Chapter 5 – Terrestrial Ecosystems

Approved Rev	Approver Position	Signature	Date
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Document revision history and tracking

Document Preparation

Rev	Status	Date	Prepared by	Position	Reviewed by	Position
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Revision history tracking record (Use after Rev 00)

Rev	Date	Description	Prepared by	Approved by

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5 Terrestrial Ecosystems

5.1 Introduction

The NT EPA's objective for the Terrestrial Ecosystems factor is to:

> *"Protect terrestrial habitats to maintain environmental values including biodiversity, ecological integrity and ecological functioning."*

This chapter assesses the significance of potential impacts to terrestrial ecosystems (i.e., flora and fauna) associated with the Project, including the refinements to project works and activities described in Chapter 2 of this SEIS. The potential impacts to terrestrial ecosystems were identified with reference to the NT EPA Direction (Appendix 1.1), the EIS TOR issued by the NT EPA, issues raised by stakeholders and project responses (Appendix 1.3 and Appendix 3.1) and evaluated using best professional judgement of the EIS team (Appendix 1.5) based on their knowledge and understanding of the Project. Potential impacts were then assessed using the EIA methods described in Chapter 3 Impact Assessment of the Draft EIS.

This chapter presents the findings of the EIA process undertaken for the Terrestrial Ecosystems factor. This chapter focuses on impacts to terrestrial (land-based) habitats – including riparian[1] and wetland vegetation and the terrestrial species that utilise these habitats. Freshwater habitats and aquatic species (i.e., species such as fish that live entirely in aquatic freshwater environments) are considered in Chapter 7 Aquatic Ecosystems. Marine habitats and species are considered in Chapter 9 Marine Ecosystems and also Chapter 15 MNES.

5.2 Information Sources

Since the Draft EIS was lodged, the following reports were prepared which deal with terrestrial ecosystem matters:

- Environmental Design Criteria and Standards (Appendix 2.1)
- Constraints Planning and Field Development Procedure (Appendix 4.1)
- Supplementary Ecology Report - Part 1 - Threatened Species (Appendix 5.1)
- Supplementary Ecology Report - Part 2 (Appendix 5.2)
- Weed Management Plan (Revised) (Appendix 5.3)
- OHTL Vegetation Management Framework (Appendix 5.4)
- Memorandum: Riparian Vegetation Assessment (Appendix 5.5)
- Groundwater Assessment – Solar Precinct (Appendix 6.1)
- Land Based Electrode Technical Report (Appendix 12.1)
- EPBC Checklist (Appendix 15.1).

[1] Habitat specifically along the edges of watercourses

5.3 Project Amendments since Draft EIS

Project refinements presented in this SEIS (Chapter 2) which require additional footprint and have been assessed in this section for their potential to impact terrestrial ecosystems include:

Solar Precinct AI (Figure 2-1)

OHTL Corridor (Figure 2-2)

Electrodes comprising:

- DCS Electrode (Figure 2-12)
- Powell Creek Electrode (Figure 2-11).

As part of the Draft EIS, the proponent had committed to undertaking further threatened species surveys at the DCS, OHTL Utilities Corridor and OHTL Railway Corridor. Furthermore, since the submission of the Draft EIS in April 2022, submissions during public consultation and direction from the NT EPA have been received requesting more information on the Terrestrial Ecosystems factor.

Additional site-specific studies and field investigations have been undertaken to support this updated assessment including:

Field surveys at Powell Creek Station for Greater Bilby, Gouldian Finch, Yellow-spotted Monitor, Grey Falcon, and opportunistic observations

Characterising the land units/land systems habitat types at Powell Creek Station relative to the project refinements

Field surveys at the DCS Electrode and HVDC Electrode Line Corridor, including for *Stylidium ensatum*

GIS modelling of estimated extent of riparian vegetation using Normalized Difference Vegetation Index (NDVI)

Desktop analysis for threatened species significant impact assessments in the absence field studies.

This Chapter has been prepared to address the following:

Detail the findings of all threatened species surveys (inclusive of Draft EIS surveys) from the Supplementary Ecology Report - Part 1 - Threatened Species (Appendix 5.1)

Detail the findings of the desktop ecological assessment of the project refinements found in Supplementary Ecology Report - Part 2 (Appendix 5.2)

Reassessment of prior Draft EIS findings where relevant to reflect project refinements (this Chapter)

Submissions from public consultation of the Draft EIS (Section 5.12)

Comments from the NT EPA Direction (Section 5.13).

5.4 Existing Environment and Values

This section presents the ecological context and an overview of the terrestrial ecosystem values encountered within the project footprint and surrounding areas (the area of influence) that could be indirectly affected by proposal activities. The proposal footprint and area of influence adopted for assessment of impacts to terrestrial ecosystems are described in Section 5.4.3.9.

For consistency with the approach undertaken in the Draft EIS, the existing environmental conditions and values are summarised for each project component and project area under the following headings:

Habitat is described using one of three spatial land resources – land systems, land units and land types. These all categorise the landscape by using aerial imagery and ground surveys to identify

groups of areas throughout which there is a recurring pattern of topography, soils, and vegetation. Each land system or land unit therefore represents a reasonably homogenous part of a land surface – distinct from surrounding terrain – with consistent properties in landform, soils, or vegetation (Hooper 1970). The key difference between land systems, land units and land types are the scale at which they have been mapped, with land types being the most detailed. Specific habitats associated with threatened species are discussed separately in Section 5.6.

Significant vegetation types are those listed in the NT Land Clearing Guidelines (DENR 2021) due to their unique and/or inherently high biodiversity values. They are rainforest, vine thicket, closed forest or riparian vegetation, mangroves, monsoon vine forest, sand sheet heath and vegetation containing large trees with hollows suitable for fauna. In addition, the *EPBC Act* allows for the listing of threatened ecological communities – of which there is only one in the NT, the Arnhem Plateau Sandstone Shrubland Complex. A detailed description of relevant significant vegetation is provided in Section 2.2 of the Supplementary Ecology Report - Part 2 (Appendix 5.2) and the Memorandum – Riparian Vegetation Assessment (Appendix 5.5).

Land condition refers to the current condition of the land and considers threatening processes to ecological values that may be present. Key Threatening Processes (KTP) discussed in this chapter are fire, weeds, and human land use (e.g., development, pastoralism). Feral animals are a threatening process. However, their ubiquitous presence in suitable habitat across the NT makes redundant the need to detail them in this section.

Significant areas are parks and reserves protected under NT or Cwth legislation, and Sites of Conservation Significance (SOCS) identified by the NTG are important sites for biodiversity conservation. SOCS are not protected under legislation; however, their value is in highlighting areas that support important populations of significance species and/or habitat that may be protected under environmental legislation.

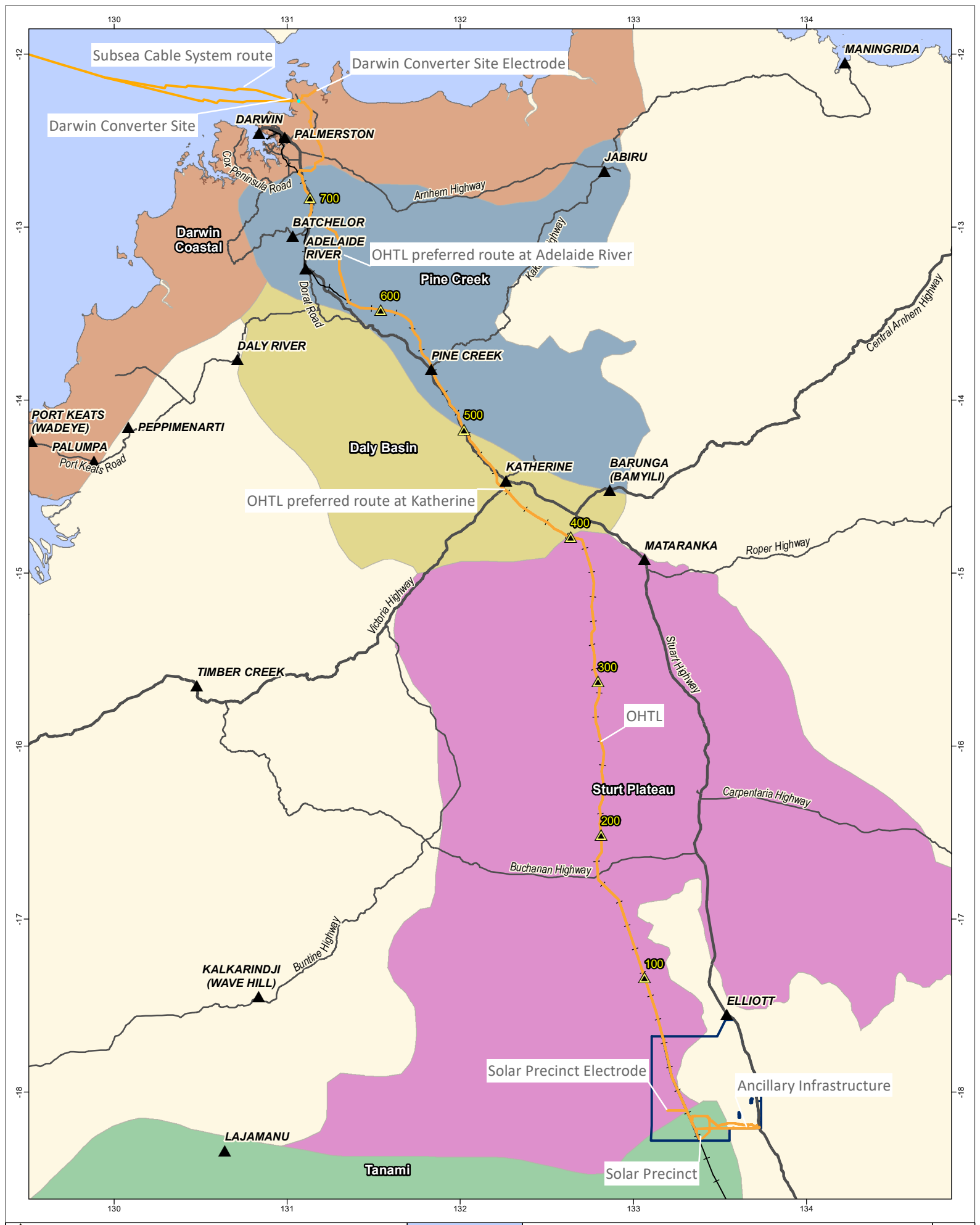
Threatened species are flora and fauna listed under NT and/or Cwth legislation as Vulnerable, Endangered or Critically Endangered. The Supplementary Ecology Report - Part 1 - Threatened Species (Appendix 5.1) presents the methods and results of the threatened species surveys that have been undertaken within the refined project areas. Not all species that could occur within the project footprint have been surveyed. As explained for the relevant project area, a screening process was undertaken to identify which threatened species are most vulnerable to impacts from the project, and therefore warrant targeted surveying to inform impact avoidance. Moreover, there remain some portions of the project footprint that have not been surveyed because land access permission has not yet been approved. These unsurveyed areas are within the OHTL Corridor, and mostly relate to the OHTL preferred route at Adelaide River and Katherine.

Terrestrial migratory species are assessed in this Chapter as well as in Chapter 15 MNES.

5.4.1 General Context

Bioregions are relatively large land areas characterised by broad, landscape-scale natural features and environmental processes that influence the functions of entire ecosystems. They capture the large-scale geophysical patterns across Australia. These patterns in the landscape are linked to fauna and flora assemblages and processes at the ecosystem scale, thus providing a useful means for simplifying and reporting on more complex patterns of biodiversity (NPWS, 2003). NT bioregions are described in Baker et al. (2005).

Figure 5-1 shows which bioregions are relevant to the project refinement footprint. A detailed description of relevant bioregions is provided in Section 5.3.1 of the Draft EIS.



Kilometre Point (KP)
Towns
Railway
Powell Creek Station
AAPowerLink infrastructure

Bioregions
Darwin Coastal
Pine Creek
Daly Basin
Sturt Plateau
Tanami

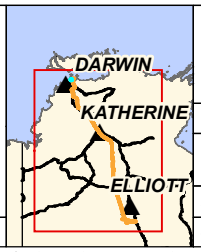


Figure 5-1: Map of bioregions relevant to the AAPowerLink

N

Project: Australia-Asia PowerLink

0 50 100 Kilometres

Reference: M-Files ID 200232

Date: 18/11/2022 | Revision: 2

Scale: 1:3,000,000 | Datum: GDA2020

Coordinate System: GDA2020 | A4

Source: Sun Cable, EcOz, NTG (NR Maps)

SUN CABLE AUSTRALIA-ASIA PowerLink

5.4.2 AI and Powell Creek Electrode

The AI and Powell Creek Electrode footprints are comprised of the following components:

The Powell Creek Electrode, HVDC Electrode Line Corridor and Access Track that joins it directly to the OHTL, north of the proposed Solar Precinct. These components occur west of the railway corridor, within the south-west boundary of Powell Creek Station. The HVDC Electrode Line Corridor survey area is ~100 m wide and runs west from the OHTL Corridor for 11 km before joining to the electrode, covering approximately 115 ha and including the electrode site access track.

AI areas are scattered across Powell Creek Station between the Solar Precinct and the Stuart Highway. The refined AI footprints external to the Solar Precinct covers approximately 134 ha within Powell Creek Station which is currently managed by Newcastle Waters Station (adjoining station to the north).

Solar Precinct Access Roads (Main Access Road and Gravel Access Road) which have been revised since the Draft EIS submission. This SEIS discusses any refinements since the Draft EIS. Information which remains the same as the Draft EIS is not included.

The Powell Creek project refinement footprints cover three bioregions (Baker et al., 2005):

The Tanami bioregion in the west comprises mainly red sandplains and low dune fields with underlying rock strata occasionally exposed as hills and ranges. The sandplains are vegetated with mixed shrubland of Acacia, Eucalyptus or Hakea over spinifex hummock grasslands. Alluvial and lacustrine calcareous deposits occur throughout, often associated with palaeo-drainage systems – which often hold high ecological significance. Some AI components are within the Tanami bioregion.

The Davenport Murchison Ranges bioregion occurs to the east of the Solar Precinct and is crossed by the Solar Precinct Access Roads and components of the AI. This bioregion is characterised by a chain of rocky ranges surrounded by lowland plains. Vegetation is typically comprised of low open Eucalyptus woodland and sparse Acacia shrubland over hummock grassland and low, rugged rocky hills with hummock grasslands and/or low open woodland dominated by Acacia species.

The Sturt Plateau bioregion contains the Powell Creek Electrode and HVDC Electrode Line Corridor. This bioregion is comprised of flat to gently undulating plains of Eucalyptus woodlands or tall shrub lands and woodlands of Bullwaddy (*Macropteranthes kekwickii*) and Lancewood (*Acacia shirleyi*). In more open areas perennial grasses dominate. Soils are mainly lateritic. However, deep sands occur in the south and cracking clays in the south-east. The vegetation within the electrode and access corridor is comprised of three communities within two Major Vegetation Groupings (MVG), Eucalypt open woodlands with hummock grass and hummock grasslands (DCCEEW, 2020).

In 2021, surveys were undertaken within Powell Creek Station to inform the Draft EIS. This included the Solar Precinct and Access Roads from the Stuart Highway. Details of these surveys can be found in the Appendix 5.1.

Aerial surveys of the Powell Creek project area – including buffer areas – were conducted on the 24 and 25 October 2022 by EcOz ecologists/zoologists Tom Ewers-Reilly and Mark Carter. The survey aimed to determine the vegetation communities (habitat) present and detect the presence of threatened species by targeting areas of suitable habitat and land areas likely to support Greater Bilby (*Macrotis lagotis*), Yellow-spotted Monitor (*Varanus panoptes*), Gouldian Finch (*Chloebia gouldiae*) and the Grey Falcon (*Falco hypoleucos*). These surveys were undertaken to address the NT EPA Direction and further clarify significant impact assessments. Results are summarised below, and the detailed results can be found in SEIS – Threatened Species Surveys report (Appendix 5.1).

The desktop review of the project area found ecological values and potential constraints associated with the presence of significant vegetation and habitat for threatened species within all project components and footprint areas (Table 5-1).

Table 5-1: Summary of terrestrial ecosystem values relevant to the AI and Powell Creek Electrode

Value	Powell Creek Electrode	AI	Solar Precinct Access
Parks and reserves	-	-	-
SOCS / Sites of Biological Significance (SOBS)	-	-	-
Important wetlands	-	-	-
Watercourses	-	✓	✓
Springs	-	-	-
Riparian vegetation	-	✓	✓
Wetlands	-	-	-
Threatened fauna records	-	✓	-
Threatened fauna habitat	✓	✓	✓
Migratory species	-	-	-

5.4.2.1 Habitat

The bioregional data is supported by NVIS vegetation mapping – which shows that the project area intersects three vegetation communities – Eucalyptus / Lysiphyllum low open woodlands, Corymbia / Hakea low open woodlands and Triodia low open hummock grasslands – within the Eucalypt open woodlands MVG (DCCEEW, 2020).

Land system and land type mapping is available for the Powell Creek region. Land system mapping is available for the project area at a scale of 1:500,000 (Christian et al., 1954; Stewart et al., 1970; Northcoat, 1960-68) and land type mapping is available at a scale of 1:250,000 (Brocklehurst and Trueman 2017) for the eastern components of the AI and the neighbouring Helen Springs Station (Figure 5-5).

The project area intersects three mapped land systems (Figure 5-6) and Table 5-2. The AI intersect desert sandplains in the west, alluvial floodplains and black soil associated with Lake Woods within the central part and rocky sandstone hills associated with Ashburton range to the east. The Solar Precinct Electrode occurs within the desert sandplains – Redsan – land system.

Six land types have been described and are intersected by various AI components (Table 5-3). Sandstone hills dominate the landscape and contains the most components with a mixed eucalypts low open woodland-shrubland over hummock grasses.

Table 5-2: Table of land systems of Powell Creek Station proximate to AI

Land system	Landform	Soil	Vegetation	Project area component
Alluvial floodplains				
Gosse	Sandy, seasonally flooded flats and drainages associated with run-off from drainages including Powell Creek, Bull Creek, Gleeson Creek and Hunter Creek.	Sandy, course textured alluvia, short seasonal flooding.	Vegetation typically includes a low Eucalypt open woodland of, a mid-open shrubland over tussocks grass with occasional areas dominated by hummock grass.	Aerodrome Alternate Location 1 Borrow Pit 2
Desert sandplains				
Redsan	Gently undulating plain with deep sandy soil that supports open Eucalyptus woodland over tussock grasses	Deep-shallow sand or sandy loam over lateritic or clays	Open Eucalyptus woodland including Eucalyptus polycarpa, E. argillacea, E. setosa, E. pruinosa, E. microtheca, E. ferruginea over spinifex (mainly Triodia pungens) interspersed with areas of tussock grasses (i.e., Aristida spp.). Also supports patches of Lancewood (Acacia shirleyi) and Bulwaddy (Macropteranthes kekwickii).	Aerodrome 2 x Batch Plant 3 x Contractor offices Main Site Office Security / Site Access Electrode site HVDC Electrode Line Corridor and Access Track
Sandstone hills				
Ashburton	Stony plateaux, tablelands and hills on sandstone, and outcrops in	Skeletal soils	Eucalyptus brevifolia or E. dichromophloia (Variable-barked Bloodwood) low open woodland with hummock grassland understory	Temporary Construction Accommodation Borrow Pit 1 Vehicle Staging

Table 5-3: Existing land types that are intersected by the AI (dataset STHLT_250)

Land type	Landform	Soil	Vegetation	AI component
Lateritic plains and rises				
e4	Plains Low flat areas	Tenosols	Mixed species Eucalyptus victrix, Lophostemon grandiflora, Ventilago viminalis mid woodland over tussock grasses	Borrow Pit 2
wo2	Low Rises	Kandosols	Acacia lysiphloia closed shrubland over tussock grasses +/- emergent eucalypts	Borrow Pit 1 Vehicle Staging
Sandstone hills				
as1	Drainage Systems Valley bottoms with stream lines	Kandosols	Mixed species Eucalyptus pruinosa, Ventilago viminalis, Cariss lanceolata low open woodland over tussock grasses	Borrow Pit 2
as3	Plateaux Nearly flat upland areas	Tenosols	Mixed Eucalypt (Eucalyptus leucophloia, Eucalyptus aspera) low open woodland-shrubland over hummock grasses (Triodia pungens)	Temporary Construction Accommodation Borrow Pit 1
as5	Alluvial Plains Valley bottoms with stream lines	Tenosols / Kandosols	Eucalyptus pruinosa low open woodland over Grevillea striata and tussock grasses (Aristida pruinosa).	Vehicle Staging
Sandstone plains and rises				
t3	Sandplains sandy plains, some elements of Te1-2	Tenosols	Triodia pungens and Triodia basedowii open hummock grassland with scattered emergent Eucalyptus leucophloia and/or Acacia species.	Vehicle Staging

Powell Creek Electrode

The Electrode Site occurs on a gently sloping sandplain that supports an open Acacia shrubland over spinifex (photographs provided in Figure 5-2 and Figure 5-3). The dominant shrub species is Acacia stipuligera with a patchy occurrence of A. ancistrocarpa, Brachychiton multicaulis, Grevillea refracta and Melaleuca viridiflora. Scattered or sparse shrubs include A. lysiphloia, A. sericophylla, Petalostigma nummularia, Petalostylis cassioides and Mirbelia viminalis. The site also supports fire-impacted trees including Eucalyptus victrix and Corymbia opaca (currently part of the shrub layer as they have been reduced to mallee form from repeat fire events). The presence of species such as M. viridiflora and E. victrix indicates that the sandplain becomes periodically wet, or there is an underlying clay layer that retains moisture to support these species.

Figure 5-2: Aerial photograph of the Electrode site

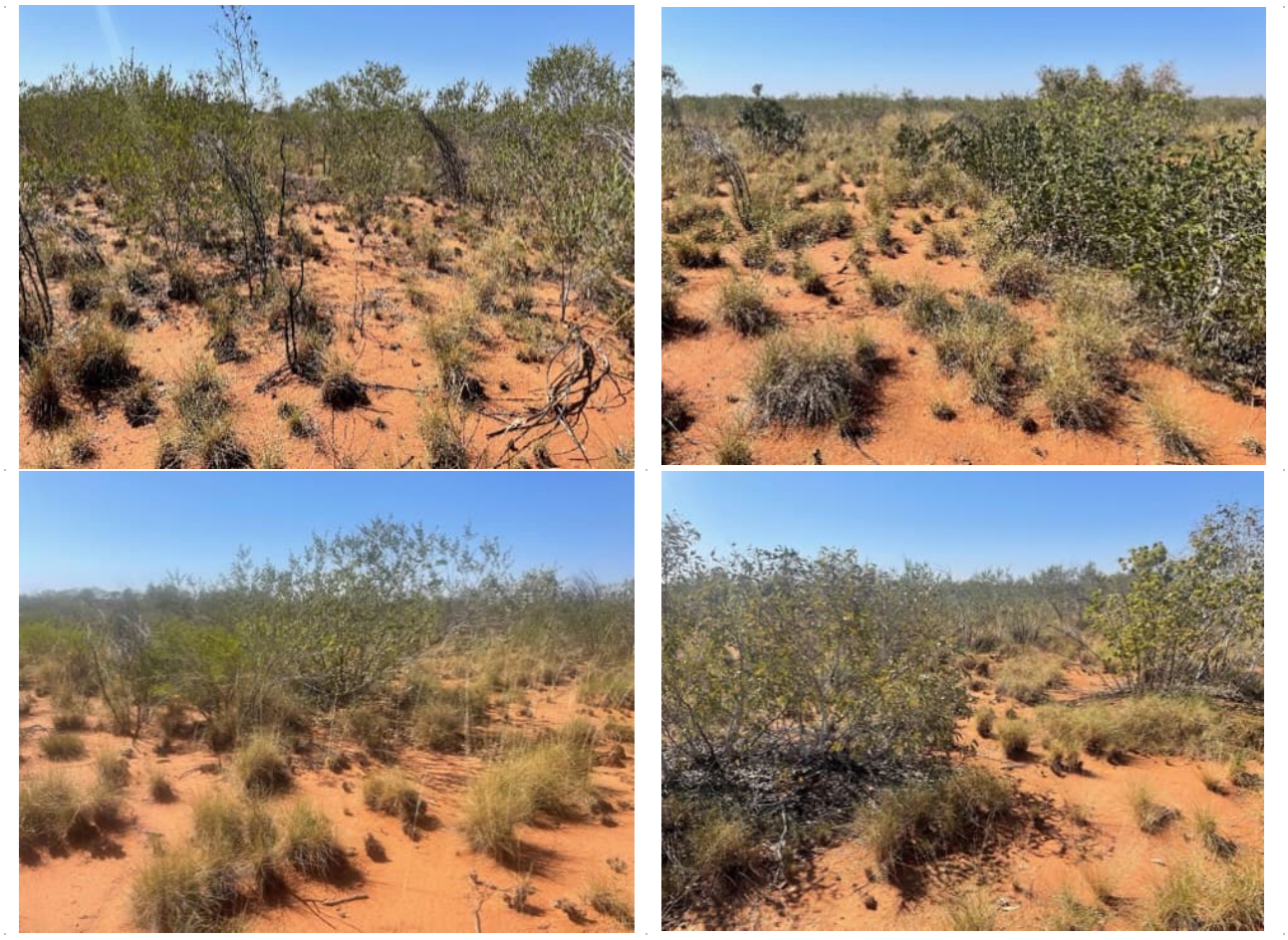


Figure 5-3: Photographs of sandplain habitat within the Electrode site

Ancillary Infrastructure

Vegetation community observations for the AI components are presented in Table 5-4, with indicative photographs provided in Figure 5-4.

Table 5-4: Vegetation community observations for the AI

Name	Description
Main site office	Flat sandplain. Sparse Acacia lysiphloia shrubland over spinifex, with scattered trees (Corymbia opaca).
Security / Site Access	Flat sandplain. Sparse Acacia lysiphloia shrubland over spinifex, with scattered trees (Corymbia opaca).
Batch Plant	Flat sandplain. Sparse Acacia lysiphloia shrubland over spinifex, with scattered trees (Corymbia opaca).
Aerodrome	Flat loamy plain, sandplain transition. Tussock grassland within scattered small trees (Bauhinia cunninghamii, Corymbia opaca and C. flavescens) and scattered shrubs (Carissa lanceolata, Acacia lysiphloia, Hakea arborescens). Some sandplain patches with spinifex.
Contractor area (north)	Sandplain. Acacia lysiphloia and Petalostigma nummularia shrubland (patchy) over spinifex, with scattered trees (Corymbia opaca, C. flavescens and Bauhinia cunninghamii).
Contractor area (south)	Sandplain. Open to patchy Acacia lysiphloia shrubland over spinifex, with scattered trees (Corymbia opaca).
Contractor area (east)	Sandplain. Open to patchy Acacia lysiphloia shrubland over a combination of both spinifex and tussock grasses, with scattered trees (Corymbia opaca).
Temporary Construction Accommodation	Undulating lateritic plateau with areas of sandstone outcrop. Open to sparse low Eucalyptus woodland over spinifex. Sparse shrubs.
Vehicle Staging Area	Lateritic plain. Low open woodland (Eucalyptus leucophloia) over spinifex. Patches of Acacia shrubs (A. lysiphloia, A. monticola, A. holosericea). Melaleuca viridiflora shrubs in old gravel pits / scrapes. Small patches of gravel plateau with low shrubland (A. hilliana) over spinifex.
Borrow Pit 1	Gravel (laterite) plateau. Very low shrubland (Acacia hilliana) over spinifex, with sparse to isolated Snappy Gum trees (Eucalyptus leucophloia). Dense patches of Acacia monticola in sandy low points/ /shallow gullies.
Borrow Pit 2	Lateritic plain. Open low woodland (Eucalyptus victrix, Ventilago viminalis, Hakea spp.), patchy shrubland (Acacia lysiphloia) over tussock grass.

Main Site Office Location

Security / Site Access Location

Batch Plants Location

Aerodrome Location

Temporary Construction Accommodation Location

Contractor area (north)

Contractor area (south)

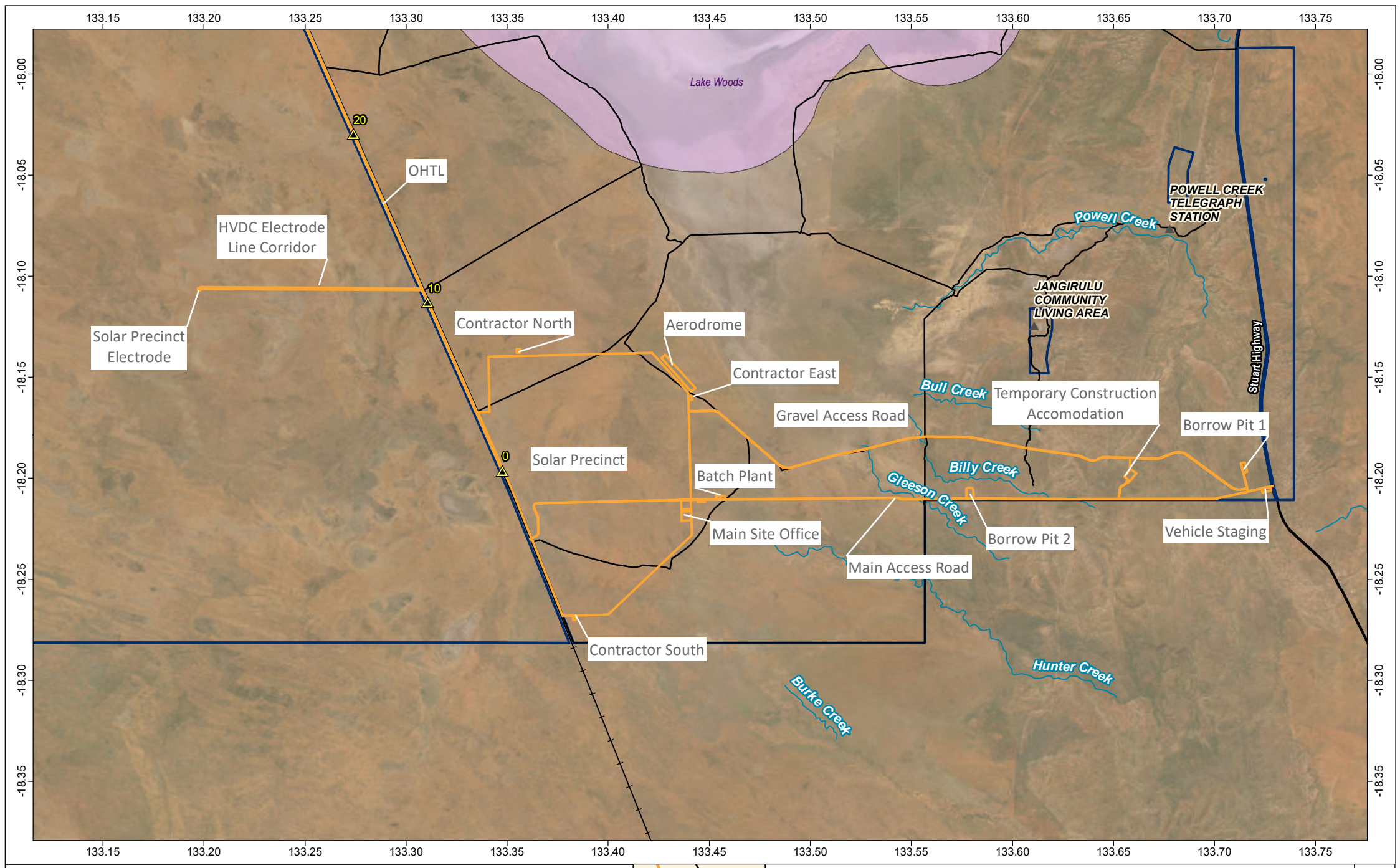
Contractor area (east)

Borrow Pit 1

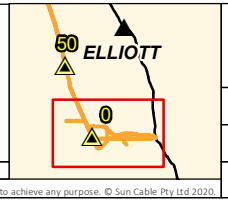
Borrow Pit 2

Vehicle Staging Area

Figure 5-4: Photos of vegetation community at proposed footprint of AI components



Kilometre Point (KP)
Homestead
Railway
Minor Drainage
Powell Creek Station
AAPowerLink footprint
Sites of Conservation Significance



Source: Sun Cable, EcOz, NTG (NR Maps)

Figure 5-5 Map of Ancillary Infrastructure and Powell Creek Electrode

Project: Australia-Asia PowerLink	Reference: M-Files ID 198726	Revision: 2
Coordinate System: GDA2020	Date: 18/11/2022	
0 5 10 Kilometres	Scale: 1:259,412	A4

N

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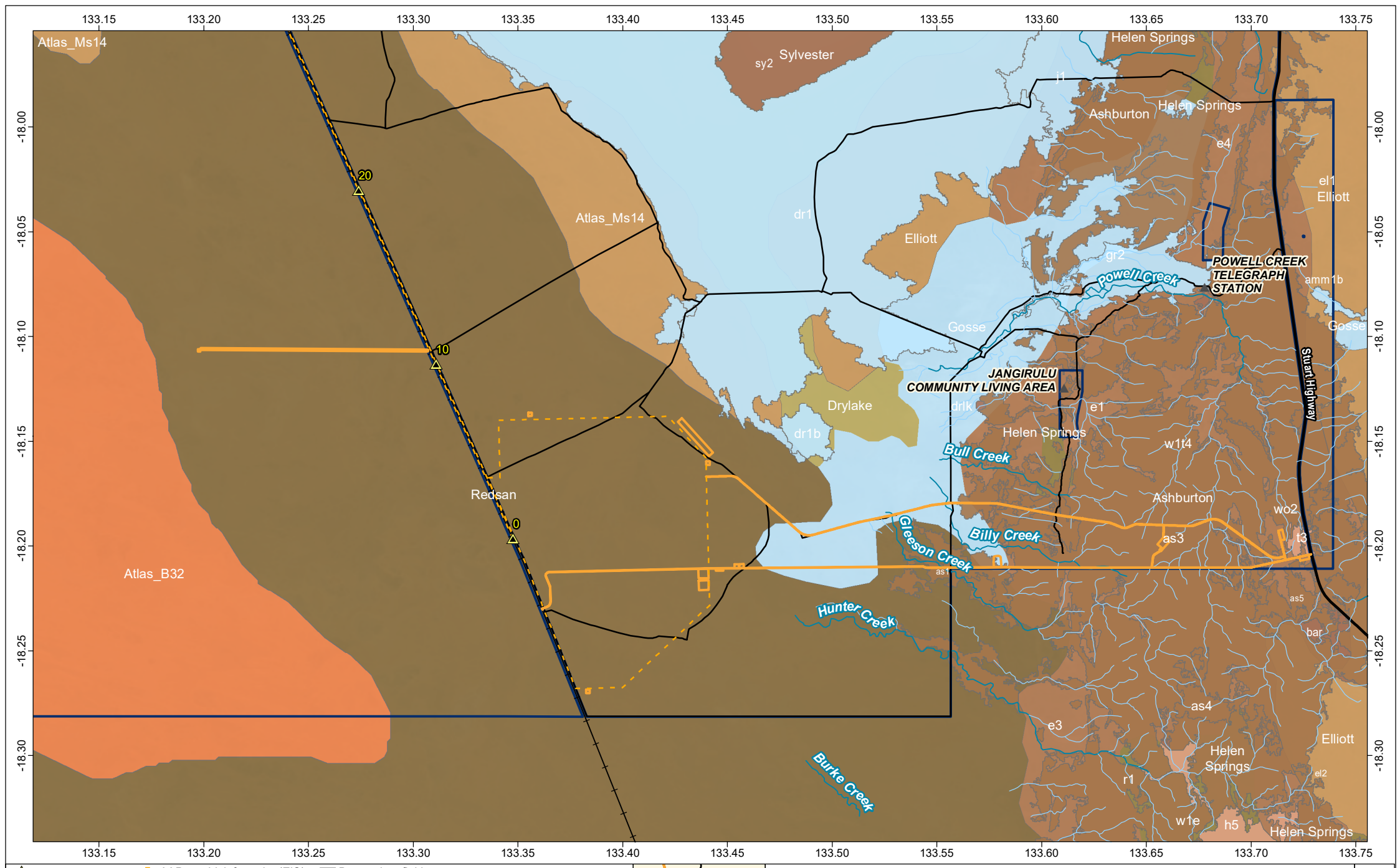


Source: Sun Cable, EcOz, NTG (NR Maps)

Figure 5-6. Map of land systems and land types of Powell Creek Station

Project: Australia-Asia PowerLink	Reference: M-Files ID 198726	Revision: 2
Coordinate System: GDA2020	Date: 18/11/2022	
0 5 10 Kilometres	Scale: 1:250,306	A4

SUN CABLE AUSTRALIA-ASIA PowerLink

5.4.2.2 Significant vegetation

The Project area is within the Lake Wood catchment which contains numerous ephemeral watercourses and drainage lines associated with the Ashburton Range (Figure 5-1). Neither the AI nor Powell Creek Electrode intersect any surface hydrological features. No waterholes were identified within, or adjacent to, the AI on the Ashburton Range. The drainages and small creeks within the project footprint area may support small episodic pools during the wet season; however, none contained water at the time of survey. Waterholes/springs were observed in the surrounding area (greater than 2 km from areas surveyed).

Route refinements made to the Solar Precinct Access Roads since the Draft EIS result in the Gravel Access Road now intersecting four additional first order streams and drainage depressions (Figure 5-1). The revised route also passes close (80 m) to one bore – RN036552.

During field surveys, observed riparian vegetation proximate to watercourse crossings of the proposed Access Roads routes was confined to isolated River Red Gums (Eucalyptus camaldulensis) which the existing station tracks have navigated around.

5.4.2.3 Land condition

There are only four weed records within 20 km of the Powell Creek project area and none within the Project footprint – Buffel Grass (Cenchrus ciliaris), Rubber Bush (Calotropis procera), Caltrop (Tribulus terrestris) and Parkinsonia (Parkinsonia aculeata). The project area is within the Alice Springs weed management region which is covered by the Alice Springs Regional Weeds Strategy 2021 - 2026. That strategy lists Rubber Bush, Parkinsonia and Buffel Grass as category 2 (for control within the region) and Caltrop as category 4 (to prevent spread). Parkinsonia is a WONS; all species are NT Declared Class B.

Weeds were not detected during the 2022 field survey.

Fire occurrence across the region is infrequent – 3 years in the last 10; however, this frequency is significant for the arid zone. Regional fire scar mapping indicates these fires are large-scale, affecting areas outside the project area. The fire frequency relevant to the AI – east in the Ashburton Range and west in the Redsan land system – is generally lower – 0 to 2 years – than the frequency in the central alluvial plains – 2 to 3 years.

5.4.2.4 Significant areas

The project area components do not intersect or fall within a SOCS; however, the Lake Woods SOCS is located approximately 10 km to the north of the AI (Figure 5-1). Lake Woods has international significance due to seasonal presence of large aggregations of waterbirds, and presence of important wetland habitat (BirdLife International 2021, Jaensch and Bellchambers 1997). NT Atlas records indicate that 24 listed migratory species have been recorded in the area. Migratory species were described in the Draft EIS and are not discussed further in this report as there has been no material change to potential impacts. While not within the proposed footprint, the AI is upstream of the SOCS and all works within the AI will need to ensure that potential impacts to the SOCS are considered and suitably mitigated.

5.4.2.5 Threatened species

Significant and threatened species relevant to this component are identified in this section and assessed in detail in Section 5.6 of this Chapter. Threatened species were identified through the desktop assessment and during the field survey, which also identified the presence of an un-listed significant species – Central Pebble Mound Mouse (see below) – within the footprint of this component.

The procedure for assessing the likelihood of occurrence of threatened species is described in Section 2.3 of the Supplementary Ecology Report - Part 1 - Threatened Species (Appendix 5.1).

A total of 32 threatened species were screened for 'likelihood of occurrence' in the AI and Powell Creek Electrode footprint. The results from the assessment (i.e., only those species found to have a moderate to high likelihood of occurrence) are presented in Table 5-5. Four species with suitable habitat and recent records were found to have a moderate to high likelihood of occurring within the Project area:

- Greater Bilby (Macrotis lagotis)
- Grey Falcon (Falco hypoleucos)
- Yellow-spotted Monitor (Varanus panoptes)
- Gouldian Finch (Chloebia gouldiae).

Table 5-5: Likelihood of occurrence screening results for Threatened Species in the AI Project footprint

Likelihood	Species	Class	Status		Justification	Impact assessment in this SEIS
			EPBC	TPWC		
HIGH	Greater Bilby (*Macrotis lagotis*)	Mammal	VU	VU	Active burrows detected in 2022 survey Recent proximate records Suitable habitat present in the Redsan land system	Section 5.6.3.23.
	Grey Falcon (*Falco hypoleucos*)	Bird	VU	VU	Recent proximate records Suitable nesting habitat present to the east of the AI (i.e., large trees on drainage)	Section 5.6.3.24.
	Yellow-spotted (Floodplain) Monitor *(Varanus panoptes)*	Reptile	-	VU	Burrows detected during 2022 surveys Known to occur in the region Suitable habitat present within the Gosse land system (i.e. floodplains and black soil)	Section 5.6.3.38.
MODERATE	Gouldian Finch (*Chloebia gouldiae*)	Bird	EN	VU	Vagrant to the region; however, a recent (2021) sighting in the region Suitable habitat present within the eastern AI components.	Section 5.6.3.6.

CR = Critically Endangered; EN = Endangered; VU = Vulnerable, NT = Near Threatened

The Central Pebble Mound Mouse (Pseudomys johnsonii) is not listed as threatened under the TPWC Act or the EPBC Act. This species was detected during the 2022 survey. These new records are significant given how far they are from most recent records.

The species is found from the Kimberley region, across sub-tropical NT through to western Queensland. Most records in the region of the Project's footprint occur within the Davenport and Murchison Ranges to the south-east of Tennant Creek (see Figure 6-6 within Appendix 5.2), with only an isolated historic record from 1986 within the Ashburton Range (which occurs within the general project area). The paucity of existing records may be a result of survey effort rather than species' absence.

The species constructs permanent rock piles (or cones) around their nesting burrows (Van Dyck, 1991), which can cover an area of 10 m2. As detailed in Supplementary Ecology Report – Part 1 – Threatened Species (Appendix 5.1), such pebble mounds were incidentally observed at 7 sites within Borrow Pit 1, Gravel Access Road (at two locations), and the Main Access Road (at two locations). The species may also be present in the proposed Temporary Construction Accommodation situated on the lateritic plateau, and other areas of suitable habitat on the proposed access roads/tracks within the Ashburton Range. It is likely that the species is common with the surrounding range system.

5.4.3 DCS Electrode

This section details the DCS Electrode, access track and HVDC Electrode Line Corridor located to the north-east of the DCS (Figure 5-12). The HVDC Electrode Line Corridor follows adjacent to the existing Fly and Leaders Creek Roads from the Gunn Point Road intersection to the DCS Electrode (Figure 5-12).

As discussed in the Draft EIS, in 2018-19 DENR undertook an extensive land unit, vegetation and biodiversity survey within the Gunn Point area. Those surveys covered both the DCS Electrode and HVDC Electrode Line Corridor, with flora and fauna survey sites nearby. This data has been incorporated in EcOz's desktop review detailed in Appendix 5.2 - Supplementary Ecology Report – Part 2.

The desktop review identified environmental values and constraints within the DSC Electrode and HVDC Electrode Line Corridor (see Table 5-6). In addition, a project-specific field survey was undertaken in July 2022 to ground-truth land units, confirm the presence/extent of sensitive vegetation communities, identify potential habitat for threatened species and record any weed occurrences. Results are summarised below; for additional detail, refer to Appendix 5.1 and 5.2.

The DSC Electrode and HVDC Electrode Line Corridor occur in the Darwin Coastal bioregion which is characterised by gently undulating plains on laterised sandstones and siltstones, with extensive and diverse floodplain associated with the lower reaches of the many large river systems. The dominant inland vegetation type is tall open forest dominated by Eucalyptus tetrodonta and Eucalyptus miniata. Within the bioregion and Gunn Point area, there are also substantial areas of mangroves, rainforest, and other riparian vegetation fringing the rivers.

Table 5-6: Summary of terrestrial ecosystem values relevant to the DCS Electrode and HVDC Electrode Line Corridor

Value	DCS Electrode	HVDC Electrode Line Corridor
Parks and reserves	-	-
SOCS / SOBS	-	-
Watercourses	-	✓
Springs	-	-
Riparian vegetation	-	✓
Rainforest	-	✓
Mangroves	-	-
Wetlands	-	-
Large hollow-bearing trees	✓	✓
Threatened flora records	-	-
Threatened flora modelled habitat	-	✓
Threatened fauna records	-	✓
Threatened fauna habitat	✓	✓
Migratory species	-	-

5.4.3.1 Habitat

A field survey was undertaken to confirm the accuracy of mapped land units from both the Greater Darwin Region (Fogarty et al. 1984) and Gunn Point (Easey et al., 2020) studies at a scale of 1:25,000. Surveyors visited sites within each of the 10 land units (see Figure 5-13 and Appendix 5.2) where they compared mapped and observed landforms, dominant species in the upper stratum, and soil types. The areas within the HVDC Electrode Line Corridor conformed to the mapped land units, with some minor boundary changes. At the DCS Electrode site, it was observed to be characterised by ‘monsoonal’ species, which were not described within existing land units.

The field survey identified 12 land units that intersect the DCS Electrode and HVDC Electrode Line Corridor (Table 5-7). The dominant land units present were plains with Eucalypt woodlands (8a and 8b land units) and side slopes with Eucalypt open woodland (land unit 2b1) (Figure 5-7 to Figure 5-11). One channel with riparian vegetation was observed within land unit 4c which was flowing during the time of survey (Figure 5-7). Drainage systems were also present as a minor component. One land unit identified as 'monsoonal’ at the DCS Electrode contained large *Eucalyptus tetrodonta*, *Alstonia actinophylla* and *Corymbia polycarpa* trees in the upper stratum, with a moderately dense mid-stratum of mixed monsoon species including *Choriceras tricorne*, *Miliusa brahei* and *Acacia auriculiformis*. Soils appeared to be a mix of hydrosol and kandosol and were non-gravelly. The ‘transitional’ land unit immediately adjacent to this area showed signs of transition from the more dominant Eucalypt woodlands observed along the HVDC Electrode Line Corridor, with the continuation of *Choriceras tricorne* as a dominant species in the mid-stratum.

The project area is within the Leaders Creek and Fly Creek catchments, both draining north to the ocean. The HVDC Electrode Line Corridor crosses the second order Leaders Creek and the first order drainages of Fly Creek (Figure 5-12). At the time of the field visit in July 2022, all creeks had flowing water, indicating the drainages may retain water throughout the dry season.

Table 5-7: Summary of the land units relevant to the DCS Electrode and HVDC Electrode Line Corridor

Land unit	Landform class	Landform description	Soil	Vegetation
2b1	Rises	Side slopes	Brown kandosols	Open woodland to woodland of *Eucalyptus miniata*, *Eucalyptus tetrodonta, Corymbia foelscheana* and *Eucalyptus tectifica* over Sorghum species.
3b	Plains	Flat to gently undulating upland surfaces	Brown kandosols	Woodland of *Eucalyptus miniata* and *Eucalyptus tetrodonta* over Sorghum species.
3c		Gently undulating upland surface	Brown Kandosols	Woodland of *E. miniata, E. tetrodonta* over Sorghum species.
4c		Gentle lower slopes	Kandosolic Redoxic Hydrosols	Open forest of *Eucalyptus spp*. over mixed grasses; wet season water table present.
8a*		Gently undulating upland plains; local relief <2m; slopes 1-2%	Very deep; non-gravelly; red; massive gradational earths	Mid woodland to open woodland of *Eucalyptus tetrodonta*, +/- *Eucalyptus miniata* over *Heteropogon triticeus* mid tussock grassland.
8a1*		Gently undulating upland plains; local relief <2m; slopes 1-2%	Moderate to very deep; gravelly; red; massive earths	Mid woodland of *Eucalyptus tetrodonta* and *Eucalyptus miniata* over *Heteropogon triticeus* mid tussock grassland.
8a2*		Gently undulating upland plains; local relief <2m; slopes 1-2%	Moderate to very deep; gravelly; red and brown; massive earths	Open woodland of Eucalyptus *tetrodonta, Corymbia bleeseri* and *Eucalyptus miniata* over *Sorghum intrans* and *Heteropogon triticeus* mid tussock grassland.
8b*		Gently undulating lowland plains fringing lower sloping broad drainage floors; local relief <2 m; slopes 1-3%	Moderate to very deep; gravelly; red and brown; massive earths	*Eucalyptus tetrodonta, Eucalyptus minia*ta +/- *Corymbia bleeseri, Corymbia polysciada* mid woodland over *Sorghum intrans, Heteropogon contortus, Heteropogon triticeus* mid tussock grassland.

Land unit	Landform class	Landform description	Soil	Vegetation
Monsoonal **		Gentle lower slopes	Brown kandosols	Woodland of *Eucalyptus tetrodonta* and *Alstonia actinophylla* with scattered *Corymbia polycarpa,* over dense mid-storey with rainforest species (*Miliusa brahei, Choriceras tricorne, Acacia auriculiformis*) dominant. Ground layer with little to no plant cover, leaf litter present.
Transitional **		Gently undulating upland surface	Brown kandosols, some gravels	Open woodland of *Eucalyptus tetrodonta* with occasional *Eucalyptus miniata.* Dense shrubland of *Choriceras tricorne* gradually becoming more open.
6b	Drainage Systems	Broad lowland plains	Tenosolic Redoxic Hydrosols	Tall shrubland to low open woodland of *Grevillea spp., Melaleuca spp., Lophostemon lactifluus* over annual *Sorghum sp., Heteropogon triticeus* grassland.
10b*		Gently sloping broad drainage floors; including open spillway depressions	Shallow to deep; gravelly; red and brown; structured soils	Low or low open woodland of *Melaleuca viridiflora, Melaleuca nervosa, Grevillea pteridifolia +/- Lophostemon lactifluus, Asteromyrtus symphyocarpa* over *Sorghum intrans* and *Eriachne burkittii* mid tussock grassland.

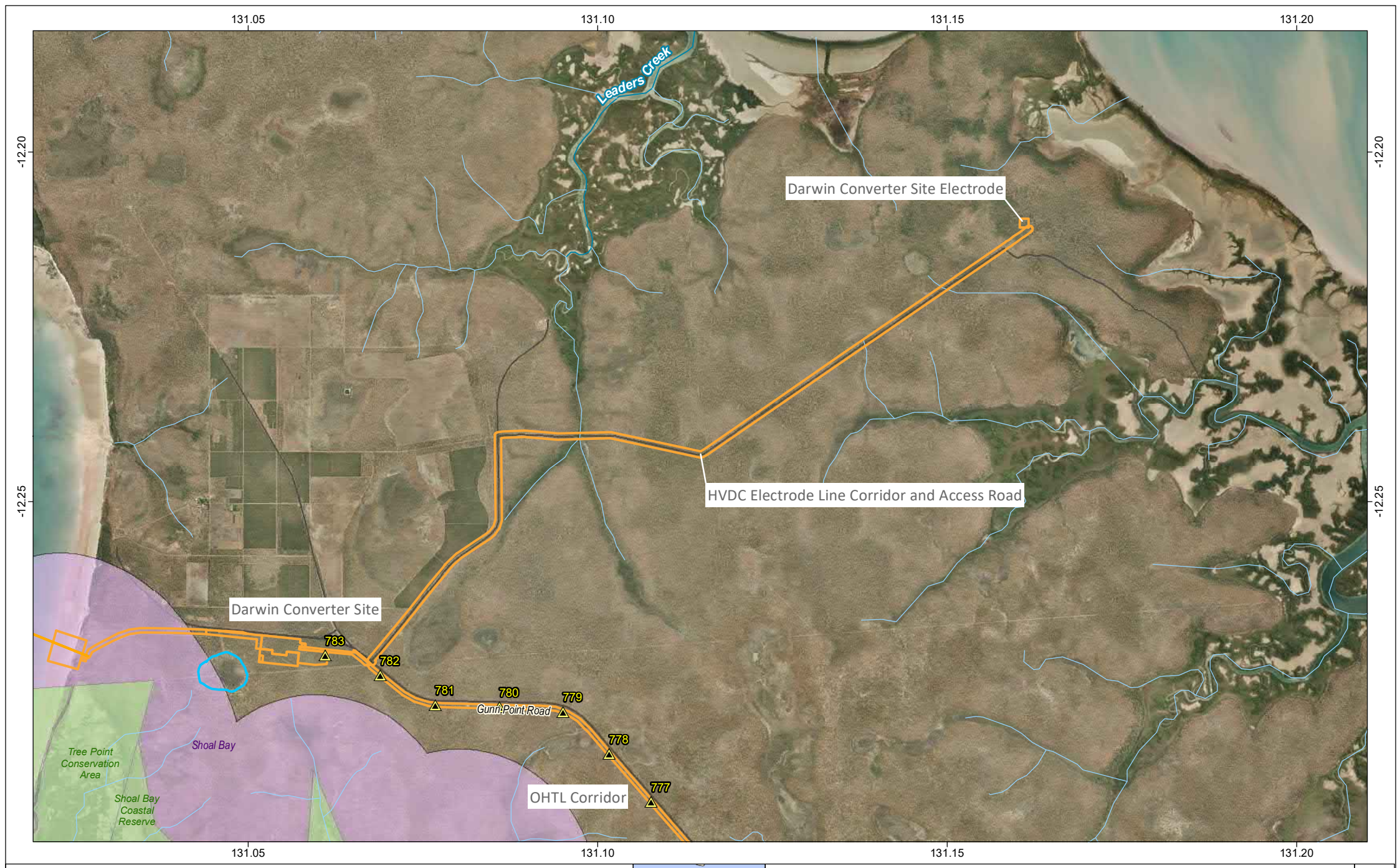
Figure 5-7: Photographs of land unit 4c observed supporting riparian vegetation in the DCS HVDC Electrode Line Corridor (Leaders Creek)

Figure 5-8: Photograph of land unit 8a1 observed intersecting the HVDC Electrode Line Corridor

Figure 5-9: Photograph of land unit 2b1 observed intersecting the HVDC Electrode Line Corridor

Figure 5-10: Photograph of land unit 8b observed intersecting the HVDC Electrode Line Corridor

Figure 5-11: Photograph of land unit 8a observed intersecting the HVDC Electrode Line Corridor



Kilometre Point (KP)
Roads
Streams
Minor Drainage
Seasonal swamp
AAPowerLink footprint
Parks and Reserves
Sites of Conservation Significance

Source: Sun Cable, EcOz, NTG (NR Maps)

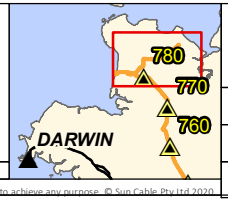


Figure 5-12. Map of the Darwin Converter Site Electrode and HVDC Electrode Line Corridor

N

Project: Australia-Asia PowerLink	Reference: M-Files ID 198726	Revision: 2
Coordinate System: GDA2020	Date: 18/11/2022	
0 3 Kilometres	Scale: 1:75,000	A4

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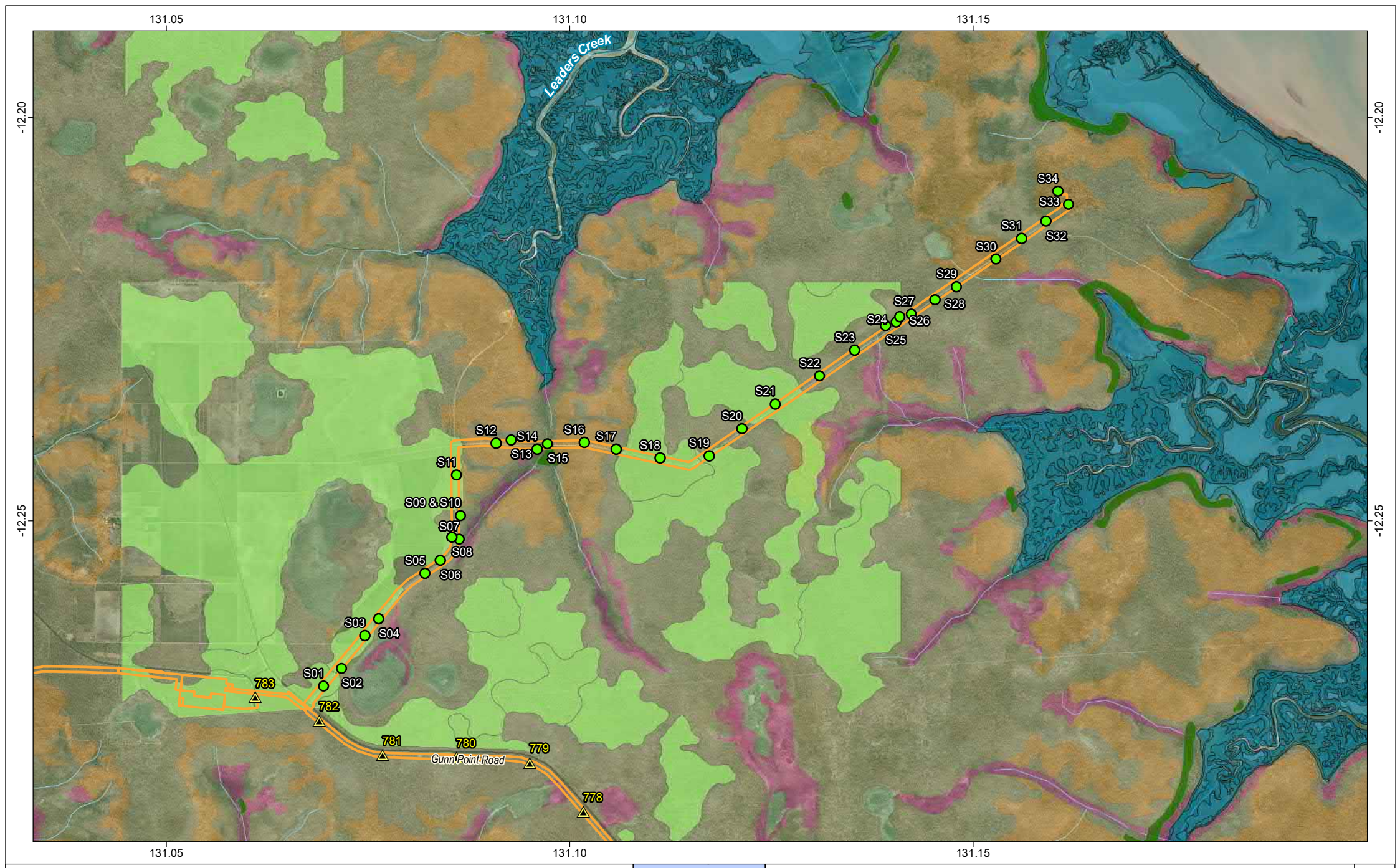
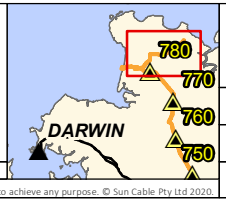


Kilometre Point (KP)
Land unit survey locations
Streams
Roads
AAPowerLink footprint

Significant Vegetation
Large hollow-bearing trees
Rainforest
Mangroves

Land units - Greater Darwin
Landform
Alluvial plains
Drainage Systems
Marine
Plains
Rises
Swamps



Source: Sun Cable, EcOz, NTG (NR Maps)

Figure 5-13. Map of land units and significant vegetation relevant to the DCS and DCS Electrode

N

Project: Australia-Asia PowerLink	Reference: M-Files ID 198726	Revision: 2
Coordinate System: GDA2020	Date: 18/11/2022	SUN CABLE AUSTRALIA-ASIA PowerLink
0 2.5 Kilometres	Scale: 1:65,000 A4	

5.4.3.2 Significant vegetation

Based on desktop analysis and field surveys, the following significant vegetation types occur proximate to the DCS Electrode and HVDC Electrode Line Corridor (Figure 5-13):

Riparian vegetation

Rainforest

Mangroves

Large hollow-bearing trees.

Wetlands and swamps occur adjacent to the HVDC Electrode Line Corridor. However, they do not intersect the proposed footprint.

Desktop analysis indicated the presence of riparian vegetation within the corridor at the intersection of Leaders Creek and possibly the upper drainage lines of Fly Creek. Field surveys confirmed the presence of riparian vegetation at Leaders Creek. However, they did not detect a discernible vegetation change within other drainage depressions.

Of relevance is the Mapping the Future project for Gunn Point that was undertaken by the NTG which included development of a biodiversity risk map where studies of land, water and biodiversity values were integrated to assist land use planning and development (Stokeld et al., 2020). Five biodiversity risk classes were assigned – with Class 5 (High) corresponding to high biodiversity areas, Class 4 (Moderate) corresponding to areas of significant vegetation and Class 3 (Uncertain) corresponding to areas requiring further biodiversity assessment before development approval. The Class 2 (Low) and below identified areas where no significant values were identified during this study.

The biodiversity risk map for the Mapping the Future project for the project area depicts 0.01% of the footprint as moderate risk, 0.55% as uncertain risk and 0.24% as low risk (refer to Figure 5-16). The project footprint does not intersect with any High Risk mapped areas. The mapping reflects the presence of three threatened flora species Darwin Cycad (*Cycas armstrongii*), *Stylidium ensatum* and *Typhonium praetermissum* (discussed in Section 5.4.3.4).

Rainforest

Rainforest mapping indicates the presence of wet riparian and spring rainforest along Leaders Creek at the intersection of the HVDC Electrode Line Corridor. This area was ground-truthed during the field survey and while riparian species were detected, monsoon rainforest species were not present. Within the DCS Electrode site, large, established, monsoon species were present (*Miliusa brahei, Choriceras tricorne, Acacia auriculiformis*) and continued into the adjacent transitional land unit.

Mangroves

Desktop resources indicate mangroves occur along the coastline of the Gunn Point Peninsula; however, this vegetation type does not intersect the DCS Electrode or HVDC Electrode Line Corridor. The closest mangroves to the DCS Electrode are approximately 700 m to the north and north-west. The closest mangroves to the HVDC Electrode Line Corridor are those within the Leaders Creek tidal inlet, approximately 700 m to the north along the creek line (Figure 5-13). Mangroves are therefore scoped out of this assessment.

Large hollow-bearing trees

The dominant vegetation communities across Gunn Point peninsula – Eucalypt forests, woodland, and riparian vegetation – have high potential for hollow-bearing trees. During the field surveys, large hollow-bearing trees were observed within the DCS Electrode and the HVDC Electrode Line Corridor, in riparian vegetation, and the Eucalypt forests and woodlands land units (Figure 5-13). These could provide roosting and/or breeding habitat for a range of mammals and birds – including such threatened species as Black-footed Tree-rat, Northern Brushtail Possum, Bare-rumped Sheathtail Bat and Masked Owl.

5.4.3.3 Land condition

Field observations confirmed the presence of four declared weed species – Gamba Grass, Mission Grass, Hyptis and Sida – and four species of environmental weeds (Table 5-8). The majority of occurrences were along roads, in drainage diversions and high-traffic campsite areas along Leaders Creek.

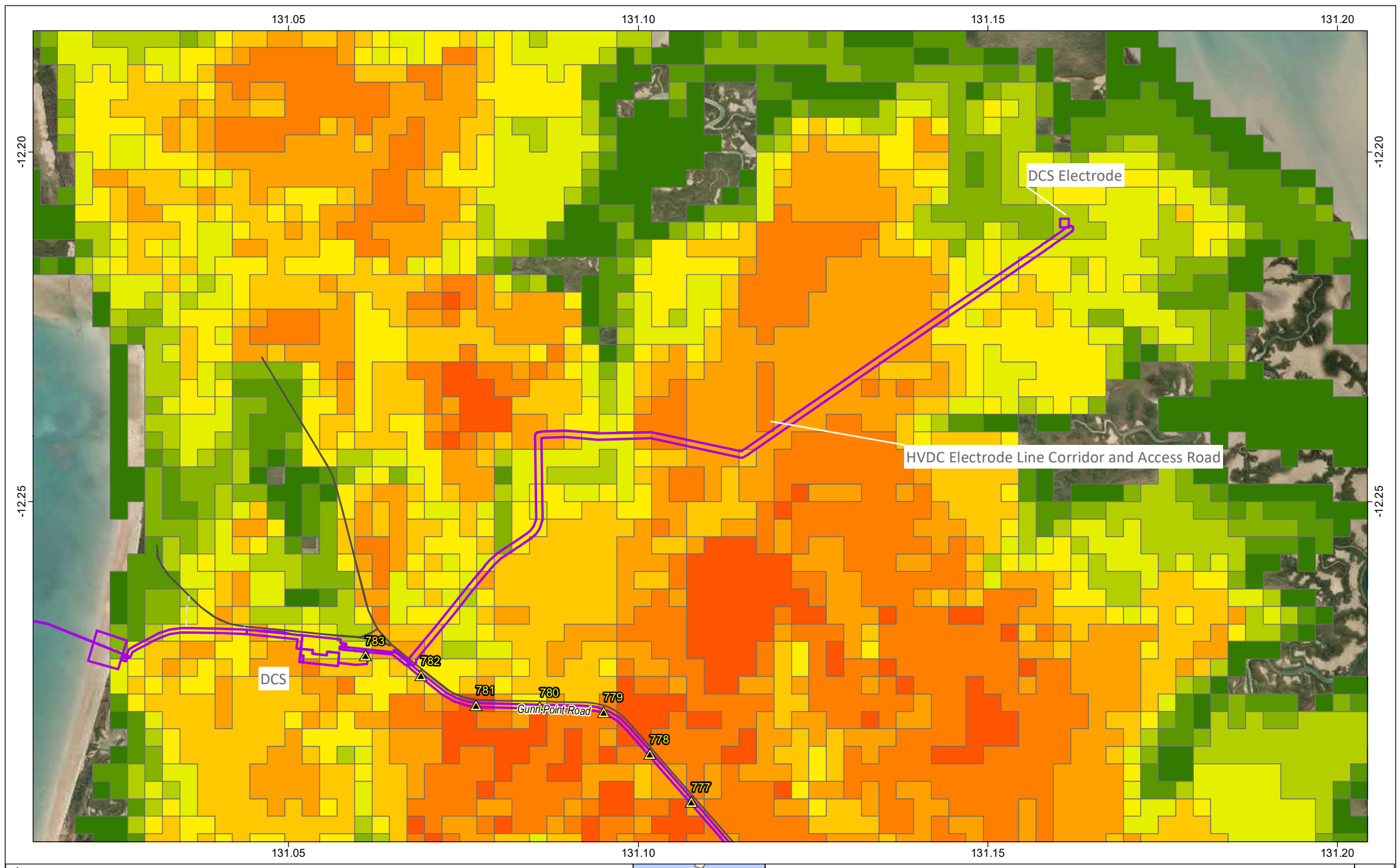
Small, isolated populations of some declared and environmental weeds were observed along the road access and on drainage diversions adjacent to the HVDC Electrode Line Corridor. One very weedy site was observed near Leaders Creek containing larger infestations of Perennial Mission Grass, Hyptis, Spinyhead Sida, Annual Mission Grass, Calopo Vine and Gambia Pea up to 100 m in diameter (Figure 5-14). The site is a high traffic area, and several well-used campsite locations were observed near the creek.

NAFI mapping shows the vegetation along the HVDC Electrode Line Corridor has burnt between 5 to 8 years in the last decade, with isolated areas with a lower burn frequency (Figure 5-15). The DCS Electrode is shown to have burnt late every year it has burnt (3 or 4 times in the past 10 years). During the field survey, however, the DCS Electrode appeared to be long unburnt due to the composition of species which indicate a transition towards monsoon vine forest. In contrast, large portions of the HVDC Electrode Line Corridor had recently – within four weeks – been burnt.

Table 5-8: List of weed species observed along the HVDC Electrode Line Corridor

Species	Common name	Declaration	No. of sites observed at
Andropogon gayanus	Gamba Grass	Class B, WONS	7
Cenchrus polystachyus	Perennial Mission Grass	Class B	4
Mesosphaerum suaveolens	Hyptis	Class B	2
Sida acuta	Spinyhead Sida	Class B	2
Cenchrus pedicellatus	Annual Mission Grass	Not Declared	5
Calopogonium mucunoides	Calopo	Not Declared	2
Stylosanthes sp.	Stylo	Not Declared	3
Mitracarpus hirtus	Berrimah Weed	Not Declared	1
Crotalaria goreensis	Gambia Pea	Not Declared	5

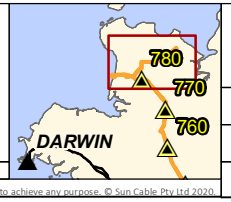
Figure 5-14: Photographs of Gamba Grass and Annual mission Grass infestations along the HVDC Electrode Line Corridor



Kilometre Point (KP)
AAPowerLink footprint
Roads

NAFI Fire Scars
Years burnt 2012 - 2021

1
2
3
4
5
6
7
8
9
10



Source: Sun Cable, EcOz, NTG (NR Maps)

Figure 5-15. Map of fire frequency in the Gunn Point area

N

Project: Australia-Asia PowerLink	Reference: M-Files ID 198726	Revision: 2
Coordinate System: GDA2020	Date: 18/11/2022	
0 2.5 Kilometres	Scale: 1:75,000	A4

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725000 730000 735000 740000

8650000 8645000 8640000

Leaders Creek Road

Gunn Point Road

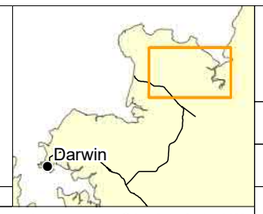
725000 730000 735000 740000

Legend

- Road
- HVDC Electrode Line Corridor
- AAPowerLink Infrastructure
- Darwin Converter Site Electrode
- Leaders Creek Fishing Base

Risk to Biodiversity

- Class 1: NIL. Highly modified
- Class 2: LOW. No significant biodiversity value
- Class 3: UNCERTAIN. Requires further biodiversity assessment
- Class 4: MODERATE. Sensitive and/or significant vegetation
- Class 5: HIGH. High biodiversity value
- Not Assessed
- Water



Source: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

Figure 5-16: Map of biodiversity values relevant to the DCS Electrode, as identified by Stokeld et al. (2020)

N

Project: Australia-Asia PowerLink	Reference #: AAPL_GNR_CTA_GEN_MAP_0420	Figure: 1 of 1	Revision: A
Coordinate System: MGA Zone 52	Datum: GDA2020	Date: 16/11/2022	
0 1 2 3 Km		Scale: 1:50,000	A4

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5.4.3.4 Threatened species

Significant and threatened species relevant to this component are identified in this section and assessed in detail in Section 5.6 of this Chapter. The procedure for assessment of threatened species is described in Section 2.3 of the Supplementary Ecology Report - Part 1 - Threatened Species (Appendix 5.1).

