to the Study Area were investigated in the December 2021 field survey and found to be unsuitable for the roosting. No evidence of the species was recorded during the field program and it is therefore considered highly unlikely that roosting individuals or a maternity roost occur in the local area. Due to the lack of potential roosting and foraging habitat, any individuals within the Study Area are not considered to comprise an important population. The Project will not result in any direct or indirect impacts on potential roosting habitat and therefore it is considered highly unlikely it will disrupt the breeding cycle of an important population.
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.	**No.** The species is expected to occur within the local area in low densities only and while dispersing due to the lack of roosting and foraging habitat and records. The Project will result in direct impacts to 615.89 ha of potential dispersal habitat. Fragmentation impacts will be low as the potential habitat to be impacted occurs directly adjacent to a historically cleared linear area (largely the same shape as the Project Area). In the context of the wider landscape, the shape and magnitude of this impact is considered unlikely to affect habitat availability and will not isolate any areas of potential habitat. Therefore, it is considered unlike the Project will modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat.	**No.** Ingestion of cane toads and competition for prey with feral predators have been identified as threats to the ghost bat. Feral cat, pig and cane toads are already known to occur within the local area. Given the co-location of the Project Area with a historically cleared linear area that may already provide a conduit for pest movement, it is unlikely that Project activities will result in the further proliferation of this species. Erosion may lead to increased areas of inundation which may provide habitat for the cane toad. The risk of increased pest species incursion will be managed through the implementation of the Project EMP.
Introduce disease that may cause the species to decline.	**No.** The threat of disease to ghost bat populations is not well known. However, a possible herpes-type virus has been identified as a potential threat to the Mount Etna population specifically. The Study Area is not located near Mount Etna and the Project does not involve any processes that are likely to introduce a disease that may result in the decline of the ghost bat. Biosecurity measures are included in the Project EMP and will ensure the potential for disease spread is controlled.

EPBC Act Criteria – is there a real possibility that the Proposed Action will:	Assessment of Significance
Interfere with the recovery of the species.	**No.** The recovery of ghost bat populations is focused on protecting known roost and breeding locations. However, the ghost bat is not known to the local area and there are no known ghost bat records nearby. Following the targeted field survey in December 2021, it was confirmed that no potential roost sites occur within the Study Area or adjacent areas. Based on this, it is considered unlikely the Project will interfere with the recovery of the species.

Yakka skink (*Egernia rugosa*)

Description and status under the EPBC Act

The yakka skink is listed as Vulnerable under the EPBC Act.

The yakka skink is a robust, long-lived skink approximately 40 cm long (head to tail tip). It's body colour ranges from pale to dark brown, usually with a broad dark brown stripe extending along the back from the neck to the tail.

Distribution

The yakka skink has a broad distribution which 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. The Mulga Lands and Brigalow Belt South Bioregions are reported to comprise the core habitat of this species (Department of Agriculture Water and the Environment, 2022), however populations throughout the Brigalow Belt are highly fragmented.

Habitat requirements

This species is known to occur in a diversity of habitats including in rocky outcrops, sand plain areas and dense ground vegetation, in association with open dry sclerophyll forest or woodland (i.e. poplar box / ironbark), brigalow forest and open shrubland. It occurs in a range of RE types on land zones 3, 4, 5, 7, 9 and 10 and occasionally on basalt plains and hills (land zone 8) although this is not representative of core habitat (Department of Agriculture Water and the Environment, 2022).

The yakka skink typically occupy self-excavated burrows and cavities under microhabitat such as large fallen timber, rock crevices, tree stumps and grass tussocks (Department of Agriculture Water and the Environment, 2022). They are also known to modify tunnel erosion, root cavities and disused rabbit warrens (Ferguson & Mathieson, 2014). The species exhibits complex sociality and within these burrows, they live in colonies or aggregations of up to 21 individuals ranging in size and age (Peck et al., 2016). Peck *et al.* (2016) suggest that these social aggregations are more likely to form in habitat with the optimum ecological requirements. This is supported by their study which found that sites in high value habitat appeared to be clumped, with multiple sites occurring in a localised area (minimum distance between sites of only 24 m).

All *Egernia* species are considered to be posturing heliotherms, meaning they modify their postural orientation to adjust to the rate of heat gain and seek shade to reduce body temperatures. Their burrows act to reduce temperature oscillations, reduce water loss and provide a stable environment (Chapple, 2003). Yakka skinks in these colonies defecate in communal latrine sites outside burrow entrances, potentially at the favoured morning basking site (Bull et al., 1999). These scat piles are conspicuous and provide a means to identify the presence of the species which is secretive and cautious and therefore often difficult to detect.

The species is crepuscular, usually leaving the burrow in the early morning and then from dusk through to early evening. They are omnivorous and consume a variety of soft plant material, including fruits as well as invertebrates. Basking and foraging is typically within close proximity to the burrow entrance, such that refuge can be easily sought at the first sign of disturbance (Threatened Species Scientific Committee, 2008a).

The yakka skink exhibits strong site fidelity with one study recording adult individuals using the same site for at least 73 months and juveniles for up to 38 months (Peck et al., 2016). This study also recorded dispersal in adults and sub-adults, where individuals moved between colonies. Five individuals from a cohort of 35, moved site locations over a 5-year study period, with a mean dispersal distance of 261 m. Some of the study sites were occupied by one individual lizard and these may represent sites where only one individual has dispersed from an aggregation and a new aggregation has not yet formed.

Threats

The primary threat to the species is habitat reduction and degradation, which is prevalent within their core range primarily associated with agricultural and urban development. Other threats to the yakka skink include inappropriate roadside management, including road widening and removal of wood debris and rock microhabitat features. Predation by feral animals such as red fox (*Vulpes vulpes*) and feral cat

(*Felis catus*) as well as ripping of rabbit warrens are also known impacts the species. The species is also susceptible to potential population crashes or local extinction due to their longevity, high site-fidelity, low fecundity and given that populations are highly fragmented.

Survey effort, timing and coverage

A total of 42 days of field surveying were conducted between 2017 and 2021 across the Study Area and adjacent areas of representative habitat. As recommended in the *Draft Referral Guidelines For Nationally Listed Brigalow Belt Reptiles* (Department of Sustainability Environment Water Population and Communities, 2011a), the field survey program included one-off diurnal searches, transects, spotlighting and camera traps.

Active searches were completed in conjunction with targeted habitat assessments during all field surveys across a range of suitable habitat types. In August and December 2021, a significantly more targeted survey was undertaken to refine habitat and search for colonies. All potential yakka skink habitat was re-surveyed which included habitat assessments, active searches, microhabitat transects and camera traps. Elliott and cage traps were not employed as no colony sites or latrines were identified. Spotlighting was also conducted in December 2021 and targeted to riparian habitats as recommended. However many of these areas were found to be unsuitable for the species due to the sandy substrate. Survey effort undertaken in November 2017 and December 2021 fall within the recommended seasonal timeframes.

Given the linear nature of the Project Area, the number of recommended survey methods employed and lack of colony sites identified, survey effort is considered sufficient.

Occurrence and potential habitat

This species was not detected during the field surveys, including in August and December 2021 when transects and microhabitat searches were conducted in areas of potential habitat. Furthermore, field surveys completed within the local area for other environmental impact assessments (see Section 4.2) did not detect the species either. No desktop records of the species occur within 50 km. However, the yakka skink is known from the Einasleigh uplands and records of this species across its entire range are generally rare. The Study Area covers both 'potential' and 'likely' mapped habitat areas as identified in the *Draft Referral guidelines for the nationally listed Brigalow Belt reptiles* (Department of Sustainability Environment Water Population and Communities, 2011a).

A total of 380.84 ha of potential habitat was identified within the Study Area including 301.93 ha of potential breeding and foraging habitat and 78.91 ha of marginal breeding and foraging habitat (Table 39, Figure 27.1 to 27.6). Areas of habitat that are considered marginal contain low levels of the microhabitat features required by the species. Due to the species' low dispersal ability, no dispersal habitat is identified.

Table 39 Yakka skink habitat within the Study Area

Habitat type	RE	Condition	Utilisation	Habitat definition	Study Area total (ha)
1. Open woodland of Eucalyptus or Melaleuca on alluvium or sand plains & 4. Low woodland to forest of *Acacia shirleyi* and *Eucalyptus persistens* on laterite.	9.3.16, 9.3.20, 9.3.22a, 9.3.24, 9.3.3a, 9.3.5, 9.3.6a, 9.7.1, 9.5.3, 9.5.11	Remnant	Breeding and foraging	Open dry sclerophyll forest or woodland on floodplains (not fringing riparian communities), old alluvial and laterite substrates with common microhabitat / burrow opportunities i.e. large fallen logs.	301.93
1. Open woodland of Eucalyptus or	9.3.6a, 9.3.22a & 9.7.2	Remnant	Breeding and foraging (marginal)	Open dry sclerophyll forest or woodland on floodplains (not fringing riparian	78.91

Habitat type	RE	Condition	Utilisation	Habitat definition	Study Area total (ha)
Melaleuca on alluvium or sand plains & 4. Low woodland to forest of *Acacia shirleyi* and *Eucalyptus persistens* on laterite.				communities), old alluvial and laterite substrates field validated to contain low levels of microhabitat / burrow opportunities i.e. large fallen logs.	

Important population

As per the *Draft referral guidelines for the nationally listed Brigalow Belt reptiles* (Department of Sustainability Environment Water Population and Communities, 2011a), the occurrence of known 'important habitat' is a surrogate for an 'important population' of this species.

'Suitable habitat' for the species has been defined in the *Draft Referral Guidelines for the Nationally Listed Brigalow Belt Reptiles* (Department of Sustainability Environment Water Population and Communities, 2011a) as:

'Open-forests to low-woodlands and scrub in QLD RE Land Zones (LZ) 3, 4, 5, 7, 8, 9, 10 and 12 (LZ 8 not considered core habitat; LZ 12 in Wet Tropics bioregion only). 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'

Known 'important habitat' for the yakka skink is defined as:

- Any contiguous patch of suitable habitat, particularly remnant vegetation, where a colony is known or identified
- Any microhabitat where colonies are likely to be found.

Suitable habitat for the yakka skink can also be considered as 'important' if it is:

- Habitat where the species has been identified during a survey
- Near the limit of the species' known range
- Large patches of contiguous, suitable habitat and viable landscape corridors (necessary for the purposes of breeding, dispersal or maintaining the genetic diversity of the species over successive generations), **OR**
- A habitat type where the species is identified during a survey, but which was previously thought not to support the species.

The species is conservatively considered a potential occurrence within the Study Area. No evidence of the species has been recorded during the field survey program, including in August and December 2021 when a targeted survey was completed which included survey methodologies as recommended by the referral guideline. The Study Area does not occur near the limit of the species known range. Habitat quality is reduced due to feral pest populations, historical clearing and ongoing cattle grazing activities and is therefore unlikely to be necessary for maintaining genetic diversity. Based on this, potential habitat within the Study Area is not considered important for the species.

Habitat critical to the survival of the species

There is no species-specific guidelines for determining habitat critical to the survival of the yakka skink, and at present no recovery plan exists. As important habitat has been defined in the *Draft Referral Guidelines for the Nationally Listed Brigalow Belt Reptiles* (Department of Sustainability Environment Water Population and Communities, 2011a) as stated above, this terminology is considered to be interchangeable with 'habitat critical to the survival of the species' in regards to this species. As such, potential habitat within the Study Area is not 'habitat critical to the survival of the species'.

Potential Project impacts

A total of 52.94 ha of suitable habitat including 40.46 ha of potential breeding and foraging habitat and 12.48 ha of marginal breeding and foraging habitat may be cleared as part of the Project. Other Project related potential indirect impacts relevant to the yakka skink includes:

- pest incursion
- fauna mortality via entrapment in excavations/trenches
- erosion and sedimentation
- light disturbance.

Project avoidance, mitigation and management measures

In addition to the general mitigation and management measures outlined in Section 8.3.1, the following species-specific mitigation measures will be implemented:

- Large hollow logs that must be removed from areas of potential yakka skink habitat should be retained and relocated to adjacent or nearby areas of suitable yakka skink habitat.
- Survey works conducted prior to clearing will include colony searches in areas of potential yakka skink habitat.

Significance assessment

An assessment of the significance of impacts to this species under the Significant Impact Guidelines Policy Statement 1.1 (Department of the Environment, 2013) is provided is provided in Table 40. The outcome of this assessment is that the Project is **unlikely to result in a significant impact** on the species.

Table 40 Significant impact assessment – yakka skink

EPBC Act Criteria – is there a real possibility that the Proposed Action will:	Assessment of Significance
Lead to a long-term decrease in the size of an important population of a species.	**No.** This species has conservatively been considered a potential occurrence within the Study Area due to the presence of suitable habitat. No evidence of the species was recorded during the field program, including in August and December 2021 when significant effort was spent in attempting to locate any potentially present colonies. The Study Area contains a total of 380.84 ha of potential habitat including 78.91 ha that is considered only marginally suitable. All potential habitat is degraded to some degree due to ongoing cattle grazing activities and the high levels of pest species such as feral cats and potentially foxes. As habitat is degraded, and no colony sites have been identified or are considered likely to occur, potential habitat present within the Study Area does not meet the criteria to be considered 'important' as defined in the referral guidelines. Habitat of equal or greater quality is likely to be abundant in the wider local area. Direct impacts via vegetation clearing for the Project will occur to a maximum of 52.94 ha of potential habitat. As large contiguous patches of potential habitat will remain within the Study Area and surrounds, this loss of habitat is considered low and unlikely to affect the persistence of the species in the area. Furthermore, direct impacts are occurring to potential habitat that is unlikely to be the highest quality in the local area as the Project Area has been co-located with an existing disturbed and linear area. Survey works prior to construction will aim to identify any potentially occurring colonies and microsite infrastructure if necessary to ensure no direct impacts occur within 200 m. Suitable microhabitat/ shelter features such as large fallen logs will be relocated to areas of adjacent potential habitat. Potential indirect impacts will

EPBC Act Criteria – is there a real possibility that the Proposed Action will:	Assessment of Significance
	be minor and temporary, but actively managed via the Project's EMP. For these reasons, the Project is considered unlikely to lead to a long-term decrease in the size of an important population of a species.
Reduce the area of occupancy of an important population.	**No.** The yakka skink has a broad distribution across seven bioregions in Queensland. The area of occupancy, or extent of occurrence have not been defined for the species, however it is known to occur in a broad variety of vegetation types which are likely to be widely available in the area surrounding the Study Area and within the broader region. As stated above, potential habitat within the Study Area does not meet the criteria to be considered 'important' as defined in the referral guidelines and therefore does not support an important population. A total of 52.94 ha of potential habitat including 12.48 ha that is considered marginal, will be directly impacted via vegetation clearing for the Project. The Project will be constructed in phases and as such only a portion of the potential habitat may be impacted at one time. Indirect impacts will be minor and temporary (i.e. noise and light spill during construction) and actively managed via the Project's EMP. The critical process for maintaining any local population long-term is to ensure that dispersal opportunities are maintained between aggregations and for individuals creating new aggregations. Some barriers to movement may be created during construction where excavation occurs, however with the implementation of species-specific mitigation measures impacts should be temporary and not lead to the loss of any individuals. Microhabitat features suitable for the sheltering of the species will be retained and relocated where possible. High quality habitat areas within the Study Area and directly adjacent will retain their ecological functionality and the carrying capacity of the habitat should not be significantly impacted. Based on this, it is unlikely that the Project will reduce the area of occupancy of an important population.
Fragment an existing important population into two or more populations.	**No.** The yakka skink exhibits strong site fidelity, however movements between colonies/aggregations are known to occur. One study (Peck et al., 2016) has shown that these dispersal distances averaged 261 m and once an individual moved, it typically stayed at the new colony for an extended period (years). These occasional movements were necessary to prevent inbreeding within a colony. No colonies have been identified within the Study Area during field surveys. Survey works prior to construction will also include colony searches in areas of potential habitat. As detailed above, due to the absence of important habitat within the Study Area an important population is not considered present. It is unlikely that the Project will reduce the ability for any dispersing individuals to move between sites as once installed, the majority of Project infrastructure will occur overhead. Furthermore, the Project Area has been co-located with a linear cleared and disturbed area. As such any individuals present within the Study Area are persisting despite existing fragmentation impacts. The construction of the Project will occur in phases ensuring only a portion of the Study Area and or potential habitat is disturbed at one time. Where excavation is required, these areas will be monitored by a spotter catcher to ensure no yakka skink individuals are entrapped. Additionally, suitable shelter features such as large fallen logs will be relocated to adjacent

EPBC Act Criteria – is there a real possibility that the Proposed Action will:	Assessment of Significance
	areas of suitable habitat. As such, an important population is unlikely to be fragmented into two or more populations as a result of the Project.
Adversely affect habitat critical to the survival of a species.	**No.** There is no Recovery Plan for this species and as such habitat critical to the survival of the yakka skink has not been defined. 'Important habitat' however, is defined for the species as per the brigalow belt reptiles referral guidelines and is considered a surrogate concept. As detailed above, the field survey program included targeted methods in 2021 and did not detect any evidence of the species or a colony. All potential habitat is degraded to some degree due to ongoing cattle grazing activities and the high levels of pest species such as feral cats and potentially foxes. As habitat is degraded, and no colony sites have been identified or are considered likely to occur, potential habitat present within the Study Area does not meet the criteria to be considered 'important'. Habitat of equal or greater quality is likely to be abundant in the wider local area, and fragmentation impacts as a result of the Project are considered low. Indirect impacts will be temporary and minor, and actively managed via the Project's EMP. Therefore, the Project is unlikely to adversely affect habitat critical to the survival of a species.
Disrupt the breeding cycle of an important population.	**No.** No specific breeding habitat or breeding season is known for the yakka skink. However, as this species' births live young and they live in colonies in burrows, it is expected that these burrow systems are used as breeding places. Aggregations of yakka skink living in burrows comprise long-term family units (Peck et al., 2016) and inbreeding is avoided by the arrival of dispersing non-related lizards which establish themselves in an aggregation. The Project is not expected to fragment any existing population and as such the movements of dispersing lizards required to maintain breeding potential should not be impacted. No colonies or active burrows were recorded during the field survey program and following the additional work completed in 2021, survey effort is considered sufficient. A total of 52.94 ha of potential habitat will be directly impacted via vegetation clearing for the Project. Due to the lack of important habitat, an important population is not considered to occur within the Study Area. Based on the likely absence of colonies within the Study Area and the scale of this impact in the context of the habitat that will remain in the wider area, it is highly unlikely the Project may disrupt the breeding cycle of an important population.
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.	**No.** The Project Area has been predominantly co-located with a linear area that has been historically disturbed and presently contains electrical infrastructure. As such, habitat to be directly impacted is likely to be of reduced quality in comparison to habitat that occurs in the wider local area. Suitable habitat is expected to be common in the wider local area. The Project will not create a barrier to movement and habitat fragmentation impacts will be low. Microhabitat features will be retained and relocated to suitable recipient areas. Indirect impacts are also considered to be minimal. Edge effects are not expected to be amplified significantly and light spill and increased noise are expected to be temporary and localised. It is therefore considered unlikely that the Project will modify, destroy, remove, isolate or decrease the availability of habitat to the extent that the species is likely to decline.

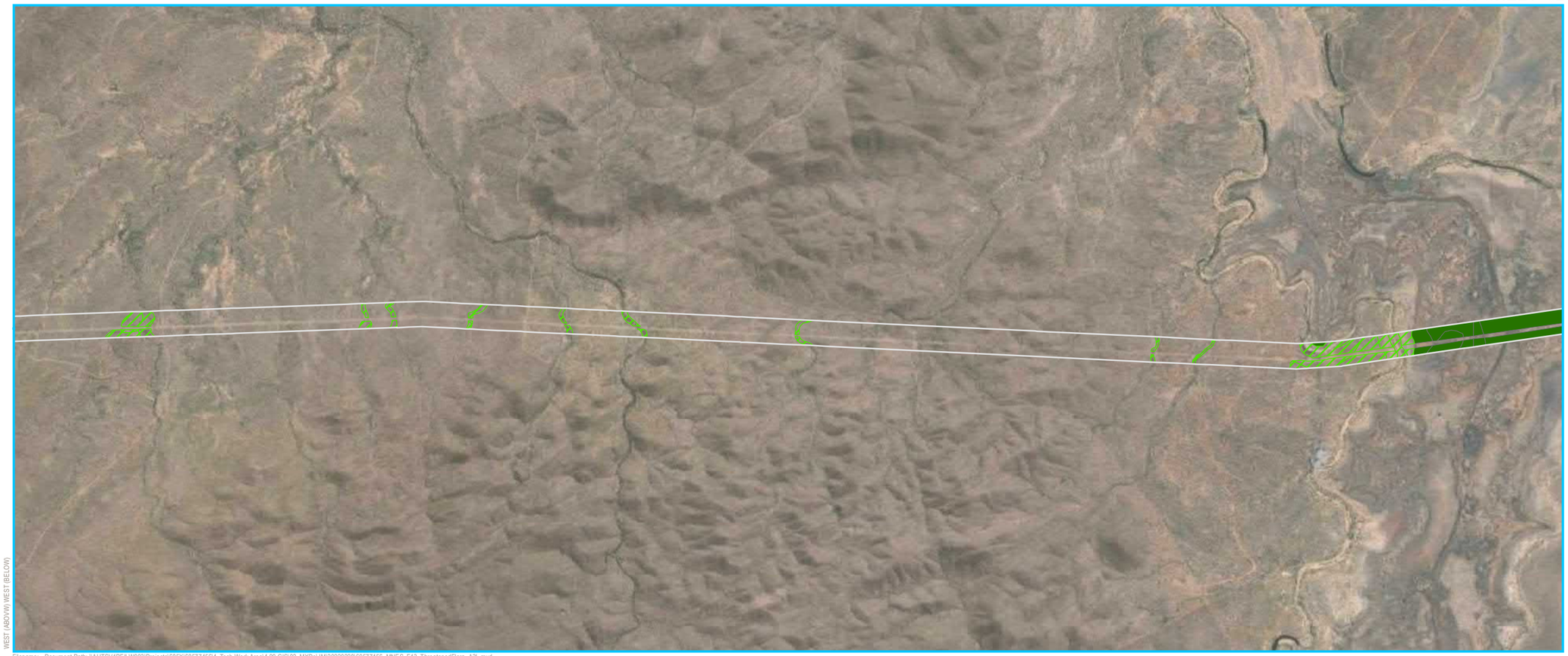
EPBC Act Criteria – is there a real possibility that the Proposed Action will:	Assessment of Significance
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat.	**No.** Predation by red fox and feral cat have been identified as a threat to the yakka skink in the SPRAT profile (Department of the Environment, 2020). These species are common within the region and are likely to utilise the existing cleared area directly adjacent to the Project Area and adjacent habitats. Activities related to the Project are not expected to exacerbate populations of these species. The implementation of weed and pest management measures will help control and prevent the establishment of invasive species.
Introduce disease that may cause the species to decline.	**No.** Disease has not been listed as a threat to this species under the *Approved Conservation Advice for Egernia rugosa (Yakka Skink)*, (n.d.). However, biosecurity measures included in the Project EMP will ensure best practice site hygiene measures.
Interfere with the recovery of the species.	**No.** The Conservation Advice specifically references the need for protection of habitat areas where the yakka skink occurs, to not adversely affect known populations. Significant survey effort has been spent across the field survey program and especially in 2021 to detect the species and no evidence of presence has been recorded. The species is also not known to the wider local area and desktop records do not occur within 50 km. Based on this, it is unlikely the Project may interfere with the recovery of the species.

Appendix F

MNES Habitat Figures

ABOVE SHEET- 01

BELOW SHEET- 02



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

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Meters

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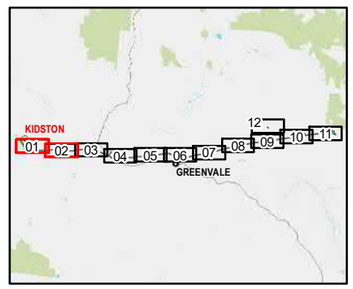
Legend

- Study Area
- Potential habitat for *Tephrosia leveillei*
- Potential habitat for blue grass *(Dichanthium setosum)*



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ABOVE SHEET- 03

BELOW SHEET- 04

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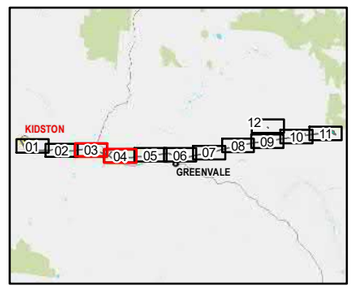

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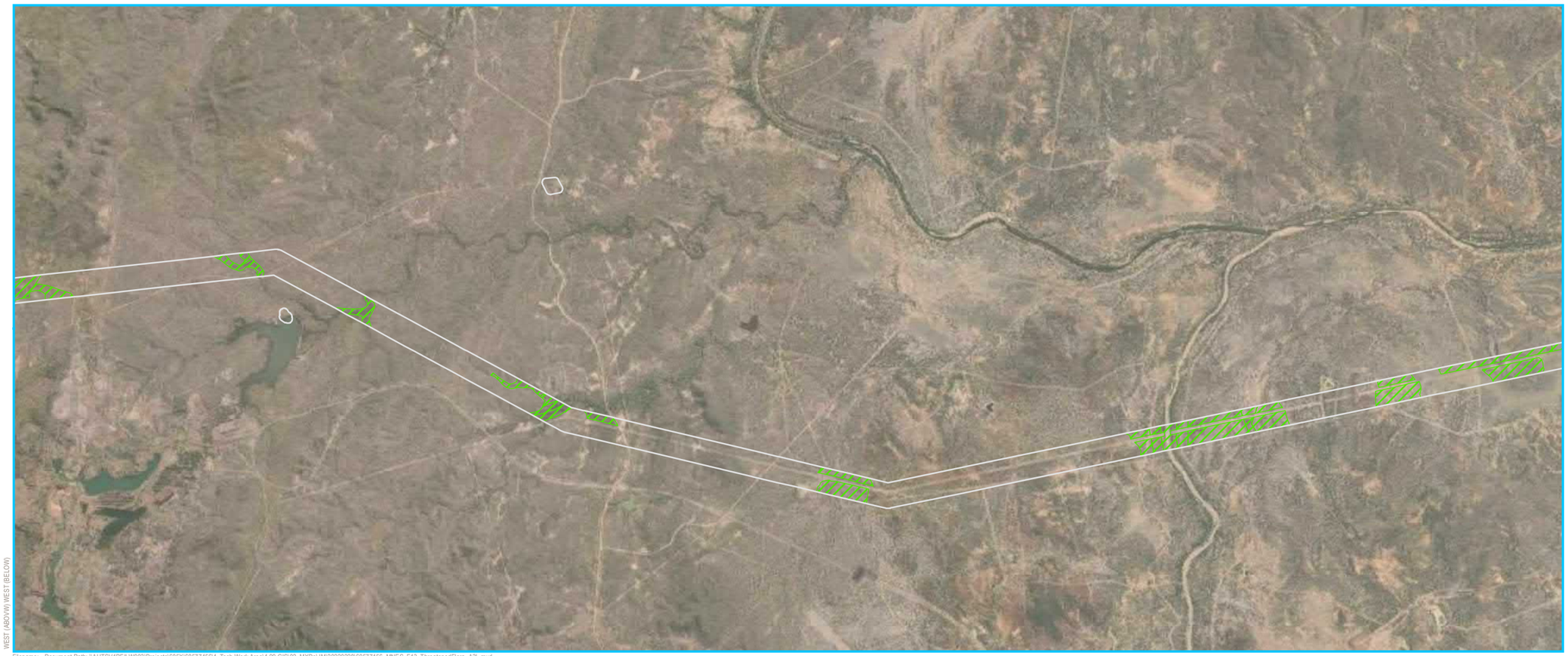
ABOVE SHEET- 05

BELOW SHEET- 06



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Projection: Transverse Mercator

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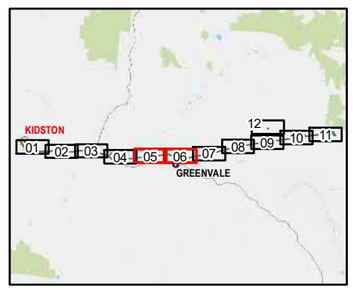

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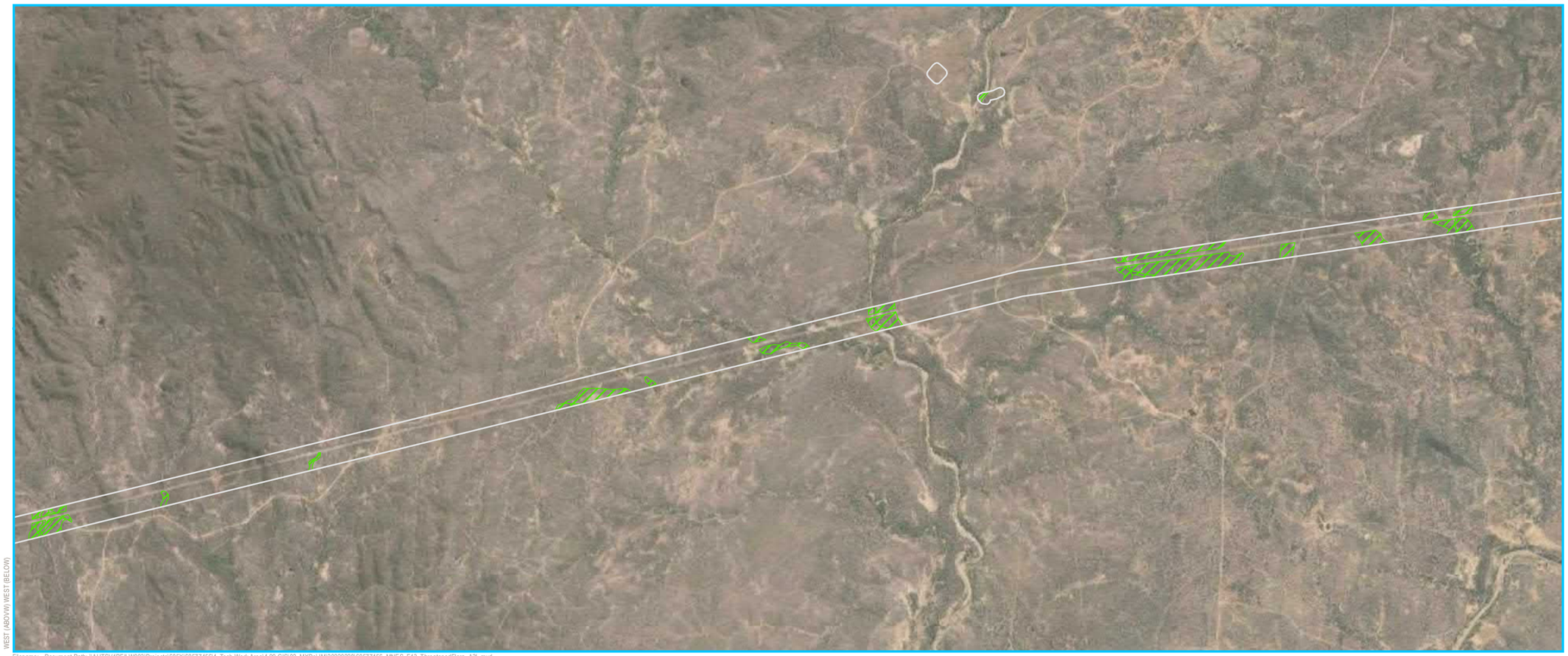
ABOVE SHEET- 07

BELOW SHEET- 08



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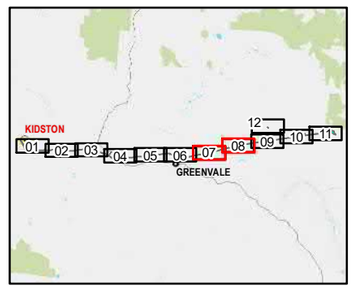

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ABOVE SHEET- 09

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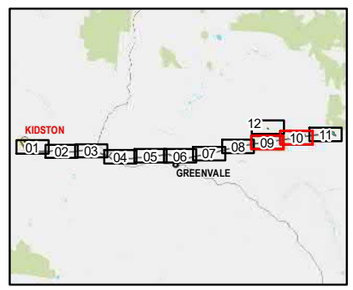

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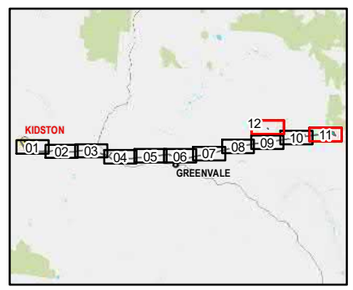

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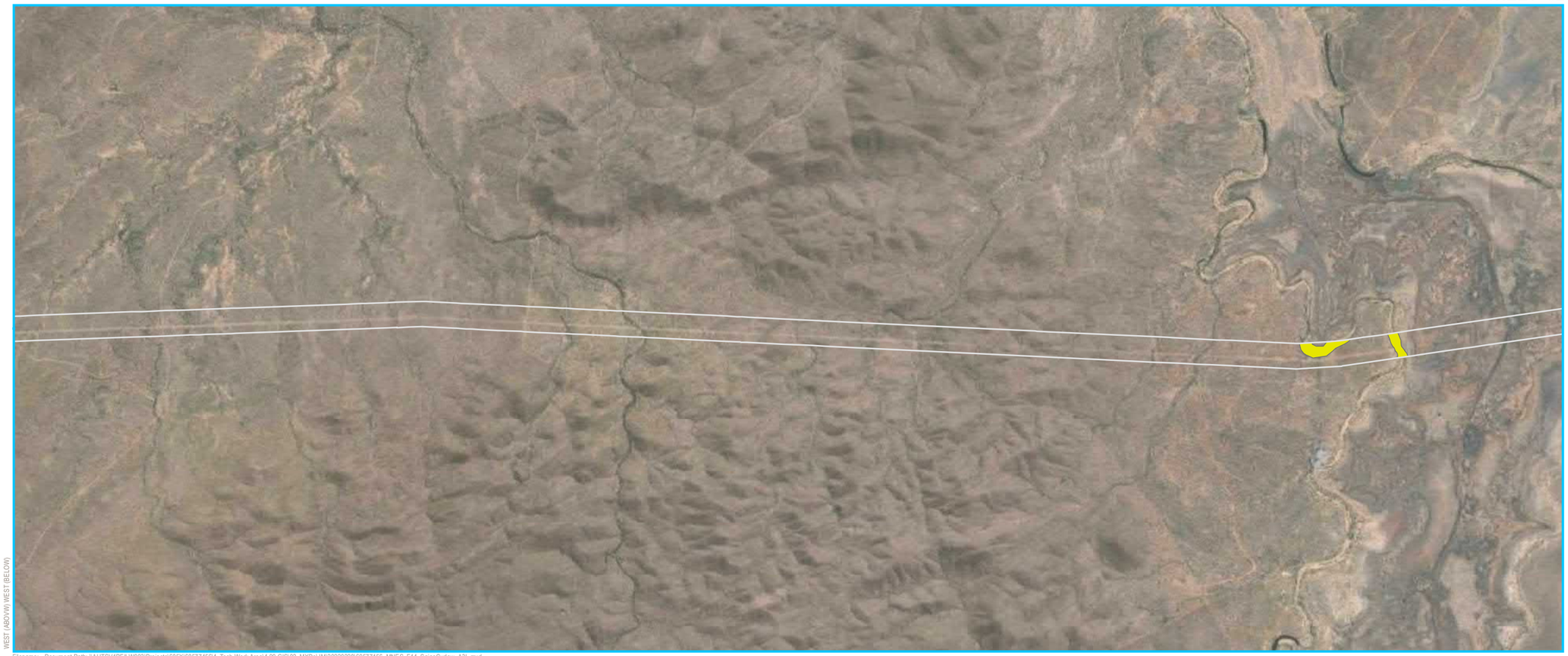

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- Study Area
- Foraging and dispersal (marginal)

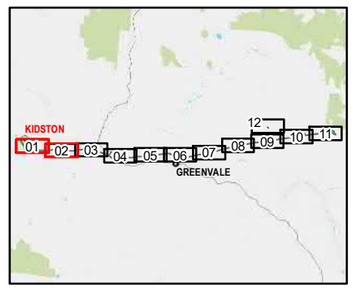

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Figure F14.1

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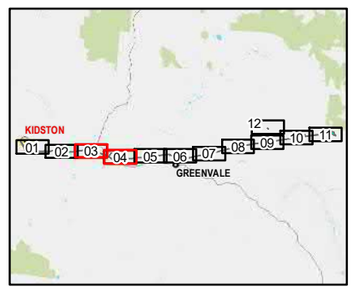

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ABOVE SHEET- 05

BELOW SHEET- 06

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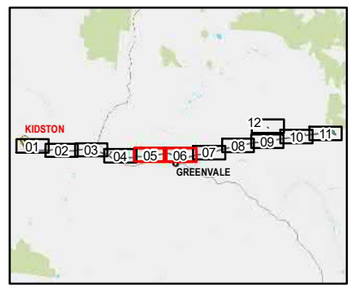

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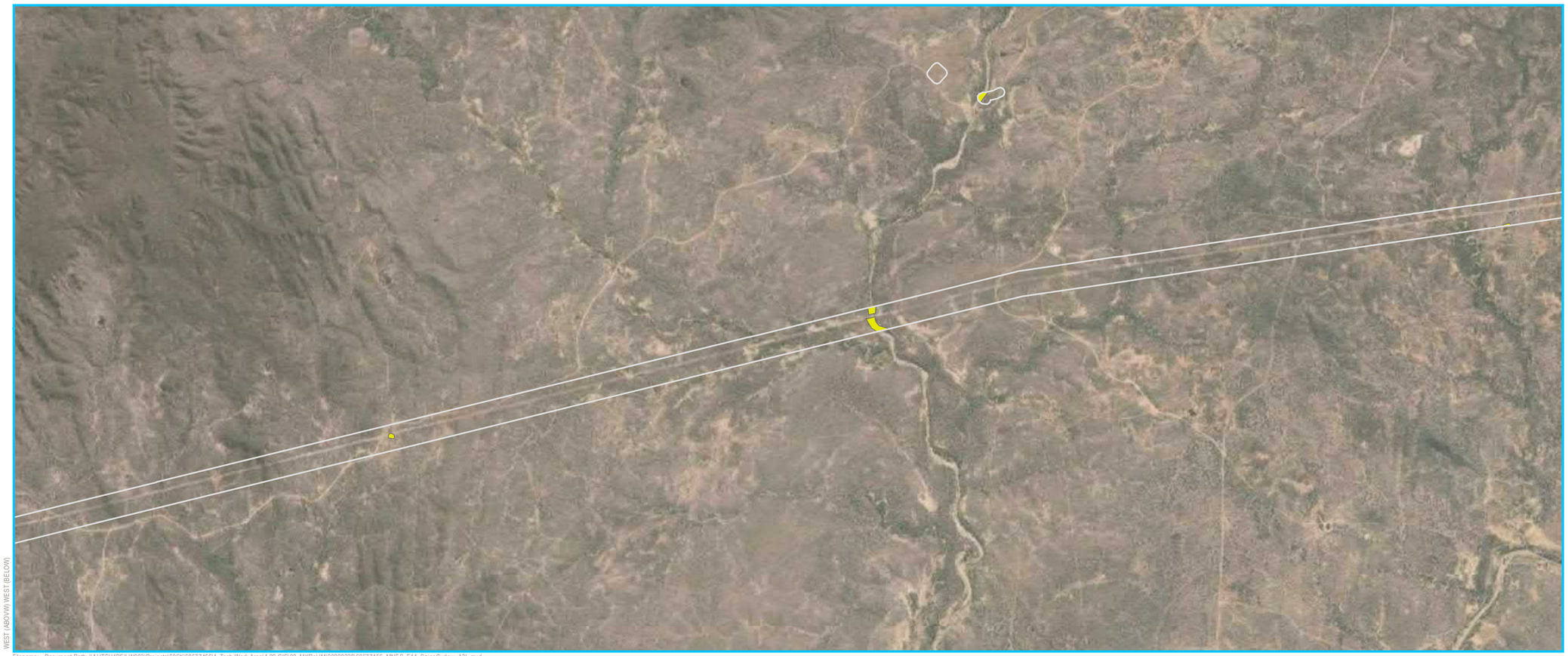

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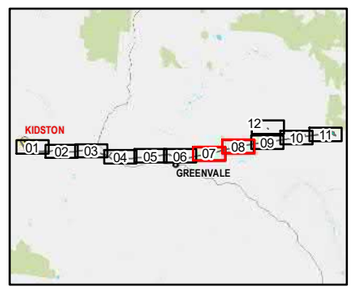

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A3 size

WEST (ABOVE) WEST (BELOW)

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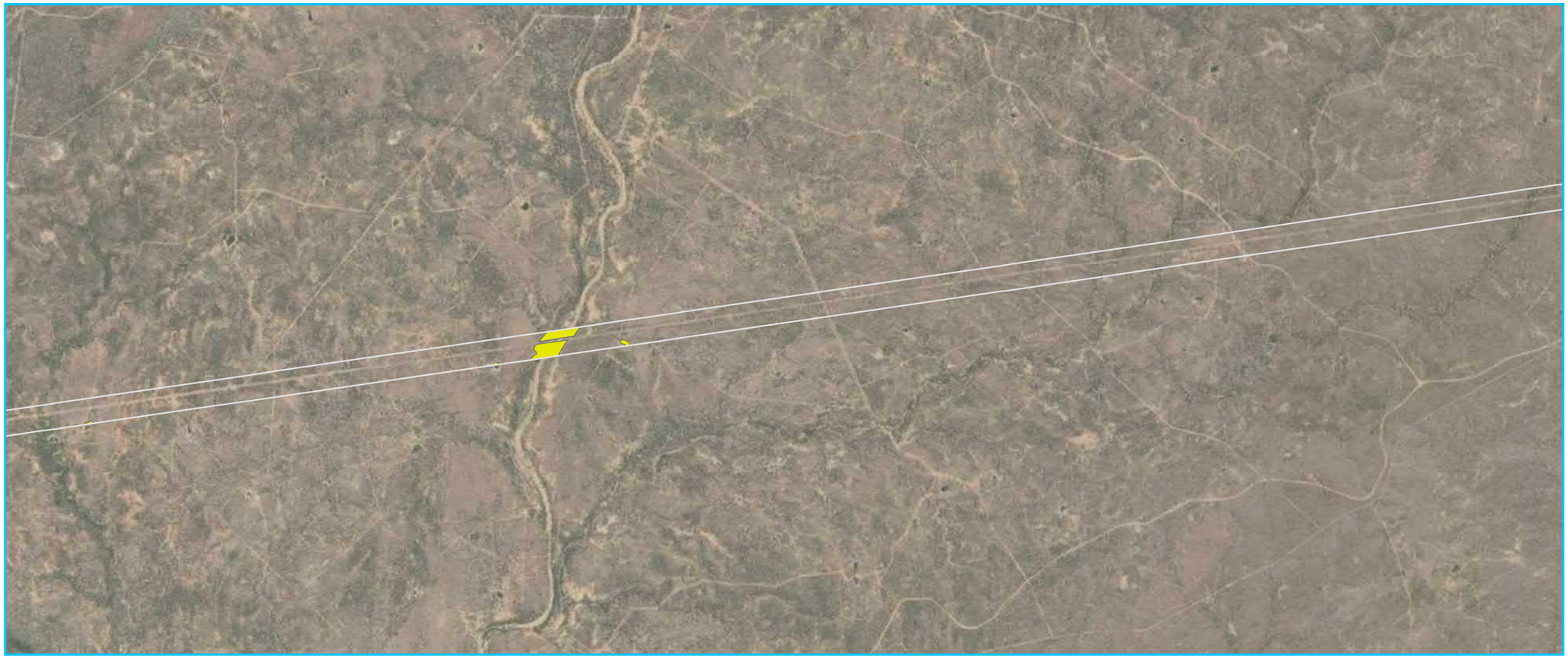
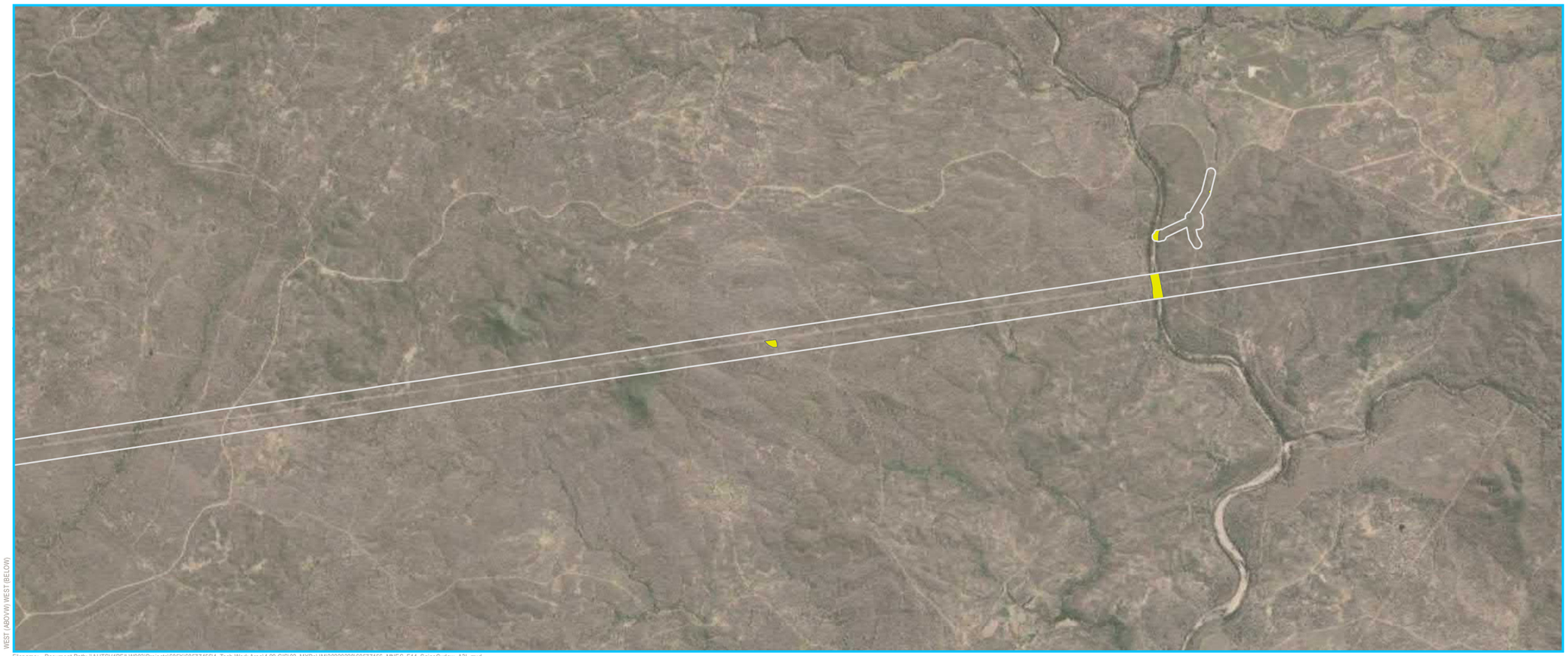


ABOVE SHEET- 09

BELOW SHEET- 10



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AECOM
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N

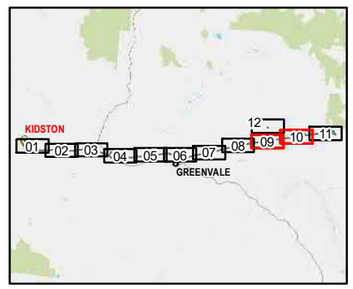
Coordinate System: GDA 1994 MGA Zone 55
Projection: Transverse Mercator

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

1:55,000 (when printed at A3)

Legend

- Study Area
- Foraging and dispersal (marginal)



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AUSTRALIAN PAINTED SNIPE & CURLEW SANDPIPER POTENTIAL HABITAT

PROJECT ID: 60577456
CREATED BY: JR
LAST MODIFIED: JB - 15/03/2022
VERSION: 1

Figure F14.5

A3 size

ABOVE SHEET- 11

BELOW SHEET- 12

WEST (ABOVE) WEST (BELOW)

Filename: Document Path: \\AUTSV1PFILW003\Projects\605X\605774564\4. Tech Work Area\4.99 GIS\02_MXDs\JM\20220228\60577456_MNES_F14_SnipeCurlew_A3L.mxd

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N

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

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Meters

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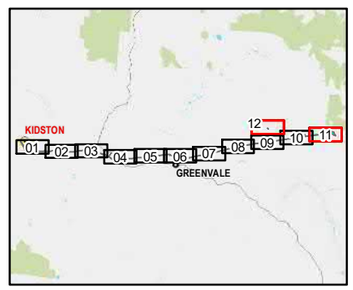
Legend

- Study Area
- Foraging and dispersal (marginal)



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AUSTRALIAN PAINTED SNIPE & CURLEW SANDPIPER POTENTIAL HABITAT

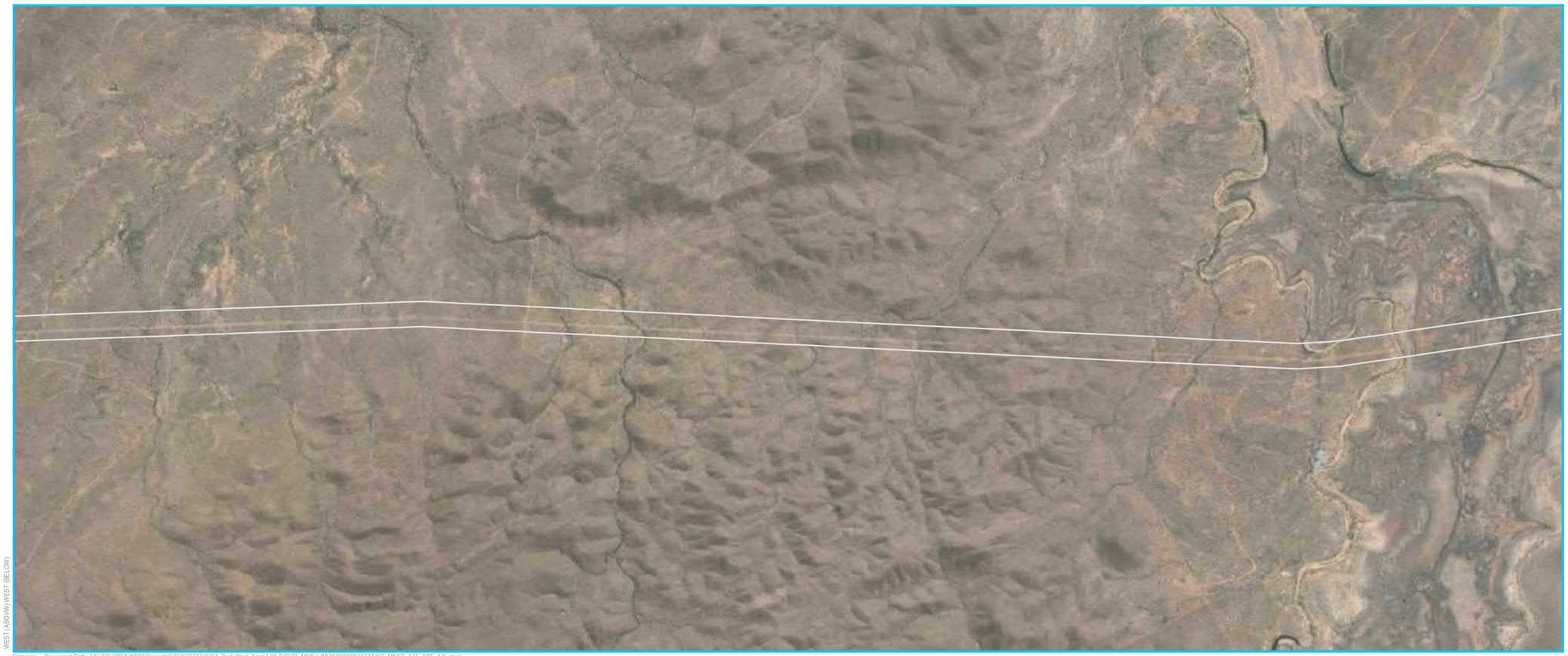
PROJECT ID: 60577456
CREATED BY: JR
LAST MODIFIED: JB - 15/03/2022
VERSION: 1

Figure F14.6

A3 size

ABOVE SHEET- 01

BELOW SHEET- 02



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

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

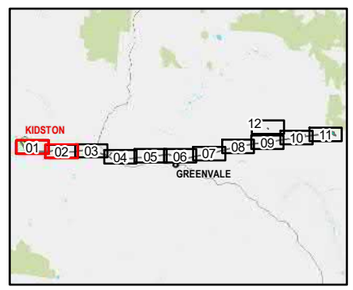
1:55,000 (when printed at A3)