As detailed in Section 5.4.3, in 2018-19 Gunn Point peninsula was subject to a broadscale survey for threatened fauna and habitat modelling for threatened flora (with some targeted surveys) – Stokeld et al. (2020). The results of that study – assessed in conjunction with the vegetation communities present within the project area – give a good indication of which threatened species are likely to be present. Consequently, the desktop analysis incorporates recent records in the 'likelihood of occurrence' determination for the DCS Electrode and HVDC Electrode Line Corridor.

The HVDC Electrode Line Corridor is in a long linear corridor. Due to the linear nature and habitats traversed, the HVDC Electrode Line Corridor potentially impacts a considerable number of different threatened species. However, the physical disturbance footprint of a corridor is, by design, narrow and localised. Therefore, threatened species with general habitat requirements and/or wide ranges are unlikely to be significantly impacted by this part of the development. The species further discussed in this section were identified by applying an extra layer of filtering to only select species that have restricted ranges or localised core habitat requirements. Undertaking this extra step in the likelihood of occurrence evaluation avoids the need to discuss a large number of species that have an inherently low likelihood of being significantly impacted by linear project activities.

Restricted species with a high or moderate likelihood of occurrence were then the subject of targeted field surveys within the project area. The results of the field survey were used to determine a revised likelihood of occurrence for these species.

A total of 17 threatened species were considered in the desktop 'likelihood of occurrence' assessment. The results from the desktop analysis are presented in Table 5-9, nine threatened species are known to occur with the Gunn Point peninsula, in habitat found within the project area. Of these, four have restricted or core habitat requirements:

Masked Owls were detected in the Gunn Point area in the DENR study in 2018-2019 through acoustic recording (Stokeld et al., 2020). Masked Owls occur mainly in tall open Eucalypt forests and use large tree hollows for breeding. Trees with large or very large hollows are rare in the tropical savanna forests (Woolley et al. 2018), meaning they are a critical resource for dependent species. Large hollow-bearing trees were detected within the DCS Electrode and HVDC Electrode Line Corridor. These could be breeding or roosting habitat for Masked Owls.

As discussed in the Draft EIS, the likelihood modelling for Darwin Cycad undertaken by Stokeld et al. (2020) identified that northern Gunn Point peninsula – near Murrumujuk and Leaders Creek turn-off – contains extensive areas with a high likelihood of supporting high density stands of Darwin Cycad. These high-likelihood habitats contain well-developed Eucalypt open forests on well-drained red earths.

Areas of high-likelihood modelling for *Typhonium praetermissum* occur within the HVDC Electrode Line Corridor (Figure 5-17).

Areas of high-likelihood modelling for *Stylidium ensatum* occur adjacent to, but outside of, the HVDC Electrode Line Corridor (Figure 5-17).

The remaining species have a low or no likelihood of occurring.

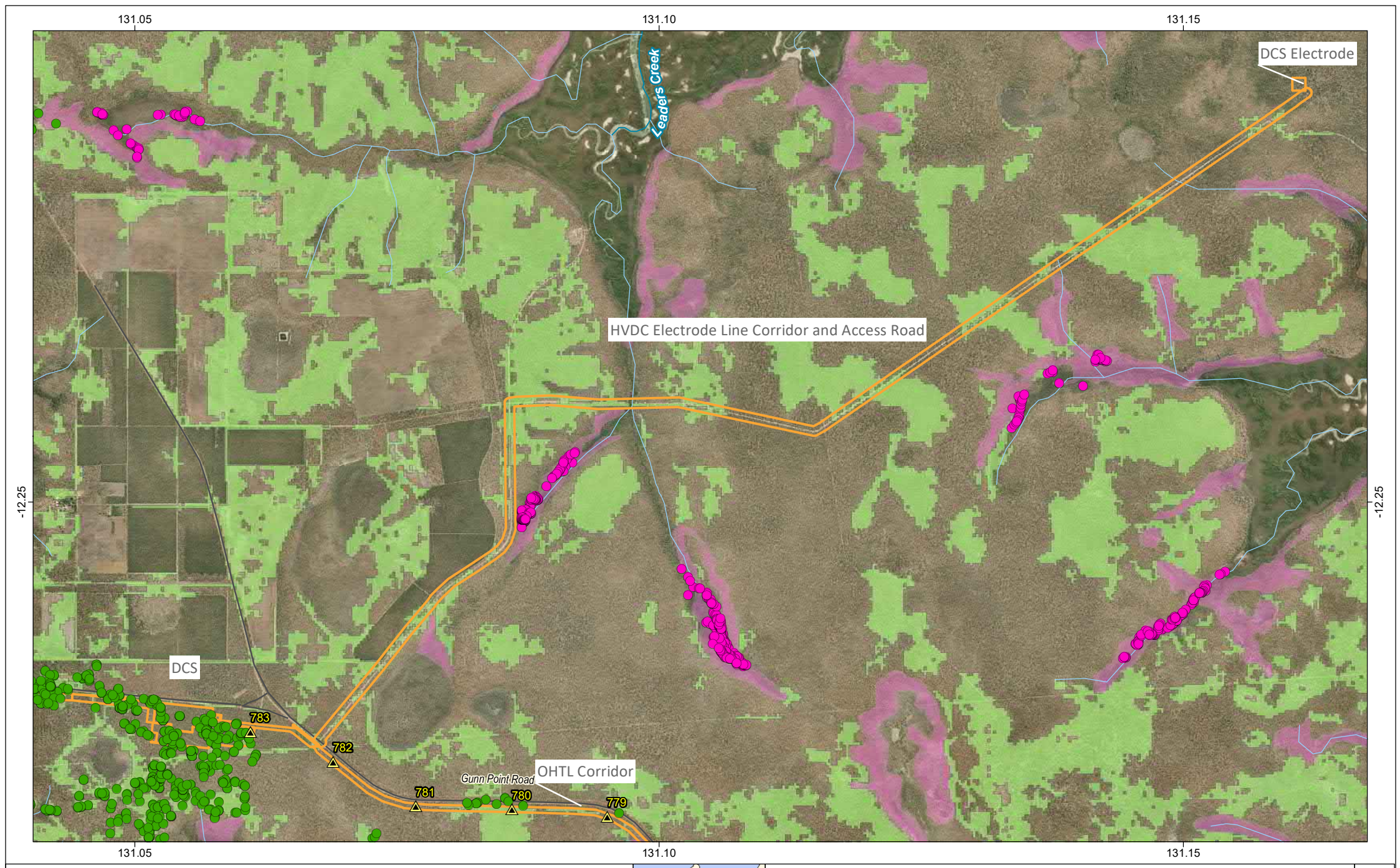
Only *Stylidium ensatum* has been subject to a targeted survey within the HVDC Electrode Line Corridor, with not records for within the project footprint – see Supplementary Ecology Report – Part 1 - Threatened Species (Appendix 5.1). More detail regarding the ecology and presence of these species within this project component is presented in the significant impact assessments in Sections 5.6.3.12 and 5.6.3.13.

Table 5-9: Summary of threatened species likelihood of occurrence assessment for the DCS Electrode

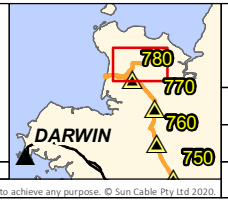
Likelihood	Species	Class	Status		Justification
			EPBC	TPWC	
HIGH	Fawn Antechinus (*Antechinus bellus*)	Mammal	VU	EN	Recorded recently on camera trap – DENR
	Black-footed Tree-rat (Kimberley and mainland NT) (*Mesembriomys gouldii gouldii*)		EN	EN	
	Northern Brushtail Possum (*Trichosurus vulpecula arnhemensis*)		VU	-	
	Partridge Pigeon (*Geophaps smithii smithii*)	Bird	VU	VU	
	Masked Owl (*Tyto novaehollandiae kimberli*)		VU	VU	Recorded recently on sound meter – DENR
	Mertens' Water Monitor *(Varanus mertensi)*	Reptile	-	VU	Recorded recently on camera trap – DENR
	Yellow-spotted Monitor *(Varanus panoptes)*		-	VU	Suitable habitat and recent records
	Darwin Cycad (*Cycas armstrongii*)	Plant	-	VU	High likelihood modelled habitat of high-density stands Detected during surveys
	Stylidium ensatum		EN	EN	High likelihood modelled habitat Detected during surveys
	Typhonium praetermissum		-	VU	
MODERATE	No species				
LOW	Pale Field-rat (*Rattus tunneyi*)	Mammal	-	VU	Suitable habitat yet not detected on DENR survey

Likelihood	Species	Class	Status		Justification
			EPBC	TPWC	
	Gouldian Finch (*Chloebia gouldiae*)	Bird	EN	VU	May occur as a vagrant – preferred breeding habitat not present
	Red Goshawk (*Erythrotriorchis radiatus*)		VU	VU	Suitable habitat albeit few records
	Howard River Toadlet *(Uperoleia daviesae)*	Amphibian	VU	VU	No suitable sandsheet heath habitat present

CR = Critically Endangered; EN = Endangered; VU = Vulnerable, NT = Near Threatened



Kilometre Point (KP)
AAPowerLink footprint
Streams
Roads
Stylidium ensatum
Typhonium praetermissum
Stylidium ensatum high likelihood habitat (Source: NTG)
Typhonium praetermissum high likelihood habitat (Source: NTG)



Source: Sun Cable, EcOz, NTG (NR Maps)

Figure 5-17. Map of threatened flora high-likelihood habitat and records relevant to the DCS and DCS Electrode

N

Project: Australia-Asia PowerLink	Reference: M-Files ID 198726	Revision: 2
Coordinate System: GDA2020	Date: 18/11/2022	
0 2 Kilometres	Scale: 1:50,000	A4

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5.4.3.5 OHTL preferred route at Adelaide River

This section provides a desktop assessment of the OHTL preferred route at Adelaide River. The preferred route of the OHTL Corridor at Adelaide River begins at approximately KP 620 and extends east of the township predominantly through pastoral and rural land. The OHTL re-enters the railway corridor west of Lake Bennett at approximately KP 690 covering approximately 400 ha in a 30 to 60 m wide corridor (Figure 5-18). The OHTL preferred route at Adelaide River traverses pastoral lease and Crown Land on the east of the Adelaide River, and private land to the west between the Adelaide River and Stuart Highway. Land use is predominantly pastoralism, with some horticulture.

The OHTL preferred route at Adelaide River is within the Pine Creek Bioregion (Figure 5-18). The Pine Creek bioregion is characterised by uneven terrain of ranges and sandstone mountains. The dominant vegetation is Eucalypt tall open forests, dominated by *Eucalyptus tetrodonta* and *Eucalyptus miniata* woodlands, with smaller monsoon rainforest patches, Melaleuca woodlands, riparian vegetation, and tussock grasslands (Baker et al 2005).

Desktop assessment of the OHTL preferred route at Adelaide River identified environmental values and constraints likely to occur within the project area. The values identified are detailed in this section and summarised in Figure 5-18 and Table 5-10. Field surveys have not been conducted for this area due to ongoing land access and tenure negotiations. As a result, the assessment has been based on desktop resources and local knowledge which will be validated in the field through the Constraints Planning and Field Development Procedure (Appendix 4.1).

Table 5-10: Summary of terrestrial ecosystem values relevant to the OHTL preferred route at Adelaide River

Value	OHTL Corridor
Parks and reserves	-
SOCS / SOBS	-
Natural land features	-
Watercourses	✓
Springs	-
Riparian vegetation	✓
Rainforest	✓
Wetlands	✓
Large hollow-bearing trees	✓
Threatened flora records	✓
Threatened flora modelled habitat	✓
Threatened fauna records	-
Threatened fauna habitat	✓

5.4.3.6 Habitat

A desktop assessment of NVIS Level 3 data (i.e., presenting the dominant species for each vegetation storey) shows that the OHTL preferred route at Adelaide River intersects with 11 native vegetation communities that fall under six broad community categories. Tropical Eucalypt woodlands / grasslands cover the largest area within the OHTL Corridor at 320 ha (Figure 5-19).

Relevant land system mapping was undertaken by Story et al. (1969) and Wood et al. (1985) at a scale of 1:250,000, with land system classifications retained across the two reports (Wood et al. 1985). The OHTL preferred route at Adelaide River intersects six land systems – described in Table 5-11 and mapped in (Figure 5-18). The OHTL preferred route at Adelaide River is predominantly within the Adelaide River floodplains.

Sinkholes are known to occur within the Adelaide River region; however, none are recorded within the OHTL Corridor (Figure 5-18).

The OHTL preferred route at Adelaide River is within the Adelaide River catchment and intersects major water courses – Adelaide River and Howley Creek – as they drain north (Table 5-12 and (Figure 5-18). The OHTL preferred route at Adelaide River is within the eastern Adelaide River floodplains and crosses 24 watercourses including 8 major watercourses and 16 minor watercourses. The minor watercourses are ephemeral and only flow after heavy or prolonged rainfall events – although they may maintain some permanent spring-fed waterholes. Some major watercourses with high stream orders retain water year-round or are spring-fed. However, none are intersected by the OHTL Corridor. The nine major watercourses crossed by the OHTL Corridor are tributaries of Howley Creek and one tributary of Adelaide River.

The numerous watercourses have riparian vegetation habitat that is important for providing ecosystem services and refugia for fauna and flora. This is further described in Section 5.4.3.7 below.

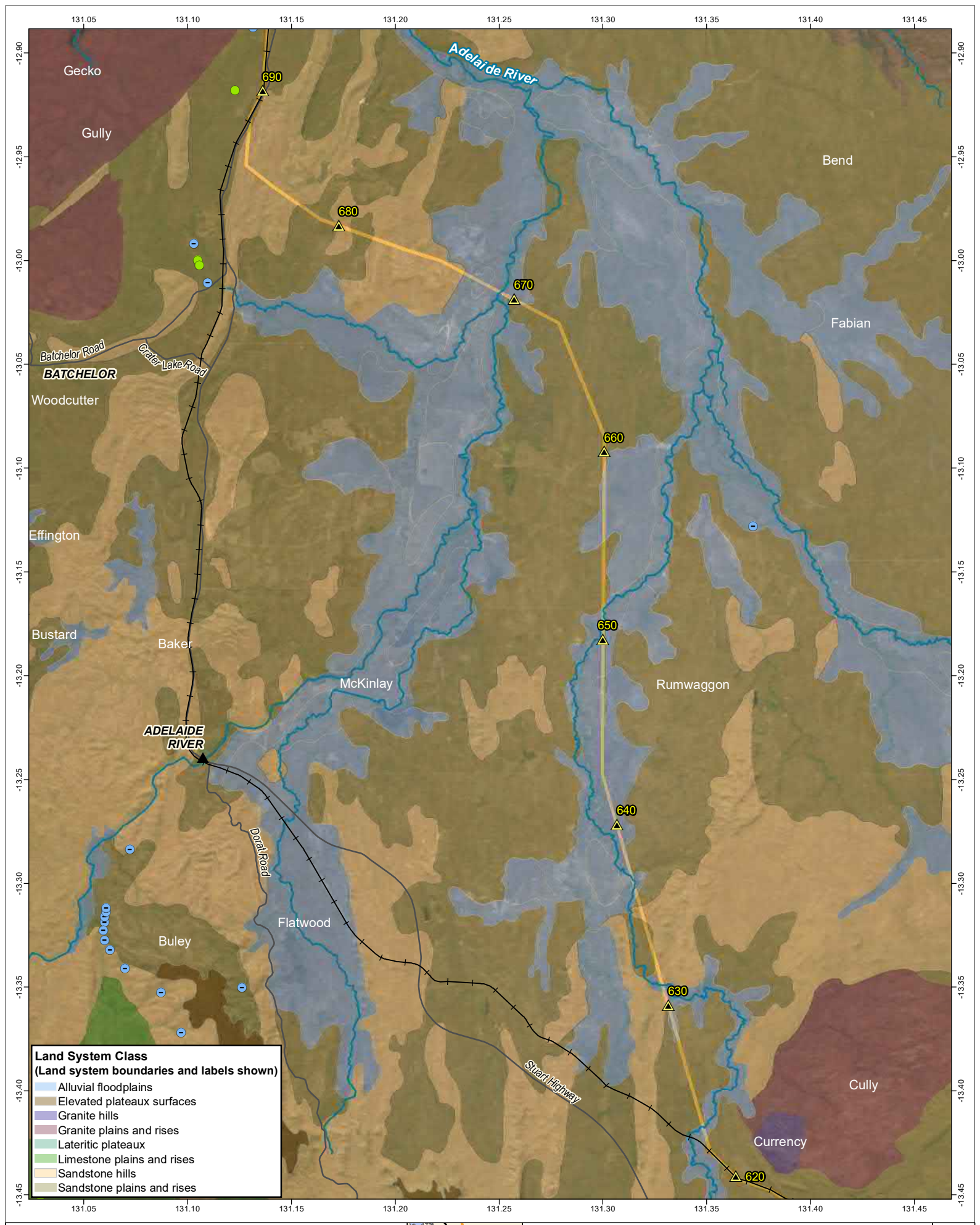
Table 5-11: Summary of the land systems relevant to the OHTL preferred route at Adelaide River

Land system	Landform	Soil	Vegetation
Sandstone hills			
Baker	Rugged hills and strike ridges with intervening narrow valleys and short lower slopes on folded Burrels Creek greywacke, sandstone, and siltstone	Skeletal soils and outcrop with minor sandy red and yellow gradational soils	Mid-high woodland of *Corymbia. dichromophloia, Eucalyptus miniata, Corymbia bleeseri, Eucalyptus tectifica* and *Corymbia terminalis* over *Sorghum* species, *Themeda triandra* and *Chrysopogon* species
Sandstone plains and rises			
Bend	Undulating low strike ridges and rises on folded Burrels Creek greywacke, sandstone, and siltstone	Skeletal soils and shallow gravelly loams	Mid-high woodland of *Corymbia latifolia*, *Corymbia foelscheana, Eucalyptus polysciadia, Eucalyptus tectifica, Erythrophleum chlorostachys* over tropical tall grass (Sorghum species, Heteropogon species, Chrysopogon species)

Land system	Landform	Soil	Vegetation
Rumwaggon	Low rounded hills and low gravelly ridges with intervening alluvial flats	Lithosols on rises, yellow podzolics on alluvial areas	Mid-high open woodland of *Eucalyptus polysciadia, Corymbia ferruginea, Corymbia foelscheana, Eucalyptus tectifica, Xanthostemon paradoxus* over Chrysopogon species, Sorghum species, *Eriachne triseta*
Alluvial floodplains			
Fabian	Level to gently undulating alluvial floodplains of dominantly silty alluvium	Silty brown and yellow earths and mottled duplex soils	Mid-high grassland of *Chrysopogon species, Themada triandra*, Cyperus species with minor areas of woodland (*Corymbia papuana, Corymbia polycarpa, Pandanus sp.,* Melaleuca species, *Eucalyptus apodophylla*)
Flatwood	Level to gently undulating alluvial floodplains of dominantly silty alluvium	Mottled yellow earths and duplex soils	Mid-high open woodland of *Melaleuca viridiflora Corymbia polycarpa, Melaleuca nervosa, Corymbia latifolia, Corymbia grandifolia* over *Chrysopogon fallax, Pseudopogonatherum spinescens*, Eriachne species
McKinlay	Alluvial floodplains and channels	Siliceous sands, silty brown and yellow earths, yellow podzolics	Mid-high grassland of Chrysopogon species, *Themada triandra,* Cyperus species with minor areas of woodland (*Corymbia papuana, Corymbia polycarpa, Pandanus sp.,* Melaleuca species, *Eucalyptus apodophylla*)

Table 5-12: Number of watercourses crossed by the OHTL preferred route at Adelaide River as per the Memorandum Riparian Vegetation Assessment (Appendix 5.5)

Stream Order	# of Watercourses
1 – Drainage lines	8 - Howley Creek
2 – Intermittent streams	6 - Howley Creek
4 – Creek	2 - Howley Creek
5 – River	8 - Adelaide River, Howley Creek



Kilometre Point (KP)
AAPowerLink footprint
Towns
Railway
Roads
Major Drainage
Bores
Springs
Sinkholes

Source: Sun Cable, EcOz, NTG (NR Maps)

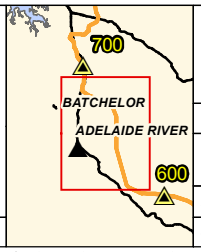


Figure 5-18. Map of the proposed OHTL preferred route at Adelaide River and relevant land systems

N

Project: Australia-Asia PowerLink

0 2 4 6 Kilometres

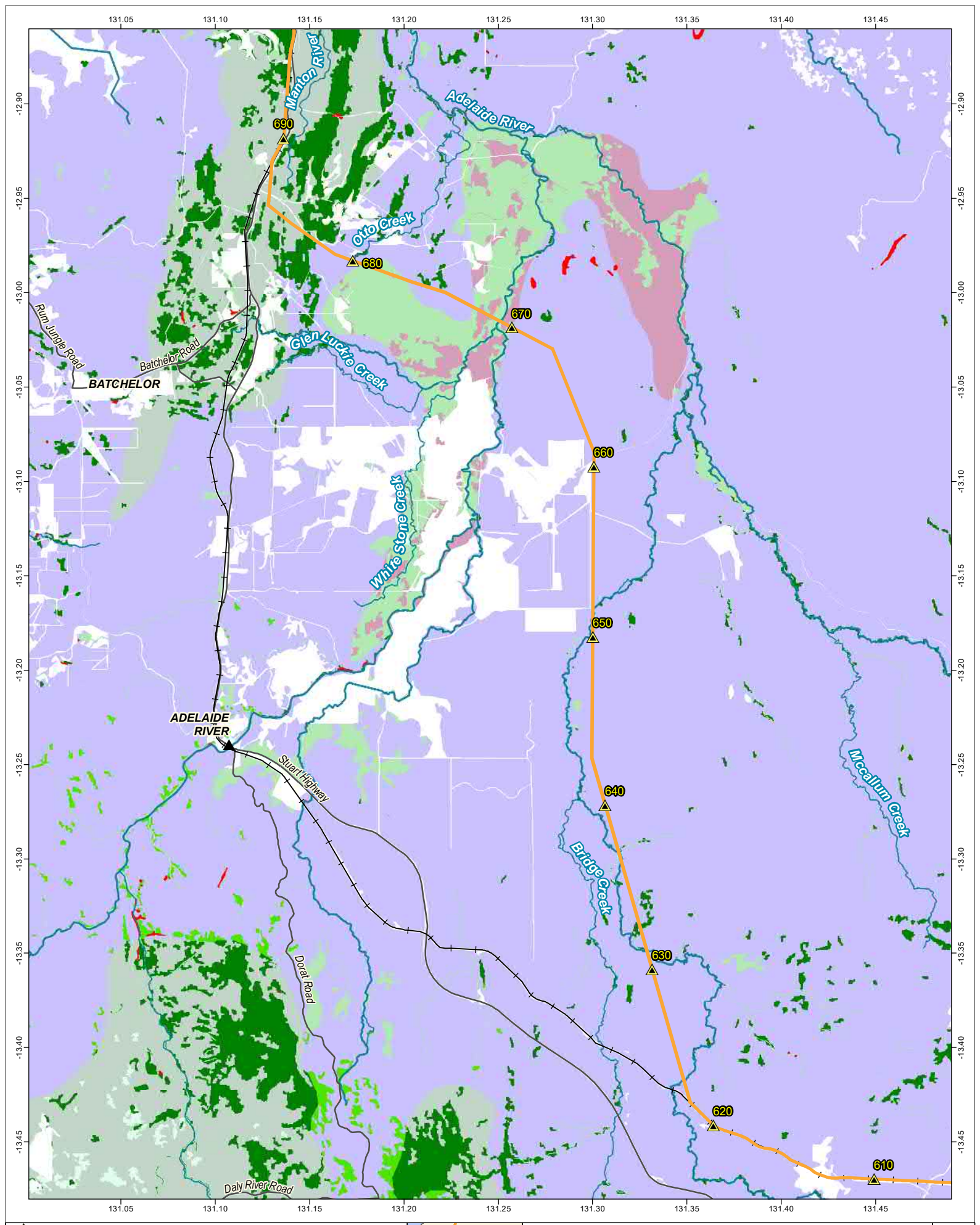
Reference: M-Files ID 217502

Date: 18/11/2022 | Revision: 2

Scale: 1:250,000

Coordinate System: GDA2020 | A4

SUN CABLE AUSTRALIA-ASIA PowerLink



Kilometre Point (KP)
Towns
Railway
Roads
Major Drainage
AAPowerLink footprint

Rainforests and Vine Thickets
Eucalypt Open Forests
Eucalypt Low Open Forests
Eucalypt Woodlands
Melaleuca Forests and Woodlands
Tropical Eucalypt Woodlands/Grasslands
Eucalypt Open Woodlands
Other Open Woodlands
Cleared, non-native vegetation, buildings

Source: Sun Cable, EcOz, NTG (NR Maps)

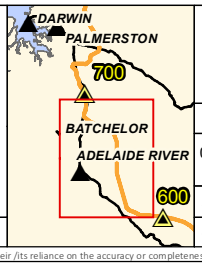


Figure 5-19. Map of NVIS vegetation groups relevant to the OHTL preferred route at Adelaide River

Project: Australia-Asia PowerLink

0 5 10 Kilometres

Scale: 1:275,000

Coordinate System: GDA2020

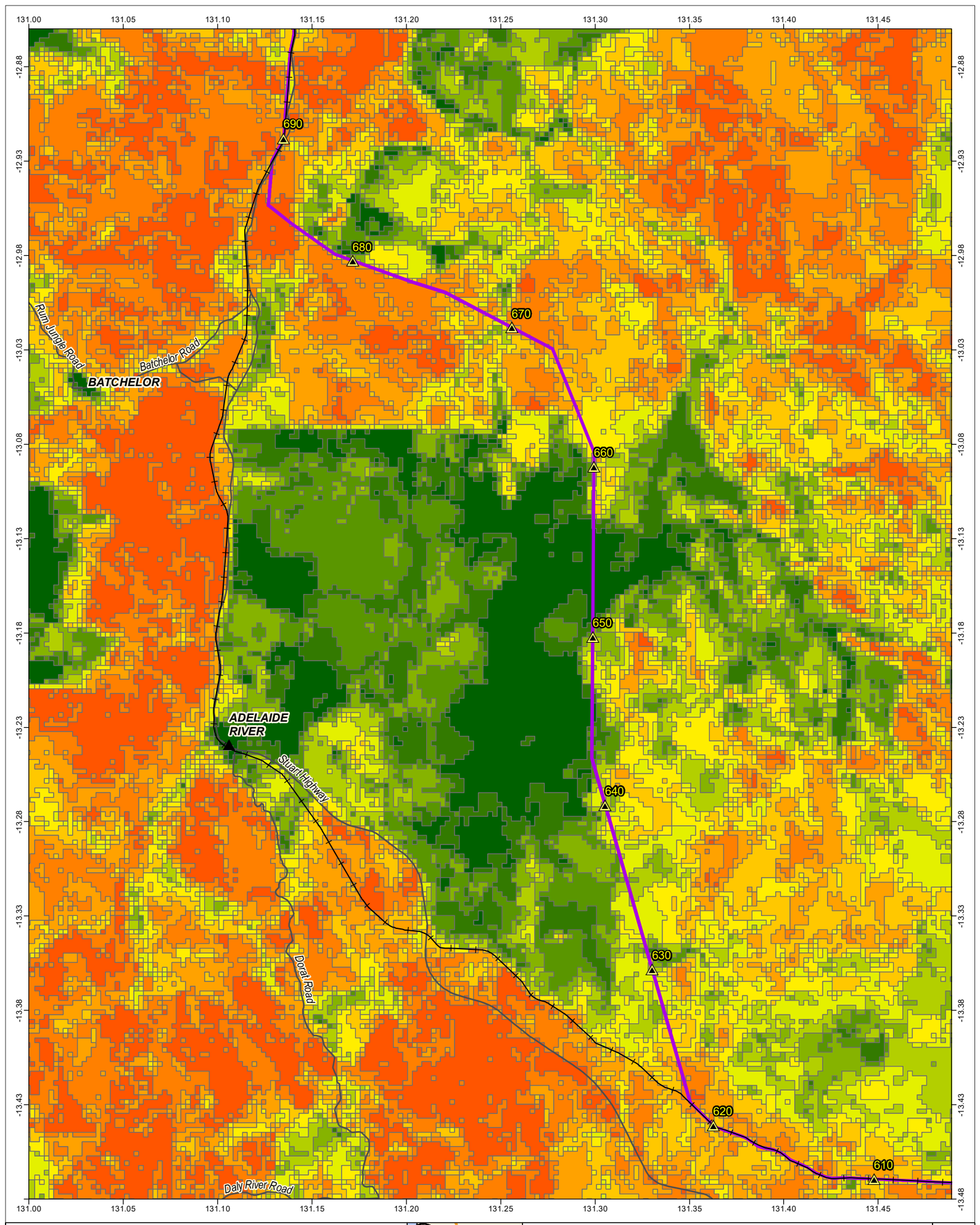
A4

Reference: M-Files ID 217502

Date: 17/11/2022

Revision: 2

SUN CABLE AUSTRALIA-ASIA PowerLink



Kilometre Point (KP)
Towns
Railway
Roads
AAPowerLink footprint

NAFI Fire Scars
Years burnt 2012 - 2021

0
1
2
3
4
5
6
7
8
9
10

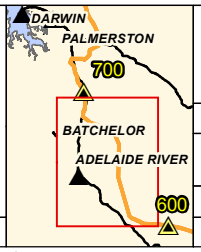


Figure 5-20. Map of fire history within the Adelaide River region

N

Project: Australia-Asia PowerLink

0 5 10 Kilometres

Reference: M-Files ID 217502

Date: 17/11/2022 | Revision: 2

Scale: 1:275,000

Coordinate System: GDA2020 | A4

Source: Sun Cable, EcOz, NTG (NR Maps)

SUN CABLE AUSTRALIA-ASIA PowerLink

5.4.3.7 Significant vegetation

Based on desktop analysis, the following significant vegetation types occur, or could occur, within the OHTL preferred route at Adelaide River:

Riparian vegetation

Rainforest

Floodplains

Large hollow-bearing trees (as discussed in Section 5.4).

Riparian vegetation

Riparian vegetation occurs along the 24 watercourses crossed by the OHTL preferred route at Adelaide River, with the project footprint occupying an estimated total of 19 ha in the OHTL Corridor riparian zone (assuming a 250 m buffer) (Appendix 5.5). This amounts to approximately 4-32 % of riparian vegetation in a 250 m buffer of each crossing, indicating that riparian vegetation is extensive in the adjacent areas. The figures in Appendix 5.5 show examples of modelled riparian vegetation at watercourse crossings that were produced as part of Appendix 5.5 Memorandum: Riparian Vegetation Assessment. Verification of the presence and quality of riparian vegetation is required and will be carried out as part of the Constraints Planning and Field Development Procedure to assist with micro-siting infrastructure.

Rainforest

Wet rainforest occurs within riparian areas. Adjacent to the Adelaide River, there are two patches of spring fed rainforests – 5 and 13 ha in size. The quality of these areas is unable to be determined from desktop assessment. Verification of presence and quality of rainforest is required as aerial imagery indicated areas of disturbance where rainforest may no longer occur – i.e., pastoral land use (Figure 5-19). This will be carried out as part of the Constraints Planning and Field Development Procedure to assist with micro-siting infrastructure.

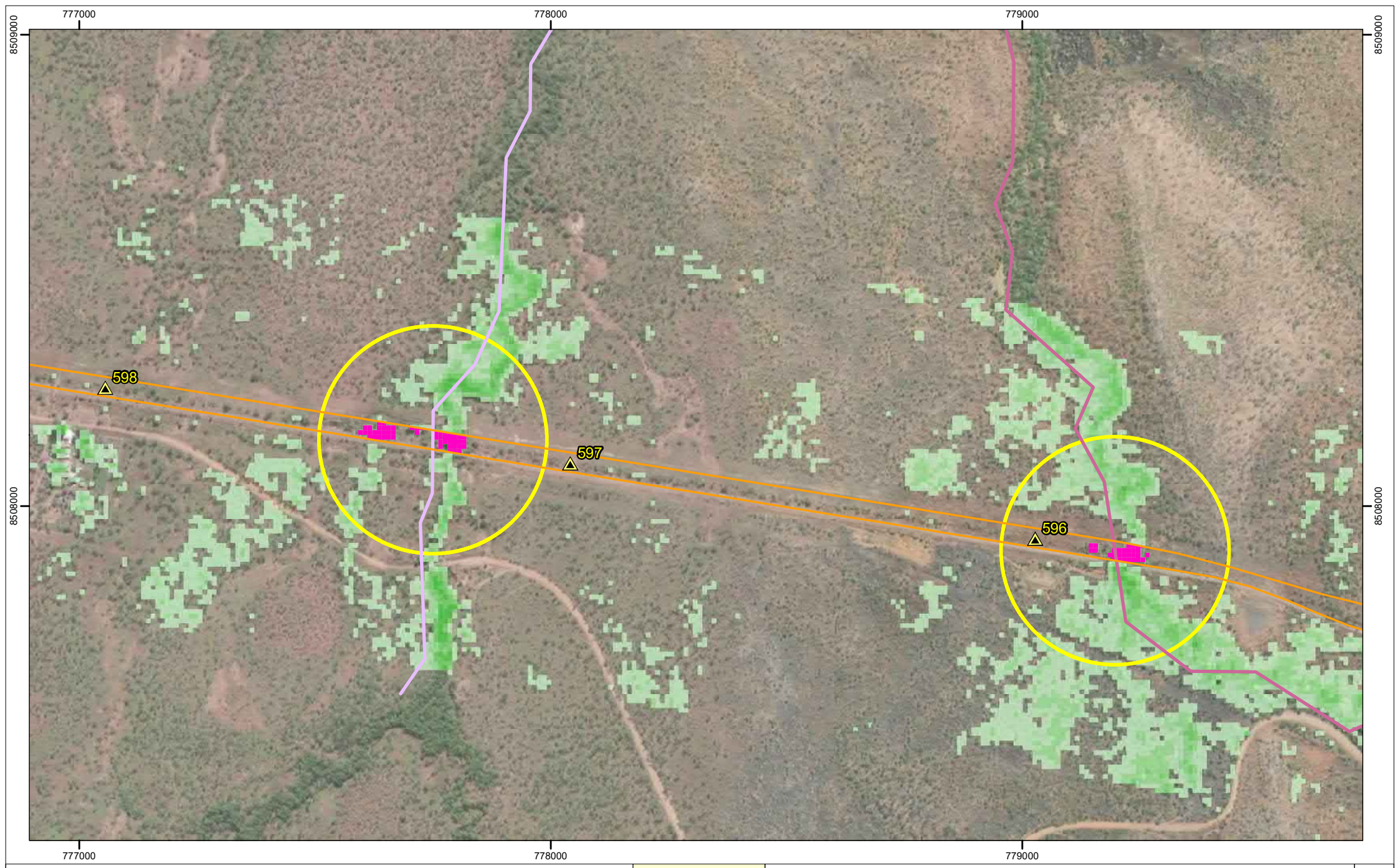
Floodplains

The Adelaide River supports a large network of floodplains crossed by the OHTL preferred route at Adelaide River (Figure 5-18).

5.4.3.8 Land condition

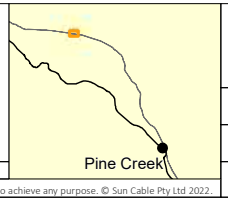
Weed records were clipped to 1 km of the OHTL preferred route at Adelaide River and assessed. There are eight species of weeds from 202 individual records. Most records are along the Adelaide River and its tributaries, around Lake Bennett and on the Stuart Highway. The absence of available weed data in other parts of the region could be due to lack of survey effort within Mount Keppler and Bridge Creek Stations. Weed species recorded included three listed as EPBC threatening processes, 3 WONS, 5 declared species and 6 species listed for Priority Control in the Darwin Regional Weeds Strategy 2021-2026. The most frequent records were of Gamba Grass (*Andropogon gayanus),* followed by Mimosa *(Mimosa pigra),* Olive Hymenachne *(Hymenachne amplexicaulis)* and Mission Grass *(Cenchrus spp.)*.

Review of available NAFI data shows that in the past 10 years, fire frequency and extent has been variable across the Adelaide River region. The area from Ringwood Road bordered by Stuart Highway to the south and west, and Howell Creek in the east has a very low – 0 to 3 years – fire frequency. In contrast, areas north of Ringwood Road, east of Howell Creek and south of the Stuart Highway have a very high fire frequency (7 to 10 years), shown in Figure 5-20. Of the areas that are burnt frequently, most are early dry season burns. The absence of fire in certain areas is attributed to heavy grazing of cattle and buffalo within pastoral stations and private land holdings.



Legend

- Kilometre Points
- OHTL Corridor
- Watercourse (Stream Order - Hierarchy)
  - 3 - Minor
  - 4 - Major
- NDVI Areas Indicative of Riparian Vegetation in the OHTL Corridor within 250m Buffer
- 250m Buffer (OHTL - Watercourse Intersection Point)
- NDVI
  - 0.28 - 0.38
  - 0.39 - 0.48
  - 0.49 - 0.58
  - 0.60 - 0.78

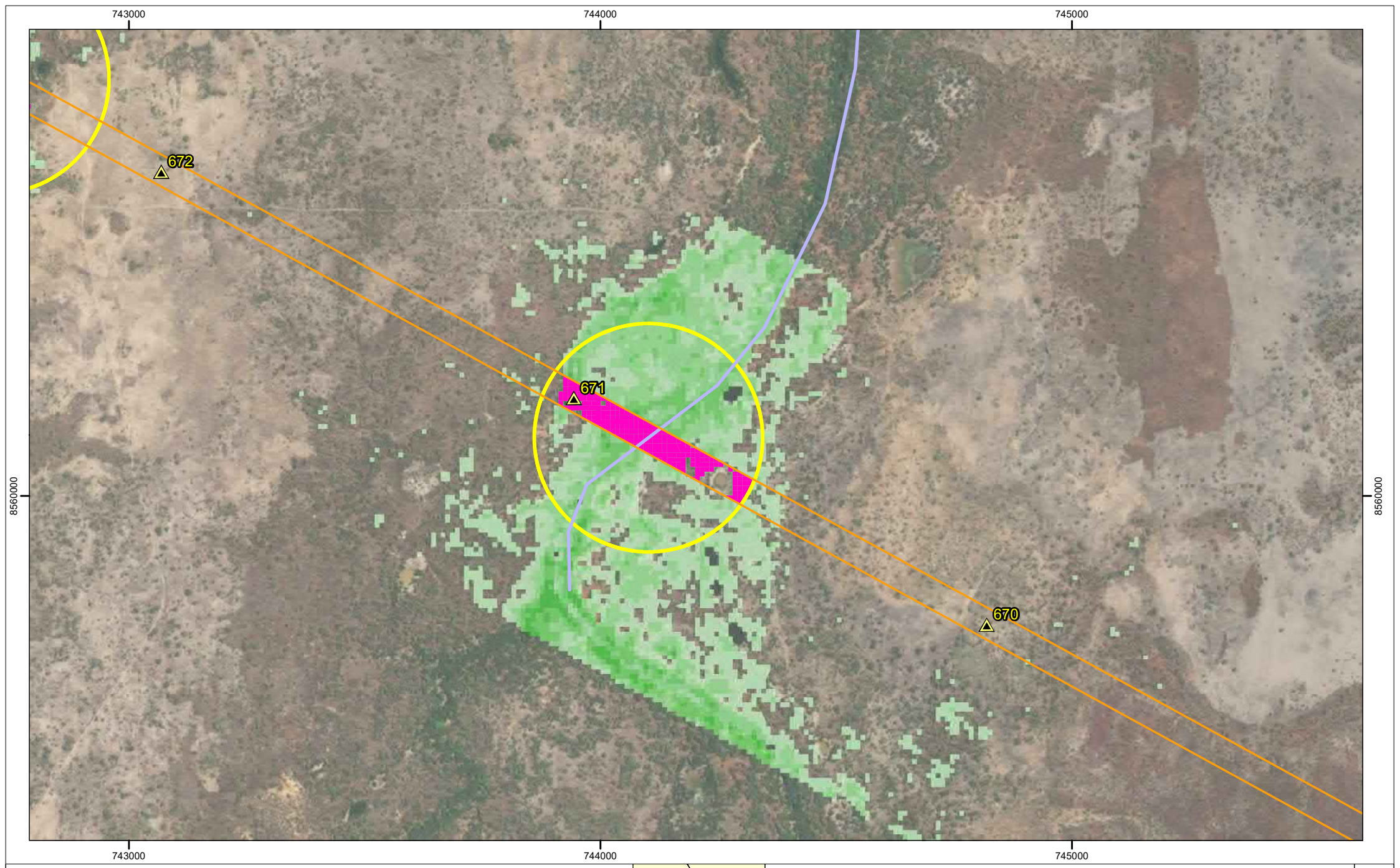


Source: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community, Sentinel-2B Copernicus Open Access Hub

Figure 5-21: Modelled NDVI Area (Riparian Vegetation) - Saunders Creek and Margaret River

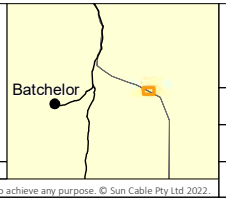
Project: Australia-Asia PowerLink	Reference #: AAPL_GNR_CTA_GEN_MAP_0402	Figure: 1 of 1	Revision: A	N
Coordinate System: MGA 52	Datum: GDA2020	Date: 18/11/2022		
0 100 200 300 400 Metres		Scale: 1:10,000	A4	

SUN CABLE AUSTRALIA-ASIA PowerLink



Legend

- Kilometre Points
- OHTL Corridor
- Watercourse (Stream Order - Hierarchy)
  - 5 - Major
- NDVI Areas Indicative of Riparian Vegetation in the OHTL Corridor within 250m Buffer
- 250m Buffer (OHTL - Watercourse Intersection Point)
- NDVI
  - 0.28 - 0.38
  - 0.39 - 0.48
  - 0.49 - 0.58
  - 0.60 - 0.78



Source: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community, Sentinel-2B Copernicus Open Access Hub

Figure 5-22: Modelled NDVI Area (Riparian Vegetation) - Adelaide River

Project: Australia-Asia PowerLink	Reference #: AAPL_GNR_CTA_GEN_MAP_0403	Figure: 1 of 1	Revision: A
Coordinate System: MGA 52	Datum: GDA2020	Date: 18/11/2022	
0 100 200 300 400 Metres		Scale: 1:10,000	A4

N

SUN CABLE AUSTRALIA-ASIA PowerLink

5.4.3.9 Threatened species

Significant and threatened species relevant to this component are identified in this section and assessed in detail in Section 5.6 of this Chapter. No targeted threatened species surveys have been undertaken within this project area. The procedure for assessment of threatened species is described in Section 2.3 of the Supplementary Ecology Report - Part 1 - Threatened Species (Appendix 5.1).

The OHTL preferred route at Adelaide River will be in the form of a long, linear corridor. Due to its 70 km length, the OHTL preferred route at Adelaide River potentially impacts a considerable number of different threatened species. As above, the physical disturbance footprint of a corridor is, by design, narrow and localised. Therefore, threatened species with general habitat requirements and/or wide ranges are unlikely to be significantly impacted by this part of the development. The species further discussed in this section were identified by applying an extra layer of filtering to only select species that have restricted ranges or localised core habitat requirements. Undertaking this extra step in the likelihood of occurrence assessment avoids the need to discuss a large number of species that have an inherently low likelihood of being significantly impacted upon by linear project activities.

A total of 72 species were considered in the desktop 'likelihood of occurrence' assessment. Table 5-13 presents the threatened species considered to have a moderate or high likelihood of being present in the OHTL preferred route at Adelaide River, and then assesses whether they have restricted ranges or localised core habitat requirements. Those that do were subject to a significant impact assessment in this SEIS, and so are further discussed.

The results are summarised as follows:

Eight species were assessed as having a high likelihood of occurrence within the OHTL preferred route at Adelaide River. Of these, three species – Red Goshawk, *Helicteres macrothrix* and *Stylidium ensatum* – have restricted or core habitat requirements.

Thirteen species were assessed to have a moderate likelihood of occurrence within the OHTL preferred route at Adelaide River. Of these, three species – Ghost Bat, Gouldian Finch, and *Goodenia quadrifida* – have restricted or core habitat requirements.

Potential impacts to the six restricted-range species discussed below are assessed in the SEIS.

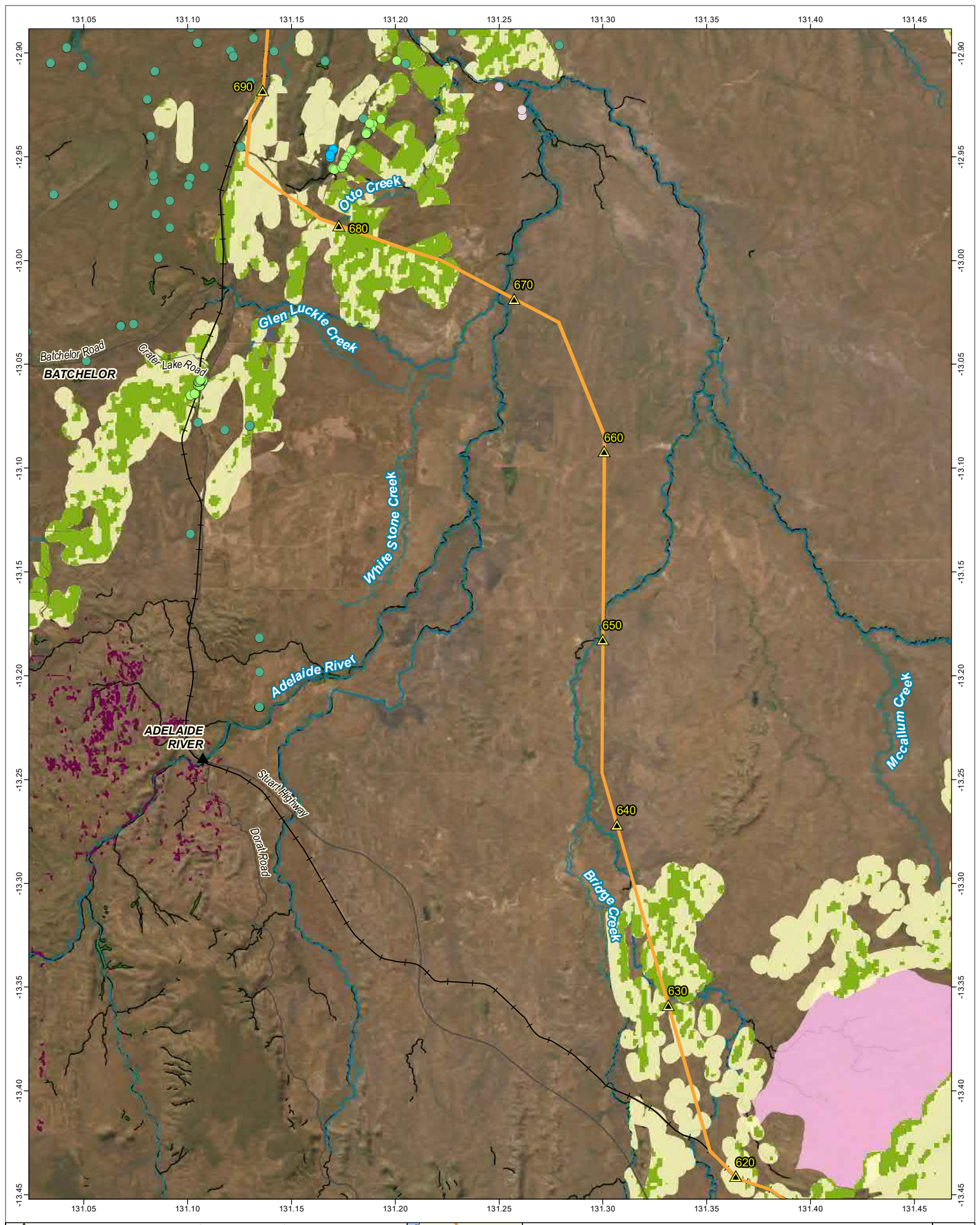
Table 5-13: Summary of threatened species likelihood of occurrence assessment for the OHTL preferred route at Adelaide River

Likelihood	Species	Class	Status		Habitat type	Core / Habitat Restrictions	Impact assessment in this SEIS
			EPBC	TPWC			
HIGH	Black-footed Tree-rat (Kimberley and mainland NT subspecies) *(Mesembriomys gouldii gouldii)*	Mammal	EN	EN	Woodlands and open forests	-	Section 5.6.3.3
	Northern Brushtail Possum (*Trichosurus vulpecula arnhemensis*)		VU	NT	Variety of habitats, including coastal beaches, floodplains, grasslands, and woodlands	-	Section 5.6.3.10
	Red Goshawk (*Erythrotriorchis radiatus*)	Bird	VU	VU	Tall forests and woodlands, riparian areas	Nest in tallest trees within 1 km of water	Section 5.6.3.33
	Partridge Pigeon (eastern subspecies) (*Geophaps smithii smithii*)		VU	VU	Open forests and woodlands	-	Section 5.6.3.30
	Mertens' Water Monitor *(Varanus mertensi)*	Reptile	-	VU	Edges of watercourses, swamps and lagoons	-	Section 5.6.3.27
	Darwin Cycad (*Cycas armstrongii*)	Plant	-	VU	Woodland and forests	-	Section 5.6.3.21
	Helicteres macrothrix		EN	EN	Eucalypt woodland	Endemic to the NT from three known locations	Section 5.6.3.7.
	Stylidium ensatum		EN	EN	Poorly-drained grassy flats, Melaleuca woodlands	Restricted to swamp fringes	Section 5.6.3.12

Likelihood	Species	Class	Status		Habitat type	Core / Habitat Restrictions	Impact assessment in this SEIS
			EPBC	TPWC			
MODERATE	Ghost Bat (*Macroderma gigas*)	Mammal	VU	NT	Woodlands	Permanent roost sites	Section **Error! Reference source not found.**.
	Fawn Antechinus (*Antechinus bellus*)		VU	EN	Woodland and open forests	-	Section 5.6.3.5
	Northern Quoll (*Dasyurus hallucatus*)		EN	CR	Wide range of habitats, now restricted to rocky upland areas	-	Section 5.6.3.11
	Nabarlek (Top End subspecies) (*Petrogale concinna canescens*)		EN	EN	Rocky areas	-	Section 5.6.3.8
	Bare-rumped Sheath-tailed Bat (*Saccolaimus saccolaimus nudicluniatus*)		VU	NT	Eucalypt forests and woodlands, *Pandanus* fringing woodlands	-	Section 5.6.3.18
	Gouldian Finch (*Chloebia gouldiae*)		EN	VU	Wooded hills and lowland drainages	Restricted nesting habitat	Section 5.6.3.6
	Crested Shrike-tit (northern subspecies) (*Falcunculus frontatus whitei*)		VU	NT	Eucalyptus and melaleuca woodlands	-	Section 5.6.3.20
	Masked Owl (northern mainland subspecies)	Bird	VU	VU	Eucalypt forests and woodlands	-	Section 5.6.3.26

Likelihood	Species	Class	Status		Habitat type	Core / Habitat Restrictions	Impact assessment in this SEIS
			EPBC	TPWC			
	(*Tyto novaehollandiae kimberli*)						
	Plains Death Adder (*Acanthophis hawkei*)	Reptile	VU	VU	Cracking soil floodplains	-	Section 5.6.3.31
	Mitchell's Water Monitor *(Varanus mitchelli)*		-	VU	Riparian areas	-	Section 5.6.3.27
	Yellow-spotted Monitor *(Varanus panoptes)*		-	VU	Beaches, floodplains, grasslands, and woodlands	-	Section 5.6.3.38
	Northern River Shark *(Glyphis garricki)*	Fish	EN	EN	Rivers and estuaries	-	Aquatic fauna are considered in Chapter 7

CR = Critically Endangered; EN = Endangered; VU = Vulnerable, NT = Near Threatened



Kilometre Point (KP)
Towns
Railway
Roads
Major Drainage
AAPowerLink footprint
Rainforest

Threatened flora records
Cycas armstrongii
Goodenia quadrifida
Helicteres macrothrix
Typhonium praetermissum

Stylidium ensatum
High likelihood

Modelled habitat
Helicteres macrothrix
High likelihood
Moderate likelihood - 300m buffer

Source: Sun Cable, EcOz, NTG (NR Maps)

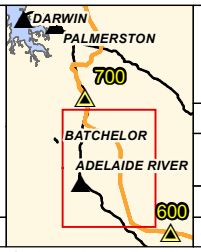


Figure 5-23. Map of threatened flora records and modelling relevant to the OHTL preferred route at Adelaide River

Project: Australia-Asia PowerLink

0 2 4 6 Kilometres

Scale: 1:250,000

Coordinate System: GDA2020

A4

Reference: M-Files ID 217502

Date: 18/11/2022

Revision: 2

SUN CABLE AUSTRALIA-ASIA PowerLink

Goodenia quadrifida is an endemic flora species that has been recorded at three sites in the NT. It is restricted to floodplains and grows on cracking clay soils on plains. The classification of *Goodenia quadrifida* as Vulnerable under the EPBC act is due to data deficiency on the species, including habitat and distribution. The closest record to the OHTL preferred route at Adelaide River is in the Marrakai Crossing area on the Adelaide River (Figure 5-23). This occurrence is approximately 8 km downstream from the OHTL crossing of the Adelaide River and the species could occur on Adelaide River floodplains.

5.4.4 OHTL preferred route at Katherine

The OHTL preferred route at Katherine is within the Daly Basin bioregion which is characterised by gently undulating plains and scattered low plateau remnants, with loamy and sandy red earths on sandstones, siltstones, and limestones (Figure 5-25). The dominant vegetation is *Eucalyptus tetrodonta* and *Eucalyptus miniata* open forest with perennial and annual grassy understories. This is verified by NVIS vegetation mapping which shows intersection with two native vegetation communities – Tropical Eucalypt Woodlands/Grasslands and Eucalypt Open Forests – and cleared, non-native vegetation areas.

Desktop assessment of the OHTL preferred route at Katherine identified ecological values and constraints likely to occur within the project area. Values identified in the desktop assessment are detailed in this section and summarised in Table 5-14. Field surveys have not been conducted for this area due to ongoing land access and tenure negotiations. As a result, the assessment has been based on desktop resources and local knowledge which will be validated in the field through the Constraints Planning and Field Development Procedure (Appendix 4.1).

Table 5-14: Summary of terrestrial ecosystem values relevant to the OHTL preferred route at Katherine

Value	OHTL preferred route at Katherine
Parks and reserves	-
SOCS/SOBS	-
Natural land features	✓
Watercourses	✓
Springs	-
Riparian vegetation	✓
Rainforest	✓
Wetlands	-
Large hollow-bearing trees	✓
Threatened Ecological Communities	-
Threatened fauna records	✓
Threatened fauna habitat	✓

5.4.4.1 Habitat

Land unit mapping is not available for the OHTL preferred route at Katherine. Land systems within the OHTL preferred route at Katherine are described at 1:250,000 by Speck et al. (1965). Land systems intersected by the OHTL preferred route at Katherine are shown in Figure 5-25 and summarised in Table 5-15. The OHTL preferred route at Katherine is within the limestone plains and rises surrounding the Katherine River alluvial flood plains.

The OHTL preferred route at Katherine crosses an unnamed second order (Figure 5-26).

Sinkholes

Sinkholes are common within the Katherine region and the OHTL preferred route at Katherine intersects one known sinkhole between KP 461 and 462 (Figure 5-26).

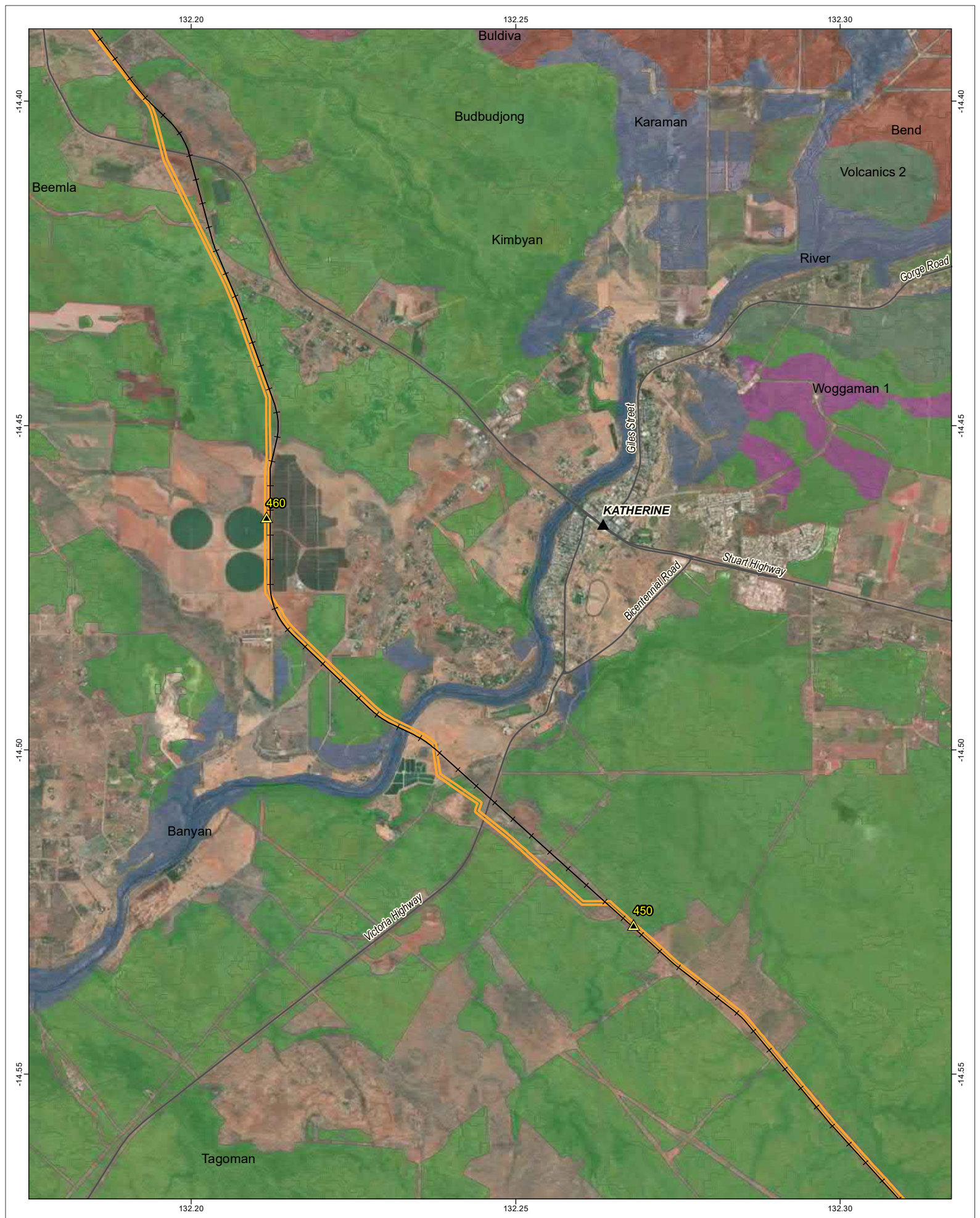
Rocky outcrops

The northern section of the OHTL preferred route at Katherine intersects an area of rocky outcrops from KP 462 to 464 (Figure 5-26). The values within these areas are unable to be determined through desktop analysis; however, they could provide habitat for species with preference for this landscape feature – e.g., Northern Quolls, possums, rock wallabies or bats.

Table 5-15: Table of land systems relevant to the OHTL preferred route at Katherine

Land system	Landform	Soil	Vegetation
Limestone plains and rises			
Budbudjong	Undulating limestone terrain, scattered outcrop hills up to 40 ft high with intervening lower slopes and very shallow depressions.	Loamy red earths mixed with outcrop.	Savanna woodland and grassland. Tropical tall grass country.
Kimbyan	Mainly stony plains and moderately extensive soil-covered plains. Erosional plains with outcrop in the lower parts, and less extensive soil-covered plains in the upper sectors with little outcrop; scattered water sinks and shallow depressions; sparse to moderately dense pattern of rectangular or branching drainage, unchanneled in the upper sector; relief mainly less than 10 ft.	Loamy red earths with limestone outcrops.	Mixed open forest, savanna woodland. Tropical tall grass country.
Tagoman	Undulating terrain, sandy crests and gentle upper slopes with extensive lower slopes forming gently undulating terrain with scattered shallow depressions and relief up to 10 ft.	Shallow soils. Loamy red earths mixed with outcrop.	Savanna woodland. Tropical tall grass country.

Figure 5-24: Aerial imagery showing rocky outcrops in the northern section of the OHTL preferred route at Katherine.



Kilometre Point (KP)
Towns
Railway
Roads
AAPowerLink footprint

Land System Class
(Land system boundaries and labels shown)

- Alluvial floodplains
- Basalt plains and rises
- Lateritic plains
- Limestone plains and rises
- Rugged quartz sandstone plateaux and hills
- Sandstone plains and rises
- Cleared, non-native vegetation, buildings

Source: Sun Cable, EcOz, NTG (NR Maps)

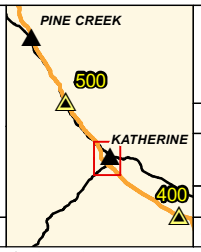


Figure 5-25. Map of land systems relevant to the OHTL preferred route at Katherine

Project: Australia-Asia PowerLink

N

0 1 2 Kilometres

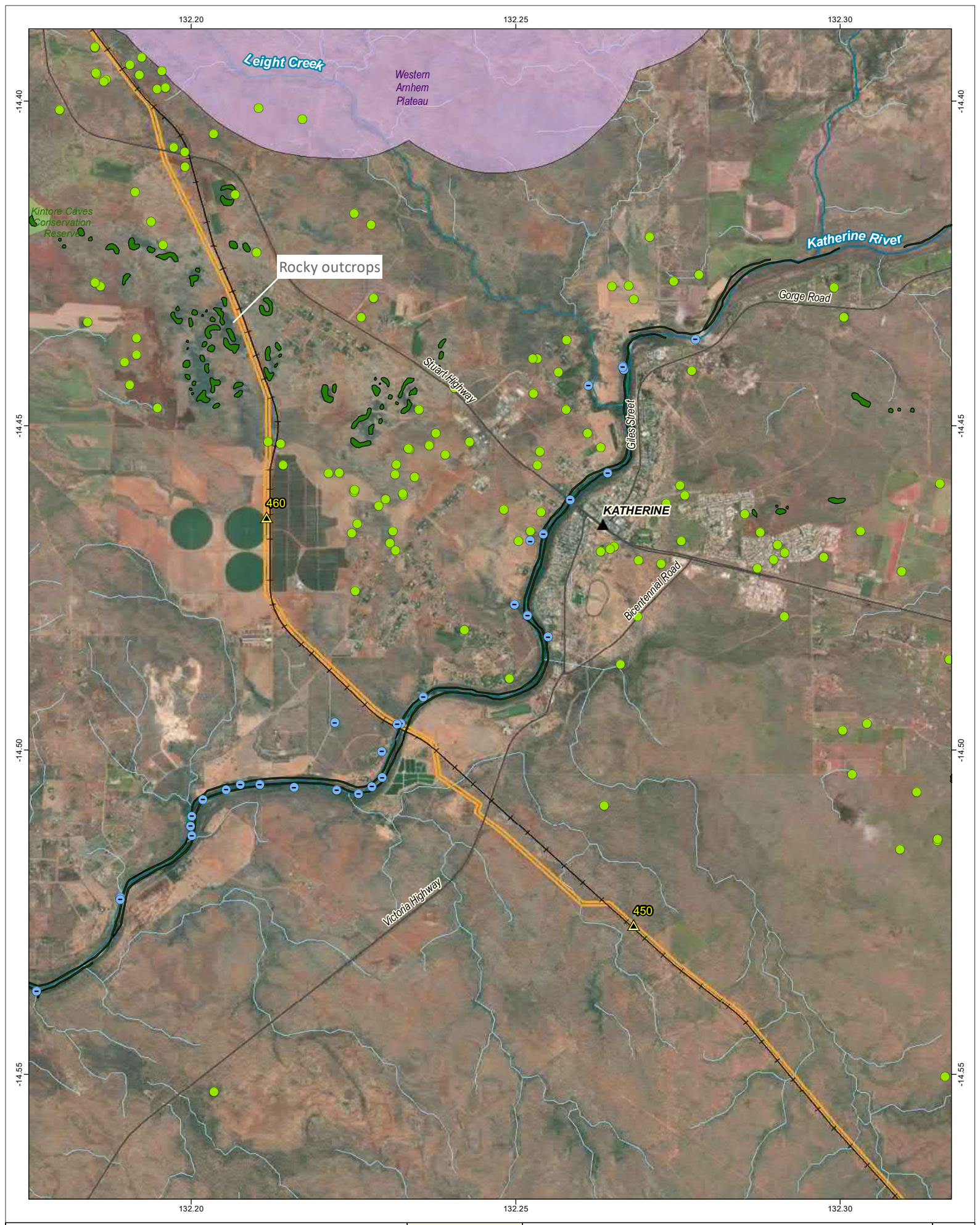
Reference: M-Files ID 217502

Date: 18/11/2022 | Revision: 2

Scale: 1:80,000

Coordinate System: GDA2020 | A4

SUN CABLE AUSTRALIA-ASIA PowerLink



- Kilometre Point (KP)
- Towns
- Sinkhole
- Springs
- Railway
- Roads
- Major Drainage
- Minor Drainage
- Streams

- AAPowerLink footprint
- Rainforest
- Parks and Reserves
- Sites of Conservation Significance

Source: Sun Cable, EcOz, NTG (NR Maps)

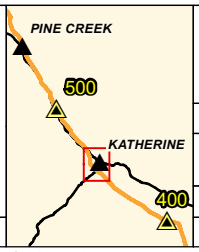


Figure 5-26. Map of ecological values relevant to the OHTL preferred route at Katherine.

Project: Australia-Asia PowerLink

0 1 2 Kilometres

Scale: 1:80,000

Coordinate System: GDA2020

A4

Reference: M-Files ID 217502

Date: 18/11/2022

Revision: 2

SUN CABLE AUSTRALIA-ASIA PowerLink

5.4.4.2 Significant vegetation

The following significant vegetation types occur within the OHTL preferred route at Katherine (Figure 5-26):

Riparian vegetation

Large hollow-bearing trees (as discussed in Section 5.4)

Rainforest.

Riparian vegetation

As described in Section 5.4.4.1, the OHTL Corridor at Katherine intersects with one minor watercourse supporting a small extent of riparian vegetation and the Katherine River (major watercourse) which has a dense coverage of riparian vegetation on the levee banks. As detailed in Appendix 5.5 Memorandum: Riparian Vegetation Assessment, riparian vegetation in the OHTL Corridor at the two watercourse crossing totals approximately 2.11 ha, of which only a small proportion is likely to be in the direct disturbance footprint. Riparian vegetation surrounding the crossing locations is extensive along the watercourse levee banks. Verification of the presence and quality of riparian vegetation is required and will be carried out as part of the Constraints Planning and Field Development Procedure (Appendix 4.1) to assist with micro-siting infrastructure. Verification of the presence and quality of riparian vegetation is required and will be carried out as part of the Constraints Planning and Field Development Procedure (Appendix 4.1) to assist with micro-siting infrastructure.

Rainforest

The OHTL preferred route at Katherine runs through an area proximate to numerous mapped patches of dry rainforest, located between KP 462 and 465 (Figure 5-26). The aerial imagery and the spatial dataset are inconsistent when overlapped in this area and ground truthing to verify presence and extent is required. This would be executed as part of a pre-construction processes detailed in Appendix 4.1 Constraints Planning and Field Development Procedure.

5.4.4.3 Land condition

Weed records within 1 km of the OHTL preferred route at Katherine were analysed and found 31 species from 987 individual records. Of these species there are 4 WONS, 18 declared species and 14 species listed for priority control in the *Katherine Regional Weeds Strategy 2021-2026*. The most frequent records are Neem *(Azadirachta indica),* followed by Chinee Apple *(Ziziphus mauritiana)*.

In the past 10 years, most areas within the OHTL preferred route at Katherine had a low fire frequency – 0 to 3 years burnt – with the areas that did burn predominantly in the early dry season. This timing and small area affected by fire is likely due to the proximity to the Katherine township, and the pastoral and agricultural land uses within the area.

5.4.4.4 Threatened species

Significant and threatened species relevant to this component are identified in this section and assessed in detail in Section 5.6 of this Chapter. No targeted threatened species surveys have been undertaken within this project area. The procedure for assessment of threatened species is described in Section 2.3 of the Supplementary Ecology Report - Part 1 - Threatened Species (Appendix 5.1).

The OHTL preferred route at Katherine will be in the form of a linear corridor 15 km long. Due to the length, the OHTL preferred route at Katherine potentially impacts a number of different threatened species. As already stated, the physical disturbance footprint of a corridor is, by design, narrow and localised. Therefore, threatened species with general habitat requirements and/or wide ranges are unlikely to be significantly impacted by this part of the development. The species further discussed in this section were identified by applying an extra layer of filtering to only select species that have restricted ranges or localised core habitat requirements. Undertaking this extra step in the likelihood of occurrence assessment avoids the need to discuss a large number of species that have an inherently low likelihood of being significantly impacted upon by linear project activities.

Table 5-16 presents all threatened species considered to have a moderate or high likelihood of being present in the OHTL preferred route at Katherine, and then assesses whether they have restricted ranges or localised core habitat requirements. Those that do have been subject to a significant impact assessment in this SEIS.

A total of 32 threatened species were considered in the desktop 'likelihood of occurrence' assessment. The results from the desktop assessment are presented in Table 5-16, and summarised as follows:

Five species were assessed to have a high likelihood of occurrence within the OHTL preferred route at Katherine. None of these have restricted or core habitat requirements.

Three species with restricted or core habitat requirements were assessed as having a moderate likelihood of occurrence within the OHTL preferred route at Katherine:

- Ghost Bat. The natural features – rocky outcrops and sinkholes – within the OHTL preferred route at Katherine potentially contain suitable roost habitat for the Ghost Bat which could be significant to the breeding success of the species.
- Red Goshawk. The presence of riparian vegetation, forest and woodlands habitats traversed by the OHTL preferred route at Katherine, indicate there is a moderate likelihood that this species could occur.
- Victoria River Land Snail (*Trachiopsis victoriana*) which is highly restricted in range to limestone sinkholes within the Katherine region. Rocky outcrops and sinkholes within the OHTL preferred route at Katherine potentially contain suitable habitat for this species.

Table 5-16: Summary of threatened species likelihood of occurrence assessment for the OHTL preferred route at Katherine

Likelihood	Species	Class	Status		Habitat Type	Habitat Restrictions	Impact Assessment within this SEIS
			EPBC	TPWC			
HIGH	Black-footed Tree-rat (Kimberley and mainland NT subspecies) (*Mesembriomys gouldii gouldii*)	Mammal	EN	EN	Woodlands and open forests	-	Section 5.6.3.3
	Northern Brushtail Possum (*Trichosurus vulpecula arnhemensis*)	Mammal	VU	NT	Variety of habitats, including coastal beaches, floodplains, grasslands, and woodlands	-	Section 5.6.3.28
	Partridge Pigeon (eastern subspecies) (*Geophaps smithii smithii*)	Bird	VU	VU	Open forests and woodlands	-	Section 5.6.3.30
	Yellow-spotted Monitor *(Varanus panoptes)*	Reptile	-	VU	Variety of habitats, including coastal beaches, floodplains, grasslands, and woodlands	-	Section 5.6.3.38
MODERATE	Red Goshawk (*Erythrotriorchis radiatus*)	Bird	VU	VU	Tall forests and woodlands, riparian areas	Nest within 1 km of water	Section 5.6.3.33
	Ghost Bat (*Macroderma gigas*)	Mammal	VU	NT	Woodlands	Permanent roost sites (cave and adits)	Section 5.6.3.22

Likelihood	Species	Class	Status		Habitat Type	Habitat Restrictions	Impact Assessment within this SEIS
			EPBC	TPWC			
	Victoria River Land Snail *(Trachiopsis victoriana)*	Invertebrate	-	VU	Limestone sinkholes		N/A

EN = Endangered; VU = Vulnerable, NT = Near Threatened

5.5 Potential Impact

The potential impacts to terrestrial ecosystems associated with the project refinements since the Draft EIS have been assessed using the EIA methodology described in Chapter 3 of the Draft EIS. The outcomes of the EIA are summarised in Table 5-61 and Table 5-62 and are discussed in the subsequent sections.

The EIA identified and assessed the following potential impacts that could occur during construction:

Loss of vegetation and habitat due to land clearing

Loss or deterioration of significant vegetation by land clearing

Degradation of flora and vegetation in surrounding areas by dust deposition

Introduction and spread of weeds

Changes in fire regimes

Direct fauna mortality by collision with construction vehicles

Habitat degradation and fragmentation

Changes to fauna behaviour due to noise, light, and waste management.

The EIA identified and assessed the following potential impacts that could occur during operations:

Introduction and spread of weeds

Direct fauna mortality caused by the perceived ‘lake effect’ of solar fields

Direct fauna mortality (bird strike) caused by collision with OHTL and HVDC Electrode Line

Degradation of flora and vegetation caused by Electrode operation

Changes to fauna behaviour due to noise and light.

Significant impacts to threatened species were assessed using the methods prescribed in the EPBC Significant Impact Guidelines 1.1 produced by the Cwth Government (DEWHA 2013). These impacts are discussed separately in Section 5.6.

Furthermore, in fulfilling threatened species survey commitments outlined in the Draft EIS as well as responding to submissions to the Draft EIS, several threatened species surveys were undertaken to inform the SEIS. These are detailed in the Supplementary Ecology Report - Part 1 - Threatened Species (Appendix 5.1) and summarised in Section 5.6.2.

5.5.1 Proposal Footprint (direct disturbance)

The area within which flora and fauna will be directly disturbed includes the extent of land that will be cleared to construct the Project’s refinements. The direct disturbance footprint for each component is outlined in Chapter 2 – Project Refinement.

5.5.2 Area of Influence (indirect disturbance)

Project activities can also indirectly disturb or affect flora and fauna in surrounding areas. Noise, dust, and light impacts could occur adjacent to the proposal footprint, although these would rapidly attenuate with distance. Habitat fragmentation, weed infestation and proliferation, and altered fire regimes could all impact the areas surrounding the project footprint.

This broader ‘area of influence’ within which indirect disturbances could occur includes riparian areas and watercourses downstream of the proposal footprint, since changes to surface water flows and/or quality has the potential to impact on the health of terrestrial habitats (noting that aquatic ecosystems

are assessed in Chapter 8). Again, these impacts will diminish with distance from the proposal footprint.

In response to the DEPWS Flora and Fauna Division Draft EIS submission (refer Section 5.12.2.3) and the NT EPA Direction – Comment 19 (refer Section 5.13.6), further assessment of potential impact to Lake Woods in the context of waterbird movement to and from the lake over the solar array has been undertaken in Section 5.5.4.2.

5.5.3 Construction

5.5.3.1 Loss of vegetation and habitat due to land clearing

AI and Powell Creek Electrode

As detailed in Chapter 2 Project Refinement, the AI is composed of several footprints which require clearing, totalling 134 ha of land. Table 2-3 in Chapter 2 provides a detailed breakdown of the AI footprints. Development of the Powell Creek Electrode requires clearing 24 ha of land, inclusive of 2 ha for the Electrode and 10 ha for the HVDC Electrode Line Corridor. An Access Track will be sited within a 30 m wide corridor (HVDC Electrode Line Corridor), with an estimated 10 m wide disturbance footprint.

Clearing of the AI footprints (134 ha) will increase total clearing for both the Wycliffe and Ashburton Range sub-bioregions by approximately 0.005%. The Powell Creek Electrode occurs within Sturt Plateau – Renehan sub-bioregion. Clearing the Powell Creek Electrode footprint (24 ha) will increase total clearing in the subregion by approximately 0.001%.

As discussed in Section 5.4.2.1, the AI and Powell Creek Electrode footprints intersects three mapped land systems (Figure 5-5 and Table 5-3); the Desert sandplains – Redsan in the west, Alluvial floodplains – Gosse in the central footprints and Sandstone Hills – Ashburton in the east.

In addition, a Decommissioning and Rehabilitation Plan for the Solar Precinct footprint will be developed as described in Section 12 Chapter 2 Proposal Description of the Draft EIS. The objective of rehabilitation post-operations is to return the site to pre-existing pastoral use and land condition.

The clearing footprints are not within any reserves or SOCS, which protect areas of land recognised as being important for regional biodiversity conservation.

The area proposed to be cleared for the AI and Powell Creek Electrode comprises a very small percentage of the small portion of the available habitat associated with the sub-bioregions and land systems located within the AI and Powell Creek Electrode footprints.

The Central Pebble Mound Mouse (*Pseudomys johnsonii*) is not listed threatened under the *TPWC Act*, or the *EPBC Act*. Central Pebble Mound Mouse (*Pseudomys johnsonii*) habitat was incidentally observed during aerial surveys of access tracks and AI proposed to be located in the Ashburton Range within Powell Creek Station (refer Appendix 5.1). Mounds were detected within the Borrow Pit 1, Gravel Access Road (at two locations), Main Access Road (at two locations). The species may also be present in the proposed Temporary Construction Accommodation Village situated on the lateritic plateau, and other areas of suitable habitat on the proposed access roads/tracks within the Ashburton Range. It is likely that the species is common within the surrounding range system. Impacts to the Central Pebble Mound Mouse ranked as high constraint and addressed through the implementation of the Constraints Planning and Field Development Procedure (Appendix 4.1). Significant impacts to this species and its habitat are not expected.

Threatened species listed under the *EPBC Act* are known to occur within the AI and Powell Creek Electrode footprints. Significant impact assessments have been undertaken for the following threatened species, which includes assessment of impacts to habitat:

Greater Bilby (assessed in Section 5.6.3.23)

Yellow-spotted (Floodplain) Monitor (*Varanus panoptes*) (assessed in Section 5.6.3.38).

DCS Electrode

Development of the DCS Electrode requires clearing 24 ha of land, inclusive of 2 ha for the Electrode and 10 ha for the HCDC Electrode Line Corridor. An Access Track will be sited within a 30 m wide corridor (HVDC Electrode Line Corridor), with an estimated 10 m wide disturbance footprint.

As discussed in Section 5.4.3.1, field surveys identified 12 land units that intersect the DCS Electrode and HVDC Electrode Line Corridor (Table 5-7). The dominant land units present were plains with Eucalypt woodlands (8a and 8b land units) and side slopes with Eucalypt open woodland (land unit 2b1) (Figure 5-7 to Figure 5-12).

Drainage systems were also present as a minor component. One land unit identified as 'monsoonal' at the DCS Electrode contained large *Eucalyptus tetrodonta*, *Alstonia actinophylla* and *Corymbia polycarpa* trees in the upper stratum, with a moderately dense mid-stratum of mixed monsoon species including *Choriceras tricorne*, *Miliusa brahei* and *Acacia auriculiformis*. Soils appeared to be a mix of hydrosol and kandosol and were non-gravelly. The 'transitional' land unit immediately adjacent to this showed signs of transition from the more dominant Eucalypt woodlands observed along the HVDC Electrode Line Corridor, with the continuation of *Choriceras tricorne* as a dominant species in the mid-stratum.

The clearing of land for the DCS Electrode will result in a loss of vegetation and habitat; however, as the HVDC Electrode Line Corridor is narrow and comprises the majority of the DCS Electrode footprint, the proportion of habitats that will be impacted in any given area is very small.

The DCS Electrode will follow existing access tracks which reduces the amount of clearing that may have otherwise been required. Consequently, with the implementation of the Constraints Planning and Field Development Procedure (Appendix 4.1), proper planning and design, land clearing within the proposal footprint is unlikely to have a significant impact on significant vegetation.

Threatened species are known to occur within the DCS Electrode footprint. Significant impact assessments have been undertaken for the following threatened species, which includes assessment of impacts to habitat:

- Darwin Cycad (assessed in Section 5.6.3.21)
- *Typhonium praetermissum* (assessed in Section 5.6.3.34)
- *Stylidium ensatum* (assessed in Section 5.6.3.12).

OHTL Preferred Route at Katherine and Adelaide River

Construction of the OHTL Preferred Route at Katherine and Adelaide River requires vegetation clearing consistent with the rest of the OHTL Corridor.

The clearing of land for the OHTL Corridor at these locations will result in a loss of vegetation and habitat with a total disturbance footprint for construction of approximately 230 ha across a majority of Eucalypt tall open forest habitat that is widespread across the region, and small patches of riparian habitat. H As the OHTL Corridor footprint is narrow, the proportion of habitats that will be impacted in any given area is very small. The nature of the OHTL Corridor is largely brownfield and disturbance will be limited in width (due to its narrow arrangement), localised and there is some flexibility as to where OHTL Structures occur. There are also sections of OHTL Corridor that are previously disturbed from pastoral and railway land use.

At Katherine, riparian vegetation in the OHTL Corridor at the two watercourse crossing totals approximately 2.11 ha (See Appendix 5.5 for further details). Applying the EIS avoidance commitments of siting OHTL structures away from watercourses and spanning major watercourses, the loss of riparian habitat is confined to the minor watercourse with approximately 0.37 ha in the direct disturbance footprint. This is representative of 9 % of the riparian vegetation in a 250 m buffer of the crossing and will be majority reinstated to retain only a 6 m wide track for operations.

Similarly at the preferred route at Adelaide River, estimated extent of riparian vegetation in the direct disturbance footprint for construction with EIS avoidance commitments applied is approximately 2.88 ha and is likely to be confined to minor watercourse crossings. Reinstatement post-construction will restore the majority of the habitat. Ongoing management of habitats will be in accordance the Appendix 5.4 OHTL Vegetation Management Framework.

The implementation of the Constraints Planning and Field Development Procedure (Appendix 4.1) would avoid or minimise significant impacts to sensitive/significant vegetation and habitat. This would include avoidance or minimisation of disturbance through prudent placement of OHTL structures to allow spanning over significant habitats without direct impact.

Where variable railway corridor widths are encountered, construction and operational requirements for the OHTL Corridor will be optimized and will consider the Constraints Planning and Field Development Procedure (Appendix 4.1).

Post-construction, the land will be reinstated, and managed in accordance with the OHTL Vegetation Management Framework (Appendix 5.4). Weeds will be managed as outlined in the Weed Management Plan (Appendix 5.3). Consequently, with proper planning and design, land clearing within the proposal footprint is unlikely to have a significant impact on most, if not all, terrestrial ecosystem values.

Threatened species are known to occur within the OHTL Preferred Route at Adelaide River and Katherine footprint. Significant impact assessments have been undertaken for the following threatened species, which includes assessment of impacts to habitat:

- Ghost Bat (assessed in Section 5.12.1.13)
- Gouldian Finch (assessed in Section 5.12.1.5)
- Red Goshawk (assessed in Section 5.6.3.33)
- *Helicteres macrothrix* (assessed in Section 5.6.3.7)
- *Stylidium ensatum* (assessed in Section 5.6.3.12).

5.5.3.2 Loss or deterioration of significant vegetation by land clearing

AI and Powell Creek Electrode

No significant vegetation has been identified at the Powell Creek Electrode. The only significant vegetation observed at the AI was comprised of riparian vegetation proximate to water crossings of the proposed Access Roads. This riparian vegetation was confined to isolated River Red Gums (*Eucalyptus camaldulensis)* which the existing station tracks have navigated around. The drainages and small creeks within the AI and Powell Creek Electrode footprint area may support small episodic pools during the wet season; however, none contained water at the time of survey.

Where possible, the placement of the Access Roads will actively avoid large trees at water crossings so that their removal can be avoided where possible. Should removal of trees be unavoidable, disturbance would be minimised as much as possible. Therefore, significant impacts to significant vegetation are not expected at AI and Powell Creek Electrode.

Threatened species are known to occur within the AI and Powell Creek Electrode footprints. Significant impact assessments have been undertaken for the following threatened species, which includes assessment of impacts to significant vegetation habitat:

Grey Falcon (*Falco hypoleucos*) (assessed in Section 5.6.3.24).

DCS Electrode

Rainforest mapping indicates the presence of wet riparian and spring rainforest along Leaders Creek at the intersection of the HVDC Electrode Line Corridor. This area was ground-truthed during the field survey and while riparian species were detected, monsoon forest species were not present.

The dominant vegetation communities across Gunn Point peninsula – Eucalypt forests, woodland, and riparian vegetation – have high potential for hollow-bearing trees.

The clearing of land for the DCS Electrode will result in a loss of vegetation and habitat; however, as the HVDC Electrode Line Corridor is narrow and comprises the majority of the DCS Electrode footprint, the proportion of habitats that will be impacted in any given area is very small. The DCS Electrode will also follow existing access tracks which reduces the amount of clearing that may have otherwise been required. Consequently, with the implementation of the Constraints Planning and Field Development Procedure (Appendix 4.1), proper planning and design, land clearing within the proposal footprint is unlikely to have a significant impact on significant vegetation.

Threatened species are known to occur within the DCS footprints and utilise certain types of significant vegetation. Significant impact assessments have been undertaken for the following threatened species, which includes assessment of impacts to significant vegetation habitat:

Masked Owl (assessed in Section 5.6.3.26).

OHTL Preferred Route at Katherine and Adelaide River

The footprints of the OHTL preferred route at Katherine and Adelaide River contain potential significant vegetation types, including riparian vegetation, rainforest, flood plains and large hollow bearing trees (refer to Sections 5.4.4.2 and 5.4.3.7).

Disturbance of significant vegetation types that occur in discrete patches – such as riparian vegetation, rainforest and sandsheet heath, can largely be avoided or minimised through prudent placement of OHTL structures to allow the OHTL Corridor to span over these habitats without direct impact. This will be achieved by verifying the presence and quality of significant vegetation, carried out as part of the Constraints Planning and Field Development Procedure (Appendix 4.1).

Threatened species are known to occur within the OHTL Preferred Route at Katherine and Adelaide River, which utilise certain types of significant vegetation (refer to Section 5.4.3.7 and 5.4.4.2 respectively). Significant impact assessments have been undertaken for relevant threatened species, which includes assessment of impacts to significant vegetation habitat (refer to Sections 5.6.3 and 5.6.3.15).

5.5.3.3 Degradation of flora and vegetation in surrounding areas by dust deposition

Construction activities undertaken within the Project's footprint have the potential to have indirect impacts on adjacent flora and vegetation (i.e., within the Project's area of influence) associated with dust emissions.

Construction methods for the project refinement areas are not considered to be materially different from what was assessed within the Draft EIS. Vegetation within and adjacent to the project refinement footprints will be exposed to higher levels of dust fall over the construction phase,

depending on the prevailing wind direction and windspeed. However, long-term effects on growth and productivity are unlikely due to the relatively short duration of impact. It is considered that the potential impacts on vegetation from dust deposition is consistent with the findings of the Draft EIS, therefore no further assessment has been undertaken.

5.5.3.4 Introduction and spread of weeds

Existing weed species have been outlined above in Section 5.4 for each of the project refinement footprint areas. There is a risk that construction activities introduce new weeds into the landscape and/or cause a proliferation in existing weeds. Clearing of native vegetation has the potential to increase the risk of weed spread because the open, disturbed ground is readily colonised and dominated by fast-growing, generalist weed species. Movement of personnel and vehicles throughout and between project areas also has the potential to increase the likelihood of weed species being introduced into areas previously not recorded.

Proliferation of weed species has the potential to lead to displacement of native vegetation, a reduction in habitat quality, reduction in food sources for fauna, and increased frequency and intensity of bushfires. The latter can also negatively impact upon the pastoral productivity of the land, as well as other land uses. Furthermore, as discussed in Chapter 5 of the Draft EIS, linear developments are notorious for spreading weeds, although weed management is undertaken by the current operator of the railway corridor.

A revised Weed Management Plan (Appendix 5.3) has been developed for the SEIS to incorporate feedback from the Draft EIS submissions and NT EPA Direction (refer Section 5.12 and 5.13), in accordance with the requirements of the *Weeds Management Act 2001* (NT) and relevant statutory weed management plans. The updated Weed Management Plan (Appendix 5.3) for the Project provides further information on:

Weed management within the project refinement areas

KTP including the five grasses Gamba Grass (Andropogon gayanus), Para Grass (Urochloa mutica), Olive Hymenachne (Hymenachne amplexicaulis), Perennial Mission Grass (Pennisetum polystachion) and Annual Mission Grass (Pennisetum pedicellatum)

Environmental weeds of concern to stakeholders or infrastructure (e.g., Buffel Grass)

Local weed management objectives, including priority management of Buffel Grass in and around Lake Woods.

Assuming effective implementation of the revised Weed Management Plan (Appendix 5.3), the likelihood and severity of the introduction and spread of weeds during construction of all project refinements are considered similar to the Project's components previously assessed in the Draft EIS.

Significant impacts from weeds are expected to be avoided and mitigated with the implementation of the Weed Management Plan (Appendix 5.3). Measures to contain and prevent the spread of weeds during the construction phase include preventative actions to ensure appropriate hygiene and weed inspections of vehicles and machinery, education of personnel on weed identification, identification of weed management zones, active management protocols for known infestations (e.g., quarantine zones, hygiene stations, spraying, mowing pre-flower, bagging) and ongoing mapping and monitoring of weed locations and effectiveness of weed control activities.

5.5.3.5 Changes in fire regimes

Construction works – particularly welding – could generate sparks and cause bushfires. Bushfire has the potential to cause direct mortality to fauna, displacement of fauna, and/or reduction in habitat quality.

Existing baseline fire conditions are outlined for project refinement areas in Section 5.4 above. Construction methods for project refinement components are not considered to be materially different from what was assessed within the Draft EIS. A refined Weed Management Plan (Appendix 5.3) has been prepared, which will complement the management framework in Chapter 17 Environmental Management. The project refinements will not change the existing fire regime. It is considered that the potential impacts from changes in fire regimes are consistent with the findings of the Draft EIS, therefore no further assessment has been undertaken.

5.5.3.6 Direct fauna mortality by collision with construction vehicles

The AI was previously assessed within the Draft EIS as part of the EIA for the Solar Precinct. As mentioned in Chapter 2, the AI is now located outside of the Solar Precinct. The Access Road locations have not materially changed since the draft EIS, therefore higher incidences of fauna are not expected. Construction methods for the project refinements are not considered to be materially different from what was assessed within the Draft EIS. Furthermore, as discussed in Chapter 12 Landuse and Transport, the project refinements are not expected to generate any significant additional traffic. Therefore, the assessment undertaken in the Draft EIS are considered sufficient in addressing the impact of direct fauna mortality by collision with construction vehicles.

In response to the DEPWS Draft EIS submissions regarding this impact, significant impact assessments have been undertaken for the following threatened species which include consideration of fauna mortality by collision with construction vehicles:

Greater Bilby (assessed in Section 5.6.3.23)

Yellow-spotted (Floodplain) Monitor (*Varanus panoptes*) (assessed in Section 5.6.3.38).

5.5.3.7 Habitat degradation and fragmentation

Degradation in habitat quality adjacent to the proposal footprint could occur due to edge effects created by land clearing. An ‘edge effect’ occurs when intact vegetation is disturbed, resulting in the newly created edges between the intact and disturbed areas becoming lower quality habitat.

Significant impact assessments have been undertaken for threatened species, which considers the impacts of habitat degradation and fragmentation (refer to Sections 5.6.3 and 5.6.3.15).

AI and Powell Creek Electrode

The AI and Powell Creek Electrode are located in habitats which are largely open and sparsely vegetated habitats. Temporary components of the AI would be reinstated at the end of construction. Construction of the Access Road through riparian vegetation may create a localised edge effect that may reduce the quality of a small area of adjacent habitat. Where possible, the placement of the Access Roads will actively avoid large trees at water crossings so that their removal can be avoided where possible. Should removal of trees be unavoidable, disturbance would be minimised as much as possible. Therefore, it is assumed that the AI and Powell Creek Electrode footprints will not experience any significant or substantial edge effects, certainly not such that will impact at an ecosystem level.

Fencing is not proposed along the HVDC Transmission Line corridor meaning that there would be no physical barriers to fauna movement.

DCS Electrode

The construction of the DCS Electrode is not expected to result in additional fragmentation effects as it will utilise and follow existing access track corridors. Fencing is not proposed along the HVDC Transmission Line corridor meaning that there would be no physical barriers to fauna movement.

Construction of the OHTL through riparian vegetation and rainforest may create a localised edge effect that may reduce the quality of a small area of adjacent habitat.

OHTL Preferred Route at Katherine and Adelaide River

Constructing the OHTL preferred route at Katherine and Adelaide River – where it traverses undisturbed land – could cause habitat fragmentation. This would be most pronounced when land is cleared and will lessen once vegetation is allowed to re-grow post-construction. Construction of the OHTL Corridor through riparian vegetation may create a localised edge effect that may reduce the quality of a small area of adjacent habitat.

The OHTL Preferred Route at Katherine and Adelaide River will not be fenced and so there will be no physical barrier to movement of fauna. The long-term removal of trees and shrubs from a 6 m wide corridor retained for inspection and maintenance access during operations is not predicted to affect movement of any species that occur. Nevertheless, habitats that occur in small patches (such as rainforest and sandsheet heath) could be vulnerable to combined effects of fragmentation and weed invasion.

5.5.3.8 Changes to fauna behaviour due to noise, light, and waste management.

Lighting to facilitate night construction works may be required. Artificial lighting may attract some fauna species and deter others. To some degree, the presence of artificial lighting inevitably changes the behaviour of local wildlife.

Construction of the DCS Electrode and Powell Creek Electrode will occur for a short duration in any one spot – limiting the duration and likelihood of noise or lighting impacts.

Impacts of noise and lighting on fauna will likely be limited to a few hundred metres from the source, and hence any impacts of fauna behaviour will be no greater than for any other construction project.

Where possible and not precluded by other design criteria such as safety and security, the Proponent will undertake the works in accordance with the National Light Pollution Guidelines for Wildlife Including Marine Turtles, Seabirds and Migratory Shorebirds (DoEE, 2020).

Construction methodologies of the OHTL Corridor remain largely unchanged since the Draft EIS. Impacts to fauna behaviour from the construction of the OHTL Preferred Route at Katherine and Adelaide are considered consistent with the assessment outlined in Section 5.4.2.8 of the Draft EIS. Therefore, no further assessment has been undertaken.

Proposed management of waste has not changed since the Draft EIS and would be implemented in all Project refinement areas. No new waste streams are anticipated from construction of the project refinements. The findings of the Draft EIS are therefore considered sufficient to address the project refinements.

5.5.4 Operations

5.5.4.1 Introduction and spread of weeds

A revised Weed Management Plan (Appendix 5.3) has been developed for the SEIS to incorporate feedback from the Draft EIS submissions and NT EPA Direction (refer Section 5.12 and 5.13). Measures to contain and prevent the spread of weeds during the operational phase include preventative actions to ensure appropriate hygiene and weed inspections of vehicles and machinery, education of personnel on weed identification, active management protocols for known infestations (e.g., quarantine zones, hygiene stations, spraying), evaluation of species used in rehabilitation or erosion controls, and monitoring of locations and effectiveness of weed control activities.

Assuming effective implementation of the revised Weed Management Plan (Appendix 5.3), the likelihood and severity of the introduction and spread of weeds during construction of all project refinements are considered similar to the Project's components previously assessed in the Draft EIS. The EIA summary for the weed risk in construction – presented in Section 5.5.3.4 – is also applicable for operations, although because there will be far fewer vehicle movements and land disturbance during operations, the likelihood of weed introduction and/or proliferation is lower.

5.5.4.2 Direct fauna mortality caused by the perceived 'lake effect' of solar fields

The information presented in this Section is solely for the purpose of addressing the DEPWS Submission regarding the further information on impacts by the perceived 'lake effect' of solar fields (Section 5.12.2.13). This impact is not relevant for any of the Project Refinements outlined in Chapter 2.

As outlined in the Draft EIS, Lake Woods is one of the largest temporary freshwater lakes in the NT and tropical Australia, and generally occupies an area of approximately 350 to 500 km^2 after wet season rains (SWE&S, 2021). However, during periods of high rainfall, the lake can occupy up to 1 000 km^2, and can retain water for 12 consecutive months. The SOCS has international significance due to seasonal presence of large aggregations of waterbirds, and presence of important wetland habitat. Lake Woods SOCS has international significance due to seasonal presence of large aggregations of waterbirds, and presence of important wetland habitat (BirdLife International, 2021, Jaensch & Bellchambers, 1997). After significant rainfall events, Lake Woods can support very large numbers of waterbirds – including internationally-significant numbers of the Plumed Whistling-duck (>27 000 birds), nationally-significant numbers of Great Egret (>3 000 birds), and large numbers of Australian Pelican, Grey Teal, Intermediate Egret, Glossy Ibis and Freckled Duck. The SOCS has been surveyed sporadically, with the highest abundances were recorded by Jaensch in 1993 and 1994. Sixty-seven species of waterbirds have been recorded at Lake Woods – including the threatened Australian Painted Snipe – of which 23 species have been reported breeding (BirdLife International, 2021, Jaensch & Bellchambers, 1997) and 24 are migratory species. An ecologically-significant population of two migratory species (i.e., at least 0.1 per cent of the flyway population) – Little Curlew and Oriental Pratincole – have been recorded at Lake Woods by Jaensch (in 1993/94) who, at the time, also counted more than 2 000 migratory shorebirds in total. Lake Woods is also listed as a Key Biodiversity Area (KBA) (formerly Important Bird Area (IBA)) with both BirdLife Australia and BirdLife International. The IBA comprises the total area of Lake Woods when it is inundated to its maximum extent (close to 100 000 ha) and includes two near-permanent waterholes (Longreach and South Newcastle) on Newcastle Creek that become broadly contiguous with Lake Woods during major flood events (BirdLife International, 2021).

Australia hosts a substantial number of regular seasonal migratory bird species (almost 10% total bird species recorded in Australia), as well as other non-migratory waterbird species which undertake long-distance nomadic movements across the country in response to variations in habitat conditions – particularly rainfall and widespread flooding and inundation in arid and semi-arid zones. Both nomadic waterbird and migratory shorebird species are likely to overfly Lake Woods and the Solar Precinct on a routine and predictable basis, especially migratory shorebirds during northward and potentially southward migration. The Birdlife Australia Birdata database provides a list of waterbird and shorebird species that are likely to be passing through the region during migration periods. Oriental Plover, Little Curlew, Black-tailed Godwit, Sharp-tailed Sandpiper, Swinhoe's Snipe, Common Sandpiper, Common Greenshank, Wood Sandpiper, Marsh Sandpiper, Australian Pratincole and Oriental Pratincole have all been recorded in the region previously and would be expected to utilise suitable wetland habitat at Lake Woods when available. Satellite and geotracker telemetry data from species which have been studied using such technology, such as Grey Plover, Bar-tailed Godwit, Ruddy Turnstone, Little Curlew, Eastern Curlew, Red Knot, Great Knot, Oriental Pratincole and Whimbrel will demonstrate that most of these species pass through (or over) central Australian regions on route to their breeding grounds in the northern hemisphere. Such studies identify that despite the Solar Precinct's geographic location and surrounding habitat types, it is

indeed within the broader East-Asian Australasian Flyway (EAAF) and likely to be seasonally traversed by a suite of waterbird and migratory shorebird species.

When undertaking long-distance migration flights, migratory shorebirds, and long-distance nomadic waterbirds, will fly at altitudes which both take advantage of prevailing wind conditions and provide thermal regulation for continuous physiological activity. Flight altitude varies between species and the distance of particular flight stages. However, they can exceed 8,000 m during daylight hours and will generally be lower during the hours of the night. At such altitudes, landscape features and landmarks such as large waterbodies will be obvious, and visible from large distances. Flood modelling prepared to inform the Solar Precinct Site selection and layout (Appendix N of the Draft EIS) indicates that during extreme flood events (i.e., 1-in-1 000 and 1-in-2 000-year events) Lake Woods could swell such that it would inundate a small portion of the north-east corner of the Solar Precinct. Based on the above information, and the long distances traversed by migratory birds during migration flight stages, Lake Woods is indeed within the area of influence of the Solar Precinct.

The potential impacts of large-scale solar energy developments to avian populations have been widely studied, albeit only relatively recently given the technology underpinning the sector worldwide has been developing since the early 2000s. A shared feature between large-scale solar facilities of all technology types is that they require relatively large areas in order to capture the sun's energy (MASCWG, 2016). Development and large-scale deployment of utility-scale solar facilities, therefore, represent a large human land use in the environment, which has the potential to affect birds and bird communities in a number of ways and during all project phases (e.g., construction, operations, and decommissioning) (MASCWG, 2016). Similar to all anthropogenic developments, the most common type of avian impact associated with the construction of solar energy facilities is habitat loss (MASCWG, 2016). Based on the geographic location of the Solar Precinct, impacts to migratory birds are unlikely to occur as a result of loss of habitat. However, are more likely to arise due to interactions (e.g., collision) with infrastructure such as photo-voltaic panels, buildings and towers, roadways, fences, and transmission lines. The Avian-Solar Science Coordination Plan (MASCWG, 2016) identifies potential sources of bird attraction to large scale solar energy facilities in the United States, albeit not scientifically tested, and includes the following:

The "Lake Effect Hypothesis" (LEH) that proposes that photovoltaic panel arrays appear as a large body of water attract wetland dependant or associated bird species (Kagan et al. 2014)

Glare from panels and mirrors, unexpected fluctuations in lighting, increased illumination, and night lighting that could disorient birds in flight or attract them to solar facilities (BLM and DOE 2010, 2012; Hockin et al. 1992; Longcore et al. 2008; Navara and Nelson 2007; Longcore and Rich 2004)

Polarised light caused by photovoltaic panels and other lighting aberrations (as listed above) that could attract insects which then attract birds (Kagan et al. 2014; Horváth et al. 2009, 2010; Longcore and Rich 2004)

Enhanced vegetation near panels and mirrors that result from excess water runoff during cleaning activities and attracts prey species (BLM and DOE 2010, 2012)

Presence of road-killed carrion, water bodies such as evaporation ponds, garbage, and perch sites that are attractive to different bird species (BLM and DOE 2010, 2012; Knight and Kawashima 1993).

Section 5.4.3.2 of the Draft EIS discusses the LEH – the hypothesis that bird species mistake photovoltaic panel arrays for water features on which the birds can land, usually at night. Such collisions often do not result in direct fatality, albeit some species of birds, such as cormorants, are unable to become airborne again because they are adapted to take off from water, not dry land. The most comprehensive studies – by Kosciuch et al. (2020 and 2021) – examined photo-voltaic solar facilities (and nearby reference sites) in southwestern USA to compare bird presence and carcasses. Key relevant findings were:

One facility – Desert Sunlight (550 MW, 1 600 ha) – is located in a desert ecosystem that lacks many permanent large waterbodies (akin to the Solar Precinct). From carcass surveys, 48% of identifiable

remains found at Desert Sunlight were of aquatic-habitat birds that foraged in water. None of the carcasses were shorebirds.

Live aquatic-habitat birds were observed flying over solar facilities – including Desert Sunlight – albeit never landing at the sites. The same species were often observed in the paired reference area (which had similar habitat to the solar facility with no solar infrastructure) – whilst, again, never landing.

There were aquatic-habitat bird detections at all solar facilities and in the agricultural site reference area, albeit not at reference areas in a desert/scrub or grassland habitat.

Amongst the dead birds collected at each facility were water-obligate species (i.e., species that can only take-off from water, and which perish on dry land). These were even found at the solar facility in a desert environment that lack water.

Most studies have identified limited, if any landing attempts by waterbird species during monitoring events at similar facilities during daylight hours. Most waterbird species undertake long-range movements at night, which is also the case for many migratory shorebird species. The LEH would be significantly amplified at night due to moonlight reflections off panels and potentially artificial lighting being far more obvious to bird species traversing the area during the day.

Based on the location of the Solar Precinct, in a largely arid environment and in proximity to Lake Woods, there is unlikely to be suitable wetland habitat present on a routine and predictable basis. Instead, habitat conditions, particularly at Lake Woods, are likely to be suitable only in response to rainfall and subsequent flooding. Under such conditions, there is likely to be widespread ephemeral wetland habitat availability in the region and resultative waterbird distributions will also be widespread. With widespread standing water across the landscape, the LEH and collision risk with project Solar Precinct PV panels is expected to be reduced. However, it is the opposite conditions which are likely to be more of a concern given the geographic context, surrounding habitat types and wetland habitat availability. While there may resultantly be a substantial increase in waterbird and shorebird abundances in the landscape, the availability of habitat means that there should be less attraction to the Solar Precinct due to the LEH, when compared to dry years in which the Solar Precinct will stand out and appear more attractive to tired migratory birds passing overhead during peak migration periods.

The Draft EIS identifies that solar panels for the Project are essentially at ground level and unlike the solar facilities studied, which had flat panel arrays and present a uniformly flat surface. In contrast, the Maverick panels proposed for the Project are concertina-ed, creating a less homogenous face, and subsequently a lower likelihood that the overall surface is mistaken to be water. At altitudes of up to 8 000 m however, the height that migratory birds can fly, this panel arrangement may still appear as a uniform surface.

Based on available literature and a distinct lack of collision mortality research associated with Solar Energy Facilities in Australia, especially for projects of this scale, there remains a large degree of uncertainty regarding the prevalence and frequency of avian impacts due to interference such as collisions. To identify whether this impact manifests at the Solar Precinct and to gauge its significance, the Project will undertake monitoring of bird utilisation and fatalities within the Solar Precinct as part of the Flora and Fauna Management Plan which will detail a protocol for routine, structured monitoring across the Solar Precinct, maintenance, mitigation measures, and identify adaptive management actions to respond to any emerging issues. Any additional incidental carcass observations will also be recorded.

5.5.4.3 Direct fauna mortality caused by collision with OHTL and HVDC Electrode Line

Further information about the potential for avi-fauna collision with OHTL structures is provided in Sections 5.12.2.22 and 5.13.5.2.

Powell Creek Electrode and DCS Electrode

It is important to note that as discussed in Section 5.4.3.2 of the Draft EIS, earth wires are most associated with bird collision involving transmission lines. The use of Electrodes removes the need for a top earth wire as part of the OHTL, significantly reducing the risk of bird collision.

The HVDC Electrode Line will be designed in accordance with AS7000: 2016 Overhead line design and is comparable in scale, height and appearance to conventional overhead distribution lines and poles. The height of these poles is approximately 12 m.

The DCS Electrode design will consider the best pathway and will consider the potential to make use of an easement adjacent to the existing public gravel road. The height of the HVDC Electrode line will largely be similar to the canopy heights of the surrounding vegetation, as opposed to the significantly higher heights of the OHTL structures (up to approximately 60 m).

As discussed in the Land Based Electrode Technical Report (Appendix 12.1), potential electrocution impacts to fauna mortality include:

Ground rise potentials from the Electrode causing dangerous touch potential due to long potential transference

Potential for the Electrode to generate current at surface presenting a danger to humans or animals on this area.

The Electrodes will be designed to ensure there is no risk to fauna mortality from touching ground or conductive surfaces (such as fences) outside a securely fenced compound at the Electrode footprints. Therefore, no further assessment has been undertaken regarding this potential risk.

Powell Creek Electrode and DCS Electrode

This will be designed in accordance with AS7000: 2016 Overhead line design and is comparable in scale, height and appearance to conventional overhead distribution lines and poles. The height of these poles is approximately 12 m.

5.5.4.4 Degradation of flora and vegetation caused by Electrode operation

Powell Creek Electrode and DCS Electrode

A Land Based Electrode Technical Report (Appendix 12.1) was prepared for the SEIS to explain how Electrode Infrastructure operates and sets out the potential environmental impacts associated with operating this infrastructure as part of the Project.

Electrodes are noted to be in operation for 40 hours in a year to less than 500 hours a year.

The longest utilisation of the Electrode would be during an extended partial OHTL repair. The time required will depend on the type and location of the repair. However, it is unlikely to cause the utilisation to exceed the estimated range of operation. If there is a failure of the OHTL (which is a very rare event), one cannot bypass the Electrode and outage and subsequent operation of the Electrode will be as long as is required in order to repair the line. If the failure is in the Converter Station, the Electrode can be bypassed as soon as local operations and maintenance staff determine it is safe to do so (approximately two to six hours).

In a planned outage, which is used to complete routine maintenance once a year, the Electrode is likely to be used for one to two hours to transition the system. Unplanned outages (and the resulting Electrode utilisation) are expected to be low.

In the event of a fault, the Electrode may be in use for up to 48 hours or the time needed to repair the fault. However, general operating practice dictates that after six hours, the system is typically reconfigured from electrode-return to using the other pole as a metallic return if the fault was not on the OHTL.

There is a potential for heating of soil by the Electrode and impact of electro-osmosis causing drying of the soil. Soil drying and heating also impacts the effectiveness of the Electrode. This may impact vegetation in the vicinity of the Electrode.

Soil drying and heating impacts require a period of time to develop and is unlikely to result due to the intermittent and short-term use of the Electrode proposed for the Project's operation. No information is available on the timeframe required for this impact to occur. Nonetheless, the potential for heating of soil to occur at a significant level to impact vegetation is considered very unlikely. Therefore, no significant vegetation degradation is expected from the operation of the Electrode.

5.5.4.5 Changes to fauna behaviour due to noise and light

Operational noise from the AI and OHTL Corridor were considered in the Draft EIS. No material changes to operational activities or noise levels are anticipated, therefore the findings of the Draft EIS are sufficient to address these project refinements. Noise impacts from the operation of the Electrodes are considered negligible. Where possible and not precluded by other design criteria such as safety and security, the Proponent will undertake the works in accordance with the National Light Pollution Guidelines for Wildlife Including Marine Turtles, Seabirds and Migratory Shorebirds (DoEE, 2020). This is specified in the Environmental Design Criteria and Standards (Appendix 2.1) which establishes the minimum environmental requirements as inputs into pre-Front-End Engineering Design (pre-FEED) packages of infrastructure works and activities associated with the Project.

5.6 Potential impacts to threatened species

5.6.1 Assessment scope and procedure

In accordance with the *EPBC Act* and *EP Act* (and associated guidelines), impact assessment for threatened species follows a different process to that for other terrestrial ecosystem values, which are addressed in this Section 5.4.3.9 of the Chapter. The significant impact assessments for threatened species presented in this Chapter consider the whole AAPowerLink project, not just the project refinement areas presented in Section 5.3.

Impacts from both construction and operations are considered, however, the highest risks of potential impacts to threatened species relate to the land clearing and development during the construction stage of the proposal.

The EPBC Significant Impact Guidelines 1.1 produced by the Cwth Government (DEWHA, 2013) describe the process for determining the significance of impacts to threatened species. The NT does not have an independent process, and so it is standard practice that species listed as threatened in the NT – but not federally – are also assessed using the Cwth's process. Further detail is provided in Section 5.5.1 of the Draft EIS.

5.6.2 Targeted surveys

In April 2022, the Proponent submitted the Draft EIS for the Project. In the Draft EIS, it was acknowledged there were outstanding information gaps relating to the fact that some project components intersect habitat with a high likelihood of supporting certain, restricted-range species

listed as threatened under the *TPWC Act*, *EPBC Act* or both. Those species are only detectable at certain times of the year, precluding targeted surveys being undertaken in time for the Draft EIS. In addition, the comments received from the NT EPA, DEPWS and other stakeholders during the Draft EIS public consultation process generated a comprehensive list of threatened species for which further information was requested (refer to Section 5.12).

The Supplementary Ecology Report Part 1 Threatened Species (Appendix 5.1) presents the methods and results of the threatened species surveys that have been undertaken to inform the SEIS. Not all species that could occur within the project footprint have been surveyed. Instead, a screening process was undertaken to identify which threatened species are most vulnerable to impacts from the Project, and therefore warrant targeted surveying to inform impact avoidance.

For the large footprint of the Powell Creek Station infrastructure, any species with a reasonable chance of being present is vulnerable to Project impacts, and so were surveyed; field investigations for Greater Bilby, Yellow-spotted Monitor, Grey Falcon, and Gouldian Finch were carried out. The remainder of the Project's footprint is narrow and localised, such that the threatened species most vulnerable to impacts from construction of the OHTL Corridor and Gunn Point infrastructure are restricted-range species which, if present in the project footprint and not avoided/managed, could experience a significant loss in population size or habitat. Particular focus was placed on flora species which cannot move out of the project footprint. Restricted-range species were surveyed if desktop distribution modelling and field habitat assessments identified there was a reasonable chance of the species being present within the project footprint. All threatened species mentioned in the Draft EIS comments are presented in Figure 5-17 with justifications as to which of those were subject to targeted surveys.

Table 5-17: Threatened species and locations surveyed for the SEIS

Species	Restricted range?	Project footprint within the species' distribution[2]?	Likelihood the project footprint contains core habitat[3]?	Targeted survey?	Notes
Acacia praetermissa	Yes	No	Low	No	-
Arnhem Land Gorges Skink	Yes	No	Low	No	-
Arnhem Leaf-nosed Bat	Yes	No	Low	No	-
Atlas Moth	Yes	No	Low	No	-
Bare-rumped Sheath-tail Bat	No	Yes	Low	No	-
Black-footed Tree-rat (Kimberley and mainland NT)	No	Yes	Low	No	-
Cleome insolata	Yes	Yes	Moderate	Yes	DCS surveyed Species not detected No suitable habitat elsewhere in the Project's footprint
Crested Shrike-tit (northern)	No	Yes	Low	No	-
Darwin Cycad	Yes	Yes	High	No	Known presence within the Gunn Point infrastructure and OHTL footprints from previous surveys
Darwin Palm	Yes	Yes	Yes	Yes	OHTL Utilities Corridor surveyed Species not detected
Fawn Antechinus	No	Yes	Low	No	-

[2] For species listed under the *EPBC Act*, this corresponds to CWTH distribution modelling. For species only listed under that TPWC Act, this was estimated using relevant records.
[3] As described in Sections 5.4.3.4 and 5.4.3.9. For some CWTH-listed species, 'core habitat' is formally defined. For all other species, this has been assumed based on available information.

Species	Restricted range?	Project footprint within the species' distribution[2]?	Likelihood the project footprint contains core habitat[3]?	Targeted survey?	Notes
*Gouldian Finch	No	No	Moderate	Yes (habitat)	Powell Creek AI and Access Roads surveyed Suitable breeding habitat recorded
Ghost Bat	No	Yes	Low	No	-
*Greater Bilby	No	Yes	Low (Solar Precinct and AI) Moderate (OHTL)	Yes	Powell Creek infrastructure surveyed Species detected
*Grey Falcon	No	Yes	Moderate	Yes (habitat)	Powell Creek AI and Access Roads surveyed Suitable breeding habitat recorded
Helicteres macrothrix	Yes	Yes	Moderate	Yes (habitat)	OHTL Utilities Corridor surveyed Suitable habitat not recorded Habitat modelled as suitable within the OHTL preferred route at Adelaide River OHTL has not been surveyed
Howard River Toadlet	Yes	Yes	Yes	No	Suitable habitat is present within the OHTL Utilities Corridor, however this species was not able to be surveyed in the 2022 wet season. Instead, this SEIS assumes the species is present in sites containing suitable habitat
Masked Owl (northern mainland)	No	Yes	Low	No	-
Mertens' Water Monitor	Yes	Yes	High	No	Assumed presence along higher-order watercourses
Mitchell's Water Monitor	Yes	Yes	High	No	Assumed presence along higher-order watercourses

Species	Restricted range?	Project footprint within the species' distribution[2]?	Likelihood the project footprint contains core habitat[3]?	Targeted survey?	Notes
Nabarlek (Top End)	Yes	Yes	Moderate	No	Possible presence in rocky areas crossed by the OHTL Corridor. This species was not surveyed, this SEIS assumes the species could be present in sites containing suitable habitat
Night Parrot	No	No	No	No	-
Northern Brushtail Possum	No	Yes	Low	No	-
Northern Brush-tailed Phascogale	No	Yes	Low	No	-
Northern Quoll	No	Yes	Moderate	No	Possible presence in rocky areas crossed by the OHTL Corridor
Painted Honeyeater	No	Yes	No	No	-
Partridge Pigeon (eastern subspecies)	No	Yes	Low	No	-
Plains Death Adder	No	Yes	No	No	-
Princess Parrot	No	Yes	Low	No	-
Red Goshawk	No	Yes	Moderate	No	Nesting potential within OHTL Corridor along higher-order watercourses
Stylidium ensatum	Yes	Yes	High	Yes	OHTL Utilities Corridor surveyed Species detected Habitat modelled as suitable within the OHTL preferred route at Adelaide River has not been surveyed
Typhonium praetermissum	Yes	Yes	High	Yes	DCS and OHTL Utilities and Railway Corridors surveyed

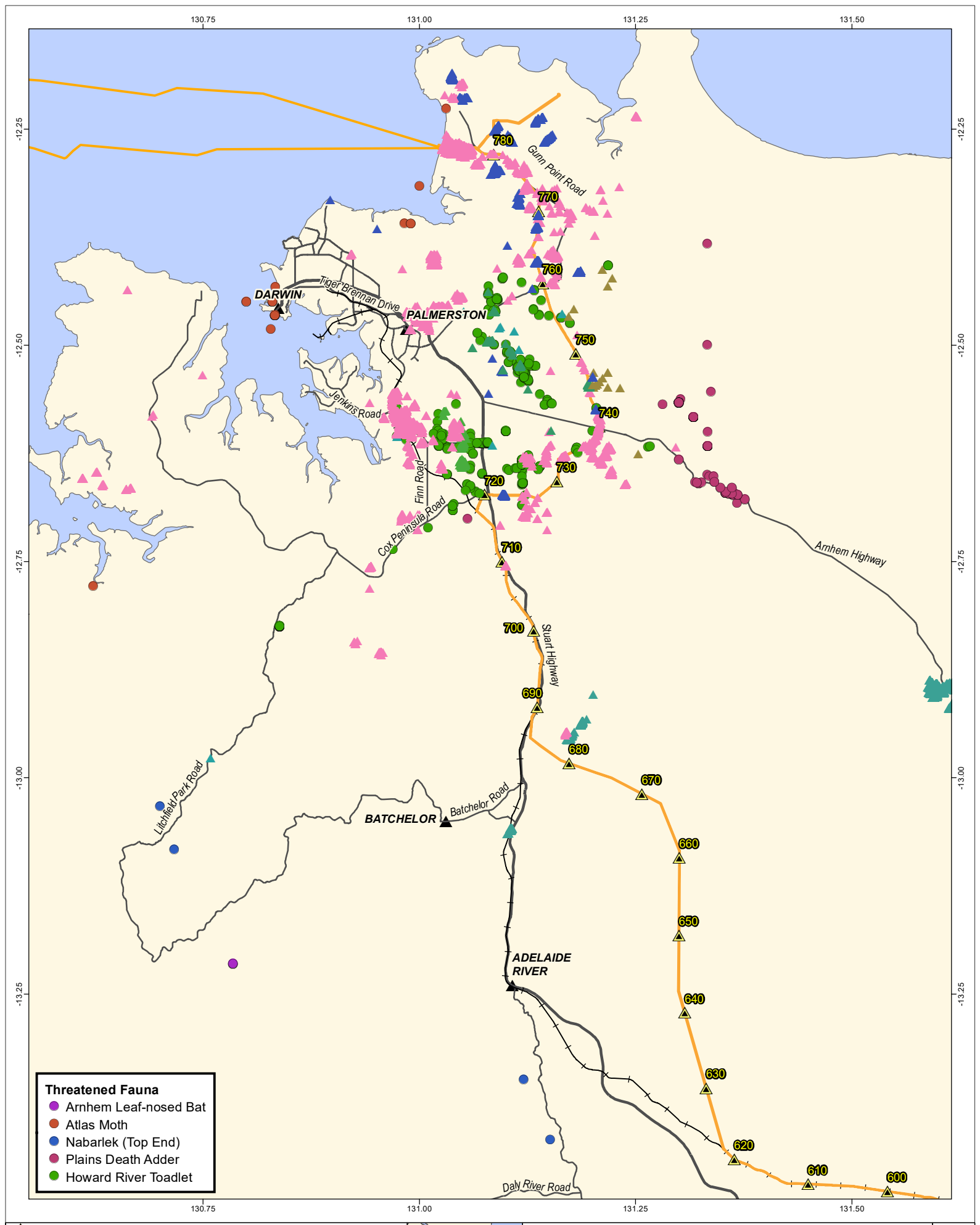
Species	Restricted range?	Project footprint within the species' distribution[2]?	Likelihood the project footprint contains core habitat[3]?	Targeted survey?	Notes
					Species detected in DCS and OHTL Utilities Corridor Habitat modelled as suitable within the HVDC Electrode Line Corridor for the DCS Electrode has not been surveyed
Typhonium taylorii	Yes	Yes	High	Yes	OHTL Utilities Corridor surveyed Species detected
Utricularia dunstaniae	Yes	Yes	High	Yes (habitat)	OHTL Utilities Corridor surveyed Species not detected
Water Mouse	No	Yes	Low	No	-
White-throated Grasswren	Yes	No	Low	No	-
*Yellow-spotted Monitor	No	Yes	High	Yes	Powell Creek infrastructure surveyed Species detected

* denotes a species with a reasonable likelihood of being present within the Powell Creek AI footprint

5.6.3 Significant Impact Assessments – Endangered Species

This section presents significant impact assessments for all threatened species listed as Endangered (or Critically Endangered) under the EPBC and/or *TPWC Act*s that could be present within one or more components of the project footprint. Also included are such species for which a significant impact assessment was requested by DEPWS and/or DCCEEW in the comments received on the Draft EIS.

To support some of these assessments, Figure 5-27 and Figure 5-28 show the location of records for certain restricted-range threatened species in relation to the project footprint.



Kilometre Point (KP)
Towns
Railway
Principal road
Secondary road
AAPowerLink infrastructure

Threatened Flora
- *Atalaya brevialata*
- *Helicteres macrothrix*
- *Ptychosperma macarthurii*
- *Stylidium ensatum*
- *Typhonium praetermissum*
- *Typhonium taylorii*
- *Utricularia dunstaniae*

Source: Sun Cable, EcOz, NTG (NR Maps)

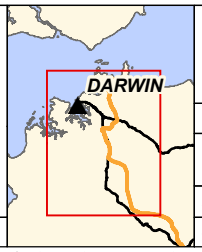


Figure 5-27: Map of restricted range threatened flora and fauna

Project: Australia-Asia PowerLink

N

0 20 Kilometres

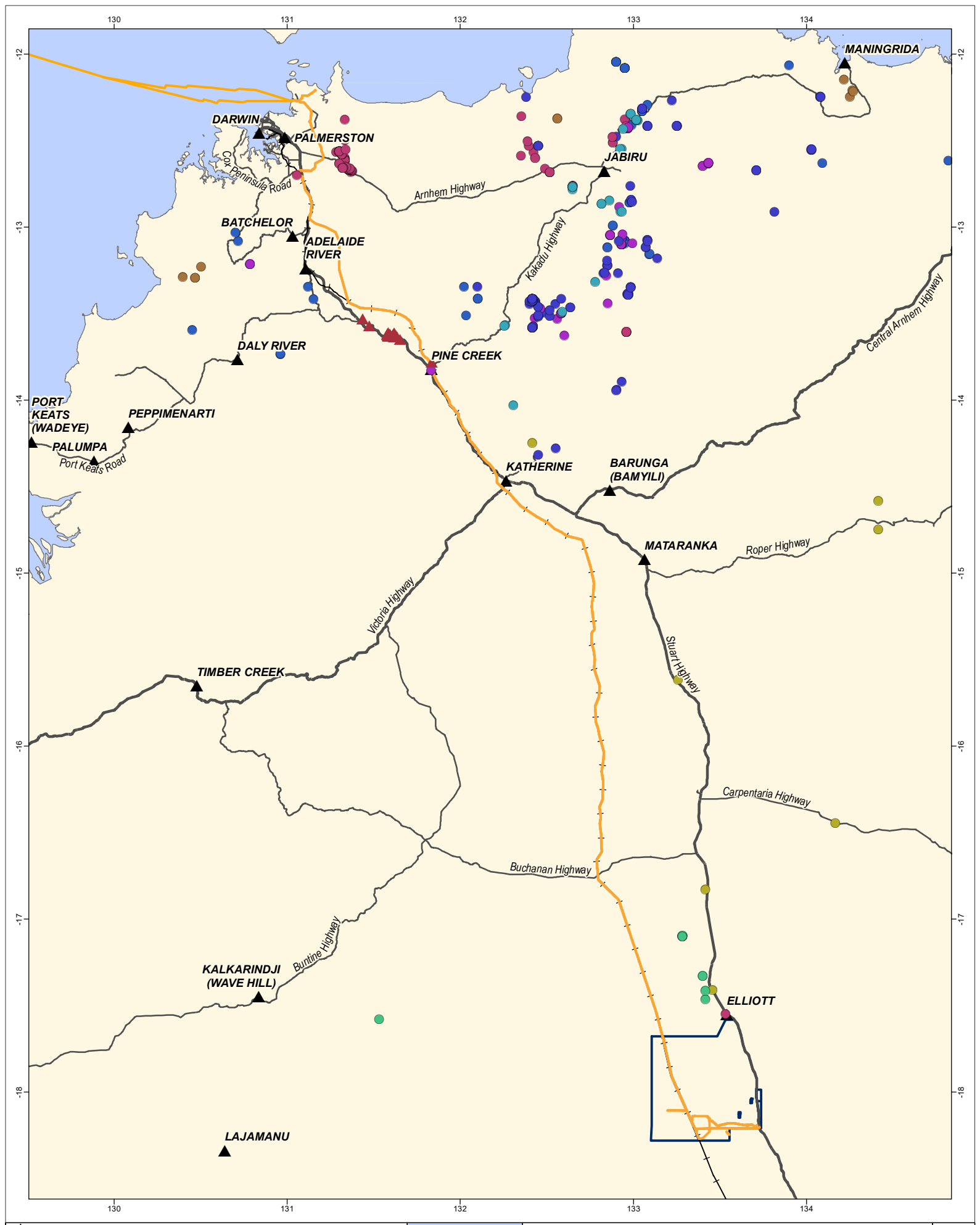
Reference: M-Files ID 200232

Date: 18/11/2022 | Revision: 1

Scale: 1:600,000 | Datum: GDA2020

Coordinate System: GDA2020 | A4

SUN CABLE AUSTRALIA-ASIA PowerLink



Towns
Kilometre Point (KP)
Railway
Powell Creek Station
AAPowerLink infrastructure

Threatened flora
Acacia praetermissa

Threatened Fauna
Arnhem Land Gorges Skink
Arnhem Leaf-nosed Bat
Nabarlek (Top End)
Painted Honeyeater
Plains Death Adder
Princess Parrot
Water Mouse
White-throated Grasswren

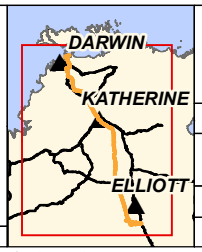


Figure 5-28: Map of restricted range threatened flora and fauna

Project: Australia-Asia PowerLink

0 50 100 Kilometres

Reference: M-Files ID 200232

Date: 18/11/2022 | Revision: 1

Scale: 1:3,000,000 | Datum: GDA2020

Coordinate System: GDA2020 | A4

N

SUN CABLE AUSTRALIA-ASIA PowerLink

Source: Sun Cable, EcOz, NTG (NR Maps)

5.6.3.1 Arnhem Land Gorges Skink *(Bellatorias obiri)*

The Arnhem Land Gorges Skink is listed as Endangered under the EPBC and *TPWC Act*. It is a restricted-range, endemic species inhabiting sandstone outcrops – typically with extensive fissures and cave systems – on the western Arnhem Land plateau (Armstrong and Dudley 2004). According to the NT Atlas, this species is known to occur from 12 locations in Arnhem Land – the nearest of which is 35 km to the east of the OHTL, there are no records within 20 km of the OHTL or to the west of the OHTL. The species distribution (DCCEEW 2022) does not intersect with the OHTL – ending over 20 km to the east.

This species has not been extensively surveyed or studied – one of the priority actions listed in the Conservation Advice (DEWHA, 2008b) is to …Undertake further research aimed at establishing the distribution, abundance, and ecological requirements of the species.

The main threats to the Arnhem Land Gorges Skink are the likely small population and restricted range, potential threats are changes to food resources and habitat quality by changing fire regimes, predation by Feral Cats and impacts from Cane Toads (DEWHA, 2008b). The Project will not increase the likelihood of impact from the main or potential threats.

The Arnhem Land Gorges Skink has not been recorded within the Project's footprint, and because the species is range restricted, the likelihood of its occurrence is low. Suitable habitat – sandstone outcrops – may occur in the Katherine region; however, these will be avoided or spanned by the OHTL whenever possible (for engineering reasons as well as ecological).

Table 5-18 presents a significant impact assessment using the criteria contained within the EPBC Significant Impact Guidelines 1.1 (DEWHA, 2013). Because the Arnhem Land Gorges Skink is unlikely to occur within the Project footprint, impacts to suitable habitat will be minimised through micro-siting, and the area of suitable habitat is very small and narrow – this species is unlikely to be significantly impacted by the Project.

Table 5-18: Significant impact assessment for the Arnhem Land Gorges Skink

Criterion	Summary of mitigation measures and significant impact assessment
Lead to a long-term decrease in the size of a population	As explained above, populations of the Arnhem Land Gorges Skink are not known, or likely, to occur within the project footprint.
Reduce the area of occupancy (AOO) of the species	The project footprint is not within the AOO of the Arnhem Land Gorges Skink – the west Arnhem plateau – and, as such, land disturbance associated with the project will not reduce the AOO of the species.
Fragment an existing population into two or more populations	There are no records of the Arnhem Land Gorges Skink within the project footprint – and all occurrences are on the eastern side of the project footprint. Therefore, there are no known populations that could be fragmented by development of the project.
Adversely affect habitat critical to the survival of the species	Critical habitat is not described for the Arnhem Land Gorges Skink. However, it can be inferred to be sandstone outcrops with extensive fissures and cave systems (DEWHA, 2008b). Due to the nature of the relevant project component – a narrow, linear corridor for the OHTL – if sandstone outcrops and caves systems are identified within the intended route, they will be assigned a medium constraint rating and the Constraints Planning and Field Development Procedure (Appendix 4.1) will be followed. If the species is found to be present, these habitat areas will be sort to be avoided or spanned between the OHTL structures. Doing so will minimise the likelihood of adversely affecting habitat critical to the survival of the species. Conversely, critical habitat could be considered to be the 12 known locations in Arnhem land, none of which will be impacted by the project.

Criterion	Summary of mitigation measures and significant impact assessment
Disrupt the breeding cycle of a population	Populations of the Arnhem Land Gorges Skink are not known, or likely, to occur within the project footprint, therefore the breeding cycle of a population will not be disrupted by the development of the project.
Modify, destroy, remove, isolate, or decrease the availability or quality of habitat to the extent the species is likely to decline	There are 12 known locations inhabited by the Arnhem Land Gorges Skink in Arnhem Land, none of which will be impacted by the project. If potential habitat is found within the project footprint, it most likely would be within the OHTL Corridor. The loss of such a small and narrow area of potential habitat is unlikely to modify, destroy, remove, isolate, or decrease the availability or quality of habitat to the extent the species is likely to decline.
Result in invasive species, that are harmful to the species, becoming established in the species' habitat	Predation by Feral Cats is a potential threat to the Arnhem Land Gorges Skink (DEWHA 2008b), with the predator already well-established in the species' habitat. Impacts from Cane Toads are also a threat; however, the Cane Toad already occupies the species' habitat (DEWHA 2008b). Changes to food resources and habitat quality from altered fire regimes – often associated with the proliferation of grassy weeds – are another threatening process to the species. The OHTL Corridor occurs in areas already populated by Feral Cats, Cane Toads and grassy weed species. Although linear clearings are known to assist movements of these invasive species, there is no nexus between the OHTL and the Arnhem Land Gorges Skink's habitat. The Weed Management Plan presented in Appendix 5.3 has been developed to minimise introduction and proliferation of weeds within the project area of influence for the life of the Project.
Introduce disease that may cause the species to decline	Disease is not listed as a threatening process for the Arnhem Land Gorges Skink. The author is not aware of any literature on diseases that could be introduced by the project and that would detrimentally affect this species.
Interfere with the recovery of a species	The Conservation Advice for the Arnhem Land Gorges Skink (DEWHA 2008b) lists three priority actions: **Undertake further research aimed at establishing the distribution, abundance, and ecological requirements of the species.** **Encourage appropriate burning regimes across the known range of the species.** **Manage the presence of Feral Cats** None of these will be interfered with by the activities of the project.

5.6.3.2 Arnhem Leaf-nosed Bat (*Hipposideros inornatus*)

The Arnhem Leaf-nosed Bat listed as Endangered under the *EPBC Act* and Vulnerable under the *TPWC Act*. It is a moderately large insectivorous bat – known to previously occur in two locations in the NT (DEPWS, 2021b) – albeit now only occurs in the Kakadu escarpment and western Arnhem Land plateau. The Arnhem Leaf-nosed Bat is considered locally extinct in Litchfield National Park because the species has not been recorded since the early 1980's despite several targeted searches (TSSC, 2015d; DEPWS, 2021b). Within the Kakadu National Park, the population is considered secure within the known range (Milne and Pavey, 2011). The species distribution included the historic areas within Litchfield National Park, is intersected by the OHTL Corridor (TSSC, 2015d).

According to the NT Fauna Atlas, the closest record in the Kakadu escarpment to the project footprint is 725 km from OHTL Corridor – KP 545 (DEWPS, 2007). Because the Arnhem Leaf-nosed Bat has not been recorded within the proposed footprint, and it has a restricted range, the likelihood of its occurrence is low. Suitable habitat – sandstone outcrops – may occur in the Katherine region from

KP 511 to 596; however, these will be avoided or spanned by the OHTL whenever possible (for engineering reasons as well as ecological).

The Conservation Advice (TSSC, 2015d) describes two moderate threats to the Arnhem Leaf-nosed Bat – Disturbance at roost sites and destruction or reduced accessibility of roost sites (old mine adits). Predation by Feral Cats and impacts to prey from inappropriate fire regimes are considered minor threats to the species (TSSC, 2015d). The project does not intersect any known roost sites, and avoidance measures such as spanning make the project unlikely to threaten the roost sites of the Arnhem Leaf-nosed Bat.

Table 5-19 presents a significant impact assessment using the criteria contained within the EPBC Significant Impact Guidelines 1.1 (DEWHA, 2013). Because the Arnhem Leaf-nosed Bat is unlikely to occur within the project footprint, impacts to suitable habitat will be minimised through micro-siting, and the area of suitable habitat is very small and narrow – this species is unlikely to be significantly impacted by the Project.

Table 5-19: Significant impact assessment for the Arnhem Leaf-nosed Bat

Criterion	Summary of mitigation measures and significant impact assessment
Lead to a long-term decrease in the size of a population	As explained above, populations of the Arnhem Leaf-nosed Bat are not known. However, they may occur (DCCEEW 2022) within the project footprint.
Reduce the AOO of the species	The project footprint is not within the AOO of the Arnhem Leaf-nosed Bat – the west Arnhem plateau – and, as such land disturbance associated with the project will not reduce the AOO of the species.
Fragment an existing population into two or more populations	There are no records of the Arnhem Leaf-nosed Bat within the project footprint – and recent occurrences are at least 72 km to the east of the project footprint. Therefore, there are no known populations that could be fragmented. Moreover, the narrow footprint is unlikely to represent a dispersal barrier to such a mobile species.
Adversely affect habitat critical to the survival of the species	Critical habitat is not described for the Arnhem Leaf-nosed Bat; however, it can be inferred to be rugged sandstone formations with caves, close to water (TSSC, 2015d). Due to the nature of the relevant project component – a narrow, linear corridor for the OHTL – if sandstone formations with caves are identified within the intended route, they will be assigned a medium constraint habitat and managed in accordance with the Constraints Planning and Field Development Procedure (Appendix 4.1). Doing so will minimise the likelihood of adversely affecting habitat critical to the survival of the species. Conversely, critical habitat could be considered the known locations in Kakadu National Park, none of which will be impacted by the project.
Disrupt the breeding cycle of a population	Populations of the Arnhem Leaf-nosed Bat are not known, or likely, to occur within the project footprint, therefore the breeding cycle of a population will not be disrupted by the development of the project.
Modify, destroy, remove, isolate, or decrease the availability or quality of habitat to the extent the species is likely to decline	The Arnhem Leaf-nosed Bat is located within Kakadu National Park, in the Arnhem Land plateau, which will not be impacted by the Project.