Legend

Study Area

Black-throated finch (southern) potential habitat

- Potential breeding habitat
- Potential foraging habitat
- Potential dispersal habitat



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BLACK-THROATED FINCH (SOUTHERN) POTENTIAL HABITAT

PROJECT ID: 60577456
CREATED BY: JR
LAST MODIFIED: JB - 16/03/2022
VERSION: 1

Figure F15.1

A3 size

ABOVE SHEET- 03

BELOW SHEET- 04

WEST (ABOVE) WEST (BELOW)

Filename: Document Path: \\AUTSV1PFILW003\Projects\605X\60577456\4. Tech Work Area\4.99 GIS\02_MXDs\JM\20220228\60577456_MNES_F15_BTF_A3L.mxd

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

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Meters

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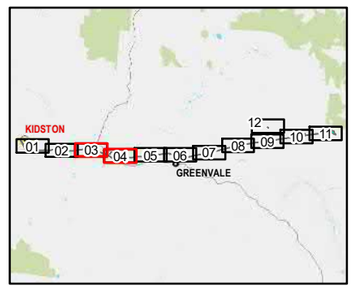
Legend

Study Area

Black-throated finch (southern) potential habitat

- Potential breeding habitat
- Potential foraging habitat
- Potential dispersal habitat



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BLACK-THROATED FINCH (SOUTHERN) POTENTIAL HABITAT

PROJECT ID:	60577456
CREATED BY:	JR
LAST MODIFIED:	JB - 16/03/2022
VERSION:	1

Figure
F15.2

A3 size

ABOVE SHEET- 05

BELOW SHEET- 06

WEST (ABOVE) WEST (BELOW)

Filename: Document Path: \\AUTSV1PFILW003\Projects\605X\60577456\4. Tech Work Area\4.99 GIS\02_MXDs\JM\20220228\60577456_MNES_F15_BTF_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

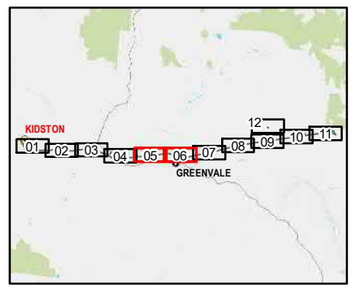
1:55,000 (when printed at A3)

Legend

Study Area

Black-throated finch (southern) potential habitat

- Potential breeding habitat
- Potential foraging habitat
- Potential dispersal habitat



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BLACK-THROATED FINCH (SOUTHERN) POTENTIAL HABITAT

PROJECT ID: 60577456
CREATED BY: JR
LAST MODIFIED: JB - 16/03/2022
VERSION: 1

Figure F15.3

A3 size

ABOVE SHEET- 07

BELOW SHEET- 08

WEST (ABOVE) WEST (BELOW)

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

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

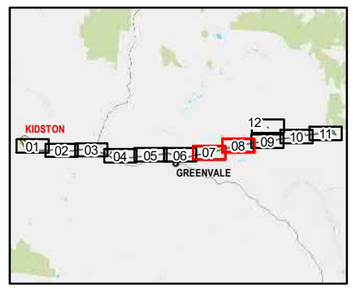
1:55,000 (when printed at A3)

Legend

Study Area

Black-throated finch (southern) potential habitat

- Potential breeding habitat
- Potential foraging habitat
- Potential dispersal habitat



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BLACK-THROATED FINCH (SOUTHERN) POTENTIAL HABITAT

PROJECT ID: 60577456
CREATED BY: JR
LAST MODIFIED: JB - 16/03/2022
VERSION: 1

Figure
F15.4

A3 size

ABOVE SHEET- 09

BELOW SHEET- 10

WEST (ABOVE) WEST (BELOW)

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

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

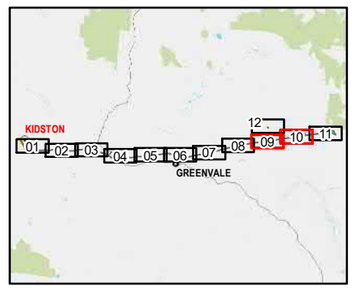
1:55,000 (when printed at A3)

Legend

Study Area

Black-throated finch (southern) potential habitat

Potential breeding habitat
Potential foraging habitat
Potential dispersal habitat



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BLACK-THROATED FINCH (SOUTHERN) POTENTIAL HABITAT

PROJECT ID: 60577456
CREATED BY: JR
LAST MODIFIED: JB - 16/03/2022
VERSION: 1

Figure F15.5

A3 size

ABOVE SHEET- 11

BELOW SHEET- 12

WEST (ABOVE) | WEST (BELOW)

Filename: Document Path: \\AUTSV1PFILW003\Projects\605X\60577456\4. Tech Work Area\4.99 GIS\02_MXDs\JM\20220228\60577456_MNES_F15_BTF_A3L.mxd

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

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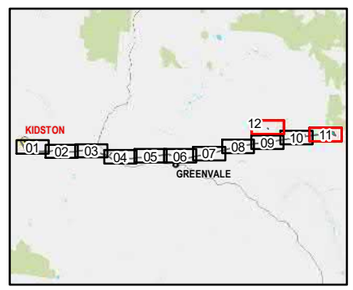
Legend

- Study Area

Black-throated finch (southern) potential habitat

- Potential breeding habitat
- Potential foraging habitat
- Potential dispersal habitat



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BLACK-THROATED FINCH (SOUTHERN) POTENTIAL HABITAT

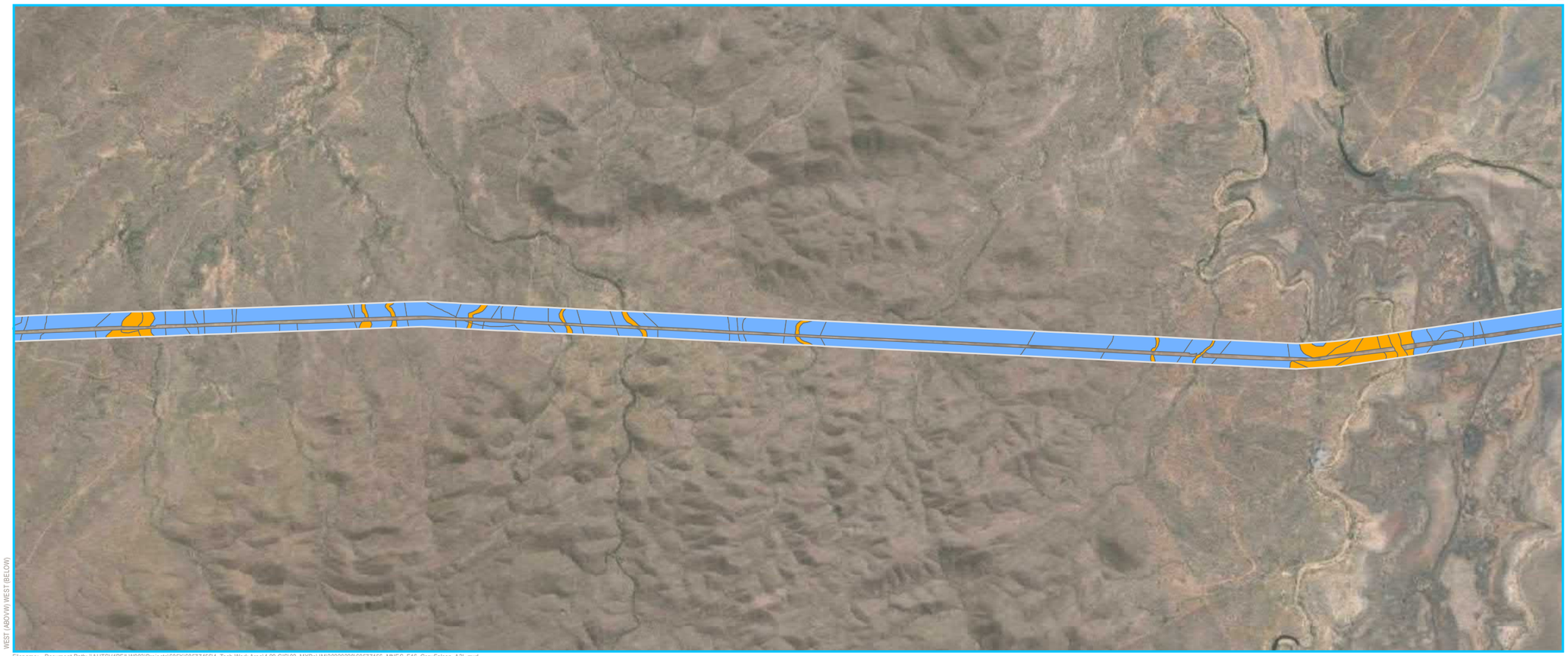
PROJECT ID: 60577456
CREATED BY: JR
LAST MODIFIED: JB - 16/03/2022
VERSION: 1

Figure F15.6

A3 size

ABOVE SHEET- 01

BELOW SHEET- 02



WEST (ABOVE\ WEST (BELOW)

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

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Meters

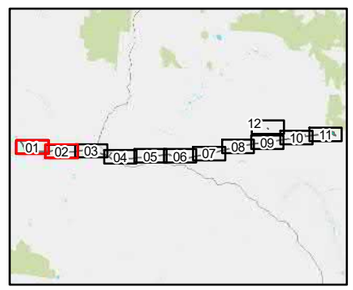
1:55,000 (when printed at A3)

Legend

- Study Area

Grey falcon potential habitat

- Potential nesting habitat
- Potential foraging and dispersal habitat



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GREY FALCON POTENTIAL HABITAT

PROJECT ID: 60577456
CREATED BY: JR
LAST MODIFIED: JB - 16/03/2022
VERSION: 1

Figure F16.1

A3 size

ABOVE SHEET- 03

BELOW SHEET- 04

WEST (ABOVE) WEST (BELOW)

Filename: Document Path: \\AUTSV1PFILW003\Projects\605X\605774564\4. Tech Work Area\4.99 GIS\02_MXDs\JM\20220228\60577456_MNES_F16_GreyFalcon_A3L.mxd

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

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Meters

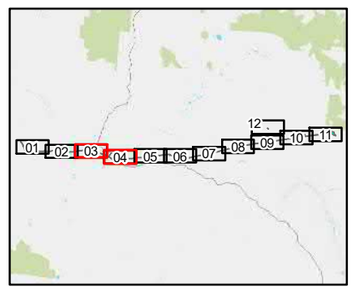
1:55,000 (when printed at A3)

Legend

- Study Area

Grey falcon potential habitat

- Potential nesting habitat
- Potential foraging and dispersal habitat



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GREY FALCON POTENTIAL HABITAT

PROJECT ID: 60577456
CREATED BY: JR
LAST MODIFIED: JB - 16/03/2022
VERSION: 1

Figure F16.2

A3 size

ABOVE SHEET- 05

BELOW SHEET- 06

WEST (ABOVE) WEST (BELOW)

Filename: Document Path: \\AUTSV1PFILW003\Projects\605X\605774564\4. Tech Work Area\4.99 GIS\02_MXDs\JM\20220228\60577456_MNES_F16_GreyFalcon_A3L.mxd

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

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Meters

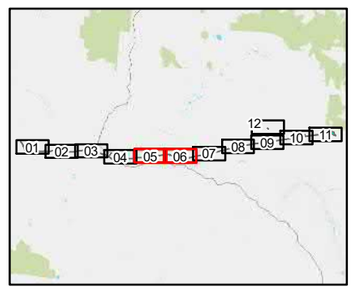
1:55,000 (when printed at A3)

Legend

- Study Area

Grey falcon potential habitat

- Potential nesting habitat
- Potential foraging and dispersal habitat



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GREY FALCON POTENTIAL HABITAT

PROJECT ID: 60577456
CREATED BY: JR
LAST MODIFIED: JB - 16/03/2022
VERSION: 1

Figure F16.3

A3 size

ABOVE SHEET- 07

BELOW SHEET- 08

WEST (ABOVE\ WEST (BELOW)

Filename: Document Path: \\AUTSV1PFILW003\Projects\605X\605774564\4. Tech Work Area\4.99 GIS\02_MXDs\JM\20220228\60577456_MNES_F16_GreyFalcon_A3L.mxd

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

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Meters

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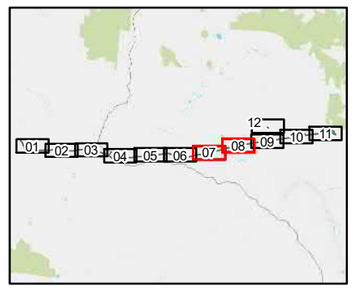
Legend

- Study Area

Grey falcon potential habitat

- Potential nesting habitat
- Potential foraging and dispersal habitat



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GREY FALCON POTENTIAL HABITAT

PROJECT ID: 60577456
CREATED BY: JR
LAST MODIFIED: JB - 16/03/2022
VERSION: 1

Figure F16.4

A3 size

ABOVE SHEET- 09

BELOW SHEET- 10

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

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Meters

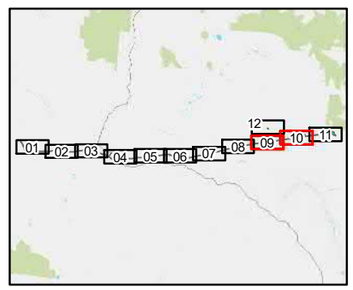
1:55,000 (when printed at A3)

Legend

- Study Area

Grey falcon potential habitat

- Potential nesting habitat
- Potential foraging and dispersal habitat



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GREY FALCON POTENTIAL HABITAT

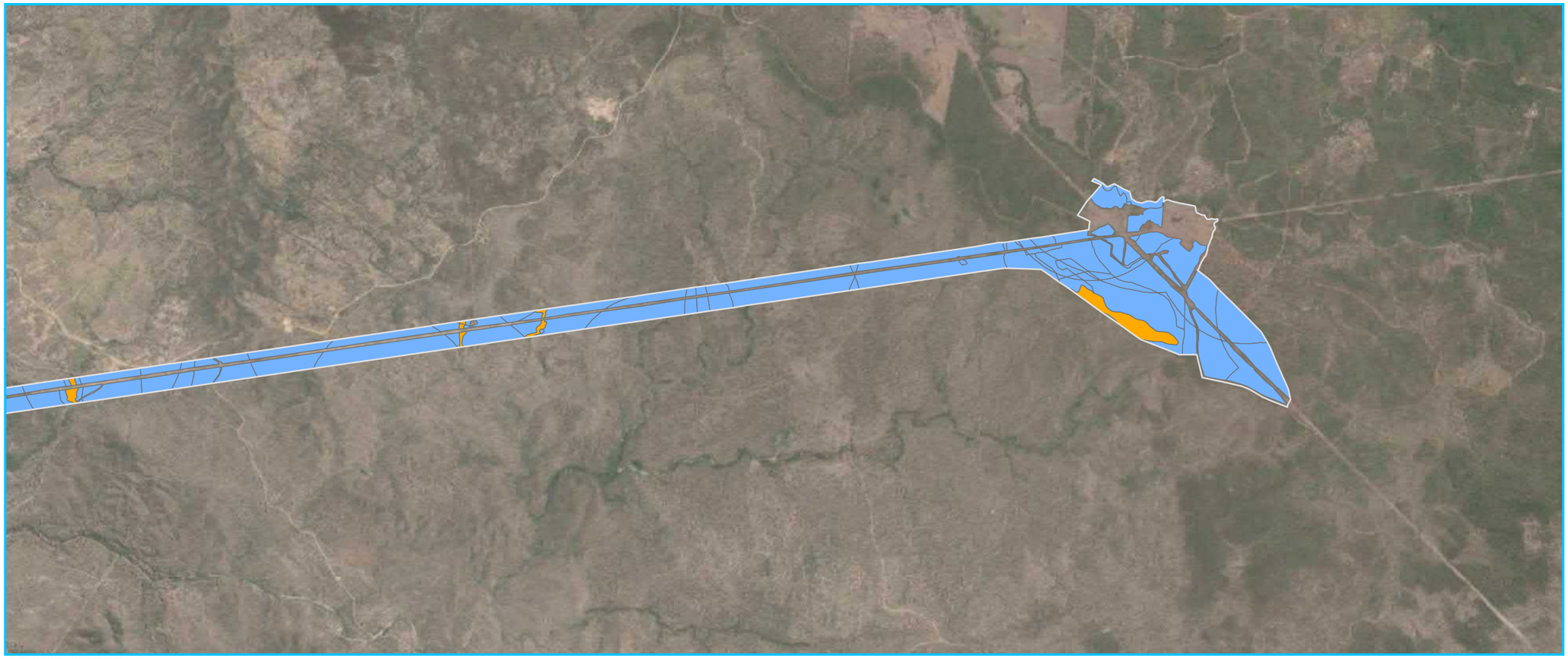
PROJECT ID: 60577456
CREATED BY: JR
LAST MODIFIED: JB - 16/03/2022
VERSION: 1

Figure F16.5

A3 size

WEST (ABOVE\ WEST (BELOW)

Filename: Document Path: \\AUTSV1PFILW003\Projects\605X\605774564. Tech Work Area\4.99 GIS\02_MXDs\JM\20220228\60577456_MNES_F16_GreyFalcon_A3L.mxd



ABOVE SHEET- 11

BELOW SHEET- 12

WEST (ABOVE) WEST (BELOW)

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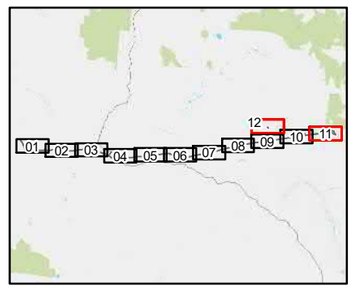
Legend

- Study Area

Grey falcon potential habitat

- Potential nesting habitat
- Potential foraging and dispersal habitat



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Powerlink Kidston Connection Project

GREY FALCON POTENTIAL HABITAT

PROJECT ID: 60577456
CREATED BY: JR
LAST MODIFIED: JB - 16/03/2022
VERSION: 1

Figure F16.6

A3 size

ABOVE SHEET- 01

BELOW SHEET- 02

WEST (ABOVE) WEST (BELOW)

Filename: Document Path: \\AUTSV1PFILW003\Projects\605X\605774564\4. Tech Work Area\4.99 GIS\02_MXDs\JM\20220228\60577456_MNES_F17_MOwl_A3L.mxd

AECOM
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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)

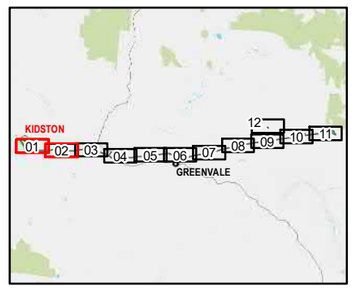
Legend

Study Area

Masked owl (northern) potential habitat

Marginal nesting habitat

Potential foraging and dispersal habitat



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Powerlink Kidston Connection Project

MASKED OWL (NORTHERN) POTENTIAL HABITAT

PROJECT ID: 60577456
CREATED BY: JR
LAST MODIFIED: JB - 16/03/2022
VERSION: 1

Figure F17.1

A3 size

ABOVE SHEET- 03

BELOW SHEET- 04

WEST (ABOVE\ WEST (BELOW)

Filename: Document Path: \\AUTSV1PFILW003\Projects\605X\605774564\4. Tech Work Area\4.99 GIS\02_MXDs\JM\20220228\60577456_MNES_F17_MOwl_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)

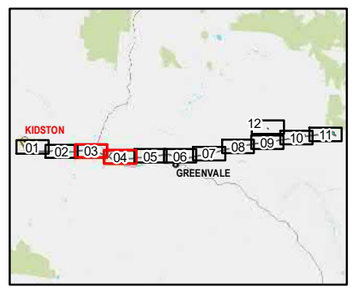
Legend

Study Area

Masked owl (northern) potential habitat

Marginal nesting habitat

Potential foraging and dispersal habitat



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Powerlink Kidston Connection Project

MASKED OWL (NORTHERN) POTENTIAL HABITAT

PROJECT ID: 60577456
CREATED BY: JR
LAST MODIFIED: JB - 16/03/2022
VERSION: 1

Figure F17.2

A3 size

ABOVE SHEET- 05

BELOW SHEET- 06

WEST (ABOVE\ WEST (BELOW)

Filename: Document Path: \\AUTSV1PFILW003\Projects\605X\605774564\4. Tech Work Area\4.99 GIS\02_MXDs\JM\20220228\60577456_MNES_F17_MOwl_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)

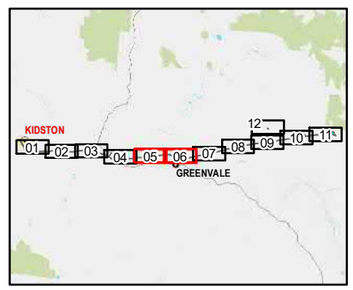
Legend

Study Area

Masked owl (northern) potential habitat

Marginal nesting habitat

Potential foraging and dispersal habitat



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MASKED OWL (NORTHERN) POTENTIAL HABITAT

PROJECT ID: 60577456
CREATED BY: JR
LAST MODIFIED: JB - 16/03/2022
VERSION: 1

Figure F17.3

A3 size

ABOVE SHEET- 07

BELOW SHEET- 08

WEST (ABOVE\ WEST (BELOW)

Filename: Document Path: \\AUTSV1PFILW003\Projects\605X\605774564. Tech Work Area\4.99 GIS\02_MXDs\JM\20220228\60577456_MNES_F17_MOwl_A3L.mxd

AECOM
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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)

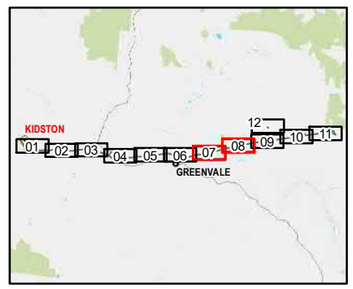
Legend

Study Area

Masked owl (northern) potential habitat

Marginal nesting habitat

Potential foraging and dispersal habitat



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MASKED OWL (NORTHERN) POTENTIAL HABITAT

PROJECT ID: 60577456
CREATED BY: JR
LAST MODIFIED: JB - 16/03/2022
VERSION: 1

Figure F17.4

A3 size

ABOVE SHEET- 09

BELOW SHEET- 10

WEST (ABOVE\ WEST (BELOW)

Filename: Document Path: \\AUTSV1PFILW003\Projects\605X\605774564. Tech Work Area\4.99 GIS\02_MXDs\JM\20220228\60577456_MNES_F17_MOwl_A3L.mxd

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

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

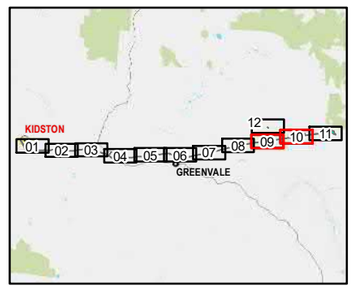
1:55,000 (when printed at A3)

Legend

- Study Area

Masked owl (northern) potential habitat

- Marginal nesting habitat
- Potential foraging and dispersal habitat



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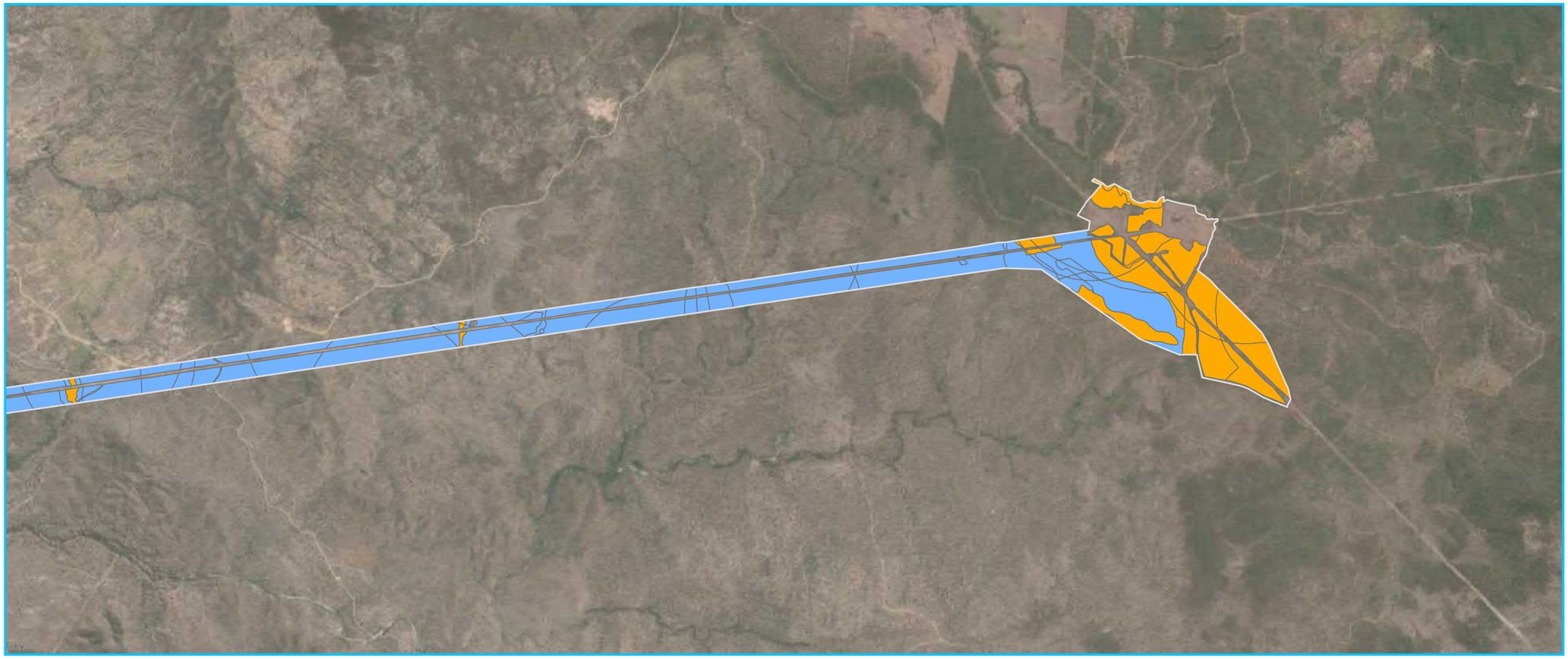
MASKED OWL (NORTHERN) POTENTIAL HABITAT

PROJECT ID:	60577456
CREATED BY:	JR
LAST MODIFIED:	JB - 16/03/2022
VERSION:	1

Figure
F17.5

A3 size



ABOVE SHEET- 11

BELOW SHEET- 12

WEST (ABOVE) WEST (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)

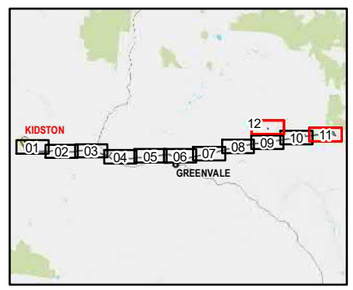
Legend

Study Area

Masked owl (northern) potential habitat

Marginal nesting habitat

Potential foraging and dispersal habitat



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MASKED OWL (NORTHERN) POTENTIAL HABITAT

PROJECT ID: 60577456
CREATED BY: JR
LAST MODIFIED: JB - 16/03/2022
VERSION: 1

Figure F17.6

A3 size

ABOVE SHEET- 01

BELOW SHEET- 02

WEST (ABOVE) WEST (BELOW)

Filename: Document Path: \\AUTSV1PFILW003\Projects\605X\60577456\4. Tech Work Area\4.99 GIS\02_MXDsJIM\20220228\60577456_MNES_F18_RedGoshawk_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

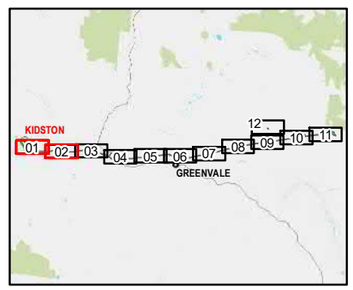
1:55,000 (when printed at A3)

Legend

- Study Area

Red goshawk potential habitat

- Potential nesting habitat
- Potential foraging and dispersal habitat



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Powerlink Kidston Connection Project

RED GOSHAWK POTENTIAL HABITAT

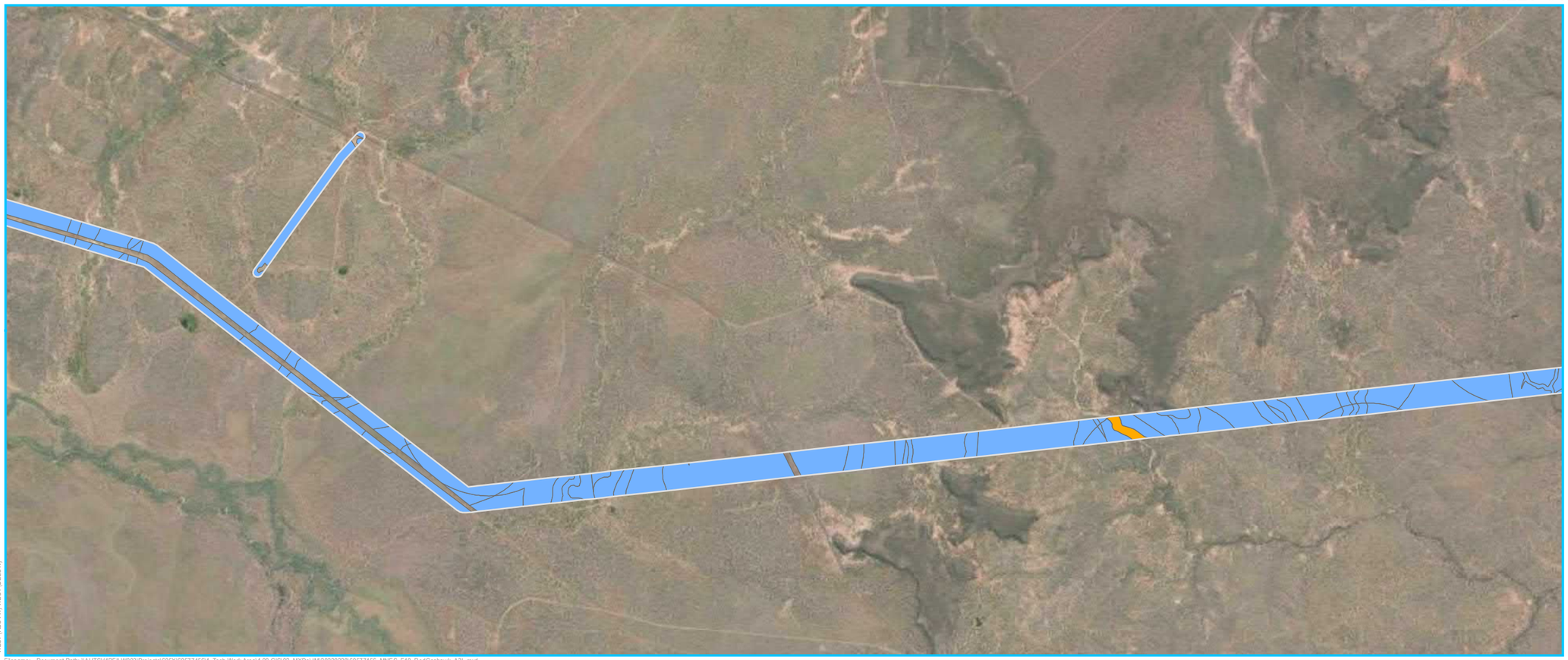
PROJECT ID: 60577456
CREATED BY: JR
LAST MODIFIED: JB - 15/03/2022
VERSION: 1

Figure F18.1

A3 size

ABOVE SHEET- 03

BELOW SHEET- 04



WEST (ABOVE) WEST (BELOW)

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

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Meters

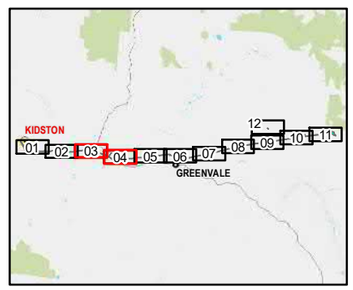
1:55,000 (when printed at A3)

Legend

- Study Area

Red goshawk potential habitat

- Potential nesting habitat
- Potential foraging and dispersal habitat



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RED GOSHAWK POTENTIAL HABITAT

PROJECT ID: 60577456
CREATED BY: JR
LAST MODIFIED: JB - 15/03/2022
VERSION: 1

Figure F18.2

A3 size

ABOVE SHEET- 05

BELOW SHEET- 06

WEST (ABOVE\ WEST (BELOW)

Filename: Document Path: \\AUTSV1PFILW003\Projects\605X\605774564\4. Tech Work Area\4.99 GIS\02_MXDsJJM\20220228\60577456_MNES_F18_RedGoshawk_A3L.mxd

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

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Meters

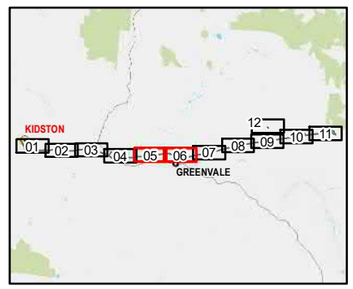
1:55,000 (when printed at A3)

Legend

- Study Area

Red goshawk potential habitat

- Potential nesting habitat
- Potential foraging and dispersal habitat



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RED GOSHAWK POTENTIAL HABITAT

PROJECT ID: 60577456
CREATED BY: JR
LAST MODIFIED: JB - 15/03/2022
VERSION: 1

Figure F18.3

A3 size

ABOVE SHEET- 07

BELOW SHEET- 08

WEST (ABOVE\ WEST (BELOW)

Filename: Document Path: \\AUTSV1PFILW003\Projects\605X\605745614. Tech Work Area\4.99 GIS\02_MXDs\JM\20220228\60577456_MNES_F18_RedGoshawk_A3L.mxd

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

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Meters

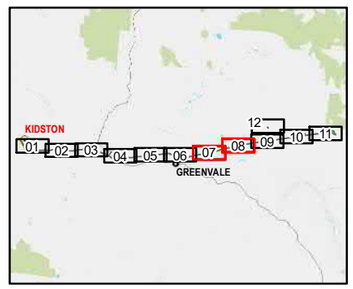
1:55,000 (when printed at A3)

Legend

- Study Area

Red goshawk potential habitat

- Potential nesting habitat
- Potential foraging and dispersal habitat



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RED GOSHAWK POTENTIAL HABITAT

PROJECT ID: 60577456
CREATED BY: JR
LAST MODIFIED: JB - 15/03/2022
VERSION: 1

Figure F18.4

A3 size

ABOVE SHEET- 09

BELOW SHEET- 10

WEST (ABOVE\ WEST (BELOW)

Filename: Document Path: \\AUTSV1PFILW003\Projects\605X\605774564\4. Tech Work Area\4.99 GIS\02_MXDs\JM\20220228\60577456_MNES_F18_RedGoshawk_A3L.mxd

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N

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

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Meters

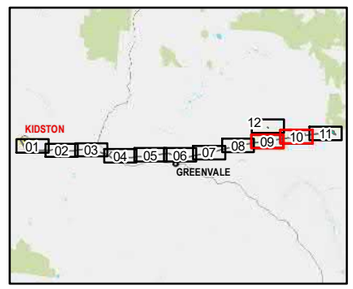
1:55,000 (when printed at A3)

Legend

- Study Area

Red goshawk potential habitat

- Potential nesting habitat
- Potential foraging and dispersal habitat



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RED GOSHAWK POTENTIAL HABITAT

PROJECT ID: 60577456
CREATED BY: JR
LAST MODIFIED: JB - 15/03/2022
VERSION: 1

Figure F18.5

A3 size

ABOVE SHEET- 11

BELOW SHEET- 12

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

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

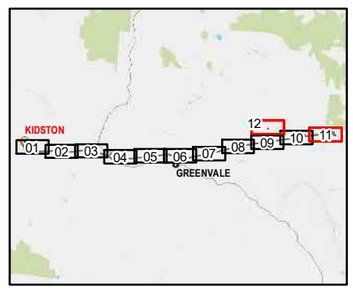
1:55,000 (when printed at A3)

Legend

- Study Area

Red goshawk potential habitat

- Potential nesting habitat
- Potential foraging and dispersal habitat



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RED GOSHAWK POTENTIAL HABITAT

PROJECT ID: 60577456
CREATED BY: JR
LAST MODIFIED: JB - 15/03/2022
VERSION: 1

Figure F18.6

A3 size

WEST (ABOVE) WEST (BELOW)

Filename: Document Path: \\AUTSV1PFILW003\Projects\605X\605774564. Tech Work Area\4.99 GIS\02_MXDs\JM\20220228\60577456_MNES_F18_RedGoshawk_A3L.mxd

ABOVE SHEET- 01

BELOW SHEET- 02

WEST (ABOVE) WEST (BELOW)

Filename: Document Path: \\AUTSV1PFILW003\Projects\605X\60577456\4. Tech Work Area\4.99 GIS\02_MXDs\JM\20220228\60577456_MNES_F19_SquatterP_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

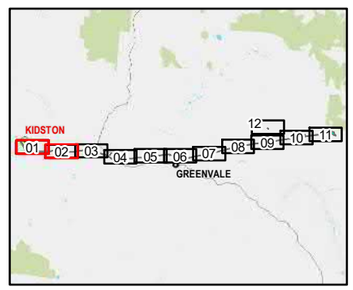
1:55,000 (when printed at A3)

Legend

- Study Area
- Squatter Pigeon Sighting Location

Squatter pigeon (southern) potential habitat

- Known breeding habitat
- Known foraging habitat
- Known dispersal habitat



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Powerlink Kidston Connection Project

SQUATTER PIGEON (SOUTHERN) POTENTIAL HABITAT

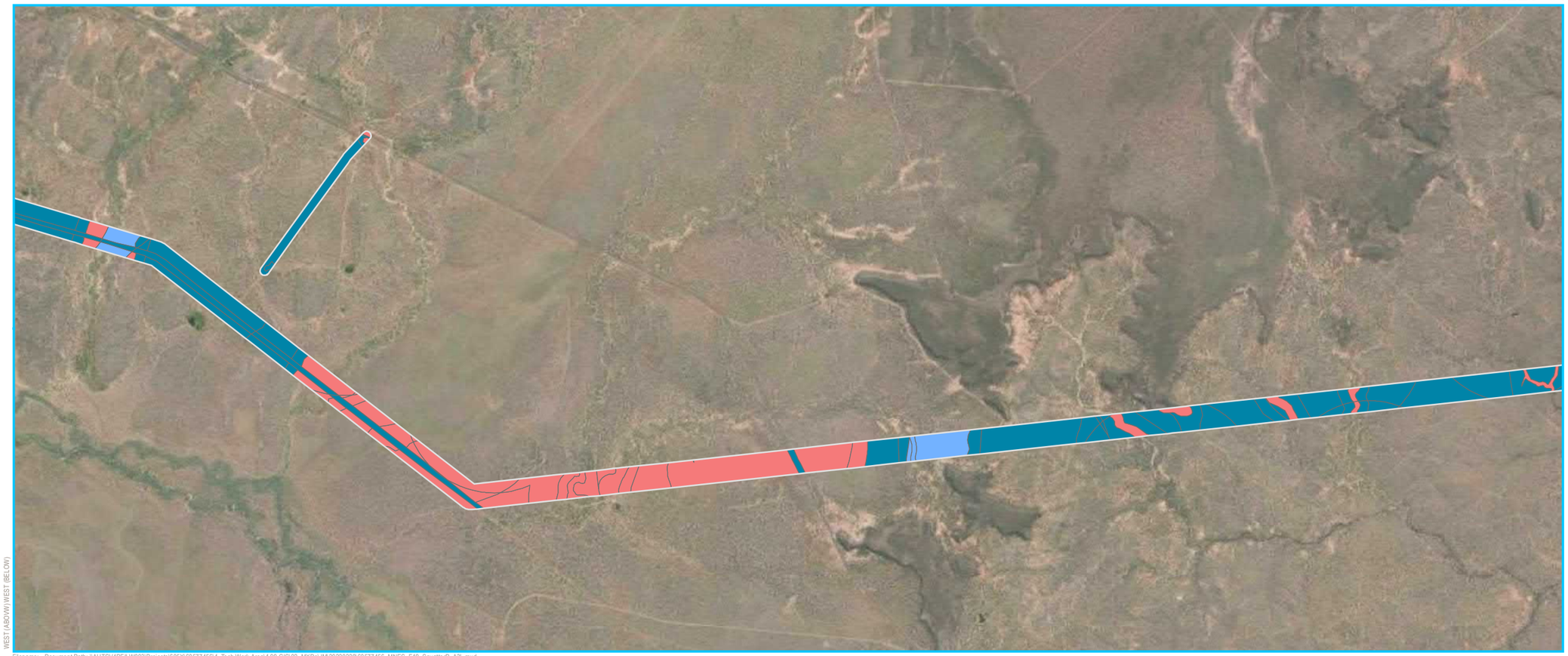
PROJECT ID: 60577456
CREATED BY: JR
LAST MODIFIED: JB - 21/03/2022
VERSION: 1

Figure F19.1

A3 size

ABOVE SHEET- 03

BELOW SHEET- 04



WEST (ABOVE) WEST (BELOW)

Filename: Document Path: \\AUTSV1PFILW003\Projects\605X\60577456\4. Tech Work Area\4.99 GIS\02_MXDs\JM\20220228\60577456_MNES_F19_SquatterP_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

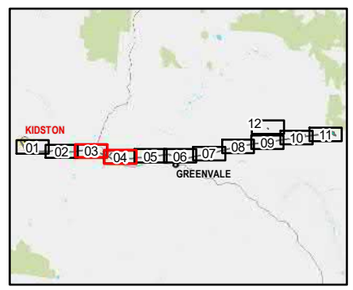
1:55,000 (when printed at A3)

Legend

- Study Area
- Squatter Pigeon Sighting Location

Squatter pigeon (southern) potential habitat

- Known breeding habitat
- Known foraging habitat
- Known dispersal habitat



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SQUATTER PIGEON (SOUTHERN) POTENTIAL HABITAT

PROJECT ID: 60577456
CREATED BY: JR
LAST MODIFIED: JB - 21/03/2022
VERSION: 1

Figure F19.2

A3 size

ABOVE SHEET- 05

BELOW SHEET- 06

WEST (ABOVE) WEST (BELOW)

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AECOM
www.aecom.com

N

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

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

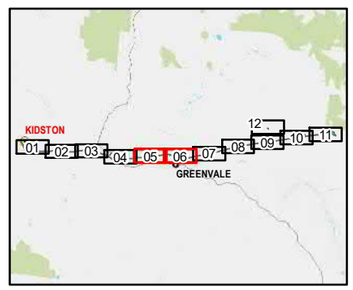
1:55,000 (when printed at A3)

Legend

- Study Area
- Squatter Pigeon Sighting Location

Squatter pigeon (southern) potential habitat

- Known breeding habitat
- Known foraging habitat
- Known dispersal habitat



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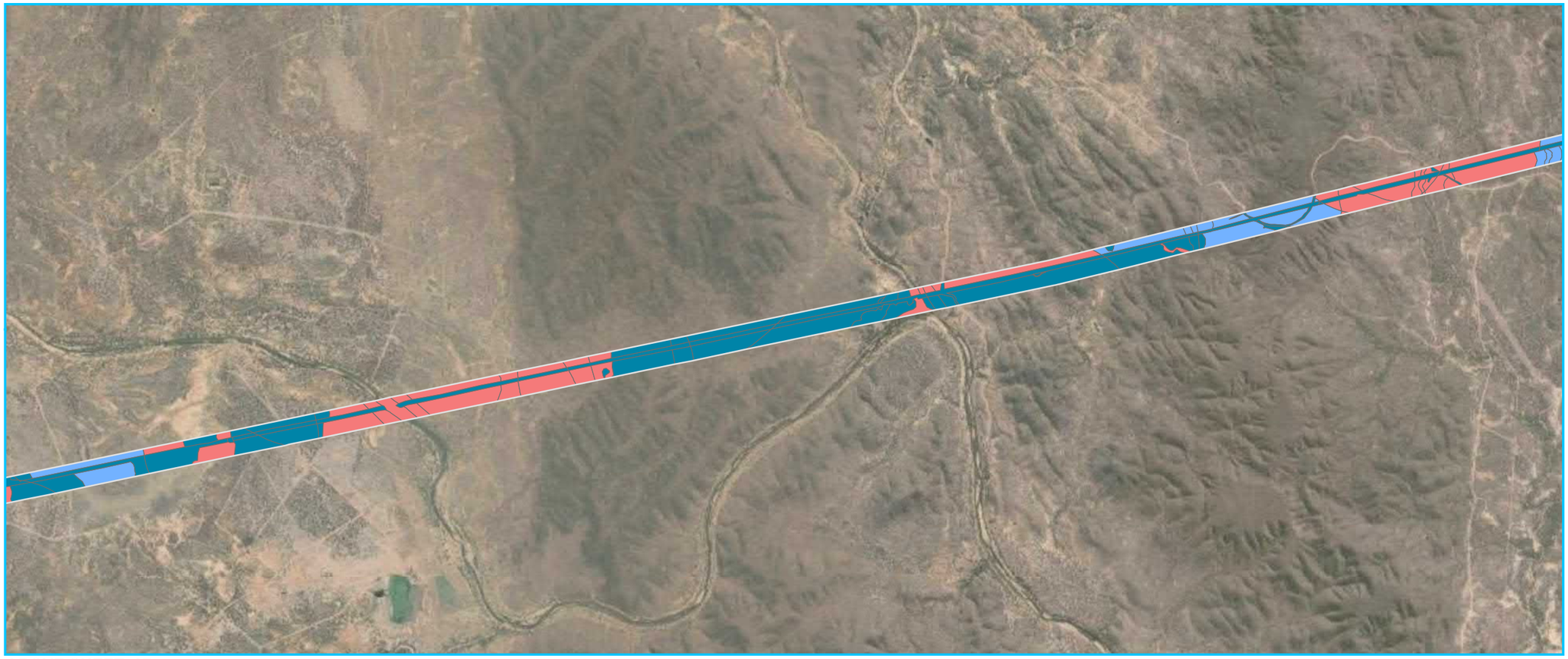
SQUATTER PIGEON (SOUTHERN) POTENTIAL HABITAT

PROJECT ID: 60577456
CREATED BY: JR
LAST MODIFIED: JB - 21/03/2022
VERSION: 1

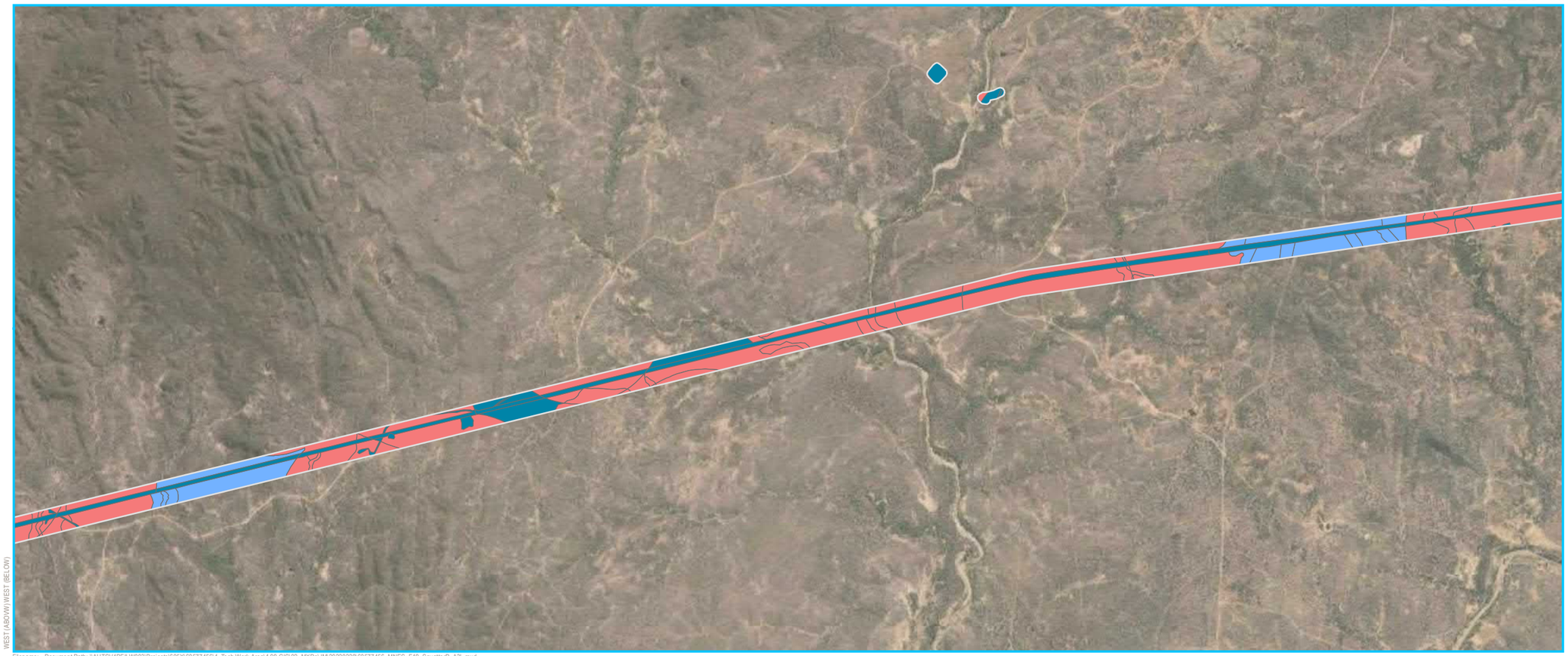
Figure F19.3

A3 size



ABOVE SHEET- 07

BELOW SHEET- 08



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

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

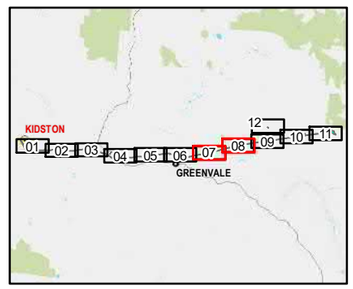
1:55,000 (when printed at A3)

Legend

- Study Area
- Squatter Pigeon Sighting Location

Squatter pigeon (southern) potential habitat

- Known breeding habitat
- Known foraging habitat
- Known dispersal habitat



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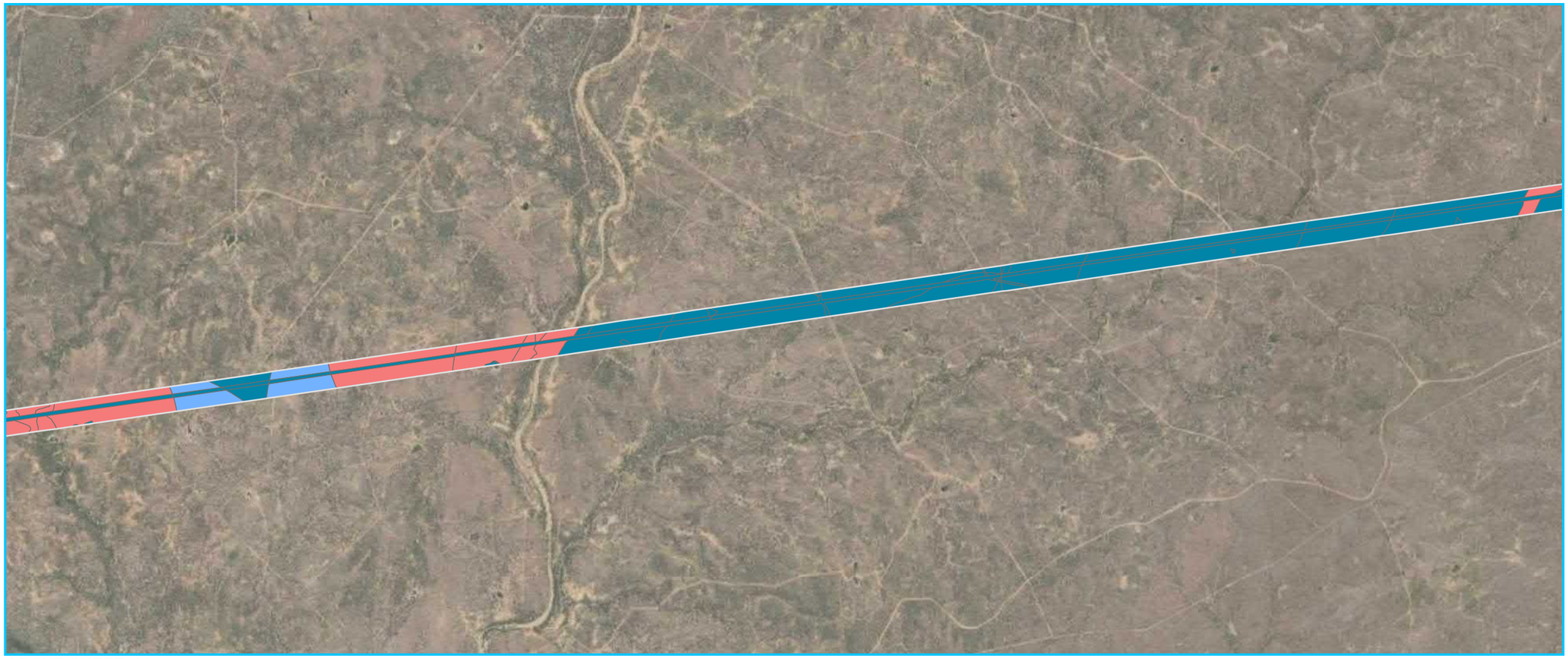
SQUATTER PIGEON (SOUTHERN) POTENTIAL HABITAT