Criterion	Summary of mitigation measures and significant impact assessment
Result in invasive species, that are harmful to the species, becoming established in the species' habitat	Predation by Feral Cats is a possible threat to the species (TSSC 2015d). Changes to prey abundance from altered fire regimes – often associated with the proliferation of grassy weeds – is also a possible threat (TSSC 2015d). Because the known locations and roost sites of the Arnhem Leaf-nosed Bat are not within the project footprint, it is unlikely that project activities will cause invasive species establishment within the species habitat. The Weed Management Plan presented in Appendix 5.3 has been developed to minimise introduction and proliferation of weeds within the project area of influence for the life of the Project.
Introduce disease that may cause the species to decline	Disease is not listed as a threatening process for the Arnhem Leaf-nosed Bat. The author is not aware of any literature on diseases that could be introduced by the Project and that would detrimentally affect this species.
Interfere with the recovery of a species	There is no Recovery Plan for the Arnhem Leaf-nosed Bat; however, the Conservation Advice (TSSC 2015d) lists management actions, including two high priority actions: • **Survey to better define distribution.** • **Establish an integrated monitoring program across its range and at known roost sites.** Neither of these will be interfered with by the activities of the Project**.**

5.6.3.3 Black-footed Tree-rat (Mesembriomys gouldii gouldii)

The Kimberley and mainland NT sub-species of the Black-footed Tree-rat (*Mesembriomys gouldii gouldii*) is listed as Endangered under both the EPBC and *TPWC Act*s. It is a medium-sized nocturnal rodent that dens mostly in tree hollows. However, it may also use clumps of dense foliage (notably *Pandanus spiralis*). The sub-species is largely arboreal and also forages on the ground. The Black-footed Tree-rat generally requires fruit and seed resources – including Pandanus fruits, fruiting trees and shrubs. The sub-species predominantly occurs in woodlands and open forests with large trees dominated by Eucalyptus and a moderately diverse mid-storey, particularly in patches of tall *Eucalyptus miniata* and *Eucalyptus tetrodonta* open forest. Black-footed Tree-rats have a large home range (~67 ha) and can travel over two kilometres in a night, moving >500 m between denning and foraging sites (Friend et al. 1992; Rankmore and Friend 2008).

The sub-species is thought to be more prevalent in woodlands with infrequent and low intensity fires (Price et al. 2005). Tree hollows are an important resource for the species and frequently burnt landscapes may contain fewer larger trees that provide hollows; however, natural events such as cyclones may also reduce the number of trees hence hollow availability (Woinarski and Westaway 2008). Frequent fire can also detrimentally impact the diversity of the mid-storey. Based on EcOz survey experience, Black-footed Tree-rats have remained relatively abundant in some parts of the Darwin rural area where they have access to suitable denning habitat and food resources. Elsewhere – such as at Gunn Point and in the Kimberley – recent surveys have yielded far fewer records of the sub-species than previously (Stokeld et al., 2020).

Between 2017 and 2018, DENR deployed 160 camera trap sites cross Gunn Point – covering the region proximate to the northern electrode, Murrumujuk and OHTL footprints (as far south as the Arnhem Highway) are located. The Black-footed Tree-rat was recorded at only four sites, indicating it is present in the region at a low density (Stokeld et al., 2020).

Based on current distribution and habitat suitability, the Black-footed Tree-rat could also be present within the OHTL footprint as far south as Katherine. Areas the species or suitable habitat is likely to occur is from Gunn Point to KP 669, and areas the species or suitable habitat may occur continues from KP 669 to KP 559 (DCCEEW, 2022).

Table 5-20 assesses whether project activities are likely to have a significant impact upon this sub-species (as defined in EPBC Significant Impact Guidelines 1.1). The conclusion is that because the proportion of Black-footed Tree-rat habitat within the project footprint is very small – combined with the implementation of den habitat avoidance (micro-siting) and mitigation (pre-clearance surveys and use of a fauna spotter-catcher) measures – the impacts to this species associated with the project are unlikely to be significant.

Table 5-20: Significant impact assessment table for Black-footed Tree-rat

Criterion	Summary of mitigation measures and significant impact assessment
Lead to a long-term decrease in the size of a population	There is a population of the Black-footed Tree-rat present at Gunn Point, and suitable habitat within the project footprint, but no records. In particular, there are areas with large hollow-bearing trees suitable for denning and breeding known to occur within the northern length of the OHTL (as far south as Pine Creek), the Murrumujuk and northern electrode footprints. The Black-footed Tree-rat is mobile, which lowers the likelihood of direct mortality during land-clearing activities for the Project. Furthermore, the Proponent will mitigate the impact of construction on this species by assigning as a high constraint habitat and managed in accordance with the Constraints Planning and Field Development Procedure (Appendix 4.1).
Reduce the AOO of the species	The AOO of the Black-footed Tree-rat estimated to be 604 km^2; however, this is expected to be a significant under-estimate due to limited sampling across the occupied range (Woinarski et al., 2014). It was calculated using a 2 x 2 km grid cell method, based on the IUCN Red List Categories and Criteria (2019). Black-footed Tree-rat habitat is present within the project footprint – including in the northern part of the OHTL between Katherine and Murrumujuk. The loss of some of that habitat cannot be avoided. Under the grid cell method, the only way that a habitat loss can lead to a reduced AOO is if it is entirely confined to within the construction footprint. In other words, if the breeding/foraging resources lost constitute the entire local occurrence of those resources, and there are no other nearby occurrences, then this could lead to a reduced AOO. However, because Black-footed Tree-rat general habitat requirements are quite broad within its distribution, habitat is not restricted to the project footprint. Therefore, its loss will not result in a reduced AOO.
Adversely affect habitat critical to the survival of the species	Critical habitat for the Black-footed Tree-rat has not been formally defined. In lieu of such, the most limiting of the sub-species habitat requirements could be considered 'critical'. For the Black-footed Tree-rat, this is den sites – large hollow-bearing trees. Such habitat occurs within the project footprint. However, it is also present within the dominant vegetation type across the population's entire range. Large hollow-bearing trees which may constitute denning habitat will be avoided as much as possible during micro-siting (see above). Consequently, loss of such habitat within the project footprint represents a negligible proportion of suitable habitat for the species, and so will not have an adverse effect or lead to the decline of the species.

Criterion	Summary of mitigation measures and significant impact assessment
Modify, destroy, remove, isolate, or decrease the availability or quality of habitat to the extent the species is likely to decline	As discussed above, the foraging habitat requirements for the Black-footed Tree-rat are both broad – Eucalypt woodlands and forests in the Top End. Such habitat occurs within the project footprint. However, it is also the dominant vegetation type across the population's entire range. Analysis was completed using MVGs from the National Vegetation Information System (NVIS) 6.0 within the full distribution of the Black-footed Tree-rats (DCCEEW, 2022). MVG's Eucalypt Forests and Woodlands[4] were selected to determine the area of habitat within the project footprint and the surrounding 20 km. The proportion of Black-footed Tree-rat habitat present within the project footprint compared within the surrounding 20 km is 0.18%. This includes occurs across 225 km of the OHTL Corridor. The loss of such a small and narrow area of habitat is unlikely to modify, destroy, remove, isolate, or decrease the availability or quality of habitat to the extent the sub-species is likely to decline.
Disrupt the breeding cycle of a population	There is an inherently low likelihood that Black-footed Tree-rats will be breeding within the project footprint which is very narrow and localised within the sub-species distribution. Nevertheless, the implementation of the Constraints Planning and Field Development Procedure (Appendix 4.1) will minimise the likelihood that the breeding cycle of Black-footed Tree-rats that are denning within the project footprint is disrupted.
Fragment an existing population into two or more populations	The Black-footed Tree-rat is a mobile animal capable of traversing narrow cleared areas like the OHTL footprint. Such an area will not represent a barrier for dispersal of this species.
Result in invasive species, that are harmful to the species, becoming established in the species' habitat	Feral Cats (as predators), Cane Toads (as potential prey that is toxic) and invasive grasses such as Gamba Grass (with large biomasses that increase fire intensity) are considered not demonstrated, but plausible threat factors to Black-footed Tree-rats in the Conservation Advice (TSSC 2015f). Feral Cats and Cane Toads are already common in the region, and development of the Project is unlikely to lead to any substantial change in their occurrence. The Weed Management Plan presented in Appendix 5.3 has been developed to minimise introduction and proliferation of weeds within the project area of influence for the life of the Project.
Introduce disease that may cause the species to decline	Disease is not considered in the Conservation Advice (TSSC 2015f) to be a potential threat factor to the Black-footed Tree-rat.
Interfere with the recovery of a species	There is no recovery plan for the Black-footed Tree-rat. Instead, the Conservation Advice for the species is considered to provide sufficient direction to implement priority actions, mitigate against key threats and enable recovery of the species (TSSC, 2015f). The primary conservation action is to 'stabilise or increase populations across range through amelioration of existing threats.' As explained elsewhere in this table, development of the Project will not interfere with that action.

[4]MVG numbers 3,4,5,11 and 12.

5.6.3.4 Darwin Palm (Ptychosperma macarthurii)

The Darwin Palm is listed as Endangered under the *TPWC Act* but is not listed under the *EPBC Act*. In the NT, the Darwin Palm occurs in dense wet rainforests associated with lowland springs near the margins of riverine floodplains (NTH, 2021). The species is known from eight populations in the Greater Darwin Region, with a restricted extent of 200 km^2 from Lambells Lagoon to Gunn Point (DEPWS, 2016). According to Stokeld et al. (2021), within the Gunn Point study area it is unlikely that additional, undetected sub-populations exist.

There are records of Darwin Palm from the Black Jungle sub-population on Crocodile Creek – located in riparian rainforest less than 500 m downstream of the OHTL. The Crocodile Creek Black Jungle sub-population contains of the 70% of the NT population (Liddle et al., 2006) and is an important population for the long-term survival of the species. As described in Appendix 5.1, in 2022 three sites containing potential habitat for the Darwin Palm were surveyed for the Project. However, suitable habitat was not detected, nor were individuals recorded within the project footprint.

This sub-population is downstream of the Project's area of influence and so there is potential for indirect impacts from the Project to affect the population though changes to surface WQ and hydrology. As detailed in Chapter 6 Hydrological Processes of the Draft EIS, OHTL structures will not be placed in watercourses or drainage lines. Only minor drainage lines that do not support threatened species will be crossed by the OHTL access track – because Crocodile Creek supports threatened species, it will not be crossed by the access track. Watercourse crossings will be installed during the dry season when no flows are present. Drainage, erosion, and sediment controls will be installed and maintained in accordance with Erosion and Sediment Control Plans (ESCP's).

Grazing by herbivores and mortality from fire are observed threats to the Darwin Palm, with changes to surface WQ, reduced hydrological flows and loss of rainforest and vegetation corridors potential threats (DEPWS, 2016). The Project will avoid significant vegetation – such as rainforest – where possible, through spanning and micro-siting, implement mitigation measures and ESCP plans to mitigate impacts from changes to surface WQ and hydrology, reducing the potential for impact to the Darwin Palm.

Table 5-21 presents a significant impact assessment using the criteria contained within the EPBC Significant Impact Guidelines 1.1 (DEWHA, 2013). In conclusion, potential indirect impacts to the Darwin Palm are unlikely to be significant due to the surface water and hydrology avoidance and mitigation measures for that will be implemented.

Table 5-21: Significant impact assessment for the Darwin Palm

Criterion	Summary of mitigation measures and significant impact assessment
Lead to a long-term decrease in the size of a population	According to Kerrigan et al. (2006), population counts of Darwin Palm in 2000-1 found 1,037 adult plants, 70% of which occurred in one population at Crocodile Creek (a watercourse crossed by the OHTL Utilities Corridor). The Darwin Palm is not present within the OHTL footprint; however, individuals could be lost downstream if there are significant changes (i.e., beyond natural variation) to surface run-off quantity and/or quality because of the development of the OHTL. For a species with such a small population, the loss of a few individuals could lead to a long-term decrease in the size of the population. For the reasons given in this table, potential impacts from changes to surface WQ and hydrology will be mitigated and significant impacts are unlikely to occur.

Criterion	Summary of mitigation measures and significant impact assessment
Reduce the AOO of the species	According to Stokeld et al. (2020), the AOO for Darwin Palm is 40 km^2, of which 78% is within the Gunn Point region. The AOO of the Darwin Palm is unlikely to be reduced as the OHTL will not cause the direct mortality of Darwin Palm individuals during the proposed land disturbance and any potential loss of Darwin Palms downstream from the Project is unlikely with the mitigation measures implemented by the Proponent.
Fragment an existing population into two or more populations	Because the species is range restricted and often occurs along a linear ecotone – wet rainforest along watercourses – the range in the NT is already severely fragmented into sub-populations (Kerrigan et al. 2006). Within the Crocodile Creek catchment, Darwin Palm records all occur downstream of the OHTL – reducing the likelihood of fragmentation of that sub-population. Fragmentation of the downstream Black Jungle sub-population is unlikely to occur because of the mitigation measures implemented by the Proponent which will avoid impacts from changes to surface WQ and hydrology.
Adversely affect habitat critical to the survival of the species	Critical habitat has not been identified for the Darwin Palm. This concept is arguably not relevant for rare species with very restricted habitat requirements; it can be assumed that the few locations within which the species occurs constitutes critical habitat. Potential impacts to such habitat are assessed under previous criteria and concludes the Project is unlikely to adversely affect habitat critical to the survival of the species.
Disrupt the breeding cycle of a population	Whilst the relevant pollinator species for the Darwin Palm are not known, it seems unlikely that mortality of some individuals would disrupt pollination of that patch. Kerrigan et al. (2006) identifies fire and disturbance by feral animals as limiting factors to plants reaching maturity, neither of which are likely to increase due to the project activities at this location.
Modify, destroy, remove, isolate, or decrease the availability or quality of habitat to the extent the species is likely to decline	The Darwin Palm occurs in habitats that rely on permanent water from springs. Individuals could be lost and/or habitat degraded if there are significant changes (i.e., beyond natural variation) to surface run-off quantity and/or quality because of the development of the OHTL. However, as detailed in Section 5.5.3.2, the risk of such impacts is low because of avoidance and/or minimisation of disturbances to drainage lines through design and micro-siting. Known occurrences and potential habitat of this species will be assigned High and Moderate constraint ratings respectively and managed in accordance with Appendix 4.1 - Constraints Planning and Field Development Procedure. For the reasons given in this table, it is unlikely that the loss, or decrease in quality, of habitat because of project activities will cause a decline in the species.
Result in invasive species, that are harmful to the species, becoming established in the species' habitat	Disturbance from feral buffalo, cattle and pigs are all identified as threatening processes to the Darwin Palm (Kerrigan et al. 2006), as are weeds which could increase fire, reduce habitat quality, and out-compete individual plants. Although linear clearings are known to assist movements of these invasive species, feral herbivores are already present within the area. The Weed Management Plan presented in Appendix 5.3 has been developed to minimise introduction and proliferation of weeds within the project area of influence for the life of the Project.
Introduce disease that may cause the species to decline	Disease is not listed as a threatening process for the Darwin Palm. The author is not aware of any literature on diseases that could be introduced by the Project and that would detrimentally affect this species.

Criterion	Summary of mitigation measures and significant impact assessment
Interfere with the recovery of a species	According to Kerrigan et al. (2006), a Recovery Plan was created for this species (Liddle and Scott 2005), but it is no longer in the public domain. The priority conservation action relevant to the Project was to protect habitat from introduced animals and fire. Throughout this table, it has been explained how the Project will not exacerbate existing introduced animal populations or fire regimes.

5.6.3.5 Fawn Antechinus (*Antechinus bellus*)

The Fawn Antechinus (*Antechinus bellus*) is listed as Vulnerable under the *EPBC Act* and Endangered under the *TPWC Act*. This species is found in the savanna woodland and tall open forest of the Top End. It shelters in tree hollows and fallen logs and appears to prefer areas exposed to less frequent and cooler fires. Species decline has been observed across its Top End range and is likely due to predation by cats and inappropriate fire regimes affecting habitat quality (DEPWS 2021g).

Between 2017 and 2018, DENR deployed 160 camera trap sites cross Gunn Point – covering the region within which the northern electrode, Murrumujuk facilities and OHTL (as far south as the Arnhem Highway) are located. The Fawn Antechinus was recorded at one site indicating in the region at a low density (Stokeld et al., 2020). This recent record was less than 1 km from the project footprint – Powell Creek Electrode. Since 2002 there have been only five new records of the Fawn Antechinus within the Greater Darwin region, despite considerable survey effort by the NTG and consultants such as EcOz (DEPWS, 2019).

Based on current distribution and habitat suitability, the Fawn Antechinus could be present within the project footprint from Gunn Point to KP 422. Areas were the Fawn Antechinus and suitable habitat are likely to occur are from Gunn Point to KP 503, and the area from KP 503 to 422 the Fawn Antechinus and suitable habitat may occur (DCCEEW, 2022).

Table 5-22 assesses whether project activities are likely to have a significant impact upon this species (as defined in EPBC Significant Impact Guidelines 1.1). The conclusion is that because the proportion of Fawn Antechinus habitat within the project footprint is very small and narrow – combined with the implementation of avoidance (micro-siting) and mitigation (pre-clearance surveys and use of a fauna spotter-catcher) measures – the impacts to this species associated with the Project are unlikely to be significant.

Table 5-22: Significant impact assessment for the Fawn Antechinus

Criterion	Summary of mitigation measures and significant impact assessment
Lead to a long-term decrease in the size of a population	Based on the recent record, a population of Fawn Antechinus are present at Gunn Point, and suitable habitat occurs within the project footprint. However, the single regional record is outside the project footprint. Habitat for Fawn Antechinus – savanna woodlands – are extensive across the Top End, with the restricting factor being hollow-bearing trees. Areas of hollow-bearing trees suitable for denning and breeding are known to occur within the northern length of the OHTL (as far south as Katherine), the Murrumujuk and DSC Electrode footprints. The Fawn Antechinus is mobile, which lowers the likelihood of direct mortality during land-clearing activities. Furthermore, the Proponent will mitigate the impact of construction on this species through assigning its habitat type – large hollow bearing trees as High constraint rating and managing in accordance with the Constraints Planning and Field Development Criteria (Appendix 4.1) and Flora and Fauna Management Plan. This will seek to minimise clearing hollow-bearing trees and logs suitable for shelter, conduct pre-clearance surveying and establish the need for a fauna spotter-catcher during clearing.

Criterion	Summary of mitigation measures and significant impact assessment
Reduce the AOO of the species	The AOO of the Fawn Antechinus is estimated at 488 km^2 and it is acknowledged that the species is poorly surveyed across its range (TSSC 2015a). This was calculated using a 2 x 2 km grid cell method, based on the IUCN Red List Categories and Criteria (2019). Fawn Antechinus habitat is present within the OHTL footprint – primarily along the northern 361 km. The loss of some of that habitat cannot be avoided. Under the grid cell method, the only way that a habitat loss can lead to a reduced AOO is if it is entirely confined to within the OHTL footprint. In other words, if the breeding/foraging resources lost constitute the entire local occurrence of those resources, and there are no other nearby occurrences, then this could lead to a reduced AOO. However, because Fawn Antechinus habitat requirements are quite broad within its distribution, habitat is not restricted to the OHTL footprint. Therefore, its loss will not result in a reduced AOO.
Fragment an existing population into two or more populations	The Fawn Antechinus is a small, mobile animal capable of traversing narrow cleared areas like the OHTL footprint. Such an area will not represent a barrier for dispersal of this species.
Adversely affect habitat critical to the survival of the species	Critical habitat for the Fawn Antechinus has not been formally defined. In lieu of such, the most limiting of the species habitat requirements could be considered 'critical'. For the Fawn Antechinus, this is day-time shelter – hollows in trees and fallen logs. Such habitat occurs within the project footprint, within the dominant vegetation type across the species entire range – savanna woodlands and forests. Hollow-bearing trees and logs which may constitute habitat will be avoided as much as possible during micro-siting. Consequently, loss of such habitat within the project footprint represents a negligible proportion of suitable habitat for the species, and so will not have an adverse effect or lead to the decline of the species.
Disrupt the breeding cycle of a population	There is an inherently low likelihood that Fawn Antechinus will be breeding within a project footprint which is very narrow and localised within the species distribution. Nevertheless, the micro-siting which avoids hollow-bearing trees and logs, supported by FSC mitigation will minimise the likelihood that the breeding cycle of Fawn Antechinus is disrupted.
Modify, destroy, remove, isolate, or decrease the availability or quality of habitat to the extent the species is likely to decline	As discussed above, the habitat requirements for the Fawn Antechinus are broad – Eucalypt woodlands and forests in the Top End. Such habitat occurs within the project footprint. However, it is also the dominant vegetation type across the population's entire range. Analysis was completed using MVGs from the NVIS 6.0 within the full distribution of the Fawn Antechinus (DCCEEW, 2022). MVG's Eucalypt Forests and Woodlands[5] were selected to determine the area of habitat within the footprint to the Project and the surrounding 20 km. The proportion of Fawn Antechinus habitat present within the project footprint compared within the surrounding 20 km is 0.13%. This occurs across 361 km of the OHTL and at Gunn Point. The loss of such a small and narrow area of habitat is unlikely to modify, destroy, remove, isolate, or decrease the availability or quality of habitat to the extent the species is likely to decline.

[5]MVG numbers 3,4,5,11 and 12.

Criterion	Summary of mitigation measures and significant impact assessment
Result in invasive species, that are harmful to the species, becoming established in the species' habitat	Feral Cats (as predators) and invasive grasses such as Gamba Grass (with large biomasses that increase fire intensity) are considered current threats to Fawn Antechinus in the Conservation Advice (TSSC 2015b). Feral Cats are already common in the region, and development of the Project is unlikely to lead to any substantial change in their occurrence. The Weed Management Plan presented in Appendix 5.3 has been developed to minimise introduction and proliferation of weeds within the area of influence for the life of the Project.
Introduce disease that may cause the species to decline	The Conservation Advice considers disease as a potential to the Fawn Antechinus. However, this is no direct evidence of decline due to disease (TSSC, 2015a). Regardless of how real this threat is to Fawn Antechinus, there is no nexus between the activities associated with the Project and introduction of a disease into the region.
Interfere with the recovery of a species	There is no recovery plan for the Fawn Antechinus. The Conservation Advice for the species is considered to provide sufficient direction to implement priority actions, mitigate against key threats and enable recovery of the species (TSSC, 2015a). The primary conservation actions are to: 1. Increase the total population size of the species 2. Investigate options for linking, enhancing, or establishing additional populations 3. Maintain and enhance habitat quality of the extant and former populations 4. Stabilise populations across the species range, through amelioration of existing threats 5. Effectively administer the recovery effort. As explained elsewhere in this table, development of the Project will not interfere with these actions.

5.6.3.6 Gouldian Finch (*Chloebia gouldiae*)

This species is listed as Endangered under the *EPBC Act* and Vulnerable under the *TPWC Act*, although some sources believe that Gouldian Finch populations may have recently stabilised, and perhaps begun to increase and spread (Garnett et al., 2021).

The critical components of suitable habitat for the Gouldian Finch vary seasonally. In the dry season, the critical components are hollow-bearing Eucalyptus trees – species of relevance to the Project are *Eucalyptus tintinnans, Eucalyptus leucophloia* and *Eucalyptus brevifolia* – with an understorey of the favoured species of annual grass and a nearby source of surface water, usually within 2 to 4 km (Dostine et al., 2001; O'Malley, 2006). The established view is that Gouldian Finches feed on five grass species as the seeds of these species become seasonally available (Lewis 2007) – *Sorghum intrans, Alloteropsis semialata, Chrysopogon fallax, Triodia bitextura* and *Heteropogon triticeus* – and that birds will move from area to area as the seeds from each species become available (Dostine and Franklin, 2002; Dostine et al., 2001). However, recent observations of Gouldian Finches eating the seeds of Gamba Grass in northern Darwin state that the species' diet is broader.

In the NT, most known breeding populations occur in the Top End, with some isolated records in the Barkly Tableland and in coastal areas of the Gulf of Carpentaria. Non-breeding birds disperse widely (Garnett et al., 2021). In 2022, there appears to have been an irruption of Gouldian Finches in the NT, with many records from outside of the species usual distribution – including from as far north as in Darwin's suburbs, to as far south as near Powell Creek Station, with observations of Gouldian Finch (including juveniles) on Newcastle Water Station drinking from a cattle water trough (pers. comm. Lauren Young 2021, DEPWS). Other than that – there are no documented records of the species within the Ashburton Range or surrounds.

A well-studied site intersected by the OHTL is the Yinberrie Hills area north of Katherine. This is the location of the largest known breeding population of the Gouldian Finch in the NT. According to Dostine et al. (2001), that population undertake regular seasonal shifts from breeding areas in hill woodland in the dry season, to adjacent lowlands throughout much of the wet season, in response to seasonal changes in food availability.

Based on current distribution and habitat suitability, the Gouldian Finch could be present within all of the project footprint except for the Solar Precinct, Powell Creek electrode, AI (on the Redsan land system) and approximately the first 38 km of the OHTL – to KP 38. Both breeding and foraging habitat are likely to be present within the OHTL footprint, as well as in the surrounding region. To give an indication of the potential impact on that habitat associated with developing the Project, Table 5-23 shows how small a proportion of each key foraging grass and breeding tree species is present in the OHTL (the entire 60 m wide corridor – noting that not all of that will be cleared) in comparison to regionally (i.e., within 20 km of the OHTL). The table also shows that none of the important tree and grass species are over-represented in the OHTL Corridor. Gouldian Finch habitat relevant to the Powell Creek infrastructure is discussed below. The footprint Gunn Point infrastructure has not been included because it is comparatively small, and because there are no breeding records of Gouldian Finch from Gunn Point.

Table 5-23: Proportion of vegetation communities with Gouldian Finch breeding and foraging plant species within the OHTL footprint

Species	% of regional occurrence	Proportion of vegetation communities with breeding / foraging plant species	
		20 km	OHTL
Foraging grass species			
Sorghum intrans	0.17%	33.49%	37.72%
Alloteropsis semialata	0.03%	0.34%	0.08%
Chrysopogon fallax	0.15%	79.84%	82.07%
Triodia bitextura	0.10%	15.04%	10.16%
Heteropogon triticeus	0.17%	59.34%	67.67%
Breeding tree species			
Eucalyptus tintinnans	0.12%	81.72%	89.62%
Eucalyptus leucophloia	0.06%	18.28%	10.38%
Eucalyptus brevifolia	0.00%	0.00%	0.00%

Figures in Table 5-23 were derived using combined NVIS 6 and 1:100,000 Vegetation of the Daly River Catchment datasets (Cuff 2011). NVIS descriptions were not used in areas where Daly River vegetation data was available. Discrete areas were selected from the NVIS dataset if any level contained the species, and areas from the Daly dataset were selected if the Map unit heading contained the species.

The OHTL preferred route at Adelaide River intersects large areas of potential foraging habitat for Gouldian Finches; however, it does not contain breeding habitat (Table 5-25).

Table 5-24: Potential Area of Gouldian Finch habitat intersected by the OHTL preferred route at Adelaide River

Location	Potential Foraging habitat (ha) (% within 20 km)	Potential Breeding habitat (ha) (% within 20 km)	Total (ha) (% within 20 km)
OHTL preferred route at Adelaide River	387.6 (0.112%)	0 (0%)	387.6 (0.105%)
Within 20 km	346,955	20,467	367,422

In October 2022, a survey was conducted using a helicopter to fly over all of the Project's components within Powell Creek Station to inspect for the presence of Snappy Gum (*Eucalyptus leucophloia*) trees and nearby waterholes water sources. If Snappy Gums were observed, a ground-based assessment was undertaken to assess potential nesting suitability for Gouldian Finch (see Appendix 5.1 for details).

The survey confirmed that Snappy Gums are present as a low open woodland or scattered to sparse trees, with a spinifex grass (*Triodia* spp.) understorey within the rocky hills and plateau of the Ashburton Range component of the project footprint. This coincides with portions of the access routes, and associated infrastructure. The majority of Snappy Gum trees have been impacted by fire within the project footprint which has severely reduced the availability of suitable nesting hollows. Potential foraging grasses are present in the general area (mostly in the alluvial plain and drainages areas), but no waterholes were identified within, or adjacent to, the proposed infrastructure on the Ashburton Range. The drainages and small creeks within the project footprint area may support small episodic pools during the wet season – however, none contained water at the time of survey. In summary, the survey indicated that that Snappy Gum trees within, and in the vicinity of, the project footprint, are unlikely to be used for Gouldian Finch for nesting purposes. Some areas may be used as foraging grounds. However, it is assumed that better quality nest sites are located elsewhere within the range system (i.e., closer proximity to waterholes).

The Gouldian Finch's status as Endangered means that any occurrence constitutes an important population. Construction of the OHTL could result in disruption of breeding, loss of breeding habitat and/or loss of core feeding/foraging habitat. Design of the OHTL preferred routes have sought to minimise intersecting suitable Gouldian Finch habitat. Any mapped suitable habitat will be assigned a high constraint rating and managed in accordance with the Constraints Planning and Field Development Procedure (Appendix 4.1). The intention will be to minimise disturbance to foraging, but especially the more limited breeding habitat, by minimising placement of OTHL structure pads within such habitat as it is identified on the ground. The route of the Solar Precinct access road will preferentially avoid the few patches of suitable breeding habitat – large Snappy Gums – in the region.

Table 5-25 presents an assessment of whether project activities are likely to have a significant impact on the Gouldian Finch, using the criteria contained within the EPBC Significant Impact Guidelines 1.1 (DEWHA, 2013). Given the large area and availability of breeding and foraging habitat in the region, the clearing of such a small (and narrow) proportion of it cannot be considered likely to lead to a long-term decrease in the size of the Gouldian Finch population because the impacts on critical habitat will be negligible.

Table 5-25: Significant impact assessment for Gouldian Finch

Criterion	Summary of mitigation measures and significant impact assessment
Lead to a long-term decrease in the size of a population	Given the mobile nature of the species, there is unlikely to be any direct mortality of individual Gouldian Finches because of interactions with construction machinery. The only other way in which this development could potentially lead to a long-term decrease in the size of the Gouldian Finch population is through substantial loss of critical habitat – which is discussed and discounted below.
Reduce the AOO of the species	Garnett et al. (2021) estimates the AOO for Gouldian Finches to be between 2,000 and 20,000 km^2 based on the IUCN 2 x 2 km grid cell method. Where Gouldian Finch habitat occurs within the OHTL or Solar Precinct access road footprints – and its loss cannot be avoided – the only way that loss can lead to a reduced AOO is if it is entirely confined to within the footprint. In other words, if the breeding/foraging resources lost constitute the entire local occurrence of those resources, and there are no other nearby occurrences, then this could lead to a reduced AOO. There is no reason to suspect that these resources will only occur within the narrow project footprints in question, and so it is very unlikely that this scenario will eventuate.
Fragment an existing population into two or more populations	The Gouldian Finch is a mobile animal capable of travelling long distances. A narrow, cleared area adjacent to a railway line will not represent a barrier for dispersal of this species.
Adversely affect habitat critical to the survival of the species	Critical habitat for the Gouldian Finch is not defined (O'Malley 2006), but for this purpose can be assumed to consist of breeding habitat and foraging habitat of the less abundant grass species that Gouldian Finch are dependent on at certain times of the year. Using the vegetation datasets listed below, an analysis has been undertaken for this project of the available foraging and breeding habitat within the OHTL, in comparison to that available within 20 km of the OHTL (a search area suggested by DEPWS): 1:100,000 Vegetation of the Daly River Catchment (Cuff 2011) NVIS 6.0. The results were that: There is 18,449 km^2 of Gouldian Finch foraging habitat mapped within the 20 km buffer. Of this, 29 km^2 (0.16%) is within the project footprint. This may be an overestimate because some of that habitat may have been cleared for the railway and associated infrastructure. Moreover, post-construction up to 80% of the OHTL clearance footprint will be re-instated, which may facilitate re-establishment of foraging grasses. There is 1,444 km^2 of Gouldian Finch breeding habitat mapped within the 20 km buffer. Of this, 1.6 km^2 (0.11%) is within the project footprint. As above, this may be an overestimate. The loss of such small proportions of this important habitat cannot be considered likely to have an adverse effect on the survival of the species.

Criterion	Summary of mitigation measures and significant impact assessment
Disrupt the breeding cycle of a population	Clearing of breeding habitat that is in use by Gouldian Finches could disrupt the breeding cycle of the Gouldian Finch. Given the very small proportion of locally available breeding habitat within the disturbance footprint, the inherent likelihood of this occurring is very low. Moreover, the Constraints Planning and Field Development Procedure will further minimise the area of breeding habitat that is disturbed. If clearing of a large area of breeding habitat in the core breeding range of the Gouldian Finch (i.e., Yinberrie Hills) cannot be avoided, then the Proponent will clear that habitat outside of breeding season.
Modify, destroy, remove, isolate, or decrease the availability or quality of habitat to the extent the species is likely to decline	Given the large area of breeding and foraging habitat in the region, the clearing of such a small (and narrow) proportion of it for the Project is unlikely to result in a loss, or decrease in quality, of habitat to the extent that it will cause a decline in the species.
Result in invasive species, that are harmful to the species, becoming established in the species' habitat	Heavy grazing by cattle and horses, and habitat disturbance by Feral Pigs are the only threats to Gouldian Finches listed by TSSC (2016a) that relate to invasive fauna species. Activities associated with the construction and operation of the Project will not result in these threats manifesting. Although not considered in TSSC (2016a), proliferation of weeds could plausibly lead to a reduction of foraging grass species and/or a detrimental change in fire regimes. The Weed Management Plan presented in Appendix 5.3 has been developed to minimise introduction and proliferation of weeds within the project area of influence for the life of the Project.
Introduce disease that may cause the species to decline	Disease is not listed as a threatening process for Gouldian Finch. The author is not aware of any literature on diseases that could be introduced by the Project and that would detrimentally affect this species.
Interfere with the recovery of a species	The National Recovery Plan for Gouldian Finch (O'Malley, 2006) contains a large number of conservation and management actions, none of which will be interfered with by development of the Project.

5.6.3.7 Helicteres macrothrix

Helicteres macrothrix is an Endangered plant listed under both the EPBC and *TPWC Act*s. *Helicteres macrothrix* is associated with Eucalyptus woodland on clayey soils – derived from siltstone; or on sandier soils – derived from the granite-like rock syenite. This species has been recorded from three populations – near Mt Bundey, near Batchelor and in the Lake Bennett area.

The main threat to *Helicteres macrothrix* is land clearing for subdivision (DoE 2022b). In addition, land clearing increases risk of weed invasion – particularly Gamba Grass and Mission Grass – which can alter fire frequency and intensity (DEWHA, 2008c).

The NTG has mapped the Extent of Occurrence (EOO) of *Helicteres macrothrix* based on known recorded locations and produced a model of habitat with a high likelihood of supporting the species (DLRM, 2016). Both the OHTL route within the railway corridor and the OHTL preferred route at Adelaide River intersect with modelled high-likelihood modelled habitat – from KP 673 to KP 687 (see Appendix 5.2). There has been little survey effort for this species in the south of its projected distribution; however, the few records from that region are within 3 km downstream of the OHTL preferred route at Adelaide River – closest to KP 682.

Analysis of high-resolution satellite imagery of the modelled habitat within the OHTL railway corridor determined the disturbance and development of the corridor precludes the presence of *Helicteres macrothrix*. In the surrounding area – within 20 km of the footprint – there is 28,007 ha of high likelihood modelled habitat. Within the project footprint 52.5 ha (0.09%) of high likelihood modelled habitat occurs along 194 km of the OHTL.

In some locations it will not be possible for all of the OHTL disturbance footprint to be contained within the railway corridor – especially the OHTL structure pads. Although the final location of these structures will be determined following the siting constraints procedure (Appendix 4.1), it is possible that some may coincide with small areas of habitat modelled as high likelihood for *Helicteres macrothrix* (noting that the habitat modelling for this species is coarse, and it is the author's experience during previous surveys for this species that *Helicteres macrothrix* is seldom detected in all modelled high-likelihood habitat). In those situations, the known records and modelled species habitat and will be assigned a Very High (no go zone) and High constraint level respectively, and surveys will be undertaken for the species prior to final pad placement following the Constraints Planning and Field Development Procedure (Appendix 4.1). This will result in appropriate avoidance and mitigation measures being adopted to minimise disturbance to this species.

Notwithstanding application of the micro-siting procedure which should ensure that *Helicteres macrothrix* is not disturbed at all, the impact assessment presented below takes a precautionary approach and assumes that if the species is present within the final project footprint (and some degree of impact is unavoidable), it is also present in immediately adjacent habitat that is outside the footprint – in other words, any local occurrences of the species are not confined to the narrow OHTL Corridor.

Given this species Endangered status, the presence of a single individual can be considered an 'important population.' Table 5-26 presents a significant impact assessment using the criteria contained within the EPBC Significant Impact Guidelines 1.1 (DEWHA 2013). The conclusion is that it is unlikely that project activities will have a significant impact upon *Helicteres macrothrix*. Even if this restricted-range species is present within the OHTL footprint, its occurrence will almost certainly be very localised, and therefore the Project's design can be altered to avoid or minimise impacts to it.

Table 5-26: Significant impact assessment for Helicteres macrothrix

Criterion	Summary of mitigation measures and significant impact assessment
Lead to a long-term decrease in the size of a population	According to DEWHA (2008b) and Cowie et al. (2012), the current estimated total number of individuals of Helicteres macrothrix is in the 100,000's. Given the inherently low likelihood that the small areas of modelled habitat for this species within the OHTL actually support the species – and the fact that the micro-siting procedure will survey for this species and avoid any occurrences – it is unlikely that any Helicteres macrothrix will be lost because of project activities. Moreover, if there are undetected occurrences of *Helicteres macrothrix* within the OHTL footprint – or micro-siting cannot avoid disturbance to all of a local occurrence of the species – then the narrowness of the footprint means that the proportion of habitat and individuals that will be destroyed is likely to be very small compared with that available in adjacent areas, as well as regionally. Loss of individual *Helicteres macrothrix* within narrow swathes is unlikely to result in a long-term decrease in the size of the species' population.
Reduce the AOO of the species	*Helicteres macrothrix* is known from three populations with an AOO of only ~0.60 km^2 (DoE 2022). There remain large areas of habitat for this species that are yet to be surveyed, so this is likely an under-estimate. Determining AOO is based on the IUCN 2 x 2 km grid cell method. If *Helicteres macrothrix* is recorded within the OHTL footprint – and its loss cannot be avoided –

Criterion	Summary of mitigation measures and significant impact assessment
	the only way that loss can lead to a reduced AOO is if it is entirely confined to within the OHTL footprint. In other words, if the plants lost constitute the entire local occurrence, and there are no other nearby occurrences, then this could lead to a reduced AOO. Where *Helicteres macrothrix* is known to occur, it is usually in patches larger than what could be encapsulated entirely within the OHTL footprint. Moreover, the micro-siting procedure will minimise any loss of *Helicteres macrothrix* plants. Consequently, it is very unlikely that this scenario will eventuate.
Fragment an existing population into two or more populations	Across its range, *Helicteres macrothrix* occurs in patches separated by areas of unsuitable habitat. The clearance footprint of the OHTL does not bisect any known patches. If new occurrences are identified in the OHTL Corridor, there will not be any disturbance to these unless spanning distance limitations unavoidably require some loss of plants, in which case the aim will be to minimise how many plants are lost and to ensure connectivity of the patch.
Adversely affect habitat critical to the survival of the species	Critical habitat has not been identified for *Helicteres macrothrix*. This concept is arguably not relevant for rare species with very restricted habitat requirements; it can be assumed that the few locations within which the species occurs constitutes critical habitat. Impacts to critical habitat will be minimised through application of the micro-siting procedure.
Disrupt the breeding cycle of a population	Helicteres is a genus of flowering plants. It is not known how *Helicteres macrothrix* is pollinated, but presumably it is by insects. Regardless, it seems unlikely that clearing a narrow corridor through a *Helicteres macrothrix* patch would disrupt pollination of that patch.
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent the species is likely to decline	For the reasons given in this table, it is unlikely that the loss, or decrease in quality, of habitat because of project activities will cause a decline in the species.
Result in invasive species, that are harmful to the species, becoming established in the species' habitat	The Conservation Advice (DEWHA 2008c) identifies weed invasion by Gamba Grass (*Andropogon gayanus*) and Mission Grass (*Pennisetum polystachion*) as a major threat to *Helicteres macrothrix.* These weeds may alter fire frequency and intensity, as well as out-competing individual plants. The Weed Management Plan presented in Appendix 5.3 has been developed to minimise introduction and proliferation of weeds within the area of influence for the life of the Project.
Introduce disease that may cause the species to decline	Disease is not listed as a threatening process for *Helicteres macrothrix*. The author is not aware of any literature on diseases that could be introduced by the project and that would detrimentally affect this species.
Interfere with the recovery of a species	There is no Recovery Plan for this species. In the Conservation Advice (DEWHA 2008c), the main identified threats are land clearing for development and weed invasion by Gamba Grass and Mission Grass. The OHTL is designed to minimise clearing of suitable habitat for *Helicteres macrothrix*. The Weed Management Plan has been developed to minimise introduction and proliferation of weeds within the Project's area of influence.

5.6.3.8 Nabarlek (Top End) (Petrogale concinna canescens)

The Nabarlek (Top End sub-species) is listed as Endangered under both the EPBC and *TPWC Act*. The Nabarlek is a small rock wallaby, once recorded on sandstone cliffs from the Arafura Swamp to the Daly River, and now thought to be restricted to the western Arnhem Land escarpment (DEPWS, 2021m). Nabarleks are nocturnal most of the year, sheltering in caves, cliffs and rockpiles during the day, emerging to feed on sedges, grasses and forbs, and sometimes travelling out onto black soil plains to feed (DEPWS 2021m).

The Nabarlek population is considered to have experienced a marked decline in the past few decades; however, there has been limited targeted survey effort for the species, and results of broad surveys are not considered comprehensive or exhaustive on Nabarlek sub-populations (TSSC 2015e). There are few recent (2009) records of the Nabarlek – in the western Arnhem Land plateau – which are 140 km from the Project. The closest historic record (1990) to the footprint is 21 km to the east in the Adelaide River region. DCCEEW (2022) species distribution for the Nabarlek intersects the project footprint, indicating suitable habitat – sandstone and granite cliffs and outcrops – may occur within the OHTL Corridor – within the historic range of the Nabarlek. A review of aerial imagery indicates that the OHTL Corridor intersects with up to 14 rocky areas that could provide suitable habitat for Nabarlek. These mapped areas will be assigned a Medium constraint rating and managed in accordance with Constraints Planning and Field Development Procedure (Appendix 4.1).

Threats and impact on the Nabarlek are poorly understood (DEPWS, 2021m). The Conservation Advice lists plausible threats as predation by Feral Cats, habitat loss and fragmentation from inappropriate fire regimes and land development such as mining (TSSC, 2015e).

Table 5-27 assesses whether project activities are likely to have a significant impact upon this species (as defined in EPBC Significant Impact Guidelines 1.1). The conclusion is that because the Nabarlek is unlikely to occur within the project footprint, impacts to suitable habitat will be minimised through micro-siting, the area of suitable habitat is very small and narrow, the implementation of mitigation (pre-clearance surveys and use of a fauna spotter-catcher) – this species is unlikely to be significantly impacted by the Project.

Table 5-27: Significant impact assessment for the Nabarlek (Top End)

Criterion	Summary of mitigation measures and significant impact assessment
Lead to a long-term decrease in the size of a population	Given the mobile nature of the species, there is unlikely to be any direct mortality of individual Nabarleks because of interactions with construction machinery. Furthermore, the Proponent will minimise the impact of OHTL construction on this species through avoidance of disturbing rocky shelter areas, a pre-clearance surveying of suitable denning habitat, and use of a fauna spotter-catcher. The only other way in which this development could potentially lead to a long-term decrease in the size of the Nabarlek population is through substantial loss of critical habitat – which is discussed and discounted below.
Reduce the AOO of the species	The AOO of the Nabarlek is estimated to be less than 2,000 km^2 (TSSC, 2015e); however, this is considered under-estimated due to limited sampling. Nabarlek habitat is potentially present within the OHTL footprint – primarily along the northern 361 km. Due to the nature of the relevant project component – a narrow, linear corridor for the OHTL – rocky areas identified within the intended route, will likely be avoided or spanned between OHTL structures. Under the grid cell method, the only way that a habitat loss can lead to a reduced AOO is if it is entirely confined to within the OHTL footprint. In other

Criterion	Summary of mitigation measures and significant impact assessment
	words, if the habitat resources lost constitute the entire local occurrence of those resources, and there are no other nearby occurrences, then this could lead to a reduced AOO. However, potential Nabarlek habitat is not restricted to the OHTL footprint. Therefore, the potential small area lost will not result in a reduced AOO.
Fragment an existing population into two or more populations	There are no records of Nabarleks within the project footprint. Therefore, there are no known populations that could be fragmented by development of the project.
Adversely affect habitat critical to the survival of the species	Critical habitat is not described for Nabarleks; however, it can be inferred to be rugged rocky sites (TSSC, 2015e). Analysis was completed using land systems from the North_250 dataset within the distribution of Nabarleks (DCCEEW, 2022). Land systems with outcrops, sandstone, limestone or plateaux[6] were selected to determine the area of potential habitat within the footprint of the Project and the surrounding 20 km. The proportion of Nabarlek potential habitat present within the project footprint compared within the surrounding 20 km is 0.15%. This occurs across 269 km of the OHTL Corridor. Due to the nature of the relevant project component – a narrow, linear corridor for the OHTL – rocky areas identified within the intended route, will likely be avoided, or spanned between OHTL structures. Doing so will minimise the likelihood of adversely affecting habitat critical to the survival of the species. Conversely, critical habitat could be considered to be the three known locations in the western Arnhem Land plateau, none of which will be impacted by the Project.
Disrupt the breeding cycle of a population	Populations of Nabarleks are not known, or likely, to occur within the project footprint. Therefore, the breeding cycle of a population will not be disrupted by the development of the Project.
Modify, destroy, remove, isolate, or decrease the availability or quality of habitat to the extent the species is likely to decline	For the reasons given in this table, it is unlikely that the loss, or decrease in quality, of suitable habitat because of project activities will cause a decline in the species.
Result in invasive species, that are harmful to the species, becoming established in the species' habitat	Predation by Feral Cats is likely a severe threat to Nabarleks, and changes to the floristic structure of habitat by invasive grasses directly or by fire are also possible threats (TSSC, 2015e). Feral fauna species are already common in the region, and development of the Project is unlikely to lead to any substantial change in their occurrence. The Weed Management Plan presented in Appendix 5.3 has been developed to minimise introduction and proliferation of weeds within the project area of influence for the life of the Project.
Introduce disease that may cause the species to decline	Disease is not listed as a threatening process for Nabarlek's. The author is not aware of any literature on diseases that could be introduced by the project and that would detrimentally affect this species.

[6]Land systems: Baker, Bend, Bustard, Currency, Hayes, Hayward, Kimbyan, Klatt, Mullaman 1, Rumwaggon, Stray, Tolmer, Wingate 1, Wingate 2, Woodcutter, Wriggley.

Criterion	Summary of mitigation measures and significant impact assessment
Interfere with the recovery of a species	There is no national Recovery Plan for the Nabarlek. The Conservation Advice (TSSC, 2015e) priorities recommend management actions – including active mitigation of threatss through reductions in abundance of Feral Cats and the frequency of high intensity fires. Development of the Project will not interfere with these actions.

5.6.3.9 Night Parrot (Pezoporus occidentalis)

The Night Parrot is listed as Endangered under the *EPBC Act* and Critically Endangered under the *TPWC Act*. The Night Parrot is an elusive, nocturnal, ground-dwelling bird that has an extremely sparse distribution across the arid region. Its preferred habitat is long unburnt flat spinifex (*Triodia* spp.) grasslands in stony or sandy environments; and samphire and chenopod shrublands – including genera such as *Atriplex, Bassia* and *Maireana* – on floodplains and claypans, and on the margins of salt lakes, creeks, or other sources of water (TSSC, 2016e).

In the NT, there have been no confirmed sightings of Night Parrot since 1923 in the Alice Springs region. With similar results elsewhere in Australia, the species was considered extinct until the Night Parrot was recently recorded in undisclosed locations in western Qld and northern-western WA (TSSC 2016e).

Threats to the Night Parrot are poorly understood. Probable key threats include altered fire regimes and associated habitat degradation – given the species' dependence on mature spinifex – as well as predation by Feral Cats and Red Foxes – night parrot decline in Alice Springs coincided with arrival of Feral Cats (DEPWS, 2021n; TSSC, 2016e).

Cwth Government distribution modelling indicate that Night Parrot habitat may occur, intersecting the project footprint at Powell Creek and to KP88 along the OHTL Corridor (DECCW, 2022). The Powell Creek project footprint supports spinifex grasslands (dominated by *Triodia pungens*) that could be suitable for the Night Parrot; however, the majority of that project footprint has burnt at least 3 times in the past 20 years. Consequently, the project footprint is deemed as not suitable for the species (as they require long unburnt patches of vegetation). This was confirmed by field observations made during land type mapping (Appendix P of the Draft EIS) and it was clear that there are no 'fire shadow' areas with large old spinifex hummocks within the Project footprint. As such, the project footprint is deemed to be not suitable for Night Parrot.

Given this species Endangered status, the presence of a single individual can be considered an 'important population.' Table 5-28 presents a significant impact assessment using the criteria contained within the EPBC Significant Impact Guidelines 1.1 (DEWHA, 2013). The conclusion is that it is unlikely that project activities will have a significant impact upon the Night Parrot. The species is unlikely to be within the project footprint because there is no suitable habitat due to the high fire frequency.

Table 5-28: Significant impact assessment for the Night Parrot

Criterion	Summary of mitigation measures and significant impact assessment
Lead to a long-term decrease in the size of a population	As explained above, populations of the Night Parrot are not known, or likely, to occur within the project footprint.
Reduce the AOO of the species	The project footprint is not within the AOO of the Night Parrot (Garnett et al., 2021) and, as such, land disturbance associated with the Project will not reduce the AOO of the species.
Fragment an existing population into two or more populations	Because the project footprint does not intersect with – nor pass between any Night Parrot populations – it is unlikely that populations will be fragmented as a result of land disturbance associated with the Project.
Adversely affect habitat critical to the survival of the species	Habitat for Night Parrots vary between reports and observations (TSSC, 2016e). Most Night Parrot records are within *Triodia* grasslands and/or chenopod shrublands, with roosting and nesting sites consistency within clumps of dense vegetation, primarily old and large spinifex clumps. Within the project footprint the *Triodia* spp. grasslands are generally 'young hummock' due to relatively high frequency of fire (every 3 to 10 years) rather than the preferred dense and old *Triodia* hummocks. Given the lack of preferred roosting and nesting habitat, it is unlikely that the land disturbance associated with the Project will adversely affect habitat critical to the survival of the species.
Disrupt the breeding cycle of a population	Breeding and nesting by the Night Parrot occurs within long unburnt spinifex hummocks (DEPWS, 2021n). Due to the fire frequency within Powell Creek Station, it is unlikely that such habitat is present.
Modify, destroy, remove, isolate, or decrease the availability or quality of habitat to the extent the species is likely to decline	The absence of suitable habitat within the project footprint means it is unlikely that the loss, or decrease in quality, of habitat because of project activities will cause a decline in the Night Parrot.
Result in invasive species, that are harmful to the species, becoming established in the species' habitat	Predation by Feral Cats and Foxes is a known threat to the Night Parrot (TSSC, 2016e). Whilst linear clearings are known to assist cat movements (see, e.g., Wysong et al., 2020), cats are already present in the region and the OHTL already contains a linear clearing for railway infrastructure, therefore the Project will not increase this impact. Red Foxes are not expected to occur within the project footprint because the Solar Precinct is at the northern edge of their range, and evidence of presence was not detected during the Solar Precinct field surveys. Altered fire regimes are another threatening process (TSSC, 2016e). This could occur if the environmental weed Buffel Grass (*Cenchrus ciliaris*) is introduced into area by construction or operations activities. The Weed Management Plan presented in Appendix 5.3 has been developed to minimise introduction and proliferation of weeds within the area of influence for the life of the Project.
Introduce disease that may cause the species to decline	The Conservation Advice (TSSC, 2016e) considers disease – psittacine beak and feather disease– as a low concern threat to the Night Parrot, provided sufficient control measures are imposed. Regardless of how real this threat is to Night Parrots, there is no nexus between the activities associated with the Project and introduction of a disease into the region.

Criterion	Summary of mitigation measures and significant impact assessment
Interfere with the recovery of a species	There is no Recovery Plan for the Night Parrot. The Conservation Advice (TSSC, 2016e) discusses an interim conservation strategy *'…to secure the only known extant population by eliminating or minimising key local threats, improving knowledge of species biology and ecology, identifying the most effective survey methods, and identifying and securing further populations across its former range…'*. This Project does not interfere with the strategy as no known populations occur within the project footprint.

5.6.3.10 Northern Brush-tailed Phascogale *(Phascogale pirata)*

The Northern Brush-tailed Phascogale is listed as Vulnerable under the *EPBC Act* and Endangered under the *TPWC Act*. The species is an elusive and poorly known mammal. It is a small, nocturnal, intermediate-sized, hollow-dwelling, carnivorous marsupial (DEPWS, 2021o). The Northern Brush-tailed Phascogale is endemic and restricted to the coastal Eucalypt savannas in the Top End (Geyle et al., 2020). Only a small number of mainland records exist, all from tall open Eucalypt forests (DEPWS, 2021o). There is evidence of a decline in both population and distribution of this species across the Top End (Woinarski et al., 2014). Melville Island is a stronghold for this species, as the Northern Brush-tailed Phascogale has not been recorded on the mainland for more than fifteen years, despite targeted survey effort (Geyle et al., 2020). Targeted surveys at Gunn Point (Stokeld et al., 2020), Middle Arm (Hill, 2020), across Darwin (Stokeld and Gillespie, 2015) and Kakadu (DEWHA, 2010) failed to detect the species. Species distribution modelling for areas the species is likely and may occur intersect the project footprint at Gunn Point and along the OHTL to KP 334 (DECCW, 2022). The mapped areas will be assigned a high constraint rating and managed in accordance with the Constraints Planning and Field Development Procedure (Appendix 4.1).

Threats to the Northern Brush-tailed Phascogale are poorly understood. Species decline at best-known localities coincided with the arrival of Cane Toads – presumably toxicosis from Cane Toad consumption alike other dasyurids – although in some localities, species decline began before arrival of Cane Toads (DEPWS, 2021o). Other probable key threats include Feral Cat predation – given the species is within the critical weight range (Murphy and Davies, 2014) – or possible disease, as well as habitat modification and fire regime changes (DEWHA, 2010).

Based on current distribution and habitat suitability, the Northern Brush-tailed Phascogale could be present within the project footprint as far south as Larrimah.

Table 5-29 assesses whether project activities are likely to have a significant impact upon this species (as defined in EPBC Significant Impact Guidelines 1.1). The conclusion is that because the proportion of Northern Brush-tailed Phascogale habitat within the project footprint is very small and narrow – combined with the implementation of avoidance (micro-siting) and mitigation (pre-clearance surveys and use of a fauna spotter-catcher) measures – the impacts to this species associated with the Project are unlikely to be significant.

Table 5-29: Significant impact assessment for the Northern Brush-tailed Phascogale

Criterion	Summary of mitigation measures and significant impact assessment
Lead to a long-term decrease in the size of a population	No known populations of the Northern Brush-tailed Phascogale are present in the project footprint, or within 20 km. Suitable habitat – areas with large hollow-bearing trees suitable for shelter – may occur within the northern length of the OHTL (as far south as Larrimah), Murrumujuk and northern electrode footprints. The Northern Brush-tailed Phascogale is mobile, which lowers the likelihood of direct mortality during land-clearing activities. Furthermore, the Proponent will mitigate the impact of construction on this species through avoidance of clearing hollow-bearing trees suitable for shelter (if possible), pre-clearance surveying and the presence of a fauna spotter/catcher during clearing.
Reduce the AOO of the species	The AOO of the Northern Brush-tailed Phascogale is estimated as less than 9,000 km^2, acknowledging that the species is poorly surveyed across its range (Geyle et al., 2020). It was calculated using a 2 x 2 km grid cell method, based on the IUCN Red List Categories and Criteria (2019). Northern Brush-tailed Phascogale habitat is present within Gunn Point and the OHTL footprint – primarily along the northern 449 km. The loss of some of that habitat cannot be avoided. Under the grid cell method, the only way that a habitat loss can lead to a reduced AOO is if it is entirely confined to within the OHTL footprint. In other words, if the breeding/foraging resources lost constitute the entire local occurrence of those resources, and there are no other nearby occurrences, then this could lead to a reduced AOO. However, because Northern Brush-tailed Phascogale habitat requirements are quite broad within its distribution, habitat is not restricted to the project footprint. Therefore, its loss will not result in a reduced AOO.
Fragment an existing population into two or more populations	The Northern Brush-tailed Phascogale is a mobile animal capable of traversing narrow cleared areas like the OHTL footprint. Such an area will not represent a barrier for dispersal of this species.
Adversely affect habitat critical to the survival of the species	Critical habitat for the Northern Brush-tailed Phascogale has not been formally defined. In lieu of such, the most limiting of the species' habitat requirements could be considered 'critical'. For the Northern Brush-tailed Phascogale, this is day-time shelter in tree hollows. Such habitat occurs within the project footprint – within the dominant vegetation type across the species entire range – Eucalypt forests. Hollow-bearing trees and logs which may constitute habitat will be avoided as much as possible during micro-siting. Consequently, loss of such habitat within the project footprint represents a negligible proportion of suitable habitat for the species, and so will not have an adverse effect or lead to the decline of the species.
Disrupt the breeding cycle of a population	There is an inherently low likelihood that Northern Brush-tailed Phascogales will be breeding within a project footprint which is very narrow and localised within the species' distribution. Nevertheless, the micro-siting which avoids large hollow-bearing trees, supported by fauna spotter-catcher mitigation will minimise the likelihood that the breeding cycle is disrupted.

Criterion	Summary of mitigation measures and significant impact assessment
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent the species is likely to decline	As discussed above, the habitat requirements for Northern Brush-tailed Phascogales are broad – coastal Eucalypt woodlands and forests in the Top End. Such habitat occurs within the project footprint. However, it is also the dominant vegetation type across the population's entire range. Analysis was completed using MVGs from the NVIS 6.0 within the full distribution of the Northern Brush-tailed Phascogale (DCCEEW, 2022). MVG's[7] Eucalypt Forests and Woodlands were selected to determine the area of habitat within the project footprint and the surrounding 20 km. The proportion of Northern Brush-tailed Phascogale habitat present within the project footprint compared within the surrounding 20 km is 0.13%. This occurs across 449 km of the OHTL and at Gunn Point. The loss of such a small and narrow area of habitat is unlikely to modify, destroy, remove, isolate, or decrease the availability or quality of habitat to the extent the species is likely to decline.
Result in invasive species, that are harmful to the species, becoming established in the species' habitat	Feral Cats and Cane Toad introduction on West Island coincides with the probable local extinction on that island of the Northern Brush-tailed Phascogale (DEWHA 2010) suggesting threats include predation and poisoning by these invasive species. Invasive grasses such as Gamba Grass (with large biomasses that increase fire intensity and reduces hollow availability) are considered likely threats to the Northern Brush-tail Phascogale (DEWHA, 2010). Feral Cats and Cane Toads are already common in the region, and development of the Project is unlikely to lead to any substantial change in their occurrence. The Weed Management Plan presented in Appendix 5.3 has been developed to minimise introduction and proliferation of weeds within the area of influence for the life of the Project.
Introduce disease that may cause the species to decline	Disease is considered to be a potential threat to the Northern Brush-tailed Phascogale (DEWHA 2010). Regardless of how real this threat is to Northern Quolls, there is no nexus between the activities associated with the Project and introduction of a disease into the region.
Interfere with the recovery of a species	There is no recovery plan for the Northern Brush-tailed Phascogale. The Conservation Advice (DEWHA, 2010) lists regional and local priority actions to support the recovery of the Northern Brush-tailed Phascogale. Development of the Project will not interfere with any of these actions.

5.6.3.11 Northern Quoll (Dasyurus hallucatus)

The Northern Quoll is a large carnivorous marsupial listed as Endangered under the *EPBC Act* and Critically Endangered under the *TPWC Act*. Prior to the establishment of Cane Toads (*Rhinella marina*) within the Top End, the Northern Quoll was known to occur in a wide range of habitats but is now seemingly restricted to the rocky areas of Eucalypt open forest (Van Dam et al., 2002) which are less suitable for Cane Toad populations. It is a nocturnal predator and shelters in hollow logs, tree hollows, rock crevices and caves (TSSC, 2005). The Northern Quoll's home range varies from 35 ha to 100 ha (Oakwood, 2008).

The Northern Quoll occurs across northern Australia; however, it has declined throughout much of its range (Stokeld and Gillespie, 2015) which is primarily associated with Cane Toad ingestion and subsequent mortality (Oakwood, 2003; Van Dam et al., 2002). However, other contributing

[7] MVG's 3, 4, 5, 11 and 12

threatening processes include inappropriate fire regimes, predation by cats and dogs, and removal, degradation, and fragmentation of habitat (Hill and Ward, 2010).

Based on current distribution and habitat suitability, the Northern Quoll could be present within the project footprint potentially as far south as Daly Waters. The mapped potential habitat for the species (rocky rugial areas) where it intersects the project footprint will be assigned a medium constraint rating and managed in accordance with the Constraints Planning and Field Development Procedure (Appendix 4.1).

Table 5-30 presents an assessment of whether project activities are likely to have a significant impact on the Northern Quoll, using the criteria contained within the EPBC Significant Impact Guidelines 1.1 (DEWHA, 2013). Critical habitat for the species will not be disturbed by project activities. This, combined with the fact that the regional proportion of Northern Quoll habitat within the project footprint is very small, and the implementation of mitigation measures (pre-clearance surveys and use of a fauna spotter-catcher) – means that the impacts to this species associated with the Project are unlikely to be significant.

Table 5-30: Significant impact assessment for Northern Quoll

Criterion	Summary of mitigation measures and significant impact assessment
Lead to a long-term decrease in the size of a population	The Northern Quoll is mobile, which lowers the likelihood of direct mortality during land-clearing activities for the Project. Furthermore, the Proponent will mitigate the impact of OHTL construction on this species through avoidance of disturbing rocky refugial areas, a pre-clearance surveying of suitable denning habitat, and use of a fauna spotter-catcher. The only other way in which this development could potentially lead to a long-term decrease in the size of the Northern Quoll population is through substantial loss of critical habitat – which is discussed and discounted below.
Reduce the AOO of the species	The AOO of the Northern Quoll is estimated to be 2020 km^2; however, this is expected to be a significant under-estimate due to limited sampling across the occupied range (Woinarski et al., 2014). It was calculated using a 2 x 2 km grid cell method, based on the IUCN Red List Categories and Criteria (2019). Northern Quoll habitat is present within Murrumujuk and OHTL footprints (potentially as far south as Daly Waters). The loss of some of that habitat cannot be avoided. Under the grid cell method, the only way that a habitat loss can lead to a reduced AOO is if it is entirely confined to within the project footprint. In other words, if the breeding/foraging resources lost constitute the entire local occurrence of those resources, and there are no other nearby occurrences, then this could lead to a reduced AOO. However, because the Northern Quoll's habitat requirements are quite broad within its distribution, habitat is never restricted to the project footprint. Therefore, loss of such small areas of habitat will not result in a reduced AOO.
Fragment an existing population into two or more populations	The Northern Quoll is a mobile animal capable travelling long distances. A narrow, cleared area adjacent to a railway line will not represent a barrier for dispersal of this species.
Adversely affect habitat critical to the survival of the species	Hill and Ward (2010) define habitat critical to survival of Northern Quolls as locations where the species is least exposed to threats, or least likely to be in the future – identifying two broad habitat types that fall into this category: rocky areas and offshore islands. The latter is not relevant to the Project. Rocky areas provide prime habitat for Northern Quolls for many reasons (as detailed in Begg 1981, Braithwaite, and Griffiths, 1994, Oakwood, 2000). Defining and mapping such areas is challenging because of their diverse and dispersed nature.

Criterion	Summary of mitigation measures and significant impact assessment
	Using the North_250 Land System dataset, an analysis has been undertaken of the available rocky refugial habitat within the OHTL, in comparison to that available within 20 km of the OHTL. The results were that: There is 8,155 km^2 of rocky habitat mapped within the 20 km buffer. Of this, 12.1 km^2 (0.15%) is within the project footprint. This may be an overestimate because some of that habitat may have been cleared for the railway and associated infrastructure. Disturbance to such habitat will be minimised because it will be spanned whenever possible (for engineering reasons as well as ecological). The loss of such small proportions of this important habitat cannot be considered likely to have an adverse effect on the survival of the Northern Quoll.
Disrupt the breeding cycle of a population	Clearing of refugial habitat that is in use by Northern Quolls could disrupt the breeding cycle of the species. However, given the very small proportion of locally-available refugial habitat within the disturbance footprint – and the fact that disturbance to that habitat will be minimised through avoidance as part of the Constraints Planning and Field Development Procedure (Appendix 4.1) – the inherent likelihood of the project leading to a disruption in the breeding cycle of a population is very low.
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent the species is likely to decline	As discussed above, the general habitat requirements for the Northern Quoll is broad – Eucalypt forests in the Top End. Such habitat occurs within the project footprint. However, it is also the dominant vegetation type across the population's entire range. Analysis was completed using MVGs from the NVIS 6.0 within the full distribution of the Northern Quoll (DCCEEW, 2022). MVG's Eucalypt Forests[8] were selected to determine the area of habitat within the footprint of the Project and the surrounding 20 km. The proportion of general Northern Quoll habitat present within the project footprint compared within the surrounding 20 km is 0.17%. This is primarily spread along 537 km of the OHTL. In addition, critical refugial habitat will not be disturbed. The loss of such a small and narrow area of habitat is unlikely to modify, destroy, remove, isolate, or decrease the availability or quality of habitat to the extent the sub-species is likely to decline.
Result in invasive species, that are harmful to the species, becoming established in the species' habitat	Feral Cats and Cane Toads are the key threats to the Northern Quoll. These species are already common in the region, and development of the Project is unlikely to lead to any substantial change in their occurrence. Hill and Ward (2010) identify that high-biomass exotic grasses may disadvantage Norther Quolls by inhibiting ground movements and intensifying fire impacts. The Weed Management Plan presented in Appendix 5.3 has been developed to minimise introduction and proliferation of weeds within the area of influence for the life of the Project.
Introduce disease that may cause the species to decline	Disease is considered to be a probable contributing factor to declines in other species of quoll, but there is no direct evidence of disease affecting Northern Quolls (Hill and Ward, 2010). Regardless of how real this threat is to Northern Quolls, there is no nexus between the activities associated with the Project and introduction of a disease into the region.
Interfere with the recovery of a species	The recovery actions within the National Recovery Plan for the Northern Quoll (Hill and Ward, 2010) are focused on the threat posed by Cane Toads (and, to a lesser degree, Feral Cats) and on management of known populations. Development of the Project will not interfere with these actions.

[8]MVG numbers 3 and 4.

5.6.3.12 Stylidium ensatum

The trigger plant, *Stylidium ensatum*, is endemic to the NT and inhabits margins of drainage areas in damp heavy clay or peaty soil (Cowie and Westaway, 2012). An Endangered species under both the EPBC and *TPWC Act*s, at the time that the approved Cwth's Conservation Advice (TSSC, 2016g) for this species was written there were only two known sub-populations – Hayes Creek (150 km south of Darwin) and the Howard River. Since then, discovery of multiple occurrences within the Gunn Point has significantly increased the abundance and extent of the total known population.

The main threats to *Stylidium ensatum* are invasion of habitat by weeds, trampling by livestock, modification of hydrology, encroaching urban development, and early dry season burning before these annual plants have produced seeds (TSSC, 2016g).