PROJECT ID: 60577456
CREATED BY: JR
LAST MODIFIED: JB - 21/03/2022
VERSION: 1

Figure F19.4

A3 size



ABOVE SHEET- 09

BELOW SHEET- 10

WEST (ABOVE) WEST (BELOW)

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

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

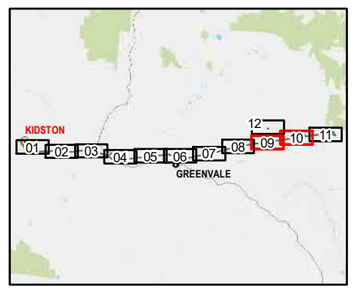
1:55,000 (when printed at A3)

Legend

- Study Area
- Squatter Pigeon Sighting Location

Squatter pigeon (southern) potential habitat

- Known breeding habitat
- Known foraging habitat
- Known dispersal habitat



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SQUATTER PIGEON (SOUTHERN) POTENTIAL HABITAT

PROJECT ID: 60577456
CREATED BY: JR
LAST MODIFIED: JB - 21/03/2022
VERSION: 1

Figure F19.5

A3 size

ABOVE SHEET- 11

BELOW SHEET- 12

WEST (ABOVE) WEST (BELOW)

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

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

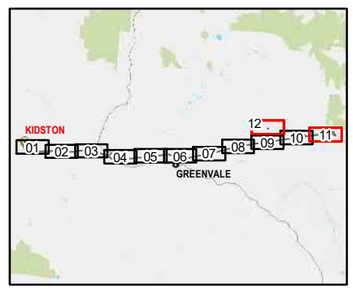
1:55,000 (when printed at A3)

Legend

- Study Area
- Squatter Pigeon Sighting Location

Squatter pigeon (southern) potential habitat

- Known breeding habitat
- Known foraging habitat
- Known dispersal habitat



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SQUATTER PIGEON (SOUTHERN) POTENTIAL HABITAT

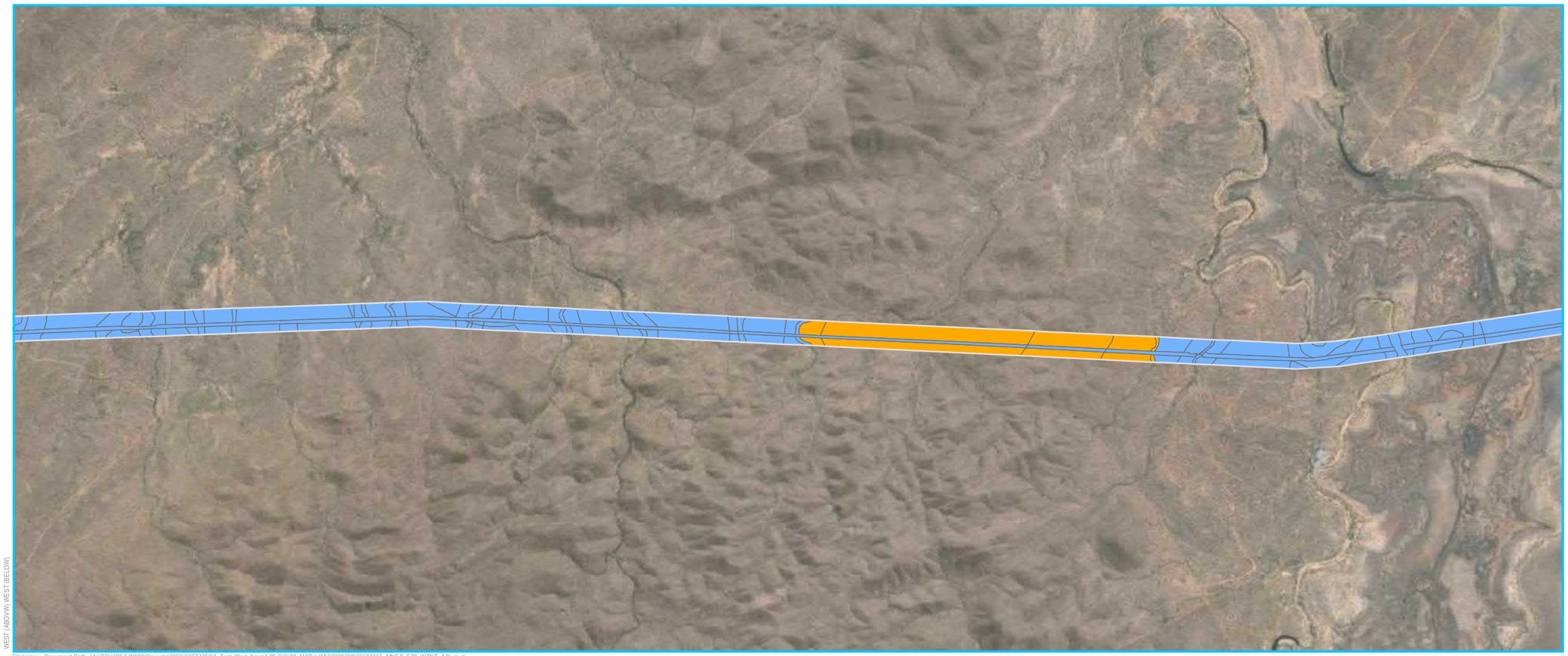
PROJECT ID: 60577456
CREATED BY: JR
LAST MODIFIED: JB - 21/03/2022
VERSION: 1

Figure F19.6

A3 size

ABOVE SHEET- 01

BELOW SHEET- 02



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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)

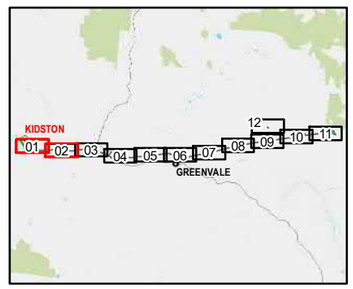
Legend

Study Area

White-throated needletail potential habitat

Likely roosting habitat

Likely foraging and dispersal habitat (aerial)



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Powerlink Kidston Connection Project

WHITE-THROATED NEEDLE-TAIL POTENTIAL HABITAT

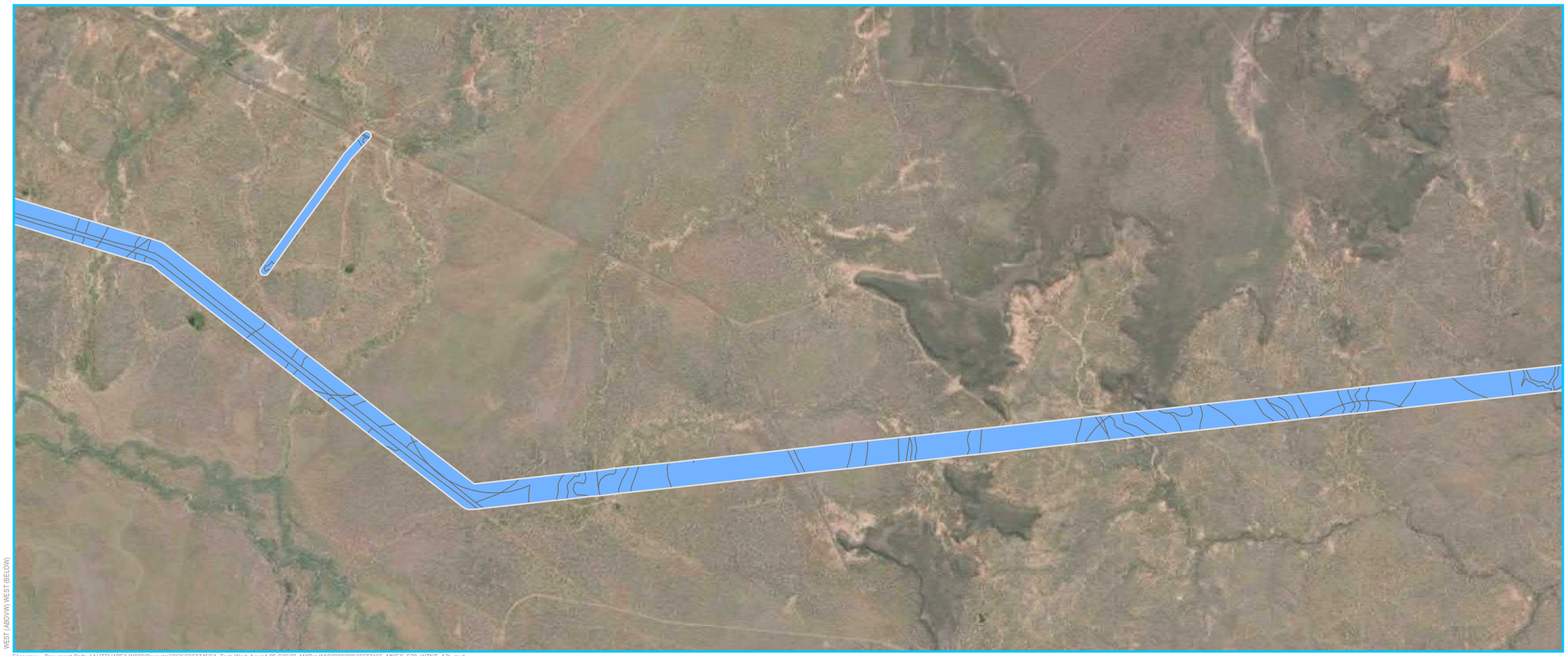
PROJECT ID: 60577456
CREATED BY: JR
LAST MODIFIED: JB - 15/03/2022
VERSION: 1

Figure
F20.1

A3 size

ABOVE SHEET- 03

BELOW SHEET- 04



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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)

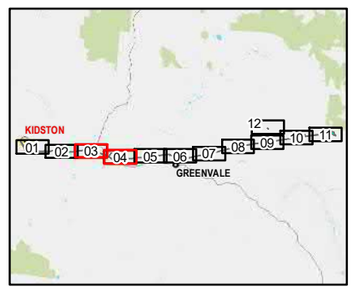
Legend

Study Area

White-throated needletail potential habitat

Likely roosting habitat

Likely foraging and dispersal habitat (aerial)



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WHITE-THROATED NEEDLE-TAIL POTENTIAL HABITAT

PROJECT ID: 60577456
CREATED BY: JR
LAST MODIFIED: JB - 15/03/2022
VERSION: 1

Figure F20.2

A3 size

ABOVE SHEET- 05

BELOW SHEET- 06

WEST (ABOVE) WEST (BELOW)

Filename: Document Path: \\AUTSV1PFILW003\Projects\605X\605774564\4. Tech Work Area\4.99 GIS\02_MXDs\JM\20220228\60577456_MNES_F20_WTNT_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)

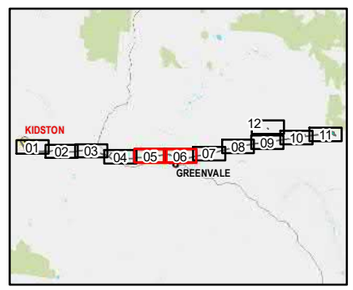
Legend

Study Area

White-throated needletail potential habitat

Likely roosting habitat

Likely foraging and dispersal habitat (aerial)



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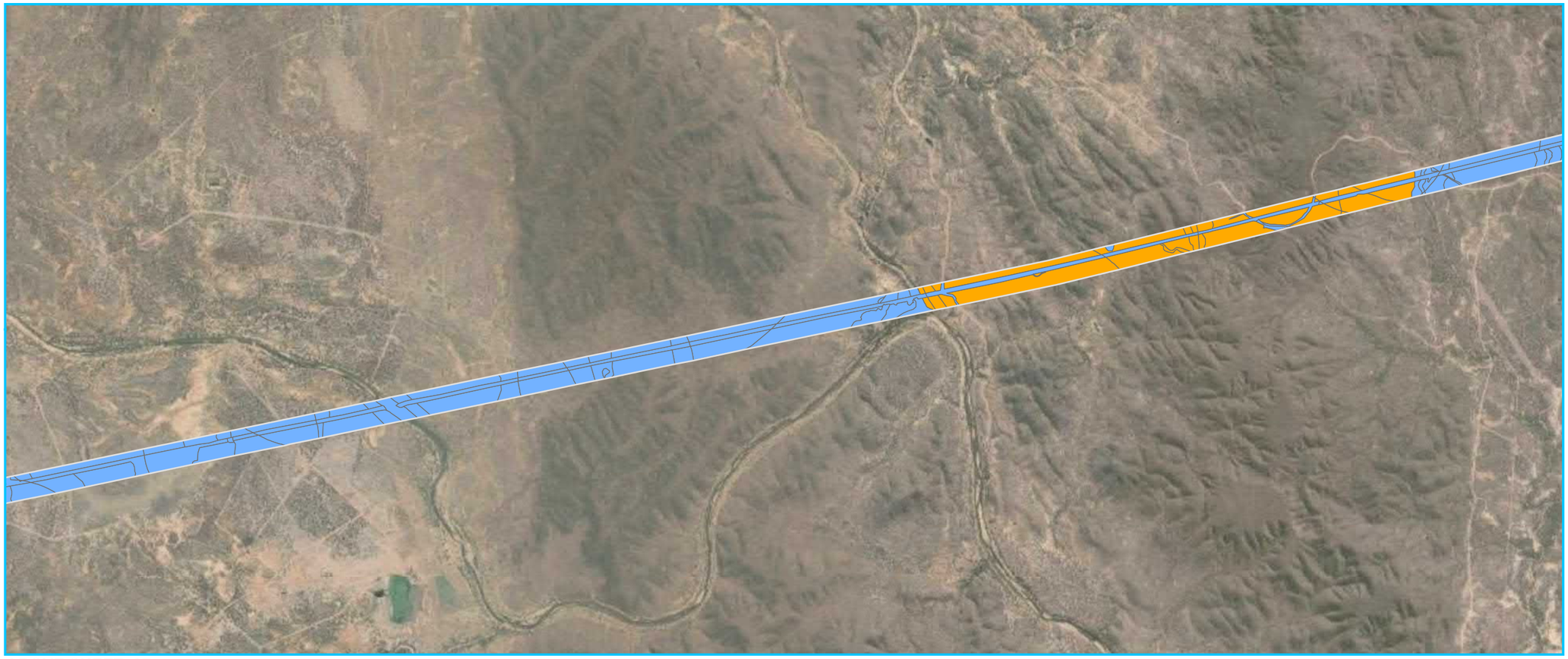
WHITE-THROATED NEEDLE-TAIL POTENTIAL HABITAT

PROJECT ID: 60577456
CREATED BY: JR
LAST MODIFIED: JB - 15/03/2022
VERSION: 1

Figure F20.3

A3 size



ABOVE SHEET- 07

BELOW SHEET- 08

WEST (ABOVE) WEST (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)

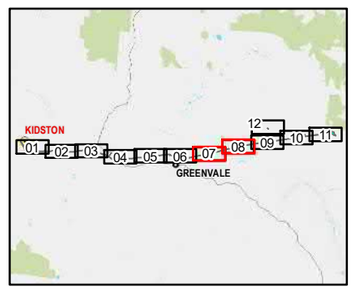
Legend

Study Area

White-throated needletail potential habitat

Likely roosting habitat

Likely foraging and dispersal habitat (aerial)



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WHITE-THROATED NEEDLE-TAIL POTENTIAL HABITAT

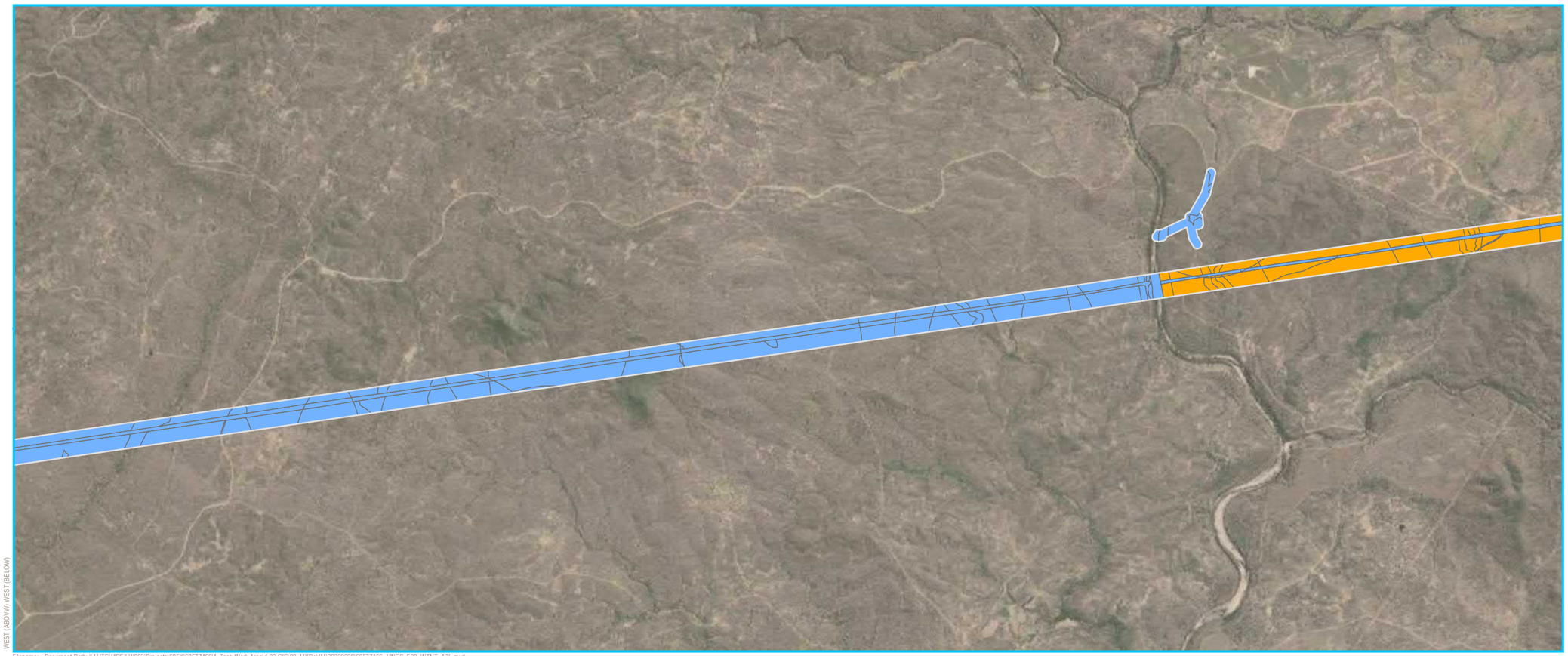
PROJECT ID: 60577456
CREATED BY: JR
LAST MODIFIED: JB - 15/03/2022
VERSION: 1

Figure
F20.4

A3 size

ABOVE SHEET- 09

BELOW SHEET- 10



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Projection: Transverse Mercator

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

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Legend

Study Area

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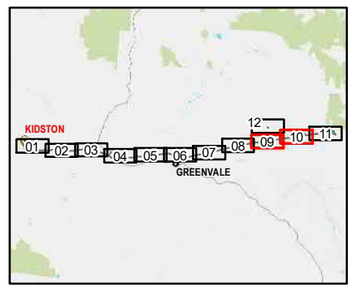
Likely foraging and dispersal habitat (aerial)



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WHITE-THROATED NEEDLE-TAIL POTENTIAL HABITAT

PROJECT ID: 60577456
CREATED BY: JR
LAST MODIFIED: JB - 15/03/2022
VERSION: 1

Figure
F20.5

A3 size

ABOVE SHEET- 11

BELOW SHEET- 12

WEST (ABOVE) WEST (BELOW)

Filename: Document Path: \\AUTSV1PFILW003\Projects\605X\605774564\4. Tech Work Area\4.99 GIS\02_MXDs\JM\20220228\60577456_MNES_F20_WTNT_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

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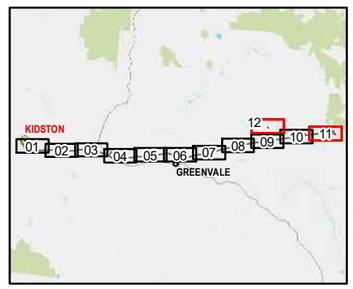
Likely roosting habitat

Likely foraging and dispersal habitat (aerial)



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WHITE-THROATED NEEDLE-TAIL POTENTIAL HABITAT

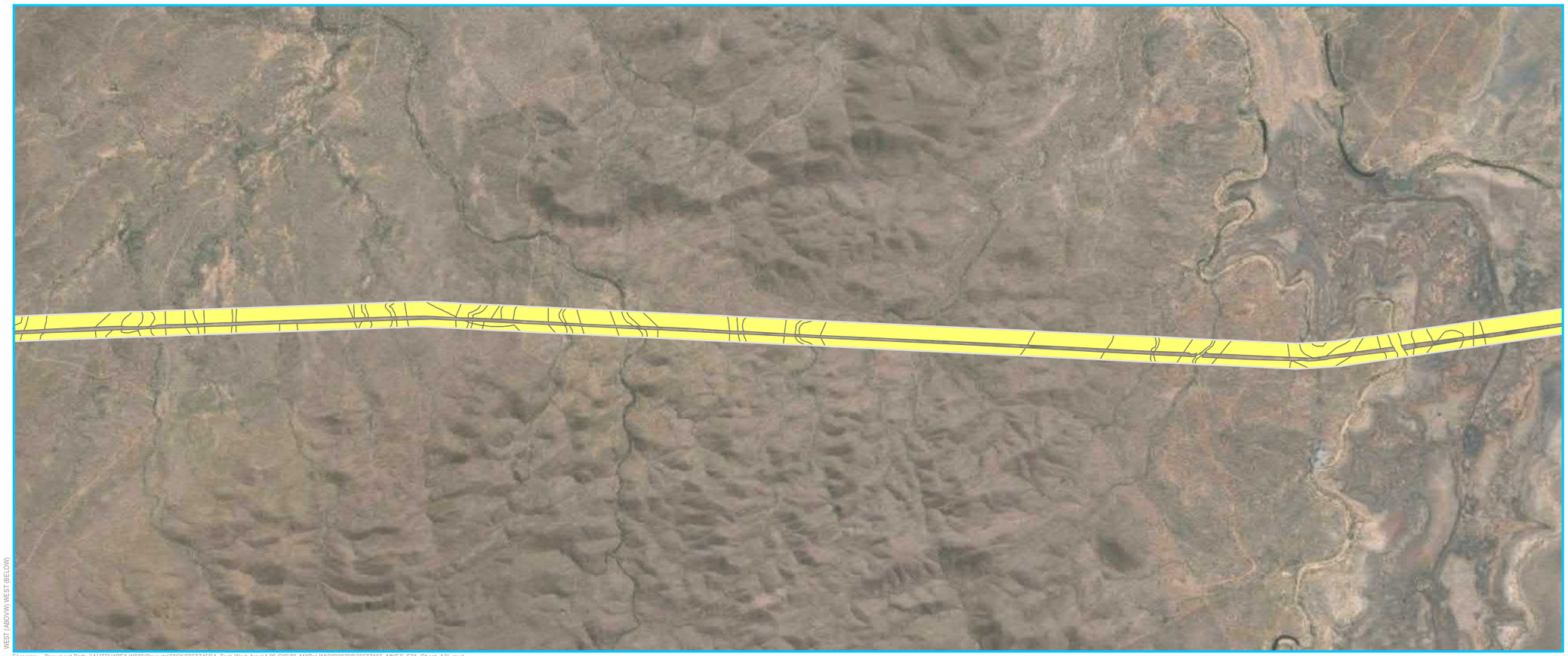
PROJECT ID: 60577456
CREATED BY: JR
LAST MODIFIED: JB - 15/03/2022
VERSION: 1

Figure F20.6

A3 size

ABOVE SHEET- 01

BELOW SHEET- 02



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

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

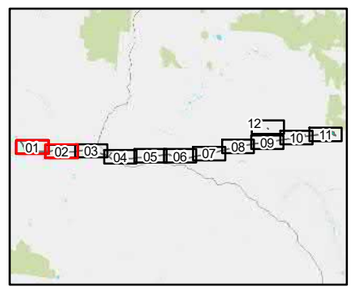
1:55,000 (when printed at A3)

Legend

- Study Area
- DoR Mineral Resource Sites - Abandoned mines

Ghost bat potential habitat

- Potential dispersal habitat



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Powerlink Kidston Connection Project

GHOST BAT POTENTIAL HABITAT

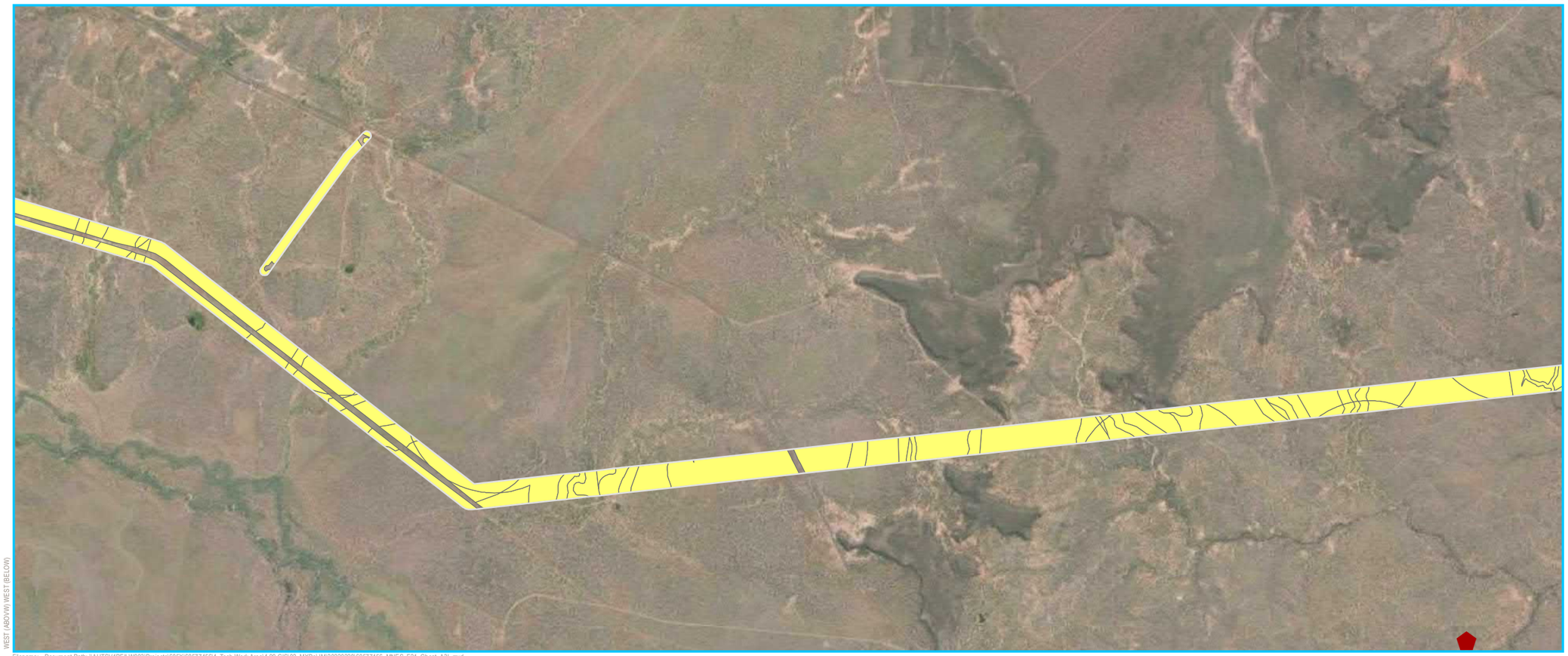
PROJECT ID: 60577456
CREATED BY: JR
LAST MODIFIED: JB - 16/03/2022
VERSION: 1

Figure F21.1

A3 size

ABOVE SHEET- 03

BELOW SHEET- 04



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

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

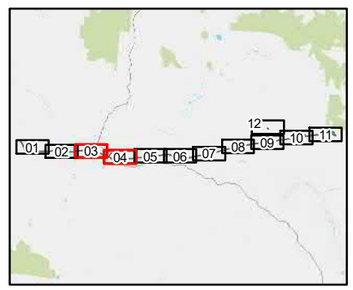
1:55,000 (when printed at A3)

Legend

- Study Area
- DoR Mineral Resource Sites - Abandoned mines

Ghost bat potential habitat

- Potential dispersal habitat



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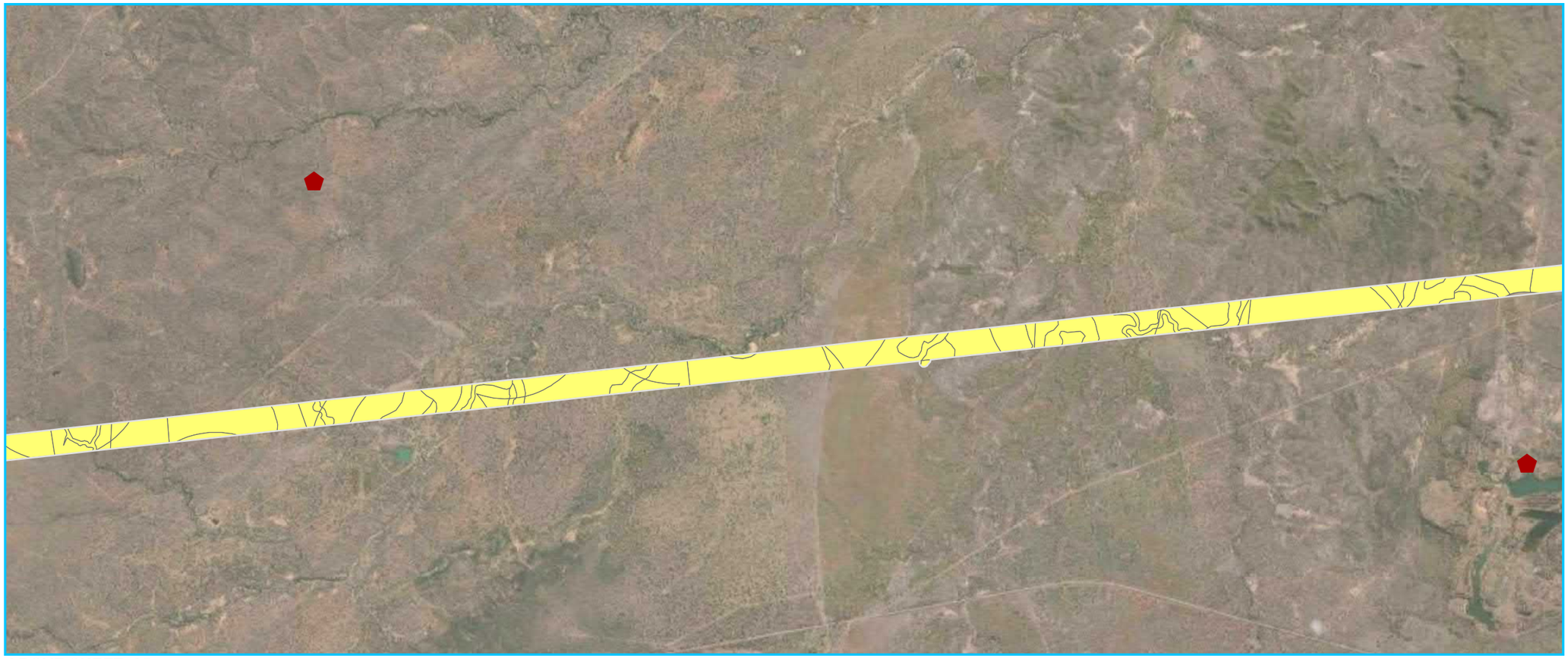
Powerlink Kidston Connection Project

GHOST BAT POTENTIAL HABITAT

PROJECT ID: 60577456
CREATED BY: JR
LAST MODIFIED: JB - 16/03/2022
VERSION: 1

Figure F21.2

A3 size



ABOVE SHEET- 05

BELOW SHEET- 06

WEST (ABOVE) WEST (BELOW)

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Projection: Transverse Mercator

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

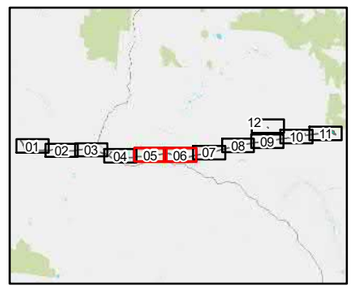
1:55,000 (when printed at A3)

Legend

- Study Area
- DoR Mineral Resource Sites - Abandoned mines

Ghost bat potential habitat

- Potential dispersal habitat



Data sources:
DCDB, Roads, Watercourses - DNRM 2017
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Powerlink Kidston Connection Project

GHOST BAT POTENTIAL HABITAT

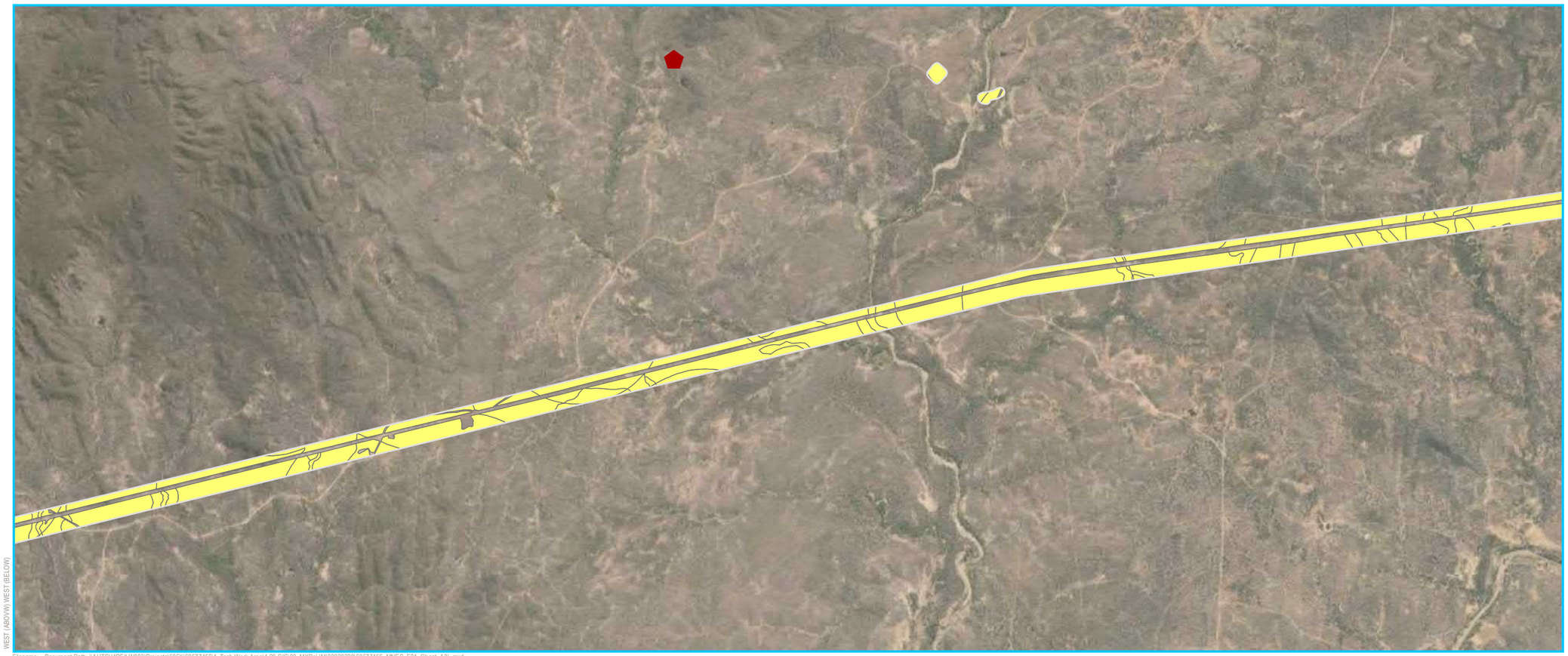
PROJECT ID: 60577456
CREATED BY: JR
LAST MODIFIED: JB - 16/03/2022
VERSION: 1

Figure F21.3

A3 size

ABOVE SHEET- 07

BELOW SHEET- 08



WEST (ABOVE\ WEST (BELOW)

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

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

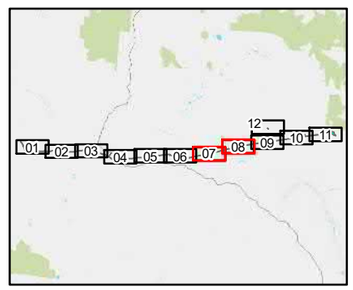
1:55,000 (when printed at A3)

Legend

- Study Area
- DoR Mineral Resource Sites - Abandoned mines

Ghost bat potential habitat

- Potential dispersal habitat



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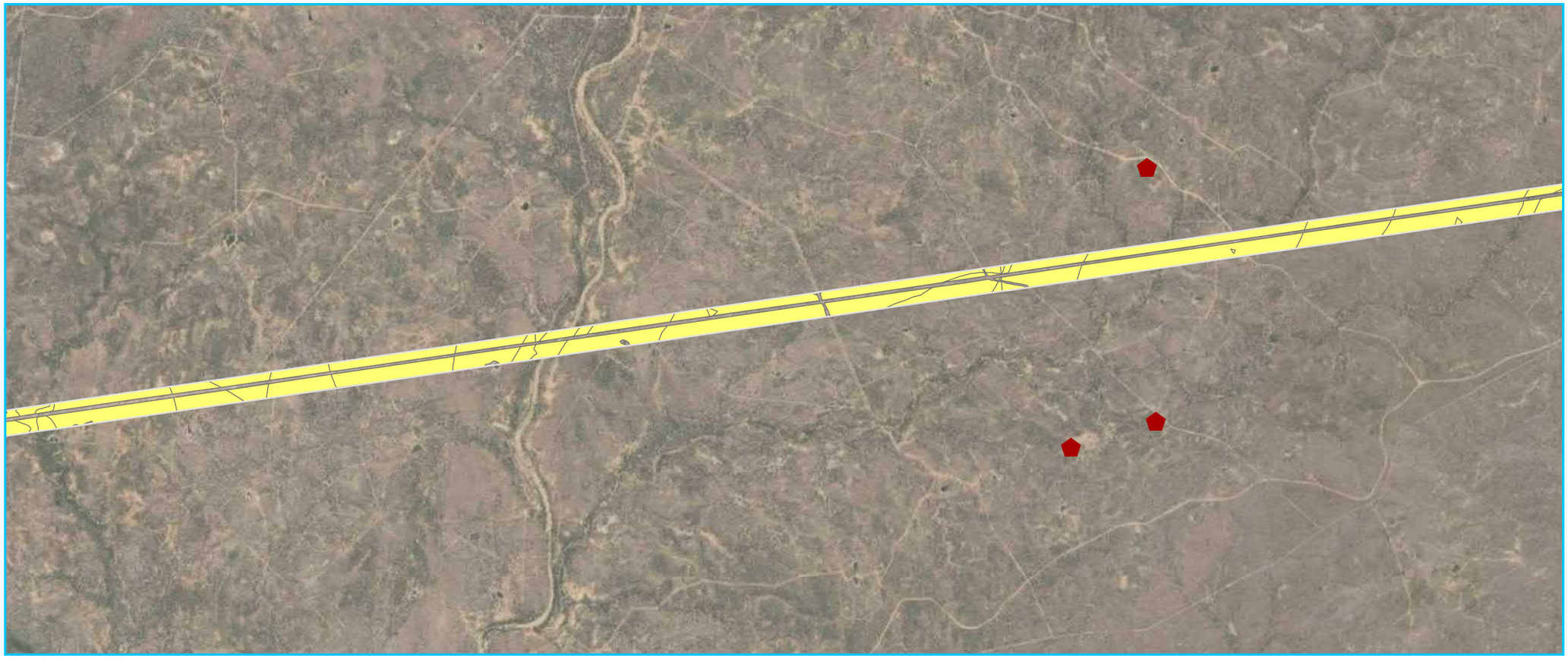
GHOST BAT POTENTIAL HABITAT

PROJECT ID: 60577456
CREATED BY: JR
LAST MODIFIED: JB - 16/03/2022
VERSION: 1

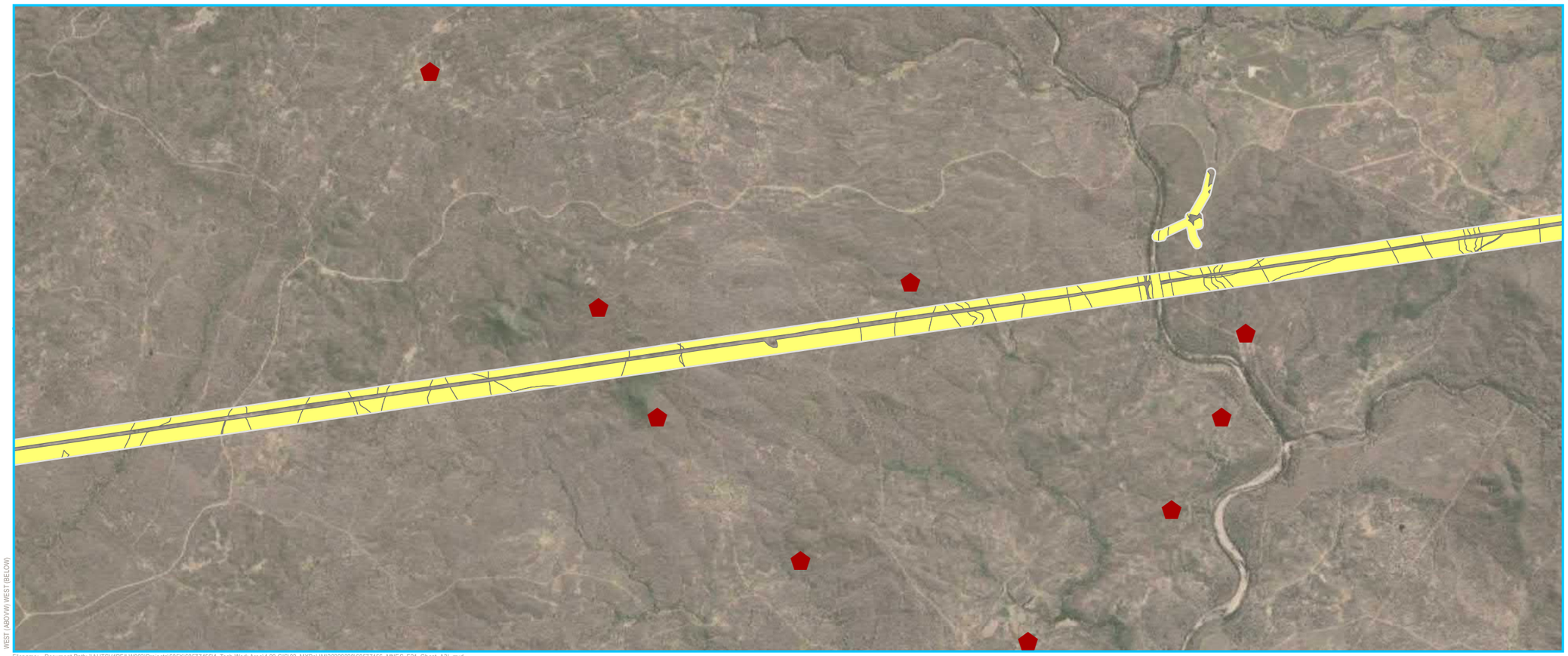
Figure F21.4

A3 size



ABOVE SHEET- 09

BELOW SHEET- 10



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

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

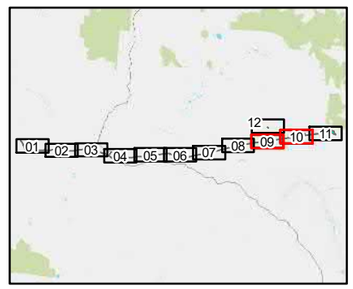
1:55,000 (when printed at A3)

Legend

- Study Area
- DoR Mineral Resource Sites - Abandoned mines

Ghost bat potential habitat

- Potential dispersal habitat



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GHOST BAT POTENTIAL HABITAT

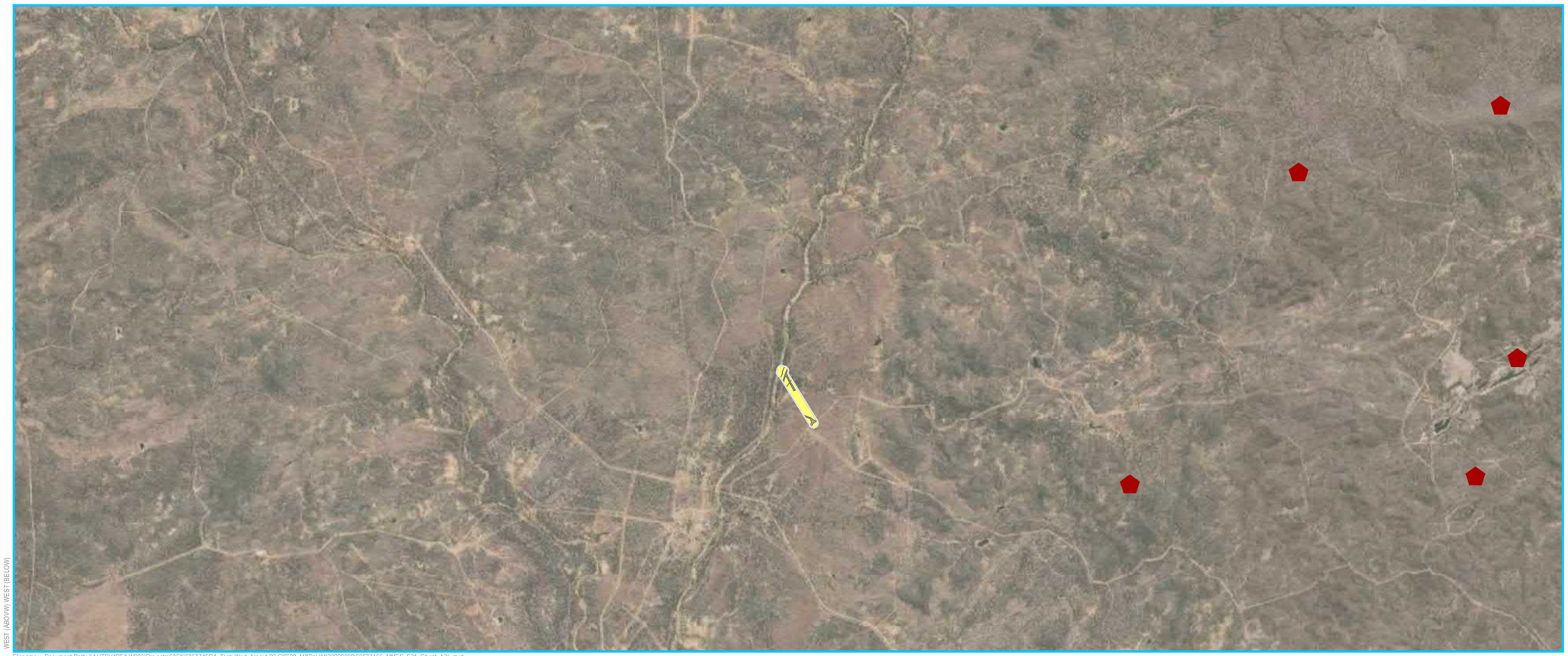
PROJECT ID: 60577456
CREATED BY: JR
LAST MODIFIED: JB - 16/03/2022
VERSION: 1

Figure F21.5

A3 size

ABOVE SHEET- 11

BELOW SHEET- 12



WEST (ABOVE\ WEST (BELOW)

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

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

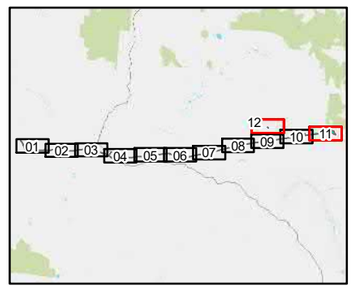
1:55,000 (when printed at A3)

Legend

- Study Area
- DoR Mineral Resource Sites - Abandoned mines

Ghost bat potential habitat

- Potential dispersal habitat



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GHOST BAT POTENTIAL HABITAT

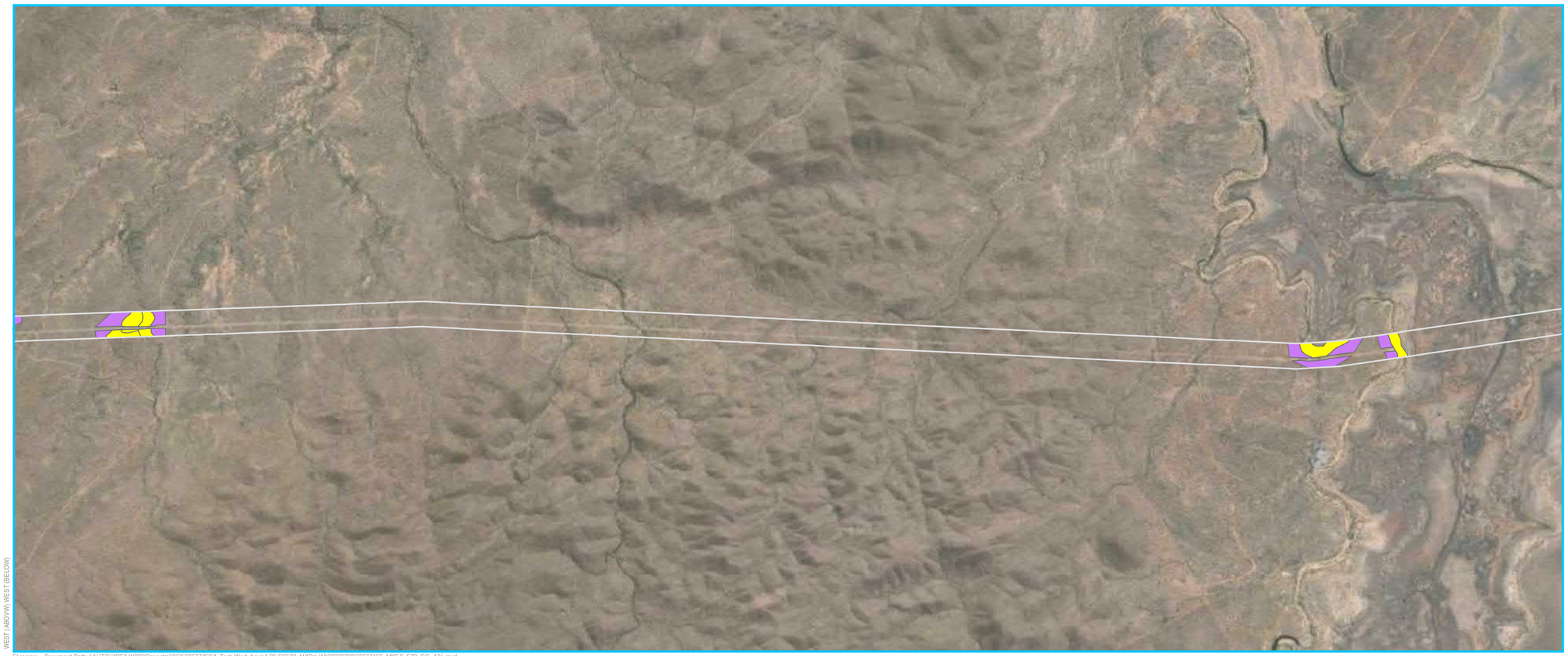
PROJECT ID: 60577456
CREATED BY: JR
LAST MODIFIED: JB - 16/03/2022
VERSION: 1

Figure F21.6

A3 size

ABOVE SHEET- 01

BELOW SHEET- 02



WEST (ABOVE) WEST (BELOW)

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

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

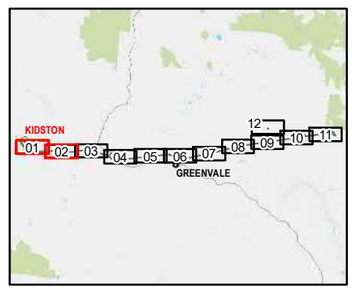
1:55,000 (when printed at A3)