Stokeld et al. (2020) identified more than 4,000 ha with a moderate or high likelihood of habitat suitability for Stylidium ensatum within Gunn Point peninsula and, in the field, found this species to be widespread and locally abundant, recorded at 12 discrete sites in the Gunn Point, many close to the OHTL Utilities Corridor. A 2021 targeted survey for the species within almost all high likelihood habitat modelled as occurring with the OHTL[9] and northern electrode OHTL Corridors (see Appendix 5.1 for details) found 954 new records in 6 new patches, with 221 records (from 4 patches) occurring within the OHTL – see

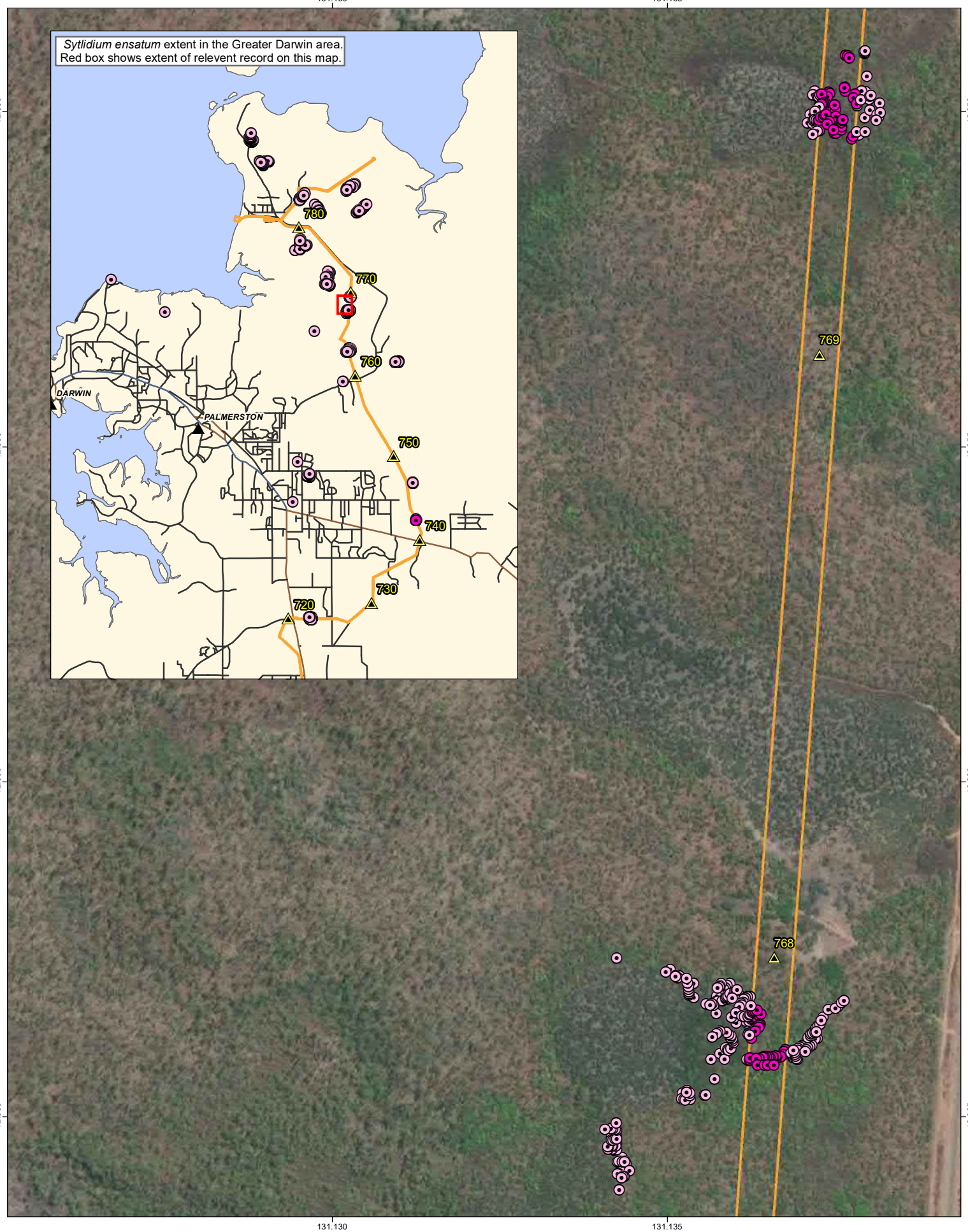
Figure 5-29, Figure 5-30, Figure 5-31 and Table 5-31. No *Stylidium ensatum* plants were located within the northern electrode OHTL, but 149 records were observed approximately 60 m south of the outer edge of the corridor.

Table 5-31: Number of Stylidium ensatum recorded within, and near, the OHTL Utilities Corridor

Location	KP	No. of plants	No. of plants within corridor
Leader's Creek Road*	n/a	149	0
Gunn Point Road (1)	769 – 770	98	48
Gunn Point Road (2)	767 – 768	254	48
Koolpinyah	762 - 764	148	0
Black Jungle Conservation Reserve*	745 – 746	4	0
Lambells Lagoon (Section 1,580)	742 – 743	31	18
Alverly Road	722 – 723	420	107
Total		**1,104**	**221**

**Records from the survey that are not within, or intersecting, the project footprint*

[9] Based on NT Government habitat modelling, there is potential for suitable habitat to occur in Section 572. However, access permission for this site was not gained and so it has not yet been surveyed for *Stylidium ensatum*.



Kilometre Point (KP)
Road
AAPowerLink infrastructure

Stylidium ensatum records

Record inside corridor
Record outside corridor
NTG modelled *Stylidium ensatum* habitat

Source: Sun Cable, EcOz, NTG (NR Maps)

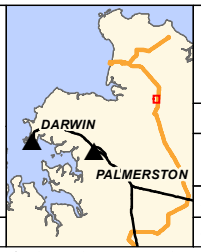


Figure 5-29. Map of *Stylidium ensatum* records at Gunn Point Road within the OHTL Utilities Corridor

Project: Australia-Asia PowerLink

0 100 200 300 Metres

Scale: 1:8,000

Coordinate System: GDA2020

A4

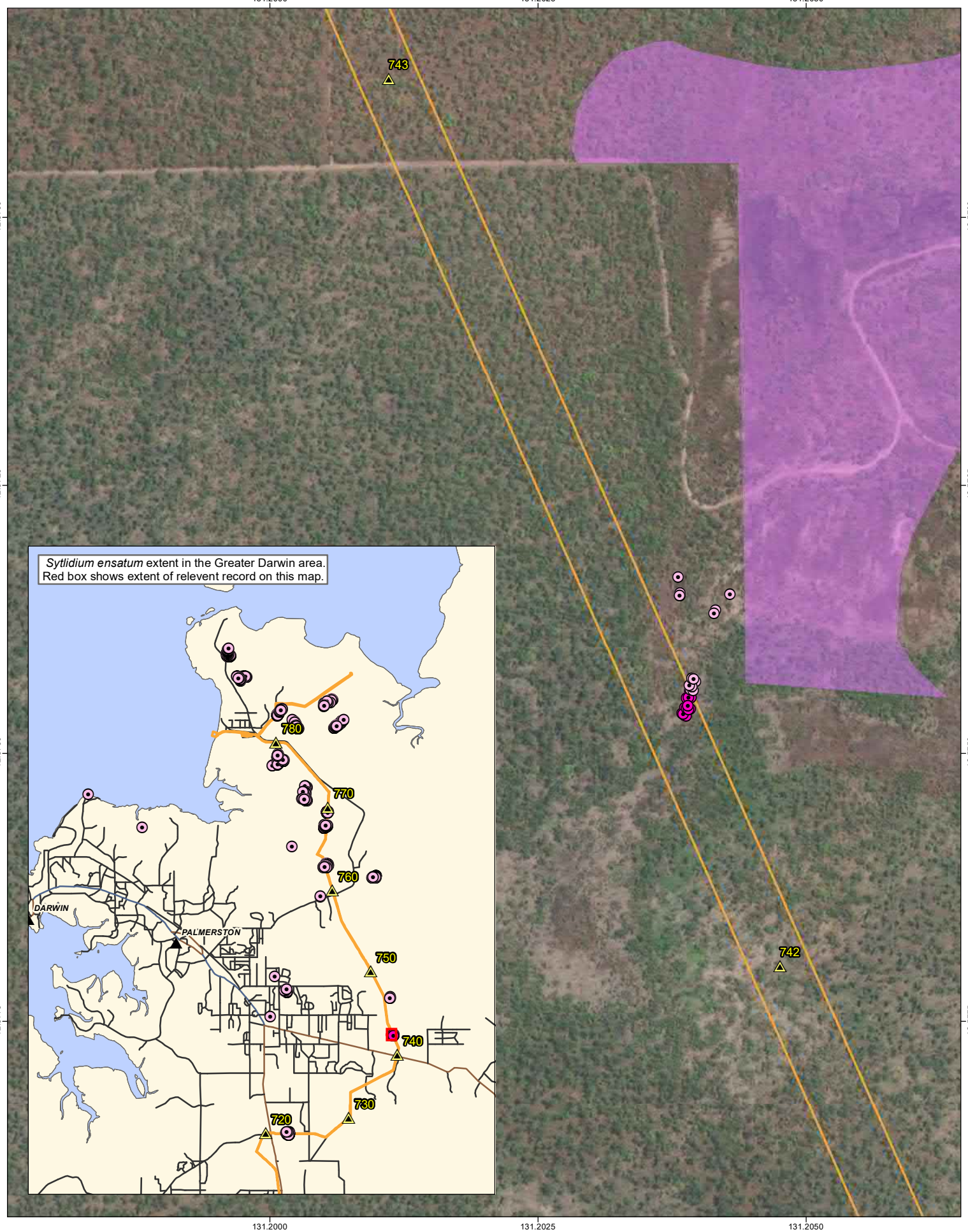
N

Reference: M-Files ID 217502

Date: 18/11/2022

Revision: 1

SUN CABLE AUSTRALIA-ASIA PowerLink



Kilometre Point (KP)
Road
AAPowerLink infrastructure
***Stylidium ensatum* records**
Record inside corridor
Record outside corridor
NTG modelled *Stylidium ensatum* habitat

Source: Sun Cable, EcOz, NTG (NR Maps)

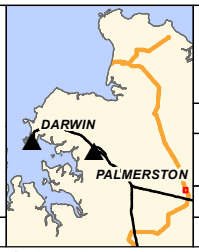


Figure 5-30. Map of *Stylidium ensatum* records at Lambells Lagoon within the OHTL Utilities Corridor

Project: Australia-Asia PowerLink

N

0 50 100 150 200 Metres

Scale: 1:5,000

Coordinate System: GDA2020

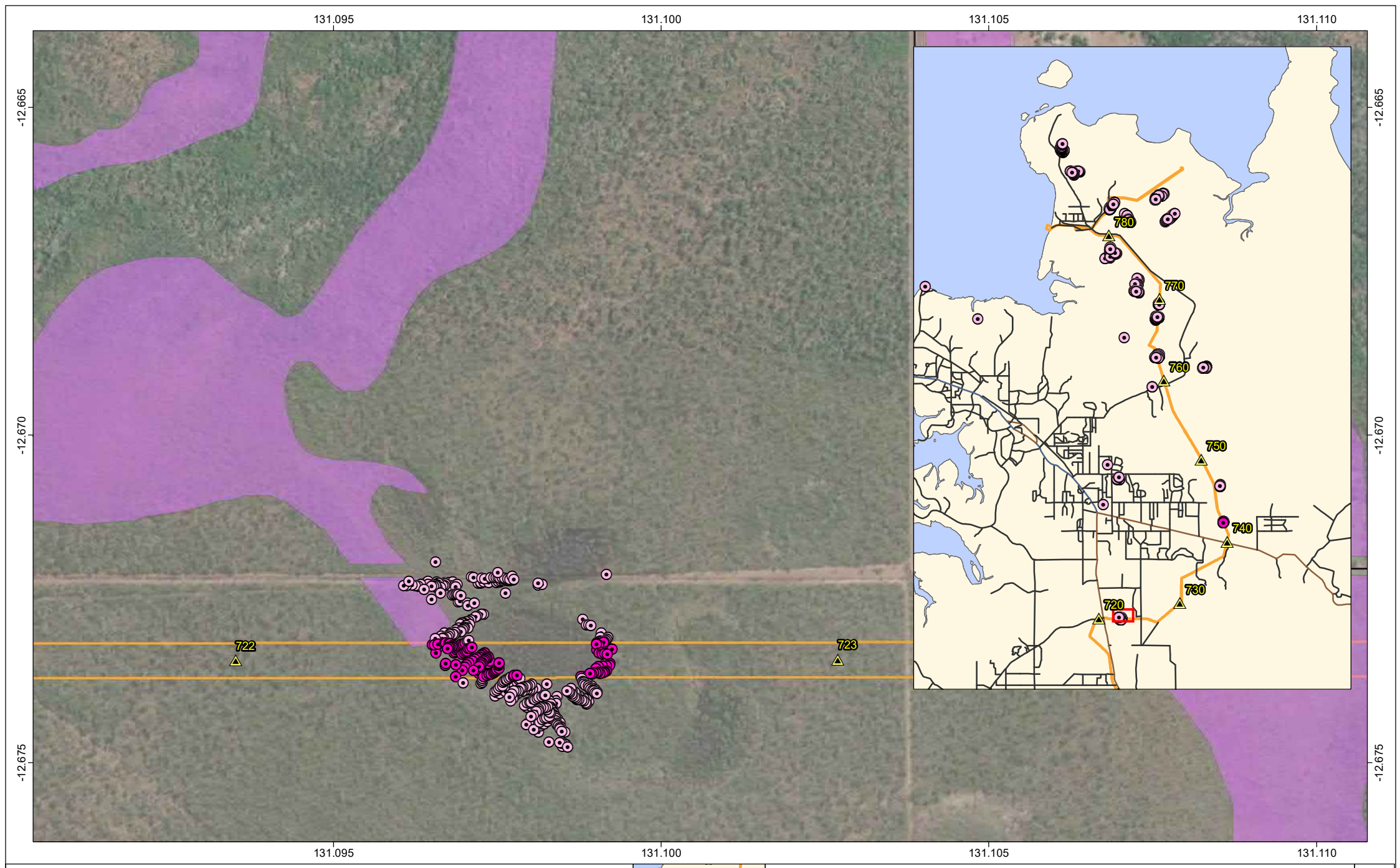
A4

Reference: M-Files ID 217502

Date: 16/11/2022

Revision: 1

SUN CABLE AUSTRALIA-ASIA PowerLink



Kilometre Point (KP)
Roads
AAPowerLink infrastructure

***Stylidium ensatum* records**
Record inside corridor
Record outside corridor
NTG modelled *Stylidium ensatum* habitat

Figure 5-31. Map of *Stylidium ensatum* records at Alverly Road within the OHTL Utilities Corridor

Project: Australia-Asia PowerLink | Reference: M-Files ID 198726 | Revision: 1

Coordinate System: GDA2020 | Date: 18/11/2022

0 80 160 240 320 400 Meters | Scale: 1:8,000 | A4

N

SUN CABLE AUSTRALIA-ASIA PowerLink

Source: Sun Cable, EcOz, NTG (NR Maps)

Areas of high likelihood habitat are modelled as occurring within the OHTL Railway Corridor. An assessment of these areas via high-resolution satellite imagery indicated they are likely to be significantly disturbed, and therefore unsuitable for *Stylidium ensatum* (Appendix 5.2). Previous surveys conducted throughout suitable habitat along the Stuart Highway indicate species absence from those areas (NTG, 2016). Modelled potential habitat – moderate likelihood – is intersected within the OHTL preferred route at Adelaide River from KP 565 and 687 – covering 52.5 ha over 122 km.

The habitat modelling for *Stylidium ensatum* is coarse, and it is the author's experience during previous surveys for this species that it is seldom detected during surveys of modelled high likelihood habitat. Consequently, it is unlikely that the modelled habitat within the OHTL Railway Corridor or preferred route will contain *Stylidium ensatum*.

Known occurrences (records) of *Stylidium ensatum* and modelled high likelihood habitat that is within the Project footprint or area of influence will be assigned Very High and High constraint ratings respectively and managed in accordance with the Constraints Planning and Field Development Procedure (Appendix 4.1).

The Proponent has committed to not disturbing the *Stylidium ensatum* records within the OHTL and buffering them by 50 m, with possibly one exception. The spatial extent of the Alverly Rd patch of *Stylidium ensatum* is such that it may not be possible to completely span all plants. Consequently, some disturbance may be unavoidable on the eastern side of the patch, with the possibility of approximately 12 of the 420 plants recorded in that patch being lost. All other records will be spanned, the access road diverted around them, and the habitat supporting them will consequently not be disturbed in any way.

Given this species Endangered status, the presence of a single *Stylidium ensatum* plant can be considered an 'important population.' Table 5-30 presents an assessment of whether project activities are likely to have a significant impact on *Stylidium ensatum*, using the criteria contained within the EPBC Significant Impact Guidelines 1.1 (DEWHA 2013). The conclusion is that it is unlikely that project activities will have a significant impact upon *Stylidium ensatum*. Impacts to known occurrences of the species – as well as any discovered in the OHTL Corridor – will be minimal, with every effort made to avoid any impacts to all occurrences.

Table 5-32: Significant impact assessment for Stylidium ensatum

Criterion	Summary of mitigation measures and significant impact assessment
Lead to a long-term decrease in the size of a population	In TSSC (2016g), the population size estimated for *Stylidium ensatum* is 11,000 individuals. However, Stokeld et al. (2020) detected thousands of additional plants at multiple Gunn Point sites, noting that 'records were often located along narrow ecotones, often only tens of metres wide'. Surveys for this project contribute another 1,104 records. As mentioned above, approximately 12 plants (possibly none) will be lost within the Utilities Corridor because of spanning distance limitations. This represents 2.8% of that particular patch, and less than 0.01% of the known population. Such a loss is unlikely to lead to a long-term decrease in the size of the *Stylidium ensatum* population. As part of the Constraints Planning and Field Development Procedure (Appendix 4.1), a survey of all modelled high likelihood habitat within the OHTL Corridor will be undertaken at the appropriate time of the year. If *Stylidium ensatum* is detected, then those occurrences will be spanned and left undisturbed unless spanning distance limitations unavoidably require some loss of plants, in which case the aim will be to minimise how many plants are lost and to ensure connectivity of the patch. In such cases, because of the narrowness of the footprint, and the fact that it is likely that the OHTL Corridor will cross *Stylidium ensatum* habitat (i.e., drainage lines) perpendicularly, the proportion of habitat and individuals that

Criterion	Summary of mitigation measures and significant impact assessment
	will be destroyed is very small compared with that available in adjacent areas, as well as regionally. Loss of individual *Stylidium ensatum* within narrow swathes is unlikely to result in a long-term decrease in the size of the species' population.
Reduce the AOO of the species	According to Stokeld et al. (2020), the AOO for *Stylidium ensatum* is 92 km^2, of which 72% is within the Gunn Point region. This is now bigger due to 2021 survey for this project identifying new occurrences. Determining AOO is based on the IUCN 2 x 2 km grid cell method. Where *Stylidium ensatum* occurs within the OHTL footprint and its loss cannot be avoided, the only way that loss can lead to a reduced AOO is if it is entirely confined to within the OHTL footprint. In other words, if the plants lost constitute the entire local occurrence, and there are no other nearby occurrences, then this could lead to a reduced AOO. The narrowness of the OHTL Corridor and its propensity to cross *Stylidium ensatum* habitat perpendicularly mean that it is very unlikely that this scenario will eventuate.
Fragment an existing population into two or more populations	Across its range, *Stylidium ensatum* occurs in patches separated by areas of unsuitable habitat. The clearance footprint of the OHTL does not bisect any known patches. If new occurrences are identified in the OHTL Corridor, there will not be any disturbance to these unless spanning distance limitations unavoidably require some loss of plants, in which case the aim will be to minimise how many plants are lost and to ensure connectivity of the patch.
Adversely affect habitat critical to the survival of the species	Critical habitat has not been identified for *Stylidium ensatum*. This concept is arguably not relevant for rare species like this with very restricted habitat requirements; it can be assumed that the few locations within which the species occurs constitutes critical habitat. Apart from the possible unavoidable disturbance of a small area of habitat in one location, impacts to all critical habitat will be avoided by leaving it undisturbed and by ensuring that any patches downstream of the OHTL are also not disturbed (through spanning and access road diversion).
Disrupt the breeding cycle of a population	*Stylidium* is a genus of trigger plants that are pollinated by insects. Whilst the relevant insect pollinator species for *Stylidium ensatum* are not known, it seems unlikely that clearing a narrow corridor (even if, unavoidably, through a patch) would disrupt pollination of that patch or other patches.
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent the species is likely to decline	For the reasons given in this table, it is unlikely that the loss, or decrease in quality, of habitat because of project activities will cause a decline in the species. Moreover, the OHTL will be constructed such that changes to existing surface hydrology are minimal – see Chapter 6 Hydrology.
Result in invasive species, that are harmful to the species, becoming established in the species' habitat	The Conservation Advice (TSSC, 2016g) identifies weeds as being a potential threat to *Stylidium ensatum*. The Weed Management Plan presented in Appendix 5.3 has been developed to minimise introduction and proliferation of weeds within the project area of influence for the life of the Project.
Introduce disease that may cause the species to decline	Disease is not listed as a threatening process for *Stylidium ensatum*. The author is not aware of any literature on diseases that could be introduced by the project and that would detrimentally affect this species.

Criterion	Summary of mitigation measures and significant impact assessment
Interfere with the recovery of a species	There is no recovery plan for *Stylidium ensatum*. In the Conservation Advice (TSSC, 2016g), the primary conservation action is identified as being to 'protect extant sites from habitat loss and hydrology changes due to urban development and early dry season burning in the Darwin regional area.' Habitat loss associated with this project is negligible, the OHTL is designed to minimise changes to the surface hydrology of watercourses and drainage line it intersects, and neither construction nor operation of the Project will result in an increase in bushfire.

5.6.3.13 Typhonium taylori

Typhonium taylori is a small perennial herb species endemic to the NT which is listed as Endangered under both the EPBC and *TPWC Act*s. The species is restricted to seasonally saturated, nutrient-poor, sand plains or adjoining riparian habitat in the Howard Sand Plains area (DEWHA, 2008c; Liddle and Trikojus, 2010). *Typhonium taylori* is known from a very restricted area – 11 sites within the Howard River catchment, 30 km east of Darwin (Liddle and Trikojus, 2010). The total population size is estimated at 67,000 plants (Liddle and Trikojus, 2010).

Potential threats to *Typhonium taylori* are loss of habitat from changes to the hydrology within the species habitat from impacts of sand mining, vegetation clearing associated with sand-mining and subdivision, and increased water demands from population expansion in the Darwin and Litchfield Shire (DEWHA 2008c; Liddle and Trikojus, 2010).

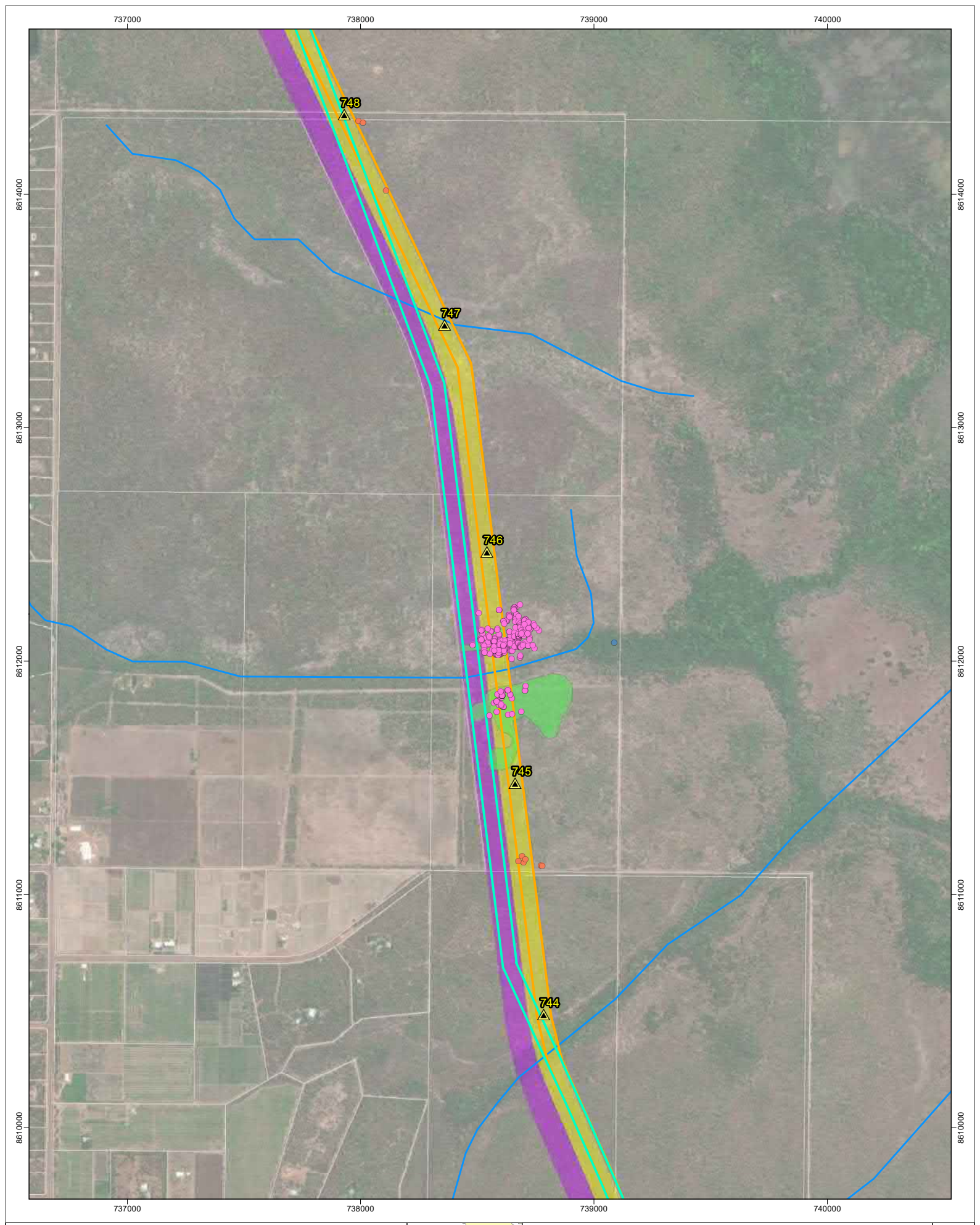
At the time of the EIS, the Project's footprint was approximately 6.8 km from the nearest record and given this species very restricted-range, *Typhonium taylori* was not considered in the Draft EIS. However, the 2022 targeted surveys for sandsheet heath species (see Appendix 5.1) identified potential *Typhonium taylori* plants in suitable habitat in one location along the OHTL in the Utilities Corridor (see Figure 5-32). No other patches of suitable habitat were recorded. A follow-up targeted survey found 386 *Typhonium taylori* plants, of which 153 were observed within the corridor. This increases the number of known sites of this species to 12.

All other sandsheet heath patches surveyed in the OHTL Corridor were determined to have a low likelihood of occurrence of *Typhonium taylori*, due to habitat being too dry, disturbed or otherwise not conforming to habitat requirements for the species. All other components of the Project are outside the Howard River catchment within which this species is restricted.

Known occurrences (records) of *Typhonium taylori* and high likelihood habitat that is within the Project footprint or area of influence will be assigned Very High and High constraint ratings respectively, and managed in accordance with the Constraints Planning and Field Development Procedure (Appendix 4.1).

The Proponent has committed to not disturbing the *Typhonium taylori* records within the OHTL Corridor and buffering them by 50 m if possible. At KP 745, it's not possible to span the species records and the habitat area without disturbance due to the size of the patch. As a solution, a minor route modification is proposed to avoid the population of *Typhonium taylori* which will be determined through on going negotiations with NTG to confirm its feasibility. A proposed option to avoid impacts to the species is for the OHTL to exit the NTG utilities corridor and enter the adjacent NTG's proposed main roads corridor (on western side) for a distance of approximately 1 km before re-entering the NTG utilities corridor and continuing to the DCSA potential deviation around the patch (see Figure 5-32).

Given this species Endangered status, the presence of a single *Typhonium taylori* plant can be considered an 'important population.' Table 5-30 presents an assessment of whether project activities are likely to have a significant impact on *Typhonium taylori*, using the criteria contained within the EPBC Significant Impact Guidelines 1.1 (DEWHA, 2013). The conclusion is that because all populations will be avoided, it is unlikely that project activities will have a significant impact upon *Typhonium taylori*.



Legend

- Kilometre Points
- Watercourses
- Cadastre
- OHTL Corridor
- Potential OHTL Corridor Deviation

Town Planning Zones

- Proposed Main Road
- Utilities

Threatened Flora (EcOz, 20220907)

- *Ptychosperma macarthurii*
- *Typhonium praetermissum*
- *Typhonium taylori*

High Value Habitat (EcOz, 20220815)

- Typhonium taylorii

Source: NTG data - Cadastre and conservation areas. Australian Government data - Railway and roads

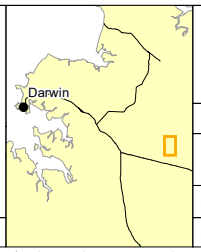


Figure 5-32: Potential Route Deviation - *Typhonium taylorii*

Project: Australia-Asia PowerLink

0 250 500 750

Metres

Scale: 1:20,000 | Datum: GDA2020

Coordinate System: MGA 52 | A4

Reference #: AAPL_GNR_CTA_GEN_MAP_0437

Date: 18/11/2022 | Figure: 1 of 1 | Revision: A

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SUN CABLE AUSTRALIA-ASIA PowerLink

Table 5-33: Significant impact assessment for Typhonium taylori

Criterion	Summary of mitigation measures and significant impact assessment
Lead to a long-term decrease in the size of a population.	As explained above, OHTL route design will ensure that no *Typhonium taylori* plants will be lost and suitable habitat will not be disturbed. This will include avoiding any impacts to the hydrology of this habitat. There is therefore no mechanism that could lead to any of these criteria being met.
Reduce the AOO of the species.	
Adversely affect habitat critical to the survival of the species.	
Modify, destroy, remove, isolate, or decrease the availability or quality of habitat to the extent the species is likely to decline.	
Disrupt the breeding cycle of a population.	
Fragment an existing population into two or more populations.	
Result in invasive species, that are harmful to the species, becoming established in the species' habitat.	Invasive species are not identified as a threat to *Typhonium taylori*. It is feasible that weeds could reduce habitat quality to the detriment of the species. The Weed Management Plan presented in Appendix 5.3 has been developed to minimise introduction and proliferation of weeds within the project area of influence for the life of the Project.
Introduce disease that may cause the species to decline.	Disease is not listed as a threatening process for *Typhonium taylori*. The author is not aware of any literature on diseases that could be introduced by the project and that would detrimentally affect this species.
Interfere with the recovery of a species.	There is no recovery plan for *Typhonium taylori*. The Project will not interfere with any of the priority actions in the species' Conservation Advice (DEWHA, 2008c).

5.6.3.14 Critically Endangered, Endangered and Vulnerable migratory shorebird species

The Directory of Important Habitat for Migratory Shorebirds in Australia (Weller et al. 2020) lists the North Darwin region as one of 15 important shorebird sites in the NT. Gunn Point Beach is within the North Darwin Shorebird Area (SBA). A SBA is intended to correspond with the non-breeding home range of a group of migratory shorebirds. SBAs vary in size, and within large SBAs, smaller 'Count Areas' have been defined and mapped to guide surveys. Count Areas generally correspond with known roosting and feeding areas within an SBA and can feasibly be counted in four hours or less by one or more observers. Tree Point, at the southern extent of Gunn Point Beach, forms one of these Count Areas within the North Darwin SBA. Due to its location, however, it is not surveyed with the same regularity as those Count Areas closer to Darwin. Data held within BirdLife Australia's Birdata database identifies North Darwin SBA as being of international significance and 'Important Habitat' for a suite of migratory shorebird species. Gunn Point Beach in isolation has supported internationally-significant numbers of Great Knot (5 500), and nationally significant numbers of Bar-tailed Godwit (900), Black-tailed Godwit (700), Greater Sand Plover (700), Grey Plover (121), Lesser

Sand Plover (925), Red knot (700), Ruddy Turnstone (160), Sharp-tailed Sandpiper (258), Terek Sandpiper (120) and Whimbrel (200). In addition to these species, Curlew Sandpiper have also been recorded along Gunn Point Beach, but not in numbers exceeding their national significance or 'Important Habitat' threshold.

Seven migratory shorebird species individually listed under the *EPBC Act* have been recorded from the Gunn Point Beach area – see Table 5-34.

Table 5-34: Critically Endangered, Endangered and Vulnerable migratory shorebird species recorded on Gunn Point Beach

Species	Status
Bar-tailed Godwit (northern subspecies) (*Limosa lapponica menzbieri*)	Critically Endangered
Curlew Sandpiper (*Calidris ferruginea*)	Critically Endangered
Far Eastern Curlew (*Numenius madagascariensis*)	Critically Endangered
Great Knot (*Calidris tenuirostris*)	Critically Endangered
Greater Sand Plover (*Charadrius leschenaultii*)	Vulnerable
Lesser Sand Plover (*Charadrius mongolus*)	Endangered
Red Knot (*Calidris canutus*)	Endangered

Note: The EIS also listed Bar-tailed Godwit (western Alaskan subspecies) (*Limosa lapponica baueri*). While both of the subspecies are likely to occur in the NT, ssp. menzbieri is significantly more abundant and is listed as Critically Endangered. As such, both subspecies are covered by this significant impact assessment based on application of the significant impact criteria for a critically endangered species. In addition, the threatened status of these species presented in the Draft EIS were those then current for the NT only, Cwth statuses were not presented. In the prevailing time, the NT and Cwth statuses have been aligned.

Shorebird species on Gunn Point Beach inhabit the coastal zone where they typically feed on invertebrates within the intertidal zone, and roost on the surrounding beaches, at exposed reefs and for some species, in mangrove forest. Aerial surveys and site visits conducted by Chatto (2003) confirmed that the southern Shoal Bay area has one of the highest numbers of shorebird sightings within the Gunn Point region – particularly the coast between Lee Point and Tree Point (i.e., south of Gunn Point Beach) – see Figure 5-33. While Gunn Point beach is identified as Important Habitat for a range of migratory shorebird species, it is the southern extent of the beach which is of the most importance as a critical high tide roosting location – the majority of the high counts of the species noted above have come from this location. A range of migratory shorebird species can be reasonably expected to utilise intertidal foraging habitat along the extent of Gunn Point Beach, where they will be seeking various types of invertebrate species within the sediment. Numbers of these shorebird species are likely to be dispersed along the intertidal parts of the complete beach extent at low tide such that any individual species would be unlikely to occur within or in proximity to the shoreline crossing location in numbers exceeding its respective significance threshold. The area surrounding the proposal has high recreation use which also likely impacts on shorebird presence, as they would be regularly disturbed by recreational users when foraging or roosting (Palmer and Smit 2020). Observations during field investigations for Project Sea Dragon found few shorebirds using the intertidal zone along the adjacent beach, potentially due to a lower abundance of invertebrates due to coarse sandy substrates, and high levels of disturbance by vehicles, people, and pets along the beach.

Habitat for listed migratory shorebird species is limited to Gunn Point Beach and intertidal zone. The project Cable Transition Facilities include the Underground Cable Corridor, the Land Sea Joint Station, and the Shore Crossing Site. Specific to the Gunn Point Beach shoreline, subsea cabling systems will be installed through Gunn Point Beach and into Shoal Bay. This will include the excavation of two trenches, one for each cable system, and consist of an approximate construction corridor footprint width of 63 m. The preferred configuration for each of the two cable systems is a Bipole with Metallic Return, which involves three cables laid parallel: Positive pole (Pole 1), Negative pole (Pole 2) and a Metallic return. Lateral spacing between the cables in each trench will be approximately 4 m, within an approximate trench width of 13.5 m. Based on this specification, and a beach width of up to 300 m (relative to tidal state), the total construction footprint is approximately 1.9 ha, within the identified shoreline crossing site of 25 ha as shown on Figure 2-3. While there may be some disturbance related impacts from construction activities at the shoreline crossing location, i.e., aversion to the use of intertidal foraging area, no direct impacts to migratory shorebird species or their habitats are likely to occur outside of the 1.9 ha construction footprint.

Given the area of Gunn Point Beach and extent of the intertidal zone, the distributions of invertebrate species present are likely to be present across the entire beach front and intertidal zone. Any potential impacts to benthic and intertidal invertebrates arising from EMF and thermal radiation emissions from project cable infrastructure will be restricted to the six linear cable alignments, which in the context of the extent of the broader Gunn Point Beach are negligible. Subsequently, the indirect impacts of EMF and thermal radiation to invertebrate abundance and diversity within such an acute geospatial area, relative to the rest of Gunn Point Beach, are considered highly unlikely to result in a measurable reduction of available foraging resources for migratory shorebirds.

In addition to the known Important Habitat present for multiple migratory shorebird species at Gunn Point Beach, within the North Darwin SBA, many of these species are routinely found across various other parts of the Australian coast as well as inland areas when suitable habitat is present. As outlined in the Draft EIS, Lake Woods is one of the largest temporary freshwater lakes in the NT and tropical Australia, and generally occupies an area of approximately 350 to 500 km after wet season rains (SWE&S, 2021). However, during periods of high rainfall, the lake can occupy up to 1,000 km2, and can retain water for 12 consecutive months. Both nomadic waterbird and migratory shorebird species are likely to overfly Lake Woods and the Solar Precinct on a routine and predictable basis, especially migratory shorebirds during northward and potentially southward migration. The Birdlife Australia Birdata database provides a list of waterbird and shorebird species that are likely to be passing through the region during migration periods. Oriental Plover, Little Curlew, Black-tailed Godwit, Sharp-tailed Sandpiper, Swinhoe's Snipe, Common Sandpiper, Common Greenshank, Wood Sandpiper, Marsh Sandpiper, Australian Pratincole and Oriental Pratincole have all been recorded in the region previously and would be expected to utilise suitable wetland habitat at Lake Woods when available. Satellite and geotracker telemetry data from species which have been studied using such technology, such as Grey Plover, Bar-tailed Godwit, Ruddy Turnstone, Little Curlew, Eastern Curlew, Red Knot, Great Knot, Oriental Pratincole and Whimbrel will demonstrate that most of these species pass through (or over) central Australian regions on route to their breeding grounds in the northern hemisphere. Such studies identify that despite the Solar Precinct's geographic location and surrounding habitat types, it is indeed within the broader East-Asian Australasian Flyway (EAAF) and likely to be seasonally traversed by a suite of waterbird and migratory shorebird species.

The potential impacts of large-scale solar energy developments to avian populations have been widely studied, but only relatively recently given the technology underpinning the sector worldwide has been developing since the early 2000s. A shared feature between large-scale solar facilities of all technology types is that they require relatively large areas in order to capture the sun's energy (MASCWG, 2016). Development and large-scale deployment of utility-scale solar facilities, therefore, represent a large human land use in the environment, which has the potential to affect birds and bird communities in a number of ways and during all project phases (e.g., construction, operations, and decommissioning) (MASCWG, 2016). Section 5.4.3.2 of the Draft EIS discusses the LEH – the hypothesis that bird species mistake photovoltaic panel arrays for water features on which

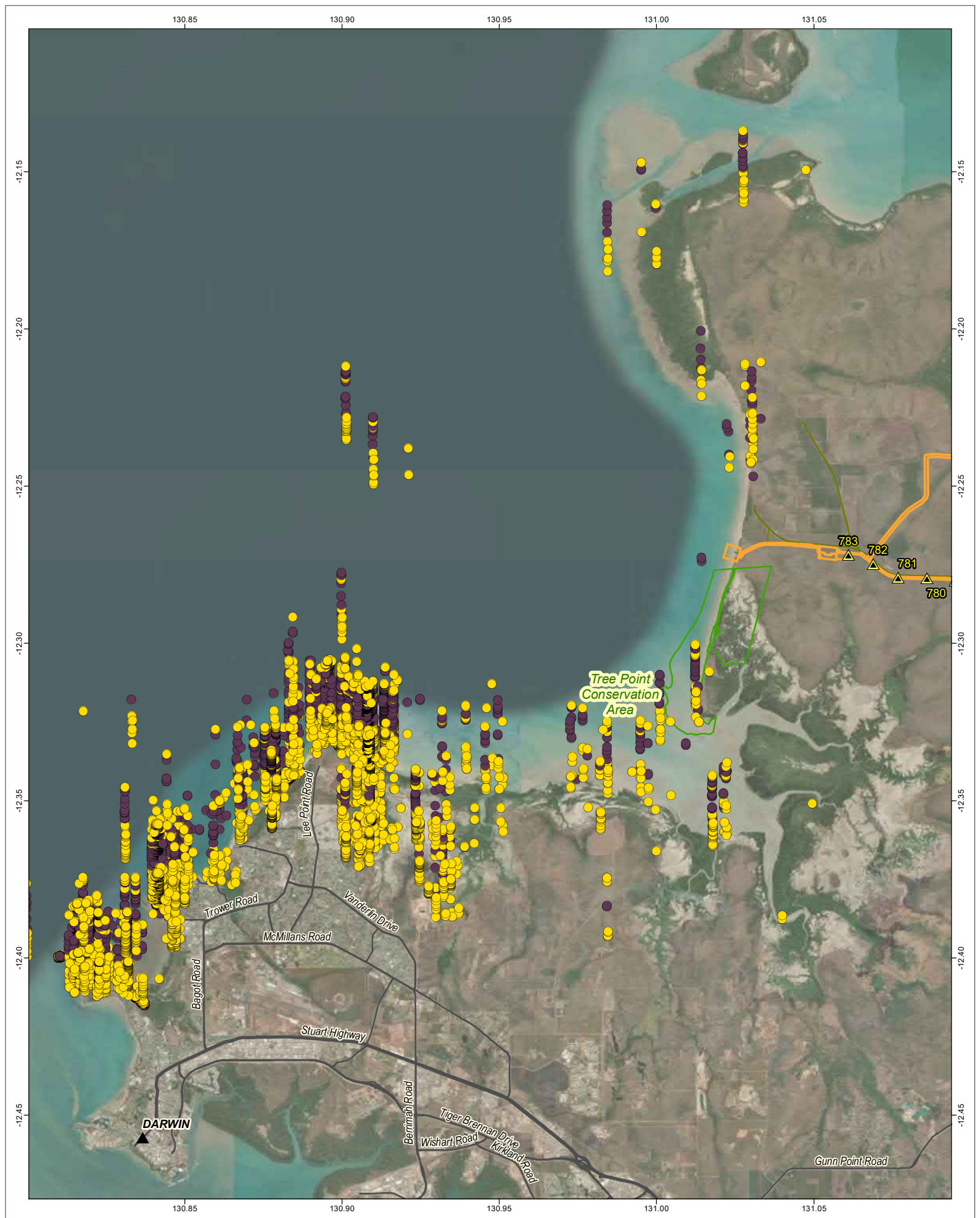
the birds can land, usually at night. Such collisions often do not result in direct fatality, but some species of birds, such as cormorants, are unable to become airborne again because they are adapted to take off from water, not dry land.

Most studies have identified limited if any landing attempts by waterbird species during monitoring events at similar facilities during daylight hours. Most waterbird species undertake long-range movements at night, which is also the case for many migratory shorebird species. The LEH would be significantly amplified at night due to moonlight reflections off panels and potentially artificial lighting being far more obvious to bird species traversing the area during the day.

Based on the location of the Solar Precinct, in a largely arid environment and in proximity to Lake Woods, there is unlikely to be suitable wetland habitat present on a routine and predictable basis. Instead, habitat conditions, particularly at Lake Woods, are likely to be suitable only in response to rainfall and subsequent flooding. Under such conditions, there is likely to be widespread ephemeral wetland habitat availability in the region and resultative waterbird distributions will also be widespread. With widespread standing water across the landscape, the LEH and collision risk with the Project's Solar Precinct PV panels is expected to be reduced. However, it is the opposite conditions which are likely to be more of a concern given the geographic context, surrounding habitat types and wetland habitat availability. While there may resultantly be a substantial increase in waterbird and shorebird abundances in the landscape, the availability of habitat means that there should be less attraction to the Solar Precinct due to the LEH, when compared to dry years in which the Solar Precinct will stand out and appear more attractive to tired migratory birds passing overhead during peak migration periods.

Based on available literature and a distinct lack of collision mortality research associated with Solar Energy Facilities in Australia, especially for projects of this scale, there remains a large degree of uncertainty regarding the prevalence and frequency of avian impacts due to interference such as collisions. Under extreme cases, each year during migration periods, the Solar Precinct may attract flocks of migrating listed shorebird species due to the LEH, and lead to mortality or injury of individuals through collisions with infrastructure. Given the unlikely chance of such a scenario eventuating, such impacts are expected to be rare, and highly unlikely to lead to the decline of any of the seven individually listed migratory shorebird species considered here. To identify whether this impact manifests at the Solar Precinct and to gauge its significance, the Proponent will undertake monitoring of bird utilisation and fatalities within the Solar Precinct as part of the Flora and Fauna Management Plan, which will identify adaptive management actions to respond to any emerging issues.

Table 5-34 presents an assessment of whether project activities are likely to have a significant impact on the individually listed migratory shorebird species recorded on Gunn Point Beach, and likely to overfly the Solar Precinct when undertaking long-distance migration flight stages. For all seven of these species (listed in Table 5-34), their use of the habitat potentially impacted by project activities is very similar. Consequently, they are assessed collectively against the criteria contained within the EPBC Significant Impact Guidelines 1.1 (DEWHA, 2013). The seven species are represented by Critically Endangered, Endangered and Vulnerable status. For maximum rigour, all species are assessed under the criteria for Critically Endangered and Endangered species. Based on the outcomes of the significant impact assessment, it is unlikely that project activities will significantly impact any threatened shorebird species because of the small disturbance area, short-term duration of proposed works, and the fact that disturbance area does not constitute important habitat.



Legend

- Threatened shorebird record
- Shorebird record
- Towns
- KP
- Conservation Area
- AAPowerLink infrastructure

Source: Sun Cable, EcOz, NTG (NR Maps)

Figure 5-33: Map of shorebird records within the North Darwin important shorebird area

Project: Australia-Asia PowerLink

N

0 5 Kilometres

Reference: M-Files ID 200232

Date: 18/11/2022 | Revision: 1

Scale: 1:165,000 | Datum: GDA2020

Coordinate System: GDA2020 | A4

SUN CABLE AUSTRALIA-ASIA PowerLink

Table 5-35: Significant impact assessment (collective) for threatened migratory shorebirds

Criterion	Summary of mitigation measures and significant impact assessment
Lead to a long-term decrease in the size of a population	***Shoreline Crossing*** Given the mobile nature of the shorebirds, temporary disturbance to intertidal and beach habitats at Gunn Point beach and expected complete reinstatement and recovery of the beach and intertidal infauna ecosystem, the construction and operation of the Project is unlikely to lead to a long-term decrease in the size of any populations for the seven individually listed migratory shorebird species. ***Solar Precinct*** Based on the geographic location of the Project's Solar Precinct, impacts to migratory birds are unlikely to occur as a result of loss of habitat. However, they are more likely to arise due to interactions (e.g., collision) with infrastructure such as photo-voltaic panels, buildings, and other associated infrastructure. Section 5.4.3.2 of the Draft EIS discusses the LEH – the hypothesis that bird species mistake photovoltaic panel arrays for water features on which the birds can land, usually at night. Such collisions often do not result in direct fatality, but some species of birds, such as cormorants, are unable to become airborne again because they are adapted to take off from water, not dry land. Australia hosts a substantial number of regular seasonal migratory bird species (almost 10% total bird species recorded in Australia), as well as other non-migratory waterbird species which undertake long-distance nomadic movements across the country in response to variations in habitat conditions – particularly rainfall and widespread flooding and inundation in arid and semi-arid zones. Both nomadic waterbird and migratory shorebird species are likely to overfly Lake Woods and the Solar Precinct on a routine and predictable basis, especially migratory shorebirds during northward and potentially southward migration. The Birdlife Australia Birdata database provides a list of waterbird and shorebird species that are likely to be passing through the region during migration periods. Oriental Plover, Little Curlew, Black-tailed Godwit, Sharp-tailed Sandpiper, Swinhoe's Snipe, Common Sandpiper, Common Greenshank, Wood Sandpiper, Marsh Sandpiper, Australian Pratincole and Oriental Pratincole have all been recorded in the region previously and would be expected to utilise suitable wetland habitat at Lake Woods when available. Satellite and geotracker telemetry data from species which have been studied using such technology, such as Grey Plover, Bar-tailed Godwit, Ruddy Turnstone, Little Curlew, Eastern Curlew, Red Knot, Great Knot, Oriental Pratincole and Whimbrel will demonstrate that most of these species pass through (or over) central Australian regions on route to their breeding grounds in the northern hemisphere. Such studies identify that despite the Solar Precinct's geographic location and surrounding habitat types, it is indeed within the broader East Asian Australasian Flyway (EAAF) and likely to be seasonally traversed by a suite of waterbird and migratory shorebird species. Based on the location of the Solar Precinct, in a largely arid environment and in proximity to Lake Woods, there is unlikely to be suitable wetland habitat present on a routine and predictable basis. Instead, habitat conditions, particularly at Lake Woods, are likely to be suitable only in response to rainfall and subsequent flooding. Under such conditions, there is likely to be widespread ephemeral wetland habitat availability in the region and resultative waterbird distributions will also be widespread. With widespread standing water across the landscape, the LEH and collision risk with the Project's Solar Precinct PV panels is expected to be reduced. However, it is the opposite conditions which are likely to be more of a concern given the geographic context, surrounding habitat types and wetland habitat availability. While there may resultantly be a substantial increase in waterbird and shorebird abundances in the landscape, the availability of habitat means that there should be less attraction to the Solar Precinct due to the LEH, when compared to dry years in which the Solar Precinct will stand out and appear more attractive to tired migratory birds passing overhead during peak migration periods.

Criterion	Summary of mitigation measures and significant impact assessment
	Based on available literature and a distinct lack of collision mortality research associated with Solar Energy Facilities in Australia, especially for projects of this scale, there remains a large degree of uncertainty regarding the prevalence and frequency of avian impacts due to interference such as collisions. Under extreme cases, each year during migration periods, the Solar Precinct may attract flocks of migrating listed shorebird species due to the LEH, and lead to mortality or injury of individuals through collisions with infrastructure. Given the unlikely chance of such a scenario eventuating, such impacts are expected to be rare, and highly unlikely to lead to the decline of any of the seven individually listed migratory shorebird species considered here. To identify whether this impact manifests at the Solar Precinct and to gauge its significance, the Proponent will undertake monitoring of bird utilisation and fatalities within the Solar Precinct as part of the Flora and Fauna Management Plan which will detail a protocol for routine, structured monitoring across the Solar Precinct, maintenance, mitigation measures, and identify adaptive management actions to respond to any emerging issues.
Reduce the AOO of the species	***Shoreline Crossing*** The AOO of the seven individually listed migratory shorebird species is unlikely to change following completion of the proposed works within the shoreline crossing site. Habitat for listed migratory shorebird species is limited to Gunn Point Beach and intertidal zone. The project Cable Transition Facilities include the Underground Cable Corridor, the Land Sea Joint Station, and the Shore Crossing Site. Specific to the Gunn Point Beach shoreline, subsea cabling systems will be installed through Gunn Point Beach and into Shoal Bay. The total construction footprint is approximately 1.9 ha, within the identified shoreline crossing site of 25 ha as shown on Figure 2-3. While there may be some disturbance related impacts from construction activities at the shoreline crossing location, i.e., aversion to the use of intertidal foraging area, no direct impacts to migratory shorebird species or their habitats are likely to occur outside of the 1.9 ha construction footprint. Given the area of Gunn Point Beach and extent of the intertidal zone, the distributions of invertebrate species present are likely to be present across the entire beach front and intertidal zone. Any potential impacts to benthic and intertidal invertebrates arising from EMF and thermal radiation emissions from cable infrastructure will be restricted to the six linear cable alignments, which in the context of the extent of the broader Gunn Point Beach are negligible. Subsequently, the indirect impacts of EMF and thermal radiation to invertebrate abundance and diversity within such an acute geospatial area, relative to the rest of Gunn Point Beach, are considered highly unlikely to result in a measurable reduction of available foraging resources for migratory shorebirds. ***Solar Precinct*** The Solar Precinct is located within an area devoid of migratory shorebird habitat and will not affect ephemeral (seasonal) habitats present at the nearby Lake Woods Important Bird Area. No reductions in the AOO of any of the seven individually listed migratory shorebird species are expected to occur as a result of the proposed the Project's Solar Precinct.

Criterion	Summary of mitigation measures and significant impact assessment
Fragment an existing population into two or more populations	***Shoreline Crossing*** Each species of migratory shorebird being considered is a part of a single population, or multiple subspecies populations (e.g., Greater Sand Plover, Lesser Sand Plover), within the East-Asian Australasian flyway. Temporary disturbance of a 1.9 ha area of intertidal and beach habitat will not fragment any of these populations. ***Solar Precinct*** Populations of any of the seven migratory shorebird species are unlikely to occur at the Solar Precinct site, and therefore no population fragmentation can occur.
Adversely affect habitat critical to the survival of the species	***Shoreline Crossing*** Critical habitat for any of the individually listed migratory shorebird species is not formally defined. Gunn Point Beach is within the North Darwin SBA, which is of international significance based on criteria outlined in the Directory of Important Habitat for Migratory Shorebirds in Australia (Weller et al. 2020). The North Darwin SBA stretches from East Point in Darwin northwards to the tip of Gunn Point – see Figure 5-33. The Directory describes how the site consistently supports high numbers of many different shorebird species. This is primarily due to the location, being one of the northern-most points in Australia, but also is a result of the area having a variety of different, high-quality habitat types, allowing birds utilising these areas to have multiple options for feeding and roosting purposes depending on their respective requirements and in response to any forms of disturbance. Within the North Darwin SBA, there are locations where nationally significant proportions of certain shorebird species have been recorded; there have been no recorded observations of the listed species in abundances exceeding their Important Habitat thresholds along the length of Gunn Point Beach apart from at its southern tip, which is a known important high tide roosting location. Proposed shoreline crossing works are situated approximately 6 km from this location. Short-term, temporary disturbance of a short length of Gunn Point Beach (which provides more than 13 km of similar foraging habitat) during the overwintering shorebird season is unlikely to affect the survival of the species. This is especially the case given that section of the beach is already regularly frequented by recreational beach users – including use of quad bikes and 4WD vehicles. ***Solar Precinct*** The Solar Precinct supports no habitat for migratory shorebirds and as such any land use changes at this location will not affect habitat critical to their survival.
Disrupt the breeding cycle of a population	Each species of threatened shorebirds being considered breeds in the northern hemisphere and comes to Australia in the non-breeding season, which coincides with the Top End wet season. Project works will be localised and discrete on a small section of potential habitat. Project activities will not disrupt the breeding cycle of any threatened shorebirds.
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent the species is likely to decline	***Shoreline Crossing*** Gunn Point Beach is accessible by vehicle and is subject to various types of chronic anthropogenic disturbance. The proposed shoreline crossing location is situated approximately 6 km from the southern extent of Gunn Point Beach, and as such, any construction phase related disturbance impacts are unlikely to affect migratory shorebird behaviour at this location. The location of the shoreline crossing is also situated between two existing primary beach access points and approximately 2 km south of Gunn Point Beach campground, and as such is subject to heightened levels of disturbance than other parts of the beach.

Criterion	Summary of mitigation measures and significant impact assessment
	The Cable Transition Facilities include the Underground Cable Corridor, the Land Sea Joint Station, and the Shore Crossing Site. Specific to the Gunn Point Beach shoreline, Subsea Cabling Systems will be installed through Gunn Point Beach and into Shoal Bay. This will include the excavation of two trenches, one for each cable system, and consist of an approximate construction corridor footprint width of 63 m. The preferred configuration for each of the two cable systems is a Bipole with Metallic Return, which involves three cables laid parallel: Positive pole (Pole 1), Negative pole (Pole 2) and a Metallic return. Lateral spacing between the cables in each trench will be approximately 4 m, within an approximate trench width of 13.5 m. Based on this specification, and a beach width of up to 300 m (relative to tidal state), the total construction footprint is approximately 1.9 ha, within the identified shoreline crossing location of 25 ha as shown on Figure 2-3. While there may be some disturbance related impacts from construction activities at the shoreline crossing location, i.e., aversion to the use of intertidal foraging area, no direct impacts to migratory shorebird species or their habitats are likely to occur outside of the 1.9 ha construction footprint. It is envisaged that all construction works within the shoreline crossing location can be scheduled and completed during the Austral winter season (end of May through to end of August), when the vast majority of migratory shorebirds are transiting to or from, or in their northern hemisphere breeding sites. This will minimise potential disturbance-related impacts arising from construction activities in the vicinity of the shoreline crossing location, noting that a small percentage (up to 30%) of the summer population of some migratory shorebird species remain in Australia and do not migrate. Spoil from trench excavation will be stockpiled along the length of each trench alignment and be reinstated on top of each cable system once installed. No fill from external sources will be used to reinstate excavated trenches in order to expedite the recovery of extant benthic and intertidal macroinvertebrates. Following the installation of the cable systems and reinstatement of excavated trench spoil, natural restoration of existing conditions is expected to occur relatively quickly, especially in those areas subject to routine tidal inundation. While it is anticipated that there will be an intertidal and beach infauna ecosystem recovery timeframe associated with excavation and reinstatement of the shoreline crossing cable system installation, areas subject to these actions are expected to be restored to pre-construction conditions largely via natural processes. The potential impacts to beach and intertidal zone invertebrates arising from the EMF and thermal radiation during transmission of electrical current through cabling is expected to be negligible and based on the small area likely to be impacted relative to overall beach and intertidal zone area, are unlikely to result in any measurable variation in migratory shorebird abundance. All temporary construction and permanent operational lighting infrastructure at the DCS and Cable Transition Facilities will be designed in accordance with the Principles of Best Practice Lighting Design, as outlined in the National Light Pollution Guidelines for Wildlife Including Marine Turtles, Seabirds and Migratory Shorebirds (DoEE, 2020). While all principles of best practice lighting will be used to guide the design of all required lighting infrastructure as far as practicable, operational safety and security lighting requirements will also need to be considered. The Principles of Best Practice Lighting Design, as outlined in the National Light Pollution Guidelines for Wildlife Including Marine Turtles, Seabirds and Migratory Shorebirds (DoEE, 2020), have been incorporated into the Project's mitigation commitments (refer Table 5-60). While there will be modification, temporary disturbance, and reduction in the available foraging habitat to migratory shorebirds to a small section of Gunn Point Beach and intertidal areas during the construction phase, these are expected to be short term only. All extant and regular visiting populations of the listed migratory

Criterion	Summary of mitigation measures and significant impact assessment
	shorebird species are considered highly unlikely to decline as a result of the proposed project works and subsequent operation. ***Solar Precinct*** There is currently no suitable habitat for migratory shorebirds within the Solar Precinct.
Result in invasive species, that are harmful to the species, becoming established in the species' habitat	***Shoreline Crossing*** The construction of the Project will not result in the incursion or establishment of any invasive species that are not already present and established in the general area. Important roosting locations for migratory shorebirds are located at the southern end of Gun Point beach, approximately 6 km south of the shoreline crossing location. Use of lighting during the construction phase may provide increased opportunities for exotic predators but this will be acute, of short-term duration, and limited to the vicinity of the shoreline crossing location. No impacts to southern parts of Gunn Point beach and the important roosting areas are expected to occur. ***Solar Precinct*** Given the location and habitat types present at the Solar Precinct, any potential resultative increases in pest and invasive animals are highly unlikely to impact migratory shorebird species
Introduce disease that may cause the species to decline	***Shoreline Crossing*** The Migratory Shorebird Conservation Action Plan (Weller et al., 2017) does not list disease, pathogens, or parasites as a threatening process for these species, apart from noting that there is an increased risk of disease transmission if birds are forced into remaining areas of habitat where overcrowding may occur. However, the likelihood of this occurring as a result of the Project's development is low. ***Solar Precinct*** Given the location and habitat types present at the Solar Precinct, diseases are highly unlikely to impact migratory shorebird species.
Interfere with the recovery of a species	***Shoreline Crossing*** The same The Migratory Shorebird Conservation Action Plan (Weller et al., 2017) lists four conservation actions for threatened shorebirds. The small and short-term disturbance of shorebird habitat that will occur during construction of the Project will not interfere with these objectives. ***Solar Precinct*** Based on the geographic location of the Solar Precinct, impacts to migratory birds are unlikely to occur as a result of loss of habitat. However, they are more likely to arise due to interactions (e.g., collision) with infrastructure such as photo-voltaic panels, buildings, and other associated infrastructure. The Draft EIS discusses the LEH in Section 5.4.3.2 – the hypothesis that bird species mistake photovoltaic panel arrays for water features on which the birds can land, usually at night. Such collisions often do not result in direct fatality, but some species of birds, such as cormorants, are unable to become airborne again because they are adapted to take off from water, not dry land. Australia hosts a substantial number of regular seasonal migratory bird species (almost 10% total bird species recorded in Australia), as well as other non-migratory waterbird species which undertake long-distance nomadic movements across the country in response to variations in habitat conditions – particularly rainfall and widespread flooding and inundation in arid and semi-arid zones. Both nomadic

Criterion	Summary of mitigation measures and significant impact assessment
	waterbird and migratory shorebird species are likely to overfly Lake Woods and the Solar Precinct on a routine and predictable basis, especially migratory shorebirds during northward and potentially southward migration. The Birdlife Australia Birdata database provides a list of waterbird and shorebird species that are likely to be passing through the region during migration periods. Oriental Plover, Little Curlew, Black-tailed Godwit, Sharp-tailed Sandpiper, Swinhoe's Snipe, Common Sandpiper, Common Greenshank, Wood Sandpiper, Marsh Sandpiper, Australian Pratincole and Oriental Pratincole have all been recorded in the region previously and would be expected to utilise suitable wetland habitat at Lake Woods when available. Satellite and geotracker telemetry data from species which have been studied using such technology, such as Grey Plover, Bar-tailed Godwit, Ruddy Turnstone, Little Curlew, Eastern Curlew, Red Knot, Great Knot, Oriental Pratincole and Whimbrel will demonstrate that most of these species pass through (or over) central Australian regions on route to their breeding grounds in the northern hemisphere. Such studies identify that despite the Solar Precinct's geographic location and surrounding habitat types, it is indeed within the broader EAAF and likely to be seasonally traversed by a suite of waterbird and migratory shorebird species. Habitat conditions, particularly at Lake Woods, are likely to be suitable only in response to rainfall and subsequent flooding. Under such conditions, there is likely to be widespread ephemeral wetland habitat availability in the region and resultative waterbird distributions will also be widespread. With widespread standing water across the landscape, the LEH and collision risk with Solar Precinct PV panels is expected to be reduced. However, it is the opposite conditions which are likely to be more of a concern given the geographic context, surrounding habitat types and wetland habitat availability. While there may resultantly be a substantial increase in waterbird and shorebird abundances in the landscape, the availability of habitat means that there should be less attraction to the Solar Precinct due to the LEH, when compared to dry years in which the Solar Precinct will stand out and appear more attractive to tired migratory birds passing overhead during peak migration periods. Based on available literature and a distinct lack of collision mortality research associated with Solar Energy Facilities in Australia, especially for projects of this scale, there remains a large degree of uncertainty regarding the prevalence and frequency of avian impacts due to interference such as collisions. Under extreme cases, each year during migration periods, the Solar Precinct may attract flocks of migrating listed shorebird species due to the LEH, and lead to mortality or injury of individuals through collisions with infrastructure. Given the unlikely chance of such a scenario eventuating, such impacts are expected to be rare, and highly unlikely to lead to the decline of any of the seven individually listed migratory shorebird species considered here. To identify whether this impact manifests at the Solar Precinct and to gauge its significance, the Proponent will undertake monitoring of bird utilisation and fatalities within the Solar Precinct as part of a Flora and Fauna Management Plan which will detail a protocol for routine, structured monitoring across the Solar Precinct, maintenance, mitigation measures, and identify adaptive management actions to respond to any emerging issues

5.6.3.15 Significant Impact Assessments – Vulnerable species

This section presents significant impact assessments for all threatened species listed as Vulnerable under the EPBC and/or *TPWC Act*s that could be present within one or more components of the project footprint. Also included are such species for which a significant impact assessment was requested by DEPWS and/or DCCEEW in the comments received on the Draft EIS.

To support some of these assessments, Figure 5-27 and Figure 5-28 show the location of records for certain restricted-range threatened species in relation to the project footprint.

5.6.3.16 Acacia praetermissa

Acacia praetermissa is listed as Vulnerable under both the EPBC and *TPWC Act*s. *Acacia praetermissa* is a small, woody shrub, endemic to the NT occurring on hillsides in lateritic soils or sandy silt in Eucalypt woodlands.

NT Flora Atlas records show occurrence at two roadside localities along 25 km of the Stuart Highway – near Emerald Springs and Hayes Creek (DEPWS, 2007). The nearest record within these localities is approximately 10 km from the OHTL footprint. Targeted searches have been conducted – and considerable survey undertaken – in the wider region for this species, suggesting that existing records reflect this species' restricted distribution and abundance. Both Hayes Creek and Emerald Springs are outside the project footprint and will not be impacted by the Project. Given the absence of additional records and the extended survey effort for this species, the likelihood of *Acacia praetermissa* occurring within the project footprint is considered low.

Threats to *Acacia praetermissa* are the impacts of frequent fires on seed germination and recruitment, and removal of plants due to the road widening and maintenance activities. The Project does not propose changes to fire regimes or require widening of the Stuart Highway. It is unlikely that the Project will impact upon important populations of *Acacia praetermissa*.

Given the very restricted range of *Acacia praetermissa* and that the species is only known from two localities, these populations are considered 'important populations' necessary for the long-term survival of the species.

Table 5-36 presents a significant impact assessment using the criteria contained within the EPBC Significant Impact Guidelines 1.1 (DEWHA, 2013). The conclusion is that it is unlikely that project activities will have a significant impact upon *Acacia praetermissa* because the project footprint does not intersect with the two known localities of this range restricted species.

Table 5-36: Significant impact assessment for Acacia praetermissa

Criterion	Summary of mitigation measures and significant impact assessment
Lead to a long-term decrease in the size of an important population	As explained above, an important population of *Acacia praetermissa* is not known, or likely, to occur within the project footprint.
Reduce the AOO of an important population	The Project does not intersect the AOO of this species and so will not reduce the AOO.
Fragment an existing important population into two or more populations	*Acacia praetermissa* is known from only two populations and is not considered severely fragmented (DoE, 2022a). Because the project footprint does not intersect with either population – or pass between them – neither will be fragmented as a result of land disturbance associated with the Project.
Adversely affect habitat critical to the survival of the species	Critical habitat has not been defined for *Acacia praetermissa*. However, given the very restricted range of the species, its known locations are considered critical for the survival of the species. The project footprint does not intersect with the populations within the restricted range and so will not adversely affect critical habitat of *Acacia praetermissa*.
Disrupt the breeding cycle of an important population	An important population of *Acacia praetermissa* are not known, or likely, to occur within the project footprint. Therefore, the breeding cycle of a population will not be disrupted by the development of the Project.
Modify, destroy, remove, isolate or decrease the	There are two known locations of *Acacia praetermissa*, neither of which will be impacted by the Project. Therefore, habitat availability or quality will not be impacted to the extent that the species is likely to decline.

Criterion	Summary of mitigation measures and significant impact assessment
availability or quality of habitat to the extent the species is likely to decline	
Result in invasive species, that are harmful to the species, becoming established in the species' habitat	Invasive species have not been identified as threats to *Acacia praetermissa*; however, grass weeds may alter fire frequency and intensity, which could impact as frequent fire is identified as a threat in the Conservation Advice (DEWHA, 2008a). The Weed Management Plan presented in Appendix 5.3 has been developed to minimise introduction and proliferation of weeds within the area of influence for the life of the Project.
Introduce disease that may cause the species to decline	Disease is not listed as a threatening process for *Acacia praetermissa*. The author is not aware of any literature on diseases that could be introduced by the project and that would detrimentally affect this species.
Interfere substantially with the recovery of the species	There is no Recovery Plan for *Acacia praetermissa*. In the Conservation Advice (DEWHA, 2008a), the main identified threats are frequent burning and road maintenance. The project footprint does not intersect with the species habitat, does not propose changes to fire regimes and will not interfere with the recovery of the species.

5.6.3.17 Atlas Moth (*Attacus wardi*)

The Atlas Moth is listed as Vulnerable under the *TPWC Act* and is not listed under the *EPBC Act*. It is a very large insect, with a wingspan of about 17 cm. The larval food plant and preferred breeding habitat of the Atlas Moth is associated with *Croton habrophyllus* growing along the edges of monsoon rainforest, restricted to coastal areas and in a patch size over 8 ha (Lane, 2010). Coastal, semi-deciduous vine thickets appear to be critical Atlas Moth breeding habitat (DEPWS, 2021c). The Atlas Moth is known from several coastal localities and has been recorded over 9 km inland from the coast (DEPWS, 2007). Atlas Moth was presumed extinct from the Darwin area (Braby et al., 2012); however, recent re-introductions and sightings have been recorded in the greater Darwin area.

The main threats for the Atlas Moth include inappropriate fire regimes which penetrate forest edges and destroy cocoons – containing diapausing pupae – in the dry season and weed incursions of African grassy weeds that contribute to fuel load and inappropriate fire regime (DEPWS, 2021c). The destruction of cocoons is problematic given the short lifespans of adult Atlas Moths (Braby and Nielsen, 2011).

There are recent records of Atlas Moth in suitable habitat within Tree Point Conservation Area which is at least 1 km south of the Cable Transition Facilities. There is no suitable habitat for the Atlas Moth within the project footprint.

Table 5-37 presents a significant impact assessment using the criteria contained within the EPBC Significant Impact Guidelines 1.1 (DEWHA, 2013). The conclusion is that it is unlikely that project activities will have a significant impact upon the Atlas Moth because the species is unlikely to occur within the project footprint.

Table 5-37: Significant impact assessment for the Atlas Moth

Criterion	Summary of mitigation measures and significant impact assessment
Lead to a long-term decrease in the size of an important population	As explained above, populations of the Atlas Moth are not known, or likely, to occur within the project footprint. Atlas Moths are nocturnal and short-lived. Direct mortalities of Atlas Moths could occur during this time from Moths attracted to artificial lighting causing increased predation (Lane et al. 2010). There will be minimal operational lighting proximate to Atlas Moth habitat.
Reduce the AOO of an important population	No occurrences of this species are impacted by the project footprint. Therefore, land disturbance associated with the Project will not reduce the AOO of the species.
Fragment an existing important population into two or more populations	Atlas Moth's occur at discrete locations, and little is known on their home range. Lane et al. (2010) proposes that preferred breeding habitat should contain stands of *Croton habrophyllus* close together to allow the moths to intersperse readily between them. The Project does not intersect or impact on such habitat and will not fragment a population.
Adversely affect habitat critical to the survival of the species	Whilst not formally defined, critical habitat for the Atlas Moth could be considered breeding habitat – coastal semi-deciduous vine thicket over 8 ha with stands of *Croton habrophyllus* – which is not within the project footprint. Therefore, the breeding cycle of a population will not be disrupted by the development of the Project.
Disrupt the breeding cycle of an important population	Trees favoured for egg laying by female Atlas Moth's occur on the outer margins of preferred breeding habitat – rainforest patches over 8 ha with stands of *Croton habrophyllus*. Fires which penetrate forest edges and destroy cocoons during the dry season are an identified threat to the Atlas Moth breeding cycle (DEPWS 2021c). Project activities will not increase the local fire regime at any component.
Modify, destroy, remove, isolate, or decrease the availability or quality of habitat to the extent the species is likely to decline	For the reasons given in this table, it is unlikely that the loss, or decrease in quality, of habitat because of project activities will cause a decline in the species.
Result in invasive species, that are harmful to the species, becoming established in the species' habitat	The NTG (DEPWS, 2021c) identifies inappropriate fire regimes modified and exacerbated by grassy weed as threats to the Atlas Moth. Project activities will not increase the local fire regime at any component. The Weed Management Plan presented in Appendix 5.3 has been developed to minimise introduction and proliferation of weeds within the area of influence for the life of the Project.
Introduce disease that may cause the species to decline	Disease is not listed as a threatening process for the Atlas Moth. The author is not aware of any literature on diseases that could be introduced by the project and that would detrimentally affect this species.
Interfere substantially with the recovery of the species	There is no recovery plan for the Atlas Moth. The NTG factsheet only identifies research priorities, none of which will be interfered with by the Project.

5.6.3.18 Bare-rumped Sheathtail Bat (Saccolaimus saccolaimus nudicluniatus)

The Bare-rumped Sheathtail Bat (listed as Vulnerable under the *EPBC Act* only) is a high-flying insectivorous bat species that occurs as two geographically-isolated populations in northern Australia – including a western population that occurs throughout the Kimberley region of Western Australia, areas of the Victoria Bonaparte bioregion, the north-western part of the Top End of the NT, and reaches into the coastal areas of the western part of the Gulf of Carpentaria to Roper River (Armstrong et al., 2021; McKenzie et al., 2018).

There have been relatively few records of Bare-rumped Sheathtail Bats across this broad distribution. The species is difficult to capture because of its tendency to fly high. Only recently have ecologists been able to develop the means to unambiguously identify it from echolocation calls, and in the Queensland part of its range it can still be difficult to distinguish from closely related species (Armstrong et al., 2021; McKenzie and Bullen, 2018; Woinarski et al., 2014). On the basis of collected voucher specimens and verified calls, Bare-rumped Sheathtail Bats have been recorded at 10 locations within the NT, including on Gunn Point Road (adjacent to the OHTL Utilities Corridor in 2005) and at Howard Springs.

Bare-rumped Sheathtail Bats forage above the tree canopy (McKenzie and Bullen, 2018). In Queensland, the Bare-rumped Sheathtail Bat is known to forage in coastal lowland rainforests, as well as more open Eucalyptus or Corymbia forests interspersed with such rainforest. Based on the types of habitats within which specimens have been recorded in the NT, suitable habitat for the western population is much broader – as suggested from the collection of specimens up to ~145 km from the coast in the NT (Milne et al., 2009), and even further inland in the Kimberley (McKenzie et al. 2018). In the NT, Bare-rumped Sheathtail Bat specimens have been collected from *Pandanus* woodland fringing sedgelands and Eucalyptus tall open forests (Churchill, 2008; Friend and Braithwaite, 1986).

All confirmed roosting sites for the Bare-rumped Sheathtail Bat have been in *Eucalyptus miniata, Eucalyptus tetrodonta* and *Eucalyptus platyphylla* (Schulz and Thomson, 2007), as well as large Melaleuca species (Armstrong et al., 2021). The species roosts in groups of 10 to 100 individuals in hollows in large trees generally characterised by broken tree trunks, large branches (Murphy, 2001; Armstrong et al., 2021) and deep hollow pipes >18 cm in diameter with hollow entrances >6 m from the ground (Churchill, 2008). Armstrong et al., (2021) notes that ‘given the widespread nature of these Eucalypt woodlands and forests across parts of northern Australia, potential for roosting appears to be high...’.

Based on current distribution and habitat suitability, the Bare-rumped Sheathtail Bat could be present within the project footprint as far south as KP 195. Areas where the species or species habitat is likely to occur is from Gunn Point to KP 672; south of KP 672 are areas the Bare-rumped Sheath-tailed Bat may occur (DCCEEW, 2022).

Table 5-20 assesses whether project activities are likely to have a significant impact upon this species (as defined in EPBC Significant Impact Guidelines 1.1). The conclusion is that because any occurrence of Bare-rumped Sheathtail Bat within the project footprint is not considered an important population, the footprint does not contain habitat critical to the survival of the species and other potential impacts can be avoided or mitigated, the impacts to this species associated with the Project are unlikely to be significant.

Table 5-38: Significant impact assessment table for Bare-rumped Sheathtail Bat

Criterion	Summary of mitigation measures and significant impact assessment
Lead to a long-term decrease in the size of an important population Reduce the AOO of an important population Fragment an existing important population into two or more populations Disrupt the breeding cycle of an important population	As discussed above, the occurrence of the species in the NT is as part of the western population of the Bare-rumped Sheathtail Bat, whose range extends from the Gulf of Carpentaria to the Kimberley. It is considered to be a single population across that broad range, indicating connectivity between all occurrences, and hence it is unlikely that the project footprint would contain unique genetic diversity. Therefore, any local occurrence of the Bare-rumped Sheathtail Bat within the footprint would not constitute a key source population, or one that is necessary for maintaining genetic diversity. Moreover, the project footprint is located well within the known distribution of this species, not at its limits (where populations of animals sometimes contain unique genetic variation). For these reasons, the occurrence of this species within the project footprint is not considered an 'important' population, and so these criteria are not relevant. Nevertheless, there is vegetation with large hollow-bearing trees within the northern length of the OHTL, and the Murrumujuk and northern electrode footprints that may be roosting and/or breeding sites for this species. The only way that project activities could materially impact the Bare-rumped Sheathtail Bat is through mortality of individuals or disruption to breeding success due to a disturbance of an active roost tree. The Proponent will mitigate the impact of OHTL construction on this species in the same way any development in the Top End does if there is the possibility of roost trees being present – through avoidance of clearing such trees (if possible) and a pre-clearance survey of large trees with hollows (as per Appendix 4.1 – Constraints Planning and Field Development Procedure).
Adversely affect habitat critical to the survival of the species Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent the species is likely to decline	Critical habitat is only loosely defined in *The National Recovery Plan for the Bare-rumped Sheathtail Bat* (Schulz and Thomson, 2007) as being foraging and roosting habitat. As discussed above, the foraging and breeding habitat requirements for the population of Bare-rumped Sheathtail Bats relevant to the NT are both broad – Eucalypt woodlands and forests in the Top End. Such habitat occurs within the project footprint. However, it is also the dominant vegetation type across the population's entire range. Analysis was completed using MVGs from the NVIS 6.0 within the full distribution of Bare-rumped Sheathtail Bats (DCCEEW, 2022). A range of MVG's[10] were selected to represent the broad foraging habits of the bat to determine the area of habitat within the project footprint and the surrounding 20 km. The results are that the proportion of such habitat present within the project footprint compared within the surrounding 20 km is 0.0012%. This occurs across 598 km of the OHTL. Loss of such habitat within the project footprint represents a negligible proportion of suitable habitat for the species, and so will not have an adverse effect or lead to the decline of the species. Large hollow-bearing trees which may constitute roosting habitat will be avoided as much as possible during micro-siting (see above).
Result in invasive species, that are harmful to the species, becoming established in the species' habitat	The only invasive species identified as possibly being harmful to the Bare-rumped Sheathtail Bat is the Asian Honey Bee (*Apis cerana*) in Queensland, which may outcompete the bat for hollows (TSSC, 2016f). The activities associated with the Project are highly unlikely to result in the establishment of the Asian Honey Bee into the region. Moreover, introduced fauna species that may prey upon the Bare-rumped Sheathtail Bat – such as Feral Cats – are already well-established in the region. These species are already common in the region, and development of the Project is unlikely to lead to any substantial change in their occurrence.

[10]MVG numbers 3, 4, 5, 9, 11, 12, 21 and 31.

Criterion	Summary of mitigation measures and significant impact assessment
Introduce disease that may cause the species to decline	The Conservation Advice (TSSC, 2016f) for this species notes that disease may be a threat factor for this species, with transmission coming from congeners. However, the activities associated with the Project are highly unlikely to lead to the introduction of diseased bats into the region.
Interfere with the recovery of the species	The National Recovery Plan for the Bare-rumped Sheathtail Bat (Schulz and Thomson, 2007) was adopted in 2008. It contains five objectives – all research-centred – none of which are relevant to this situation. Consequently, development of the Project will not interfere with the recovery of the species.

5.6.3.19 Cleome insolata

Cleome insolata listed as Vulnerable under the *TPWC Act* and is not listed under the *EPBC Act*. *Cleome insolata* is a small herb with a conspicuous flower that is known to occur in low, open woodlands on seasonally waterlogged sandy soils (DEPWS, 2021d). This species is endemic to the NT and thought to be restricted to the Darwin region. NT Flora Atlas records show occurrences in the Darwin rural area and Shoal Bay Conservation Reserve, where it is recorded within 2 km of the OHTL Utilities Corridor (DEPWS, 2007).

The key threat to *Cleome insolata* is land clearing for sub-division, development and intensification of land use in the Darwin rural area, as well as extractive industry operations which change surface and near-surface hydrology, facilitate grassy weed invasions and intensify fire regime change (DEPWS, 2021d).

Records for this species do not occur within the project footprint. However, initial desktop analysis identified potential habitat within two components – the OHTL Utilities Corridor and DCS. Follow-up verification field surveys in September 2021 within the OHTL Utilities Corridor did not find suitable habitat for *Cleome insolata*, and the likelihood of the species occurrence was re-assessed as low for this component. Likewise, field verification surveys in February 2022 at the DCS did not detect the presence of *Cleome insolata*. The OHTL preferred route at Adelaide River is outside of the distribution of this species.

Table 5-39 presents a significant impact assessment using the criteria contained within the EPBC Significant Impact Guidelines 1.1 (DEWHA, 2013). The conclusion is that it is unlikely that project activities will have a significant impact upon *Cleome insolata* because the species is unlikely to occur within the project footprint.

Table 5-39: Significant impact assessment for Cleome insolata.

Criterion	Summary of mitigation measures and significant impact assessment
Lead to a long-term decrease in the size of an important population	As explained above, an important population of *Cleome insolata* is not known, or likely, to occur within the project footprint.
Reduce the AOO of an important population	No occurrences of this species are impacted by the project footprint, therefore land disturbance associated with the Project will not reduce the AOO of the species.
Fragment an existing important population into two or more populations	*Cleome insolata* does not occur within the project footprint, therefore an important population will not be fragmented by the land clearing associated with the Project.

Criterion	Summary of mitigation measures and significant impact assessment
Adversely affect habitat critical to the survival of the species	Critical habitat for *Cleome insolata* is not defined. This concept is arguably not relevant for rare species like this with very restricted habitat requirements; it can be assumed that the few locations within which the species occurs constitutes critical habitat. Suitable habitat for *Cleome insolata* was not found to occur within the OHTL Utilities Corridor and the area of potential habitat at the DCS did not support any *Cleome insolata* individuals. Consequently, habitat critical to the survival of this species will not be affected by the Project.
Disrupt the breeding cycle of an important population	*Cleome insolata* is not present within the project footprint. Therefore, the breeding cycle of an important population will not be disrupted by the development of the Project.
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent the species is likely to decline	A threat to *Cleome insolata* identified by the NTG is changes to surface or near surface hydrology (DEPWS, 2021d). Construction of OHTL structures and access tracks has the potential to alter the hydrology at a local level and could impact on *Cleome insolata* habitat. However, no known habitat has been recorded downstream of the OHTL. Moreover, as detailed in Section 5.5.3.2, the risk of such impacts is low because of avoidance and/or minimisation of disturbances to drainage lines through design and micro-siting (as per Appendix 4.1 – Constraints Planning and Field Development Procedure).
Result in invasive species, that are harmful to the species, becoming established in the species' habitat	The NTG (DEPWS, 2021d) identifies changes to fire regimes by grassy weed invasion as a threat to *Cleome insolata.* The Weed Management Plan presented in Appendix 5.3 has been developed to minimise introduction and proliferation of weeds within the area of influence for the life of the Project.
Introduce disease that may cause the species to decline	Disease is not listed as a threatening process for *Cleome insolata*. The author is not aware of any literature on diseases that could be introduced by the project and that would detrimentally affect this species.
Interfere substantially with the recovery of the species	There is no listed Recovery Plan for this species. Because the project footprint does not intersect with any known populations, development of the Project is unlikely to interfere with the recovery of the species.

5.6.3.20 Crested Shrike-tit (northern) *(Falcunculus frontatus whitei)*

The Crested Shrike-tit (northern sub-species – but henceforth just 'Crested Shrike-tit') is listed as Vulnerable under the *EPBC Act* and Near Threatened under the *TPWC Act*. This sub-species is historically known from the Kimberley in WA to Borroloola in the NT, with numerous records around the Katherine region (DEPWS, 2019). The Crested Shrike-tit is a distinctive, small bird that typically lives in savanna woodlands, in small groups within a 20 ha territory which can be up to 20 km apart (TSSC, 2016b).

Crested Shrike-tit habitat is highly variable across the NT, with the sub-species showing a preference for Eucalypt open woodlands dominated by *Eucalyptus opaca, E. tectifica* and *E. confertiflora*, occurring less often in *E. miniata, E. tetrodonta* or *Corymbia bleeseri* dominated woodland (DSEWPaC, 2013). The sub-species is patchily distributed across the Top End, which, combined with their territorial nature and small groups, leave it susceptible to habitat loss and fragmentation (DEPWS, 2021f).

The population and distribution of the Crested Shrike-tit is poorly known, due to a lack of targeted survey effort, their patchy distribution, and low densities (TSSC, 2016b). Based on current

distribution and habitat suitability, the Crested Shrike-tit could be present within the OHTL footprint between KP 183 and 659.

The recent Action Plan for Australian Birds (Garnett et al., 2021) lists this sub-species of Crested Shrike-tit as Least Concern because it is a 'sparsely distributed species which is being detected more frequently. There is no evidence of population decline.'

Table 5-40 presents an assessment of whether project activities are likely to have a significant impact on the Crested Shrike-tit, using the criteria contained within the EPBC Significant Impact Guidelines 1.1 (DEWHA, 2013). Given the large area of habitat in the region, the clearing of such a small (and narrow) proportion of it cannot be considered likely to lead to a long-term decrease in the size of the Crested Shrike-tit population because the impacts on critical habitat will be negligible.

Table 5-40: Significant impact assessment for the Crested Shrike-tit (northern)

Criterion	Summary of mitigation measures and significant impact assessment
Lead to a long-term decrease in the size of an important population	The Crested Shrike-tit occurs in both the NT and WA, and it is unclear whether those occurrences constitute two sub-populations. General occurrence of a Vulnerable species in a region is not, in itself, sufficient to meet the definition of an 'important' population. However, because the OHTL traverses the entire mainland distribution of the sub-species, any occurrence of the Crested Shrike-tit in the OHTL at the edge of its range would constitute an 'important population' as per the EPBC Significant Impact Guidelines 1.1 (DEWHA, 2013). The Crested Shrike-tit is a mobile species, which lowers the likelihood of direct mortality during land-clearing activities for the Project. The only other way in which this development could potentially lead to a long-term decrease in the size of the Crested Shrike-tit population is through substantial loss of critical habitat – which is discussed below.
Reduce the AOO of an important population	Based on the IUCN 2 x 2 km grid cell method, Garnett et al. (2021) estimates the AOO for Crested Shrike-tit to be between 520 and 200,000 km^2 – confounded by the low density of surveys undertaken for this species. Where Crested Shrike-tit habitat occurs within the OHTL or Solar Precinct access road footprints – and its loss cannot be avoided – the only way that loss can lead to a reduced AOO is if it is entirely confined to within the footprint. In other words, if the breeding/foraging resources lost constitute the entire local occurrence of those resources, and there are no other nearby occurrences, then this could lead to a reduced AOO. There is no reason to suspect that these resources will only occur within the narrow project footprints in question, and so it is very unlikely that this scenario will eventuate.
Fragment an existing important population into two or more populations	The Crested Shrike-tit is a mobile animal capable of travelling long distances. A narrow, cleared area adjacent to a railway line will not represent a barrier for dispersal of this species.
Adversely affect habitat critical to the survival of the species	Critical habitat for the Crested Shrike-tit has not been formally defined. As noted above, only a very small area of potential habitat for this species will be disturbed. This will not affect the survival of the Crested Shrike-tit.
Disrupt the breeding cycle of an important population	Clearing of breeding habitat that is in use by Crested Shrike-tit could disrupt the breeding cycle of the sub-species. Given the very small proportion of locally available breeding habitat within the disturbance footprint, the inherent likelihood of this occurring is very low. Moreover, the micro-siting procedure will further minimise the area of breeding habitat that is disturbed.
Modify, destroy, remove, isolate, or decrease the availability or quality of habitat to the extent the species is likely to decline	As discussed above, the foraging habitat requirements for the Crested Shrike-tit are broad – Eucalypt woodlands in the Top End. Such habitat occurs within the OHTL footprint. However, it is also the dominant vegetation type across the population's entire range. Analysis was completed using MVGs from the NVIS 6.0 within the likely distribution of Crested Shrike-tits (DCCEEW, 2022). MVG's Eucalypt Woodlands[11] were selected to determine the area of habitat within the OHTL footprint and the surrounding 20 km. The proportion of Crested Shrike-tit habitat present within the project footprint compared within the surrounding 20 km is 0.11%. This is along 476 km of the OHTL Corridor. The loss of such a small and narrow area of habitat is unlikely to modify,

[11]MVG numbers 5,11 and 12.

Criterion	Summary of mitigation measures and significant impact assessment
	destroy, remove, isolate, or decrease the availability or quality of habitat to the extent the sub-species is likely to decline.
Result in invasive species, that are harmful to the species, becoming established in the species' habitat	Broadscale environmental change due to, *inter alia*, heavy grazing by livestock and feral animals is the only threat to Crested Shrike-tit listed by TSSC (2016b) that relate to invasive fauna species. Activities associated with the construction and operation of the Project will not result in these threats manifesting. Proliferation of grassy weeds could plausibly lead to a reduction of foraging grass species and/or a detrimental change in fire regimes. The Weed Management Plan presented in Appendix 5.3 has been developed to minimise introduction and proliferation of weeds within the project area of influence for the life of the Project.
Introduce disease that may cause the species to decline	Disease is not listed as a threatening process for Crested Shrike-tit. The author is not aware of any literature on diseases that could be introduced by the Project and that would detrimentally affect this species.
Interfere substantially with the recovery of the species	The Crested Shrike-tit was previously included in a recovery plan, but that document is no longer in effect. The Conservation Advice (TSSC, 2016b) for the sub-species contains several conservation and management actions, none of which will be interfered with by development of the Project.

5.6.3.21 Darwin Cycad (Cycas armstrongii)

The Darwin Cycad is listed as Vulnerable under the *TPWC Act*. However, it is not listed under the *EPBC Act*. The species occurs in open grassy woodlands where adequate draining appears to be a limiting factor (Liddle, 2009). It also occurs on rocky outcrops, undulating hills, and plains (Kerrigan et al., 2006a). Darwin Cycads are endemic to the Top End, with abundant populations occurring throughout the greater Darwin region, often forming dense stands (DEPWS, 2021e). Nevertheless, their long-term conservation must be considered because they are long-lived, have a slow reproductive rate and localised distribution (Liddle, 2009).

Within the favoured habitat and when conditions are favourable, the Darwin Cycad can occur at densities ranging from several to more than 1,000 individuals per ha (Watkinson and Powell, 1997; Liddle, 2004). Areas with high-density stands of cycads – i.e., densities of >700 mature stems per ha are considered very high density and >400 mature stems/ha are deemed high density – are important for maintaining the species' diversity and function (Hill, 2020). According to Stokeld et al., (2020):

Areas with 'high' and 'very high' density stands of the species complex are widely distributed across the coastal and sub-coastal regions of the western Top End, including the Tiwi Islands and the Daly River/Port Keats Aboriginal Land Trust.

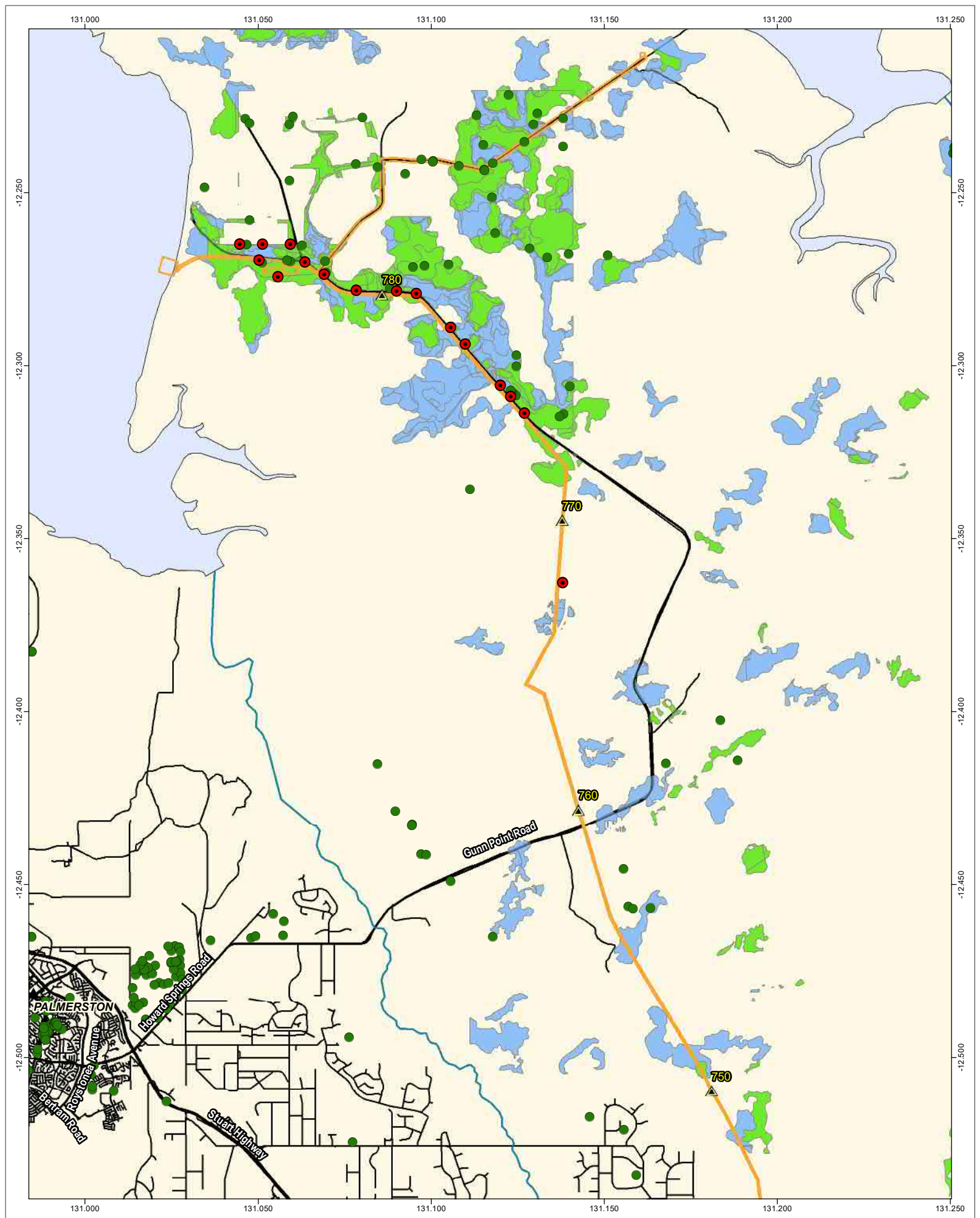
Within the OHTL, Darwin Cycads could occur from about KP 646 onwards. No surveys for the Darwin Cycad have occurred within the OHTL Corridor or OHTL preferred route at Adelaide River.

Of relevance to the OHTL Corridor, northern electrode and Murrumujuk facilities, the Darwin Cycad has a widespread, patchy distribution on Gunn Point Peninsula according to the recent surveys (Astrebla, 2017; Stokeld et al., 2020) (

Figure 5-34). Likelihood of occurrence modelling by Stokeld et al. (2020) identified 7% (4,988 ha) of the Gunn Point Peninsula study area as having a high likelihood of supporting high density cycad stands, and 9% (6,117 ha) a moderate likelihood. The high-density likelihood modelling begins north of KP 751 and intersects all components on the Gunn Point Peninsula (

Figure 5-34)., approximately 123 ha (2.5%) of the high likelihood modelling and approximately 71 ha (1.2%) of moderate likelihood occurs within the Project footprint. During the OHTL Corridor field survey, Darwin Cycads were generally observed in the most commonly occurring land units throughout the corridor and there were areas of high-density Darwin Cycads noted. The northern Gunn Point peninsula near Murrumujuk and Leaders Creek turn-off also contains extensive areas with a high likelihood of supporting high density stands of Darwin Cycad. This was confirmed with the observation of areas of high-density Darwin Cycads within the DCS and CTF footprints during the field investigations for the Project. The flora survey for the adjacent Project Sea Dragon site (Astrebla, 2017) recorded an average of 887 individual Darwin Cycads per ha in Eucalyptus woodland on the site – often in dense clumps separated by areas with relatively few or no cycads. This suggests that across the 90 ha of this habitat type within the Project Sea Dragon site, there may be approximately 79,830 individuals present. Individual Darwin Cycads were also found in other low woodlands, but in much lower densities.

The northern electrode footprint does not support many Darwin Cycads, but there is a high-density patch within the connection OHTL footprint.



▲ Towns
△ Kilometre Point (KP)

Roads
- Principal road
- Secondary road
- Minor road
- OHTL Corridor

● Darwin Cycad record
● High density stand (Stokeld et al 2020)

Darwin Cycad high density modelling
- High likelihood
- Moderate likelihood

Source: Sun Cable, EcOz, NTG (NR Maps)

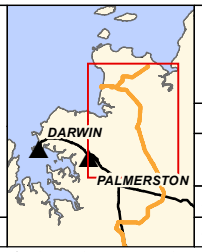


Figure 5-34. Map of Darwin Cycad high density likelihood modelling at Gunn Point

N

Project: Australia-Asia PowerLink

0 1 2 3 4 5 Kilometres

Reference: M-Files ID 217502

Date: 23/11/2022 | Revision: 1

Scale: 1:150,000

Coordinate System: GDA2020 | A4

SUN CABLE AUSTRALIA-ASIA PowerLink

The mainland Darwin Cycad population is considered a single population – one which this project's activities are unlikely to have a significant impact upon. Because the species is locally common within its restricted range, the focus for conservation is typically on high density stands (> 400 stems per ha). As discussed, some conservation-significant stands of Darwin Cycad are known to occur within the project footprint; others may be detected once the OHTL preferred route at Adelaide River is surveyed and during micro-siting.

Whilst locally abundant, the Darwin Cycad is poorly represented in the NT reserve system. Almost every greenfield development in the Darwin region leads to the loss of some Darwin Cycads, and thereby contributes to a long-term decrease in the size of the Darwin Cycad population.

In developing the Project, all efforts will be made to minimise loss of the Darwin Cycad. This will be achieved through application of the Constraints Planning and Field Development Procedure (Appendix 4.1) to ensure that careful placement of pole pads avoid high-density patches and translocation. Moreover, the Darwin Cycad is a species that is likely over time to recolonise reinstated areas of the footprint. Nevertheless, the species is so abundant within the region that development of the Project will inevitably lead to the loss of some Darwin Cycads. However, due to the small area of habitat lost compared to the total distribution of the species, that loss is not likely to affect the conservation status of the species in the NT.

Table 5-41 assesses whether project activities are likely to have a significant impact upon the Darwin Cycad. Because the occurrence of Darwin Cycad within the project footprint is not an important population, the footprint does not contain habitat critical to the survival of the species, and the impacts to this species will be minimised through avoidance of high-density patches, translocation and natural regeneration in the reinstated parts of the footprint, it is unlikely that there will be a significant impact on the species.

Table 5-41: Significant impact assessment table for Darwin Cycad

Criterion	Summary of mitigation measures and significant impact assessment
Lead to a long-term decrease in the size of an important population	The mainland Darwin Cycad population is considered a single population. The project footprint runs through the middle of the species' distribution, contains only a very small proportion of plants and suitable habitat, and will avoid most high-density stands. Therefore, the Darwin Cycads that will be affected by this development do not constitute a key source population, nor one that is necessary for maintaining genetic diversity. Only if Darwin Cycads are detected within the OHTL preferred route at Adelaide River would there be any records within the project footprint which are at the limits of the species' distribution of this species. Such records would be attributed high-conservation status and either avoided or salvage for re-planting back into the reinstated area. For these reasons, the occurrence of this species within the project footprint is not considered an 'important' population (as defined in EPBC Significant Impact Guidelines 1.1) and these criteria are not relevant.
Fragment an existing important population into two or more populations	
Disrupt the breeding cycle of an important population	
Reduce the AOO of an important population	According to Stokeld et al. (2020), the AOO for Darwin Cycad is 1,456 km^2, of which 11% is within the Gunn Point region. Determining AOO is based on the IUCN 2 x 2 km grid cell method. Where Darwin Cycads occur within the OHTL footprint and their loss cannot be avoided, the only way that loss can lead to a reduced AOO is if it is entirely confined to within the OHTL footprint. In other words, if the plants lost constitute the entire local occurrence, and there are no other nearby occurrences, then this could lead to a reduced AOO. The narrowness of the OHTL Corridor and local abundance of the species in the region mean that it is very unlikely that this scenario will eventuate.

Criterion	Summary of mitigation measures and significant impact assessment
Adversely affect habitat critical to the survival of the species	Critical habitat has not been defined for the Darwin Cycad. The species is locally abundant in suitable habitat across its distribution.
Modify, destroy, remove, isolate, or decrease the availability or quality of habitat to the extent the species is likely to decline	Although development of the Project will involve clearing Darwin Cycad habitat and the loss of individual plants, substantial areas of suitable habitat and numerous plants will still be present elsewhere on Gunn Point Peninsula and across greater Darwin, such that it is unlikely to significantly contribute to a decline in the species.
Result in invasive species, that are harmful to the species, becoming established in the species' habitat	The Management Plan for Cycads of the NT (Liddle, 2009) identifies invasive grasses such as Gamba Grass (with large biomasses that increase fire intensity and outcompete native plants) are harmful to the Darwin Cycad. The Weed Management Plan presented in Appendix 5.3 has been developed to minimise introduction and proliferation of weeds within the project area of influence for the life of the Project.
Introduce disease that may cause the species to decline	Disease is not listed as a threatening process for Darwin Cycad. The author is not aware of any literature on diseases that could be introduced by the Project and that would detrimentally affect this species.
Interfere substantially with the recovery of the species	There is no recovery plan or actions for this species. The Management Plan for Cycads of the NT (Liddle, 2009) focusses on research and wild harvesting of cycads and does not contain any recovery actions that are relevant to this development.

5.6.3.22 Ghost Bat (Macroderma gigas)

The Ghost Bat is listed as Vulnerable under the *EPBC Act* and Near Threatened under the *TPWC Act*. The species has a broad distribution and generalist foraging requirements, but only 14 breeding sites are known (Worthington Wilmer, 2012) – with a concentration around the Pine Creek and Katherine region. Permanent roost sites are generally deep natural caves or disused mines; most breeding sites are caves with multiple entrances (TSSC, 2016c). Known Ghost Bat roost sites within the Katherine region are the Kintore Caves Conservation Reserve and the Cutta Cutta Caves Nature Park. Ghost Bats near Pine Creek were found to forage over relatively small areas (mean 61 ha) within 2 km from the daytime roost, and in most cases returned to the same roosting cave (Pettigrew et al., 1986; Tidemann et al., 1985). The species moves between a number of caves seasonally or as dictated by weather conditions and require a range of cave sites (Hutson et al., 2001). DCCEEW (2022) species distribution modelling shows the Ghost Bat or suitable habitat is likely or may occur within the project footprint, in contiguous vegetation from Gunn Point to KP 202. Isolated areas where the species or species habitat may occur also intersect the footprint from KP 104 to 118, KP 49 to 65 and the AI at Powell Creek.

The Kohoonir Adit colony – the largest known maternity site for Ghost Bat – is located just south of Pine Creek, and approximately 200 m to the west of the OHTL Corridor. The location of known Ghost Bat roosts is restricted information that is not in the public domain. However, the Proponent has confirmed with the custodians of that information – the Flora and Fauna Division of DEPWS – that the Kohinoor Adit is the only known roost site relevant to the OHTL footprint.

Advice sought from DEPWS regarding mitigating potential impacts to Ghost Bats was to apply a minimum 1 km buffer to construction and disturbance works around this roost site. This is not possible. However, construction of the OHTL within 1 km of that site will be restricted to occurring outside of breeding season (i.e., not between July to September). The noise generated by machinery installing OHTL structures will be temporary (each OHTL structure will require only a few days to erect). No blasting is required, and the footprint is adjacent to an operating – and therefore periodically noisy – railway line, and very close to Pine Creek township. The placement of structures will be as far from the Kohoonir Adit colony as possible. Localised construction noise for a short duration outside of breeding season is unlikely to have a significant impact on roosting Ghost Bats.

Known roost sites in the Adelaide River region are to the south-west of the OHTL preferred route at Adelaide River footprint, however, given the mining history of the region, there could be disused adits within the footprint that could be roosting/breeding sites for Ghost Bats. Consequently, prior to locating OHTL structures in the footprint, an assessment of suitable roosting habitat – such as caves and adits – within 1 km of the footprint will be undertaken. The Constraints Planning and Field Development Procedure will be applied to mitigate impacts during the construction and operations phase.

Table 5-42 assesses whether project activities are likely to have a significant impact upon the Ghost Bat. The narrow footprint and the mitigations proposed – primarily to do with timing of works – mean that impacts to this species associated with the Project are unlikely to constitute a significant impact.

Table 5-42: Significant impact assessment table for the Ghost Bat

Criterion	Summary of mitigation measures and significant impact assessment
Lead to a long-term decrease in the size of an important population	Ghost Bat populations are genetically distinct at both regional and local scales; the presence of a nearby maternity cave – and the species' high degree of female philopatry (i.e., faithfulness to a breeding site) – means the site is likely a key source population for breeding. The disturbance of breeding females has the potential to reduce the AOO and population size significantly (TSSC, 2016c). For these reasons, it is assumed that an important Ghost Bat population occurs very close to project footprint for at least part of the year. Given the mobile nature of this species, there is unlikely to be any direct mortality of individual Ghost Bats because of interactions with construction machinery. Although the largest of micro-bats, this species is still too small and agile to have a negative interaction with powerlines (as explained in Section 5.12.2.21). No barbed wire fencing will be required during construction or operations. Prior to construction, the Proponent will define an exclusion zone surrounding the Kohoonir Adit, to avoid disturbance by human visitation to the cave. Moreover, to minimise the chances of Ghost Bats colliding with powerlines, a visual cue such as white bunting will be applied to the powerlines along the length of the OHTL within 1 km of the Kohinoor adit.
Reduce the AOO of an important population	The AOO of the Ghost Bat is estimated to be <10 km^2. However, this is limited to roost sites (Woinarski et al., 2014). Applying the controls described above, development of the Project is unlikely to lead to a loss in any roost sites. If foraging habitat was included in the AOO, it would be many orders of magnitude larger. The loss of some of that habitat cannot be avoided. Under the grid cell method, the only way that a habitat loss can lead to a reduced AOO is if it is entirely confined to within the OHTL footprint. In other words, if the Ghost Bat foraging resources lost constitute the entire local occurrence of those resources, and there are no other nearby occurrences, then this could lead to a reduced AOO. However, because Ghost Bats foraging habitat requirements are quite

Criterion	Summary of mitigation measures and significant impact assessment
	broad within its distribution, habitat is not restricted to the OHTL footprint. Therefore, its loss will not result in a reduced AOO.
Fragment an existing important population into two or more populations	The narrow project footprint – running adjacent to an existing railway lie corridor – is unlikely to represent a dispersal barrier to such a mobile species.
Disrupt the breeding cycle of an important population	By undertaking any construction work within 1 km of known or suspected roosting audits outside the breeding season, the likelihood of a maternity colony's breeding cycle being disrupted is low.
Adversely affect habitat critical to the survival of the species	Critical habitat for the Ghost Bat is diurnal roosting habitat (Bat Call WA 2021). Such habitat will not be directly impacted by project activities, and indirect impacts will be avoided and mitigated through pre-construction assessments and mitigation measures to be adopted by in the Constraints Planning and Field Development Procedure.
Modify, destroy, remove, isolate, or decrease the availability or quality of habitat to the extent the species is likely to decline	The proportion of Ghost Bat foraging habitat present within the project footprint compared within the surrounding 20 km is 0.12%. This occurs across 581 km of the OHTL and at Gunn Point. The loss of such a small and narrow area of habitat is unlikely to modify, destroy, remove, isolate, or decrease the availability or quality of habitat to the extent the species is likely to decline.
Result in invasive species, that are harmful to the species, becoming established in the species' habitat	Poisoning by Cane Toads, prey competition with (and predation by) Feral Cats and disturbance of roosts by Feral Pigs are all potential threatening processes for Ghost Bat (Bat Call WA, 2021 and TSSC, 2016c). These species are already common in the region, and development of the Project is unlikely to lead to any substantial change in their occurrence.
Introduce disease that may cause the species to decline	Disease is considered a potential threatening process for Ghost Bat (Bat Call WA, 2021 and TSSC, 2016c). Regardless of how real this threat is to Ghost Bats, there is no nexus between the activities associated with the Project and introduction of a disease into the region.
Interfere substantially with the recovery of the species	Despite being recommended by TSSC (2016c), there is no recovery plan or actions for this species. The primary conservations actions in the Conservation Advice (TSSC, 2016c) are to protect roost sites from mining, human disturbance and collapse, and replace the top strands of barbed wire in fences near roost sites with single-strand wire. Development of the Project will not interfere with these actions.

5.6.3.23 Greater Bilby (*Macrotis lagotis*)

The Greater Bilby (*Macrotis lagotis*) is listed as Vulnerable under both the EPBC and *TPWC Act*s. There is a Recovery Plan for the species (Pavey, 2006), but also a draft Recovery Plan currently being considered as a replacement (CoA, 2019). Given the latter is a more recent document, it has been referenced in the following significant impact assessment for the Greater Bilby.

Records

Since the late 1800s, the Greater Bilby has disappeared from at least 80% of its former range (Southgate, 1990), with a steady contraction northward (CoA, 2019). In the past twenty years, the vast majority of records of this species in the NT are from the Tanami Desert west to the WA border, but also from targeted surveys in Murranji Station, which is approximately 100 km to the north of the Solar Precinct site – see Figure 5-35.

There are recent records (from 2011 and 2020) of the Greater Bilby in the NT Fauna Atlas on Murranji Station (and on the same Redsan land system upon which the Solar Precinct is located), and historic reports to the west (circa 1982) and south (2001) of the Solar Precinct. In a comment on the Draft EIS, DEPWS states that there are records of the species from 2008 in the railway corridor in, and close to, the Solar Precinct footprint. These are records withheld by the CLC (noting that the entire Project is within the NLC's territory). The Proponent has not been able to view the location of these or garner any detail regarding how they were collected. Without viewing these records, it cannot be confirmed whether these occurrences overlap with the project footprint.

In November 2020, the Greater Bilby was subject to an intensive, targeted, field study for the Project. The methods employed were sign-based and followed approved methodologies and advice from DEPWS, and the key elements of the Cwth survey guidelines for threatened mammals (CoA, 2011) for the species in terms of tracking and species detection in areas of suitable habitat. Due to the large size of the Solar Precinct, a helicopter survey was employed in combination with ground-based track-plot sampling. The approach was to visit known Greater Bilby sites for reference, and then survey suitable habitat within the project footprint – i.e., the Solar Precinct and relevant length of the OHTL (approximately the first 150 km). The survey methods and results were presented in detail in Appendix P of Draft EIS. Another survey using similar methods was undertaken in October 2022 targeting areas of the proposed project footprint that were not captured in the previous surveys – Appendix 5.1 of SEIS.

The 2020 survey did not find any Greater Bilby burrows within the proposed Solar Precinct footprint; nor was there any evidence of recent activity. Moreover, there were no confirmed signs of Greater Bilbies within the first 150 km of the proposed OHTL Corridor. Nevertheless, it was concluded that it is likely the Greater Bilby occurs within part of the OHTL Corridor – particularly on Murranji Station – due to the presence of suitable habitat, records from 2011 within the railway corridor, and proximity to the known, existing colony on the station.

The 2022 survey confirmed presence – i.e., active burrows – of Greater Bilby at one site within the railway corridor on the western side of the railway tracks – 209 m from the western boundary of the Solar Precinct, and also recorded potential Greater Bilby sign elsewhere along the railway corridor adjacent to the OHTL Corridor – see Figure 5-36.

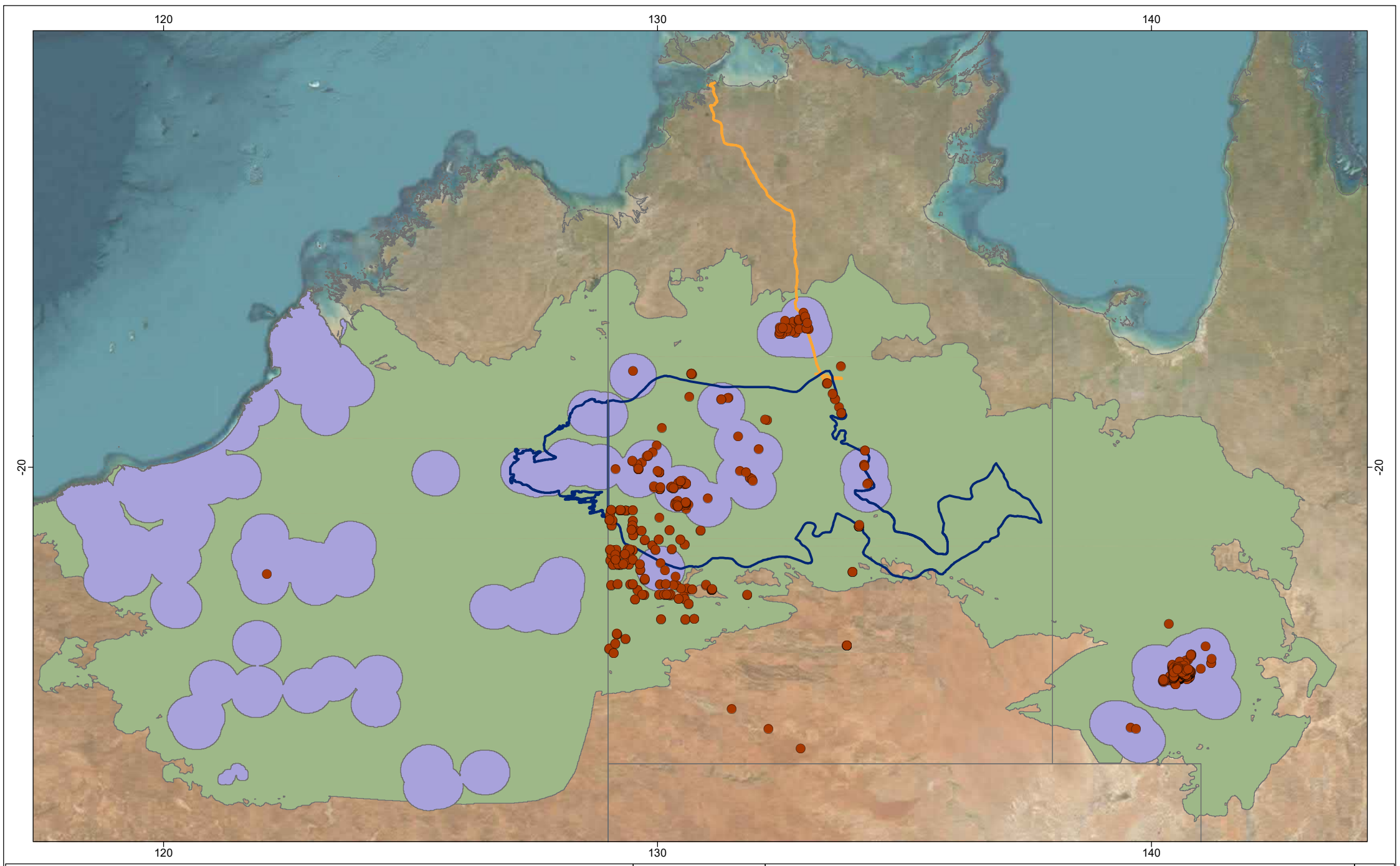


Figure 5-35. Map of Greater Bilby modelled distribution and recent records

Project: Australia-Asia PowerLink	Reference: M-Files ID 198726	Revision: 1
Coordinate System: GDA2020	Date: 18/11/2022	
0 125 250 375 500 Kilometres	Scale: 1:10,612,524	A4

N

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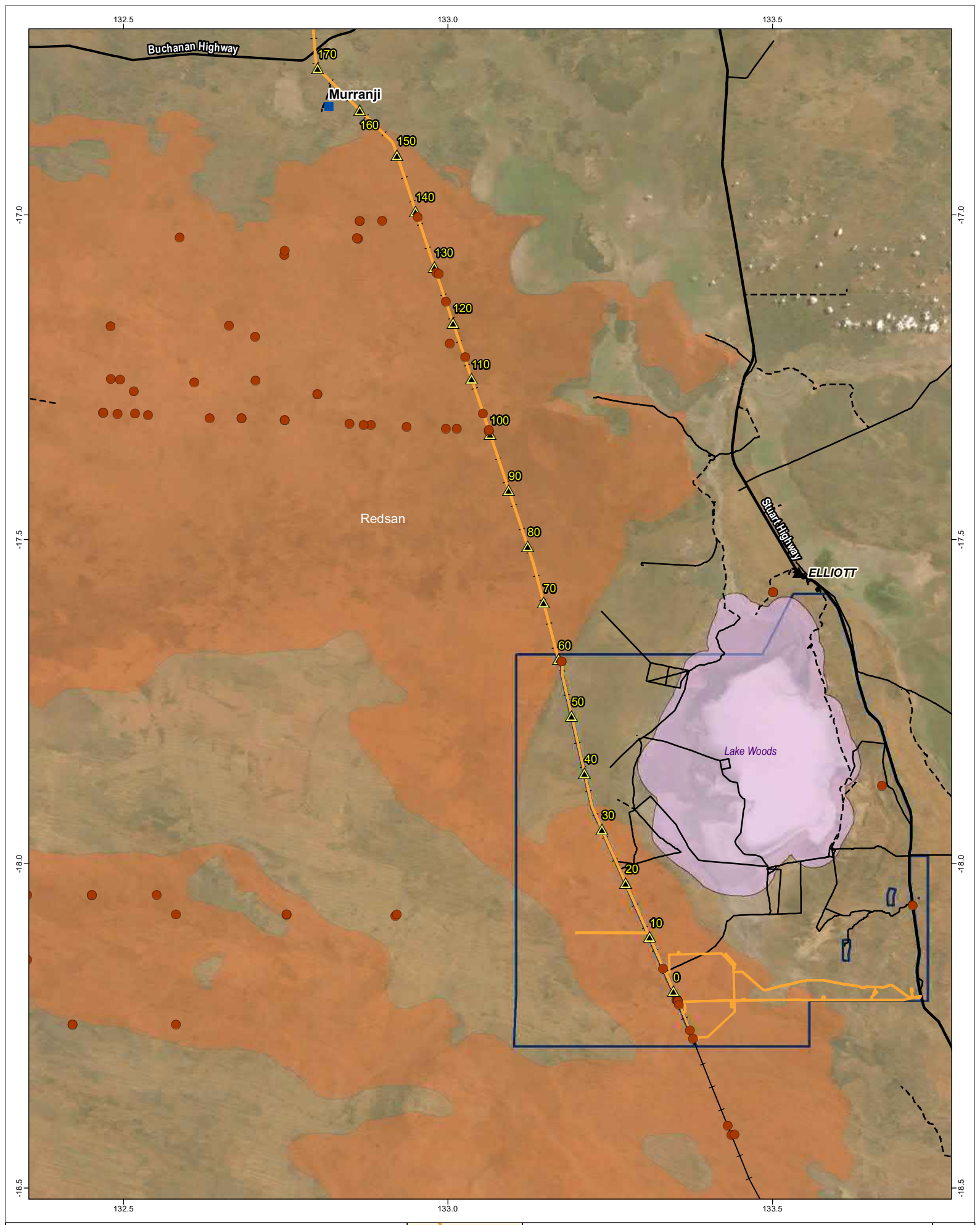


Legend

- Towns
- KP
- Aboriginal Community
- Bilby record
- Railway
- Powell Creek Station
- AAPowerLink infrastructure
- Sites of Conservation Significance

Land System

- Redsan

Source: Sun Cable, EcOz, NTG (NR Maps)

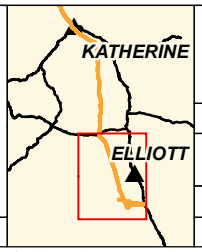


Figure 5-36. Map showing Greater Bilby habitat and records relevant to the AAPowerLink

Project: Australia-Asia PowerLink

0 25 Kilometres

Reference: M-Files ID 200232

Date: 16/11/2022 | Revision: 1

Scale: 1:800,000 | Datum: GDA2020

Coordinate System: GDA2020 | A4

SUN CABLE AUSTRALIA-ASIA PowerLink

Habitat

Across the species' large distribution, the Greater Bilby uses a diversity of habitats (Southgate et al., 2007). Occupancy modelling in the NT indicates that palaeo-drainage lines remain more persistently suitable for Greater Bilby than other habitats such as sand plains and dune fields (Southgate et al., 2018). CoA (2019) describes habitat usage for the species in various locations. In the Tanami Desert – the nearest such location to the project footprint – Greater Bilby occurrence is:

Strongly associated with substrate type, with the species less abundant on dune and sand substrates than on laterite/rock features or drainage/calcrete substrates – citing Paltridge (2016) and Southgate et al. (2007). These habitats support shrub species such as Acacia kempeana, A. hilliana and A. rhodophylla, which have root-dwelling larvae (Latz, 1995, cited in Southgate et al., 2007) that provide a relatively reliable food source for bilbies.

The 2020 survey of the Solar Precinct footprint included comprehensive land type assessments that recorded vegetation and soils characteristics, which were used to assess the suitability of the habitat for the Greater Bilby. The results indicate that the paleo-drainage lines and laterite/rock features habitat types that are strongly associated with Greater Bilby presence do not occur in the project footprint. The results also indicate that there is currently a very low availability of viable food resources for Greater Bilby within the footprint; only Turpentine (*Acacia lysiphloia*) and a few patches of Cockroach Bush (*Senna notabilis*) and Camel Weed (*Scaevola parvifolia*) were recorded. Two plant species known to be a major dietary component of Greater Bilby in the Tanami Desert (Southgate and Carthew, 2006) – *Yakirra australiense* and *Cyperus bulbosus* – were not detected within the footprint. In contrast, those species were observed at the reference survey sites at Murranji. Notwithstanding the fact that food availability may change post-fire (as it can in most of this landscape), because many tree species that the Greater Bilby prefer are post-fire ephemerals, the absence of known preferred habitat types suggest the habitat quality is low within the Solar Precinct footprint. This conclusion was supported by the targeted survey results which did not detect any sign of the Greater Bilby using the habitats in that footprint.

The 2022 survey of the northern electrode site and corridor, and the AI concluded that majority of the habitat within those components of project footprint is suitable for Greater Bilby; but that habitat is widespread in the area (and the surrounding desert sandplains and dune fields in the Tanami Desert to the west) and is not unique to the project footprint – Appendix 5.1 of SEIS.

It is considered that habitat within the Electrode site and the components of the AI which occur on the Redsan land system is suitable for Greater Bilby; however, similar habitat is widespread in the surrounding region and the Electrode site does not provide any unique habitat characteristics specifically favoured by the Greater Bilby. In fact, there is currently a low abundance and richness of potential food plants available (i.e., only scattered Turpentine observed). The situation is the same for the sections of the access routes within the Redsan land system to the west of Ashburton Range, noting that that access routes in this area have been positioned on existing station tracks.

It is possible that the railway corridor provides better quality habitat for Greater Bilby than surrounding habitat, due to the exclusion of cattle, presence of micro-habitat features such as depressions (from borrow pits), and evidence of more of a mosaic burn pattern. There is also anecdotal evidence that the Greater Bilby favour linear structures such as railway lines and tracks (although, so do their predators).

The Powell Creek project footprint and surrounds have experienced relatively large-scale fires – particularly in the spinifex sandplains. Large-scale fires can reduce habitat quality for bilby (who prefer mosaic-type burning). It is likely that the mosaic of *Acacia lysiphloia* within the area is driven by fire scars and, as such, its presence across the landscape will likely vary between seasons and years based on fire history (and bilbies will move with those changes). The active burrows found within the railway corridor in 2022 (adjacent to the Solar Precinct) occur in an area that has not burnt for 10 to 11 years and are on the edge of several different fire scars (thereby providing access to a range of fire ages), potentially due to the presence of the railway (fire break) and clay pan area to the west (very low fire frequency).

Finally, pastoral activity may also play a role in habitat suitability for bilby in the area. Currently, there is a higher level of pastoral impact east of the railway – due to the presence of bores and tanks – with survey observations identifying a higher frequency of cattle pads, grazing impacts, and hoof density. In addition, the managers of Powell Creek station have recently installed new bores in the southern end of the station – including within the Solar Precinct footprint – with the intention of intensifying pastoralism in that region. This would likely have a negative impact on suitable Greater Bilby habitat moving forward. The land to the west of the OHTL Corridor has no bores and is not currently used for cattle grazing, and so may provide better quality habitat for the Greater Bilby. Almost all records of the Greater Bilby from the past few decades in the Tanami region and surrounds – which is a stronghold for the species – are on Aboriginal Land, with very few from pastoral stations.

In summary, almost all of the Powell Creek project footprint that is situated on the Redsan land system provides nominally suitable habitat for the Greater Bilby; however, there is currently a low abundance and richness of potential food plants available within that footprint. Furthermore, the paleo-drainage lines and laterite/rock features habitat types that are strongly associated with Greater Bilby presence do not occur and, despite two targeted surveys, Greater Bilby burrows were only recorded in one location within the OHTL railway corridor and adjacent to the Powell Creek project footprint. The main characteristic of the burrow site compared with the rest of the project footprint is that it is one of the few patches of sandplain that has not burnt within the past 10 years, which may be why mature patches of Acacia shrubs are present.

Threats

Predation by Red Foxes – but also Feral Cats – is the most serious threat to the Greater Bilby, followed by inappropriate fire regimes, and land degradation and resource depletion by livestock and feral herbivores (Woinarski et al., 2014). Land clearing can lead to loss of habitat, degradation of surrounding habitat, increased predation, and fragmentation effects (Bradley et al., 2015).

Impact assessment

The presence of Greater Bilby on the western boundary of the Solar Precinct qualifies as an ‘important population’ by virtue of being near the limit of the species’ range. As noted by DEPWS in their comments on the Draft EIS, the known Greater Bilby colony on Murranji Station adjacent to the proposed OHTL Corridor is at the northernmost extent of the Greater Bilby’s current distribution – i.e., near the limit of the species’ range – and therefore qualifies as being an important population. In addition, as noted in the draft Recovery Plan (CoA, 2019): the Greater Bilby largely now occurs as small groups which are fragments of the former, near-continuous distribution. Each of these groups is important and under pressure.

Table 5-43 presents an assessment of whether project activities are likely to have a significant impact on the Greater Bilby, using the criteria contained within the EPBC Significant Impact Guidelines 1.1 (DEWHA, 2013). The key sources of potential impacts to the Greater Bilby from the project activities considered in the assessment are direct mortality during land clearing, and indirect impacts associated with removal of suitable (but unoccupied) habitat. The assessment concludes that a significant impact is unlikely because most of the suitable habit for Greater Bilby that will be lost is peripheral, of lower quality, and has not been shown to support the species (based on two

surveys). In addition, mitigation measures will be put into place to avoid direct mortality of the species during construction.

Table 5-43: Significant impact assessment for the Greater Bilby

Criterion	Summary of mitigation measures and significant impact assessment
Lead to a long-term decrease in the size of an important population	The focus for this criterion is on the potential for direct mortality. Other ways in which this development could potentially lead to a long-term decrease in the size of the Greater Bilby population – e.g., reproductivity/recruitment failure, loss of habitat – are discussed under other criteria below. Surveys of the area to be cleared for the Powell Creek infrastructure have not detected the presence of the Greater Bilby, although there is a 2022 record immediately to the west of the Solar Precinct within the OHTL. There are also records of the Greater Bilby from within the OHTL Corridor, and the species could occur within the Redsan land system sections of the OHTL. There are a few records of Greater Bilby to the east of Powell Creek station in the Ashburton land system which is the location of some of the Powell Creek infrastructure access road corridor. However, those records are either very old (1968 to 1983), or from an unconfirmed source. The 2020 and 2021 surveys did not record any evidence of the species occurring within the access route footprints – most of which occurs in the unsuitable habitat of the Ashburton Ranges. Greater Bilbies utilise numerous burrows across their home range. The most plausible potential cause for a long-term decrease in the size of a local Greater Bilby population would be if burrows within the project footprint are occupied during construction, and the occupants are killed as a result of construction activities. This is less likely for the OHTL footprint because it is very narrow and will therefore, at most, only intersect with a few burrows within individuals' home ranges. Nevertheless, an ecologist experienced with detecting sign of the species will inspect all proposed clearance areas within the Redsan land system prior to any land-clearing for Greater Bilby during pre-construction surveys. If any suspected active burrows are found, a clearance impact mitigation procedure will be implemented to avoid deaths of any Greater Bilbies. This procedure will be developed in consultation with experts and will draw on lessons learnt from such work done elsewhere, such as in the Pilbara. During construction, land-based works will operate during a standard day shift. In limited cases, night shift, or 24-hours operation may be needed depending on the construction activities. As discussed in Section 5.4.2.6 of the Draft EIS, direct fauna mortality due to interactions with vehicles ('fauna strike') or construction equipment is a potential construction impact. Proposal activities will involve increased movement of vehicles, equipment and plant along highways, access tracks and within Powell Creek Solar Precinct and Electrode and AI. The Project WHS Management System and Traffic Management Plans in development as part of the management framework described in Chapter 17 Environmental Management will incorporate procedures and controls for safe driving and operation of plant and equipment to minimise risks to workers and the community, and also to fauna associated with collisions. Controls applied at each construction location will be risk-based and will include measures such as nominated speed limits for different vehicle types, traffic control measures, restrictions on night driving in areas of high collision risk (including areas of identified Bilby activity), and removal of roadkill away from the side of the road. The controls to be implemented in Traffic Management Plans are outlined in Table 5-60, including amendments to night driving. Ongoing monitoring for fauna sightings and encounters during works will be used to inform the development and refinement of Traffic Management Plans, particularly to identify areas of high collision risk. The inherently low risk of occupied burrows being destroyed during construction – coupled with the avoidance and mitigation measures proposed – should ensure that mortality of

Criterion	Summary of mitigation measures and significant impact assessment
	Greater Bilby is very unlikely to occur, and therefore there will not be a long-term decrease in the size of a Greater Bilby population.
Reduce the AOO of an important population	Woinarski et al. (2014) state that the AOO of the Greater Bilby is 2,150 km^2 (but likely an under-estimate). By definition, the AOO is the 'area within a species EOO which is occupied by the species, excluding cases of vagrancy. The measure reflects the fact that a taxon will not usually occur throughout the area of its EOO, which may contain unsuitable or unoccupied habitats' (IUCN, 2012). The Powell Creek infrastructure footprint is within the Greater Bilby's EOO, but despite two targeted surveys, the only evidence of their presence is on the western boundary of the Solar Precinct. This new record of Greater Bilby within the OHTL – together with historic records from Murranji within the OHTL – means that the AOO of the species intersects with sections of the OHTL component of the project footprint. However, it does not intersect within any other areas of the Powell Creek infrastructure footprint. Short-term disturbance of the railway corridor during construction of the OHTL may deter Greater Bilby from using that habitat temporarily; however, post-construction there is a reasonable chance that the species will return to using the OHTL Corridor as previously done. There is unlikely to be an overall reduction in the AOO.
Fragment an existing important population into two or more populations	As noted above, the Greater Bilby now occurs in fragmented groups that are considered to be all members of one population. Therefore technically, in the event that project activities fragment any existing group (which is unlikely, as explained below), there would still only be one population. The following analysis, however, takes a more conservative approach by considering each of the fragmented 'groups' to be 'populations.' This Solar Precinct footprint is a large area which could reduce some connectivity; however, not to the degree that north-south or east-west movement of the species is no longer possible. This is supported by the fact that the Solar Precinct and adjacent infrastructure are on the eastern periphery of the Greater Bilby's distribution, and that the paucity of recent records indicate that persistence of the species to the east is unlikely. Moreover, because Greater Bilby are a mobile species, the clearing of a narrow corridor (22 m reducing to 6 m post-construction) to construct the OHTL Corridor (and even narrower for the access road) will not present any more of a barrier to Greater Bilby movement than the existing railway line and access road and will therefore not lead to any fragmentation of a population.
Disrupt the breeding cycle of a population	Timing of the Greater Bilby breeding season depends on seasonal conditions and food availability (TSSC 2016d). Infant bilbies spend ~75 to 80 days in their mother's pouch, and then another two weeks in a burrow (Woinarski et al., 2014). After two surveys, Greater Bilby burrows have only been recorded in the OHTL railway corridor. Application of the pre-clearance mitigation plan discussed above across the whole Redsan land system component of the Powell Creek infrastructure footprint should ensure that adult Greater Bilbies within active burrows are not harmed during construction of project infrastructure. However, if a burrow contains infants, these may be lost. This risk would only manifest if construction in the vicinity of the burrow coincides with the few weeks in which infants may be in the burrow – which has an inherently low likelihood of occurring. Even if infants are lost from a burrow, it is possible that the individual adults affected could breed again shortly afterwards. Temporary disruption of what, at most, would be a few individuals' breeding cycles, does not reasonably constitute a significant impact to the Greater Bilby population.

Criterion	Summary of mitigation measures and significant impact assessment
Adversely affect habitat critical to the survival of the species	The draft National Recovery Plan (CoA, 2019) defines critical habitat as: • Any area where the species is known or likely to occur as shown on the Distribution Map on the Greater Bilby (see Figure 5-35). • Any location outside the above area where bilbies are found to occur • Any area, between the areas noted above, that may be periodically occupied by bilbies • Any area which bilbies may naturally colonise or may feasibly be re-introduced. Given the recent records within the first approximate 150 km of the OHTL, that part of the project footprint meets the first and/or third of those criteria. However, the area of such critical habitat that will be disturbed is very small and narrow compared with that available in the surrounds. Moreover, after construction of the OHTL, up 80% of that footprint will be reinstated to such a degree as to likely re-constitute suitable habitat for the Greater Bilby. It is not reasonable to conclude that the loss of such habitat will be to the jeopardy of the survival of the species. Regarding the Powell Creek project footprint, almost all of it that is situated on the Redsan land system provides nominally suitable habitat for the Greater Bilby; however, there is currently a low abundance and richness of potential food plants available within that footprint. Furthermore, the paleo-drainage lines and laterite/rock features habitat types that are strongly associated with Greater Bilby presence are not present and, despite two targeted surveys, Greater Bilby burrows were not recorded within the Powell Creek project footprint (only once immediately to the west). Almost all records of the Greater Bilby from the past few decades in the Tanami region and surrounds are on Aboriginal Land, with very few from pastoral stations. Powell Creek station is located on the very eastern boundary of the Greater Bilby's current distribution. Applying this information to the critical habitat criteria presented above leads to the conclusion that for the Powell Creek project footprint does not qualify under the first or second criteria – see also Figure 5-35. The third and fourth criteria – that Greater Bilbies may periodically occupy, or could naturally colonise, the land within the Powell Creek infrastructure footprint – are only weakly met because the habitat present is only nominally suitable, there are no records from two targeted surveys over three years, the land is used for pastoralism (which appears to be related regionally to Greater Bilby absence), and the footprint is on the periphery of the Greater Bilbies distribution (which is shrinking). For these reasons, the Powell Creek infrastructure footprint is not considered critical habitat for the Greater Bilby.
Modify, destroy, remove, isolate, or decrease the availability or quality of habitat to the extent the species is likely to decline	For the reasons given in this table, it is unlikely that the loss, or decrease in quality, of habitat because of project activities will cause a decline in the species. This is due to the large area of available suitable habitat in the region, the absence of critical habitat features, and the absence of records anywhere except on the edge of the project footprint.
Result in invasive species, that are harmful to the species, becoming established in the species' habitat	Predation by Feral Cats and Red Foxes is the most serious threat to the Greater Bilby (Woinarski et al., 2014). The project area is to the north of the Red Fox's range and so the species is unlikely to be present. Whilst linear clearings are known to assist cat movements (see, e.g., Wysong et al., 2020), the OHTL Corridor already contains a linear clearing for railway infrastructure, and so this project will not facilitate this impact. Creation of uncontained water-points can also assist in the spread and proliferation of cats and foxes. However, these are not a feature of this project. Altered fire regimes are another threatening process. This could occur if the environmental weed Buffel Grass (*Cenchrus ciliaris*) is introduced into area by construction or operations activities. The project's Weed Management Plan (Appendix 5.3) has been developed to minimise the likelihood of this occurring.

Criterion	Summary of mitigation measures and significant impact assessment
Introduce disease that may cause the species to decline	Disease is not listed as a threatening process for the Greater Bilby. The author is not aware of any literature on diseases that could be introduced by the project and that would detrimentally affect this species.
Interfere with the recovery of the species	The Conservation Advice (TSSC, 2016d) lists a number of priority conservation actions, none of which will be interfered with by the activities of this project.

5.6.3.24 Grey Falcon (Falco hypoleucos)

The Grey Falcon is listed as Vulnerable under both EPBC and *TPWC Act*s. The species is known to occur in areas of lightly timbered lowland plains, typically on inland drainage systems, where the average annual rainfall is less than 500 mm (DEPWS, 2021h). The Grey Falcon occupies nests (often built by other bird species) in the tallest trees along watercourses (Garnett et al., 2011), as well as on telecommunications towers. Nesting is normally between June to November (DEPWS, 2021h). The Grey Falcon is generally a solitary bird, sometimes found in pairs or family groups (Debus, 1998).

The Grey Falcon is always found in low densities (Garnett et al., 2011), primarily throughout arid and semi-arid areas (DEPWS, 2021h), including the NT and Queensland. Based on current distribution and habitat suitability, the Grey Falcon could be present within the OHTL footprint as far north as Gunn Point. However, most records are from the Tanami Desert and in the lower third of the NT (DEPWS, 2019). There are records along the Stuart Highway adjacent to Powell Creek Station.

The most severe threats to the Grey Falcon are predation by Feral Cats, grazing by exotic herbivores, small population size, nest shortages and increased temperatures in arid and semi-arid Australia (TSSC, 2020).

Field surveys in 2020 and 2022 for the Project confirmed that the Solar Precinct and AI do not contain breeding habitat for the Grey Falcon and, as such, the species has a low likelihood of occurrence within the footprint of those components except in transit – see Appendix O of the EIS and Appendix 5.1 of the SEIS.

The Grey Falcon has a higher likelihood of occurrence in the region traversed by the access roads due to the proximity of historic records, and the presence of vegetation communities known to support suitable nesting habitat along some of the large drainages. In October 2022, a survey was conducted using a helicopter to fly over all of the project components within Powell Creek Station to inspect for the presence of tall trees established along creek lines (see Appendix 5.1 of the SEIS for details). The main tree species of interest for nest establishment in this region is the River Red Gum (*Eucalyptus camaldulensis*). The survey did not identify any suspected nests of Grey Falcon within the footprint or surrounds. However, all drainages / creek lines that support River Red Gum were recorded as potential nesting habitat for Grey Falcon.

The survey did not observe any suspected Grey Falcon nests. However, it did identify several waterways with River Red Gum on their banks which are suitable for use by Grey Falcon for nesting. In general, trees within the access routes are less than 10 m in height, which lowers their suitability for nesting. The largest River Red Gum trees were mostly present within the lower reaches of Hunter Creek, Bull Creek, and Gleeson Creek. However, vegetation clearing will not be required in these areas as existing station tracks are being utilised for the access routes.

The Ashburton Range region could be used for general foraging / hunting by Grey Falcons. However, there are no unique characteristics within the corridor that make it a preferred hunting area for the species and suitable foraging habitat is widespread in the surrounding region. As such, although this

species has been given a high likelihood of occurrence, it is naturally sparse in the landscape and so an observation of a hunting/foraging individual would be considered to be rare. More frequent observations would only be expected if a nesting site is present within, or close to, the access roads corridor. There is no current evidence of nest occurrence.

Table 5-44 presents an assessment of whether project activities are likely to have a significant impact on the Grey Falcon, using the criteria contained within the EPBC Significant Impact Guidelines 1.1 (DEWHA, 2013). The conclusion is that the small area of habitat that will be lost, coupled with mitigation measures to ensure breeding is not disrupted, means it is unlikely there will be a significant impact to the species.