Legend

- Study Area
- Greater Glider Location

Greater glider potential habitat

- Known breeding and foraging habitat
- Known foraging and dispersal habitat



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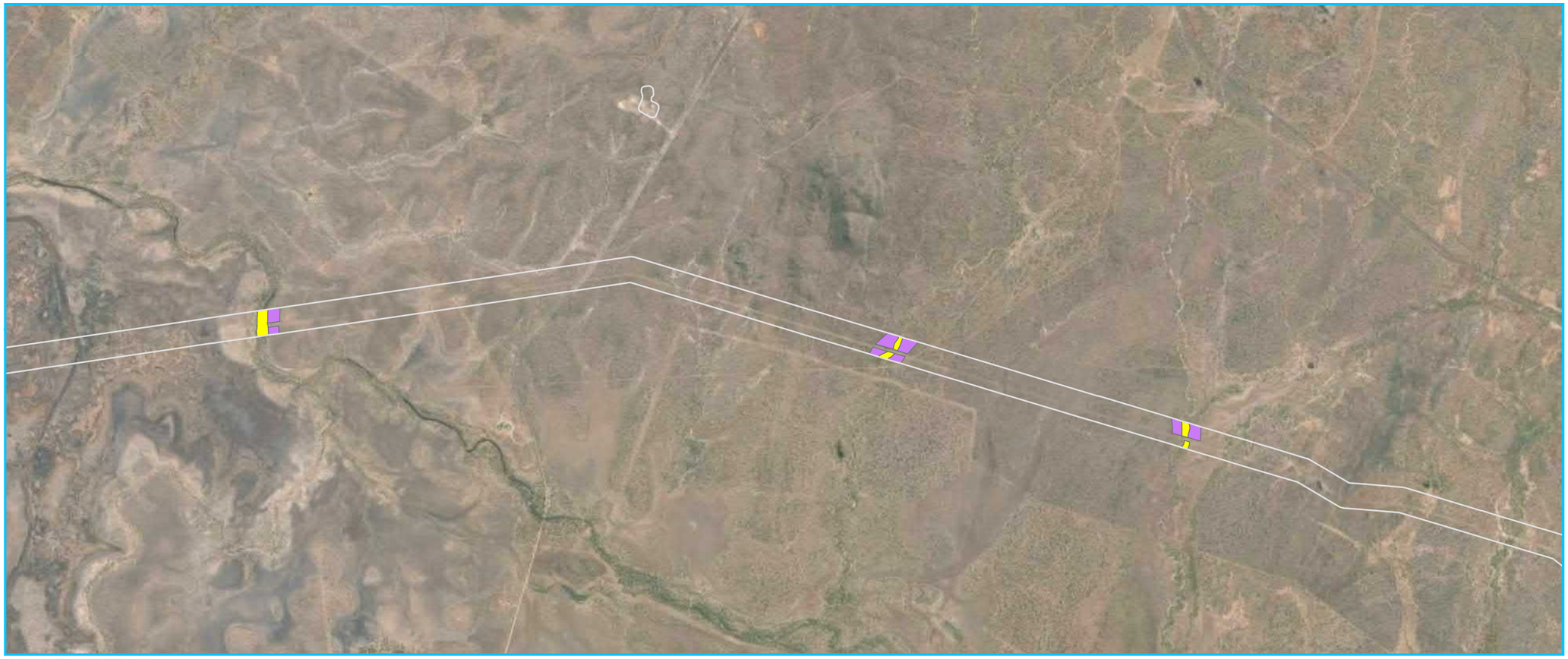
GREATER GLIDER POTENTIAL HABITAT

PROJECT ID: 60577456
CREATED BY: JR
LAST MODIFIED: JB - 21/03/2022
VERSION: 1

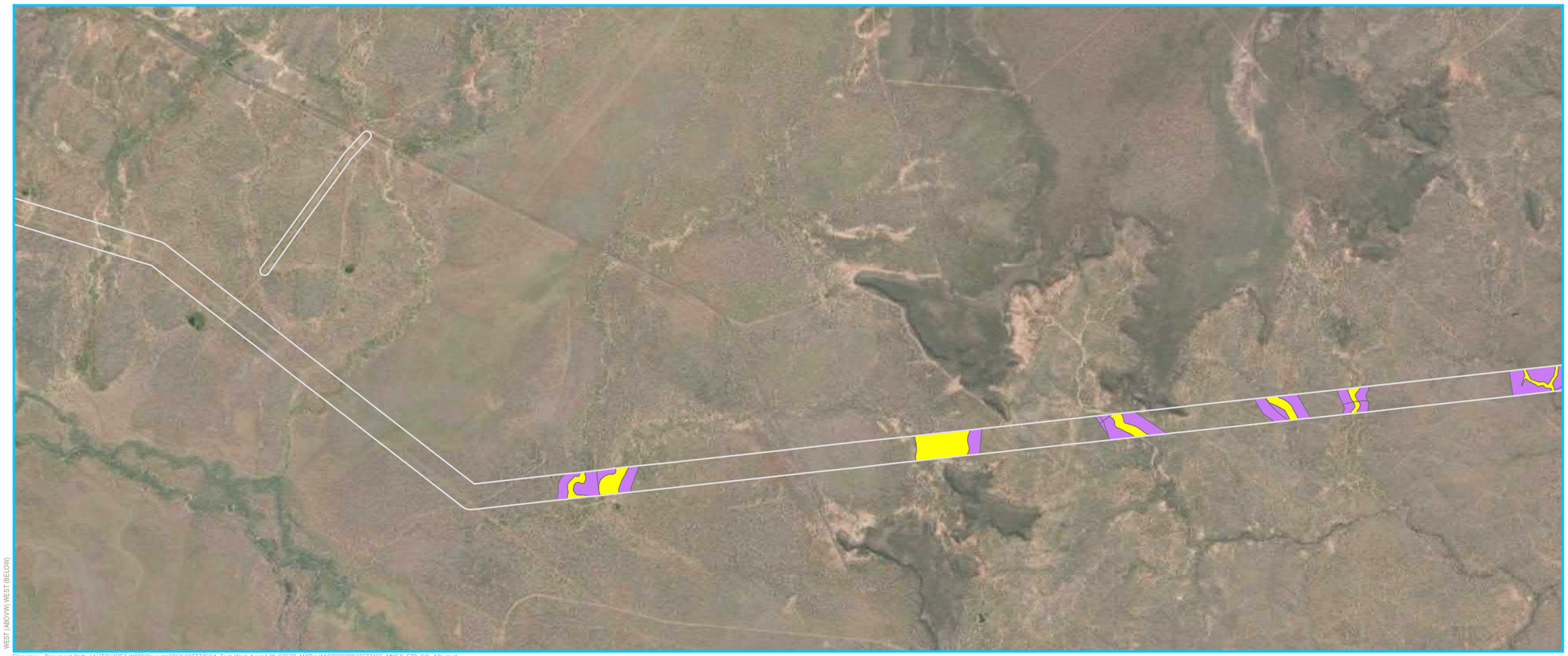
Figure F22.1

A3 size



ABOVE SHEET- 03

BELOW SHEET- 04



WEST (ABOVE) WEST (BELOW)

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

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

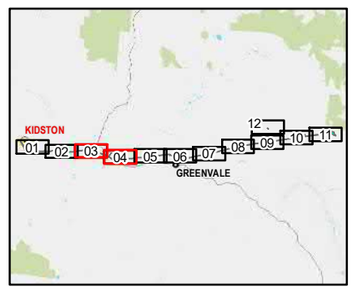
1:55,000 (when printed at A3)

Legend

- Study Area
- Greater Glider Location

Greater glider potential habitat

- Known breeding and foraging habitat
- Known foraging and dispersal habitat



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GREATER GLIDER POTENTIAL HABITAT

PROJECT ID: 60577456
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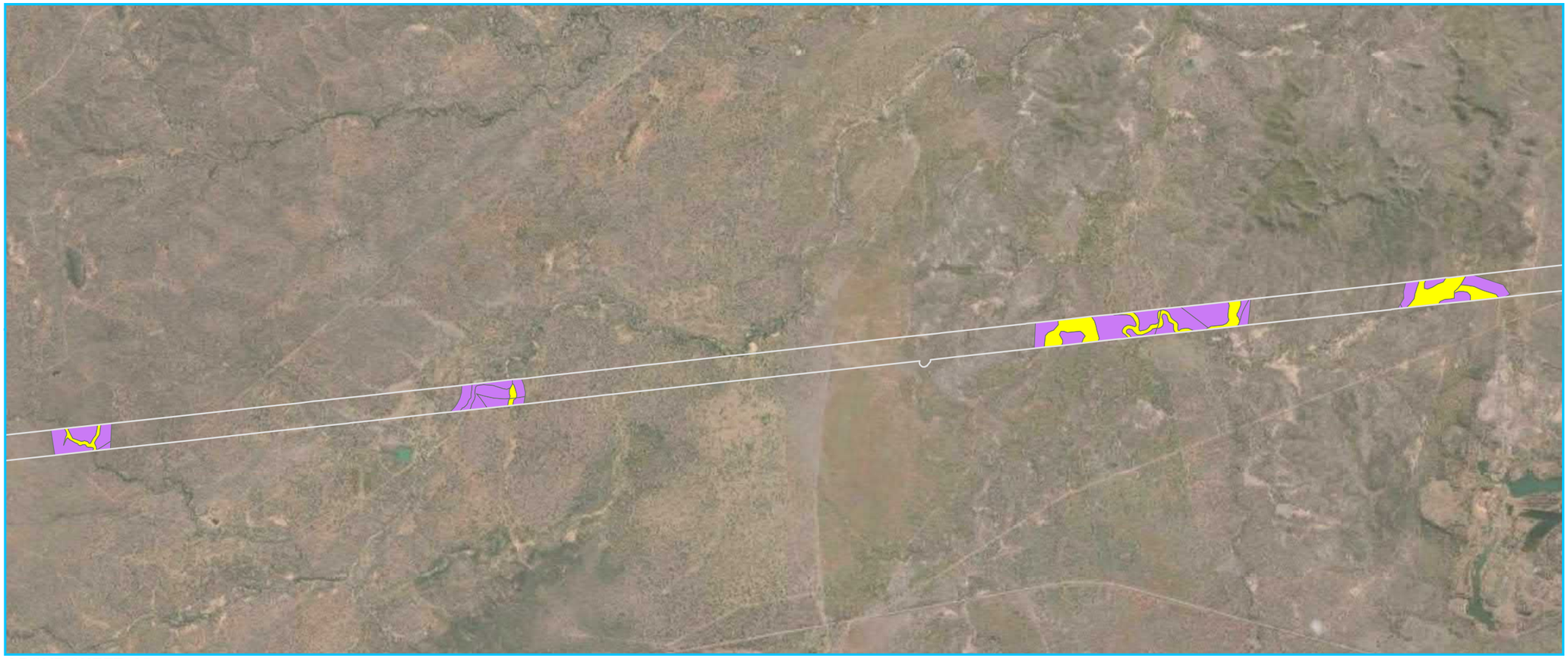
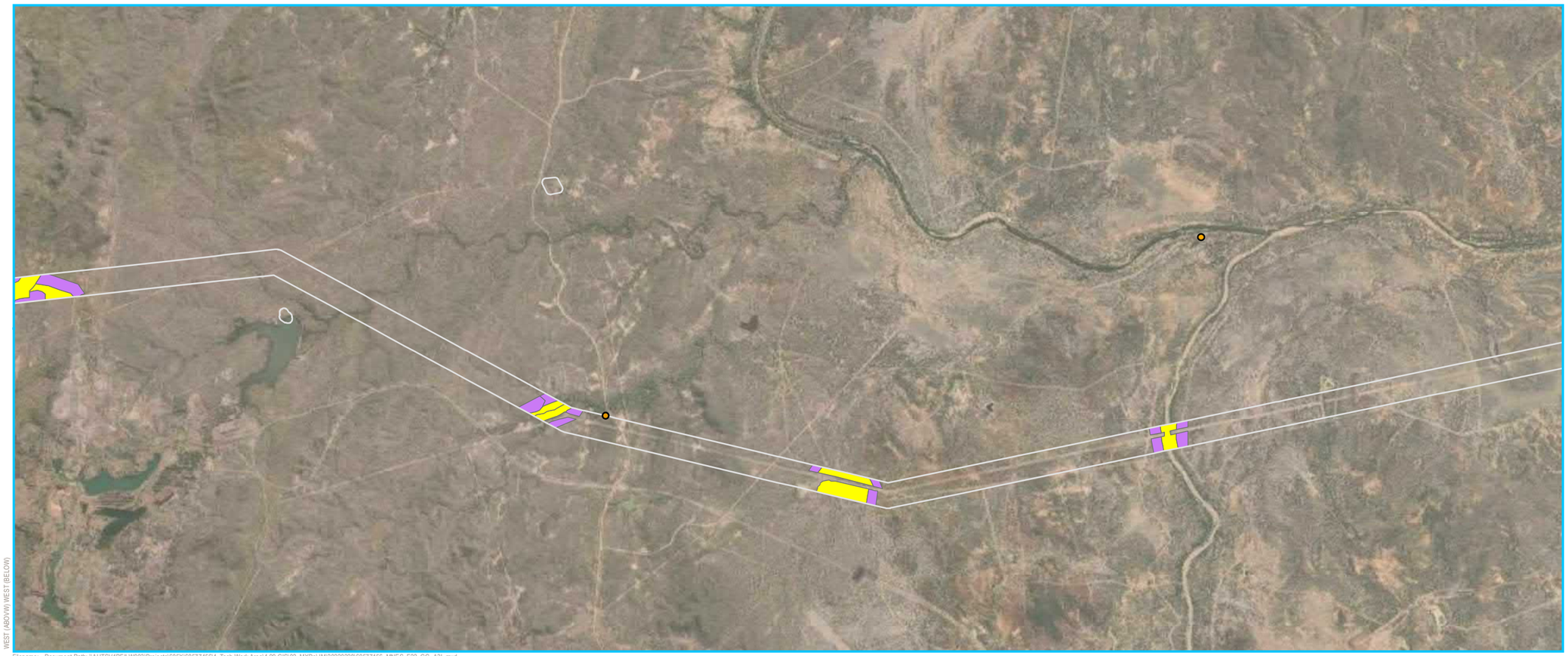
Figure F22.2

A3 size



ABOVE SHEET- 05

BELOW SHEET- 06



WEST (ABOVE) WEST (BELOW)

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

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

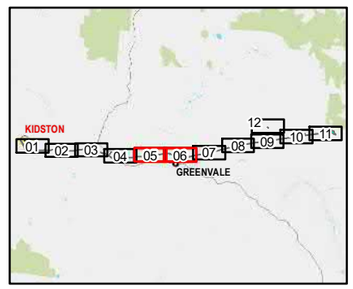
1:55,000 (when printed at A3)

Legend

- Study Area
- Greater Glider Location

Greater glider potential habitat

- Known breeding and foraging habitat
- Known foraging and dispersal habitat



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GREATER GLIDER POTENTIAL HABITAT

PROJECT ID: 60577456
CREATED BY: JR
LAST MODIFIED: JB - 21/03/2022
VERSION: 1

Figure F22.3

A3 size

ABOVE SHEET- 07

BELOW SHEET- 08

WEST (ABOVE) WEST (BELOW)

Filename: Document Path: \\AUTSV1PFILW003\Projects\605X\605774564. Tech Work Area\4.99 GIS\02_MXDs\JM\20220228\60577456_MNES_F22_GG_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

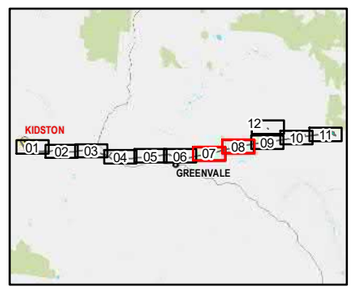
1:55,000 (when printed at A3)

Legend

- Study Area
- Greater Glider Location

Greater glider potential habitat

- Known breeding and foraging habitat
- Known foraging and dispersal habitat



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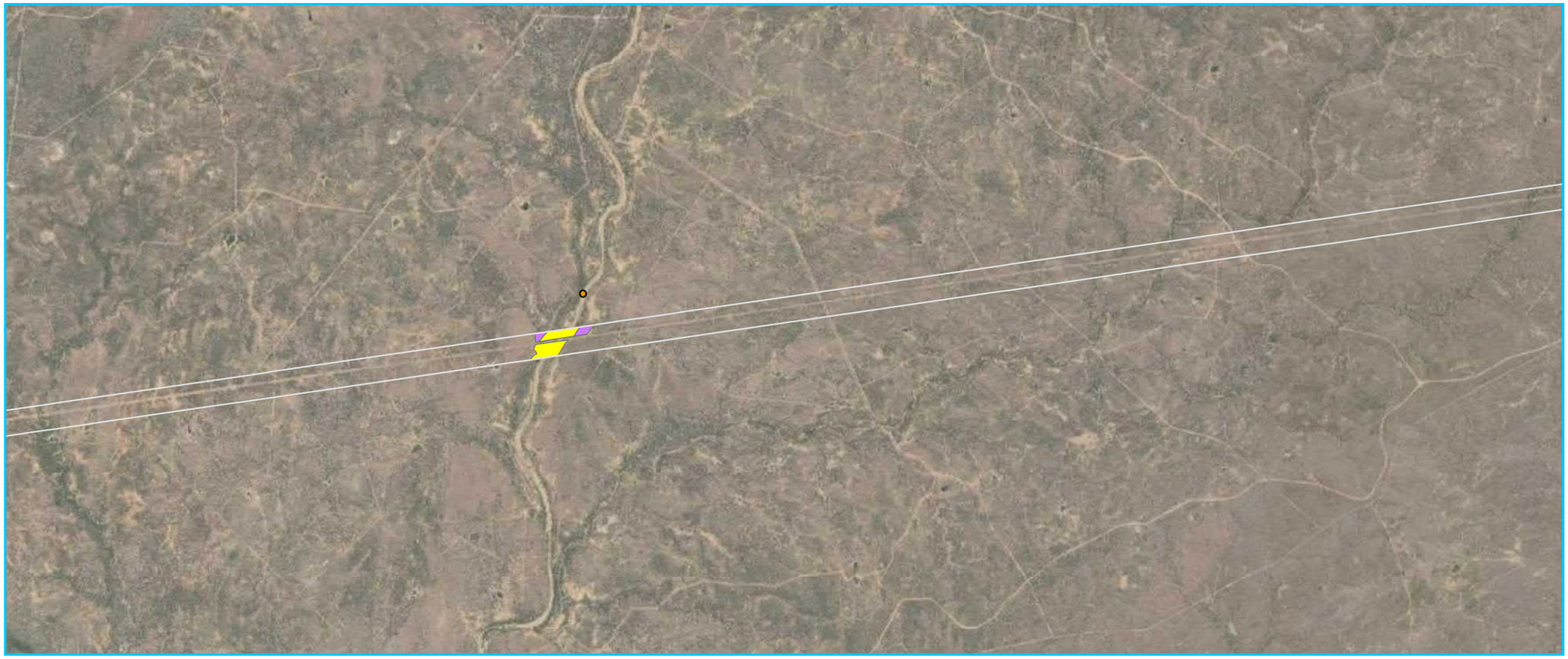
GREATER GLIDER POTENTIAL HABITAT

PROJECT ID: 60577456
CREATED BY: JR
LAST MODIFIED: JB - 21/03/2022
VERSION: 1

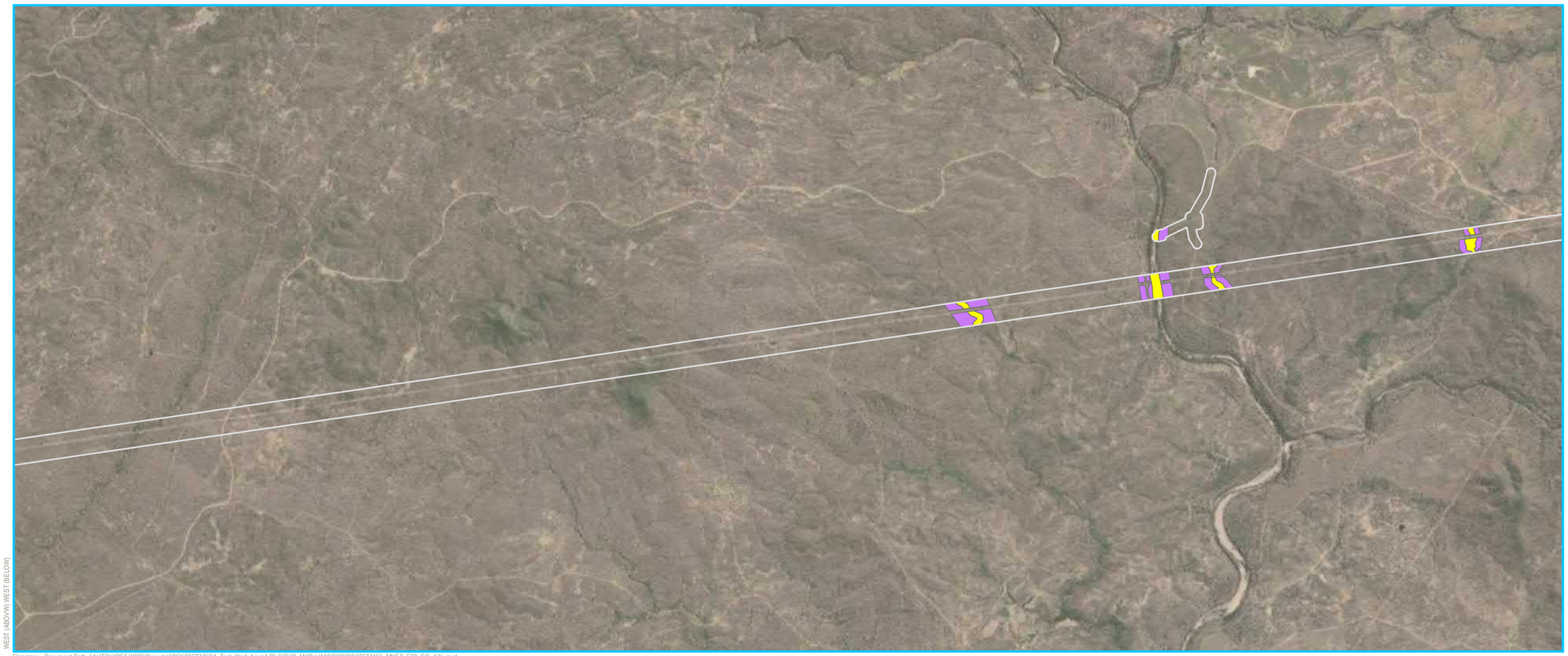
Figure F22.4

A3 size



ABOVE SHEET- 09

BELOW SHEET- 10



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

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

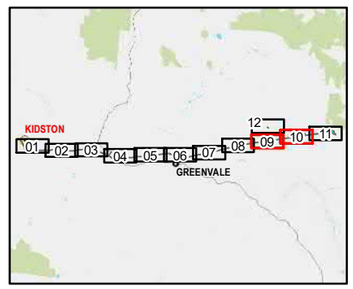
1:55,000 (when printed at A3)

Legend

- Study Area
- Greater Glider Location

Greater glider potential habitat

- Known breeding and foraging habitat
- Known foraging and dispersal habitat



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GREATER GLIDER POTENTIAL HABITAT

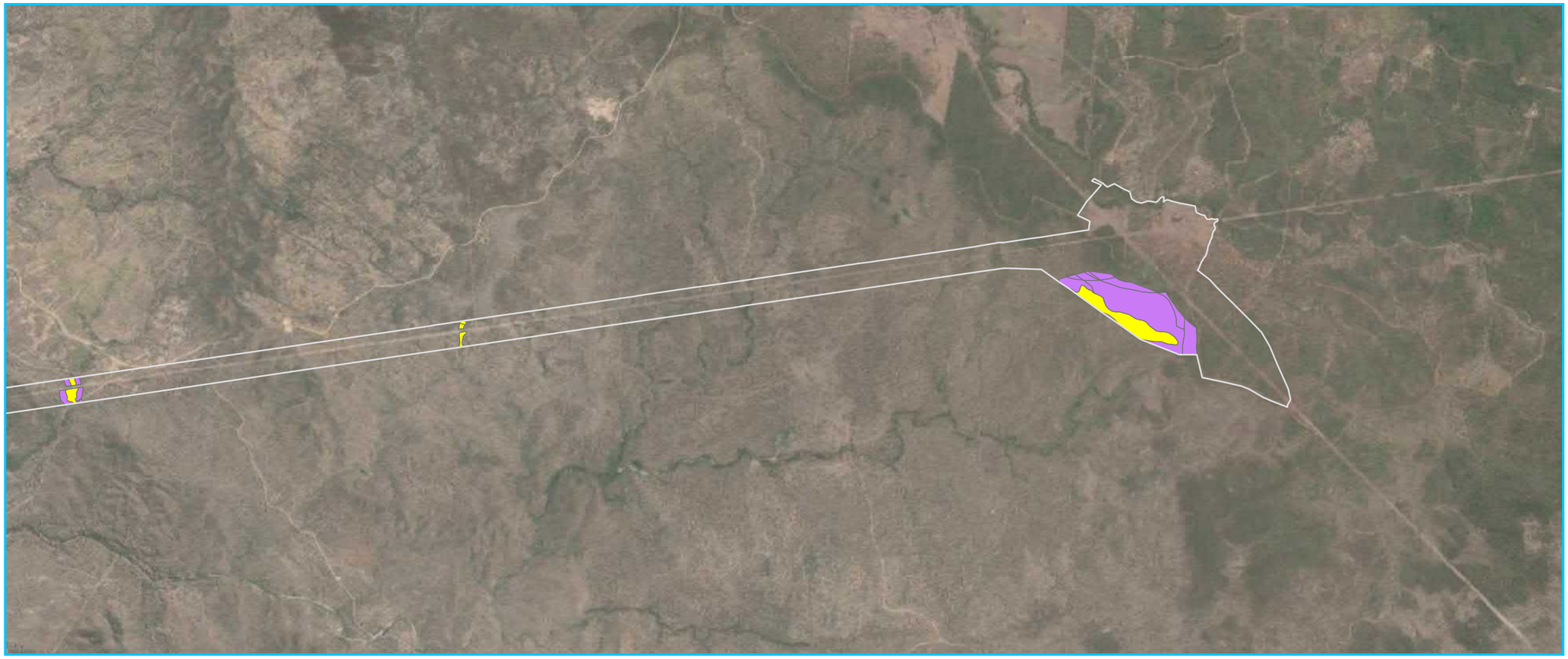
PROJECT ID: 60577456
CREATED BY: JR
LAST MODIFIED: JB - 21/03/2022
VERSION: 1

Figure F22.5

A3 size

WEST (ABOVE) WEST (BELOW)

Filename: Document Path: \\AUTSV1PFILW003\Projects\605X\605774564. Tech Work Area\4.99 GIS\02_MXDs\JM\20220228\60577456_MNES_F22_GG_A3L.mxd



ABOVE SHEET- 11

BELOW SHEET- 12

WEST (ABOVE) WEST (BELOW)

Filename: Document Path: \\AUTSV1PFILW003\Projects\605X\605774564\4. Tech Work Area\4.99 GIS\02_MXDs\JM\20220228\60577456_MNES_F22_GG_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

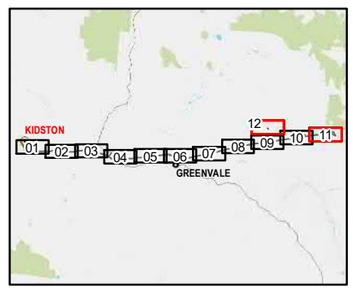
1:55,000 (when printed at A3)

Legend

- Study Area
- Greater Glider Location

Greater glider potential habitat

- Known breeding and foraging habitat
- Known foraging and dispersal habitat



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GREATER GLIDER POTENTIAL HABITAT

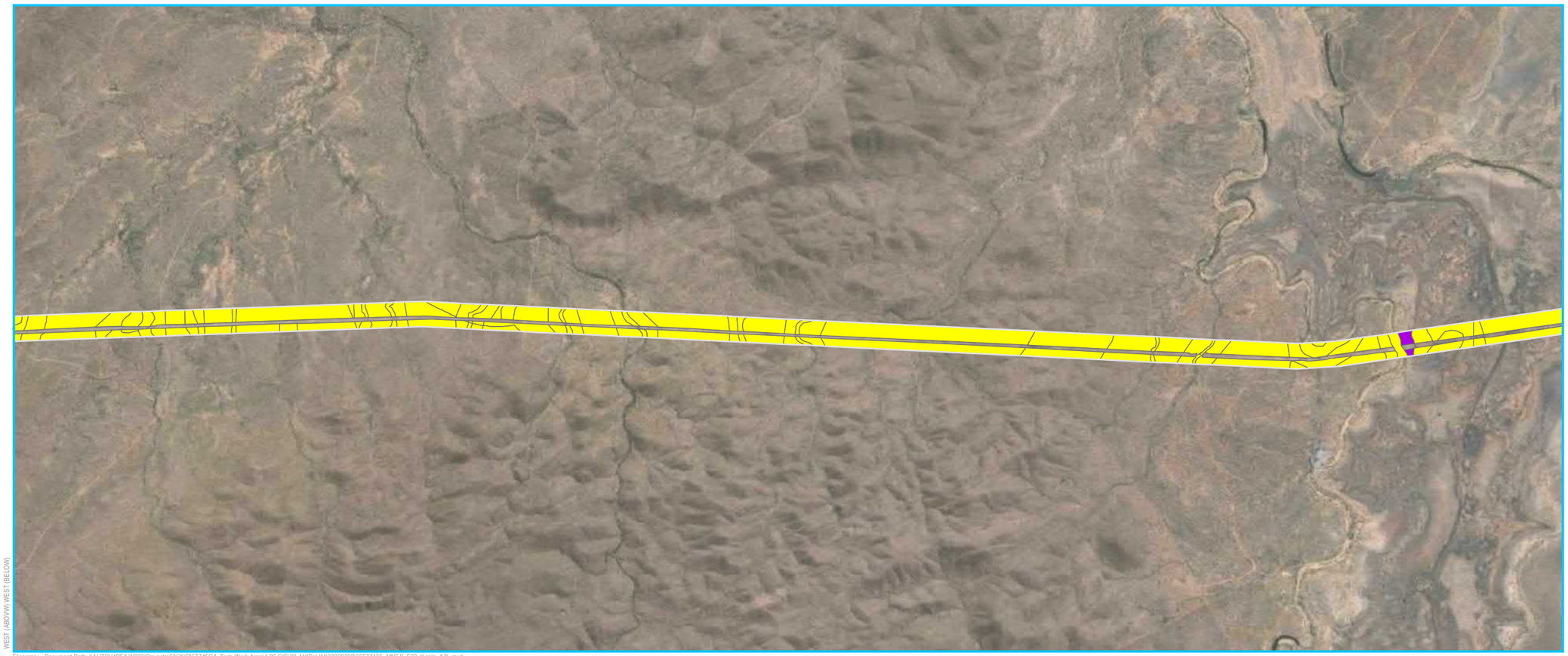
PROJECT ID: 60577456
CREATED BY: JR
LAST MODIFIED: JB - 21/03/2022
VERSION: 1

Figure F22.6

A3 size

ABOVE SHEET- 01

BELOW SHEET- 02



WEST (ABOVE\ WEST (BELOW)

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

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

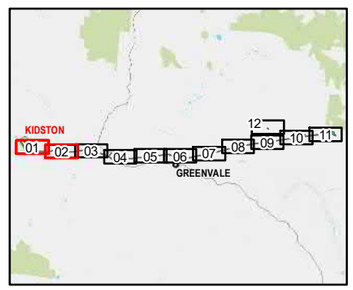
1:55,000 (when printed at A3)

Legend

- Study Area

Koala potential habitat

- Likely refuge habitat
- Likely foraging habitat
- Likely dispersal habitat



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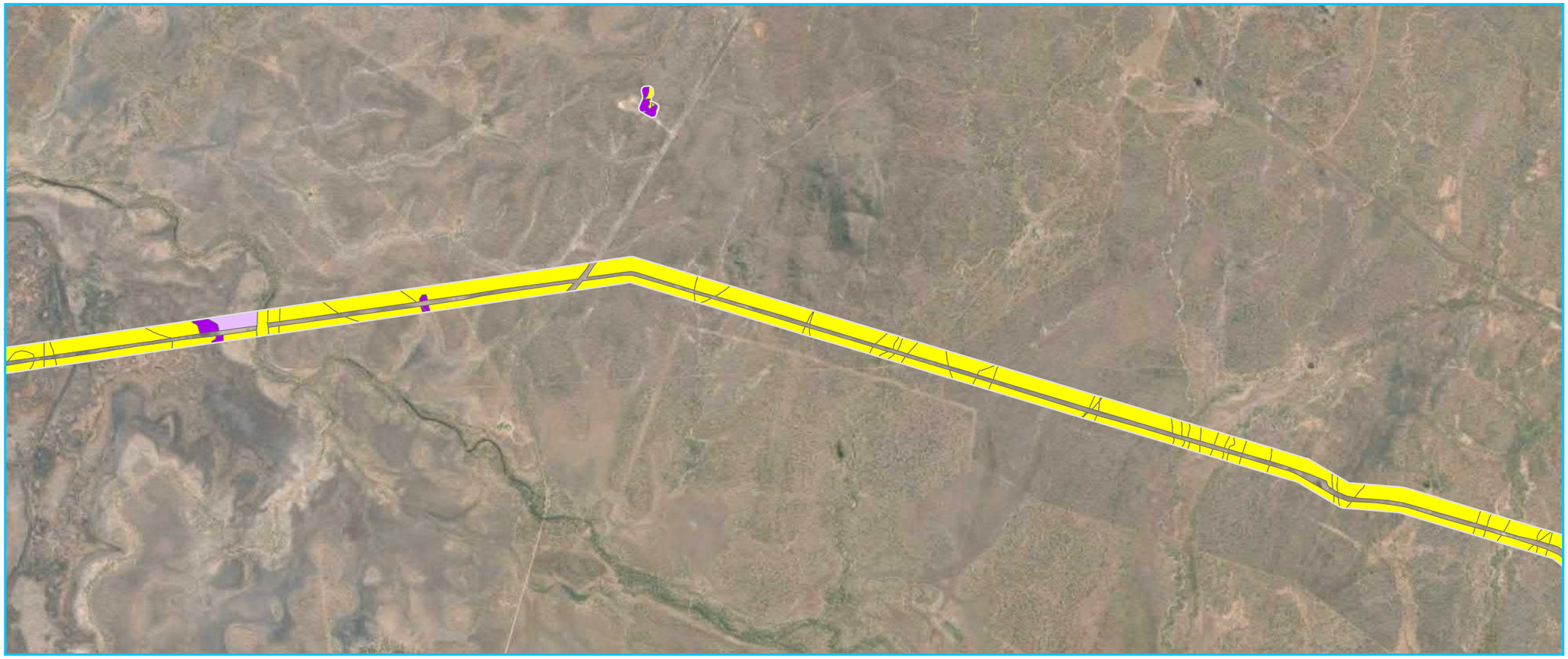
KOALA POTENTIAL HABITAT

PROJECT ID: 60577456
CREATED BY: JR
LAST MODIFIED: JB - 15/03/2022
VERSION: 1

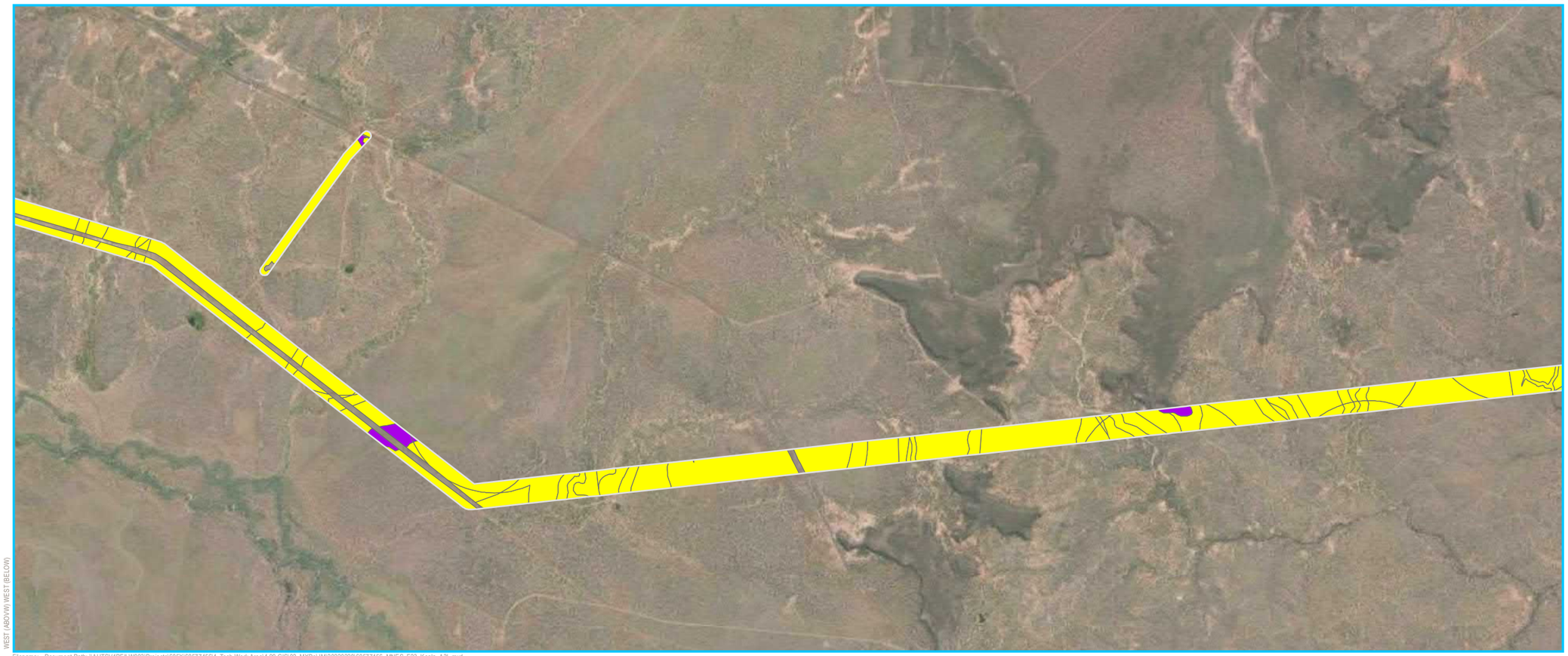
Figure F23.1

A3 size



ABOVE SHEET- 03

BELOW SHEET- 04



WEST (ABOVE) WEST (BELOW)

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

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

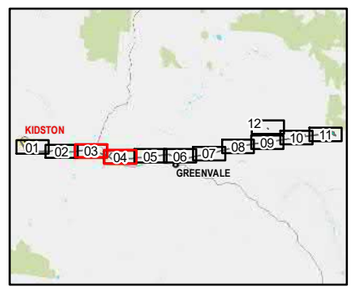
1:55,000 (when printed at A3)

Legend

- Study Area

Koala potential habitat

- Likely refuge habitat
- Likely foraging habitat
- Likely dispersal habitat



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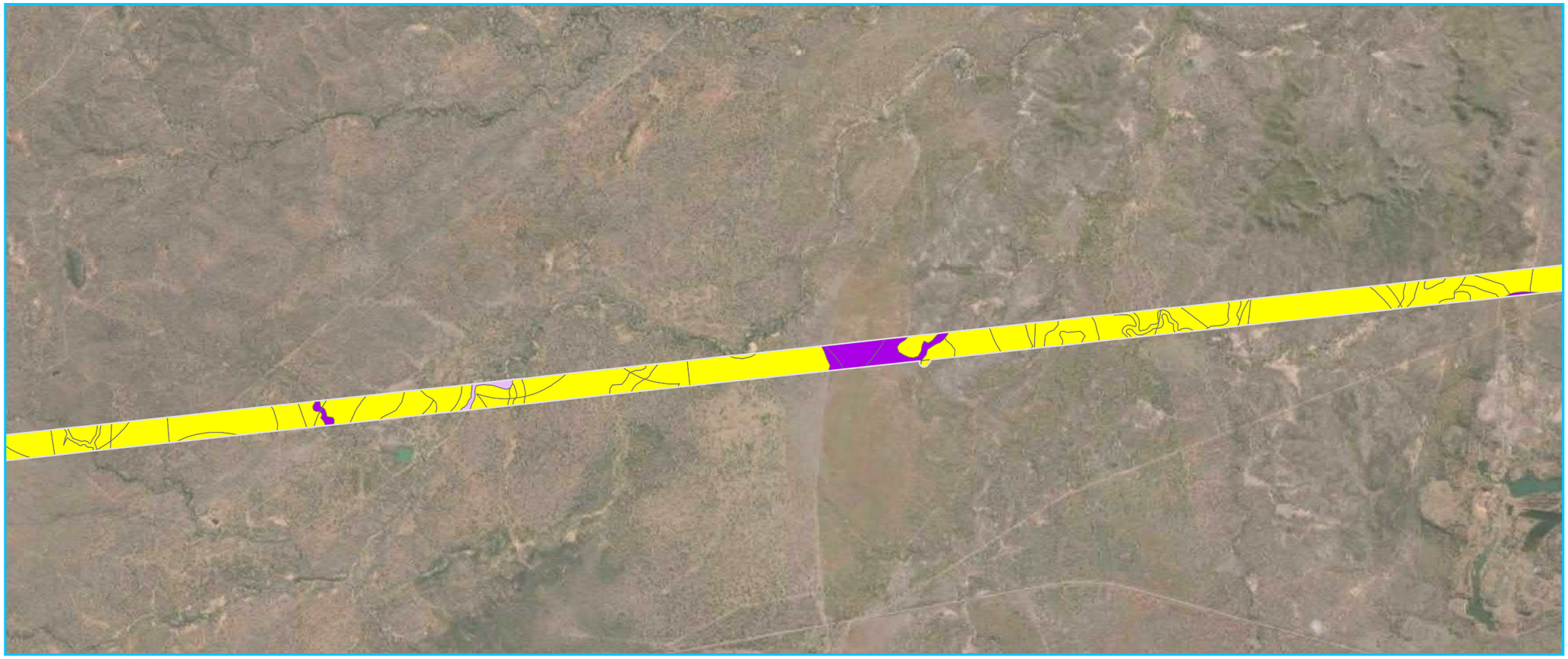
KOALA POTENTIAL HABITAT

PROJECT ID: 60577456
CREATED BY: JR
LAST MODIFIED: JB - 15/03/2022
VERSION: 1

Figure F23.2

A3 size



ABOVE SHEET- 05

BELOW SHEET- 06

WEST (ABOVE\ WEST (BELOW)

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AECOM
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N

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

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

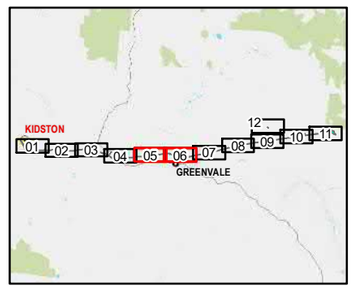
1:55,000 (when printed at A3)

Legend

- Study Area

Koala potential habitat

- Likely refuge habitat
- Likely foraging habitat
- Likely dispersal habitat



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KOALA POTENTIAL HABITAT

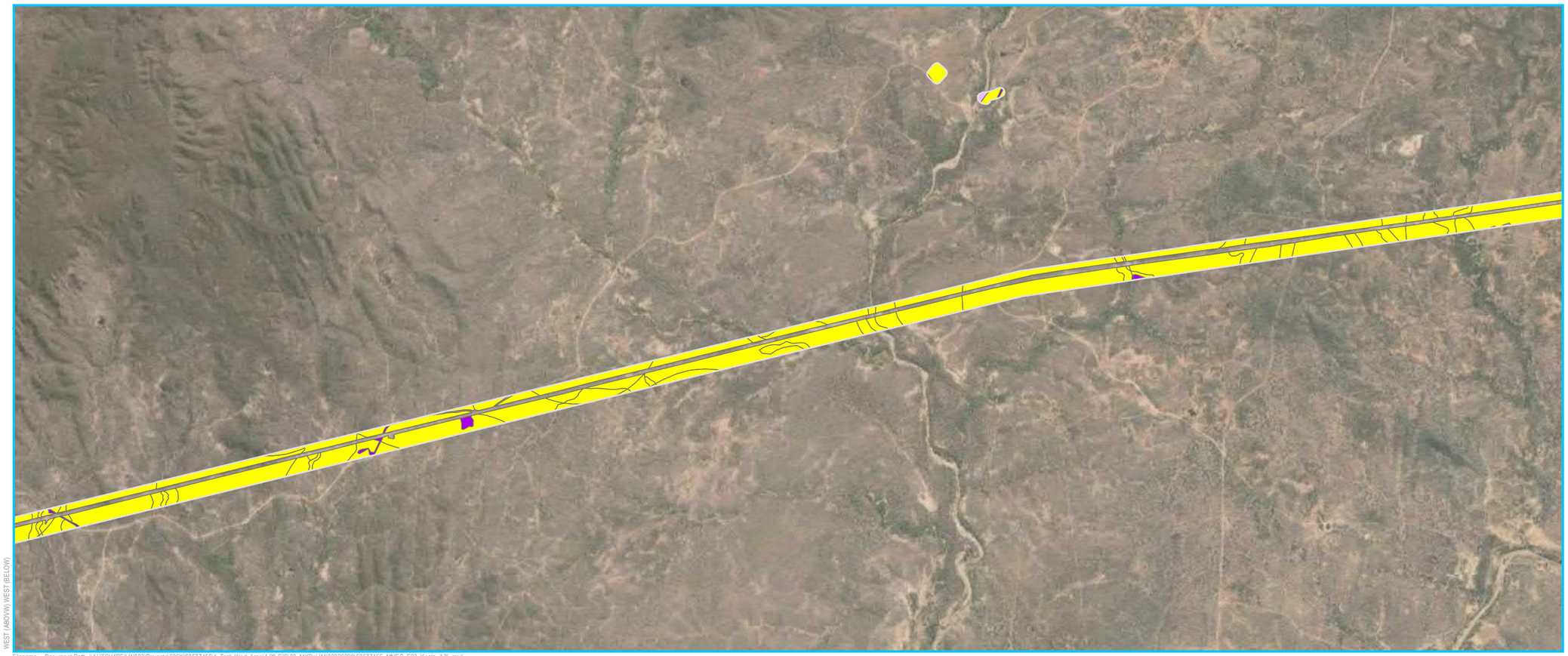
PROJECT ID: 60577456
CREATED BY: JR
LAST MODIFIED: JB - 15/03/2022
VERSION: 1

Figure F23.3

A3 size

ABOVE SHEET- 07

BELOW SHEET- 08



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AECOM
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N

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

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

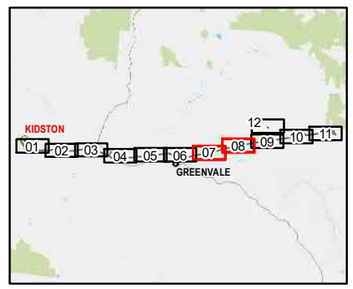
1:55,000 (when printed at A3)

Legend

- Study Area

Koala potential habitat

- Likely refuge habitat
- Likely foraging habitat
- Likely dispersal habitat



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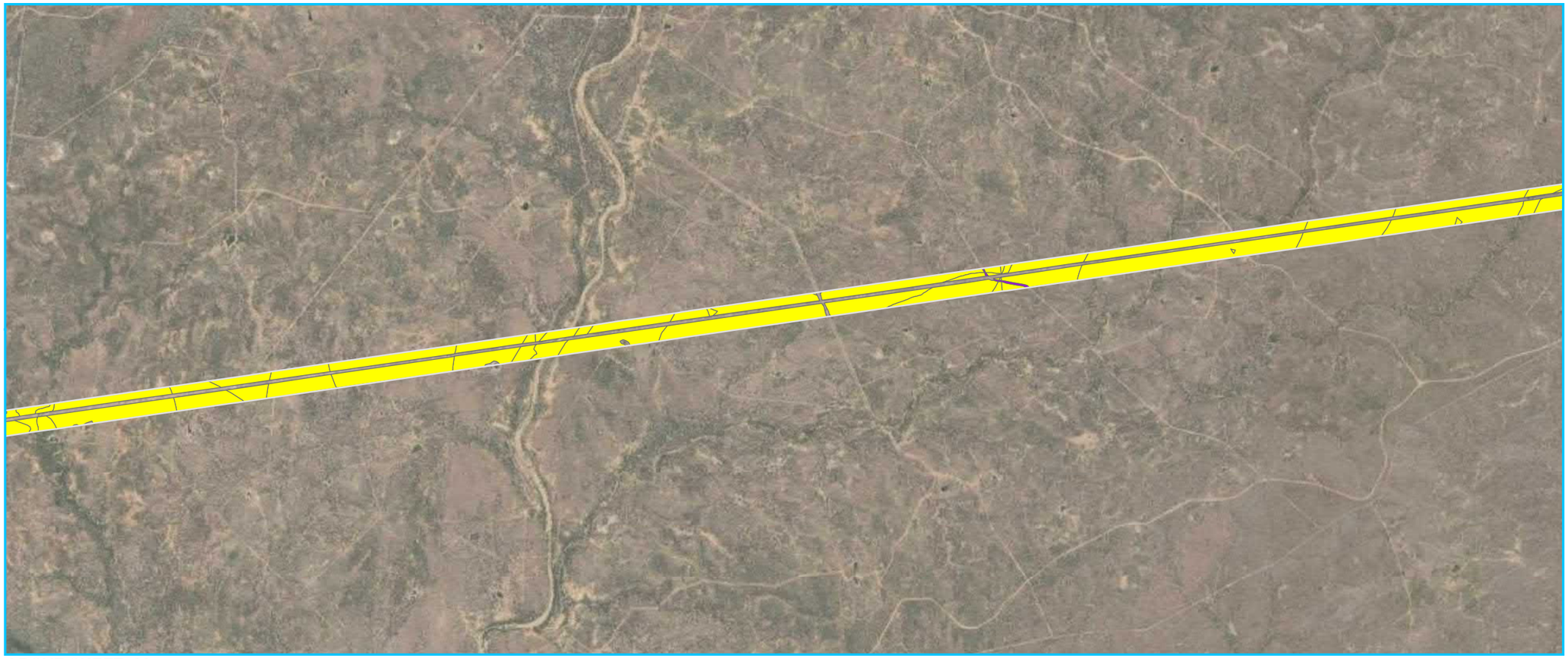
KOALA POTENTIAL HABITAT

PROJECT ID: 60577456
CREATED BY: JR
LAST MODIFIED: JB - 15/03/2022
VERSION: 1

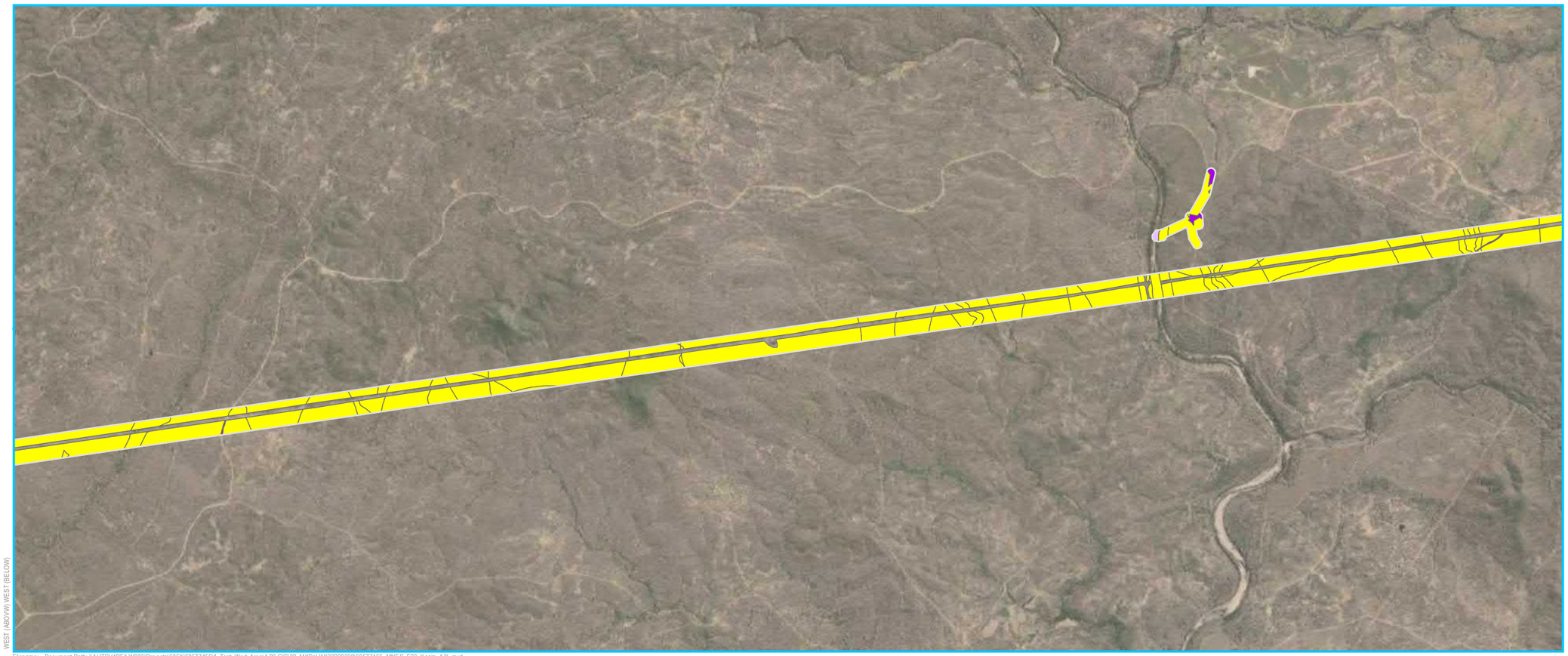
Figure F23.4

A3 size



ABOVE SHEET- 09

BELOW SHEET- 10



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

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

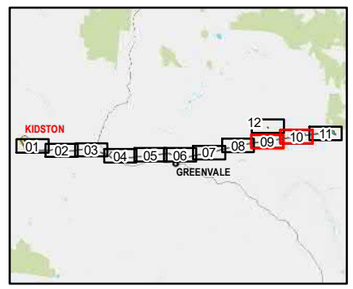
1:55,000 (when printed at A3)

Legend

- Study Area

Koala potential habitat

- Likely refuge habitat
- Likely foraging habitat
- Likely dispersal habitat



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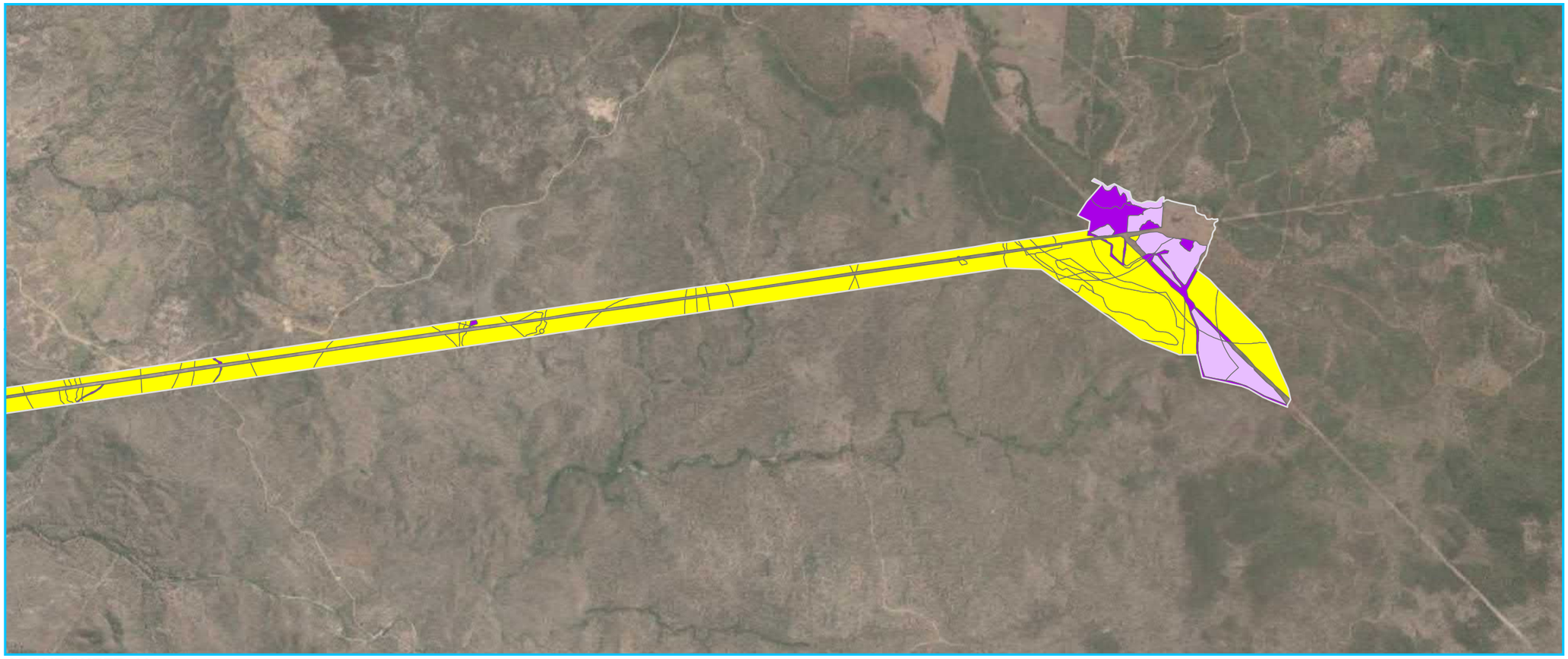
KOALA POTENTIAL HABITAT

PROJECT ID: 60577456
CREATED BY: JR
LAST MODIFIED: JB - 15/03/2022
VERSION: 1

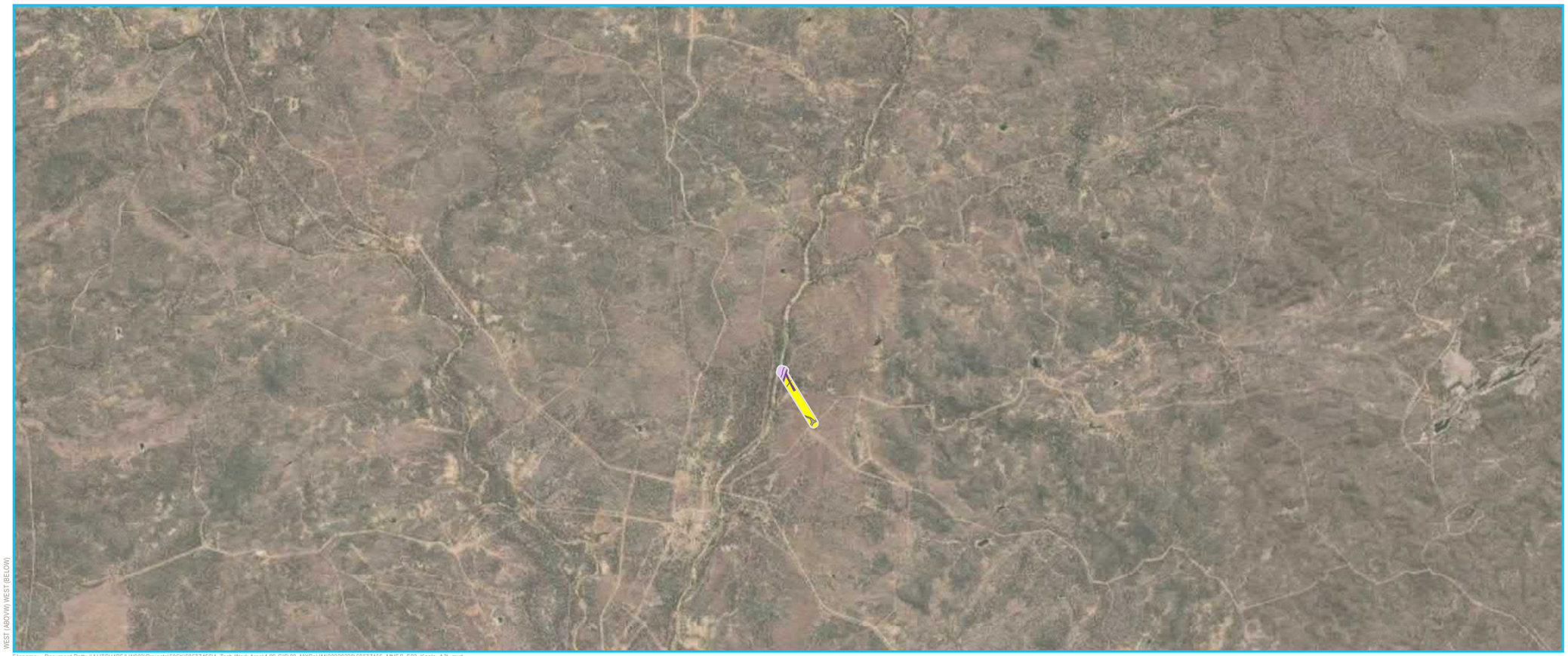
Figure
F23.5

A3 size



ABOVE SHEET- 11

BELOW SHEET- 12



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

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

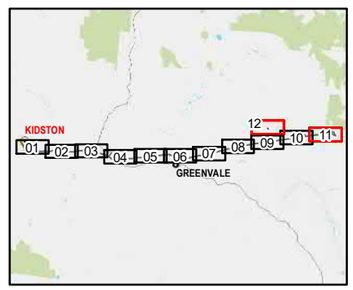
1:55,000 (when printed at A3)

Legend

- Study Area

Koala potential habitat

- Likely refuge habitat
- Likely foraging habitat
- Likely dispersal habitat



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KOALA POTENTIAL HABITAT

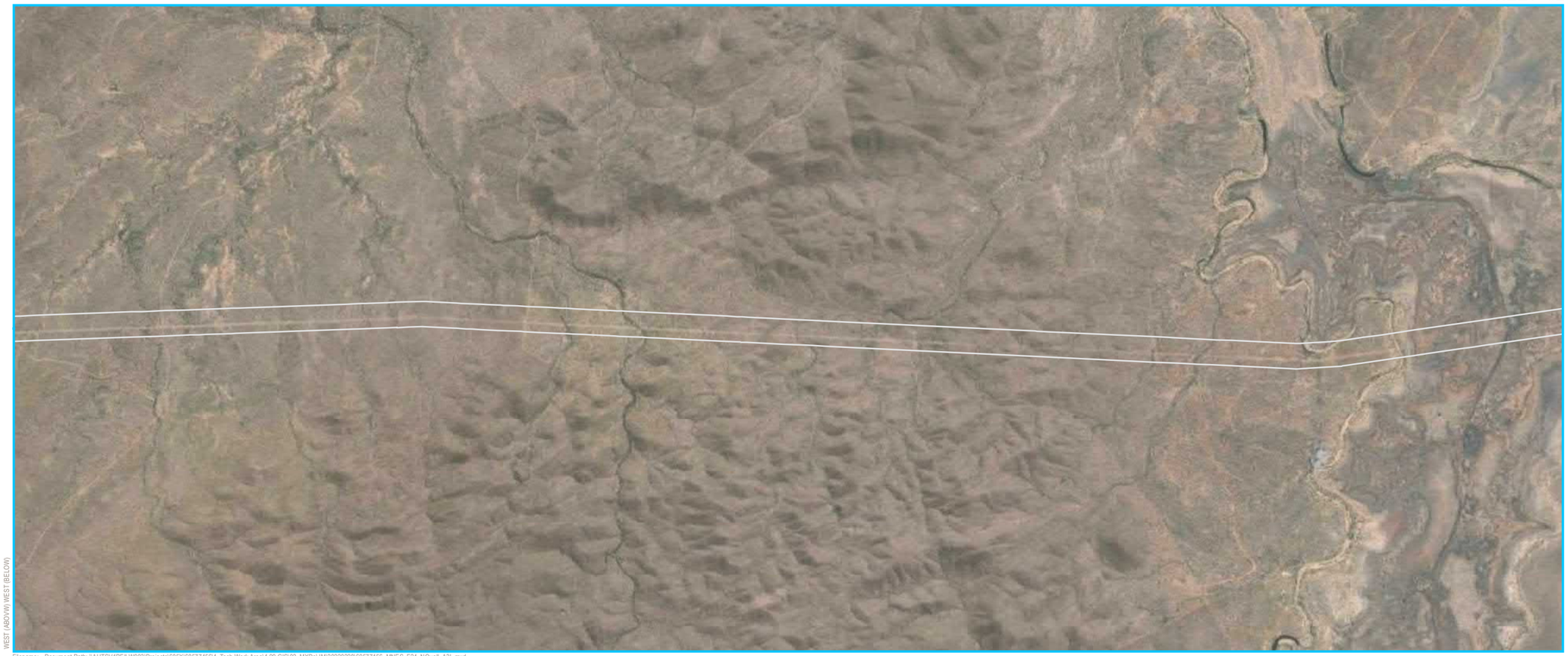
PROJECT ID: 60577456
CREATED BY: JR
LAST MODIFIED: JB - 15/03/2022
VERSION: 1

Figure F23.6

A3 size

ABOVE SHEET- 01

BELOW SHEET- 02



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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)

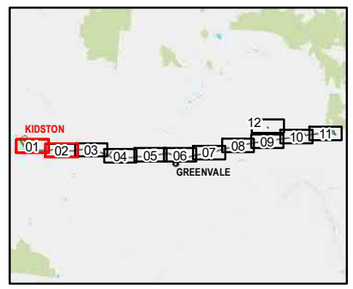
Legend

Study Area

Northern quoll potential habitat

Marginal breeding and refuge habitat

Marginal foraging and dispersal habitat



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Powerlink Kidston Connection Project

NORTHERN QUOLL POTENTIAL HABITAT

PROJECT ID: 60577456
CREATED BY: JR
LAST MODIFIED: JB - 16/03/2022
VERSION: 1

Figure F24.1

A3 size

ABOVE SHEET- 03

BELOW SHEET- 04

WEST (ABOVE) WEST (BELOW)

Filename: Document Path: \\AUTSV1PFILW003\Projects\605X\605774564. Tech Work Area\4.99 GIS\02_MXDs\JM\20220228\60577456_MNES_F24_NQuoll_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)

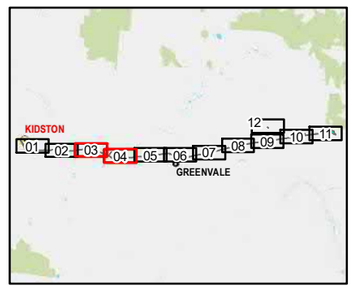
Legend

Study Area

Northern quoll potential habitat

Marginal breeding and refuge habitat

Marginal foraging and dispersal habitat



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NORTHERN QUOLL POTENTIAL HABITAT

PROJECT ID: 60577456
CREATED BY: JR
LAST MODIFIED: JB - 16/03/2022
VERSION: 1

Figure F24.2

A3 size

ABOVE SHEET- 05

BELOW SHEET- 06

WEST (ABOVE) WEST (BELOW)

Filename: Document Path: \\AUTSV1PFILW003\Projects\605X\605774564\4. Tech Work Area\4.99 GIS\02_MXDs\JM\20220228\60577456_MNES_F24_NQuoll_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)

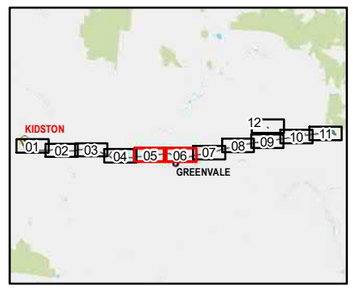
Legend

Study Area

Northern quoll potential habitat

Marginal breeding and refuge habitat

Marginal foraging and dispersal habitat



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NORTHERN QUOLL POTENTIAL HABITAT

PROJECT ID: 60577456
CREATED BY: JR
LAST MODIFIED: JB - 16/03/2022
VERSION: 1

Figure F24.3

A3 size

ABOVE SHEET- 07

BELOW SHEET- 08

WEST (ABOVE) WEST (BELOW)

Filename: Document Path: \\AUTSV1PFILW003\Projects\605X\60577456\4. Tech Work Area\4.99 GIS\02_MXDs\JM\20220228\60577456_MNES_F24_NQuoll_A3L.mxd

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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)

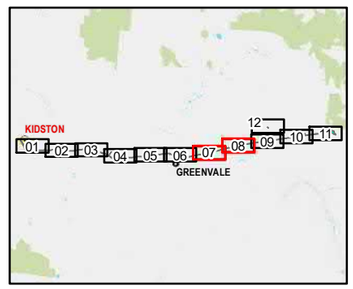
Legend

Study Area

Northern quoll potential habitat

Marginal breeding and refuge habitat

Marginal foraging and dispersal habitat



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NORTHERN QUOLL POTENTIAL HABITAT

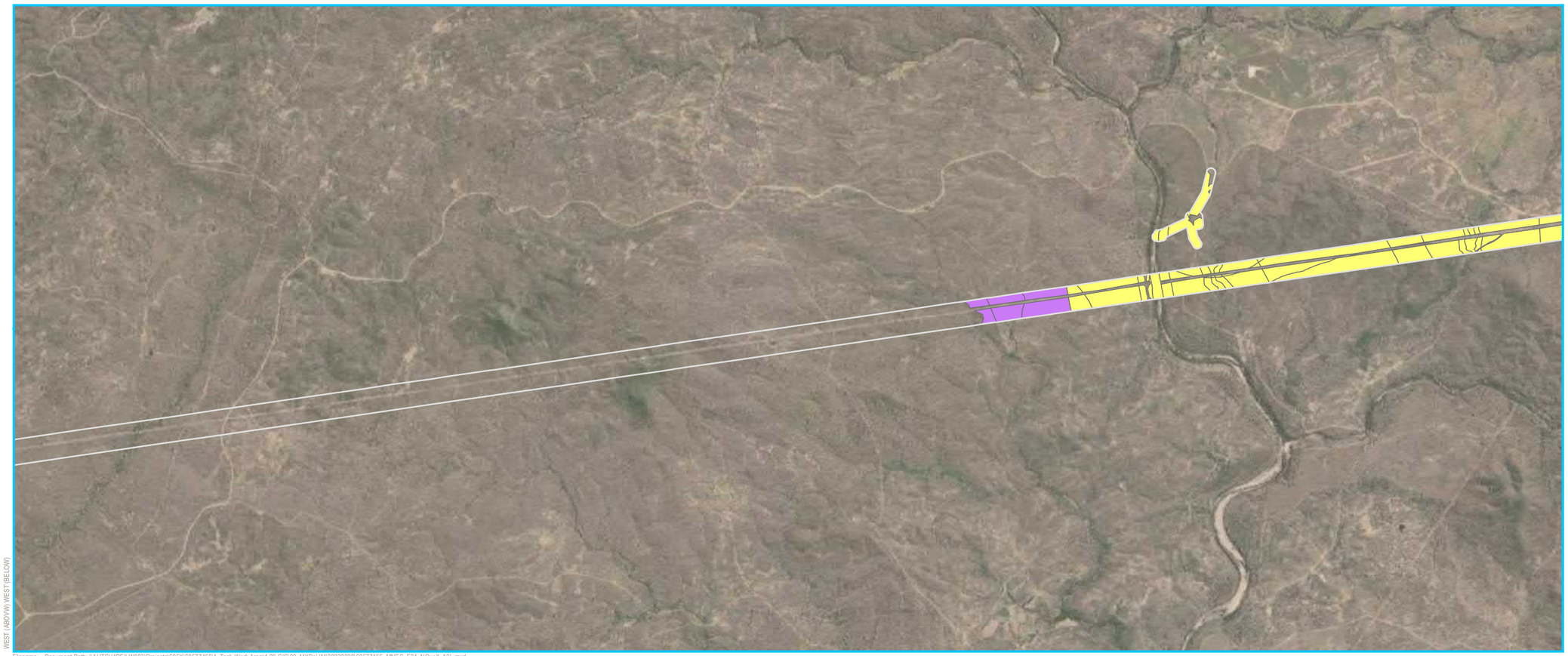
PROJECT ID: 60577456
CREATED BY: JR
LAST MODIFIED: JB - 16/03/2022
VERSION: 1

Figure F24.4

A3 size

ABOVE SHEET- 09

BELOW SHEET- 10



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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)

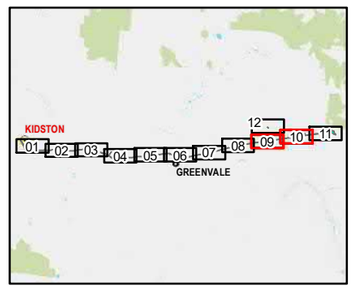
Legend

Study Area

Northern quoll potential habitat

Marginal breeding and refuge habitat

Marginal foraging and dispersal habitat



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NORTHERN QUOLL POTENTIAL HABITAT

PROJECT ID: 60577456
CREATED BY: JR
LAST MODIFIED: JB - 16/03/2022
VERSION: 1

Figure F24.5

A3 size

ABOVE SHEET- 11

BELOW SHEET- 12

WEST (ABOVE) WEST (BELOW)

Filename: Document Path: \\AUTSV1PFILW003\Projects\605X\605774564\4. Tech Work Area\4.99 GIS\02_MXDs\JM\20220228\60577456_MNES_F24_NQuoll_A3L.mxd

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

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Meters

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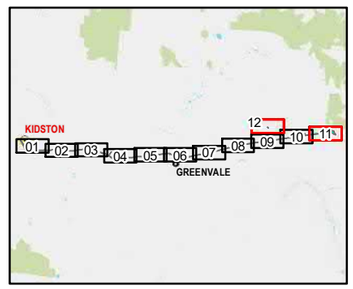
Legend

Study Area

Northern quoll potential habitat

Marginal breeding and refuge habitat

Marginal foraging and dispersal habitat



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NORTHERN QUOLL POTENTIAL HABITAT

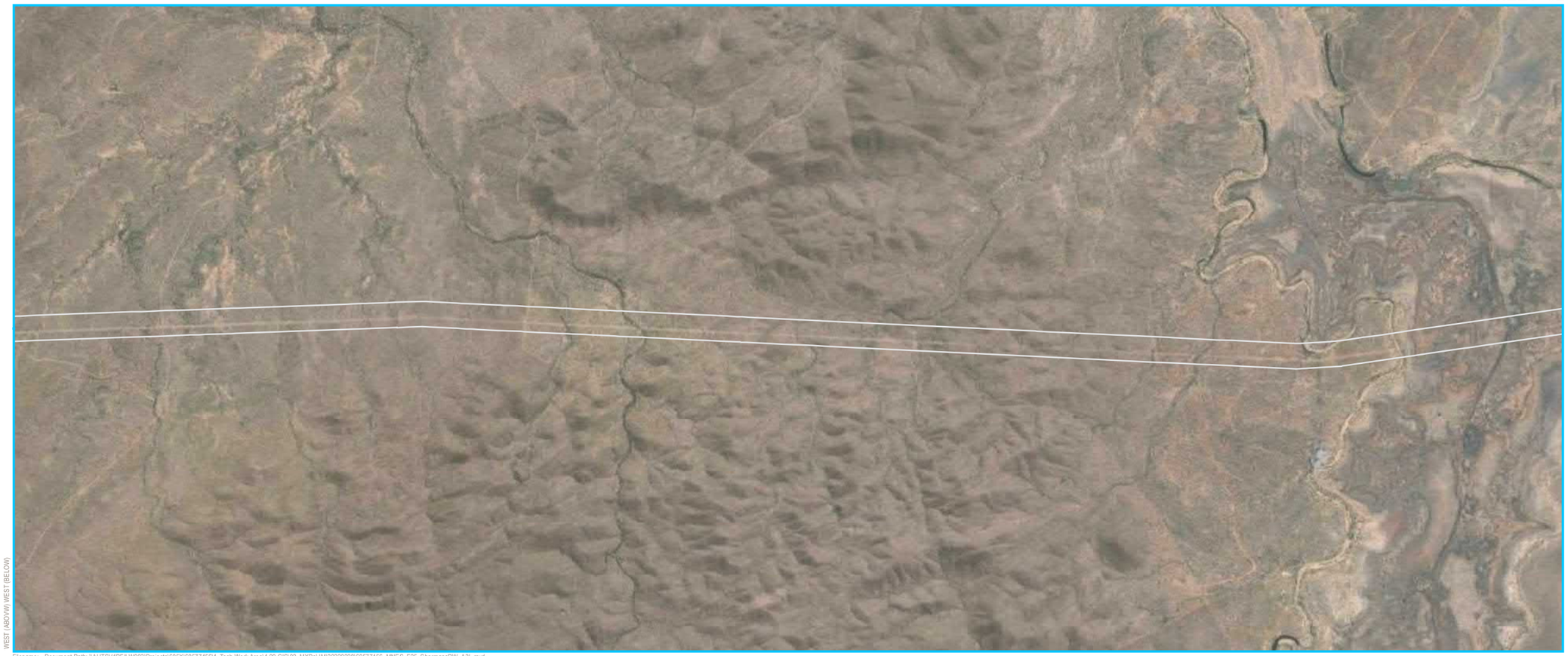
PROJECT ID: 60577456
CREATED BY: JR
LAST MODIFIED: JB - 16/03/2022
VERSION: 1

Figure F24.6

A3 size

ABOVE SHEET- 01

BELOW SHEET- 02



WEST (ABOVE) WEST (BELOW)

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

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

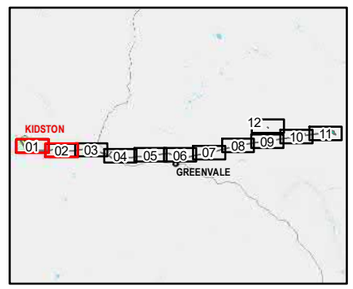
1:55,000 (when printed at A3)

Legend

- Study Area
- Sharman's rock wallaby sighting

Sharman rock wallaby

- Known breeding habitat
- Known foraging and dispersal habitat



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SHARMAN'S ROCK WALLABY POTENTIAL HABITAT

PROJECT ID: 60577456
CREATED BY: JR
LAST MODIFIED: JB - 21/03/2022
VERSION: 1

Figure
F25.1

A3 size

ABOVE SHEET- 03

BELOW SHEET- 04

WEST (ABOVE) WEST (BELOW)

Filename: Document Path: \\AUTSV1PFILW003\Projects\605X\605774564\4. Tech Work Area\4.99 GIS\02_MXDs\JM\20220228\60577456_MNES_F25_SharmansRW_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

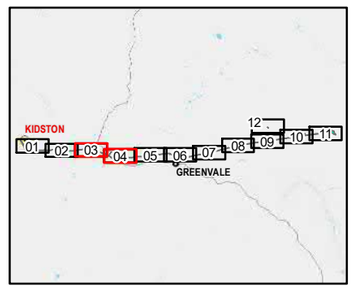
1:55,000 (when printed at A3)

Legend

- Study Area
- Sharman's rock wallaby sighting

Sharman rock wallaby

- Known breeding habitat
- Known foraging and dispersal habitat



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SHARMAN'S ROCK WALLABY POTENTIAL HABITAT

PROJECT ID: 60577456
CREATED BY: JR
LAST MODIFIED: JB - 21/03/2022
VERSION: 1

Figure F25.2

A3 size

ABOVE SHEET- 05

BELOW SHEET- 06

WEST (ABOVE) WEST (BELOW)

Filename: Document Path: \\AUTSV1PFILW003\Projects\605X\605774564\4. Tech Work Area\4.99 GIS\02_MXDsJJM\20220228\60577456_MNES_F25_SharmansRW_A3L.mxd

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N

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

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

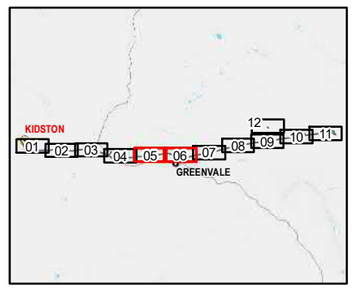
1:55,000 (when printed at A3)

Legend

- Study Area
- Sharman's rock wallaby sighting

Sharman rock wallaby

- Known breeding habitat
- Known foraging and dispersal habitat



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Powerlink Kidston Connection Project

SHARMAN'S ROCK WALLABY POTENTIAL HABITAT

PROJECT ID: 60577456
CREATED BY: JR
LAST MODIFIED: JB - 21/03/2022
VERSION: 1

Figure F25.3

A3 size

ABOVE SHEET- 07

BELOW SHEET- 08

WEST (ABOVE) WEST (BELOW)

Filename: Document Path: \\AUTSV1PFILW003\Projects\605X\605774564. Tech Work Area\4.99 GIS\02_MXDs\JM\20220228\60577456_MNES_F25_SharmansRW_A3L.mxd

AECOM
www.aecom.com

N

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

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

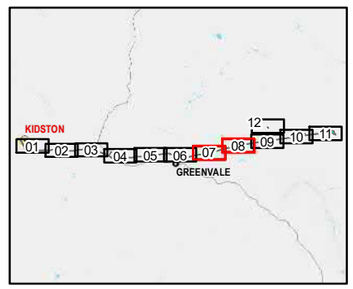
1:55,000 (when printed at A3)

Legend

- Study Area
- Sharman's rock wallaby sighting

Sharman rock wallaby

- Known breeding habitat
- Known foraging and dispersal habitat



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SHARMAN'S ROCK WALLABY POTENTIAL HABITAT

PROJECT ID: 60577456
CREATED BY: JR
LAST MODIFIED: JB - 21/03/2022
VERSION: 1

Figure F25.4

A3 size

ABOVE SHEET- 09

BELOW SHEET- 10

WEST (ABOVE\ WEST (BELOW)

Filename: Document Path: \\AUTSV1PFILW003\Projects\605X\605774564. Tech Work Area\4.99 GIS\02_MXDs\JM\20220228\60577456_MNES_F25_SharmansRW_A3L.mxd

AECOM
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N

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

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

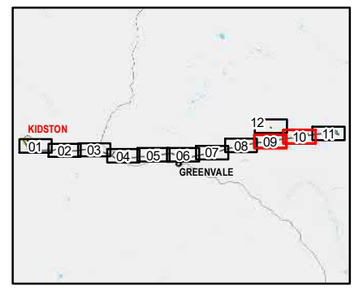
1:55,000 (when printed at A3)

Legend

- Study Area
- Sharman's rock wallaby sighting

Sharman rock wallaby

- Known breeding habitat
- Known foraging and dispersal habitat



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SHARMAN'S ROCK WALLABY POTENTIAL HABITAT

PROJECT ID: 60577456
CREATED BY: JR
LAST MODIFIED: JB - 21/03/2022
VERSION: 1

Figure
F25.5

A3 size

ABOVE SHEET- 11

BELOW SHEET- 12

WEST (ABOVE) WEST (BELOW)

Filename: Document Path: \\AUTSV1PFILW003\Projects\605X\605774564\4. Tech Work Area\4.99 GIS\02_MXDs\JM\20220228\60577456_MNES_F25_SharmansRW_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

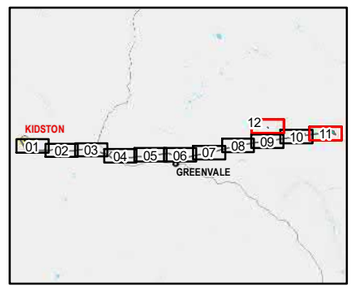
1:55,000 (when printed at A3)

Legend

- Study Area
- Sharman's rock wallaby sighting

Sharman rock wallaby

- Known breeding habitat
- Known foraging and dispersal habitat



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SHARMAN'S ROCK WALLABY POTENTIAL HABITAT

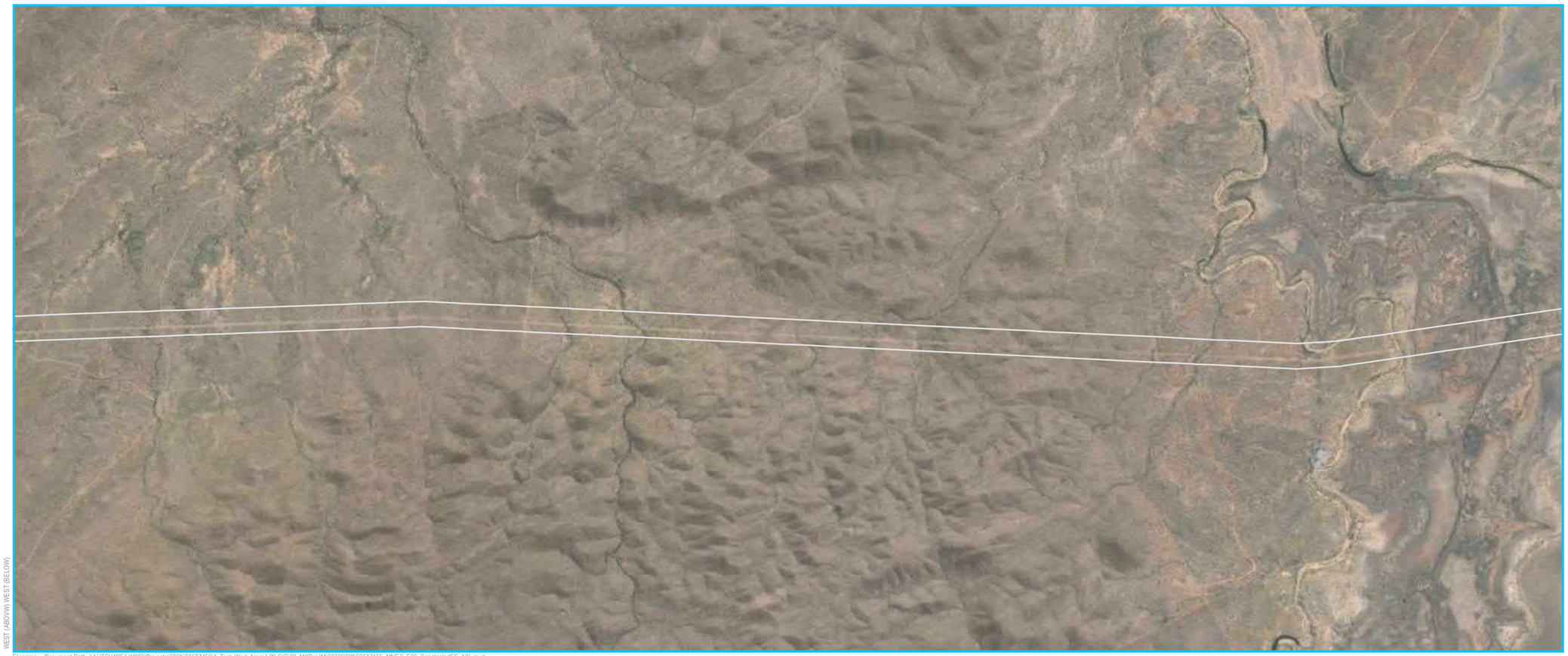
PROJECT ID: 60577456
CREATED BY: JR
LAST MODIFIED: JB - 21/03/2022
VERSION: 1

Figure F25.6

A3 size

ABOVE SHEET- 01

BELOW SHEET- 02



WEST (ABOVE) WEST (BELOW)

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

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

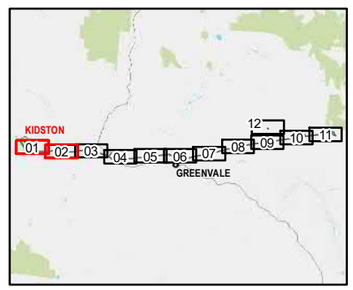
1:55,000 (when printed at A3)

Legend

Study Area

Spectacled flying-fox potential habitat

Potential foraging and dispersal habitat



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SPECTACLED FLYING-FOX POTENTIAL HABITAT

PROJECT ID: 60577456
CREATED BY: JR
LAST MODIFIED: JB - 15/03/2022
VERSION: 1

Figure F26.1

A3 size

ABOVE SHEET- 03

BELOW SHEET- 04

WEST (ABOVE\ WEST (BELOW)

Filename: Document Path: \\AUTSV1PFILW003\Projects\605X\605774564\4. Tech Work Area\4.99 GIS\02_MXDs\JM\20220228\60577456_MNES_F26_SpectacledFF_A3L.mxd

AECOM
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N

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

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

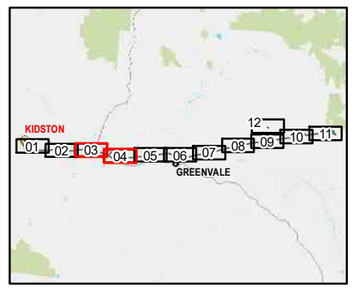
1:55,000 (when printed at A3)

Legend

Study Area

Spectacled flying-fox potential habitat

Potential foraging and dispersal habitat



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SPECTACLED FLYING-FOX POTENTIAL HABITAT

PROJECT ID: 60577456
CREATED BY: JR
LAST MODIFIED: JB - 15/03/2022
VERSION: 1

Figure F26.2

A3 size

ABOVE SHEET- 05

BELOW SHEET- 06

WEST (ABOVE\ WEST (BELOW)

Filename: Document Path: \\AUTSV1PFILW003\Projects\605X\60577456\4. Tech Work Area\4.99 GIS\02_MXDs\JM\20220228\60577456_MNES_F26_SpectacledFF_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

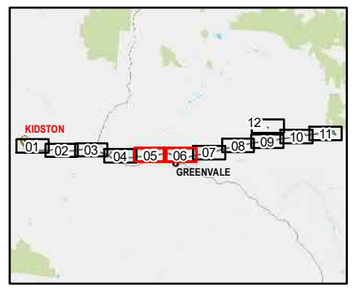
1:55,000 (when printed at A3)

Legend

Study Area

Spectacled flying-fox potential habitat

Potential foraging and dispersal habitat



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SPECTACLED FLYING-FOX POTENTIAL HABITAT

PROJECT ID: 60577456
CREATED BY: JR
LAST MODIFIED: JB - 15/03/2022
VERSION: 1

Figure F26.3

A3 size

ABOVE SHEET- 07

BELOW SHEET- 08

WEST (ABOVE) WEST (BELOW)

Filename: Document Path: \\AUTSV1PFILW003\Projects\605X\605774564. Tech Work Area\4.99 GIS\02_MXDs\JM\20220228\60577456_MNES_F26_SpectacledFF_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

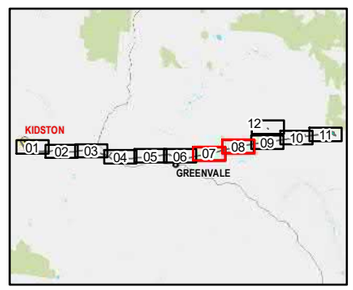
1:55,000 (when printed at A3)

Legend

Study Area

Spectacled flying-fox potential habitat

Potential foraging and dispersal habitat



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SPECTACLED FLYING-FOX POTENTIAL HABITAT

PROJECT ID: 60577456
CREATED BY: JR
LAST MODIFIED: JB - 15/03/2022
VERSION: 1

Figure F26.4

A3 size

ABOVE SHEET- 09

BELOW SHEET- 10

WEST (ABOVE\ WEST (BELOW)

Filename: Document Path: \\AUTSV1PFILW003\Projects\605X\605774564\4. Tech Work Area\4.99 GIS\02_MXDs\JM\20220228\60577456_MNES_F26_SpectacledFF_A3L.mxd

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

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Meters

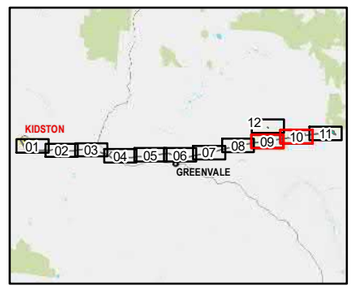
1:55,000 (when printed at A3)

Legend

Study Area

Spectacled flying-fox potential habitat

Potential foraging and dispersal habitat



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SPECTACLED FLYING-FOX POTENTIAL HABITAT

PROJECT ID: 60577456
CREATED BY: JR
LAST MODIFIED: JB - 15/03/2022
VERSION: 1

Figure
F26.5

A3 size

ABOVE SHEET- 11

BELOW SHEET- 12

WEST (ABOVE) WEST (BELOW)

Filename: Document Path: \\AUTSV1PFILW003\Projects\605X\605774564\4. Tech Work Area\4.99 GIS\02_MXDs\JM\20220228\60577456_MNES_F26_SpectacledFF_A3L.mxd

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

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Meters

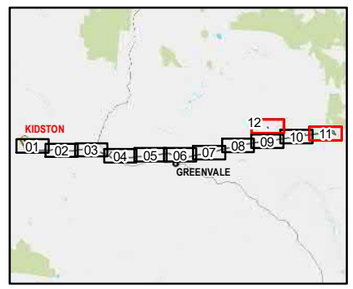
1:55,000 (when printed at A3)

Legend

Study Area

Spectacled flying-fox potential habitat

Potential foraging and dispersal habitat



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SPECTACLED FLYING-FOX POTENTIAL HABITAT

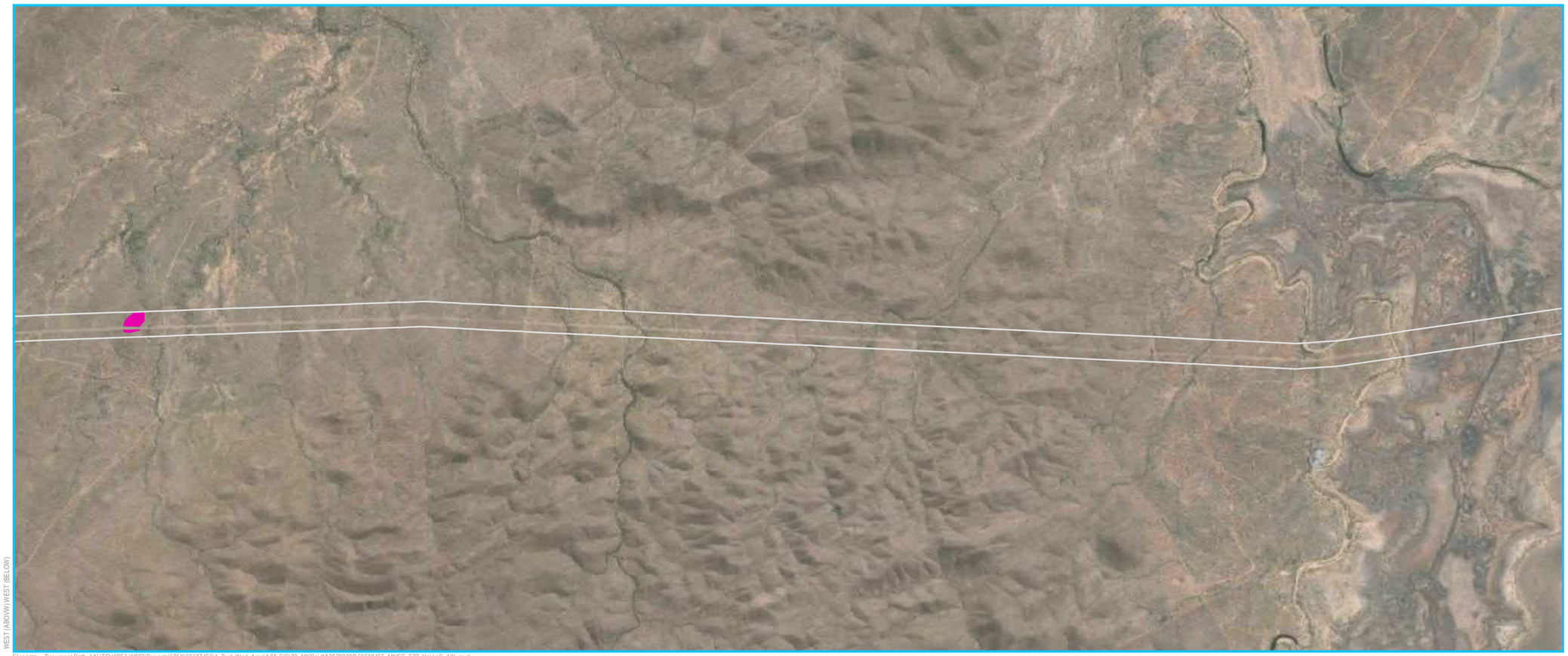
PROJECT ID: 60577456
CREATED BY: JR
LAST MODIFIED: JB - 15/03/2022
VERSION: 1

Figure F26.6

A3 size

ABOVE SHEET- 01

BELOW SHEET- 02



WEST (ABOVE) WEST (BELOW)

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

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

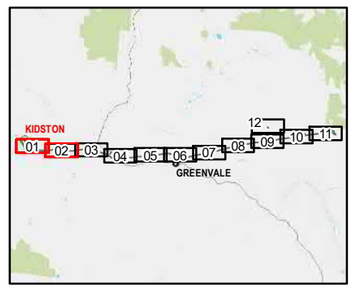
1:55,000 (when printed at A3)

Legend

- Study Area

Yakka Skink

- Potential breeding and foraging habitat
- Potential breeding and foraging habitat (marginal)



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YAKKA SKINK POTENTIAL HABITAT

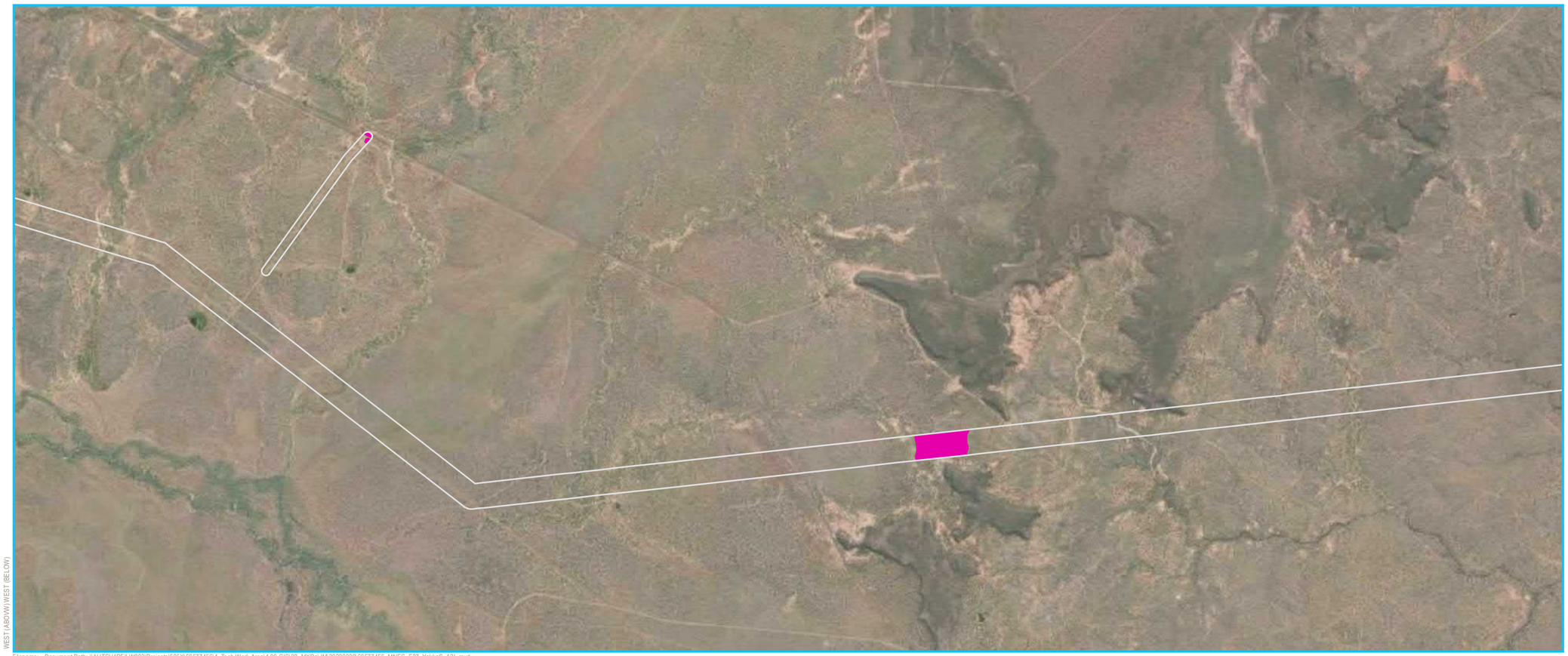
PROJECT ID: 60577456
CREATED BY: JR
LAST MODIFIED: JB - 25/03/2022
VERSION: 1

Figure F27.1

A3 size

ABOVE SHEET- 03

BELOW SHEET- 04



WEST (ABOVE) WEST (BELOW)

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AECOM
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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)

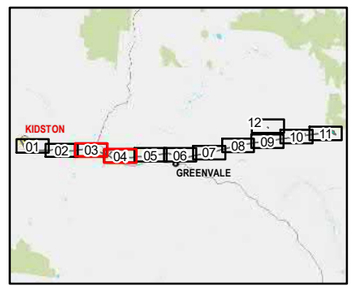
Legend

Study Area

Yakka Skink

Potential breeding and foraging habitat

Potential breeding and foraging habitat (marginal)



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YAKKA SKINK POTENTIAL HABITAT

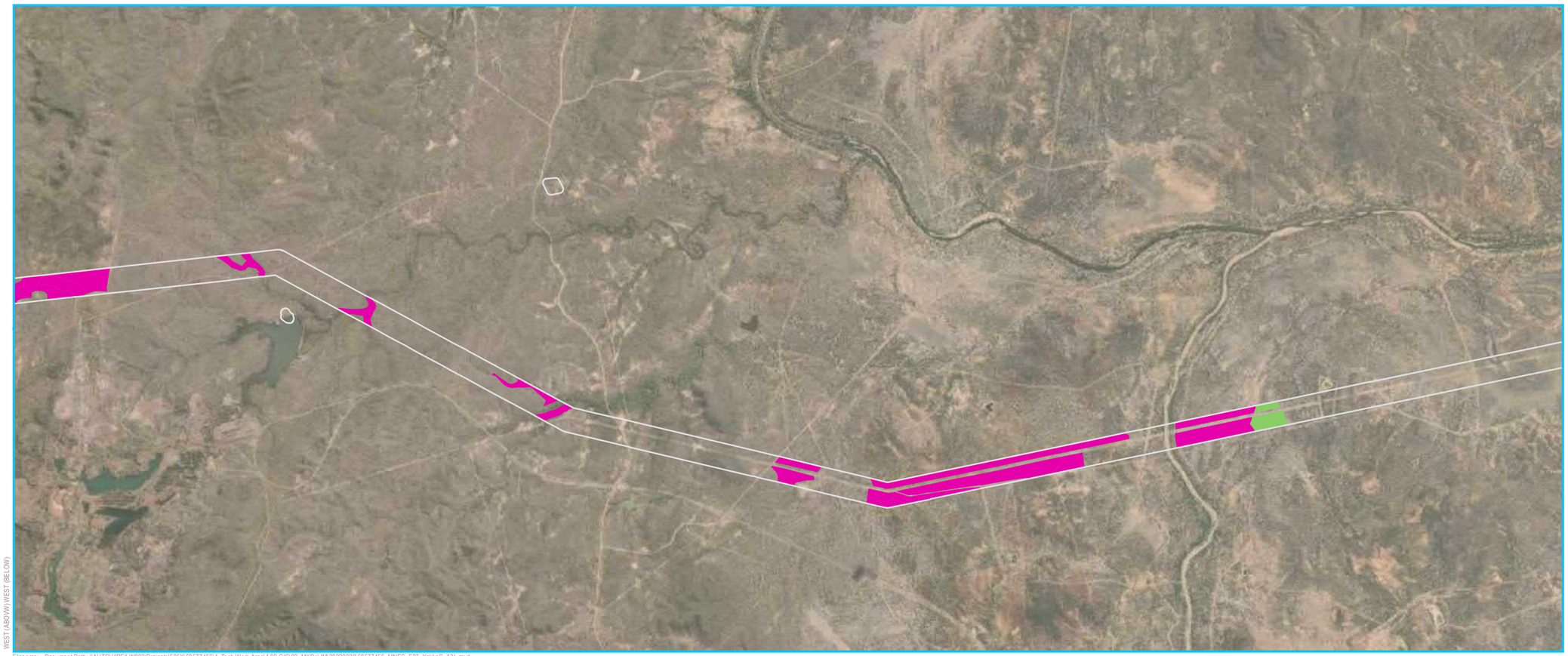
PROJECT ID: 60577456
CREATED BY: JR
LAST MODIFIED: JB - 25/03/2022
VERSION: 1

Figure F27.2

A3 size

ABOVE SHEET- 05

BELOW SHEET- 06



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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)

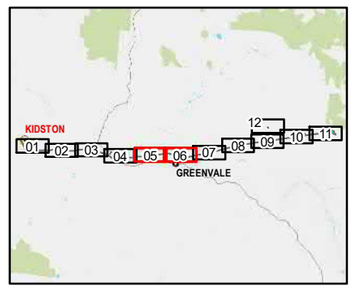
Legend

Study Area

Yakka Skink

Potential breeding and foraging habitat

Potential breeding and foraging habitat (marginal)