Table 5-44: Significant impact assessment for the Grey Falcon

Criterion	Summary of mitigation measures and significant impact assessment
Lead to a long-term decrease in the size of an important population	General occurrence of a Vulnerable species in a region is not, in itself, sufficient to meet the definition of an 'important' population. The Conservation Advice for Grey Falcon (TSSC, 2020) states that the species consists of a single population with a total population size of less than <1,000 mature individuals. Such a restricted population means that, in a sense, every individual of this species is an important population. Given the mobile nature of the species, there is unlikely to be any direct mortality of individual Grey Falcons because of interactions with construction machinery. There is the potential that the species could be collide with powerlines – but this is unlikely, as discussed in Section 5.12.2.21). The only other way in which this development could potentially lead to a long-term decrease in the size of the Grey Falcon population is through substantial loss of critical habitat. This is discussed and discounted below.
Reduce the AOO of an important population	Garnett et al. (2011) state that the AOO of the Grey Falcon is estimated at 6,000 km^2. Field surveys have confirmed that the Solar Precinct and OHTL do not contain breeding habitat for the Grey Falcon. These components do contain potential foraging habitat. However, so does most of the central, north and west of Australia (i.e., millions of square kilometres). It would not be reasonable to conclude that clearing the Solar Precinct would result in a substantive reduction on the AOO of this species. There is foraging habitat for the Grey Falcon within the Solar Precinct access road footprint; however, the only way the loss of that habitat can lead to a reduced AOO is if they are entirely confined to within the 10 m wide road footprint. This is because determining AOO is based on the IUCN 2 x 2 km grid cell method. Consequently, if the habitat lost constitutes the entire local occurrence of that habitat, and there are no other nearby occurrences of that habitat, then this could lead to a reduced AOO. However, within the species' range, foraging habitat is widespread and breeding habitat is unlikely to occur within the access road footprint. Consequently, the loss of small areas of habitat for development of the access road will not result in a reduced AOO for the Grey Falcon.
Fragment an existing important population into two or more populations	The Grey Falcon is a mobile animal with a large territory. The development of the Project will not represent a barrier for dispersal of this species.
Disrupt the breeding cycle of an important population	The Grey Falcon typically occupies nests (often built by other bird species) in the tallest trees along watercourses, as well as on telecommunications towers. No such habitat is present in the Solar Precinct or along the length of OHTL that transects a semi-arid landscape. Moreover, field observations indicate that whilst the vegetation in the region of the Solar Precinct access road is such that potential nest sites could

Criterion	Summary of mitigation measures and significant impact assessment
	occur adjacent to permanent or semi-permanent water where larger trees (>10 m in height) are established, no such nests have been observed. The Grey Falcon occurs in low densities across its range; the likelihood of a 10 m wide access road corridor intersecting with a Grey Falcon nest is very low. Nevertheless, to inform the final access road route, an ecologist with suitable expertise in identifying raptor nests will inspect high likelihood habitat for trees containing raptor nests. If required, the access road route will avoid any such trees by 100 m. To ensure that Grey Falcons have not established a nest in the proposed route between its selection and road construction, immediately prior to construction of the access road a suitably qualified ecologist will check the previously identified areas of high likelihood habitat for trees containing Grey Falcon nests. In the highly unlikely event that a nest is now present, the access road route will be altered to avoid the nest by 100 m. These avoidance and mitigation measures will minimise disruption to the species' breeding cycle.
Adversely affect habitat critical to the survival of the species	Critical habitat has not been formally defined for the Grey Falcon, but arguably constitutes tall trees and telecommunications towers used for nesting within the core of its distribution. As noted above, through avoidance and mitigation, impacts to such habitat will be negligible.
Modify, destroy, remove, isolate, or decrease the availability or quality of habitat to the extent the species is likely to decline	Given the large area of breeding and foraging habitat in the region, the clearing of such a small proportion of it for the Project is unlikely to result in a loss, or decrease in quality, of habitat to the extent that it will cause a decline in the species.
Result in invasive species, that are harmful to the species, becoming established in the species' habitat	The Conservation Advice (TSSC, 2020) identifies predation by Feral Cats and grazing by exotic herbivores such as Feral Camels as two of the three highest threats to the Grey Falcon. Whilst linear clearings are known to assist cat movements (see, e.g., Wysong et al., 2020), the relevant length of the OHTL already contains a linear clearing for railway infrastructure, and so this project will not facilitate this impact.
Introduce disease that may cause the species to decline	Disease is not listed as a threatening process for the Grey Falcon. The author is not aware of any literature on diseases that could be introduced by the project and that would detrimentally affect this species.
Interfere with the recovery of the species	There is no recovery plan for the Grey Falcon. The Conservation Advice (TSSC, 2020) provides sufficient direction to implement priority actions, mitigate against key threats and enable recovery. The priorities therein are to improve habitat management (reducing grazing and fire pressures), protect known nesting trees, and to undertake Feral Cat and Feral Camel control. None of these will be interfered with by project activities.

5.6.3.25 Howard River Toadlet (*Uperoleia daviesae*)

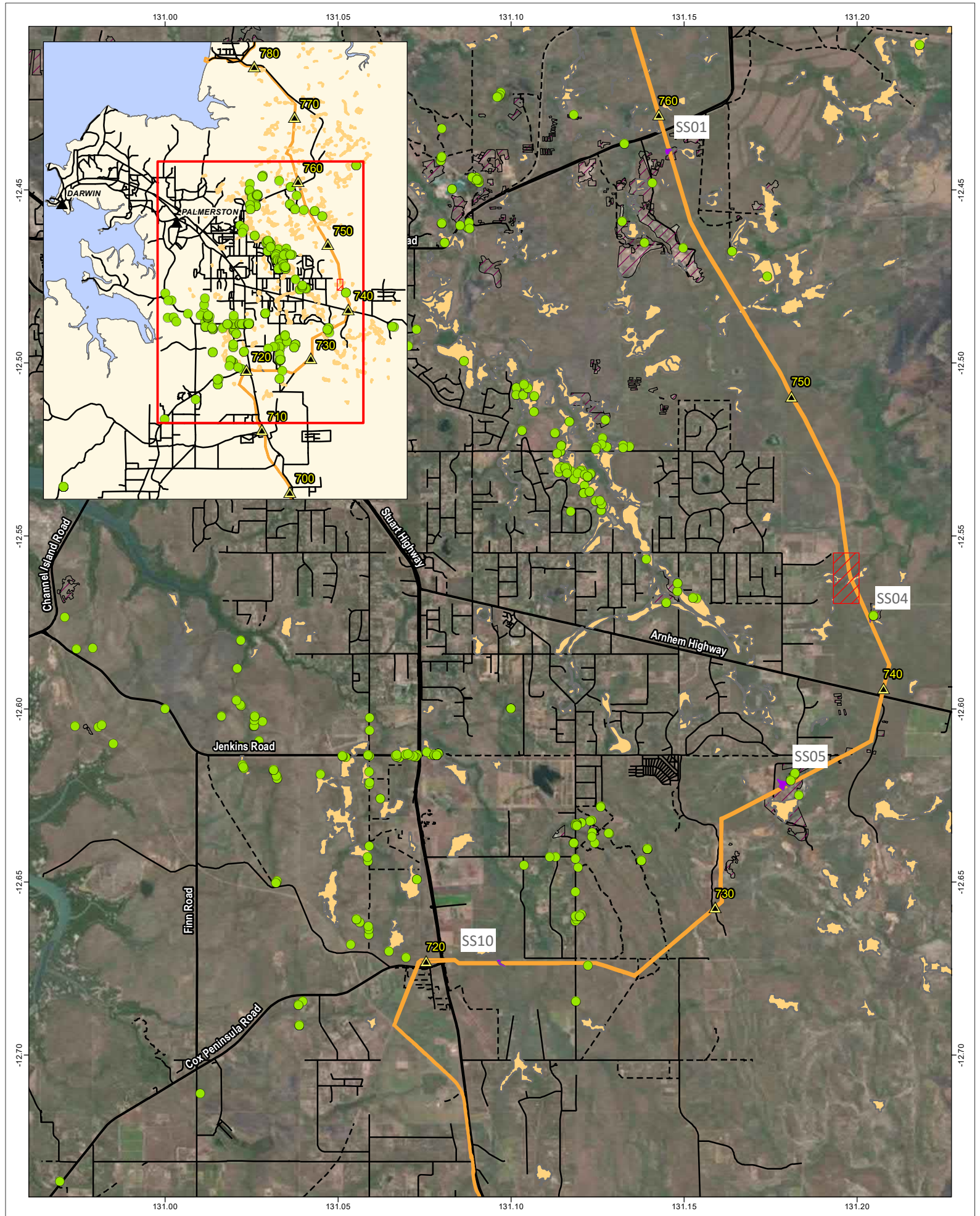
Howard River Toadlet is an endemic species that was only formally described in 2005. It is listed as Vulnerable under both the EPBC and *TPWC Acts*. The species is highly restricted to shallow drainage systems that intersect sandsheet habitat of the Darwin region (Young et al., 2005; Fisher et al., 2011). Sandsheet heath is only found in patches within the greater Darwin region.

The Howard River Toadlet only occurs in the Howard and Elizabeth River catchments, and there are many records proximate to the southern and central sections of the OHTL Utilities Corridor. The species was only recorded at four sites (during a below average wet season) in the Gunn Point region by Stokeld et al. (2020), who noted that presence of the species at a site was associated with the occurrence of debil-debil microrelief, higher proportion of sand in the soil to a depth of 60 cm, and larger patches of sandsheet heath.

Key threats are primarily loss of habitat. In addition, the sandsheet heath habitat that supports this species is very reliant on the local surface hydrology regime. Any changes to waterflows up or downstream of known Howard River Toadlet habitat could render it unsuitable for the species, leading to loss of that occurrence. Other threats are inappropriate fire regimes, and predation and habitat disturbance by feral animals (TSSC, 2021b).

A habitat suitability assessment undertaken along the length of the OHTL within the Howard and Elizabeth River catchments in 2022 (and reported, in full, in Appendix 5.1 of the SEIS) confirmed there are four sites that are suitable for supporting the Howard River Toadlet because of key habitat characteristics and proximity to previous records (see Figure 5-37). These sites have not been subjected to targeted surveys for this species. However, the Proponent has committed to not disturbing these patches of sandsheet heath and buffering them by 50 m. The OHTL access road will be diverted around them, and consequently the potential Howard River Toadlet habitat will not be disturbed in any way.

Table 5-43 presents an assessment of whether project activities are likely to have a significant impact on the Howard River Toadlet, using the criteria contained within the EPBC Significant Impact Guidelines 1.1 (DEWHA, 2013). The conclusion is that if this restricted-range species is present within the OHTL, the commitment by the Proponent to span and buffer the areas identified as suitable habitat for Howard River Toadlet will make it unlikely that the project will have a significant impact on this species.



▲ Towns
△ Kilometre Points (KP)

Roads
- Principal road
- Secondary road
- Minor road
- Track

AAPowerLink infrastructure
Section 572 - not assessed
Historic mining
Sandsheet Heath (NTG mapped)

Uperoleia daviesii
- Records (NTG)
- Suitable habitat (EcOz verified)

Source: Sun Cable, EcOz, NTG (NR Maps)

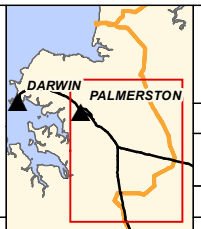


Figure 5-37. Map showing high-likelihood Howard River Toadlet habitat relevant to the AAPowerLink infrastructure

Project: Australia-Asia PowerLink

0 1 2 3 Kilometres

Scale: 1:150,000

Coordinate System: GDA2020

A4

N

Reference: M-Files ID 217502

Date: 18/11/2022 | Revision: 1

SUN CABLE AUSTRALIA-ASIA PowerLink

Table 5-45: Significant impact assessment for the Howard River Toadlet

Criterion	Summary of mitigation measures and significant impact assessment
Lead to a long-term decrease in the size of an important population.	The OHTL runs along the eastern limit of the species range, and therefore any records of this Vulnerable species within the OHTL would likely constitute an 'important population' near the limit of the species' range, and therefore necessary for maintaining genetic diversity. As explained above, OHTL route design will ensure that areas identified from fieldwork as being suitable habitat for the Howard River Toadlet will not be disturbed. This will include avoiding any impacts to the hydrology of these habitat areas. There is therefore no mechanism that could lead to any of these criteria being met.
Reduce the AOO of an important population.	
Disrupt the breeding cycle of a population.	
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent the species is likely to decline.	
Fragment an existing important population into two or more populations.	
Adversely affect critical habitat.	Critical habitat has not been identified for the Howard River Toadlet – but is arguably a sub-set of sandsheet heath patches. This concept is arguably not relevant for rare species with very restricted habitat requirements; it can be assumed that the few locations within which the species occurs constitutes critical habitat. Avoidance measures to minimise potential impacts to such habitat are assessed under previous criteria.
Result in invasive species, that are harmful to the species, becoming established in the species' habitat.	TSSC (2021b) identifies invasive fauna species as plausible threats to the Howard River Toadlet – as predators (Cane Toads) and as disturbers of habitat (cattle, buffalo, horses, and pigs) – with their impact unknown. However, feral fauna species are already common in the region, and development of the Project is unlikely to lead to any substantial change in their occurrence. Invasive grasses such as Gamba Grass (with large biomasses that increase fire intensity) are also considered a plausible threat to the Howard River Toadlet (TSSC, 2021b). The Weed Management Plan presented in Appendix 5.3 has been developed to minimise introduction and proliferation of weeds within the project area of influence for the life of the Project.
Introduce disease that may cause the species to decline.	Disease is not listed as a threatening process for the Howard River Toadlet. The author is not aware of any literature on diseases that could be introduced by the project and that would detrimentally affect this species.
Interfere with the recovery of the species.	There is no Recovery Plan for this species. In DEPWS (2021i), it is stated that 'current knowledge is insufficient to provide much guide to management beyond protecting known localities from development and sand mining.' To ensure this, the OHTL has been designed to avoid clearing of suitable habitat for the Howard River Toadlet.

5.6.3.26 Masked Owl (northern mainland) *(Tyto novaehollandiae kimberli)*

The Masked Owl (northern mainland sub-species) is listed as Vulnerable under both EPBC and *TPWC Act*s. The sub-species occurs mainly in Eucalyptus tall open forests (especially those dominated by *E. miniata* and *E. tetrodonta*), but also roosts in monsoon rainforests and forages in more open vegetation types, including grasslands (DEPWS, 2021j). This sub-species usually nests in large tree hollows within closed forest (Debus, 2009).

The Masked Owl is poorly described, with little known on populations sizes and trends (Garnett and Baker, 2021). Historically, this sub-species range was across the Top End – from north-west WA to the Atherton Tablelands in Qld. The current range is estimated from Borroloola to the Kimberly, with reasons for the decline unknown (Garnett and Baker, 2021). Within the NT, the two populations are geographically distinct and assumed to also be genetically separate – NT mainland and Groote Eylandt (Garnett and Baker, 2021). The mainland population is estimated at 250 individuals – including Coburg Peninsula; however, the last targeted surveys was in 2010 and only 12 new occurrences have been recorded since 2010. A Masked Owl was detected through acoustic survey at Gunn Point (Stokeld et al., 2020), the first record in this location.

Threats and reasons for Masked Owl decline are poorly understood. Food resource shortage is considered the main contributor to Masked Owl decline because of declines in native mammal prey populations across northern Australia. Threats impacting prey species – such as Feral Cat predation and altered fire regimes – may function as indirect threats to the Masked Owl (TSSC, 2015g). Invasion of exotic grasses may also reduce Masked Owl foraging efficiency and contribute to altered fire regimes, which is thought to reduce tree hollow availability that the Masked Owl requires for roosting and nesting (DEPWS, 2021j).

Based on current distribution and habitat suitability, the Masked Owl could be present within the project footprint as far south as KP 64. DCCEEW (2022) species distribution shows the project footprint intersects areas where the species or species habitat is likely to occur from Gunn Point to KP 450, and areas where the species or species habitat may occur from KP 450 to 64.

Table 5-46 assesses whether project activities are likely to have a significant impact upon an important population of this species (as defined in EPBC Significant Impact Guidelines 1.1). The conclusion is that because the proportion of Masked Owl habitat within the project footprint is very small and narrow – combined with the implementation of avoidance (micro-siting) and mitigation (pre-clearance surveys and use of a fauna spotter-catcher) measures – the impacts to this species associated with the Project are unlikely to be significant.

Table 5-46: Significant impact assessment for the Masked Owl (northern mainland).

Criterion	Summary of mitigation measures and significant impact assessment
Lead to a long-term decrease in the size of an important population.	While the single occurrence of a Vulnerable species in a region is not, in itself, sufficient to meet the definition of an 'important' population; a population of Masked Owls in a previously undetected location would be considered important given the low number of mature individuals and the suspected population decline of the sub-species. Suitable habitat – areas with large hollow-bearing trees suitable for breeding – are known to occur within the northern length of the OHTL (as far south as Katherine), Murrumujuk and northern electrode footprints. The recent survey at Gunn Point detected one Masked Owl (Stokeld et al., 2020). The Masked Owl is mobile, which lowers the likelihood of direct mortality during land-clearing activities for the Project. Furthermore, the Proponent will mitigate the impact of construction on this sub-species through avoidance of clearing trees suitable for breeding (if possible) and a pre-clearance surveying of large trees with hollows.

Criterion	Summary of mitigation measures and significant impact assessment
Reduce the AOO of an important population.	The current AOO of the Masked Owl (northern mainland) sub-species is estimated at 10,000 km^2 – from Groote Eylandt to the Kimberly (Garnett and Baker, 2021). It was calculated using a 2 x 2 km grid cell method, based on the IUCN Red List Categories and Criteria (2019). Suitable habitat is present within the OHTL footprint – primarily along the northern 333 km. The loss of some of that habitat cannot be avoided. Under the grid cell method, the only way that a habitat loss can lead to a reduced AOO is if it is entirely confined to within the project footprint. In other words, if the breeding/foraging resources lost constitute the entire local occurrence of those resources, and there are no other nearby occurrences, then this could lead to a reduced AOO. However, because Masked Owl general habitat requirements are quite broad within its distribution, habitat is not restricted to the project footprint. Therefore, its loss will not result in a reduced AOO.
Fragment an existing important population into two or more populations.	The Masked Owl is a mobile animal capable of traversing narrow cleared areas like the OHTL footprint. Such an area will not represent a barrier for dispersal of this species.
Adversely affect habitat critical to the survival of the species.	Critical habitat for the Masked Owl has not been formally defined. In lieu of such, the most limiting of the sub-species habitat requirements could be considered 'critical.' For the Masked Owl, this is breeding and roost sites – large hollow-bearing tree with large hollows. Such habitat occurs within the project footprint. However, it is present within the dominant vegetation type across the population's entire range. Large hollow-bearing trees which may constitute breeding and roosting habitat will be avoided as much as possible during micro-siting (see above). Consequently, loss of such habitat within the project footprint represents a negligible proportion of suitable habitat for the species, and so will not have an adverse effect or lead to the decline of the species.
Disrupt the breeding cycle of an important population.	There is an inherently low likelihood that Masked Owls will be breeding within the project footprint which is very narrow and localised within the sub-species distribution. Nevertheless, the implementation of the Constraints Planning and Field Development Procedure (Appendix 4.1) to avoid large trees with hollows combined with fauna spotter-catcher mitigation will minimise direct mortality and reduce the likelihood of disruption to the breeding cycle of Masked Owls that may be breeding or roosting within the project footprint.
Modify, destroy, remove, isolate, or decrease the availability or quality of habitat to the extent the species is likely to decline.	As discussed above, the foraging habitat requirements for the Masked Owl are broad – woodlands, forests, and grasslands in the Top End. Such habitat occurs within the project footprint. However, it is also the dominant vegetation type across the population's entire range. Analysis was completed using MVG's from the NVIS 6.0 within the full distribution of the Masked Owls (DCCEEW, 2022). A range of MVG's[12] were selected to represent the broad foraging habits of the Masked Owl to determine the area of habitat within the project footprint and the surrounding 20 km. The proportion of suitable habitat present within the project footprint compared within the surrounding 20 km is 0.16%. This occurs across 719 km of the OHTL. The loss of such a small and narrow area of habitat is unlikely to modify, destroy, remove, isolate, or decrease the availability or quality of habitat to the extent the sub-species is likely to decline.

[12]MVG numbers 1, 3,4,5, 6, 9, 10, 11, 12, 13, 19, 20, 21, 23 and 31.

Criterion	Summary of mitigation measures and significant impact assessment
Result in invasive species, that are harmful to the species, becoming established in the species' habitat.	The reasons for species decline and threats to the Masked Owl are unclear. It is likely that they have been affected by the changing environment in the Top End, such as decreased prey availability following small mammal declines, changes to habitat and decreased hollow availability from increased fire frequency and intensity. Invasive grasses such as Gamba and Mission Grass change fire frequency and intensity. These species could contribute to threatening process for the Masked Owl. The Weed Management Plan presented in Appendix 5.3 has been developed to minimise introduction and proliferation of weeds within the project area of influence for the life of the Project.
Introduce disease that may cause the species to decline.	Disease is not listed as a threatening process for Masked Owls. The author is not aware of any literature on diseases that could be introduced by the project and that would detrimentally affect this species.
Interfere substantially with the recovery of the species.	There is no Recovery Plan in effect for this species. The Conservation Advice describes conservation actions to address potential threats to the species – appropriate fire management and reducing impacts from invasive species at a landscape level (TSSC, 2015g). The Project's actions will not interfere with the conservation actions and recovery of the species.

5.6.3.27 Mertens' Water Monitor (*Varanus mertensi*) and Mitchell's Water Monitor (*Varanus mitchelli*)

These two species have been assessed collectively because of their similar ecologies and distributions, and the fact that ingestion of Cane Toads is their primary threat. Both species are listed as Vulnerable under the *TPWC Act* and nominated for listing under the *EPBC Act*.

Mitchell's Water Monitor

Mitchell's Water Monitor is a diurnal, semi-aquatic and arboreal, medium-sized monitor (DEPWS, 2021l). Mitchell's Water Monitor shelters in tree hollows or under bark and inhabits margins of Pandanus-lined watercourses, swamps, and lagoons in Northern Australia (DEPWS, 2021l). Found close to watercourses, Mitchell's Water Monitor basks on overhanging vegetation and submerges into water when approached (Swanson, 2007). In a recent paper, de Laive et al. (2021) argue that the ecological niche occupied by Mitchell's Water Monitor is broader than currently recognised and that the species should be considered as potentially occurring in most mangrove habitats across their known range. In the NT, the distribution of the species includes the catchments of all rivers flowing to the Timor Sea, Arafura Sea and the Gulf of Carpentaria. There are records of Mitchell's Water Monitor living in mangroves around the Darwin Harbour region, including from a 2010 survey of the nearby East Arm mangroves.

Mertens' Water Monitor

The Mertens' Water Monitor is listed as Vulnerable under the *TPWC Act* and nominated for listing under the *EPBC Act*. A moderately large semi-aquatic and arboreal monitor, this species forages extensively in freshwater. The Mertens' Water Monitor has a flexible diet which enables it to adapt to seasonal and spatial differences in prey availability. The species has a broad distribution, occurring in coastal and inland waters across northern Australia, from the Kimberley in WA to the western side of Cape York Peninsula in Queensland. (Christian et al., 2004; DEPWS, 2021k). Within the NT, records span across most of the Top End and Gulf Region (DEPWS, 2021k).

Whilst Mertens' and Mitchell's Water Monitor numbers have declined because of Cane Toads (Ward, 2012), there does not appear to be a range contraction for these species, since there are still many recent records across their historic distribution.

Interactions between the Project and these two species of water monitor will be limited to OHTL water crossings from approximately Katherine northwards. As discussed in Section 5.5.3.2, significant impacts on riparian habitats are not expected.

Table 5-47 assesses whether project activities are likely to have a significant impact upon an important population of these species (as defined in EPBC Significant Impact Guidelines 1.1). The conclusion is that because an important population of either species is not involved, no critical habitat will be lost, and only a small proportion of these species' habitat will be disturbed by the development of the Project, it is unlikely that there will be a significant impact to the Mitchell's Water Monitor or Mertens' Water Monitor as consequence of the Project.

Table 5-47: Significant impact assessment for the Mitchell's and Mertens' Water Monitor

Criterion	Summary of mitigation measures and significant impact assessment
Lead to a long-term decrease in the size of an important population.	Given the mobile nature of these species, there is unlikely to be any direct mortality of individual water monitors because of interactions with construction machinery. The only other way in which this development could potentially lead to a long-term decrease in the size of the either water monitors' population is through substantial loss of critical habitat. This is discussed and discounted below.
Reduce the AOO of an important population.	According to (DAWE, 2021b and c), the AOO for Mitchell's and Mertens' Water Monitors is 244 km^2 and 936 km^2 respectively. Determining AOO is based on the IUCN 2 x 2 km grid cell method. Where water monitor habitat occurs within the OHTL footprint – and its loss cannot be avoided – the only way that loss can lead to a reduced AOO is if it is entirely confined to within the OHTL footprint. In other words, if the breeding/foraging resources lost constitute the entire local occurrence of those resources, and there are no other nearby occurrences, then this could lead to a reduced AOO. There is no reason to suspect that these resources will only occur within the OHTL footprint, and so it is very unlikely that this scenario will eventuate.
Fragment an existing important population into two or more populations.	The localised, short-term disruption to very small areas of suitable habitat that may occur during construction of the Project are unlikely to disrupt the breeding cycle or create a dispersal barrier for either species.
Disrupt the breeding cycle of an important population.	

Criterion	Summary of mitigation measures and significant impact assessment
Adversely affect habitat critical to the survival of the species.	Critical habitat for either water monitor species has not been formally defined. Both species are present in suitable habitat across their distributions.
Modify, destroy, remove, isolate, or decrease the availability or quality of habitat to the extent the species is likely to decline.	Given the large area of habitat in the region, the clearing of such a small (and narrow) proportion of it for the Project is unlikely to result in a loss, or decrease in quality, of habitat to the extent that it will cause a decline in either species.
Result in invasive species, that are harmful to the species, becoming established in the species' habitat.	The primary threat to the Mitchell's and Mertens' Water Monitors comes from mortality due to ingestion of toxic Cane Toads (DAWE, 2021b, c). Predation of eggs by Feral Pigs and Wild Dogs is considered a suspected threat factor (DAWE, 2021b, c).
Introduce disease that may cause the species to decline.	Disease is not considered to be a potential threat factor to the Mitchell's Water Monitor (DAWE, 2021c) or Mertens' Water Monitor (DAWE, 2021b).
Interfere substantially with the recovery of the species.	There is no recovery plan for the Mitchell's or Mertens' Water Monitor. DAWE (2021a, b) suggest primary conservation actions for these species, none of which will be interfered by the development of the Project.

5.6.3.28 Northern Brushtail Possum (Trichosurus vulpecula arnhemensis)

The north-western sub-species of the Brushtail Possum is listed as Vulnerable in the *EPBC Act* and Near Threatened under the *TPWC Act*. A nocturnal semi-arboreal marsupial, this sub-species occurs discontinuously from the Gulf of Carpentaria hinterland near Borroloola, in the NT, to the Kimberley, in Western Australia (Morris et al., 2016). The Northern Brushtail Possum mainly inhabits tall Eucalypt open forests and woodlands with large hollow-bearing trees, particularly where the understorey contains shrubs that bear fleshy fruits, but also occurs in mangrove communities (especially where these contain hollow-bearing trees), rainforests and semi-urban areas (notably around Darwin) (TSSC, 2021a). Northern Brushtail Possum abundance is associated with high shrub density (Stobo-Wilson et al., 2019).

The broadscale decline of the sub-species' populations in Australia's Top End and reduction of its home range across the NT – an estimated 72 % decrease in the species' historical geographic range in north-western Australia between 1993 and 2019 – is largely attributed to frequent extensive fires, which reduces shelter sites and shrub density, thereby increasing risk of feral cat predation, as well as habitat modification from invasive grasses, namely Gamba Grass (*Andropogon gayanus*) and Mission Grass (*Pennisetum polystachion*) (Stobo-Wilson et al., 2019; TSSC, 2021a). The Northern Brushtail Possum and suitable habitat – forests and woodlands with large hollow-bearing tress with fruiting mid storey – occurs at Gunn Point, and likely to occur along the OHTL. During a recent survey by the NTG at Gunn Point, the Northern Brushtail Possum was the most frequently detected species at 25 (26%) of the 96 camera sites (Stokeld et al., 2020).

DCCEEW (2022) species distribution shows the project footprint intersects areas where the species or species habitat is likely to occur from Gunn Point to KP 361 and KP 216 to 16. Areas where the species or species habitat may occur from are from KP 361 to 216 and within the Solar Precinct and Electrode, and associated AI at Powell Creek Station.

Table 5-48 assesses whether project activities are likely to have a significant impact upon an important population of this species (as defined in EPBC Significant Impact Guidelines 1.1). The conclusion is that because the proportion of Northern Brushtail Possum habitat within the project footprint is very small and narrow – combined with the implementation of avoidance (micro-siting) and mitigation (pre-clearance surveys and use of a fauna spotter-catcher) measures – the impacts to this species associated with the Project are unlikely to be significant.

Table 5-48: Significant impact assessment for the Northern Brushtail Possum

Criterion	Summary of mitigation measures and significant impact assessment
Lead to a long-term decrease in the size of an important population	General occurrence of a Vulnerable species in a region is not, in itself, sufficient to meet the definition of an 'important' population. The Northern Brushtail Possum is considered to be one population: with a possible sub-population on the Tiwi Islands (TSSC, 2021a). The species' decline has disproportionally affected semi-arid north-western Australia, with most of the current population detected within the NT (TSSC, 2021a). Therefore, the NT occurrences are considered an important population for the species' long-term survival and recovery. Northern Brushtail Possum records are numerous within the 20 km of the project footprint; despite not including recent surveys results (Stokeld et al., 2020). Suitable habitat – areas with large hollow-bearing trees suitable for shelter; forests and woodlands – are known to occur within the northern length of the OHTL (as far south as Katherine), the Murrumujuk and northern electrode footprints. The Northern Brushtail Possum is mobile, which lowers the likelihood of direct mortality during land-clearing activities for the Project. Furthermore, the Proponent will mitigate the impact of construction on this species through avoidance of clearing trees suitable for shelter (if possible) and a pre-clearance surveying of large trees with hollows.
Reduce the AOO of an important population	The AOO for the Northern Brushtail Possums is estimated to be 1,392 km^2 (TSSC, 2021a), calculated using a 2 x 2 km grid cell method, based on the IUCN Red List Categories and Criteria (2019). Given the large EOO of this species – estimated at over 570,000 km^2 – the AOO is likely larger given the low survey effort relative to the EOO. Northern Brushtail Possum habitat is present at Gunn Point and within the OHTL footprint – primarily along the northern 422 km from Katherine. The loss of some of that habitat cannot be avoided. Under the grid cell method, the only way that a habitat loss can lead to a reduced AOO is if it is entirely confined to within the project footprint. In other words, if the breeding/foraging resources lost constitute the entire local occurrence of those resources, and there are no other nearby occurrences, then this could lead to a reduced AOO. However, because Northern Brushtail Possum habitat requirements are quite broad within its distribution, habitat is not restricted to the project footprint. Therefore, its loss will not result in a reduced AOO.
Fragment an existing important population into two or more populations	All mainland Australia occurrences of Northern Brushtail Possum are considered one population, with a patchy distribution (TSSC, 2021a). The Northern Brushtail Possum is a mobile animal with a large home range, capable of traversing narrow cleared areas like the OHTL footprint. Such an area will not represent a barrier for dispersal of this species, nor fragment the population.

Criterion	Summary of mitigation measures and significant impact assessment
Adversely affect habitat critical to the survival of the species	Critical habitat for the Northern Brushtail Possum has not been formally defined. In lieu of such, the most limiting of the species habitat requirements could be considered 'critical'. For the Northern Brushtail Possum, this is day-time shelter – large hollow-bearing trees with a food source (fleshy fruiting) midstory. Such habitat occurs within the project footprint, but far more broadly in the savanna woodland that dominates the region. Hollow-bearing trees which may constitute habitat will be avoided as much as possible during micro-siting. Consequently, loss of such habitat within the project footprint represents a negligible proportion of suitable habitat for the species, and so will not have an adverse effect or lead to the decline of the species.
Disrupt the breeding cycle of an important population	Direct mortality and displacement of individual Northern Brushtail Possums may cause a localised disruption to breeding cycles, due to their territorial nature and lack of a defined breeding season. Given the extensive range of the species, there is an inherently low likelihood that the only breeding Northern Brushtail Possums in a regional population are within the project footprint – which is very narrow and localised within the species distribution. Nevertheless, the micro-siting which avoids large hollow-bearing trees, supported by fauna spotter-catcher mitigation will further reduce the likelihood of direct mortality and a disruption to the breeding cycle.
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent the species is likely to decline	As discussed above, the habitat requirements for the Northern Brushtail Possum are broad – Eucalypt woodlands and forests, rainforest, riparian areas, and semi-urban environments in the Top End. Such habitat occurs within the project footprint. However, it is also the dominant vegetation type across the population's entire range. Analysis was completed using MVGs from the NVIS 6.0 within the full distribution of the Northern Brushtail Possum (DCCEEW, 2022). A range of MVG's[13] were selected to represent the broad habitat of the Northern Brushtail Possum to determine the area of habitat within the project footprint and the surrounding 20 km. The proportion of Northern Brushtail Possum habitat present within the project footprint compared within the surrounding 20 km is 0.33%. This occurs across 767 km of the OHTL and at Gunn Point. The loss of such a small and narrow area of habitat is unlikely to modify, destroy, remove, isolate, or decrease the availability or quality of habitat to the extent the species is likely to decline.
Result in invasive species, that are harmful to the species, becoming established in the species' habitat	Feral Cats (as predators) and invasive grasses such as Gamba Grass (with large biomasses that increase fire intensity and modify habitat) are considered current threats to Northern Brushtail Possum in the Conservation Advice (TSSC, 2021a). Feral Cats are already common in the region, and development of the Project is unlikely to lead to any substantial change in their occurrence. The Weed Management Plan presented in Appendix 5.3 has been developed to minimise introduction and proliferation of weeds within the area of influence for the life of the Project.
Introduce disease that may cause the species to decline	The Conservation Advice considers disease carried by Black Rats as a potential threat to the Northern Brushtail Possum due to documented population decline from epizootic disease (TSSC, 2021a). Black Rats are existing invasive species within the possum's range, and the project activities are unlikely to lead to any substantial change in their occurrence.

[13]MVG numbers 1, 3,4, 5, 9, 10, 11, 12, 25 and 31.

Criterion	Summary of mitigation measures and significant impact assessment
Interfere substantially with the recovery of the species	There is no Recovery Plan for the Northern Brushtail Possum. Instead, the Conservation Advice for the species is considered to provide sufficient direction to implement priority actions, mitigate against key threats and enable recovery of the species (TSSC, 2021a). The Conservation Advice (TSSC, 2021a) lists four primary conservation actions: Identify and protect important habitat for the Northern Brushtail Possum from habitat loss, degradation, and fragmentation. Minimise levels of feral cat predation by managing habitat to reduce cat impacts (through fire management, the removal of feral introduced herbivores, and not killing dingoes). Manage fire to promote resources important to the species, as well as reduce risk from predation. Undertake long-term monitoring to assess changes in population status, evaluate the success of management actions, and inform adaptive management. The habitat loss associated with the Project is minimal and not within areas identified as important habitat. The small areas cleared are unlikely to interfere with the recovery of the species.

5.6.3.29 Painted Honeyeater (*Grantiella picta*)

The Painted Honeyeater is listed as Vulnerable under both the TPWC and *EPBC Act*s. A distinctive, medium-sized honeyeater, the species inhabits Eucalypt forests/woodlands, riparian woodlands of Black Box and River Red Gum, Box Ironbark / Yellow Gum woodlands, Acacia-dominated woodlands, paperbarks, Casuarina, Callitris and trees on farmland or gardens (DoE, 2015). The Painted Honeyeater occurs through the eastern states, from the eastern NT through south-west Queensland to northern Victoria. Generally uncommon through its range, concentrations of the species are located on the inland slopes of the Victorian and New South Wales alpine regions, and in Roma, Queensland (Morecombe, 2003). The species breeds between Victoria and south-east Queensland southern regions between October and March (BirdLife International, 2016; Pizzey et al., 2012) and migrates to the drier interior outside of these times (Garnett et al., 2011). However, the use of habitat in north-west Qld is becoming increasingly uncommon (DoE, 2015). Records from the NT are sparse and uncommon and are expected to be occasional occurrences of the species moving from the critical habitat for a short period.

The main threat to Painted Honeyeater is habitat loss through the clearing of woodland habitat with the species' preferred mistletoe species (DoE, 2015; Watson 2012; Garnett et al., 2011). Preferred habitat is generally located on rich fertile soils that are also valued as farmland. Habitat loss through continued degradation of woodland by inappropriate fire and grazing regimes also threatens the species.

According to distribution modelling by the Cwth Government and the location of the few records of this species in the NT, the Painted Honeyeater is unlikely to occur within the project footprint, except possibly in section of the Powell Creek access track in the Ashburton Range and eastwards.

Table 5-49 assesses whether project activities are likely to have a significant impact upon an important population of this species (as defined in EPBC Significant Impact Guidelines 1.1). Because the Painted Honeyeater is unlikely to occur within the project footprint except as vagrant – and impacts to suitable habitat will be very minimal – this species is unlikely to be significantly impacted by the Project.

Table 5-49: Significant impact assessment for the Painted Honeyeater

Criterion	Summary of mitigation measures and significant impact assessment
Lead to a long-term decrease in the size of an important population	As explained above, an important population of the Painted Honeyeater is not known, or likely, to occur within the project footprint.
Reduce the AOO of an important population	The project footprint is not within the AOO of the Painted Honeyeater (Garnett et al. 2021) and, as such, land disturbance associated with the Project will not reduce the AOO of the species.
Fragment an existing important population into two or more populations	There are no records of the Painted Honeyeater within the project footprint – and all occurrences are on the eastern side of the project footprint. Therefore, there are no known populations that could be fragmented by development of the Project.
Adversely affect habitat critical to the survival of the species	Critical habitat is defined for the Painted Honeyeater in the National Recovery Plan for the Painted Honeyeater (DAWE, 2021d). The definition does not include any habitats within the project footprint.
Disrupt the breeding cycle of an important population	The Painted Honeyeater does not breed in the NT.
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent the species is likely to decline	For the reasons given in this table, it is unlikely that the loss, or decrease in quality, of suitable habitat because of project activities will cause a decline in the species.
Result in invasive species, that are harmful to the species, becoming established in the species' habitat	Predation by invasive species such as Feral Cats is likely a threat to the Painted Honeyeater (DAWE, 2021d). Feral fauna species are already common in the region, and development of the Project is unlikely to lead to any substantial change in their occurrence.
Introduce disease that may cause the species to decline	Disease is not listed as a threatening process for Nabarlek's. The author is not aware of any literature on diseases that could be introduced by the project and that would detrimentally affect this species.
Interfere substantially with the recovery of the species	None of the objectives within the National Recovery Plan for the Painted Honeyeater (DAWE, 2021d) will be interfered with by the development of the Project.

5.6.3.30 Partridge Pigeon (eastern subspecies) *(Geophaps smithii smithii)*

The Partridge Pigeon is listed as Vulnerable under both EPBC and *TPWC Act*s. The Partridge Pigeon is a medium-sized ground dwelling bird which forages entirely on the ground and rarely flies, except when flushed. The sub-species is largely sedentary and typically occurs singly or in small family groups. Larger aggregations may occur around waterholes (DEPWS 2021p). The Partridge Pigeon nests on the ground, preferentially in lowland Eucalypt open forests and woodlands at sites with relatively dense grass cover in the early dry season. This is in contrast to the relatively open (often burnt) areas the sub-species prefers for feeding, which suggests that fire regimes may significantly affect the sub-species (DEPWS, 2021p).

The Partridge Pigeon has suffered a severe range contraction, now occurring in scattered populations in the NT (TSSC, 2015c). The sub-species is restricted in area from the coast to Yinberrie Hills in the south, east to western Arnhem Land and west to Litchfield National Park (TSSC, 2015c). Isolated sub-populations exist on the Tiwi Islands and the Coburg Peninsula (TSSC, 2015c). Recent surveys at Gunn Point failed to detect the Partridge Pigeon (Stokeld et al., 2020). Based on current distribution and habitat suitability, the Partridge Pigeon could be present within the project footprint as far south as Katherine.

Changes to fire regimes – resulting in large area fires and the loss of a landscape-scale mosaic habitat patches with varying fire histories – is the primary threat to the Partridge Pigeon (Rossiter et al., 2003).

Table 5-50 assesses whether project activities are likely to have a significant impact upon an important population of this sub-species (as defined in EPBC Significant Impact Guidelines 1.1). The conclusion is that because the proportion of Partridge Pigeon habitat within the footprint is very small and narrow – combined with the use of a fauna spotter-catcher during construction – the impacts to this species associated with the Project are unlikely to be significant.

Table 5-50: Significant impact assessment for the Partridge Pigeon

Criterion	Summary of mitigation measures and significant impact assessment
Lead to a long-term decrease in the size of an important population	General occurrence of a Vulnerable species in a region is not, in itself, sufficient to meet the definition of an 'important' population. However, because the OHTL traverses the entire mainland distribution of the sub-species, any occurrence of the Partridge Pigeon in the OHTL at the edge of its range would constitute an 'important population' as per the EPBC Significant Impact Guidelines 1.1 (DEWHA, 2013). The Partridge Pigeon is mobile and can move up to 10 km in response to resource availability, which lowers the likelihood of direct mortality during land-clearing activities for the Project. Furthermore, the Proponent will mitigate the impact of construction on this species through a pre-clearance survey of suitable habitat.
Reduce the AOO of an important population	The AOO of the Partridge Pigeon is estimated to be 9,600 km^2; however, this is likely to be an underestimate (Garnett and Baker, 2021). It was calculated using a 2 x 2 km grid cell method, based on the IUCN Guidelines for Using the IUCN Red List Categories and Criteria (2019). Partridge Pigeons habitat is present at Gunn Point and within the OHTL footprint – primarily along the northern 320 km. The loss of some of that habitat cannot be avoided. Under the grid cell method, the only way that a habitat loss can lead to a reduced AOO is if it is entirely confined to within the OHTL footprint. In other words, if the breeding/foraging resources lost constitute the entire local occurrence of those resources, and there are no other nearby occurrences, then this could lead to a reduced AOO. However, because Partridge Pigeons general habitat requirements are quite broad within its distribution, they are known to undertake large local movements in response to resource availability and their habitat is not restricted to the project footprint. Therefore, its loss will not result in a reduced AOO.
Fragment an existing important population into two or more populations	The Partridge Pigeon is a mobile animal capable of traversing narrow, cleared areas like the OHTL footprint. Such an area will not represent a barrier for dispersal of this species.
Adversely affect habitat critical to the survival of the species	Critical habitat for the Partridge Pigeon has not been formally defined. In lieu of such, the most limiting of the sub-species' habitat requirements could be considered 'critical'. For the Partridge Pigeon, this would be seed food resources

Criterion	Summary of mitigation measures and significant impact assessment
	and diversity of habitat within their home range – namely dense, unburnt grasses for nesting and open (typically burnt) areas for feeding. Such habitat occurs within the project footprint, but far more broadly in the savanna woodland that dominates the region. Partridge Pigeons are known to move locations in response to changing resources, and the loss of such habitat within the project footprint represents a negligible proportion of suitable habitat for the species, and so will not have an adverse effect or lead to the decline of the species.
Disrupt the breeding cycle of an important population	Partridge Pigeons are ground-nesting birds, typically in dense grass in the early dry season. Direct mortality and displacement of pairs may cause a localised disruption to breeding cycles. Given the large range and generalist habitat requirements of the Partridge Pigeons, as well as the fire and weed presence within the OHTL, there is an inherently low likelihood that the only breeding pigeons in a local population are within the project footprint – which is very narrow and localised within the species distribution. Nevertheless, use of fauna spotter-catcher mitigation during construction will reduce the likelihood of direct mortality of nesting pairs.
Modify, destroy, remove, isolate, or decrease the availability or quality of habitat to the extent the species is likely to decline	As discussed above, the habitat requirements for Partridge Pigeons are broad – Eucalypt woodlands and forests in the Top End. Such habitat occurs within the project footprint. However, it is also the dominant vegetation type across the population's entire range. Analysis was completed using MVG's from the NVIS 6.0 within the full distribution of the Partridge Pigeon (DCCEEW, 2022). MVG's[14] Eucalypt Forests and Woodlands were selected to determine the area of habitat within the project footprint and the surrounding 20 km. The proportion of Partridge Pigeon habitat present within the project footprint compared within the surrounding 20 km is 0.0014%. This is spread across 320 km of the OHTL and at Gunn Point. The loss of such a small and narrow area of habitat is unlikely to modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent the sub-species is likely to decline.
Result in invasive species, that are harmful to the species, becoming established in the species' habitat	Two threats to the Partridge Pigeon are predation by Feral Cats, and changes to forest structure and fire regimes by invasive grasses such as Gamba and Mission Grass (TSSC, 2015c). Feral Cats are already common in the region, and development of the Project is unlikely to lead to any substantial change in their occurrence. The Weed Management Plan presented in Appendix 5.3 has been developed to minimise introduction and proliferation of weeds within the area of influence for the life of the Project.
Introduce disease that may cause the species to decline	Disease is not listed as a threatening process for Partridge Pigeons. The author is not aware of any literature on diseases that could be introduced by the project and that would detrimentally affect this sub-species.
Interfere substantially with the recovery of the species	There is no Recovery Plan for this sub-species. Instead, the Conservation Advice (TSSC, 2015c) describes conservation actions to address threats to the species – appropriate fire management, feral cat control and weed management strategies. The Project's actions will not interfere with any of these conservation actions or the recovery of the Partridge Pigeon.

[14] MVG numbers 3, 4, 5, 11 and 12.

5.6.3.31 Plains Death Adder (*Acanthophis hawkei*)

The Plains Death Adder is listed as Vulnerable under the *TPWC Act* and under the *EPBC Act*. A nocturnal species, it occurs on floodplains and cracking soil plains (Webb et al., 2002). According to Ward and Phillips (2012):

During the Wet season, individuals move every three to ten days, in apparently random directions, distances ranging from a few metres to a kilometre (Phillips and Webb, unpublished data). When it floods, they simply float in debris or rest on emergent vegetation. During the Dry season, movement is less frequent, and they often retreat into deep soil cracks. Radio-tracking suggests that they are nomadic and do not have definable home ranges.

The exact distribution of Plains Death Adder is unclear. Based upon field experience and encounter rates across its range, the species can be locally common (in the absence of Cane Toads) on the highly productive floodplains of northern Australian rivers.

The main identified threat to the Plains Death Adder is death by ingestion of the introduced Cane Toad (DSEWPC, 2012). Other potential threats to the Plains Death Adder are habitat modification due to over-grazing by cattle and inappropriate fire regimes.

The Plains Death Adder is known from two disjunct occurrences – the floodplains of the Adelaide, Mary and Alligator Rivers, and the black soils of the Barkly Tableland. It is unknown whether these are separate populations or simply reflects the low survey effort across the species' potential habitat. There are also citizen science records attributed to this species that are doubtful because they are not in suitable habitat – including from Darwin, west of the Stuart Hwy and Elliott.

The OHTL footprint intersects with potential Plains Death Adder habitat from Gunn Point to KP 570 and around Lake Woods from KP 23 to 27.

Table 5-51 assesses whether project activities are likely to have a significant impact upon an important population of this species (as defined in EPBC Significant Impact Guidelines 1.1). The conclusion is that because the proportion of Plains Death Adder habitat within the project footprint is very small and narrow – and does not constitute critical habitat – the impacts to this species associated with the Project are unlikely to be significant.

Table 5-51: Significant impact assessment for the Plains Death Adder

Criterion	Summary of mitigation measures and significant impact assessment
Lead to a long-term decrease in the size of an important population	The project footprint only intersects with 575 km^2 of suitable habitat for the Plains Death Adder, none of which is within a floodplain system known to support an occurrence of the species. It is therefore considered unlikely that a population of the Plains Death Adder are not known, or likely, to occur within the project footprint.
Reduce the AOO of an important population	The project footprint is not within the AOO of the Plains Death Adder and, as such land disturbance associated with the Project will not reduce the AOO of the species.
Fragment an existing important population into two or more populations	There are no records of the Plains Death Adder within the project footprint – and all occurrences are on the eastern side of the project footprint. Therefore, there are no known populations that could be fragmented.
Disrupt the breeding cycle of an important population	Populations of the Plains Death Adder are not known, or likely, to occur within the project footprint, therefore the breeding cycle of a population will not be disrupted by the development of the Project.

Criterion	Summary of mitigation measures and significant impact assessment
Adversely affect habitat critical to the survival of the species	Plains Death Adder habitat is floodplains and cracking soil plains (Webb et al. 2002). There is no literature that identifies critical habitat features within that broad habitat. As noted above, only a very small area of potential habitat for this species will be disturbed. This will not affect the survival of the Plains Death Adder.
Modify, destroy, remove, isolate, or decrease the availability or quality of habitat to the extent the species is likely to decline	For the small areas of suitable habitat within the project footprint, the removal of a short length of a 22 m wide linear corridor is not likely to cause the decline of the Plains Death Adder, especially since there are no nearby records to indicate that the species is present in that habitat, and there remain vast areas of suitable habitat in the region.
Result in invasive species, that are harmful to the species, becoming established in the species' habitat	According to DSEWPC (2012), the main identified threat to the Plains Death Adder is mortality by ingestion of the toxic Cane Toad. Cane Toads are slowly encompassing the geographic distribution of the Plains Death Adder, and it has been predicted that by 2030 Cane Toads will have encompassed almost all of the Plains Death Adder known range (Phillips et al., 2003).
Introduce disease that may cause the species to decline	Disease is not listed as a threatening process for the Plains Death Adder. The author is not aware of any literature on diseases that could be introduced by the project and that would detrimentally affect this species.
Interfere substantially with the recovery of the species	The Cwth Listing Advice on Plains Death Adder (DSEWPC, 2012) identifies priority recovery and threat abatement actions to support the recovery of the Plains Death Adder. The Project's actions will not interfere with any of these actions.

5.6.3.32 Princess Parrot (Polytelis alexandrae)

The Princess Parrot – Vulnerable under both the *EPBC Act* and *TPWC Act* – is a medium-sized parrot that usually occupies dune swales, and occasionally slopes and crests of dunes (Pavey, 2006). Breeding occurs in hollows in large River Red Gums (*Eucalyptus camaldulensis*), Marble Gums (*Eucalyptus gongylocarpa*) and Desert Oaks (Pavey, 2006). Breeding is sporadic and generally driven by rainfall and abundance of food resources, rather than a set time of year.

A nomadic species, the Princess Parrot is confined to the arid regions of WA, NT, and SA (Barrett et al., 2003; Blakers et al., 1984; Higgins, 1999). All recent records in the NT are from the southern section of the Tanami Desert down to the SA / NT border. It is unclear whether the Princess Parrot is resident in the NT (DEPWS, 2021q). The Princess Parrot is considered to occur in a single, connected population spread across many locations (Garnett et al., 2021).

There are no identified threats for the Princess Parrot. However, increased fire intensity is suspected to impact the species by reducing tree hollow and food availability, as well as killing River Red Gums important for breeding (Pavey et al., 2014).

The preferred foraging for the Princess Parrot is not within the project footprint and there are no recent records from the region. The project footprint is just within the northernmost extent of Cwth Government distribution modelling for the Princess Parrot (i.e., is considered habitat within which the species 'may' occur). On the basis of this information, it seems reasonable to assume that the presence of Princess Parrot within the project footprint would only ever be as a vagrant. Although suitable breeding habitat is present along the watercourses intersected by the Solar Precinct access roads, the likelihood that the Princess Parrot would ever breed in the region is low.

Table 5-52 assesses whether project activities are likely to have a significant impact upon an important population of this species (as defined in EPBC Significant Impact Guidelines 1.1). The conclusion is that it is unlikely that project activities will have a significant impact upon the Princess Parrot because the species is only likely to occur within the project footprint in passing, and there is no suitable foraging habitat present.

Table 5-52: Significant impact assessment for the Princess Parrot

Criterion	Summary of mitigation measures and significant impact assessment
Lead to a long-term decrease in the size of an important population.	As explained above, an important population of the Princess Parrot is not known, or likely, to occur within the project footprint.
Reduce the AOO of an important population.	The project footprint is not within the AOO of the Princess Parrot (Garnett et al., 2021) and, as such, land disturbance associated with the Project will not reduce the AOO of the species.
Fragment an existing important population into two or more populations.	The Princess Parrot is a nomadic and highly mobile species capable of traversing large areas. Land disturbance associated with the Project will not represent a barrier for dispersal of this species.
Adversely affect habitat critical to the survival of the species.	Critical habitat is not defined for the Princess Parrot. Given its nomadic nature – and the fact that long periods of time can pass between observations of the Princess Parrot at a location where the species has been recorded before – the concept of critical habitat is arguably not applicable to the Princess Parrot.
Disrupt the breeding cycle of an important population.	Potential breeding habitat for the Princess Parrot is present where the Solar Precinct access roads intersect watercourses. However, for the reasons given above, it is unlikely that the princess Parrot breeds in the region. Moreover, the proportion of such habitat that will be disturbed by project activities is negligible.
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent the species is likely to decline.	The absence of suitable foraging habitat within the project footprint means it is unlikely that the loss, or decrease in quality, of habitat because of project activities will cause a decline in the Princess Parrot.
Result in invasive species, that are harmful to the species, becoming established in the species' habitat.	The Conservation Advice for the Princess Parrot (TSSC, 2018) identifies habitat modification by Buffel Grass, land degradation by Camels and predation by Feral Cats as threats to the Princess Parrot. Feral Cats are already common in the region, and development of the Project is unlikely to lead to any substantial change in their occurrence. The Weed Management Plan presented in Appendix 5.3 has been developed to minimise introduction and proliferation of weeds within the area of influence for the life of the Project.
Introduce disease that may cause the species to decline	Psittacine Circoviral Disease is considered to be a potential threat to the Princess Parrot (Garnett et al, 2021). Regardless of how real this threat is, there is no nexus between the activities associated with the Project and introduction of a disease into the region.

Criterion	Summary of mitigation measures and significant impact assessment
Interfere substantially with the recovery of the species	There is no recovery plan for the Princess Parrot. The primary conservation action for the Princess Parrot – to maintain breeding habitat by undertaking active fire management and control of domestic and invasive species – will not be interfered with by project actions because it is unlikely that the species breeds in the region.

5.6.3.33 Red Goshawk (Erythrotriorchis radiatus)

The Red Goshawk is listed as Vulnerable under both the EPBC and *TPWC Act*s. The species can have a home range of up to 200 km^2 (Czechura and Hobson, 2000). Red Goshawks forage across a broad range of Top End habitats. However, they have much more specific breeding and roosting habitat requirements. The species nests in large trees – frequently the tallest and most massive in a tall stand – and invariably within 1 km of permanent water (Debus and Czechura, 1988; Aumann and Baker-Gabb, 1991). The primary threats to the Red Goshawk are large-scale vegetation clearance leading to habitat loss, fragmentation, and degradation (TSSC, 2015b).

The OHTL Corridor may overlap with the territory of Red Goshawks. Based on current distribution (DCCEEW, 2022) and habitat suitability, the Red Goshawk could be present across the entire project footprint. Areas that are likely to contain the species of suitable habitat occur from Gunn Point to KP 311.

Core habitat for this species – especially nesting habitat – is likely limited to the larger rivers intersected by the OHTL. Given the very small amount and proportion (regionally) of riparian vegetation that will be disturbed (see Section 5.5.3.2 of this SEIS for more detail), the only way this project could have a significant impact on the Red Goshawk is by disturbing breeding pairs.

Table 5-53 presents an assessment of whether project activities are likely to have a significant impact on the Red Goshawk, using the criteria contained within the EPBC Significant Impact Guidelines 1.1 (DEWHA, 2013). The conclusion is that the small area of habitat that will be lost, coupled with mitigation measures to ensure breeding is not disrupted, means it is unlikely there will be a significant impact to the species.

Table 5-53: Significant impact assessment for the Red Goshawk

Criterion	Summary of mitigation measures and significant impact assessment
Lead to a long-term decrease in the size of an important population	General occurrence of a Vulnerable species in a region is not, in itself, sufficient to meet the definition of an 'important' population. According to TSSC (2015), the species consists of two sub-populations, one on the Tiwi Islands and a mainland population. However, population estimates are that there less than 600 pairs on the mainland (Garnett et al., 2021), meaning that, in a sense, every individual of this species is an important population. Given the mobile nature of the species, there is unlikely to be any direct mortality of individual Red Goshawks because of interactions with construction machinery. There is the potential that the species could be collide with powerlines – but this is unlikely, as discussed in Section 5.12.2.21). The only other way in which this development could potentially lead to a long-term decrease in the size of the Red Goshawk population is through substantial loss of critical habitat. This is discussed and discounted below.
Reduce the AOO of an important population	Garnett et al. (2021) state that the AOO of the Red Goshawk is between 90,000 and 140,000 km^2 (but likely an under-estimate). There is foraging and breeding habitat for the Red Goshawk within the OHTL footprint, but the only way the loss of that habitat can lead to a reduced AOO is if they are entirely confined to within the 60 m wide OHTL footprint. This is because determining AOO is based on the IUCN 2 x 2 km grid cell method. Consequently, if the habitat lost constitutes the entire local occurrence of that habitat, and there are no other nearby occurrences of that habitat, then this could lead to a reduced AOO. However, within the species' range, foraging habitat is widespread and breeding habitat – whilst more limited – is still abundant and will not occur just in the OHTL footprint. Consequently, the loss of small areas of habitat for development of the OHTL will not result in a reduced AOO for the Red Goshawk.
Fragment an existing important population into two or more populations	The Red Goshawk is a mobile animal with a large territory. A narrow, cleared area adjacent to a railway line will not represent a barrier for dispersal of this species.
Disrupt the breeding cycle of an important population	The species has very large home ranges (up to 200 km^2) and so the likelihood of a narrow OHTL Corridor intersecting a pair's nest is very low. Design of the OHTL preferred route has sought to minimise intersecting suitable Red Goshawk breeding habitat. The Constraints Planning and Field Development Procedure (Appendix 4.1) will further seek to minimise disturbance to breeding habitat, by moving the disturbance footprint as far away as possible from any active nests identified during the implementation of the procedure. Moreover, where clearing is required in breeding habitat – i.e., stands of very tall trees within 1 km of a river – a pre-clearance survey will be undertaken by a suitably-qualified ecologist to identify nests. In the event that there are any Red Goshawk nests within the corridor, then all attempts will be made to retain the nest. Based on research and communications with David Baker-Gabb – who has monitored more than 20 active Red Goshawk nesting territories over 12 breeding seasons on the Tiwi Islands – Red Goshawks have been observed to be tolerant of human activity around the nest site. During surveys for the species, Czechura et al. (2009) observed that both adults and young were confiding and appeared tolerant of human presence. Aumann and Baker-Gabb (1991) observed that: *the Red Goshawk is tolerant of human activity in the vicinity of nest trees. Individuals of both sexes appeared undisturbed by the nest observations conducted, although most defended aggressively if the nest tree was climbed. One of the successful nests*

Criterion	Summary of mitigation measures and significant impact assessment
	found during the project was within 100 m of a permanently occupied settlement, and several others were close to well-used tracks and roads. A more remote pair tolerated a buffalo catchers' stockyard within 80 m of the nest tree, despite attendant noise and activity throughout much of the incubation and nestling periods. Baker-Gabb, in an email correspondence to EcOz in January 2019, added that: *One successful Red Goshawk nest I studied was in a very busy permanently active camping area in Kakadu where several people drove directly under the nest every day, mowed grass etc.* Given this expert advice, there appears to be no justifiable benefit to restricting works near active nests during the species' breeding period unless construction activities involve use of helicopters or sudden noise sources such as pile-driving or blasting. If so, then construction within 100 m of the nest will be undertaken outside of breeding period. If retaining a nest tree is not possible because of land tenure or engineering reasons, then the tree will be destroyed in the late Wet season, well prior to egg-laying which occurs in the NT between mid-July and late August (Aumann and Baker-Gabb 1991). This will allow sufficient time for a breeding pair to re-nest and minimise disruption to the species' breeding cycle.
Adversely affect habitat critical to the survival of the species	The National Recovery Plan for Red Goshawk (DERM, 2012) states that 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 as defined by the *EPBC Act*. There are no such sites known to occur within the project footprint. Breeding habitat is more limited than foraging and is known to occur within the footprint – especially in riparian vegetation along the major watercourses. As discussed in Section 5.5.3.2 of this SEIS, disturbance to riparian vegetation will be avoided wherever possible, and minimised when unavoidable. The proportion of riparian habitat that will be lost is negligible in comparison with that available regionally.
Modify, destroy, remove, isolate, or decrease the availability or quality of habitat to the extent the species is likely to decline	Given the large area of breeding and foraging habitat in the region, the clearing of such a small (and narrow) proportion of it for the Project is unlikely to result in a loss, or decrease in quality, of habitat to the extent that it will cause a decline in the species.
Result in invasive species, that are harmful to the species, becoming established in the species' habitat	Neither the Conservation Advice nor the Recovery Plan for Red Goshawk identify any invasive species that are threats to the species. Alterations to fire regimes is a known threat, and this can be exacerbated by proliferation of grassy weeds such as Gamba Grass. The Project's Weed Management Plan (Appendix 5.3) has been developed to minimise the likelihood of this occurring.
Introduce disease that may cause the species to decline	Disease is not listed as a threatening process for the Red Goshawk. The author is not aware of any literature on diseases that could be introduced by the project and that would detrimentally affect this species.
Interfere with the recovery of the species	There is a National Recovery Plan for the Red Goshawk (DERM, 2012). The recovery objectives in that plan are predominantly related to information gathering and awareness raising. The only potentially relevant objective is to protect and appropriately-manage important habitat areas, none of which are within the project footprint.

5.6.3.34 Typhonium praetermissum

Typhonium praetermissum is listed as Vulnerable under the *TPWC Act* and is not listed under the *EPBC Act*. *Typhonium praetermissum* is a small perennial herb with above ground parts present during the annual wet season, usually between December and April. This species occurs in open woodland and favours relatively unshaded areas in red brown clay and shallow, gravelly soils. Plants are typically found in small, relatively open (unshaded) patches of gravel or gravelly, sandy substrate supporting less than 20% vegetation ground cover, and located on the edge of lateritic plateau areas (NTH, 2021).

The species is endemic to the greater Darwin region, extending from the Gunn Point area, south to Lake Bennett and west to Cox Peninsula. The NTG has developed a habitat model for *Typhonium praetermissum* for the Greater Darwin region (Cuff and Green, 2019).

Large areas of the region within which the DCS, northern electrode corridor and OHTL Utilities Corridor are located are modelled as high-likelihood habitat. During the field survey that ground-truthed the land units within those project components, the veracity of modelled high-likelihood habitat within them was assessed, and any additional areas that should be considered as high-likelihood habitat were identified. In 2022, all high likelihood *Typhonium praetermissum* habitat was surveyed across all relevant components except for the northern electrode corridor (because of survey timing) – see Appendix 5.1 for details. The survey noted that the OHTL Railway Corridor is a highly modified environment, making it unsuitable for *Typhonium praetermissum.* Other components are discussed below.

DCS

The 2022 survey recorded 197 *Typhonium praetermissum* plants within the DCS, and a further 289 individuals in suitable habitat that was surveyed to the south (see Figure 5-39). Of the plants within the footprint, a high proportion occurred along the proposed route for the Underground Cable Corridor closest to the coast. The remaining plants were found evenly distributed throughout the DCS. These results were anticipated due to the large number of historical records of *Typhonium praetermissum* to the west of the DCS (as per Figure 5-39).

As a general rule, for individuals to be considered as part of an existing sub-population, they must occur less than 2.5 km away in continuous intact habitat considered suitable for the species (Cuff and Green 2019). Therefore, those records – and the ones from this survey – are likely to all be members of the Murrumujuk sub-population identified in Cuff and Green (2019) and Stokeld et al. (2020) which is situated close to the coast and extends roughly 2.5 km inland. The records from this survey – combined with existing NTG and Project Sea Dragon records – indicate a known population of more than 1,000 individuals present.

From observations made in the field, it is highly likely that the extent of the observed population extends much further than what has only been surveyed within the Gunn Point region. Therefore, the known sub-population's extent is likely to be greater than what has been recorded within the project's footprint and adjacent areas.

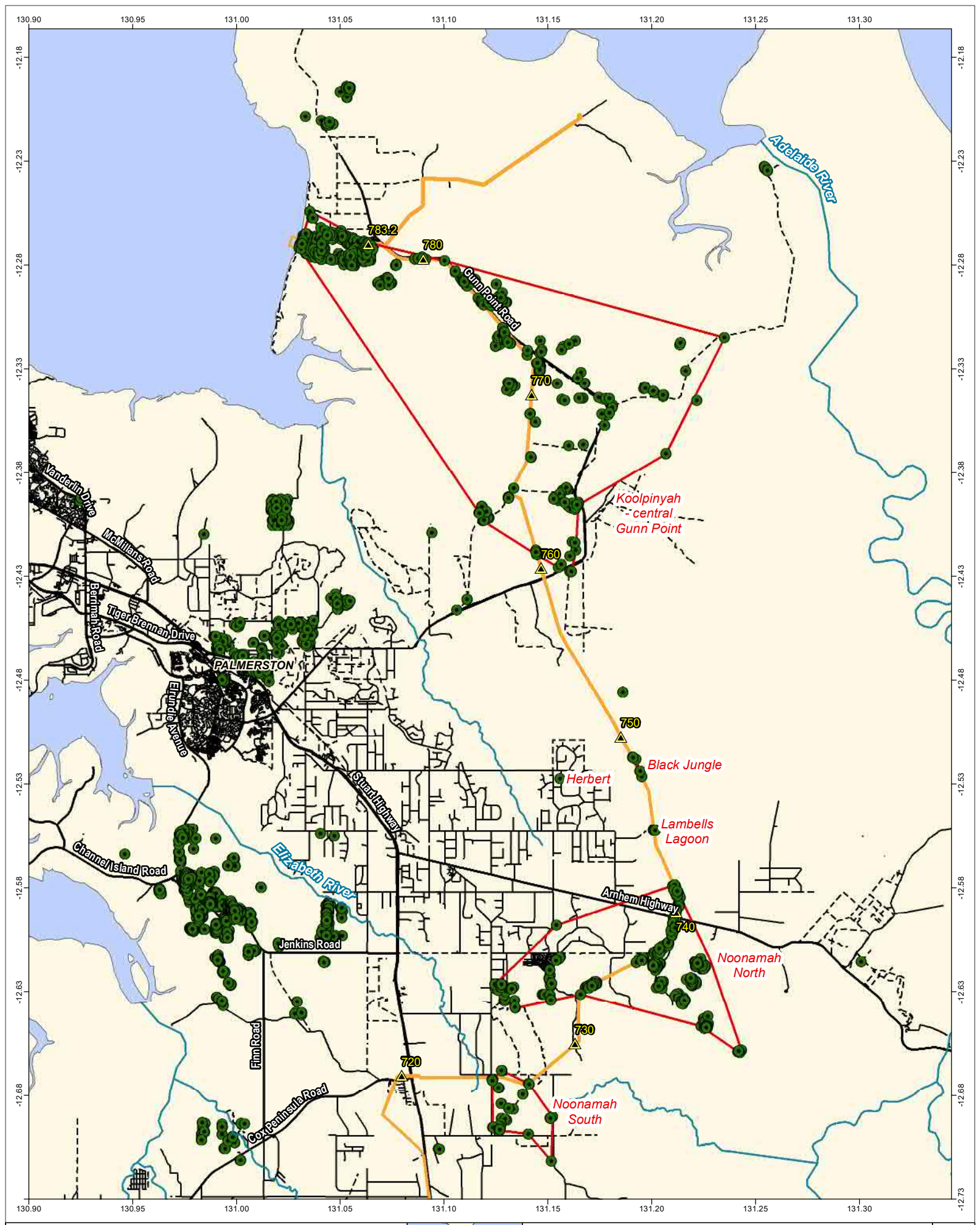
OHTL Utilities Corridor

A total of 416 *Typhonium praetermissum* plants were recorded within, and proximate to, the OHTL Utilities Corridor footprint in six localities, of which two are likely to be new sub-populations given their distance from other known occurrences. Of these records, 237 individuals were observed within the project footprint and 179 were outside the project footprint – see Figure 5-40 and Figure 5-41. The northern records fill spatial gaps that justify an amalgamation of the Murrumujuk, Gunn Point Road North and Koolpinyah (central Gunn Point) sub-populations (i.e., there are no longer any gaps of greater than 2 km between those sub-populations) – see Figure 5-38. The southern records link

previous records attributed to the Noonamah North sub-population with those made by DEPWS in 2021 to create a single sub-population south of Arnhem Highway (see Figure 5-38).