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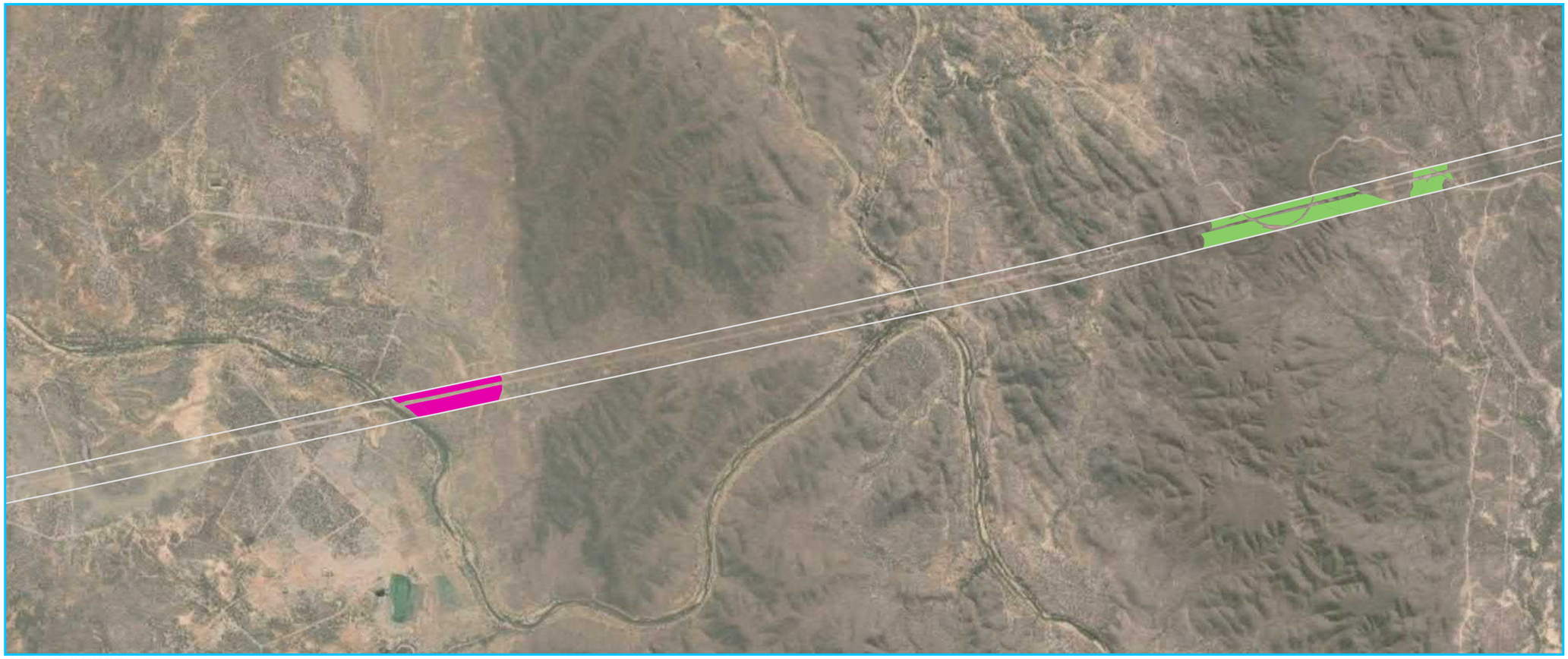
Powerlink Kidston Connection Project

YAKKA SKINK POTENTIAL HABITAT

PROJECT ID: 60577456
CREATED BY: JR
LAST MODIFIED: JB - 25/03/2022
VERSION: 1

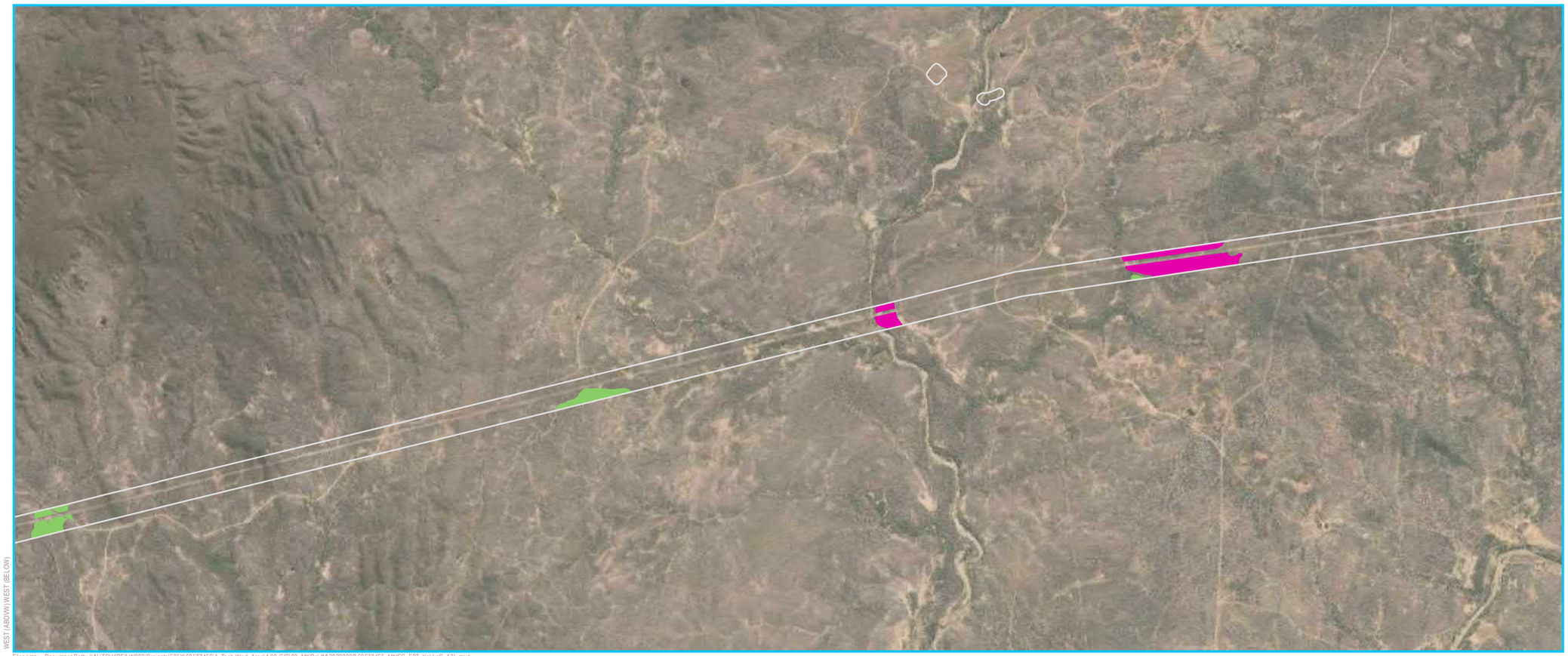
Figure F27.3

A3 size



ABOVE SHEET- 07

BELOW SHEET- 08



WEST (ABOVE) WEST (BELOW)

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

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

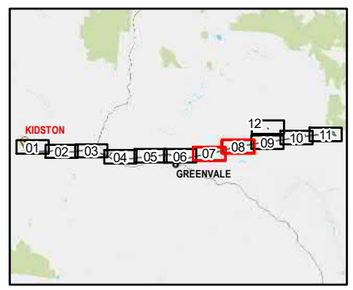
1:55,000 (when printed at A3)

Legend

- Study Area

Yakka Skink

- Potential breeding and foraging habitat
- Potential breeding and foraging habitat (marginal)



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LAST MODIFIED: JB - 25/03/2022
VERSION: 1

Figure F27.4

A3 size

ABOVE SHEET- 09

BELOW SHEET- 10

WEST (ABOVE) WEST (BELOW)

Filename: Document Path: \\AUTSV1PFILW003\Projects\605X\60577456\4. Tech Work Area\4.99 GIS\02_MXDs\JM\20220228\60577456_MNES_F27_YakkaS_A3L.mxd

AECOM
www.aecom.com

N

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

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

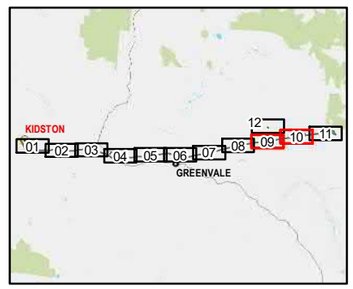
1:55,000 (when printed at A3)

Legend

- Study Area

Yakka Skink

- Potential breeding and foraging habitat
- Potential breeding and foraging habitat (marginal)



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YAKKA SKINK POTENTIAL HABITAT

PROJECT ID: 60577456
CREATED BY: JR
LAST MODIFIED: JB - 25/03/2022
VERSION: 1

Figure F27.5

A3 size

ABOVE SHEET- 11

BELOW SHEET- 12

WEST (ABOVE) WEST (BELOW)

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AECOM
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N

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

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

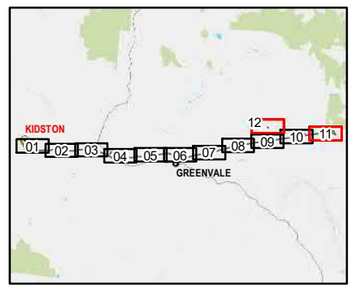
1:55,000 (when printed at A3)

Legend

- Study Area

Yakka Skink

- Potential breeding and foraging habitat
- Potential breeding and foraging habitat (marginal)



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YAKKA SKINK POTENTIAL HABITAT

PROJECT ID: 60577456
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LAST MODIFIED: JB - 25/03/2022
VERSION: 1

Figure F27.6

A3 size

ABOVE SHEET- 01

BELOW SHEET- 02

WEST (ABOVE) WEST (BELOW)

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

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Meters

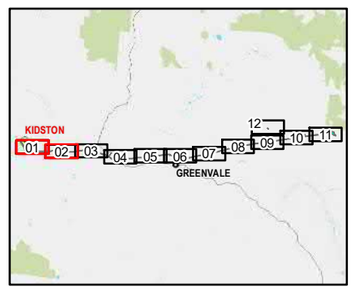
1:55,000 (when printed at A3)

Legend

Study Area

Fork-tailed Swift

Likely foraging and dispersal habitat (aerial)



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FORK-TAILED SWIFT POTENTIAL HABITAT

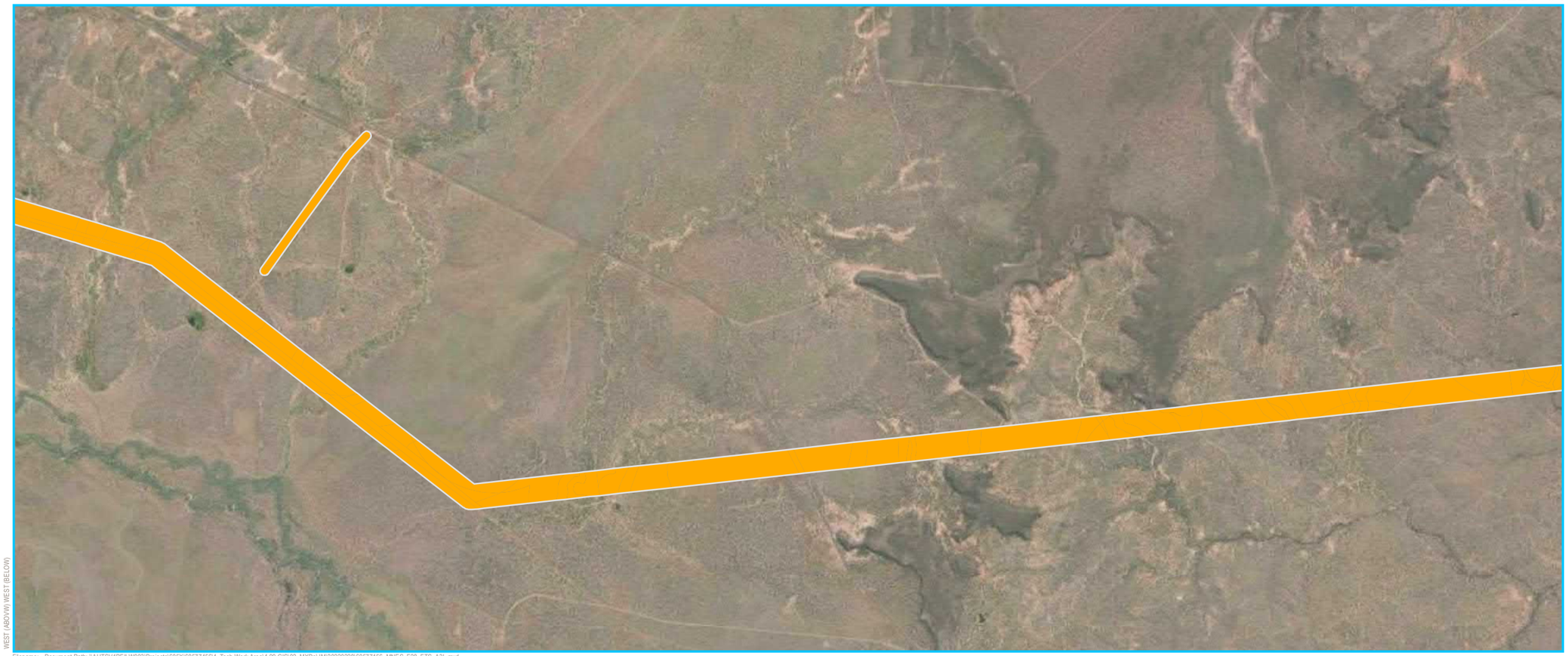
PROJECT ID: 60577456
CREATED BY: JR
LAST MODIFIED: JB - 16/03/2022
VERSION: 1

Figure F28.1

A3 size

ABOVE SHEET- 03

BELOW SHEET- 04



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AECOM
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N

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

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Meters

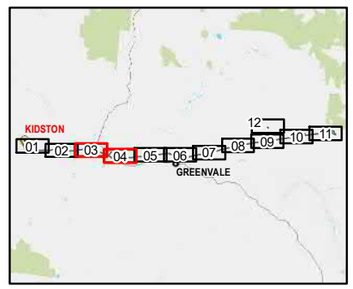
1:55,000 (when printed at A3)

Legend

Study Area

Fork-tailed Swift

Likely foraging and dispersal habitat (aerial)



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FORK-TAILED SWIFT POTENTIAL HABITAT

PROJECT ID: 60577456
CREATED BY: JR
LAST MODIFIED: JB - 16/03/2022
VERSION: 1

Figure F28.2

A3 size

ABOVE SHEET- 05

BELOW SHEET- 06

WEST (ABOVE) WEST (BELOW)

Filename: Document Path: \\AUTSV1PFILW003\Projects\605X\605774564\4. Tech Work Area\4.99 GIS\02_MXDs\JM\20220228\60577456_MNES_F28_FTS_A3L.mxd

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

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

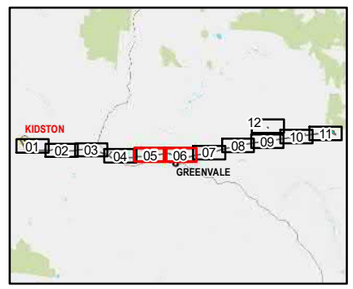
1:55,000 (when printed at A3)

Legend

Study Area

Fork-tailed Swift

Likely foraging and dispersal habitat (aerial)



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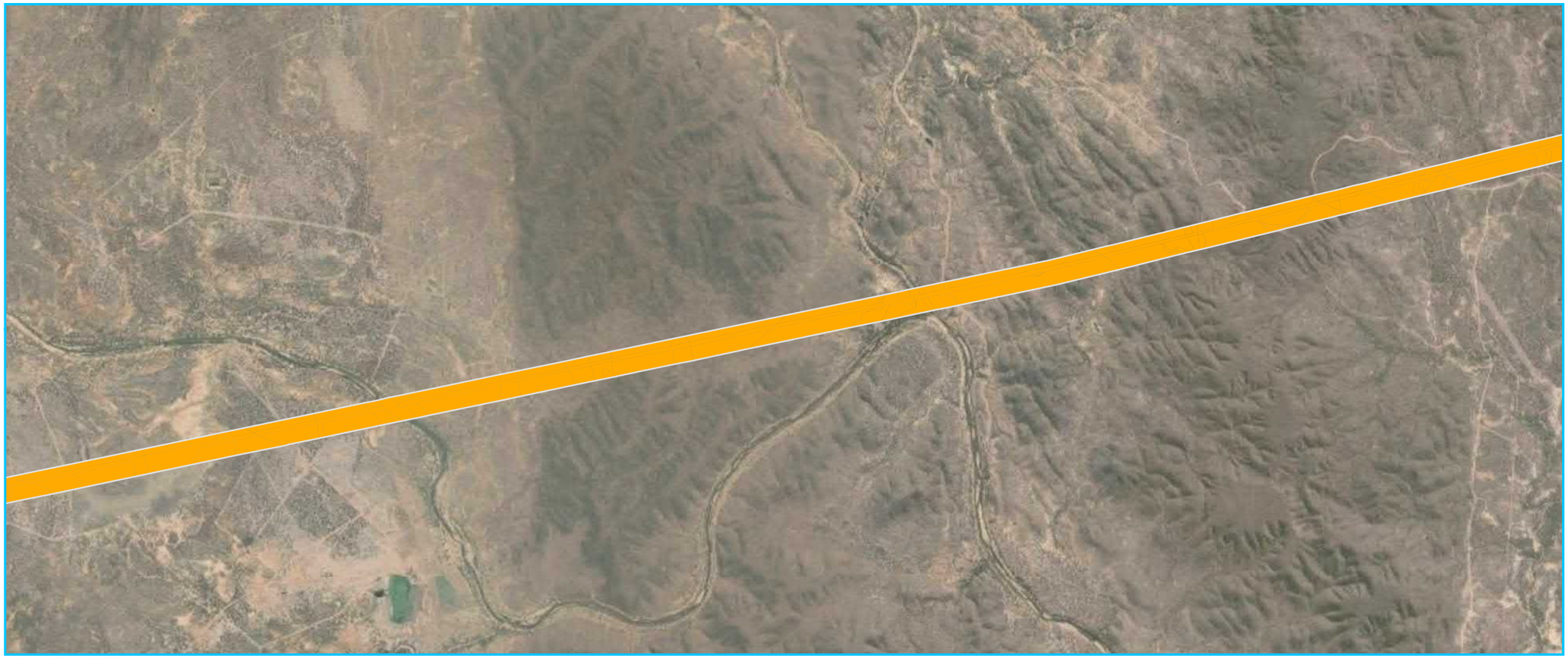
FORK-TAILED SWIFT POTENTIAL HABITAT

PROJECT ID: 60577456
CREATED BY: JR
LAST MODIFIED: JB - 16/03/2022
VERSION: 1

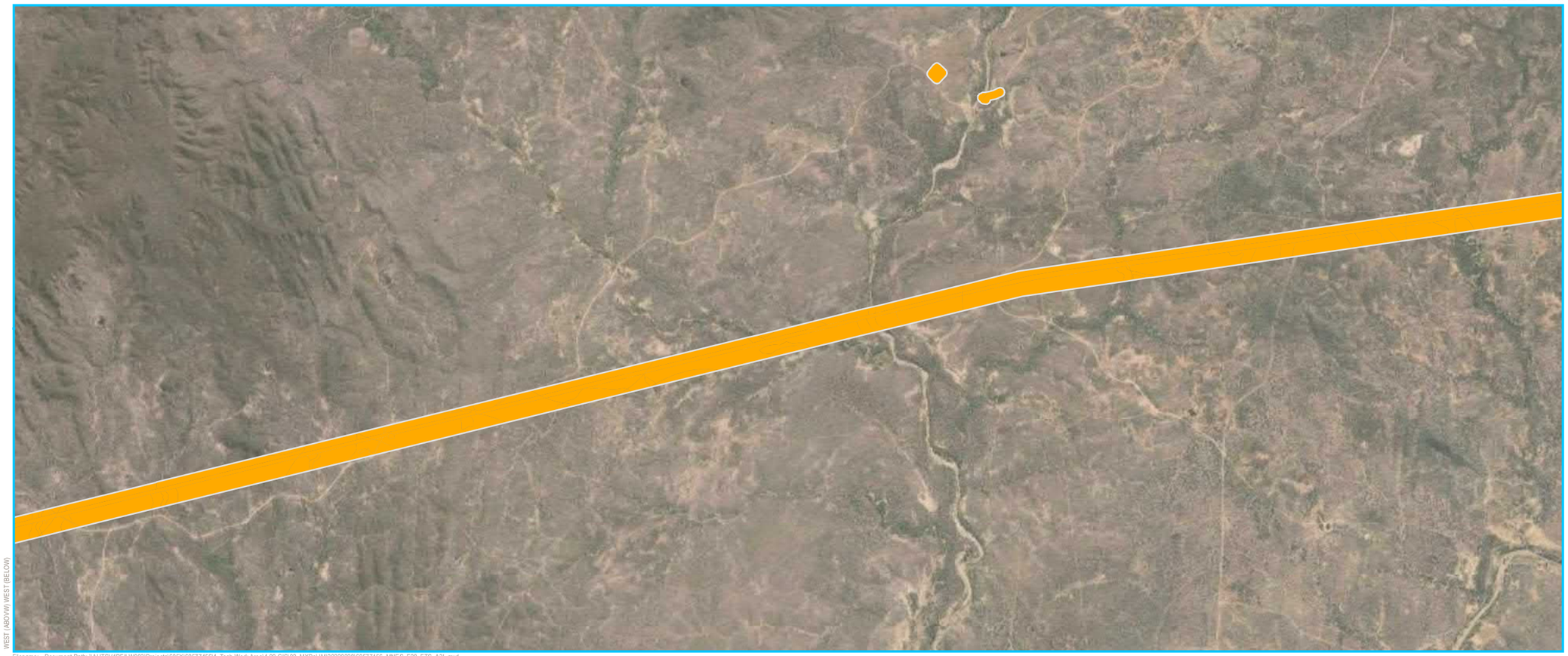
Figure F28.3

A3 size



ABOVE SHEET- 07

BELOW SHEET- 08



WEST (ABOVE) WEST (BELOW)

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

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

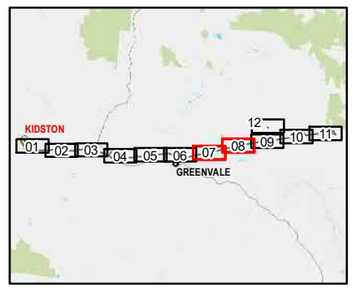
1:55,000 (when printed at A3)

Legend

Study Area

Fork-tailed Swift

Likely foraging and dispersal habitat (aerial)



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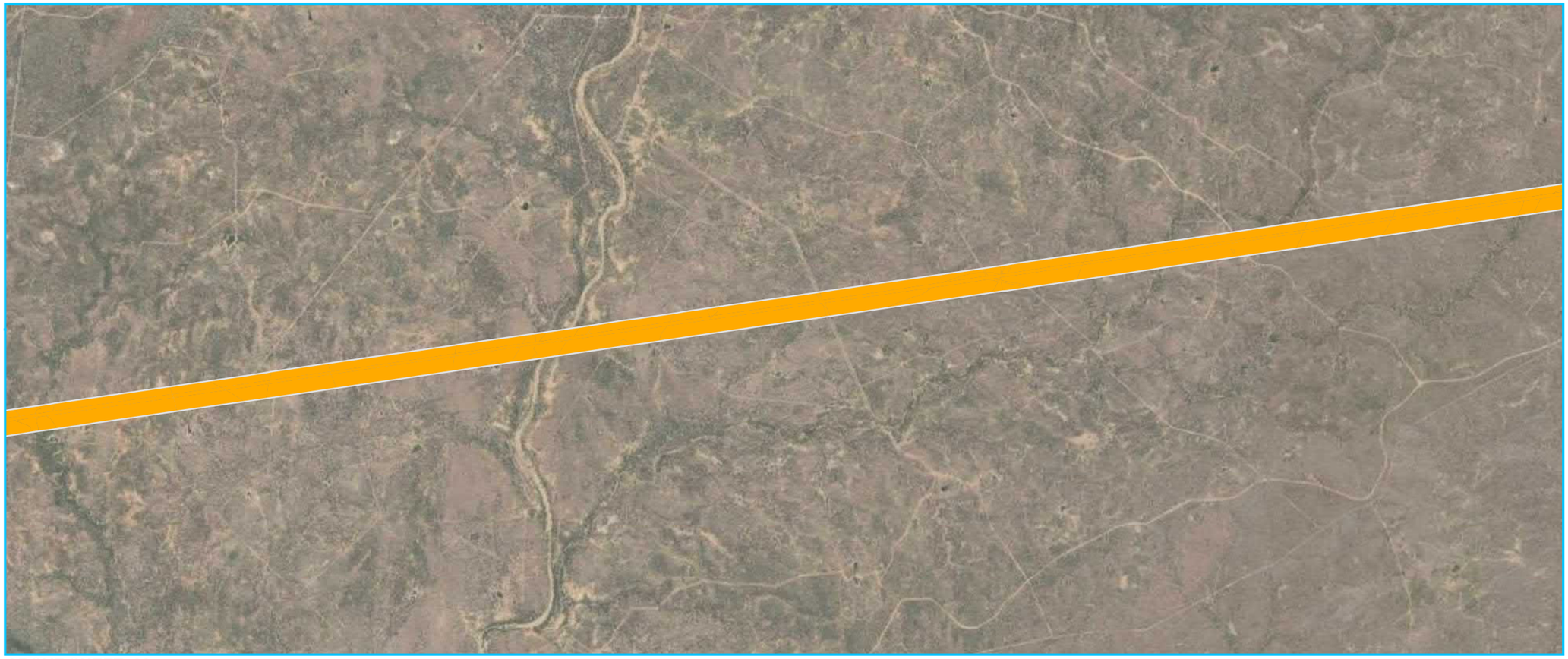
FORK-TAILED SWIFT POTENTIAL HABITAT

PROJECT ID: 60577456
CREATED BY: JR
LAST MODIFIED: JB - 16/03/2022
VERSION: 1

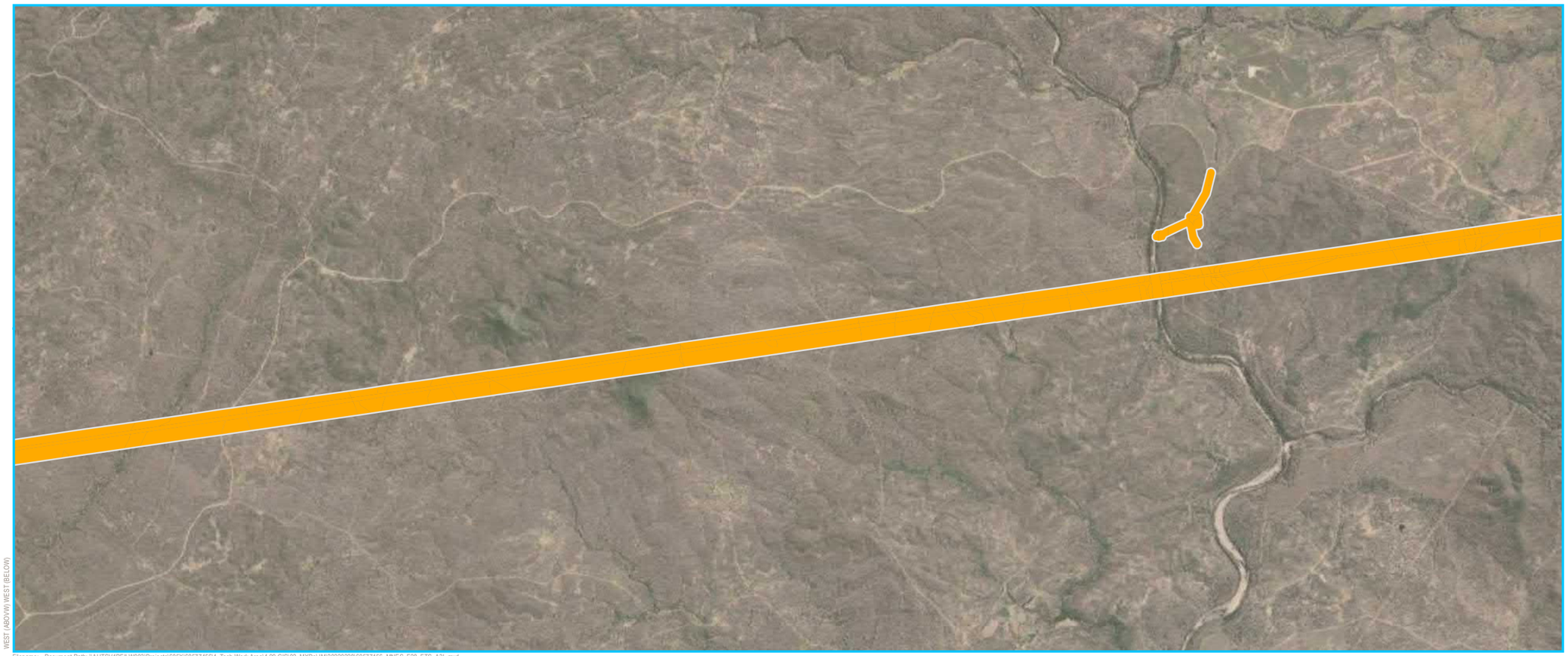
Figure F28.4

A3 size



ABOVE SHEET- 09

BELOW SHEET- 10



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

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Meters

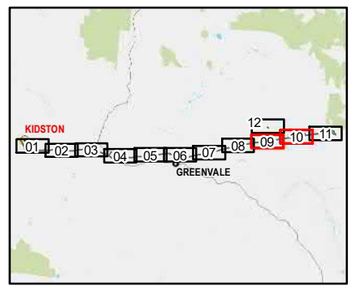
1:55,000 (when printed at A3)

Legend

Study Area

Fork-tailed Swift

Likely foraging and dispersal habitat (aerial)



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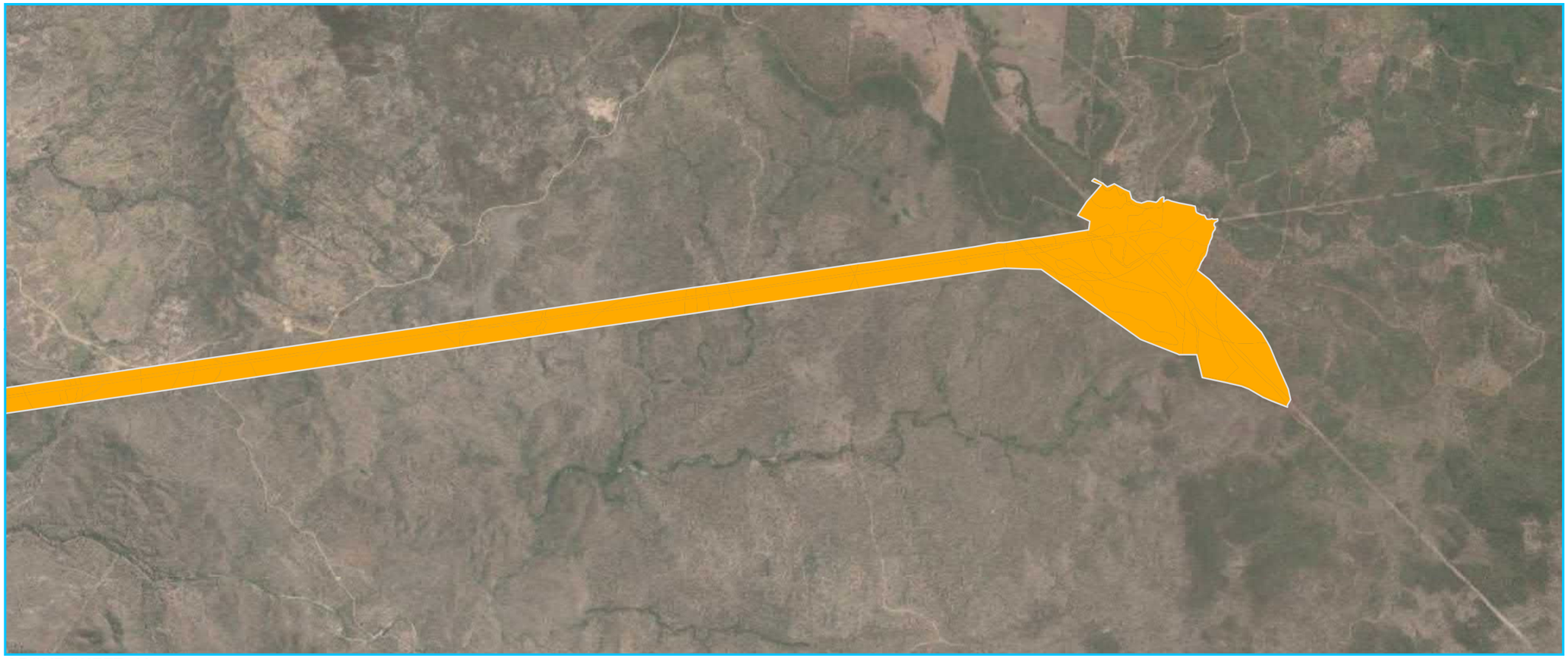
FORK-TAILED SWIFT POTENTIAL HABITAT

PROJECT ID: 60577456
CREATED BY: JR
LAST MODIFIED: JB - 16/03/2022
VERSION: 1

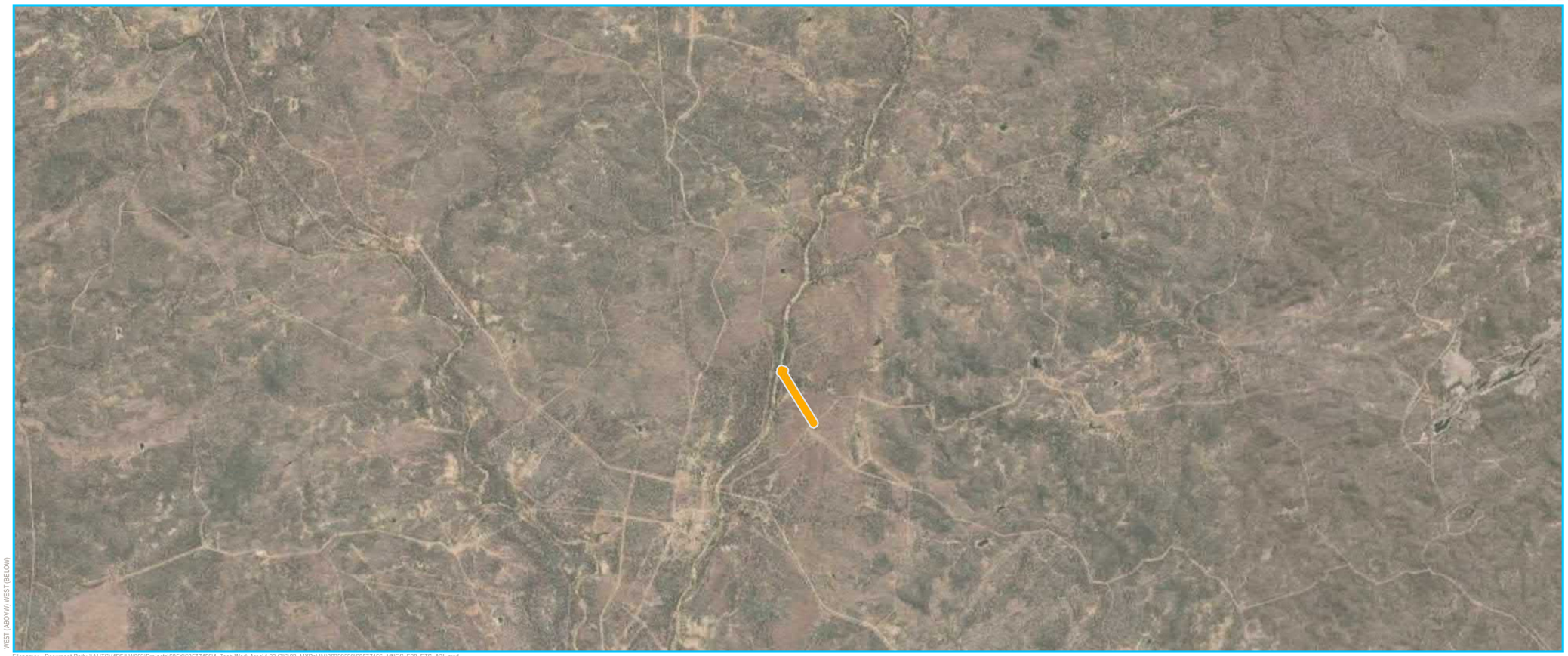
Figure
F28.5

A3 size



ABOVE SHEET- 11

BELOW SHEET- 12



WEST (ABOVE) WEST (BELOW)

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

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

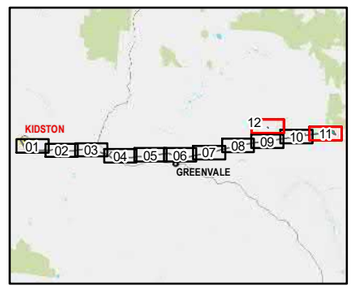
1:55,000 (when printed at A3)

Legend

Study Area

Fork-tailed Swift

Likely foraging and dispersal habitat (aerial)



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FORK-TAILED SWIFT POTENTIAL HABITAT

PROJECT ID: 60577456
CREATED BY: JR
LAST MODIFIED: JB - 16/03/2022
VERSION: 1

Figure F28.6

A3 size

ABOVE SHEET- 01

BELOW SHEET- 02

WEST (ABOVE\ WEST (BELOW)

Filename: Document Path: \\AUTSV1PFILW003\Projects\605X\60577456\4. Tech Work Area\4.99 GIS\02_MXDs\JM\20220228\60577456_MNES_F29_OCRF_A3L.mxd

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N

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

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Legend

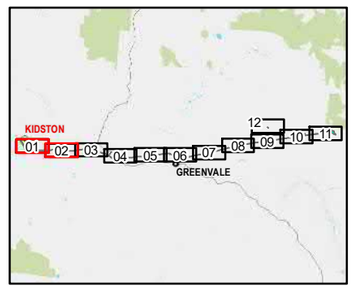
Study Area

Rufous Fantail

Potential foraging and dispersal habitat (marginal)

Oriental Cuckoo

Potential foraging and dispersal habitat



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ORIENTAL CUCKOO AND RUFOUS FANTAIL POTENTIAL HABITAT

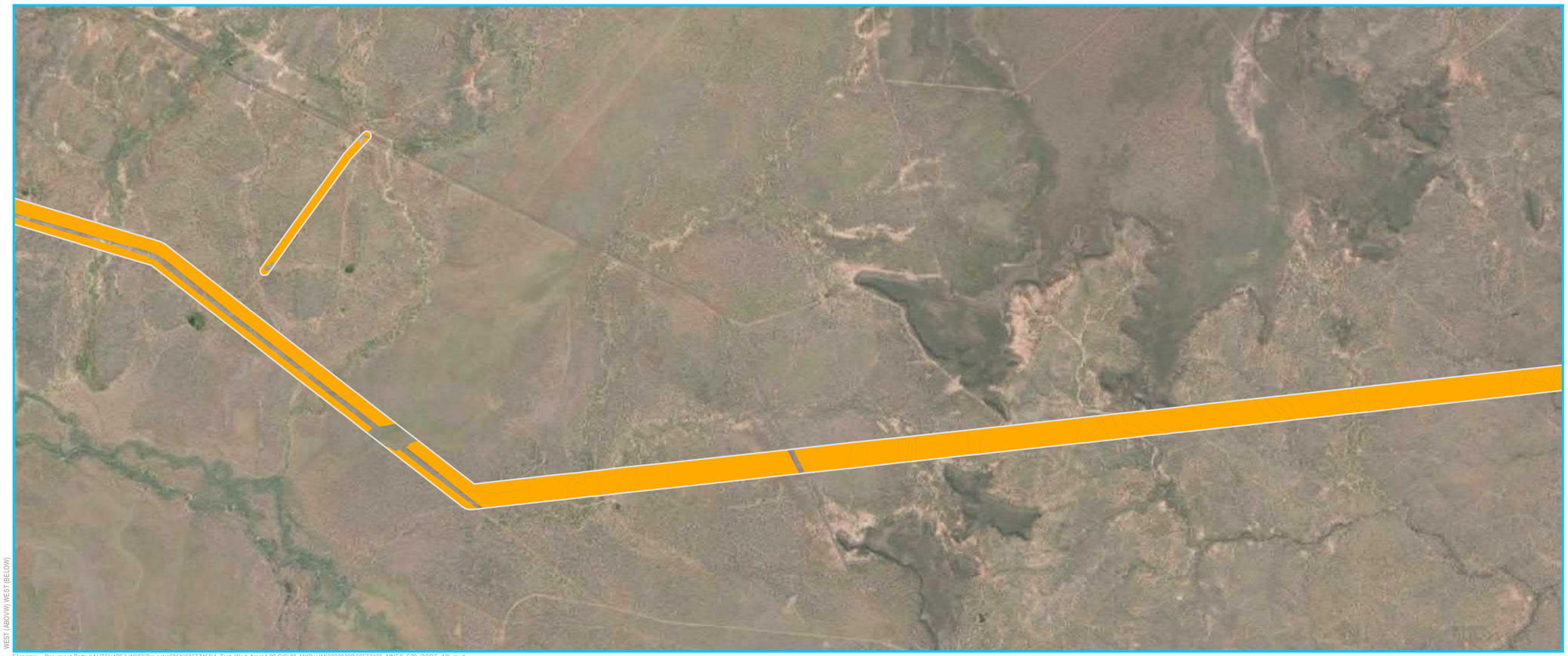
PROJECT ID: 60577456
CREATED BY: JR
LAST MODIFIED: JB - 15/03/2022
VERSION: 1

Figure
F29.1

A3 size

ABOVE SHEET- 03

BELOW SHEET- 04



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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

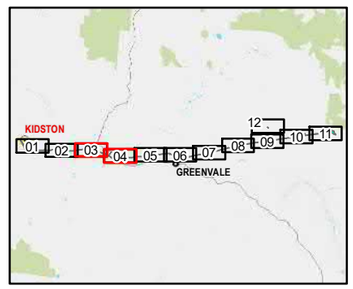
Study Area

Rufous Fantail

Potential foraging and dispersal habitat (marginal)

Oriental Cuckoo

Potential foraging and dispersal habitat



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ORIENTAL CUCKOO AND RUFOUS FANTAIL POTENTIAL HABITAT

PROJECT ID: 60577456
CREATED BY: JR
LAST MODIFIED: JB - 15/03/2022
VERSION: 1

Figure F29.2

A3 size

ABOVE SHEET- 05

BELOW SHEET- 06

WEST (ABOVE) WEST (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

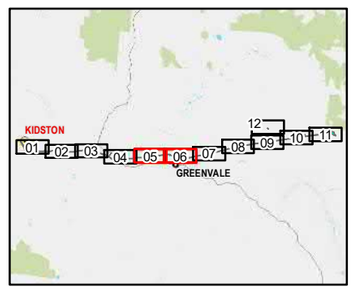
Study Area

Rufous Fantail

Potential foraging and dispersal habitat (marginal)

Oriental Cuckoo

Potential foraging and dispersal habitat



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ORIENTAL CUCKOO AND RUFOUS FANTAIL POTENTIAL HABITAT

PROJECT ID: 60577456
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LAST MODIFIED: JB - 15/03/2022
VERSION: 1

Figure F29.3

A3 size

ABOVE SHEET- 07

BELOW SHEET- 08

WEST (ABOVE\ WEST (BELOW)

Filename: Document Path: \\AUTSV1PFILW003\Projects\605X\605774564. Tech Work Area\4.99 GIS\02_MXDs\JM\20220228\60577456_MNES_F29_OCRF_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

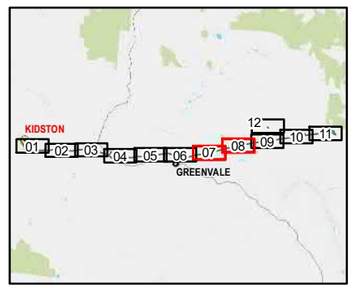
Study Area

Rufous Fantail

Potential foraging and dispersal habitat (marginal)

Oriental Cuckoo

Potential foraging and dispersal habitat



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ORIENTAL CUCKOO AND RUFOUS FANTAIL POTENTIAL HABITAT

PROJECT ID: 60577456
CREATED BY: JR
LAST MODIFIED: JB - 15/03/2022
VERSION: 1

Figure F29.4

A3 size

ABOVE SHEET- 09

BELOW SHEET- 10

WEST (ABOVE\ WEST (BELOW)

Filename: Document Path: \\AUTSV1PFILW003\Projects\605X\605774564\4. Tech Work Area\4.99 GIS\02_MXDs\JM\20220228\60577456_MNES_F29_OCRF_A3L.mxd

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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

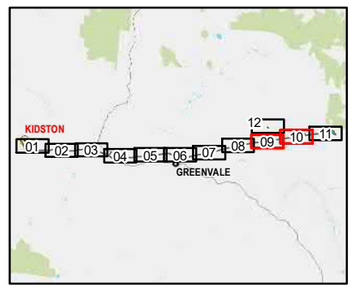
Study Area

Rufous Fantail

Potential foraging and dispersal habitat (marginal)

Oriental Cuckoo

Potential foraging and dispersal habitat



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ORIENTAL CUCKOO AND RUFOUS FANTAIL POTENTIAL HABITAT

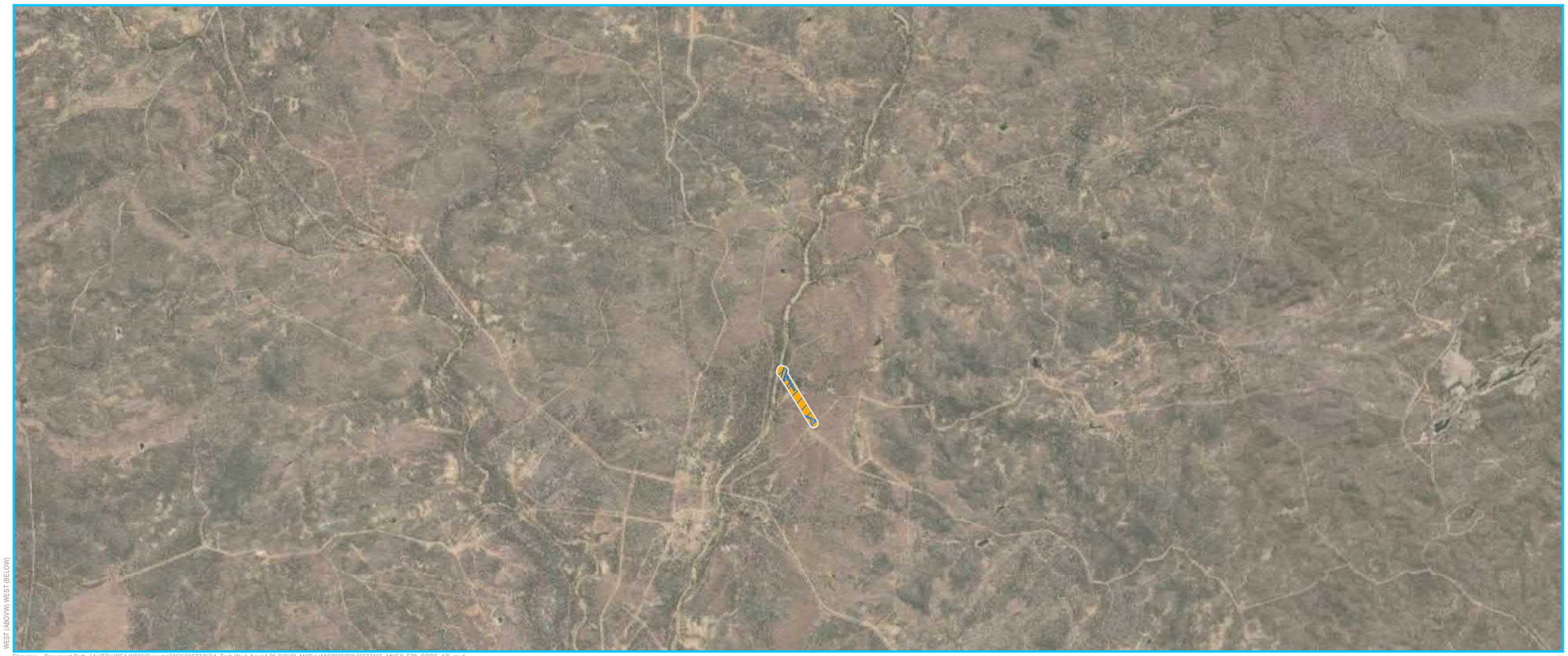
PROJECT ID: 60577456
CREATED BY: JR
LAST MODIFIED: JB - 15/03/2022
VERSION: 1

Figure
F29.5

A3 size

ABOVE SHEET- 11

BELOW SHEET- 12



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AECOM
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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

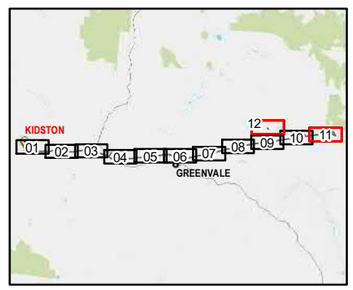
Study Area

Rufous Fantail

Potential foraging and dispersal habitat (marginal)

Oriental Cuckoo

Potential foraging and dispersal habitat



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ORIENTAL CUCKOO AND RUFOUS FANTAIL POTENTIAL HABITAT

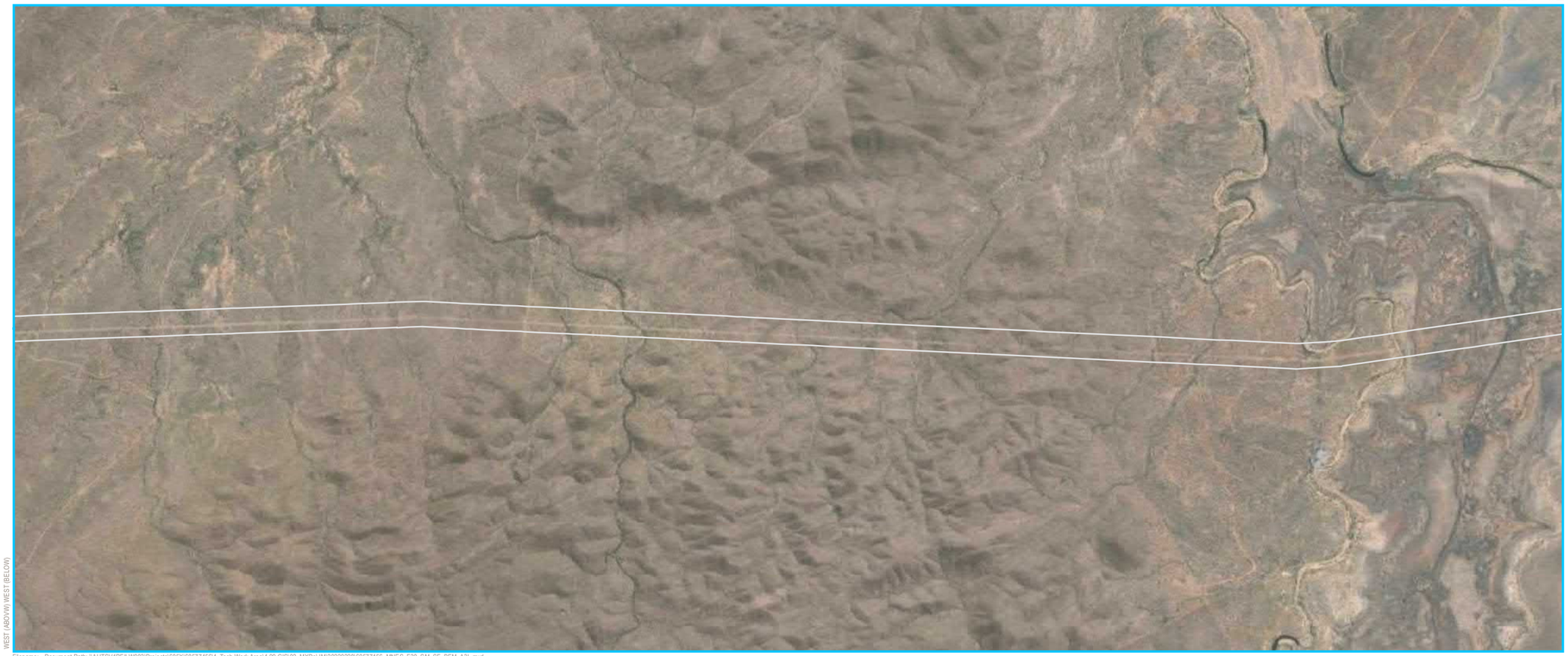
PROJECT ID: 60577456
CREATED BY: JR
LAST MODIFIED: JB - 15/03/2022
VERSION: 1

Figure F29.6

A3 size

ABOVE SHEET- 01

BELOW SHEET- 02



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AECOM
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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

Black-faced monarch potential habitat

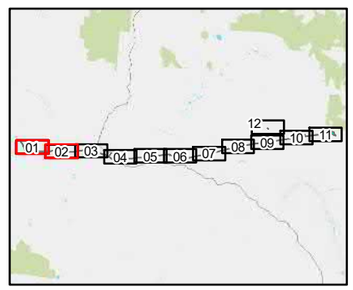
Foraging and dispersal habitat (marginal)

Spectacled monarch potential habitat

Potential breeding, foraging and dispersal habitat (marginal)

Satin flycatcher potential habitat

Foraging and dispersal habitat



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SPECTACLED MONARCH, SATIN FLYCATCHER AND BLACK-FACED MONARCH POTENTIAL HABITAT

PROJECT ID: 60577456
CREATED BY: JR
LAST MODIFIED: JB - 16/03/2022
VERSION: 1

Figure F30.1

A3 size

ABOVE SHEET- 03

BELOW SHEET- 04

WEST (ABOVE\ WEST (BELOW)

Filename: Document Path: \\AUTSV1PFILW003\Projects\605X\605774564. Tech Work Area\4.99 GIS\02_MXDs\JM\20220228\60577456_MNES_F30_SM_SF_BFM_A3L.mxd

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N

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

Black-faced monarch potential habitat

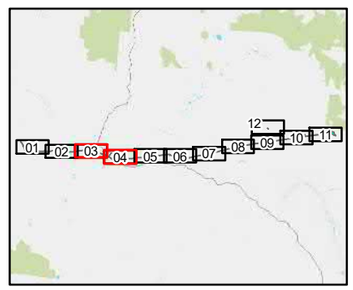
Foraging and dispersal habitat (marginal)

Spectacled monarch potential habitat

Potential breeding, foraging and dispersal habitat (marginal)

Satin flycatcher potential habitat

Foraging and dispersal habitat



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SPECTACLED MONARCH, SATIN FLYCATCHER AND BLACK-FACED MONARCH POTENTIAL HABITAT

PROJECT ID: 60577456
CREATED BY: JR
LAST MODIFIED: JB - 16/03/2022
VERSION: 1

Figure F30.2

A3 size

ABOVE SHEET- 05

BELOW SHEET- 06

WEST (ABOVE) WEST (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

Black-faced monarch potential habitat

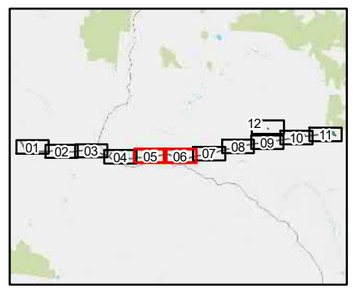
Foraging and dispersal habitat (marginal)

Spectacled monarch potential habitat

Potential breeding, foraging and dispersal habitat (marginal)

Satin flycatcher potential habitat

Foraging and dispersal habitat



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SPECTACLED MONARCH, SATIN FLYCATCHER AND BLACK-FACED MONARCH POTENTIAL HABITAT

PROJECT ID: 60577456
CREATED BY: JR
LAST MODIFIED: JB - 16/03/2022
VERSION: 1

Figure F30.3

A3 size

ABOVE SHEET- 07

BELOW SHEET- 08

WEST (ABOVE\ WEST (BELOW)

Filename: Document Path: \\AUTSV1PFILW003\Projects\605X\605774564. Tech Work Area\4.99 GIS\02_MXDs\JM\20220228\60577456_MNES_F30_SM_SF_BFM_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

Black-faced monarch potential habitat

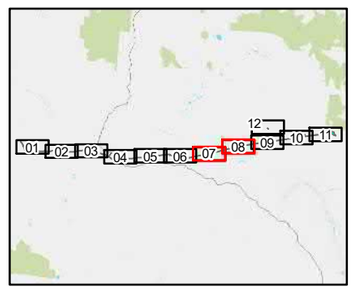
Foraging and dispersal habitat (marginal)

Spectacled monarch potential habitat

Potential breeding, foraging and dispersal habitat (marginal)

Satin flycatcher potential habitat

Foraging and dispersal habitat



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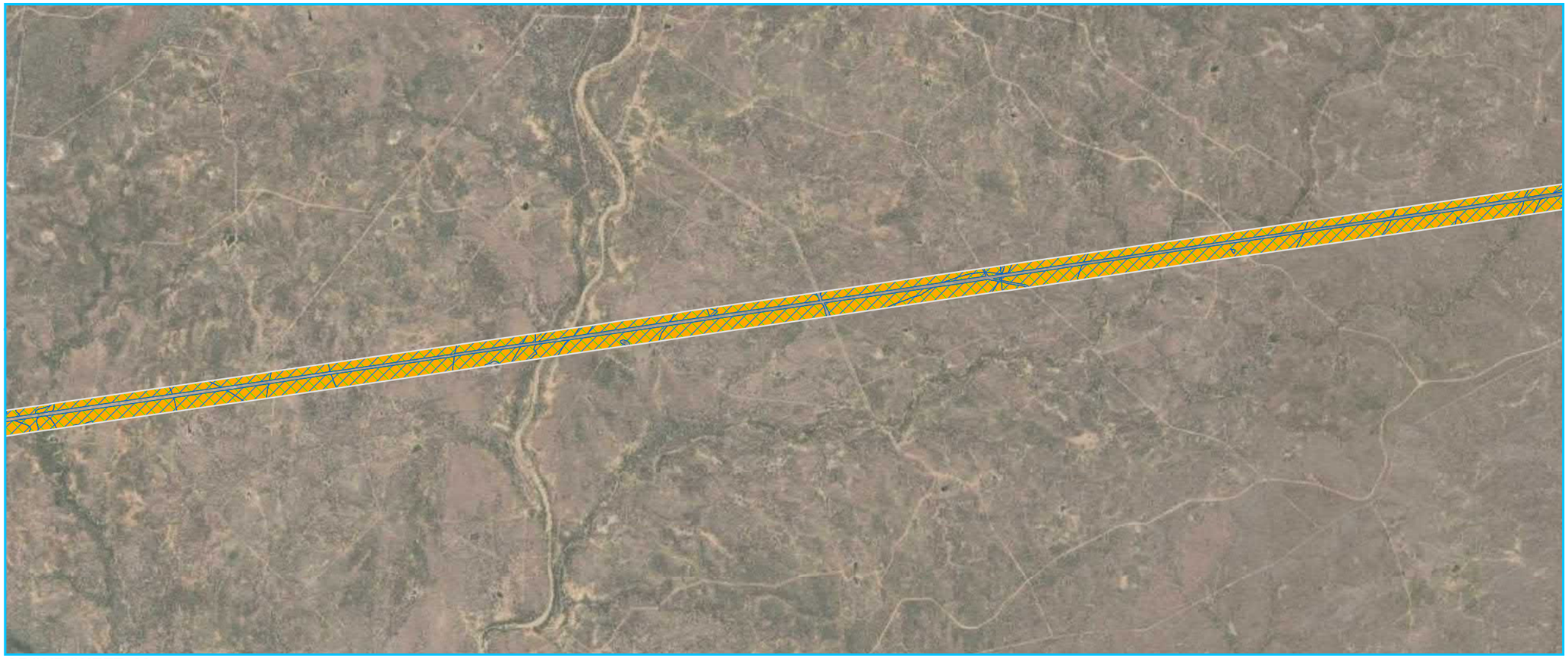
SPECTACLED MONARCH, SATIN FLYCATCHER AND BLACK-FACED MONARCH POTENTIAL HABITAT

PROJECT ID: 60577456
CREATED BY: JR
LAST MODIFIED: JB - 16/03/2022
VERSION: 1

Figure F30.4

A3 size



ABOVE SHEET- 09

BELOW SHEET- 10

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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

Black-faced monarch potential habitat

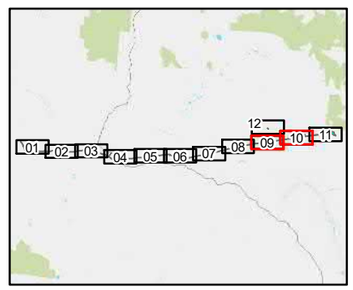
Foraging and dispersal habitat (marginal)

Spectacled monarch potential habitat

Potential breeding, foraging and dispersal habitat (marginal)

Satin flycatcher potential habitat

Foraging and dispersal habitat



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SPECTACLED MONARCH, SATIN FLYCATCHER AND BLACK-FACED MONARCH POTENTIAL HABITAT

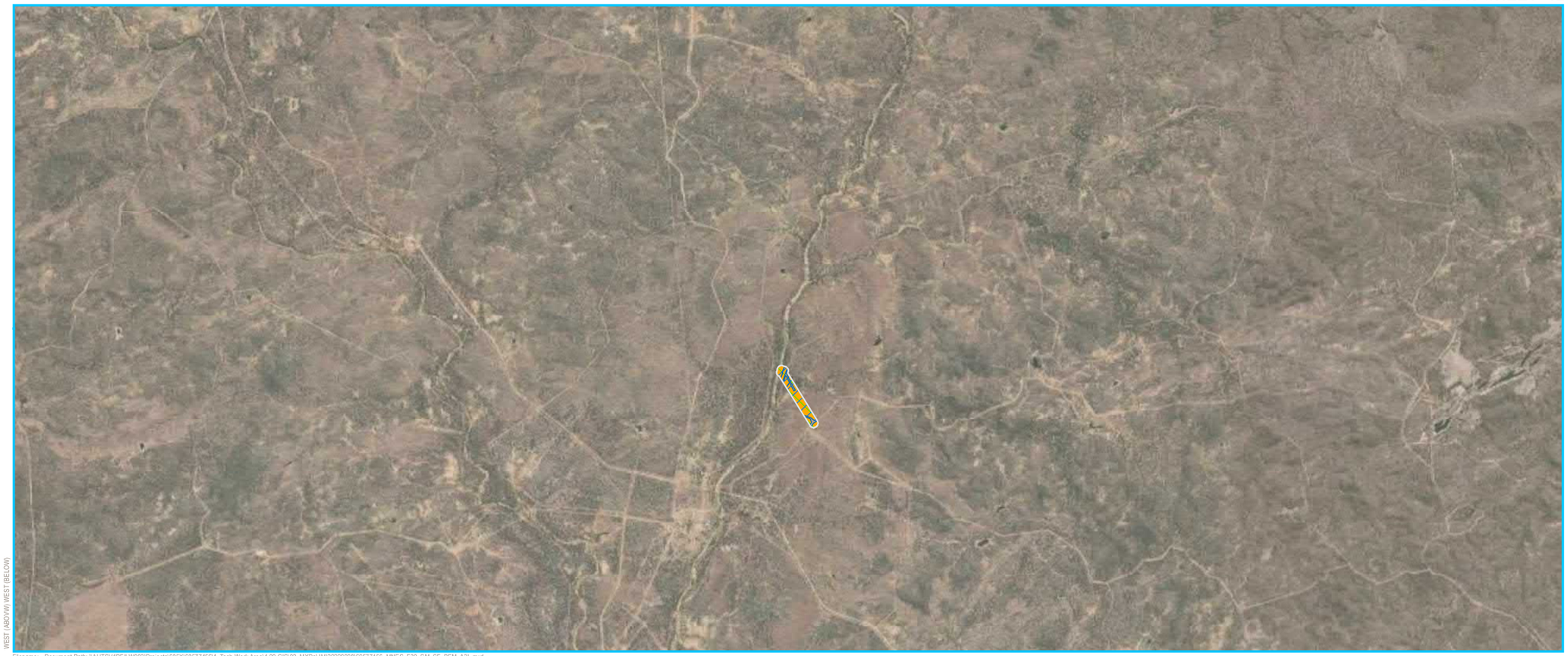
PROJECT ID: 60577456
CREATED BY: JR
LAST MODIFIED: JB - 16/03/2022
VERSION: 1

Figure F30.5

A3 size

ABOVE SHEET- 11

BELOW SHEET- 12



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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

Black-faced monarch potential habitat

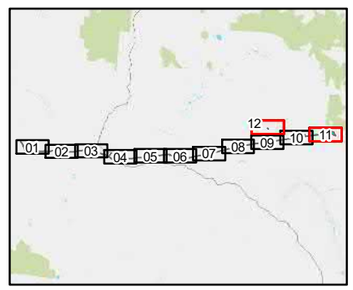
Foraging and dispersal habitat (marginal)

Spectacled monarch potential habitat

Potential breeding, foraging and dispersal habitat (marginal)

Satin flycatcher potential habitat

Foraging and dispersal habitat



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SPECTACLED MONARCH, SATIN FLYCATCHER AND BLACK-FACED MONARCH POTENTIAL HABITAT

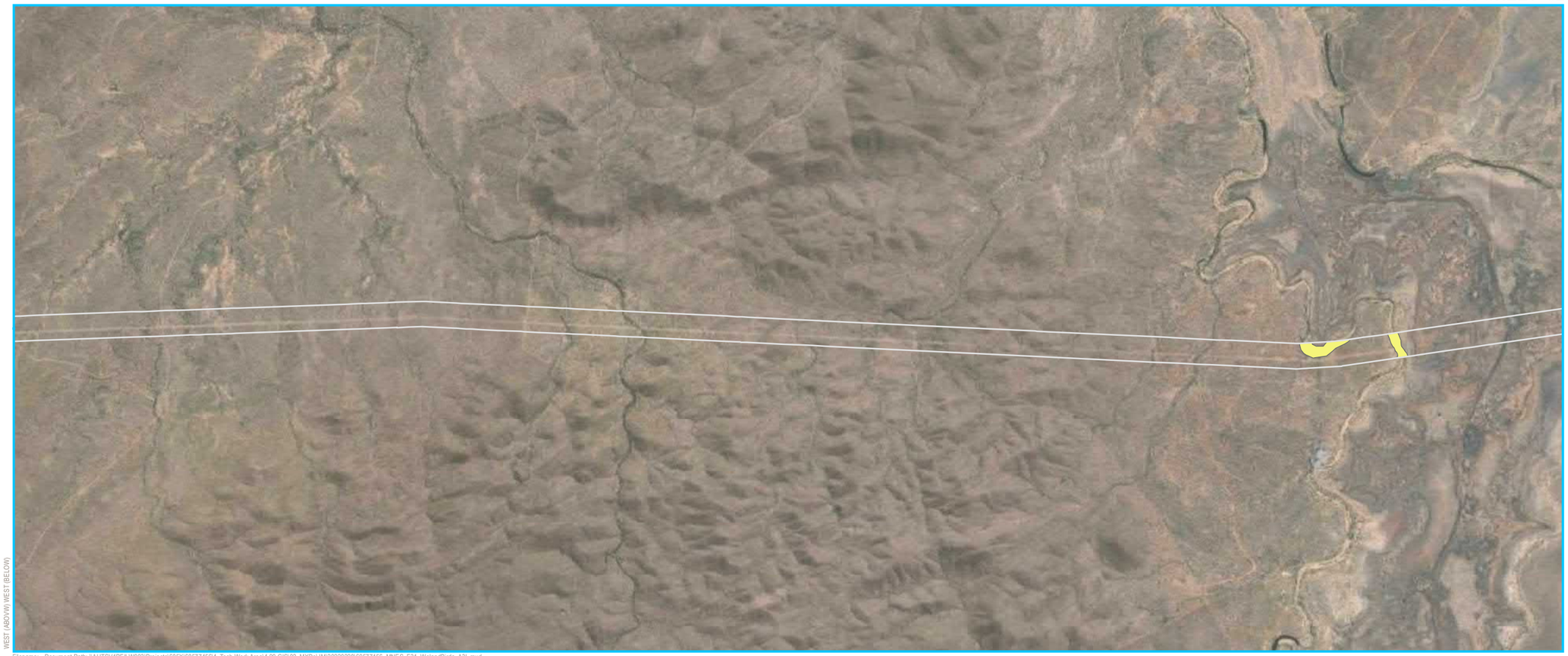
PROJECT ID: 60577456
CREATED BY: JR
LAST MODIFIED: JB - 16/03/2022
VERSION: 1

Figure F30.6

A3 size

ABOVE SHEET- 01

BELOW SHEET- 02



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

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Meters

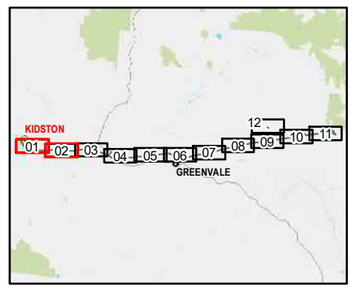
1:55,000 (when printed at A3)

Legend

Study Area

Red-necked stint, common greenshank, common sandpiper, sharp-tailed sandpiper & glossy ibis potential habitat

Foraging and dispersal habitat (marginal)



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MIGRATORY WETLAND BIRDS POTENTIAL HABITAT

PROJECT ID: 60577456
CREATED BY: JR
LAST MODIFIED: JB - 15/03/2022
VERSION: 1

Figure
F31.1

A3 size

ABOVE SHEET- 03

BELOW SHEET- 04

WEST (ABOVE\ WEST (BELOW)

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

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Meters

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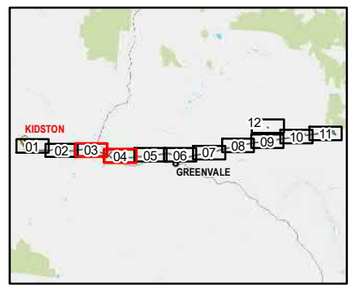
Legend

Study Area

Red-necked stint, common greenshank, common sandpiper, sharp-tailed sandpiper & glossy ibis potential habitat

Foraging and dispersal habitat (marginal)



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MIGRATORY WETLAND BIRDS POTENTIAL HABITAT

PROJECT ID: 60577456
CREATED BY: JR
LAST MODIFIED: JB - 15/03/2022
VERSION: 1

Figure F31.2

A3 size

ABOVE SHEET- 05

BELOW SHEET- 06

WEST (ABOVE\ WEST (BELOW)

Filename: Document Path: \\AUTSV1PFILW003\Projects\605X\605774564\4. Tech Work Area\4.99 GIS\02_MXDs\JM\20220228\60577456_MNES_F31_WelandBirds_A3L.mxd

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

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Meters

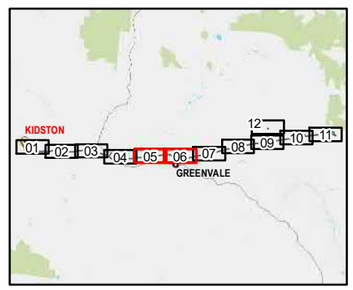
1:55,000 (when printed at A3)

Legend

Study Area

Red-necked stint, common greenshank, common sandpiper, sharp-tailed sandpiper & glossy ibis potential habitat

Foraging and dispersal habitat (marginal)



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MIGRATORY WETLAND BIRDS POTENTIAL HABITAT

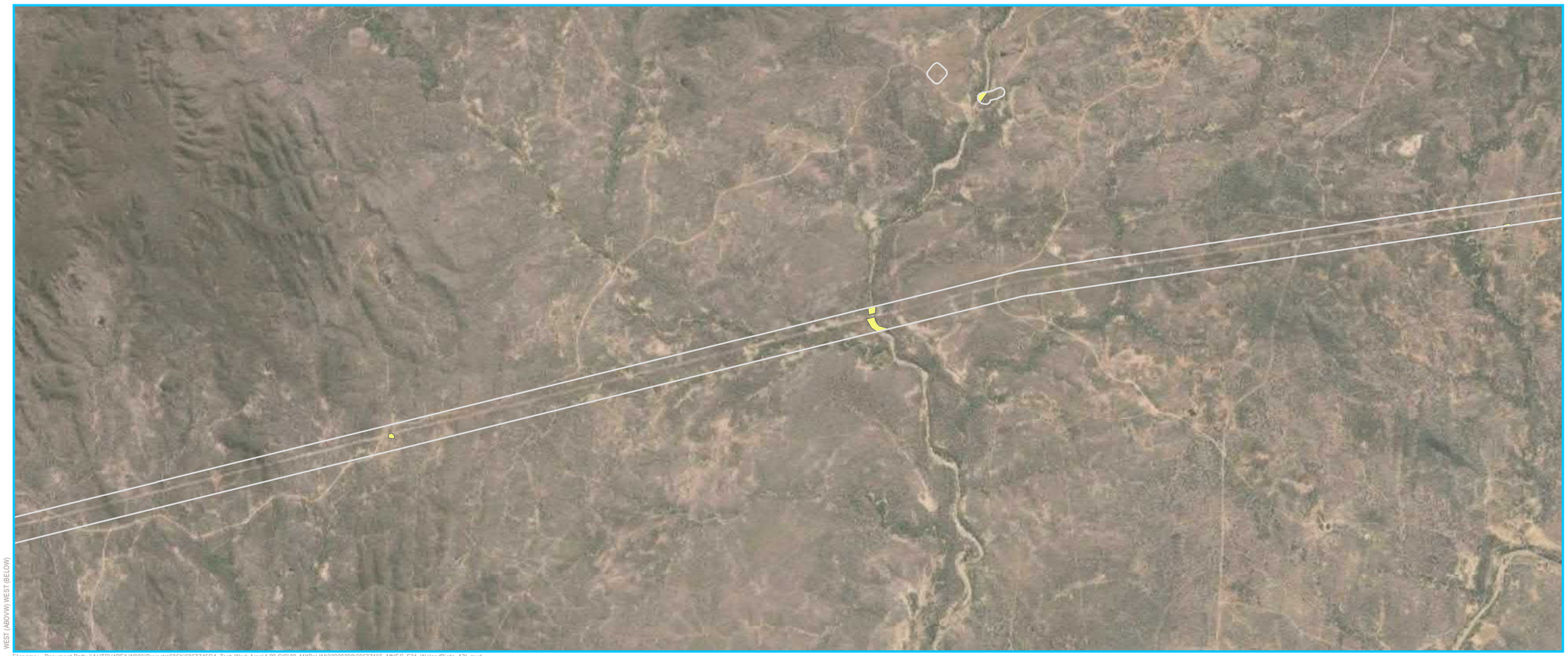
PROJECT ID: 60577456
CREATED BY: JR
LAST MODIFIED: JB - 15/03/2022
VERSION: 1

Figure F31.3

A3 size

ABOVE SHEET- 07

BELOW SHEET- 08



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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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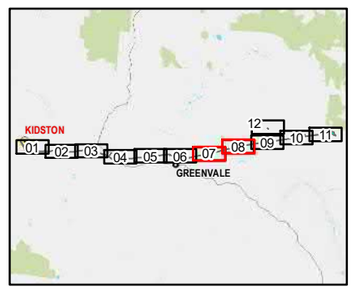
Legend

Study Area

Red-necked stint, common greenshank, common sandpiper, sharp-tailed sandpiper & glossy ibis potential habitat

Foraging and dispersal habitat (marginal)



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MIGRATORY WETLAND BIRDS POTENTIAL HABITAT

PROJECT ID: 60577456
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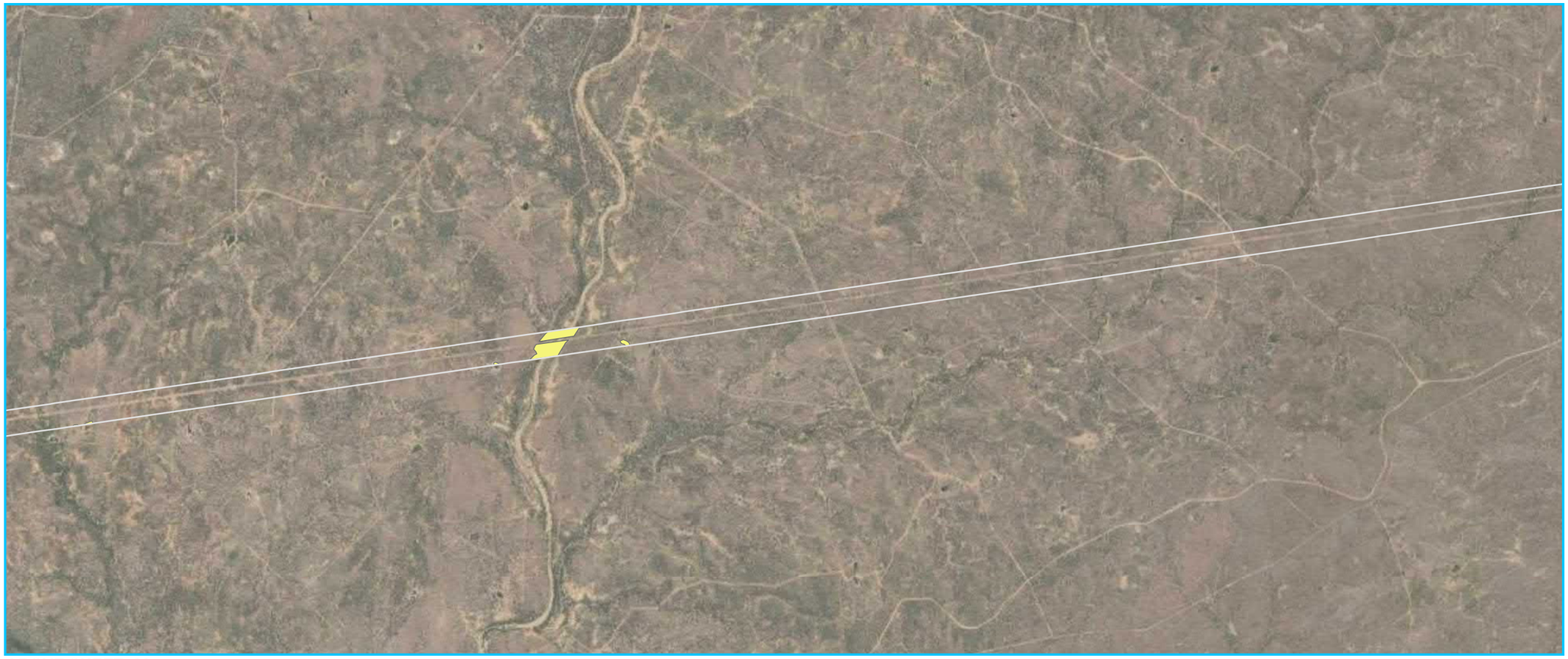
LAST MODIFIED: JB - 15/03/2022
VERSION: 1

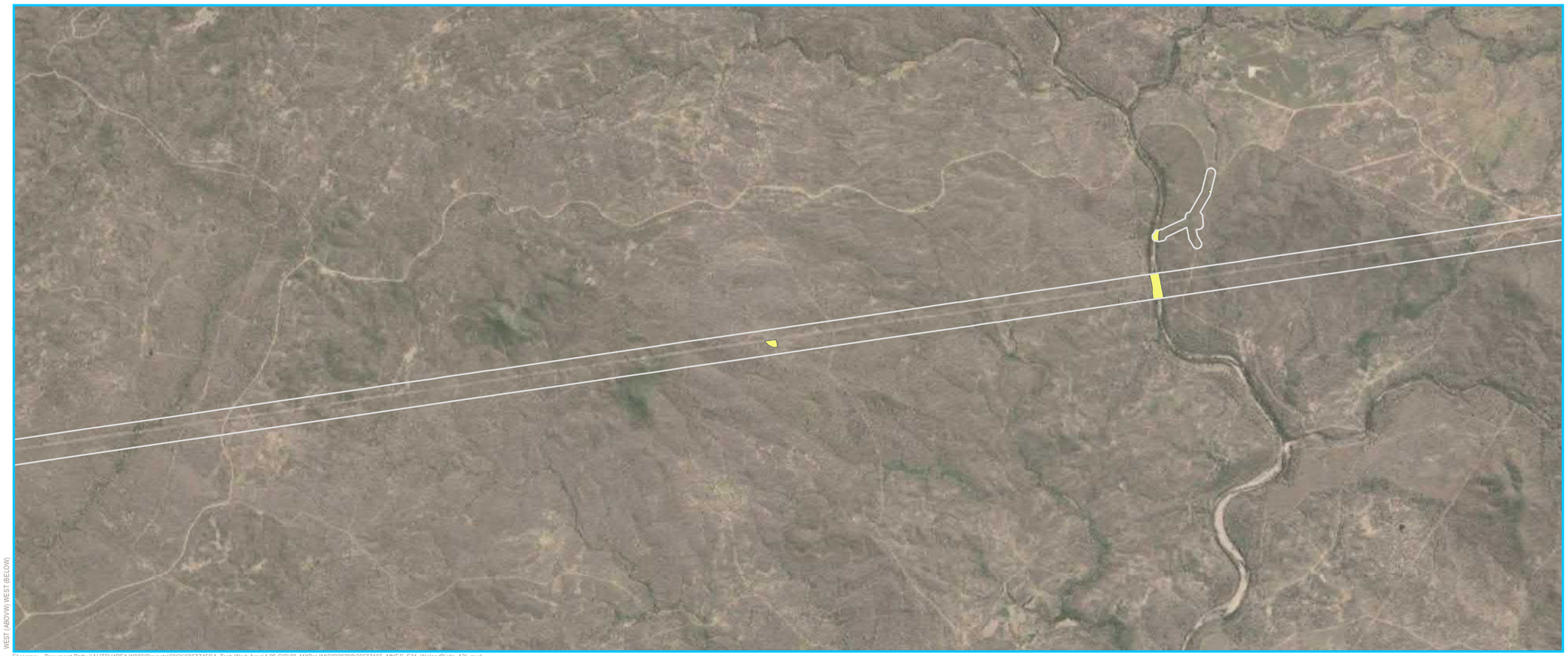
Figure F31.4

A3 size



ABOVE SHEET- 09

BELOW SHEET- 10



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Meters

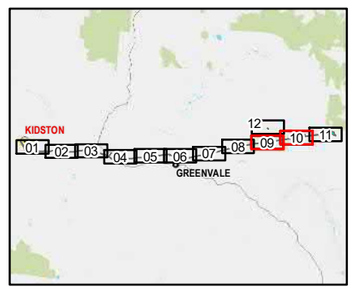
1:55,000 (when printed at A3)

Legend

Study Area

Red-necked stint, common greenshank, common sandpiper, sharp-tailed sandpiper & glossy ibis potential habitat

Foraging and dispersal habitat (marginal)



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MIGRATORY WETLAND BIRDS POTENTIAL HABITAT

PROJECT ID: 60577456
CREATED BY: JR
LAST MODIFIED: JB - 15/03/2022
VERSION: 1

Figure
F31.5

A3 size

ABOVE SHEET- 11

BELOW SHEET- 12

WEST (ABOVE) WEST (BELOW)

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

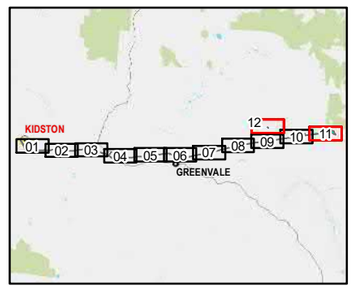
1:55,000 (when printed at A3)

Legend

Study Area

Red-necked stint, common greenshank, common sandpiper, sharp-tailed sandpiper & glossy ibis potential habitat

Foraging and dispersal habitat (marginal)



Data sources:
DCDB, Roads, Watercourses - DNRM 2017
Site Features and Layout - AECOM 2018
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MIGRATORY WETLAND BIRDS POTENTIAL HABITAT

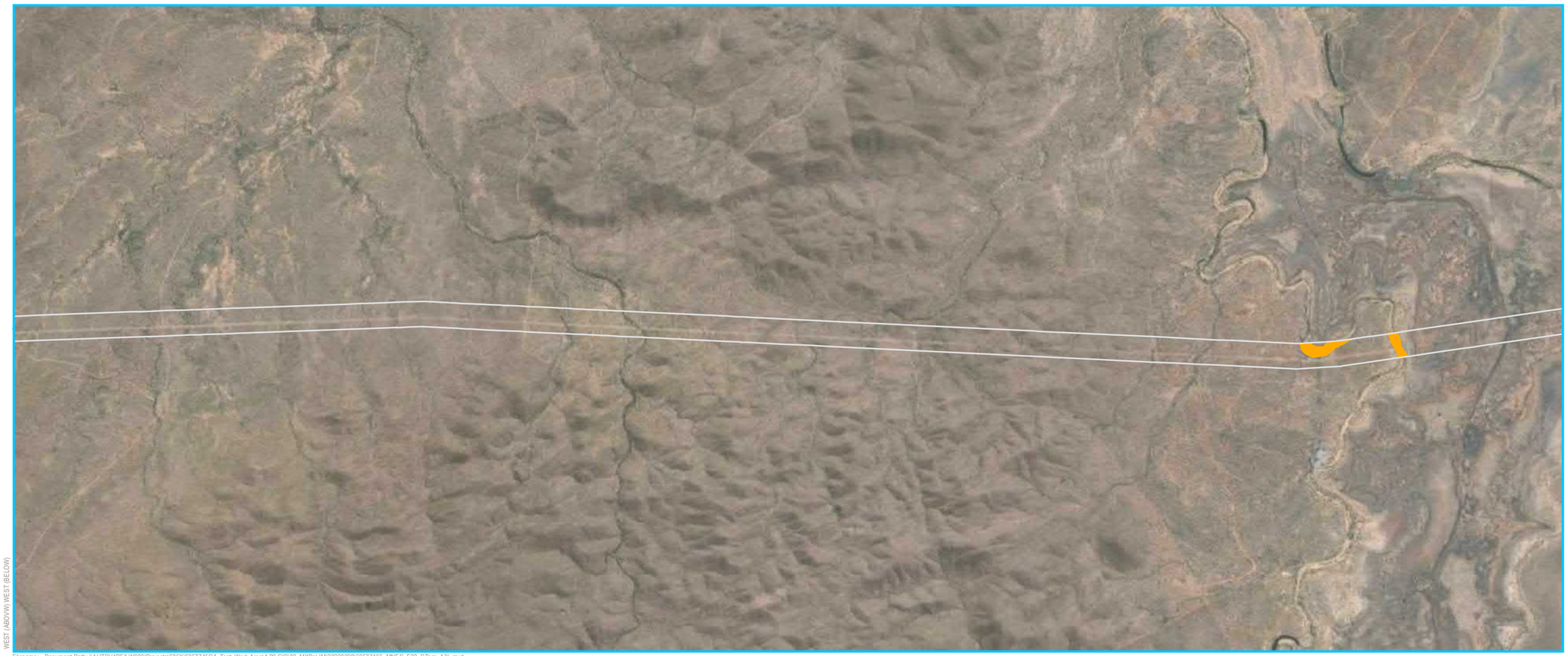
PROJECT ID: 60577456
CREATED BY: JR
LAST MODIFIED: JB - 15/03/2022
VERSION: 1

Figure F31.6

A3 size

ABOVE SHEET- 01

BELOW SHEET- 02



WEST (ABOVE) WEST (BELOW)

Filename: Document Path: \\AUTSV1PFILW003\Projects\605X\605774564\4. Tech Work Area\4.99 GIS\02_MXDs\JM\20220228\60577456_MNES_F32_CTern_A3L.mxd

AECOM
www.aecom.com

N

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

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

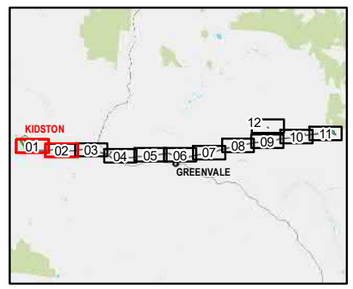
1:55,000 (when printed at A3)

Legend

Study Area

Caspian Tern

Potential foraging and dispersal habitat



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CASPIAN TERN POTENTIAL HABITAT

PROJECT ID: 60577456
CREATED BY: JR
LAST MODIFIED: JB - 15/03/2022
VERSION: 1

Figure F32.1

A3 size

ABOVE SHEET- 03

BELOW SHEET- 04

WEST (ABOVE) WEST (BELOW)

Filename: Document Path: \\AUTSV1PFILW003\Projects\605X\605774564\4. Tech Work Area\4.99 GIS\02_MXDs\JM\20220228\60577456_MNES_F32_CTern_A3L.mxd

AECOM
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N

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

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

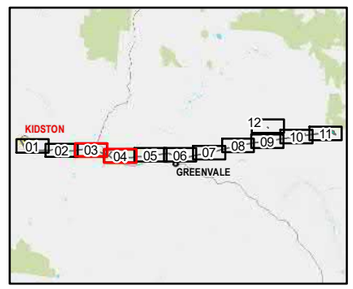
1:55,000 (when printed at A3)

Legend

Study Area

Caspian Tern

Potential foraging and dispersal habitat



Data sources:
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LAST MODIFIED: JB - 15/03/2022
VERSION: 1

Figure F32.2

A3 size

ABOVE SHEET- 05

BELOW SHEET- 06

WEST (ABOVE) WEST (BELOW)

Filename: Document Path: \\AUTSV1PFILW003\Projects\605X\605774564\4. Tech Work Area\4.99 GIS\02_MXDs\JM\20220228\60577456_MNES_F32_CTern_A3L.mxd

AECOM
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N

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

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

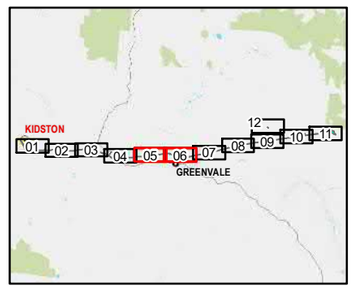
1:55,000 (when printed at A3)

Legend

Study Area

Caspian Tern

Potential foraging and dispersal habitat



Data sources:
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CASPIAN TERN POTENTIAL HABITAT

PROJECT ID: 60577456
CREATED BY: JR
LAST MODIFIED: JB - 15/03/2022
VERSION: 1

Figure F32.3

A3 size

ABOVE SHEET- 07

BELOW SHEET- 08

WEST (ABOVE) WEST (BELOW)

Filename: Document Path: \\AUTSV1PFILW003\Projects\605X\605774564. Tech Work Area\4.99 GIS\02_MXDs\JM\20220228\60577456_MNES_F32_CTern_A3L.mxd

AECOM
www.aecom.com

N

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

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

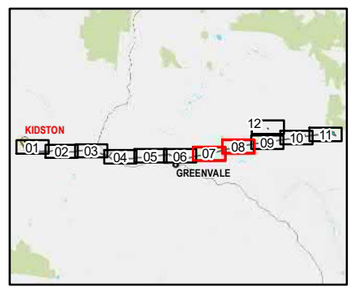
1:55,000 (when printed at A3)

Legend

Study Area

Caspian Tern

Potential foraging and dispersal habitat



Data sources:
DCDB, Roads, Watercourses - DNRM 2017
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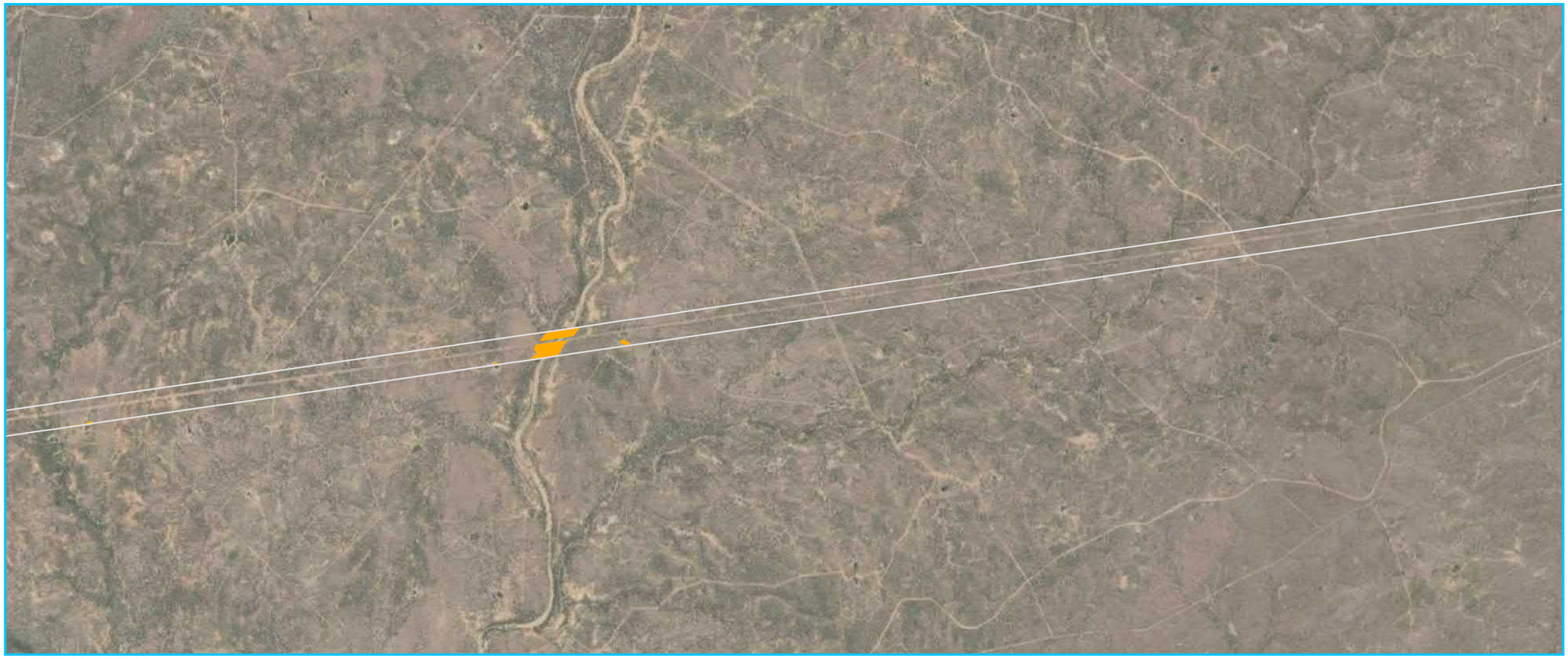
Powerlink Kidston Connection Project

CASPIAN TERN POTENTIAL HABITAT

PROJECT ID: 60577456
CREATED BY: JR
LAST MODIFIED: JB - 15/03/2022
VERSION: 1

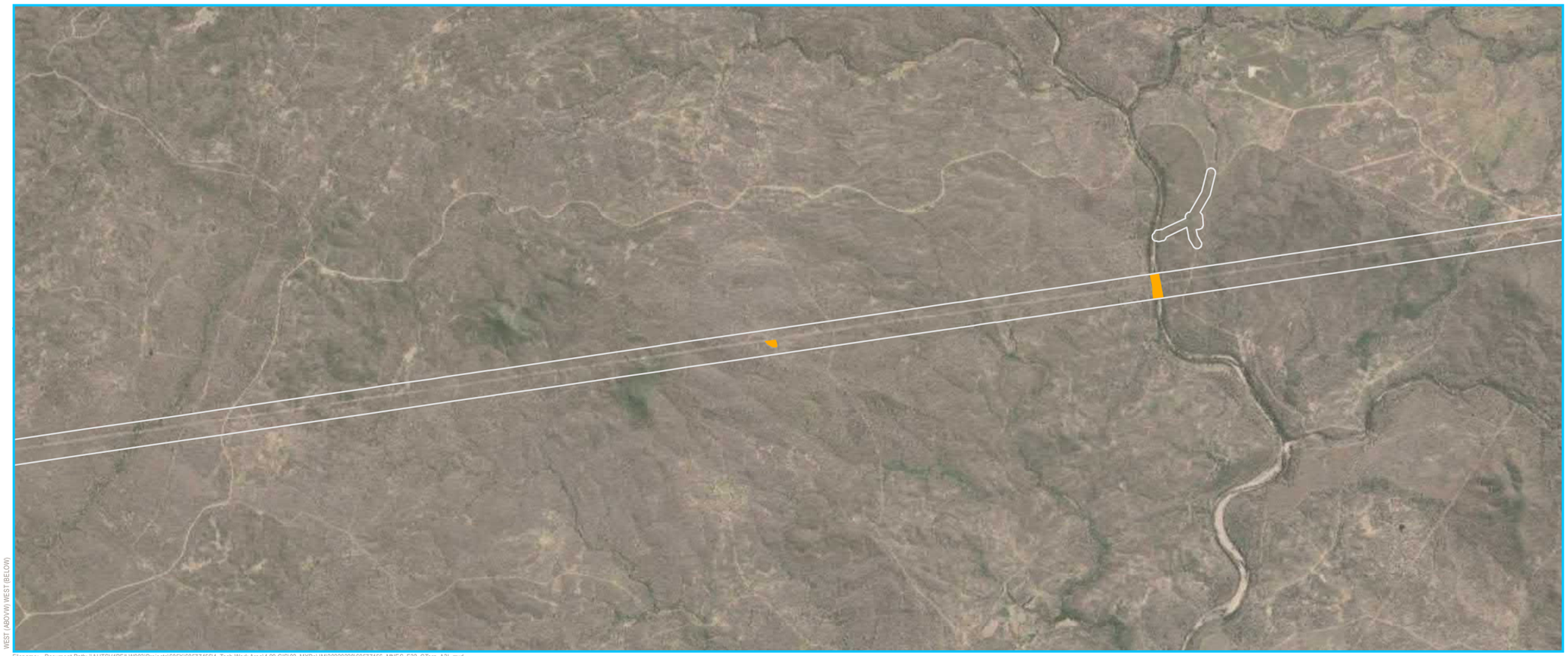
Figure F32.4

A3 size



ABOVE SHEET- 09

BELOW SHEET- 10



WEST (ABOVE\ WEST (BELOW)

Filename: Document Path: \\AUTSV1PFILW003\Projects\605X\60577456\4. Tech Work Area\4.99 GIS\02_MXDs\JM\20220228\60577456_MNES_F32_CTern_A3L.mxd

AECOM
www.aecom.com

N

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

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

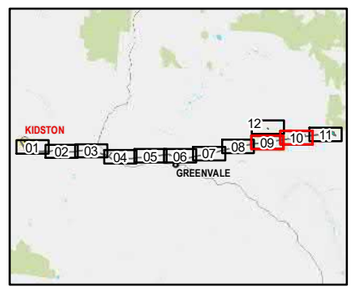
1:55,000 (when printed at A3)

Legend

Study Area

Caspian Tern

Potential foraging and dispersal habitat



Data sources:
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CASPIAN TERN POTENTIAL HABITAT

PROJECT ID: 60577456
CREATED BY: JR
LAST MODIFIED: JB - 15/03/2022
VERSION: 1

Figure F32.5

A3 size

ABOVE SHEET- 11

BELOW SHEET- 12

WEST (ABOVE) WEST (BELOW)

Filename: Document Path: \\AUTSV1PFILW003\Projects\605X\605774564\4. Tech Work Area\4.99 GIS\02_MXDs\JM\20220228\60577456_MNES_F32_CTern_A3L.mxd

AECOM
www.aecom.com

N

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

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

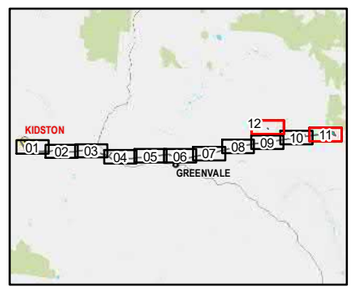
1:55,000 (when printed at A3)

Legend

Study Area

Caspian Tern

Potential foraging and dispersal habitat



Data sources:
DCDB, Roads, Watercourses - DNRM 2017
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Powerlink Kidston Connection Project

CASPIAN TERN POTENTIAL HABITAT

PROJECT ID: 60577456
CREATED BY: JR
LAST MODIFIED: JB - 15/03/2022
VERSION: 1

Figure F32.6

A3 size

Appendix G

Balance! Environmental Reports

Microbat Call Identification Report

Prepared for ("Client"):	AECOM
Survey location/project name:	Kidston Connection, NE Qld
Survey dates:	9-15 December 2021
Client project reference:	
Job no.:	AEC-2201
Report date:	31 January 2022

Methods

Data received

Balance! Environmental received 14686 full-spectrum ultrasonic acoustic files (WAV files), recorded on two Anabat Swifts and an Anabat Walkabout over the nights of 9th – 15th December 2021. GPS metadata in the Swift files shows that they were deployed at separate locations and each unit remained in one place for the duration of deployment, *viz.*:

- AECOM 2 - SN553552
    - deployed on the nights of 13th, 14th, 15th, 16th December
    - site coordinates: -18.8532196, 145.7626114
    - total WAV files recorded = 2228
- AECOM 4 - SN605635
    - Deployed on the nights of 9th, 10th, 11th, 12th December
    - Site coordinates: -18.96793586, 144.9826509
    - Total WAV files recorded = 12403

The Anabat Walkabout recorded 55 WAV files, with time-stamps indicating that it operated for various periods between about 19:00 and 22:00 on the nights of 10th-14th December.

Call analysis and species identification

Data were processed in Anabat Insight (Version 2.0.1; Titley Scientific, Brisbane). A noise filter was applied to the WAV files to set aside those that contained only non-bat noise. All files that passed the noise filter (i.e., those that contained bat calls) were processed through a Decision Tree analysis to group calls with similar pulse characteristics and apply tentative species labels. Species identities were then verified, and labels corrected where necessary, by reviewing each group manually and comparing call spectrograms and derived metrics with those of regionally relevant reference calls and published call descriptions (*e.g.*, Reinhold et al. 2001; Pennay et al. 2004).

The target species for these surveys was the Ghost Bat (*Macroderma gigas*), which produces very low intensity echolocation calls that are not easily recorded. It also makes a range of characteristic, low-frequency social calls that can be distinguished from other non-bat sounds like insect calls. Such calls would be excluded during the noise filtration process described above; consequently, a manual review of "noise" file spectrograms was conducted to ensure no *M. gigas* calls were missed in the analysis. The manual review focussed on early evening (18:30-20:30) and pre-dawn (03:30-05:30) periods for each night, since that is when *M. gigas* is most likely to be making social calls as they emerge from and return to roosts, and when they may be hunting for other emerging bats.

The likelihood of species' occurrence in the study area was also confirmed by referring to the Australasian Bat Society's *BatMap* application (https://www.ausbats.org.au/batmap.html) and other relevant published material (*e.g.*, Churchill 2008; van Dyck et al. 2013).

Reporting standard

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

Species nomenclature follows Armstrong *et al.* (2020).

Results & Discussion

Noise filtration excluded 12,707 files from further analysis, including all 55 files recorded on the Anabat Walkabout unit. The other 1979 WAV files contained 2068 identifiable bat calls. Most (2046) of the calls were positively identified to one of 14 species:

- *Rhinolophus megaphyllus*
- *Chalinolobus gouldii*
- *Chalinolobus morio*
- *Chalinolobus nigrogriseus*
- *Nyctophilus* species
- *Scotorepens greyii*
- *Scotorepens sanborni*
- *Miniopterus australis*
- *Miniopterus orianae*
- *Austronomus australis*
- *Chaerephon jobensis*
- *Ozimops lumsdenae*
- *Ozimops ridei*
- *Saccolaimus flaviventris*

The other 22 “unresolved” calls could not be reliably identified but belonged to *C. nigrogriseus* and/or *S. greyii* and/or *S. sanborni*.

There was no evidence of *M. gigas* echolocation or social calls in any of the manually reviewed data.

Table 1 provides a summary of the species detected at each site, while a full breakdown of the number of calls allocated to each species and unresolved species group appears in **Appendix 2**. Sample call spectrograms are presented in **Appendix 1**.

References

Armstrong, K.N., Reardon, T.B., and Jackson, S.M. (2020). *A current taxonomic list of Australian Chiroptera.* Australasian Bat Society. Version 2020-06-09. URL: http://ausbats.org.au/species-list/4593775065

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

Pennay, M., Law, B., and Reinhold, L. (2004). Bat calls of New South Wales: Region based guide to echolocation calls of Microchiropteran bats. NSW Department of Environment and Conservation, Hurstville.

Reardon, T. (2003). Standards in bat detector based surveys. Australasian Bat Society Newsletter 20, 41-43.

Reinhold, L., Law, B., Ford, G. and Pennay, M. (2001). Key to the bat calls of south-east Queensland and north-east New South Wales. Department of Natural Resources and Mines, Brisbane.

van Dyck, S., Gynther, I. and Baker, A. (ed.) (2013). Field Companion to the Mammals of Australia. New Holland; Sydney.

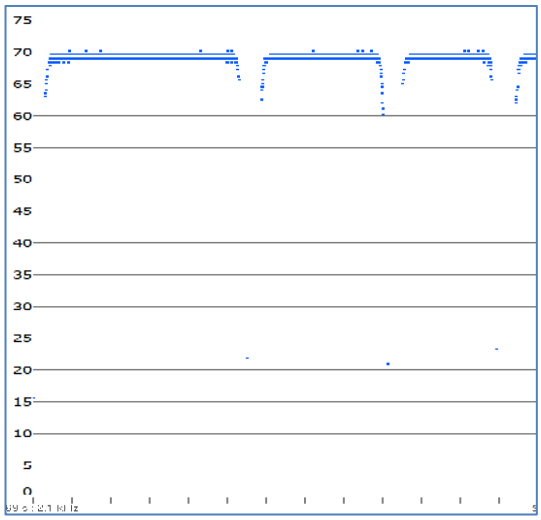
Table 1 Bats recorded during the Kidston Connection survey 9-15 December 2021.

♦ = definite; at least one call recorded at the site was positively attributed to the species

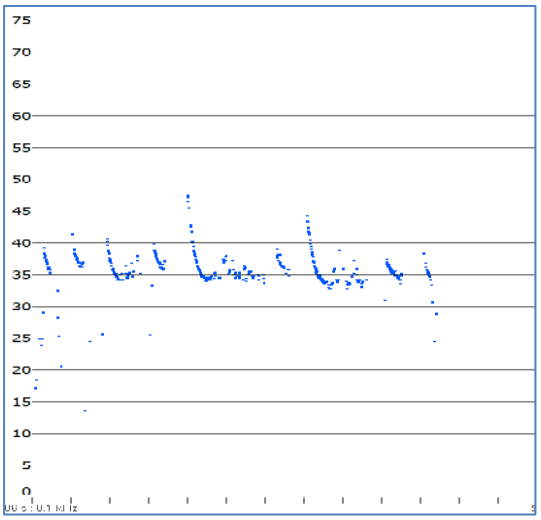
□ = possible; calls like those of the species were present but could not be positively identified

Detector	AECOM 2 - SN553552	AECOM 4 - SN605635
Rhinolophus megaphyllus	♦	
Chalinolobus gouldii		♦
Chalinolobus morio		♦
Chalinolobus nigrogriseus	♦	♦
Nyctophilus sp.	♦	♦
Scotorepens greyii	♦	♦
Scotorepens sanborni	♦	♦
Miniopterus australis	♦	♦
Miniopterus orianae	♦	♦
Austronomus australis	♦	
Chaerephon jobensis	♦	♦
Ozimops lumsdenae	♦	♦
Ozimops ridei	♦	♦
Saccolaimus flaviventris	♦	♦

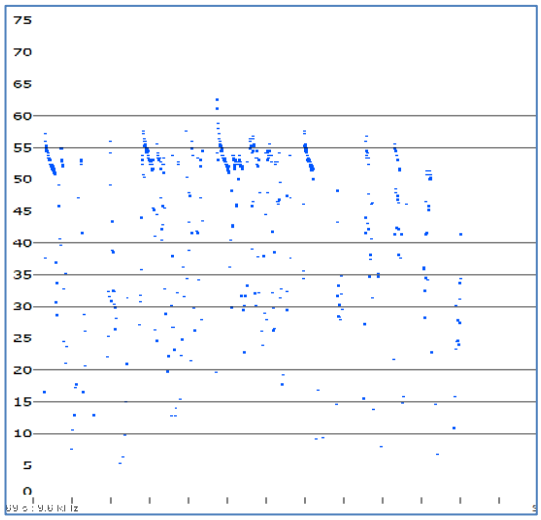
Appendix 1 Representative sonograms from the Kidston Connection survey, 9-15 December 2021.
X-axis (time)=10 msec per tick; time between pulses compressed



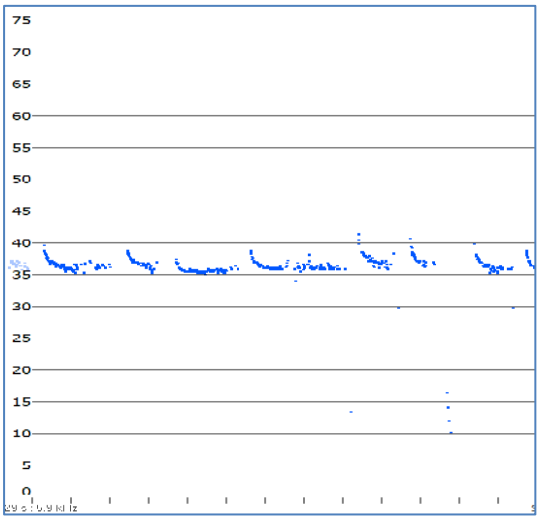
Rhinolophus megaphyllus



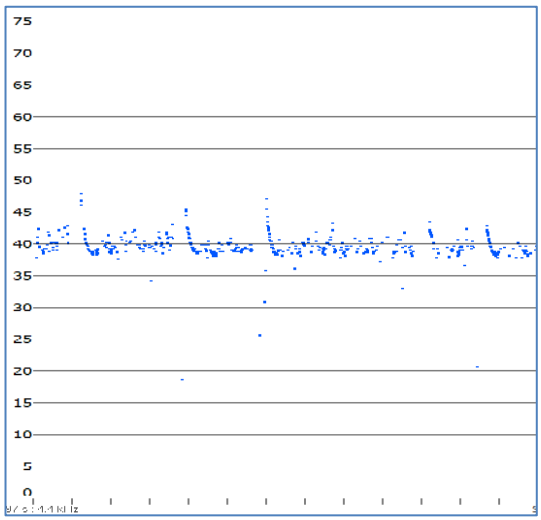
Chalinolobus gouldii



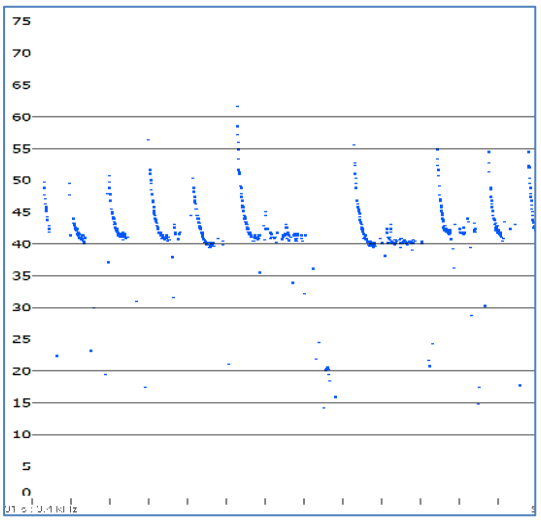
Chalinolobus morio



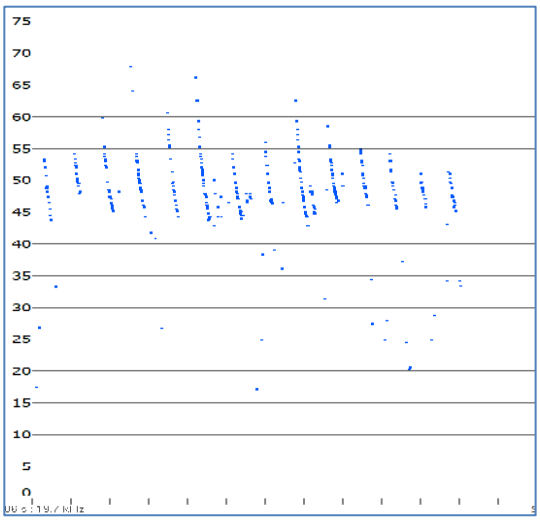
Chalinolobus nigrogriseus



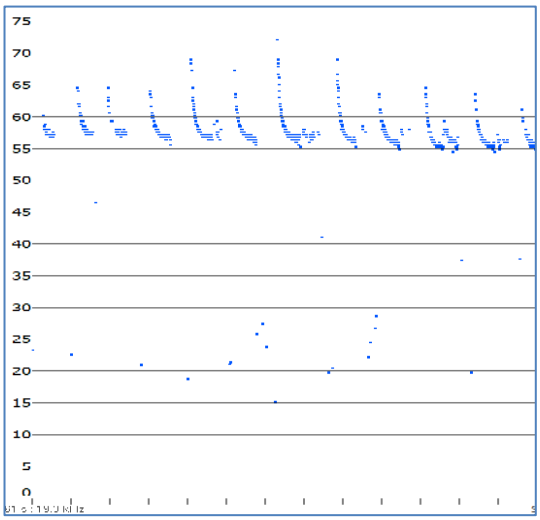
Scotorepens greyii



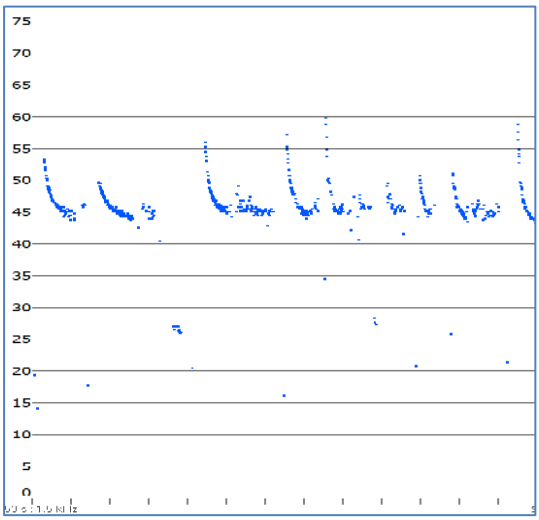
Scotorepens sanborni



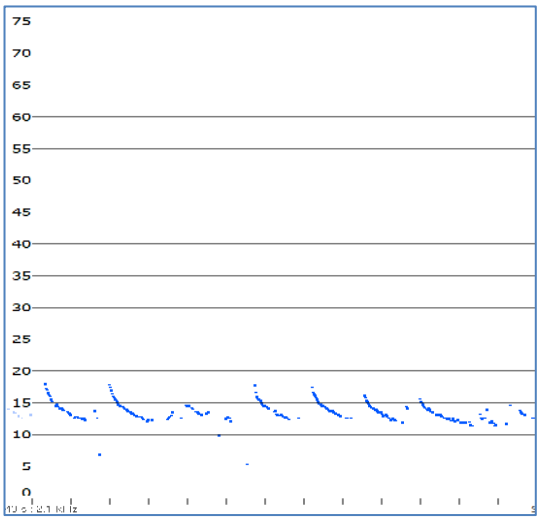
Nyctophilus sp.



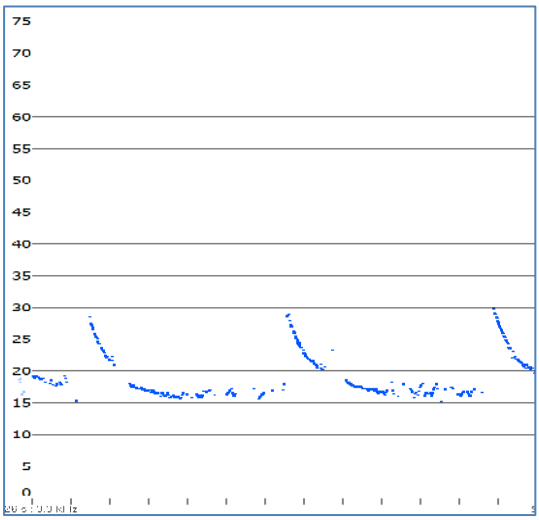
Miniopterus australis



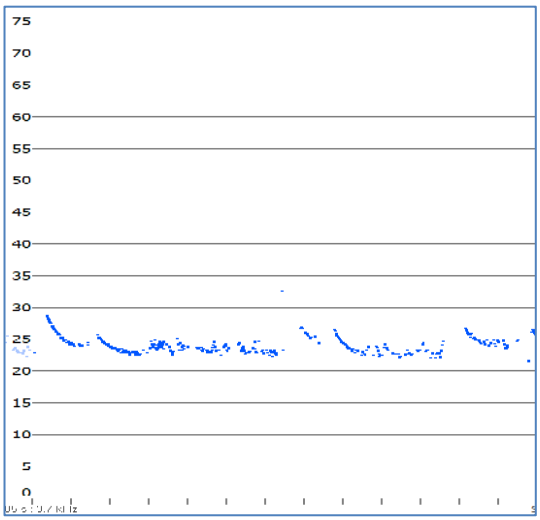
Miniopterus orianae



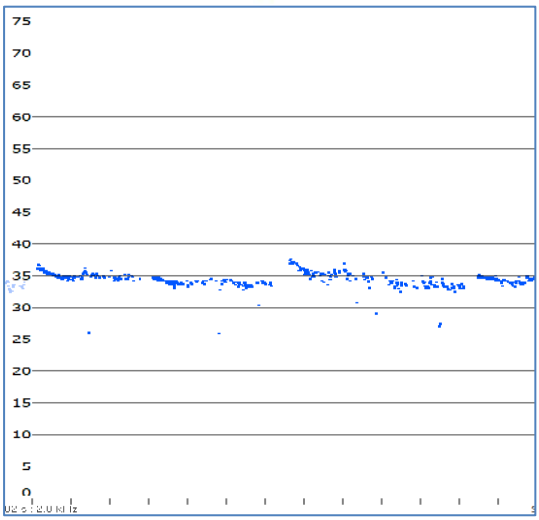
Austronomus australis



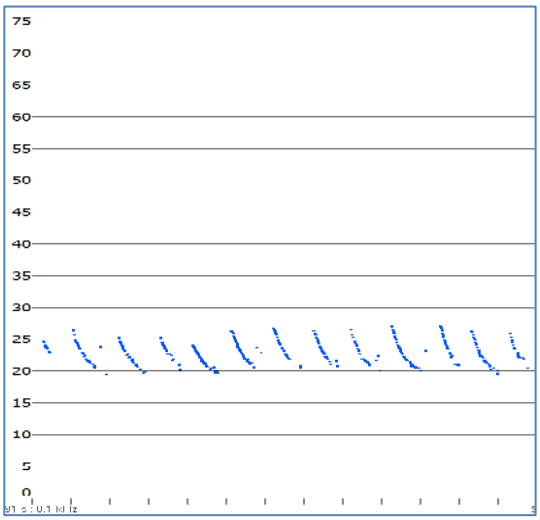
Chaerephon jobensis



Ozimops lumsdenae



Ozimops ridei



Saccolaimus flaviventris

Appendix 2 Bats recorded during the Kidston Connection survey, 9-15 December 2021. Count of calls recorded per species per site.

Detector	AECOM 2 - SN553552	AECOM 4 - SN605635	Species total
Positively identified calls			
Rhinolophus megaphyllus	535		535
Chalinolobus gouldii		1	1
Chalinolobus morio		3	3
Chalinolobus nigrogriseus	11	149	160
Nyctophilus sp.	1	1	1
Scotorepens greyii	1	4	5
Scotorepens sanborni	14	22	36
Miniopterus australis	205	4	209
Miniopterus orianae	183	12	195
Austronomus australis	3		3
Chaerephon jobensis	26	345	371
Ozimops lumsdenae	81	198	279
Ozimops ridei	6	198	204
Saccolaimus flaviventris	24	19	43
Unresolved calls			
C. nigrogriseus / Scotorepens sp.	3	19	22
Site total	1093	975	2068

Microbat Call Identification Report

Prepared for ("Client"):	AECOM
Survey location/project name:	Powerlink Greenvale-Mt Fox
Survey dates:	12-19 June 2018
Client project reference:	60577456 1.02
Job no.:	AEC-1803
Report date:	14 July 2018

Methods

Survey summary and data received

Four Song Meter SM2 bat detectors (Wildlife Acoustics, Maynard MA, USA) were deployed over seven consecutive nights (12th-18th June 2018) along a transmission line route between Greenvale and Mt Fox, NE Queensland. Detectors were set to record between sunset and sunrise each night and saved the resulting echolocation acoustic data as full-spectrum .WAV files.

Balance! Environmental received over 4628 WAV files for analysis.

Bat-call analysis and species identification

Call analyses were performed using the Cluster Analysis function of *Kaleidoscope Pro,* which rapidly scanned the WAV files and automatically clustered detected bat-calls into groups with similar pulse-characteristics (based on zero-crossing analysis). All clusters were then manually scanned in spectrogram view and allocated either to single species or groups of difficult-to-differentiate species ("unresolved calls").

Manual verification of call identities was based on comparison of call spectrograms and derived metrics with those of reference calls from northern Queensland and/or with published call descriptions (e.g. Reinhold et al. 2001; Milne 2002). Consideration was also given to the probability of species' occurrence based on published distribution information (e.g. Churchill 2008; van Dyck *et al.* 2013) and on-line database records (e.g. http://www.ala.org.au).

Reporting standard

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

Species nomenclature follows Jackson & Groves (2015), who elevated the sub-genus names proposed by Reardon *et al.* (2008, 2014) for the *Mormopterus* free-tailed bats to genus level. New names used in this report include:

- *Ozimops lumsdenae* (Northern Free-tailed Bat) – formerly *M. beccarii* (Beccari's Freetail Bat); and
- *O. ridei* (Ride's Free-tailed Bat) – formerly *M. ridei* and *M.* 'species 2' (Eastern Freetail Bat).

Jackson and Groves (2015) also allocate the Large (Eastern) Bent-winged Bat to *M. orianae* (formerly *Miniopterus schreibersii*).

Results & Discussion

The cluster analysis recognised 1765 distinct bat calls and grouped them into 14 clusters. Verification of call identities in those clusters resulted in the further subdivision of some clusters due to the presence of multiple call types that were obvious to the experienced observer.

Almost 99% (1744) of the recognised bat calls were positively identified to one of 10 distinct species or two groups of species that cannot be further differentiated (*Chalinolobus nigrogriseus/Scotorepens greyii/S. sanborni* and *Nyctophilus* species).

The remaining 21 calls displayed characteristics that were intermediate between several of the positively-identified species and were allocated to one of three 'unresolved groups' (*Chalinolobus gouldii/Ozimops ridei; Chaerephon jobensis/Saccolaimus flaviventris;* and *C. jobensis/Ozimops lumsdenae*).

Table 1 provides a summary of species recorded each detector-night throughout the survey. Where calls were allocated to an 'unresolved' group, all group members are listed as "possible" unless more 'typical' calls from one or more group members were also positively identified.

Sample spectrograms of all identified call types are shown at **Appendix 1**.

References

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

Corben, C. (2017). *AnalookW for bat call analysis using ZCA. Version 4.2n*, 16 March 2017.

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Reinhold, L., Law, B., Ford, G. and Pennay, M. (2001). *Key to the bat calls of south-east Queensland and north-east New South Wales*. Department of Natural Resources and Mines, Brisbane.

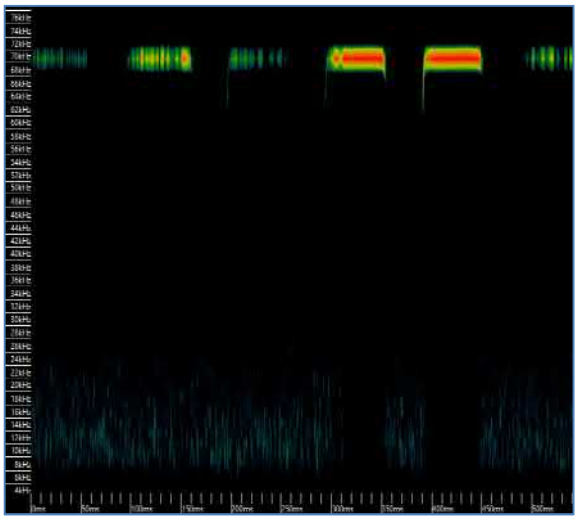
van Dyck, S., Gynther, I. and Baker, A. (ed.) (2013). *Field Companion to the Mammals of Australia*. New Holland; Sydney.

Table 1 Microbat species recorded during the Greenvale-Mt Fox Transmission Line surveys, 12th-19th June 2018.

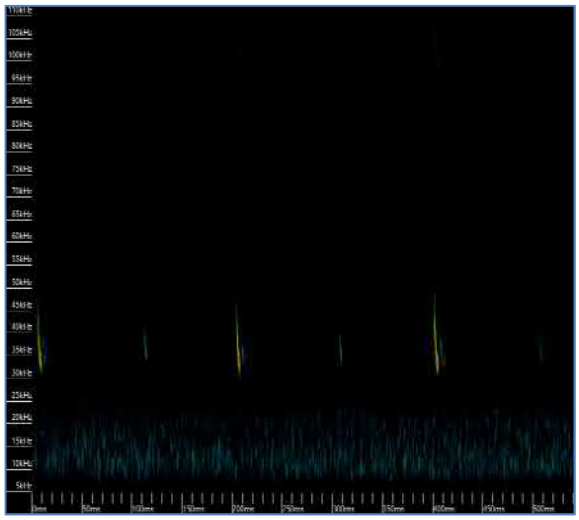
♦ = 'definite' - at least one call was attributed unequivocally to the species
□ = 'possible' - calls like those of the species were recorded, but were not reliably identified

Detector name:	**SM1**					**SM2**					
Deployment date:	13/6	14/6	15/6	17/6	18/6	12/6	13/6	15/6	16/6	17/6	18/6
No. of calls identified:	59	67	110	69	18	127	55	1	3	0	0
Rhinolophus megaphyllus						♦	♦				
Chalinolobus gouldii	□	♦	♦								
C. nigrogriseus / Scotorepens spp.	♦	♦	♦		♦	♦	♦				
Nyctophilus spp.											
Vespadelus troughtoni	♦	♦	♦	♦							
Miniopterus australis	♦	♦	♦	♦	♦	♦	♦				
Miniopterus orianae	♦	♦		♦	♦	♦	♦				
Austronomus australis	♦	♦	♦								
Chaerephon jobensis	♦	♦	♦	♦	♦	♦	♦	♦	♦		
Ozimops lumsdenae	♦		♦				♦				
Ozimops ridei	♦	♦	♦			♦	♦				
Saccolaimus flaviventris	♦	♦	♦	♦							
Detector name:	**SM3**					**SM4**					
Deployment date:	13/6	14/6	15/6	17/6	18/6	12/6	13/6	15/6	16/6	17/6	18/6
No. of calls identified:	251	137	133	19	8	292	261	82	60	10	3
Rhinolophus megaphyllus		♦	♦	♦							
Chalinolobus gouldii	□	□				♦	♦	♦			
C. nigrogriseus / Scotorepens spp.	♦	♦	♦		♦	♦	♦	♦			♦
Nyctophilus spp.										♦	
Vespadelus troughtoni	♦	♦	♦								
Miniopterus australis	♦	♦	♦	♦		♦		♦	♦	♦	
Miniopterus orianae	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	
Austronomus australis										♦	♦
Chaerephon jobensis	♦	♦	♦			♦	♦	♦	♦	♦	
Ozimops lumsdenae	♦		♦			♦	♦	♦	♦		
Ozimops ridei	♦	♦	♦			♦	♦	♦	♦		
Saccolaimus flaviventris	♦	♦	♦						♦		

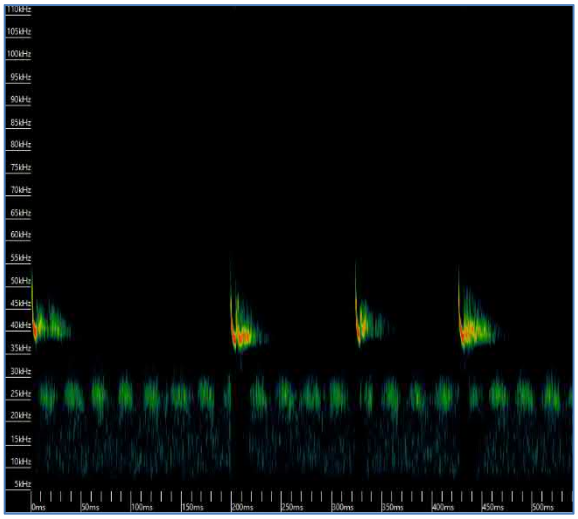
Appendix 1 Representative call sequences from the Greenvale-Mt Fox surveys, June 2018.
x-axis = 2 ms per tick-mark; time between pulses removed



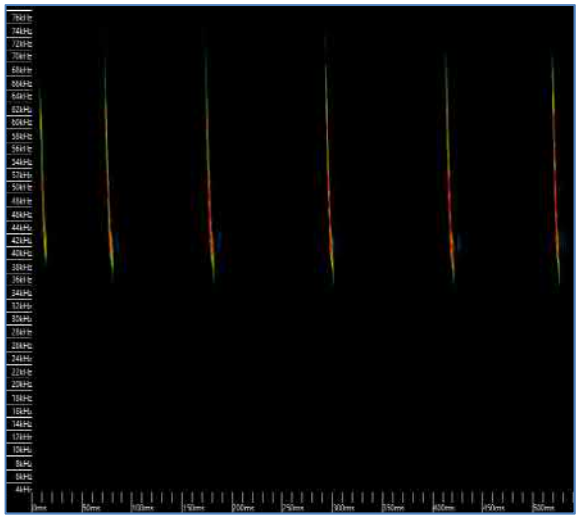
Rhinolophus megaphyllus



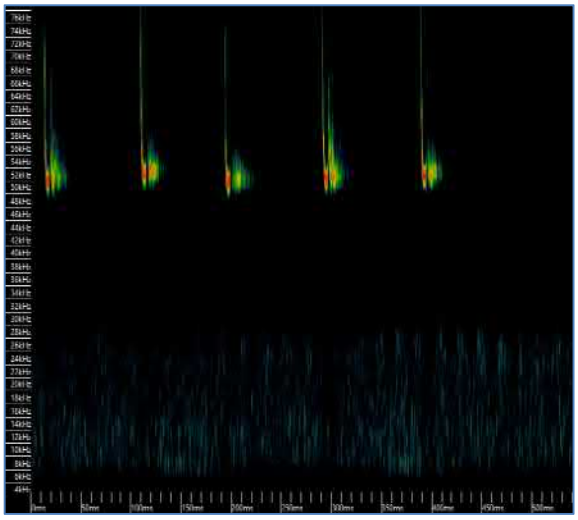
Chalinolobus gouldii



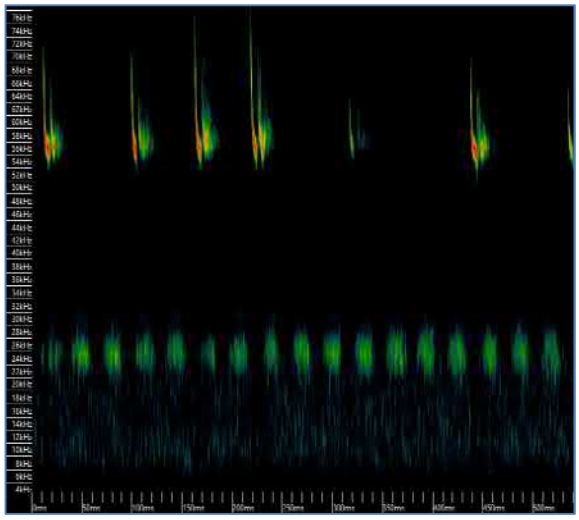
C. nigrogriseus / S. greyii / S. sanborni



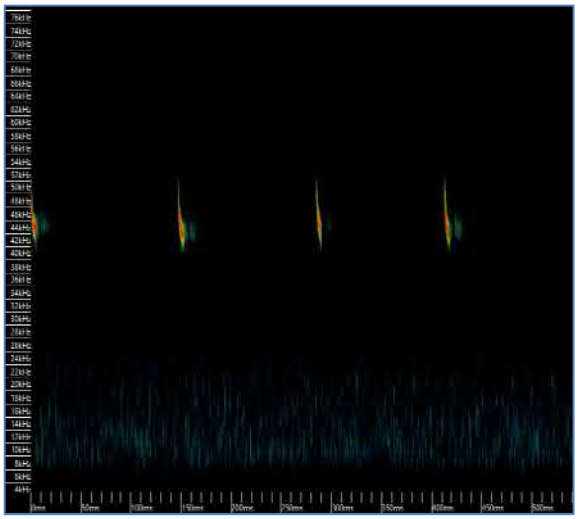
Nyctophilus species



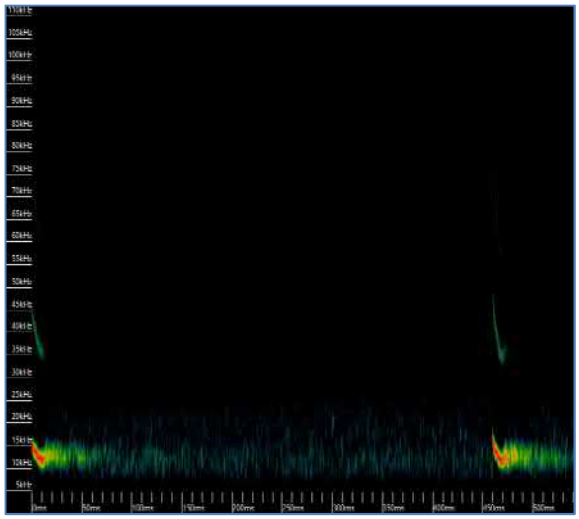
Vespadelus troughtoni



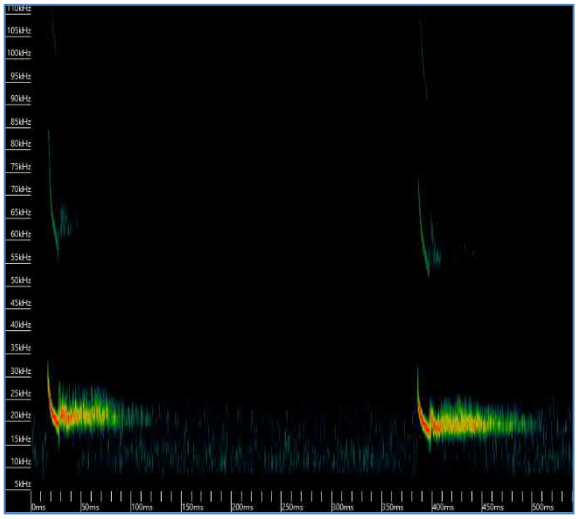
Miniopterus australis



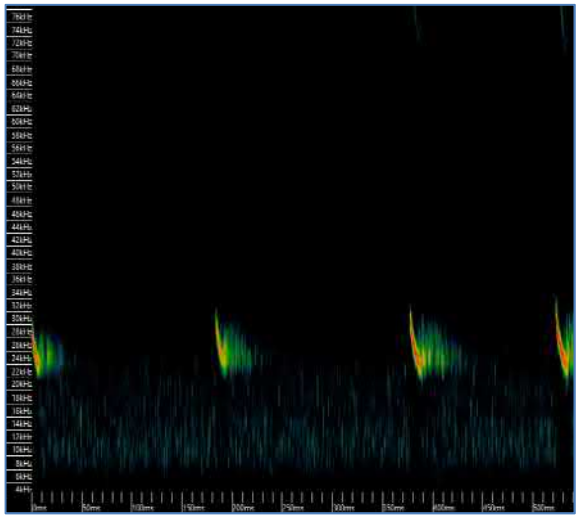
Miniopterus orianae oceanensis



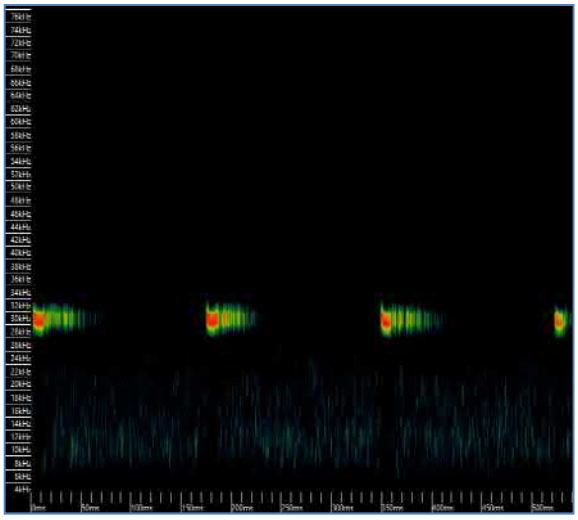
Austronomus australis



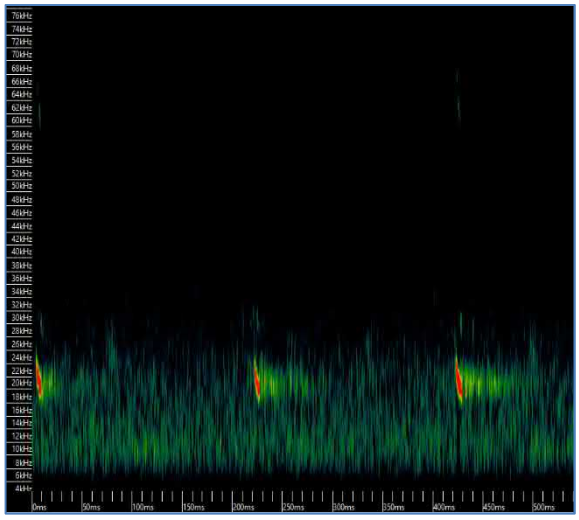
Chaerephon jobensis



Ozimops lumsdenae



Ozimops ridei



Saccolaimus flaviventris

Microbat Call Interpretation Report

Prepared for ("Client"):	AECOM
Survey location/project name:	Kidston Solar, NE Qld
Survey dates:	November 2017
Client project reference:	Project #: 60544566; Task 1.02
Job no.:	AEC-1709
Report date:	6 January 2018

Methods

Data received

Balance! Environmental received 96 compressed audio files (WAC format; Wildlife Acoustics, Maynard MA, USA), recorded over two survey nights (14th and 15th November 2017) by two Song Meter SM2BAT detectors,

Post-processing

Wildlife Acoustics' *Kaleidoscope* (Version 4.5.1) was used to convert the WAC files to bat-call sequence files in both zero-crossing analysis format (ZC files) and full-spectrum format (WAV files).

Call analysis and identification

Zero-crossing analysis

All ZC files were analysed using *AnalookW* (Corben 2017), with species identification achieved manually by comparing the call spectrograms with those of reference calls from northern Queensland and/or with published call descriptions (*e.g.* Reinhold et al. 2001; Milne 2002). Consideration was also given to the probability of species' occurrence based on published distribution information (Churchill 2008; van Dyck *et al.* 2013) and on-line database records (e.g. http://www.ala.org.au).

Full-spectrum analysis

Full-spectrum copies of some calls were also viewed (using the *Kaleidoscope Viewer*) to confirm identities assigned to the ZC files. Calls in the 18-28 kHz frequency range were assessed to determine the presence and pattern of harmonics, which can be used to differentiate between several sheath-tailed and free-tailed bats that produce similar calls within that range.

Reporting standard

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

Species nomenclature follows Jackson & Groves (2015), which elevates the sub-genus names proposed by Reardon *et al.* (2014) for the *Mormopterus* free-tailed bats to genus level; hence the use of *Ozimops* (*O. lumsdenae* & *O. ridei*) herein.

Results & Discussion

The compressed audio files yielded almost 1200 unique bat call sequences from the two detectors. Detector "SM1" recorded 288 call sequences on the first night (14th November), but nothing on night two (15th November). The few WAV files extracted from "SM1" for 15th November contained only 'white-noise' and a few insect buzzes. Some 905 call sequences were recorded by detector "SM2", spread evenly across the two nights (458 on 14th November; 447 on 15th November).

Of the 1193 call sequences identified, 943 (79%) were reliably attributable either to single species or groups of inseparable species. The remaining 250 calls were of insufficient quality for reliable identification (*i.e.* pulses were few and/or weak and/or atypical or intermediate shapes).

Table 1 provides an inventory of species recorded on each night by the two detectors. Sample spectrograms of each recorded call type are shown at Appendix 1.

Table 1 Microbat species recorded during the Kidston survey, 14-15 November 2017.

♦ = 'definite' - at least one call was attributed unequivocally to the species

□ = 'possible' - calls similar to those of the species were recorded, but were not reliably identified

Detector:	SM1		SM2	
Date:	14/11/2017	15/11/2017	14/11/2017	15/11/2017
Total call sequences:	288	0	458	447
Chalinolobus gouldii	♦		♦	□
Chalinolobus morio			♦	♦
Chalinolobus nigrogriseus	□			
Nyctophilus species			♦	♦
Scotorepens balstoni	♦		♦	♦
Scotorepens greyi / S. sanborni	♦		♦	♦
Miniopterus australis	♦			
Miniopterus orianae oceanensis	♦		♦	♦
Chaerephon jobensis	♦		♦	♦
Ozimops lumsdenae	♦		♦	♦
Ozimops ridei	□		♦	♦
Saccolaimus flaviventris	♦		♦	♦

At least 11 and as many as 15 species were recorded during the November 2017 Kidston survey (Table 1). Nine call types were positively identified to individual species, with another two call types each potentially representing two or three species and allocated to the following groups:

- *Nyctophilus* spp.
    - Steep, almost-linear calls with terminal frequency around 35-45 kHz
    - Impossible to differentiate calls from the species in this genus
    - Up to three *Nyctophilus* species may be present – *N. bifax, N. geoffroyi* and *N. gouldi*
- *Scotorepens greyii / S. sanborni*
    - Steep curvilinear pulses with characteristic frequency (Fc) of 38-41 kHz and distinctive "hooked" pulse bodies with up-swept tails
    - These *Scotorepens* species' calls cannot be differentiated from each other
    - *Chalinolobus nigrogriseus* calls overlap this Fc range and have similar pulse shape but usually without "hook" (*i.e.* body is curved with no tail or down-swept tail)
    - Several calls with intermediate features were recorded by "SM1", hence "probable" listing of *C. nigrogriseus* for that detector-night

Most of the 250 poorer quality, unresolved calls belonged to species that were positively identified from more typical calls. The "probable" listing of *Ozimops ridei* ("SM1" on 14th November) and *Chalinolobus gouldii* ("SM2" on 15th November) was derived from a few calls with features intermediate between these two species (mixed or intermediate pulse shapes at Fc~28-32 kHz).

Technical terms used in the above descriptions are explained in the Glossary.

References

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

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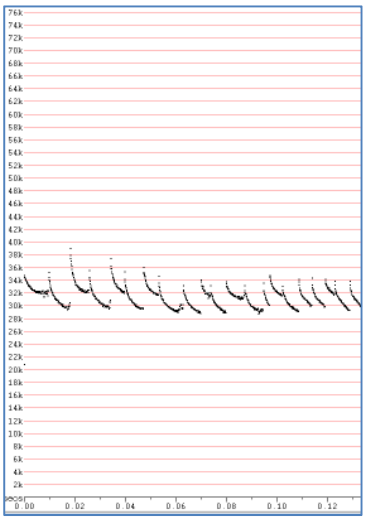
van Dyck, S., Gynther, I. and Baker, A. (ed.) (2013). *Field Companion to the Mammals of Australia*. New Holland; Sydney.

Glossary

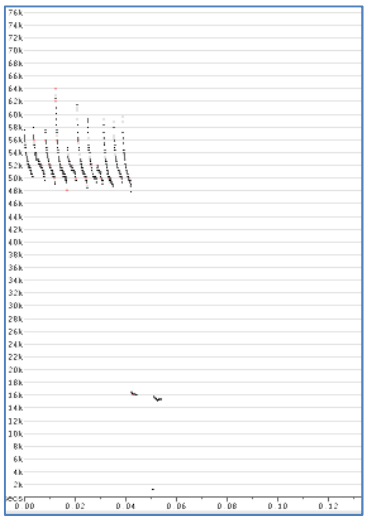
Technical terms used in this report are described in the following table.

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

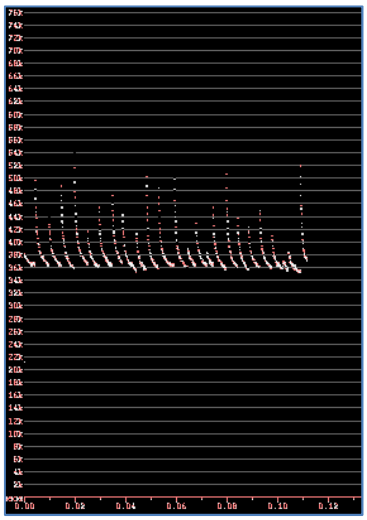
Appendix 1 Representative call sequences from the Kidston survey, November 2017.
AnalookW spectrograms with time between pulses removed



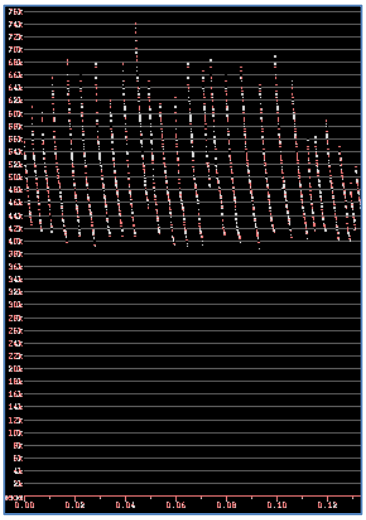
Chalinolobus gouldii



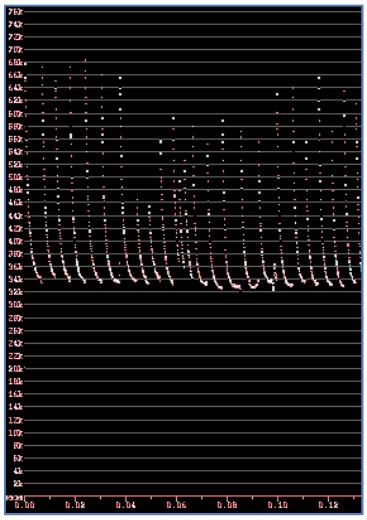
Chalinolobus morio



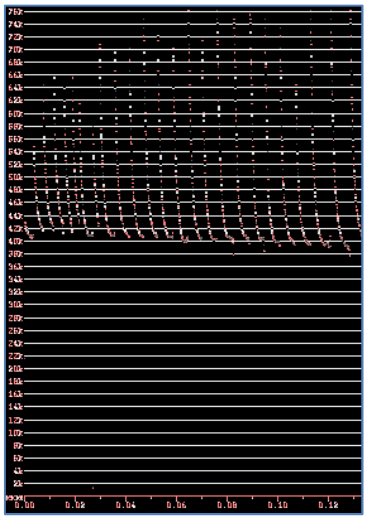
Possibly *Chalinolobus nigrogriseus*



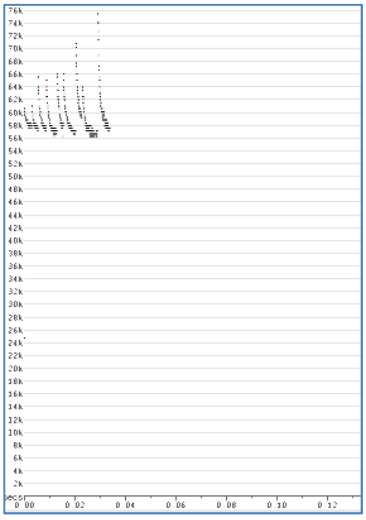
Nyctophilus sp.



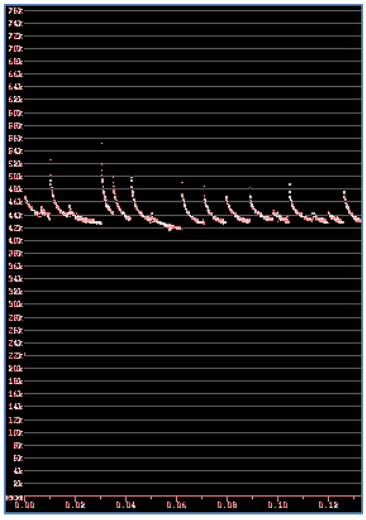
Scotorepens balstoni



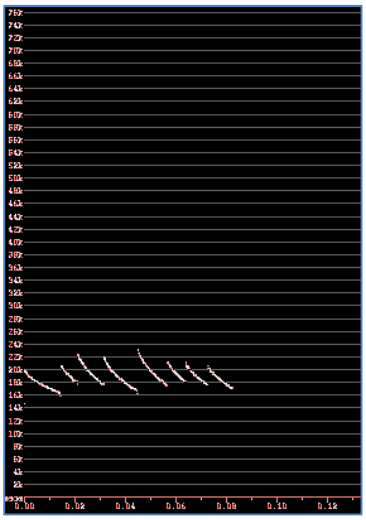
Scotorepens sanborni / S. greyi



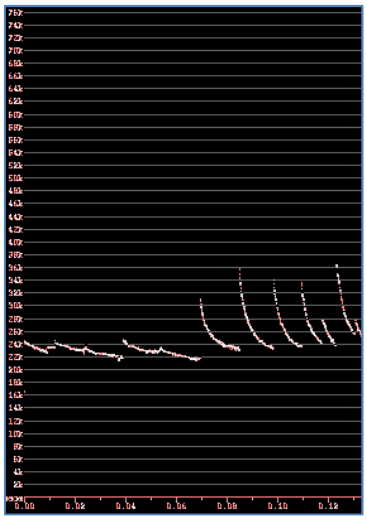
Miniopterus australis



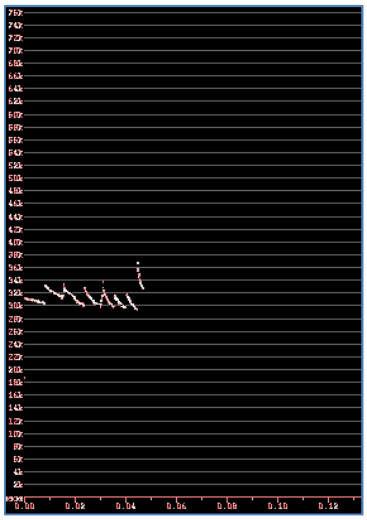
Miniopterus orianae oceanensis



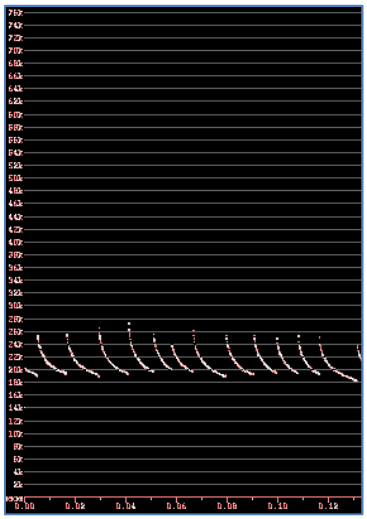
Chaerephon jobensis



Ozimops lumsdenae



Ozimops ridei



Saccolaimus flaviventris

Appendix H

Species Lists – All Surveys

Appendix H Species Lists – All Surveys

Table 41 Flora species list

Family	Scientific Name	Common Name
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	

Family	Scientific Name	Common Name
	*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*	
CAESALPINIACEAE	*Cassia brewsteri*	
	*Chamaecrista absus**	
	Chamaecrista concinna	
	Chamaecrista mimosoides	
	Chamaecrista rotundifolia var. *rotundifolia**	
	Erythrophleum chlorostachys	
	Lysiphyllum cunninghamii	
	Lysiphyllum hookeri	

Family	Scientific Name	Common Name
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*	

Family	Scientific Name	Common Name
ERYTHROXYLACEAE	*Erythroxylum australe*	
	Erythroxylum ellipticum	
EUPHORBIACEAE	*Euphorbia drummondii*	
	*Euphorbia hirta**	
FABACEAE	*Crotalaria brevis*	
	Crotalaria calycina	
	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	

Family	Scientific Name	Common Name
	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*	
	Cassytha filiformis	
LAXMANNIACEAE	*Eustrephus latifolius*	

Family	Scientific Name	Common Name
	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	

Family	Scientific Name	Common Name
	Acacia hyaloneura	
	Acacia implexa	
	Acacia lazaridis	
	Acacia leptocarpa	
	Acacia leptostachya	
	Acacia melanoxylon	
	Acacia shirleyi	
	Acacia umbellata	
	Acacia victoriae	
	Archidendropsis basaltica	
	*Mimosa pudica**	
	Neptunia gracilis	
	*Vachellia bidwillii**	
	*Vachellia farnesiana**	
MORACEAE	*Ficus obliqua*	
	Ficus opposita	
MYRTACEAE	*Corymbia clarksoniana*	
	Corymbia confertiflora	
	Corymbia dallachiana	
	Corymbia erythrophloia	
	Corymbia intermedia	
	Corymbia lamprophylla	

Family	Scientific Name	Common Name
	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	

Family	Scientific Name	Common Name
	Melaleuca fluviatilis	
	Melaleuca leucadendra	
	Melaleuca nervosa	
	Melaleuca trichostachya	
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	

Family	Scientific Name	Common Name
	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	
	Dichanthium sericeum	
	Digitaria parviflora	
	Enneapogon lindleyanus	
	Enneapogon polyphyllus	

Family	Scientific Name	Common Name
	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	

Family	Scientific Name	Common Name
	Triodia pungens	
	*Urochloa mosambicensis**	
	*Urochloa mutica**	
POLYGONACEAE	*Persicaria attenuata*	
PORTULACACEAE	*Portulaca oleracea*	
PROTEACEAE	*Grevillea glauca*	
	Grevillea mimosoides	
	Grevillea parallela	
	Grevillea striata	
	Grevillea wickhamii	
	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	

Family	Scientific Name	Common Name
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	

Table 42 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*	✓								
Pacific baza	*Aviceda subcristata*			✓						
Red-winged parrot	*Aprosmictus erythropterus*	✓	✓	✓				✓		
Wedge-tailed eagle	*Aquila audax*		✓					✓		
Hardhead	*Aythya australis*									✓
Cattle egret	*Bubulcus ibis*									✓
Sulphur-crested cockatoo	*Cacatua galerita*	✓	✓	✓						✓
Fan-tailed cuckoo	*Cacomantis flabelliformis*			✓						
Red-tailed black-cockatoo	*Calyptorhynchus banksii*	✓						✓		

Common Name	Scientific Name	Incidental Sighting	Habitat Type							
			1	2	3	4	5	6	7	8 & 9
Pheasant coucal	*Centropus phasianinus*	✓	✓	✓			✓	✓	✓	
Horsfield's bronze-cuckoo	*Chalcites basalis*			✓						
Australian wood duck	*Chenonetta jubata*									✓
Great bowerbird	*Chlamydera nuchalis*	✓	✓				✓			
Brown treecreeper	*Climacteris picumnus*		✓				✓			
Grey shrike-thrush	*Colluricincla harmonica*					✓			✓	
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*	✓	✓	✓		✓	✓	✓		✓
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*			✓						

Common Name	Scientific Name	Incidental Sighting	Habitat Type							
			1	2	3	4	5	6	7	8 & 9
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*		✓					✓		
White-throated nightjar	*Eurostopodus mystacalis*	✓								
Dollarbird	*Eurystomus orientalis*						✓			
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*			✓						

Common Name	Scientific Name	Incidental Sighting	Habitat Type							
			1	2	3	4	5	6	7	8 & 9
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*			✓						
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*			✓			✓	✓		

Common Name	Scientific Name	Incidental Sighting	Habitat Type							
			1	2	3	4	5	6	7	8 & 9
Striated pardalote	*Pardalotus striatus*		✓	✓	✓	✓	✓	✓	✓	✓
Australian pelican	*Pelecanus conspicillatus*									✓
Tree martin	*Petrochelidon nigricans*	✓							✓	
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*	✓		✓						
Australasian grebe	*Tachybaptus novaehollandiae*									✓

Common Name	Scientific Name	Incidental Sighting	Habitat Type							
			1	2	3	4	5	6	7	8 & 9
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*	✓								✓
Fish										
Spangled perch	*Leiopotherapon unicolor*	✓								
Sea mullet	*Mugil cephalus*	✓								
Mammals										
Rufous bettong	*Aepyprymnus rufescens*	✓		✓						✓
White-striped free-tailed bat	*Austronomus australis*		✓	✓						
Chital	*Axis axis**	✓								
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*									✓

Common Name	Scientific Name	Incidental Sighting	Habitat Type							
			1	2	3	4	5	6	7	8 & 9
Undetermined microbat	*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*									✓
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*								✓	
Black rat	*Rattus rattus**			✓		✓				
Smaller horseshoe bat	*Rhinolophus megaphyllus*								✓	
Yellow-bellied sheathtail bat	*Saccolaimus flaviventris*		✓					✓	✓	✓

Common Name	Scientific Name	Incidental Sighting	Habitat Type							
			1	2	3	4	5	6	7	8 & 9
Inland broad-nosed bat	*Scotorepens balstoni*									✓
Little broad-nosed bat	*Scotorepens greyi*									✓
Northern broad-nosed bat	*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										
Zizag velvet gecko	*Amalosia rombifer*	✓								
Brown tree snake	*Boiga irregularis*					✓				
Lined rainbow-skink	*Carlia jarnoldae*								✓	
Shaded-litter rainbow-skink	*Carlia munda*							✓	✓	
Lively rainbow-skink	*Carlia vivax*		✓							
Elegant snake-eyed skink	*Cryptoblepharus pulcher*							✓		
Eastern striped skink	*Ctenotus spaldingi*					✓		✓		
Unidentified delma	*Delma sp.*								✓	
Yellow-faced whipsnake	*Demansia psammophis*	✓								
Tommy-round head	*Diporiphora australis*	✓						✓	✓	
Bynoe's gecko	*Heteronotia binoei*					✓		✓	✓	
Unidentified lerista	*Lerista sp.*								✓	
Eastern brown snake	*Pseudonaja textilis*	✓								

Common Name	Scientific Name	Incidental Sighting	Habitat Type							
			1	2	3	4	5	6	7	8 & 9
Black-headed monitor	*Varanus tristis*	✓				✓				
Amphibians										
Cane toad	*Bufo marinus**	✓	✓	✓						
Green tree frog	*Litoria caerulea*								✓	