The *Typhonium praetermissum* in the centre of the OHTL Utilities Corridor are not proximate to any known sub-populations. The nearest sub-population to these records is 3.5 to 4 km to the north and west of the patch identified within Black Jungle, and approximately 5.5 km from the Herbert patch. None of the Black Jungle plants are situated within the project footprint, all are adjacent. South of this, three plants were observed and, of these, only one was detected within the OHTL Utilities Corridor. These qualify as two new sub-populations.

It is important to note that each of these *Typhonium praetermissum* sub-populations are likely to have undetected members. When the species was found during targeted surveys for this project within the OHTL footprint, surveyors endeavoured to identify the extent of the occurrences, but did not survey suitable habitat within the entire vicinity of each occurrence.



- Towns
- KP
- Railway
- Minor Drainage
- *Typhonium pratermissum* record
- *T. praetermissum* sub-population
- AAPowerLink infrastructure

Roads

- Principal road
- Secondary road
- Minor road
- Track

Source: Sun Cable, EcOz, NTG (NR Maps)

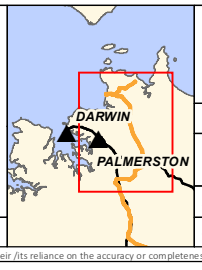


Figure 5-38. Map of *Typhonium pratermissum* sub-populations relevent to the AAPowerLink footprint

Project: Australia-Asia PowerLink

N

0 2.5 5 Kilometres

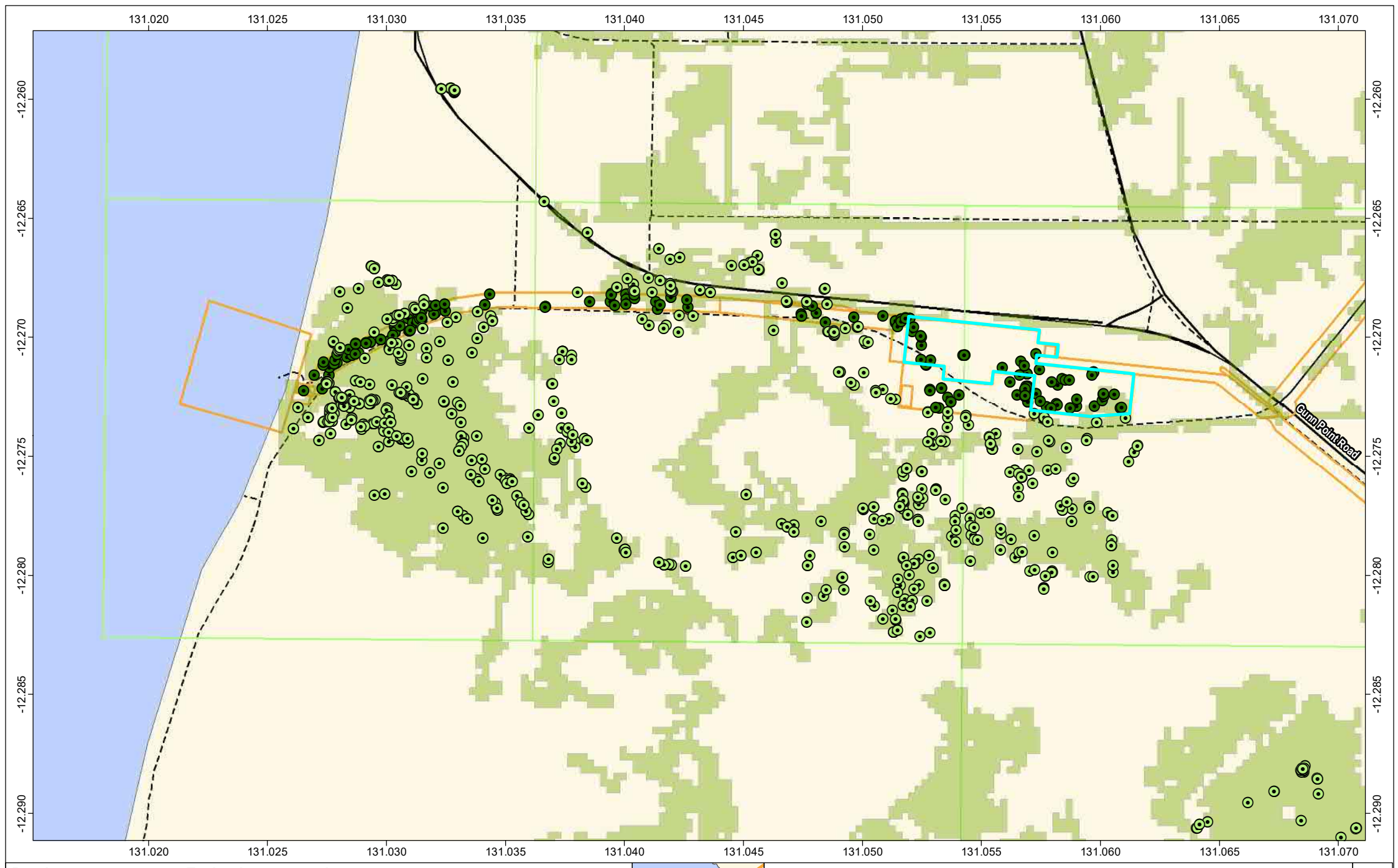
Reference: M-Files ID 217502

Date: 16/11/2022 | Revision: 1

Scale: 1:250,000

Coordinate System: GDA2020 | A4

SUN CABLE AUSTRALIA-ASIA PowerLink



Roads
- Secondary road
- Minor road
- Track
- AAPowerLink infrastructure

Typhonium pratermissum
- Record inside footprint
- Record outside footprint
- AOO
- High likelihood modelling

Figure 5-39. Map showing *Typhonium praetermissum* records relevant to the Murrumujuk project footprint

N

Project: Australia-Asia PowerLink	Reference: M-Files ID 198726	Revision: 1
Coordinate System: GDA2020	Date: 18/11/2022	SUN CABLE AUSTRALIA-ASIA PowerLink
0 240 480 720 960 Meters	Scale: 1:22,000 A4	

Source: Sun Cable, EcOz, NTG (NR Maps)

▲ Towns
OHTL Corridor

Roads
Secondary road
Minor road
Track

Typhonium pratermissum
Record inside footprint
Record outside footprint
High likelihood modelling

Figure 5-40. Map showing *Typhonium praetermissum* records relevant to the northern OHTL Utilities Corridor footprint

Project: Australia-Asia PowerLink

N

0 1 2 Kilometres

Reference: M-Files ID 217502

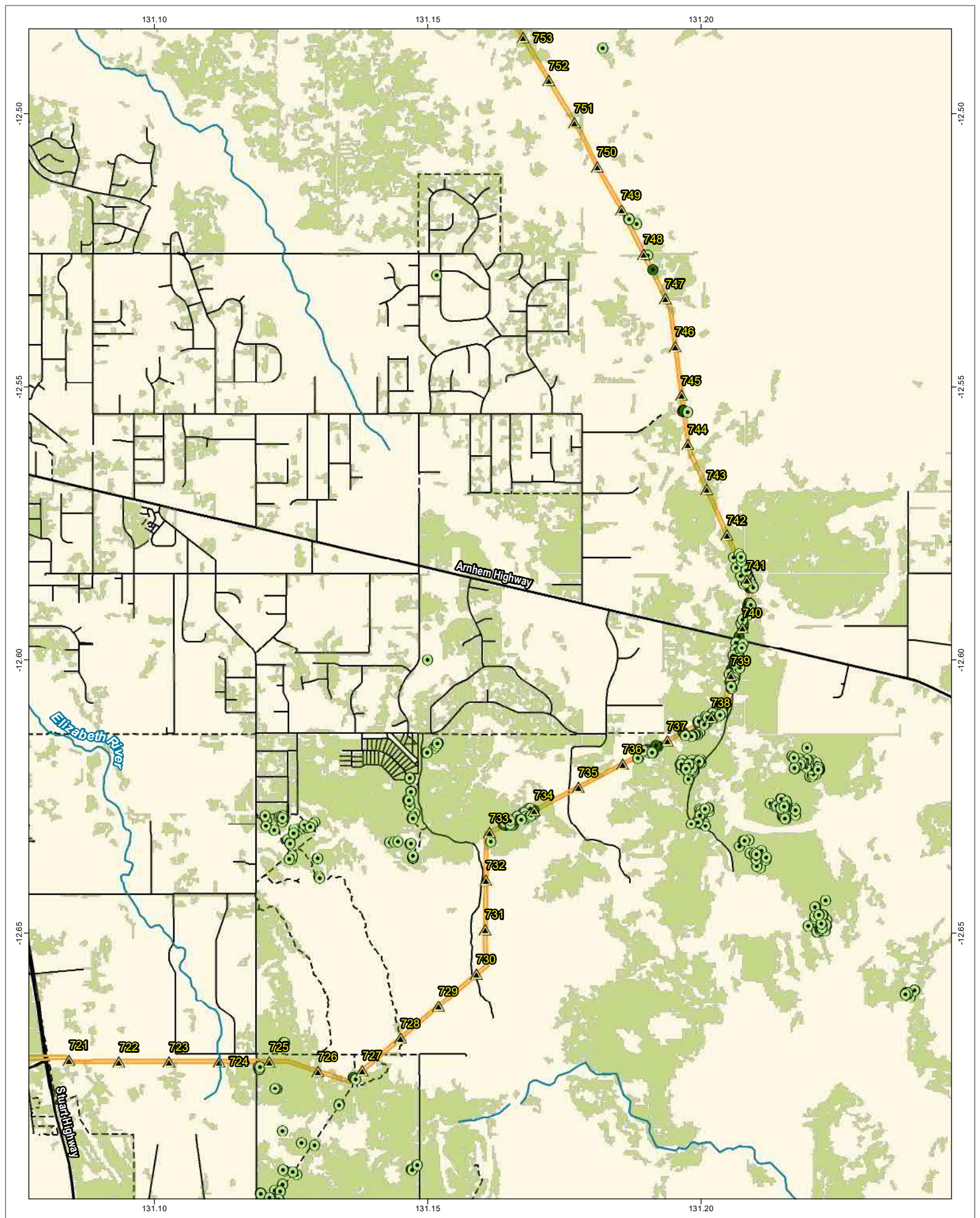
Date: 18/11/2022 | Revision: 1

Scale: 1:75,000

Coordinate System: GDA2020 | A4

Source: Sun Cable, EcOz, NTG (NR Maps)

SUN CABLE AUSTRALIA-ASIA PowerLink



Towns
Minor Drainage
OHTL Corridor

Roads
Principal road
Secondary road
Minor road
Track

Typhonium pratermissum
Record inside footprint
Record outside footprint
High likelihood modelling

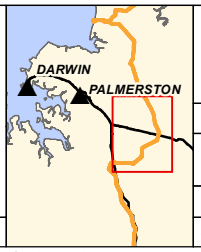


Figure 5-41. Map showing *Typhonium praetermissum* records relevant to the southern OHTL Utilities Corridor footprint

Project: Australia-Asia PowerLink

0 2.5 Kilometres

Reference: M-Files ID 217502

Date: 18/11/2022 | Revision: 1

Scale: 1:95,000

Coordinate System: GDA2020 | A4

N

Source: Sun Cable, EcOz, NTG (NR Maps)

SUN CABLE AUSTRALIA-ASIA PowerLink

The general occurrence of a Vulnerable species in a region is not, in itself, sufficient to meet the definition of an 'important' population. Instead, under the EPBC Significant Impact Guidelines 1.1 (DEWHA, 2013) the occurrence needs to be necessary for a species' long-term survival and recovery. This may include populations identified in recovery plans and/or that are:

Key source populations either for breeding or dispersal

Populations that are necessary for maintaining genetic diversity

Populations that are near the limit of the species' range.

DEPWS are currently undertaking the analysis required to identify which occurrences of *Typhonium praetermissum* meet either of the first two criteria. The results are expected in December 2022 and DEPWS were unwilling to share any initial findings with the Proponent before then. As proxy, however, an assumption is made in this assessment that the three new sub-populations of *Typhonium praetermissum* that were identified during survey work for this project are important populations necessary for maintaining genetic diversity. Moreover, those occurrences also qualify as important populations because they are near the limit of the species' range.

Typhonium praetermissum within the project footprint is at risk of being lost during land-clearing activities. Table 5-54 provides an overview of the potential impact on each sub-population, assuming all plants present within the footprint of the relevant project component are lost. To avoid any reduction in the AOO of the Lambells Lagoon sub-population, those records will be spanned and buffered from any disturbance. Likewise, because the Black Jungle sub-population has so few members, all records within the OHTL footprint will be spanned and buffered from any disturbance. Implementation of the Constraints Planning and Field Development Procedure (Appendix 4.1) to inform prudent placement of OHTL structures will minimise the number of *Typhonium praetermissum* plants lost from the Noonamah North and Central Gunn Point sub-populations.

Table 5-54: Details of Typhonium praetermissum sub-populations within the project footprint

Sub-population name and size	Project component	No. and % within the project footprint	No. of AOO grid cells that could be lost	% within the project footprint that will be lost	No. of AOO grid cells that will be lost
Murrumujuk, Gunn Point Road North and Koolpinyah (Central Gunn Point) – amalgamated (1,619 plants)	LSJC	1 (0.1%)	1	15.7%	0
	OHTL	49 (3.0%)			
	DCS*	83 (5.1%)			
	UCC	121 (7.5%)			
Black Jungle (15 plants)	OHTL	1 (6.6%)	0	0	0
Lambells Lagoon (six plants)	OHTL	4 (66.6%)	1	0	0
Noonamah North (853 plants)	OHTL	174 (20.4%)	0	No more than 10%	0

Sub-population name and size	Project component	No. and % within the project footprint	No. of AOO grid cells that could be lost	% within the project footprint that will be lost	No. of AOO grid cells that will be lost
Noonamah South (81 plants)	OHTL	1 (1.2%)	0	1.2%	0

* Includes future use area

Table 5-55 presents an assessment of whether project activities are likely to have a significant impact on the *Typhonium praetermissum*, using the criteria contained within the EPBC Significant Impact Guidelines 1.1 (DEWHA, 2013). The conclusion is that by spanning important occurrences and minimising loss of plants elsewhere, it is unlikely there will be a significant impact to the species.

Table 5-55: Significant impact assessment for the Typhonium praetermissum

Criterion	Summary of mitigation measures and significant impact assessment
Lead to a long-term decrease in the size of an important population	Table 5-54 shows for three of the five sub-populations of *Typhonium praetermissum* intersected by the project footprint, there will be no loss of plants. For the two other sub-populations – both of which are very large and likely to contain many more plants than recorded given the proximity of suitable, unsurveyed habitat – at most 15% and 10% of individuals will be lost. Losing such a small proportion of the known number of plants within these sub-populations is unlikely to lead to a long-term decrease in either.
Reduce the AOO of an important population	According to Stokeld et al. (2021), the AOO for *Typhonium praetermissum* is 256 km^2, of which 27% is within the Gunn Point region. Since that calculation was made, a large number of *Typhonium praetermissum* patches have been recorded (for this project, and others in the Darwin region) that were not accounted for. Using those data, a revised AOO has been calculated as 520 km^2. Determining AOO is based on the IUCN 2 x 2 km grid cell method. If *Typhonium praetermissum* is recorded within the project footprint – and its loss cannot be avoided – the only way that loss can lead to a reduced AOO is if it is entirely confined to within the footprint. In other words, if the plants lost constitute the entire local occurrence, and there are no other nearby occurrences, then this could lead to a reduced AOO. This could only occur for the Lambells Lagoon and the Central Gunn Point sub-populations. Both can be avoided through spanning and buffering particular *Typhonium praetermissum* patches within the OHTL – for the Lambells Lagoon sub-population, this would be all plants; for the Central Gunn Point sub-population, plants occurring south of Gunn Point Road just before the OHTL enters the DCS. As a consequence, there will not be any reduction in the AOO of any sub-population of *Typhonium praetermissum.*

Criterion	Summary of mitigation measures and significant impact assessment
Fragment an existing important population into two or more populations	In some locations, construction of the OHTL will clear a swathe through an existing patch of *Typhonium praetermissum*. The maximum width of habitat that would be lost is 226, reinstated and reduced to 6 m post-construction (assuming construction pads and pole sites are chosen to avoid disturbing this species as per Appendix 4.1 -Constraints Planning and Field Development Procedure). Given the distinction between sub-populations of *Typhonium praetermissum* requires distances of greater than 2 km, such minor additional gaps in its habitat will not cause fragmentation into more populations or disrupt the breeding cycle.
Disrupt the breeding cycle of a population	
Adversely affect habitat critical to the survival of the species	Critical habitat has not been identified for *Typhonium praetermissum*. This concept is arguably not relevant for rare species with restricted habitat requirements; it can be assumed that the few locations within which the species occurs constitutes critical habitat. Potential impacts to such habitat are assessed throughout this table.
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent the species is likely to decline	For the reasons given in this table, it is unlikely that the loss, or decrease in quality, of habitat because of project activities will cause a decline in the species.
Result in invasive species, that are harmful to the species, becoming established in the species' habitat	Cowie and Westaway (2012), identify the proliferation of the weed species Gamba Grass and Mission Grass as dramatically increasing fuel loads resulting in more intense fires which may reduce habitat quality for *Typhonium praetermissum*. The Weed MP presented in Appendix Q has been developed to minimise introduction and proliferation of weeds within the project area of influence for the life of the Project.
Introduce disease that may cause the species to decline	Disease is not listed as a threatening process for this species. The author is not aware of any literature on diseases that could be introduced by the project and that would detrimentally affect this species.
Interfere with the recovery of the species	There is no Recovery Plan for this species. Westaway and Cowie (2012) consider the main threats to be land clearing for development and weed invasion by Gamba Grass and Mission Grass. The OHTL is designed to minimise clearing of suitable habitat for *Typhonium praetermissum*. The Weed Management Plan has been developed to minimise introduction and proliferation of weeds within the project area of influence.

5.6.3.35 Utricularia dunstaniae

Utricularia dunstaniae is listed as Vulnerable under the *TPWC Act* and is not listed under the *EPBC Act*. *Utricularia dunstaniae* is a small, annual, terrestrial bladderwort, flowering between March and May. In the NT, the species is associated with 'sandsheet heath' type habitats such as *Melaleuca nervosa* woodland or *Melaleuca verticordia* shrubland in wet sand – often in shallow water, frequently where water is percolating from the ground. The species tends to occur in slightly wetter micro-habitats than other sympatric *Utricularia* species (Kerrigan and Cowie, 2012). *Utricularia dunstaniae* has a scattered distribution across north-western NT and is known to occur in the Darwin area (particularly the Howard Springs region), Kakadu National Park and Cobourg Peninsula.

Threats to *Utricularia dunstaniae* include habitat disturbance from sandmining, quad bike and motorbike activity, subdivision, and changes to hydrology; some of the few known localities of this species are susceptible to this disturbance (Kerrigan and Cowie, 2012).

Using high-resolution satellite imagery and existing sandsheet mapping for the greater Darwin Region (Hempel 2003), ten potential sandsheet habitats were identified within the OHTL Utilities Corridor – see Appendix 5.2. These sites were then verified in the field with reference to key indicator species and sandy soils. Multiple field surveys were completed – first in September 2021 to verify the presence of sandsheet heath habitat, then second in May 2022 once seasonal conditions were appropriate for *Utricularia* detection. Of the ten sites visited, none were suitable nor supported *Utricularia dunstaniae* – see Appendix 5.1.

Results of the field surveys found that *Utricularia dunstaniae* is not known to occur within the project footprint. Table 5-56 presents a significant impact assessment using the criteria contained within the EPBC Significant Impact Guidelines 1.1 (DEWHA, 2013). The conclusion is that it is unlikely that project activities will have a significant impact upon *Utricularia dunstaniae*.

Table 5-56: Significant impact assessment for Utricularia dunstaniae

Criterion	Summary of mitigation measures and significant impact assessment
Lead to a long-term decrease in the size of an important population.	As explained above, *Utricularia dunstaniae* is unlikely to be present within the project footprint. In addition, the OHTL route design will ensure that areas identified from fieldwork as being suitable habitat for *Utricularia dunstaniae* will not be disturbed. This will include avoiding any impacts to the hydrology of these habitat areas. There is therefore no mechanism that could lead to any of these criteria being met.
Reduce the AOO of an important population.	
Fragment an existing important population into two or more populations.	
Disrupt the breeding cycle of an important population.	
Modify, destroy, remove, isolate, or decrease the availability or quality of habitat to the extent the species is likely to decline.	
Adversely affect habitat critical to the survival of the species.	Critical habitat has not been identified for the *Utricularia dunstaniae* – but is arguably a sub-set of sandsheet heath patches. This concept is arguably not relevant for rare species with very restricted habitat requirements; it can be assumed that the few locations within which the species occurs constitutes critical habitat. Avoidance measures to minimise potential impacts to such habitat are assessed under previous criteria.
Result in invasive species, that are harmful to the species, becoming established in the species' habitat.	Populations of *Utricularia* species are susceptible to damage from inappropriate burning, which can be caused by introduced perennial grasses – Gamba Grass and Mission Grass – through hotter fires (NTH, 2012). Tully Grass is also a threat as it changes fire behaviour and competes with native species within wet environments. The Weed Management Plan presented in Appendix 5.3 has been developed to minimise introduction and proliferation of weeds within the area of influence for the life of the Project.

Criterion	Summary of mitigation measures and significant impact assessment
Introduce disease that may cause the species to decline.	Disease is not listed as a threatening process for *Utricularia dunstaniae*. The author is not aware of any literature on diseases that could be introduced by the project and that would detrimentally affect this species.
Interfere substantially with the recovery of the species.	There is no Recovery Plan for this species; however, the NTG (Kerrigan and Cowie, 2012) identifies the following conservation and management actions: **Protect the habitat of known localities of the species.** Conduct research to: **Provide a more detailed assessment of distribution, habitat requirements and population size.** **Provide an assessment of factors limiting distribution, and/or threats to survival.** None of these will be interfered with by the activities of the Project.

5.6.3.36 Water Mouse (Xeromys myoides)

The Water Mouse *(Xeromys myoides)* is listed as Vulnerable under the *EPBC Act* and as Data Deficient under the *TPWC Act*. The Water Mouse is a nocturnal rodent that inhabits aquatic environments – including coastal saltmarshes, mangroves, samphire shrublands, saline reed-beds and grasslands, and coastal freshwater wetlands (DAWE, 2021a) across northern Australia, from WA to Qld. In the NT, the Water Mouse is known to occur along the floodplains of the Glyde River and Tomkinson River in Arnhem Land, along the South Alligator and Daly Rivers in Kakadu National Park, and on Melville Island (DAWE, 2021a). Some Queensland populations of the Water Mouse have been subject to detailed assessments. However, there is limited information on the NT occurrences (DAWE, 2021a).

Degradation and fragmentation of freshwater and intertidal wetland communities is the primary threat to the Water Mouse in the NT, particularly saltwater intrusion, spread of exotic pastoral grasses, and grazing impacts of feral animals and livestock intensification (DAWE, 2021a).

There is no suitable habitat for Water Mouse within the project footprint, nor has the Water Mouse been recorded within the project footprint. Table 5-57 presents a significant impact assessment using the criteria contained within the EPBC Significant Impact Guidelines 1.1 (DEWHA, 2013). As the project footprint will not impact on known populations or suitable habitat, the Water Mouse is unlikely to be significantly impacted by the Project.

Table 5-57: Significant impact assessment for Xeromys myoides

Criterion	Summary of mitigation measures and significant impact assessment
Lead to a long-term decrease in the size of an important population.	As explained above, there is no suitable habitat for the Water Mouse within the project footprint. Moreover, populations of Water Mouse are not known, or likely, to occur within the project footprint. Consequently, none of these criteria are relevant.
Reduce the AOO of an important population.	
Fragment an existing important population	

Criterion	Summary of mitigation measures and significant impact assessment
into two or more populations.	
Adversely affect habitat critical to the survival of the species.	
Disrupt the breeding cycle of an important population.	
Modify, destroy, remove, isolate, or decrease the availability or quality of habitat to the extent the species is likely to decline.	
Result in invasive species, that are harmful to the species, becoming established in the species' habitat.	Predation by introduced species such as pigs, cats and dogs, is a known threat to the Water Mouse (DAWE, 2021a). Feral cats, dogs and pigs already occur throughout the project footprint and are unlikely to increase due to project activities. The spread of exotic pasture grasses is also a known threat with its potential to modify habitat and increase fire intensity (DAWE, 2021a). The Weed Management Plan presented in Appendix 5.3 has been developed to minimise introduction and proliferation of weeds within the area of influence for the life of the Project.
Introduce disease that may cause the species to decline.	Disease is not listed as a threatening process for the Water Mouse. The author is not aware of any literature on diseases that could be introduced by the project and that would detrimentally affect this species.
Interfere substantially with the recovery of the species.	There is no current Recovery Plan for the Water Mouse, the plan adopted in has been superseded by the Conservation Advice (DAWE, 2021a) which lists conservation and recovery actions – including to increase the species knowledge and conservation actions in areas to be potential habitat. Pre-construction surveys of potential habitat supports this objective. All other recovery actions will not be interfered with by the Project.

5.6.3.37 White-throated Grasswren *(Amytornis woodwardi)*

The White-throated Grasswren is listed as Vulnerable under both EPBC and *TPWC Act*s. It is a small, secretive bird that lives in family groups amongst spinifex in sandstone escarpments. The White-throated Grasswren has experienced a significant decline and has not been detected across the previous extent of its range in recent studies, being now restricted to the Arnhem plateau and escarpment within Kakadu National Park and neighbouring Warddeken and Djelk IPA's (DoE, 2014).

Hotter fires and increased fire extent and frequency – which do not leave unburnt refugia – in western Arnhem Land is considered the primary threat to the White-throated Grasswren (DoE, 2014). Populations of this species are particularly vulnerable to single fire events due to the species' restricted geographic range (Skroblin and Murphy, 2013).

According to the NT Fauna Atlas, the closest record of a White-throated Grasswren to the OHTL is from 1991 within Nitmiluk National Park, and 30 km from the preferred OHTL route at Katherine (KP 464). There have been more recent surveys for this species in Nitmiluk National Park (not within the OHTL), but any new records are not within the public domain. Table 5-58 presents a significant impact assessment using the criteria contained within the EPBC Significant Impact Guidelines 1.1 (DEWHA, 2013). Because the White-throated Grasswren is unlikely to occur within the project footprint – and impacts to suitable habitat will be very minimal – this species is unlikely to be significantly impacted by the Project.

Table 5-58: Significant impact assessment for the White-throated Grasswren

Criterion	Summary of mitigation measures and significant impact assessment
Lead to a long-term decrease in the size of an important population.	As explained above, populations of White-throated Grasswren are not known, or likely, to occur within the project footprint.
Reduce the AOO of an important population.	The White-throated Grasswren is not known to occur within the project footprint, therefore land disturbance associated with the project will not reduce the AOO of the species.
Fragment an existing important population into two or more populations.	There are no records of the White-throated Grasswren within the project footprint – and all occurrences are on the eastern side of the project footprint. Therefore, there are no known populations that could be fragmented. Moreover, the narrow project footprint is unlikely to represent a dispersal barrier to such a mobile species.
Adversely affect habitat critical to the survival of the species.	Critical habitat is not described for this species; however, it can be inferred to be sandstone outcrops with spinifex (DoE, 2014). Due to the nature of the relevant project component – a narrow, linear corridor for a powerline – if sandstone outcrops are identified within the intended route, they can easily be avoided or spanned between OHTL structures. Doing so will minimise the likelihood of adversely affecting habitat critical to the survival of the species.
Disrupt the breeding cycle of an important population.	Populations of the White-throated Grasswren are not known, or likely, to occur within the project footprint, therefore the breeding cycle of a population will not be disrupted by the development of the Project.
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent the species is likely to decline.	The White-throated Grasswren is restricted in habitat to the Arnhem Land plateau sandstone escarpments with spinifex (DoE, 2014). The Project does not intersect the Arnhem Land plateau and therefore will not impact on the availability or quality of this habitat.
Result in invasive species, that are harmful to the species, becoming established in the species' habitat.	Increased fire frequency and extent are likely threatening to the species (DoE, 2014). The spread of exotic pasture grasses is by extension a threat with their potential to modify habitat and increase fire intensity. The Weed Management Plan presented in Appendix 5.3 has been developed to minimise introduction and proliferation of weeds within the area of influence for the life of the Project.
Introduce disease that may cause the species to decline.	Disease is not listed as a threatening process for the White-throated Grasswren. The author is not aware of any literature on diseases that could be introduced by the project and that would detrimentally affect this species.

Criterion	Summary of mitigation measures and significant impact assessment
Interfere substantially with the recovery of the species.	There is no Recovery Plan for the White-throated Grasswren. The Conservation Advice (DoE, 2014) lists two conservation objectives: **Establish a stable population of White-throated Grasswrens** **Improve habitat quality across the species range.** Neither of these will be interfered with by the activities of the Project.

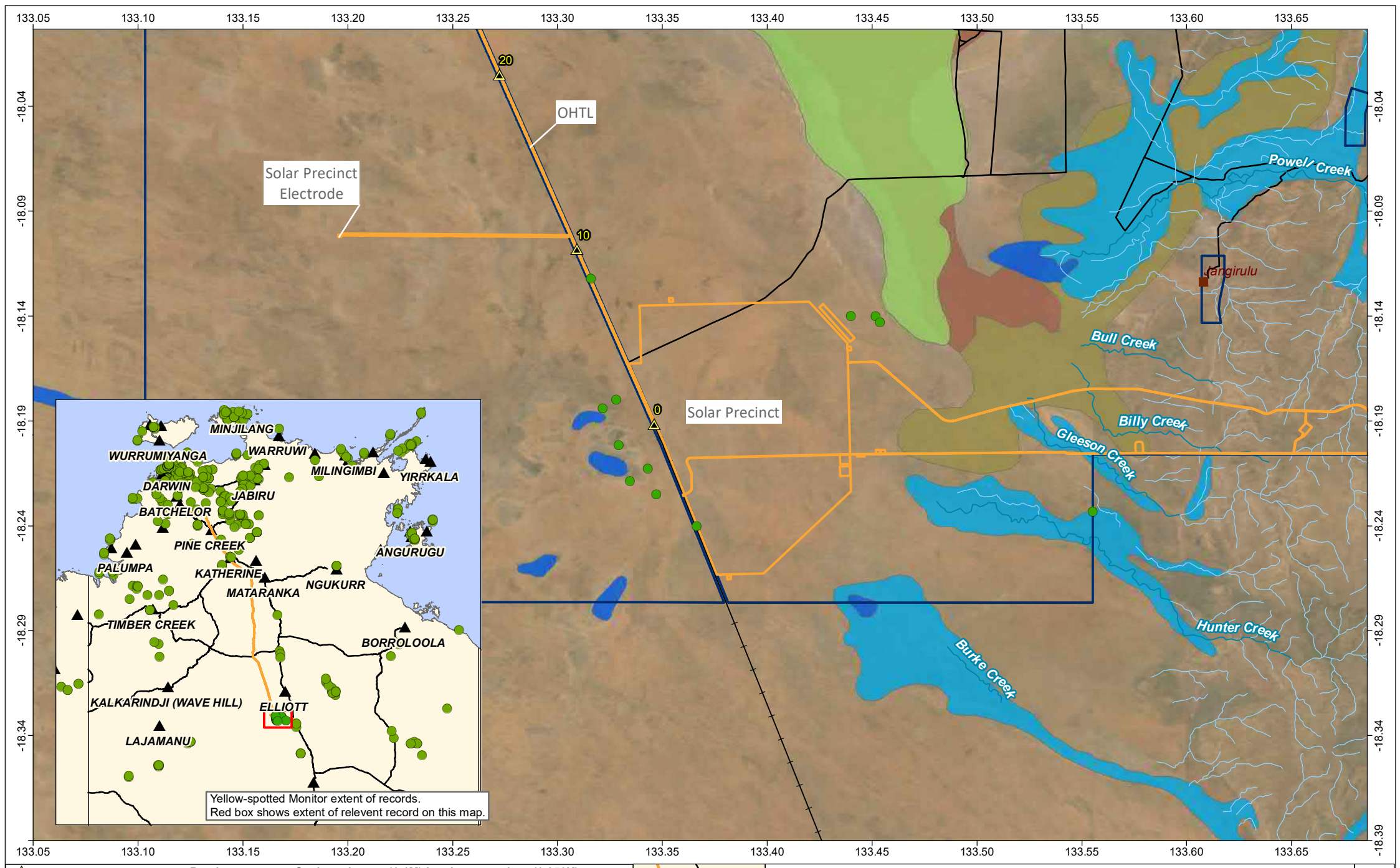
5.6.3.38 Yellow-spotted Monitor (*Varanus panoptes*)

The Yellow-spotted Monitor (also known as the Floodplain Monitor) is listed as Vulnerable under the *TPWC Act* only. It occupies a variety of habitats – including coastal beaches, floodplains, grasslands and woodlands (Ward et al., 2012) – across the top half of the NT (from Tennant Creek northwards). The Yellow-spotted Monitor occurs across a broad geographic range across the far north of Australia from the Kimberley to Cape York Peninsula, and southwards through most of Queensland. The species' propensity to eat Cane Toads and die from the ingested toxins has caused a significant decline in the population (Ward et al., 2012).

The Yellow-spotted Monitor could be present across almost the entire project footprint. Likelihood of occurrence may increase towards the south where there are fewer Cane Toads. This is where the majority of local sightings and records of the species are, according to NT Atlas and discussions with Cultural Monitors.

In October 2022, a survey was conducted using a helicopter to fly over all of the Project's components within Powell Creek Station to inspect for the presence of Greater Bilby burrows and, incidentally, Yellow-spotted Monitor burrows – see Appendix 5.1 of the SEIS for details. Twelve burrows characteristic of Yellow-spotted Monitors were recorded – see Figure 5-42. None of these sites are within the Project footprint. However, site 98 is only 8 m to the east of the OHTL Corridor. The majority of sites were observed close to alluvial areas and ephemeral lakes. Only two were situated away from alluvial-based habitat. Both of those sites occurred within the railway corridor in loamy plains that support spinifex with open Silver Box (*Eucalyptus pruinosa*). However, the railway corridor has numerous borrow pits and scrapes that often hold water for short periods of time post-rainfall. This modified habitat may create micro-habitat features suited to those preferred by the Yellow-spotted Monitor. The survey did not detect any suspected Yellow-spotted Monitor burrows within the broad sandplains, but because the Yellow-spotted Monitor is mobile, it could occur anywhere within the project footprint outside of the rocky areas associated with the Ashburton Range.

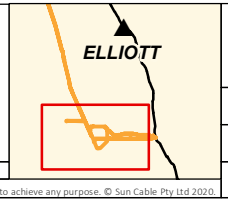
Table 5-59 assesses whether project activities are likely to have a significant impact upon the Yellow-spotted Monitor using the criteria contained within the EPBC Significant Impact Guidelines 1.1 (DEWHA, 2013). The general conclusion is that because the Yellow-spotted Monitor is a habitat generalist that occurs across a huge range, potential impacts to this species from project activities will not be significant. In the Powell Creek infrastructure area – where an 'important population' of the Yellow-spotted Monitor occurs (as explained in the table below) – that clearance of small areas of preferred habitat within the project footprint is also unlikely to have a significant impact on the species, especially with proposed pre-clearance mitigation measures.



KP
Yellow-spotted Monitor record
Railway
Powell Creek Station
AAPowerLink infrastructure

Roads
Principal road
Secondary road
Minor road
Track

Geology dataset (1:1M) Land system class (1:250K)
Alluvial areas
Black soil plain
Lake deposits
Alluvial floodplains
Clay plains



Source: Sun Cable, EcOz, NTG (NR Maps)

Figure 5-42. Map showing Yellow-spotted Monitor records relevant to the AAPowerLink infrastructure

N

Project: Australia-Asia PowerLink	Reference: M-Files ID 198726	Revision: 0
Coordinate System: GDA2020	Date: 15/11/2022	
0 5 10 Kilometres	Scale: 1:250,000	A4

SUN CABLE AUSTRALIA-ASIA PowerLink

Table 5-59: Significant impact assessment table for the Yellow-spotted Monitor

Criterion	Summary of mitigation measures and significant impact assessment
Lead to a long-term decrease in the size of an important population.	Because the Yellow-spotted Monitor is a habitat-generalist that occurs across northern Australia, it is reasonable to assume it occurs as a single population. Nevertheless, occurrences in the south of its distribution (that is less affected by Cane Toads) constitute an 'important population' as per the EPBC Significant Impact Guidelines 1.1 (DEWHA, 2013) by merit of being at the limit of the species' range, and arguably a key source population – in the absence of Cane Toads – for breeding or dispersal. Consequently, assessment in this table of the impacts to an important population of the Yellow-spotted Monitor will focus on the Powell Creek infrastructure. The negligible proportion of Yellow-spotted Monitor habitat that will be disturbed for the OHTL and northern components – together with the fact that the species is highly mobile and so can avoid interactions land clearing activities – mean that it is unlikely there will be any impacts to the remaining population of Yellow-spotted Monitors. The burrows of the Yellow-spotted Monitor are conspicuous. During construction of the Powell Creek infrastructure, an ecologist experienced with detecting Yellow-spotted Monitor burrows will inspect all proposed clearance areas prior to any land-clearing. Similarly for the Greater Bilby, if any suspected active burrows are found, a clearance impact mitigation procedure will be implemented to avoid deaths of any Yellow-spotted Monitors. This procedure will be developed in consultation with experts and will draw on lessons learnt from such work done elsewhere. During construction, land-based works will operate during a standard day shift. In limited cases, night shift, or 24-hours operation may be needed depending on the construction activities. As discussed in Section 5.4.2.6 of the Draft EIS, direct fauna mortality due to interactions with vehicles ('fauna strike') or construction equipment is a potential construction impact. Proposal activities will involve increased movement of vehicles, equipment and plant along highways, access tracks and within Powell Creek Solar Precinct and Electrode and AI. The Project WHS Management System and Traffic Management Plans in development as part of the management framework described in Chapter 17 Environmental Management will incorporate procedures and controls for safe driving and operation of plant and equipment to minimise risks to workers and the community, and also to fauna associated with collisions. Controls applied at each construction location will be risk-based and will include measures such as nominated speed limits for different vehicle types, traffic control measures, restrictions on night driving in areas of high collision risk (including areas of identified fauna activity), and removal of roadkill away from the side of the road. The controls to be implemented in Traffic Management Plans are outlined in Table 5-60, including amendments to night driving. Ongoing monitoring for fauna sightings and encounters during works will be used to inform the development and refinement of Traffic Management Plans, particularly to identify areas of high collision risk.
Reduce the AOO of an important population.	The AOO for the Yellow-spotted Monitor has not been determined. However, it would likely be very large because of the species' broad distribution across three states – even if restricted to areas that have low Cane Toad densities. Clearing small areas of preferred habitat for the Yellow-spotted Monitor within the project footprint is unlikely to substantively reduce the AOO of the species.

Criterion	Summary of mitigation measures and significant impact assessment
Fragment an existing important population into two or more populations.	This Solar Precinct footprint is a large area which could reduce some connectivity between occurrences of Yellow-spotted Monitor; however, not to the degree that north-south or east-west movement of the species is no longer possible. Moreover, once developed the Solar Precinct may still provide some level of foraging and dispersal habitat for this mobile, omnivorous species.
Disrupt the breeding cycle of an important population.	It is not documented when Yellow-spotted Monitors breed in the more arid parts of their distribution, although many fauna species in the arid zone time breeding to align with seasonal conditions and food availability. As explained above, the Solar Precinct does not contain breeding habitat, but some locations within the OHTL and where the access routes cross do contain breeding habitat (and records of active burrows). Disruption to breeding Yellow-spotted Monitors could occur if there are active burrows within the project footprint. Application of the pre-clearance mitigation plan discussed above should ensure that adult Yellow-spotted Monitors within active burrows are not harmed during construction of project infrastructure. However, if a burrow contains eggs or infants, these may be lost. This risk would only be present during the brief time in which construction occurs in that section of the OHTL / access routes, and it is possible that the individual adults affected could breed again shortly after the loss of their burrow. Temporary disruption of what, at most, would be a few individuals' breeding cycles, does not reasonably constitute a significant impact to an important population of Yellow-spotted Monitors.
Adversely affect habitat critical to the survival of the species.	Critical habitat has not been defined for the Yellow-spotted Monitor and is generally not relevant given the species is a habitat-generalist with a broad distribution. Conservatively, one could consider that the region of the Yellow-spotted Monitor's distribution which has low densities of Cane Toads is critical habitat. Even so, that is a very large, of which only a tiny proportion is being cleared. Development of the Project will not have a substantive adverse effect on habitat critical to the survival of the Yellow-spotted Monitor.
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent the species is likely to decline.	Because it is a habitat-generalist, the proportion of Yellow-spotted Monitor habitat present within the project footprint compared within the surrounding area is negligible. For the reasons given in this table, it is unlikely that the loss, or decrease in quality, of suitable habitat because of project activities will cause a decline in the species.
Result in invasive species, that are harmful to the species, becoming established in the species' habitat.	Cane Toads are the key threat to the Yellow-spotted Monitor. These species are already common in the region, and development of the Project is unlikely to lead to any substantial change in their occurrence.
Introduce disease that may cause the species to decline.	Disease is not known to be a threat to the Yellow-spotted Monitor. The author is not aware of any literature on diseases that could be introduced by the Project and that would detrimentally affect this species.
Interfere substantially with the recovery of the species.	There is no recovery plan or actions for this species. If there were, it would almost certainly focus on actions addressing the threat posed by Cane Toads. Development of the Project would not interfere with such actions.

5.7 Avoidance, Mitigation, and Monitoring

Impact mitigation was undertaken in accordance with the environmental decision-making hierarchy consistent with Section 26 of the *EP Act*. The decision-making hierarchy sets the following priorities when addressing impacts which have been considered in developing Table 5-60:

1. Avoid – ensure that actions are designed to avoid adverse impacts on the environment
2. Mitigate – identify management options to mitigate adverse impacts on the environment to the greatest extent practicable
3. Offset – if appropriate, provide for environmental offsets for residual adverse impacts on the environment that cannot be avoided or mitigated.

Table 5-60: Terrestrial Ecosystems – Avoidance, mitigation, monitoring, and reporting commitments

Impact	Avoidance	Mitigation	Monitoring	Reporting
Loss of vegetation and habitat. **Loss or deterioration of significant vegetation.**	Significant vegetation and threatened species habitat will be assigned an appropriate constraint rating and managed in accordance with the Constraints Planning and Field Development Produce (Appendix 4.1). Micro-siting of project infrastructure to avoid significant vegetation where possible. Preferential use of existing cleared areas where possible for temporary construction requirements such as access tracks, laydown areas and construction camps.	The area to be cleared for the Solar Precinct is clearly flagged and marked on-ground. Clearance only within the boundaries approved in licences obtained to clear native vegetation as per the *Planning Act 1999* (NT) and/or the *Pastoral Land Act 1992* (NT). Re-instatement of all temporary construction footprints and follow-up weed control post-construction. Post-operations rehabilitation of cleared areas as per the Decommissioning and Rehabilitation Plan. Develop and implement Flora and Fauna Management Plan with a Bilby procedure created in consultation with DCCEEW and DEPWS. This will state mitigation measures if Great Bilby is found within project footprint including but not limited to: • Conducting land management operations (i.e., fire management and pest control) in adjacent areas to project footprints to enhance habitat quality (in negotiation with landowners)	Consistent with Draft EIS measures. Visual inspections during clearing to ensure clearing is within approved boundaries. Results recorded, along with any photographs. Rehabilitation inspections following first wet season post-construction or until vegetation is established and sites are stable.	Consistent with Draft EIS measures: • Records of clearing undertaken. • External reporting in accordance with environmental approval conditions.
Introduction and spread of weeds	Avoid introducing new weeds into proposal footprint by implementing weed hygiene, as per the Weed Management Plan (Appendix 5.3)	Implementation of Weed Management Plan (Appendix 5.3) that has been developed in accordance with the requirements of the Weeds Management Act and relevant statutory weed management plans.	As per the Weed Management Plan (Appendix 5.3).	As per the Weed Management Plan (Appendix 5.3).

Impact	Avoidance	Mitigation	Monitoring	Reporting
Changes in fire regime	Observe fire bans.	Develop and implement a Bushfire Management Plan, including first response capability	Visual monitoring for fires. Monitoring NAFI website for proximate fires which may impact proposal. Monitoring conditions for fire risk.	Any fires reported to Bushfires NT or appropriate authority.
Direct fauna mortality	Avoiding clearing large hollow-bearing trees where possible.	Site inductions will ensure that all personnel are aware of potential/confirmed areas of fauna habitat, are aware of their obligations and know the correct procedures for fauna encounters. Clearing will be conducted in a single direction, allowing any fauna to move out of way of clearing activities. If fauna is spotted in immediate clearing area and are in danger, clearing will be stopped until safe to continue. Clearing in a progressive manner to allow wildlife to natural disperse from the area as clearing undertaken. Site inductions will ensure that all personnel are aware of their obligations and know the correct procedures for fauna encounters. Vehicle speed restrictions apply when travelling near uncleared areas or in higher risk conditions. Develop and implement a Flora and fauna Management Plan with a specific section to address any risk to Avian species Develop and implement Flora and Fauna Management Plan with a Bilby procedure created in consultation with DCCEEW and DEPWS. This will	Record any fauna encounters, injuries, or death as result of works for the duration of works. Information on fauna encounters, injuries or death will be used to monitor the effectiveness of avoidance and mitigation measures, and to inform potential refinements or additional measures to be applied to minimise/eliminate the risk of future incidents.	Internal record keeping of incidents of fauna encounters, injuries, or death as a result of works for the duration of works. External reporting in accordance with environmental approval conditions.

Impact	Avoidance	Mitigation	Monitoring	Reporting
		state mitigation measures if Great Bilby is found within project footprint including but not limited to: • Clearing in the surrounding area to be delayed until burrows are verified as not in use • Any active burrows within the clearing footprint are avoided with a 20 m buffer until no longer occupied.		
Habitat degradation and fragmentation	The OHTL will fragment habitat; the majority of the OHTL route has been located in the railway corridor where habitat fragmentation has already occurred.	Reinstatement of all temporary construction footprints and follow-up weed control post-construction. Vegetation management conducted in accordance with the OHTL Vegetation Management Procedure (Appendix 5.4)	Nil	Nil
Changes to fauna behaviours due to noise, light, and waste management	Project activities are to be undertaken in accordance with the National Light Pollution Guidelines (DoEE, 2020) where possible.	Project activities are to be undertaken in accordance with the National Light Pollution Guidelines (DoEE, 2020) where possible.	Nil	Nil
Threatened species (restricted range).	All threatened species known records and habitat area will be assigned a constraint rating and managed in accordance with the Constraints Planning and Field Development Procedure (Appendix 4.1)	Clearance only within the boundaries approved in licences obtained to clear native vegetation as per the *Planning Act 1999* (NT) and/or the *Pastoral Land Act 1992* (NT). Reinstatement of all temporary construction footprints. Post-operations rehabilitation of cleared areas as per the Decommissioning and Rehabilitation Plan.	Visual inspections during clearing to ensure clearing is within approved boundaries. Results recorded, along with any photographs. Rehabilitation inspections following the first wet season post-construction or until vegetation is	Records of clearing undertaken. External reporting in accordance with environmental approval conditions.

Impact	Avoidance	Mitigation	Monitoring	Reporting
	Appropriate implementation of avoidance (micro-siting) and mitigation (pre-clearance surveys and use of a fauna spotter-catcher) measures will be applied in accordance with the Constraints Planning and Field Development Procedure (Appendix 4.1)	Areas known to support threatened flora species are clearly flagged and signposted as 'No-Go Zones' as per the Constraint Planning and Field Management Procedure (Appendix 4.1) Ghost Bat (*Macroderma gigas*) If any suitable roosting habitat is located, construction of the OHTL Corridor would be restricted within 1 km of that habitat to outside of breeding season (i.e., not between July to September). Darwin Cycad (*Cycas armstrongii*) Where clearing of Darwin Cycad cannot be avoided, impacted species would be salvaged and translocated for re-planting into the re-instated area where possible.	established and sites are stable.	

5.8 Residual Impact

Each impact to terrestrial ecosystems was assigned a residual impact rating taking into consideration the scale, magnitude and duration of the impacts, the presence/absence of environmental values and/or sensitive receptors and the level of certainty with respect to the intensity of the impact and the effectiveness of the mitigation measures. All residual impacts have a rating of 'minor,' and 'moderate' showing no change to the residual impact conclusions reached in the Draft EIS.

As noted in Section 5.6, the assessment of threatened species follows a different process to that for other ecological values. Significant impacts to threatened species were assessed using the methods prescribed in the EPBC Significant Impact Guidelines 1.1 produced by the Cwth Government (DEWHA, 2013).

The significant impact assessment on Critically Endangered, Endangered and Vulnerable migratory shorebird species (Section 5.6.3.14) concludes that based on available literature and a distinct lack of collision mortality research associated with Solar Energy Facilities in Australia, especially for projects of this scale, there remains a large degree of uncertainty regarding the prevalence and frequency of avian impacts due to potential LEH impacts at the Solar Precinct. To mitigate impacts, the Proponent will undertake monitoring of bird utilisation and fatalities within the Solar Precinct as part of a as part of a Flora and Fauna Management Plan which will detail a protocol for routine, structured monitoring across the Solar Precinct, maintenance, mitigation measures, and identify adaptive management actions to respond to any emerging issues.

No significant impacts were identified for any other threatened species assessed (refer to Sections 5.6.3 and 5.6.3.15).

Table 5-61: Summary of EIA results - Terrestrial ecosystems factor - Construction

Impact	Location	Likelihood	Scale	Duration	Magnitude	Value rating	Certainty	Residual Impact
Loss of vegetation and habitat due to land clearing.	AI.	**Likely** Loss will occur.	**Localised** Footprint comprised of several components. Total clearing footprint is approximately 134 ha	**Permanent** Some AI will remain permanently. Remediation back to pastoral land use is proposed at end of life.	**Minor** Threatened species and habitat present within footprint, however no localised core habitat for threatened species. Minor occurrence of riparian vegetation.	**High** Threatened species habitat present within footprint. Large hollow bearing trees present along at Access Road Water crossings Is considered locally important.	**High** Ecological surveys undertaken.	**Moderate**
	Powell Creek Electrode.	**Likely** Loss will occur.	**Limited** 2 ha Electrode and 10 ha HVDC Electrode Line Corridor (30 m wide corridor with estimated 10 m wide disturbance footprint)	**Permanent** Electrode will remain for an extended period. Land cleared during construction of HVDC Electrode Line will be reinstated with native vegetation, excepting for a 6 m wide access track.	**Minor** Narrow zone of disturbance. Electrode Infrastructure placement as per Constraints Planning and Field Development Procedure.	**Low** Habitats are common. No significant vegetation.	**High** Ecological surveys undertaken.	**Minor**

Impact	Location	Likelihood	Scale	Duration	Magnitude	Value rating	Certainty	Residual Impact
	DCS Electrode.	**Likely** Loss will occur.	**Limited** 2 ha Electrode and 10 ha HVDC Electrode Line Corridor (30 m wide corridor with estimated 10 m wide disturbance footprint)	**Permanent** Electrode will remain for an extended period. Land cleared during construction of HVDC Electrode Line will be reinstated with native vegetation, excepting for a 6 m wide access track.	**Minor** Narrow zone of disturbance. Electrode Infrastructure placement as per Constraints Planning and Field Development Procedure to avoid riparian and rainforest vegetation.	**High** Sensitive values present in the footprint are riparian vegetation and rainforest. Threatened species and threatened habitat present within footprint.	**High** Ecological surveys undertaken.	**Minor**
	OHTL preferred Route at Katherine.	**Likely** Loss will occur.	**Limited** Narrow 60 m wide linear corridor	**Medium Term** Land cleared during construction will be reinstated with native vegetation, excepting for a 6m wide access track (as per OHTL Corridor Vegetation Management Framework Appendix 5.4).	**Minor** Narrow zone of disturbance. OHTL Infrastructure placement as per Constraints Planning and Field Development Procedure to avoid sensitive values.	**Medium** Sensitive values present in the footprint are riparian vegetation, large hollow bearing trees and dry rainforest.	**High** Desktop Ecological assessment undertaken Location and extent of riparian and dry rainforest known. Commitment made to minimise clearing.	**Minor**

Impact	Location	Likelihood	Scale	Duration	Magnitude	Value rating	Certainty	Residual Impact
	OHTL preferred Route at Adelaide River.	**Likely** Loss will occur.	**Limited** Narrow 60 m wide linear corridor	**Medium Term** Land cleared during construction will be reinstated with native vegetation, excepting for a 6m wide access track (as per OHTL Corridor Vegetation Management Framework Appendix 5.4).	**Minor** Narrow zone of disturbance. Pole placement will be used to avoid clearing sensitive vegetation as per Constraints Planning and Field Development Procedure (Appendix 4.1).	**High** Sensitive values present in the footprint are riparian vegetation, floodplains, large hollow bearing trees, and rainforest, threatened species vegetation. Threatened species habitat with high and medium likelihoods are present within footprint.	**High** Desktop Ecological assessment undertaken Location and extent of riparian vegetation, rainforest and floodplains, threatened species vegetation known. Commitment made to minimise clearing.	**Moderate**
Loss or deterioration of significant vegetation by land clearing.	AI.	**Possible** Access routes cross areas of sparse riparian vegetation.	**Limited** Access road corridors are approximately 10m wide	**Permanent** Riparian vegetation in footprint will be removed.	**Minor** Loss of vegetation in corridor will not affect ecosystem more broadly.	**Medium** Riparian vegetation along access roads is locally important.	**High** Ecological surveys undertaken.	**Minor**
	Powell Creek Electrode.	**Unlikely** No significant vegetation identified	Not assessed as no significant vegetation in footprint.				**High** Ecological surveys undertaken.	**Minor**

Impact	Location	Likelihood	Scale	Duration	Magnitude	Value rating	Certainty	Residual Impact
	DCS Electrode.	**Possible** Significant vegetation within footprint.	**Limited** 2 ha Electrode and 10 ha HVDC Electrode Line Corridor (30 m wide corridor with estimated 10 m wide disturbance footprint)	**Permanent** Electrode will remain for an extended period. Land cleared during construction of HVDC Electrode Line will be reinstated with native vegetation, excepting for a 6 m wide access track.	**Minor** Narrow zone of disturbance. Electrode Infrastructure placement as per Constraints Planning and Field Development Procedure to avoid riparian, rainforest vegetation and threatened flora species.	**Medium** Sensitive values present in the footprint are riparian vegetation, rainforest and threatened flora species.	**High** Ecological surveys undertaken.	**Minor**
	OHTL preferred Route at Katherine.	**Possible** OHTL Corridor traverses watercourses where riparian vegetation is present and areas of rainforest.	**Limited** Narrow 60 m wide linear corridor Commitment made to minimise clearing at major watercourses. Impact limited to minor watercourses.	**Long Term** Any cleared vegetation outside of the access corridor will grow back over time.	**Minor** Narrow zone of disturbance. OHTL Infrastructure placement as per Constraints Planning and Field Development Procedure to avoid sensitive values.	**Medium** Sensitive values present in the footprint are riparian vegetation, large hollow bearing trees and dry rainforest.	**High** Desktop Ecological assessment undertaken. Location and extent of riparian and dry rainforest known. Commitment made to minimise clearing.	**Minor**

Impact	Location	Likelihood	Scale	Duration	Magnitude	Value rating	Certainty	Residual Impact
	OHTL preferred Route at Adelaide River.	**Possible** OHTL Corridor traverses watercourses where riparian vegetation is present, floodplains and areas of rainforest.	**Limited** Narrow 60 m wide linear corridor Commitment made to minimise clearing at major watercourses. Impact limited to minor watercourses.	**Long Term** Any cleared vegetation outside of the access corridor will grow back over time.	**Minor** Narrow zone of disturbance. Structure placement will be used to avoid clearing sensitive vegetation as per Constraints Planning and Field Development Procedure (Appendix 4.1).	**Medium** Sensitive values present in the footprint are riparian vegetation, floodplains, large hollow bearing trees, and rainforest, threatened species vegetation.	**High** Desktop Ecological assessment undertaken. Location and extent of riparian vegetation, rainforest and floodplains, threatened species vegetation known. Commitment made to minimise clearing.	**Minor**
Degradation of flora and vegetation in surrounding areas by dust deposition.	All sites.	**Draft EIS Assessment considered sufficient for Project Refinements.**					**High** Mitigation measures are routine and proven effective.	**Minor**
Introduction and spread of weeds.	All sites.	**Draft EIS Assessment considered sufficient for Project Refinements.**					**High** Potential impacts are well understood from other projects and Weed MP will reduce risk to ALARP.	**Moderate**

Impact	Location	Likelihood	Scale	Duration	Magnitude	Value rating	Certainty	Residual Impact
Changes in fire regimes.	All sites.	**Draft EIS Assessment considered sufficient for Project Refinements.**					**High** Bushfire risks well understood, and bushfire response will reduce risk to ALARP.	**Minor**
Direct fauna mortality by collision with construction vehicles.	All sites.	**Draft EIS Assessment considered sufficient for Project Refinements.**					**High** Potential impacts are well understood from other projects. Mitigation measures are routine and will reduce risk to ALARP.	**Minor**
Habitat degradation and fragmentation.	AI.	**Unlikely**	**Limited** Access road corridors are approximately 10m wide.	**Permanent** Potential unavoidable riparian vegetation removal.	**Minor** Loss of vegetation in corridor will not affect ecosystem more broadly.	**Medium** Riparian vegetation along access roads is locally important.	**High** Ecological surveys undertaken.	**Minor**
	Powell Creek Powell Creek Electrode.	**Unlikely**	Not assessed. Open sparse vegetation types that are regionally common means fragmentation impacts are unlikely.				**High** Ecological surveys undertaken.	**Minor**

Impact	Location	Likelihood	Scale	Duration	Magnitude	Value rating	Certainty	Residual Impact
	DCS Electrode.	**Unlikely** DCS Electrode will follow existing access tracks	**Limited** Fauna in proximity to the corridor may be affected but no wider impact to viability of fauna populations. Localised edge effects that may reduce the quality of a small area of adjacent habitat.	**Long Term** Vegetation cleared for construction will gradually regrow, but localised edge effects will persist for an extended period.	**Minor** Narrow zone of disturbance. Localised edge effect that may reduce the quality of a small area of adjacent habitat.	**Medium** Sensitive values present in the footprint are riparian vegetation, rainforest and threatened flora species.	**High** Ecological surveys undertaken	**Minor**
	OHTL preferred Route at Katherine.	**Possible** OHTL preferred route at Katherine will traverse intact habitats.	**Limited** Fauna in proximity to the corridor may be affected but no wider impact to viability of fauna populations.	**Long Term** Vegetation cleared for construction will gradually regrow, but fragmentation will persist for an extended period.	**Moderate** Narrow unfenced corridor will not limit movement for most species.	**Medium** Sensitive values present in the footprint are riparian vegetation, large hollow bearing trees and dry rainforest.	**High** Desktop Ecological assessment undertaken. Location and extent of riparian and dry rainforest known. Commitment made to minimise clearing.	**Minor**

Impact	Location	Likelihood	Scale	Duration	Magnitude	Value rating	Certainty	Residual Impact
	OHTL preferred Route at Adelaide River.	**Possible** OHTL preferred route at Adelaide River will traverse intact habitats.	**Limited** Fauna in proximity to the corridor may be affected but no wider impact to viability of fauna populations.	**Long Term** Vegetation cleared for construction will gradually regrow, but fragmentation will persist for an extended period.	**Moderate** Narrow unfenced corridor will not limit movement for most species.	**Medium** Sensitive values present in the footprint are riparian vegetation, floodplains, large hollow bearing trees, and rainforest, threatened species vegetation.	**High** Desktop Ecological assessment undertaken. Location and extent of riparian vegetation, rainforest and floodplains, threatened species vegetation known. Commitment made to minimise clearing.	**Minor**
Changes to fauna behaviour due to noise, light, and waste management.	All sites.	**Draft EIS Assessment considered sufficient for Project Refinements.**						**Minor**

Table 5-62: Summary of EIA results - Terrestrial ecosystems factor - Operations

Impact	Location	Likelihood	Scale	Duration	Magnitude	Value rating	Certainty	Residual Impact
Introduction and spread of weeds.	All sites.	**Draft EIS Assessment considered sufficient for Project Refinements.**						**Moderate**
Direct fauna mortality caused by the perceived 'lake effect' of solar fields.	Solar Precinct.	**Possible** Some recent studies suggest that birds may collide with solar panels for as per the LEH.	**Limited** The impact of bird deaths will be limited to isolated locations within the Solar Precinct.	**Medium Term** Impact could occur intermittently over the life of the Solar Precinct.	**Moderate** Intermittent bird deaths would not be expected to affect biodiversity or ecological function/integrity. Monitoring and adaptive management and mitigation will be implemented to respond to any emerging issues.	**Medium** Species most likely to be affected are those most abundant, but less common species could also be affected.	**Low** There has been limited study of this impact around the world and no assessment relevant to the proposed location. Monitoring and adaptive management and mitigation will be implemented to respond to any emerging issues.	**Minor**

Impact	Location	Likelihood	Scale	Duration	Magnitude	Value rating	Certainty	Residual Impact
Direct fauna mortality caused by collision with OHTL.	All Sites	**Possible** The large diameter of the powerlines makes then conspicuous and avoidable but strikes by birds are possible.	**Limited** The impact of bird deaths will be limited to isolated locations within the proposal footprint.	**Medium Term** Impact could occur intermittently over the life of the Solar Precinct.	**Negligible** The number of birds deaths will be low and will not affect biodiversity or ecological function/integrity.	**Low** Species most likely to be affected are larger birds. There are no threatened large bird species that are likely to be affected.	**High** Potential impacts are well understood from other projects. Proven mitigation measures (visibility markers) are available to implement if issues arise.	**Minor**
Degradation of flora and vegetation due to Electrode Operation.	Powell Creek Electrode. DCS Electrode.	Unlikely	Not assessed. Soil drying impact associated with Electrode operation is unlikely to occur at a magnitude large enough to impact vegetation.				**High** Operation and risk of Electrode operation is widely understood.	**Minor**
Changes to fauna behaviour due to noise and light.	All sites.	**Draft EIS Assessment considered sufficient for Project Refinements.**						**Minor**

5.9 Cumulative impacts

Due to the low level of residual impact to terrestrial ecosystems associated with the Project refinements combined with no change in assessment conclusion ratings for the Draft EIS, there is limited potential for new cumulative impacts not previously considered to occur. Potential cumulative impacts associated with the Project's refinements for the other major projects identified in the Draft EIS (agriculture, mining, gas developments, railway corridor, construction of utilities in the Utility Corridor, future development of residential areas) are consistent with that described in the Draft EIS.

5.10 Offsets

Comprehensive significant impact assessments are presented in Sections 5.6.3 and 5.6.3.15 for more than 40 threatened species. The conclusion is that development of the Project will not have a significant impact on any threatened species. Moreover, impacts to sensitive or significant vegetation will be avoided except when it is not possible to do so at a few river crossings (as discussed in Section 5.5.3.2). The residual impact to threatened species and significant vegetation will be minimal, and consequently these values do not require offsets.

5.11 Conclusion

A review of the project refinements identified in Chapter 2 – Project Refinement and submissions received during the public submission period (Section 5.12) has not identified any new significant impacts. All residual impacts have a rating of 'minor' or 'moderate' and thus the Project can achieve the objective of protecting terrestrial habitats to maintain environmental values including biodiversity, ecological integrity, and ecological functioning.

5.12 Submission Responses

During the Draft EIS Public Submissions period, the following government comments were received regarding potential terrestrial ecosystem impacts:

DCCEEW

DEPWS

CCGC.

The ECNT and NT Field and Game also provided comments, as did several community submitters, including anonymous submitters.

These comments relate to the key themes of:

Assessment of impacts to threatened species

Avoidance, mitigation, and monitoring measures

Fauna mortality from collisions with the OHTL.

The Proponent's to the submissions received are provided in Sections 5.12.1 to 5.12.8.

5.12.1 DCCEEW Submission

5.12.1.1 OHTL Railway and Utilities Corridor Surveys

The Department acknowledges that surveys of threatened species within the OHT Railway and Utilities Corridor are incomplete. Therefore, further surveys and analysis are required to draw final conclusions about the project's significant impacts on EPBC Act protected species. The proponent has committed to conducting targeted field surveys of restricted-range threatened species to confirm their presence, location, and significance within the OHT Railway and Utilities Corridor and to provide the results in the Supplementary EIS. The Department strongly recommends including the following EPBC Act protected species and their respective suitable habitats in the targeted field surveys:

Red Goshawk (Erythrotriorchis radiatus)

Gouldian Finch (Chloebia gouldiae)

Greater Bilby (Macrotis lagotis)

Grey Falcon (Falco hypoleucos)

Howard River Toadlet (Uperoleia daviesae)

Northern Brushtail Possum (Trichosurus vulpecula arnhemensis)

Black-footed Tree-rat (Mesembriomys gouldii gouldii)

Northern Quoll (Dasyurus hallucatus)

Bare-rumped Sheath-tailed bat (Saccolaimus nudicluniatus nudicluniatus)

Nabarlek (Petrogale concinna canescens)

Fawn Antechinus (Antechinus bellus)

Plains Death Adder (Acanthophis hawkei)

Partridge Pigeon (eastern subspecies) (Geophaps smithii smithii)

Threatened flora species such as Stylidium ensatum

Helicteres macrothrix.

The Department advises using the EPBC Act Significant Impact Guidelines 1.1 (significant impact guidelines) to assess the significance of project's impacts on the above-listed species and their habitats, including areas adjacent to the project site. If applicable, please provide avoidance and mitigation measures and if necessary, provide proposed offsets to compensate for residual significant impacts.

5.12.1.2 Response

Significant impact assessments have been completed for all of these species, as cross-referenced below:

Red Goshawk *(Erythrotriorchis radiatus)* – Section 5.6.3.33

Gouldian Finch (*Chloebia gouldiae*) – Section 5.6.3.6

Greater Bilby (*Macrotis lagotis*) – Section 5.6.3.23

Grey Falcon (*Falco hypoleucos*) – Section 5.6.3.24

Howard River Toadlet (*Uperoleia daviesae*) – Section 5.6.3.25

Northern Brushtail Possum (*Trichosurus vulpecula arnhemensis*) – Section 5.6.3.28

Black-footed Tree-rat (*Mesembriomys gouldii gouldii*) (Kimberley and mainland NT) – Section 5.6.3.3

Northern Quoll (*Dasyurus hallucatus)* – Section 5.6.3.11

Bare-rumped Sheathtail Bat (*Saccolaimus nudicluniatus nudicluniatus*) – Section 5.6.3.18

Nabarlek (*Petrogale concinna canescens*) (Top End) – Section 5.6.3.8

Fawn Antechinus (*Antechinus bellus)* – Section 5.6.3.5

Plains Death Adder (*Acanthophis hawkei)* – Section 5.6.3.31

Partridge Pigeon (eastern) (*Geophaps smithii smithii*) – Section 5.6.3.30

Stylidium ensatum – Section 5.6.3.12

Helicteres macrothrix – Section 5.6.3.7.

5.12.1.3 Vegetation Mapping Scale

The Department notes that an inconsistent and very coarse scale has been used for vegetation mapping across the terrestrial components of the project (OHT Railway, Utilities Corridor, DCS and Cable Transition Facilities) except for the Solar Precinct footprint. Vegetation mapping have been described using outdated references (Lynch et al. 2012; Christian and Stewart 1968) and have not been ground-truthed. The Department is of the view that land systems mapping is insufficient to adequately identify threatened ecological communities and threatened species habitat. The Department highly recommends undertaking field vegetation surveys, particularly, along the OHT Railway and Utilities Corridor to confirm the presence, location and significance of the Threatened Ecological Community (TEC) Arnhem Plateau Sandstone Shrubland Complex, threatened flora species and critical or suitable habitat of threatened fauna species.

5.12.1.4 Response

Vegetation and land types within the Solar Precinct, AIZ, OHTL Utilities Corridor, DCS, CTF, and northern electrode site (and OHTL Corridor) have all been ground-truthed. All potential habitat for threatened species within those footprints has been assessed and, where considered suitable, surveyed for the relevant species.

For the OHTL Railway Corridor, the use of course-scaled vegetation mapping is commensurate with the low level of risk that clearing small areas adjacent to an existing railway line poses to the threatened species likely to be present. As explained in the EIS, the physical disturbance footprint of the OHTL is – by design – narrow and localised, and there is some flexibility in the location of the structures. Therefore, threatened species with general habitat requirements and/or wide ranges are inherently unlikely to be significantly impacted by the proposed development. Consequently, only species with a restricted-range or localised core habitat were considered. Further assessment of those species is presented in other sections of this document. Where necessary, other mapping datasets have been used to identify important habitat for restricted range species – e.g., modelled habitat for *Stylidium ensatum* and *Helicteres macrothrix*, vegetation mapping at 1:100,000 for Gouldian Finch, riparian vegetation at OHTL Corridor water crossings.

There is only one Threatened Ecological Community (TEC) in the NT – the Arnhem Plateau Sandstone Shrubland Complex. The likely and possible extents of this complex have been mapped, showing that the OHTL Railway Corridor intersects land classed as possibly supporting this TEC in three locations north-west and south-east of Katherine (noting that the TEC mapping includes a large buffer). This mapping was interrogated by using GIS to:

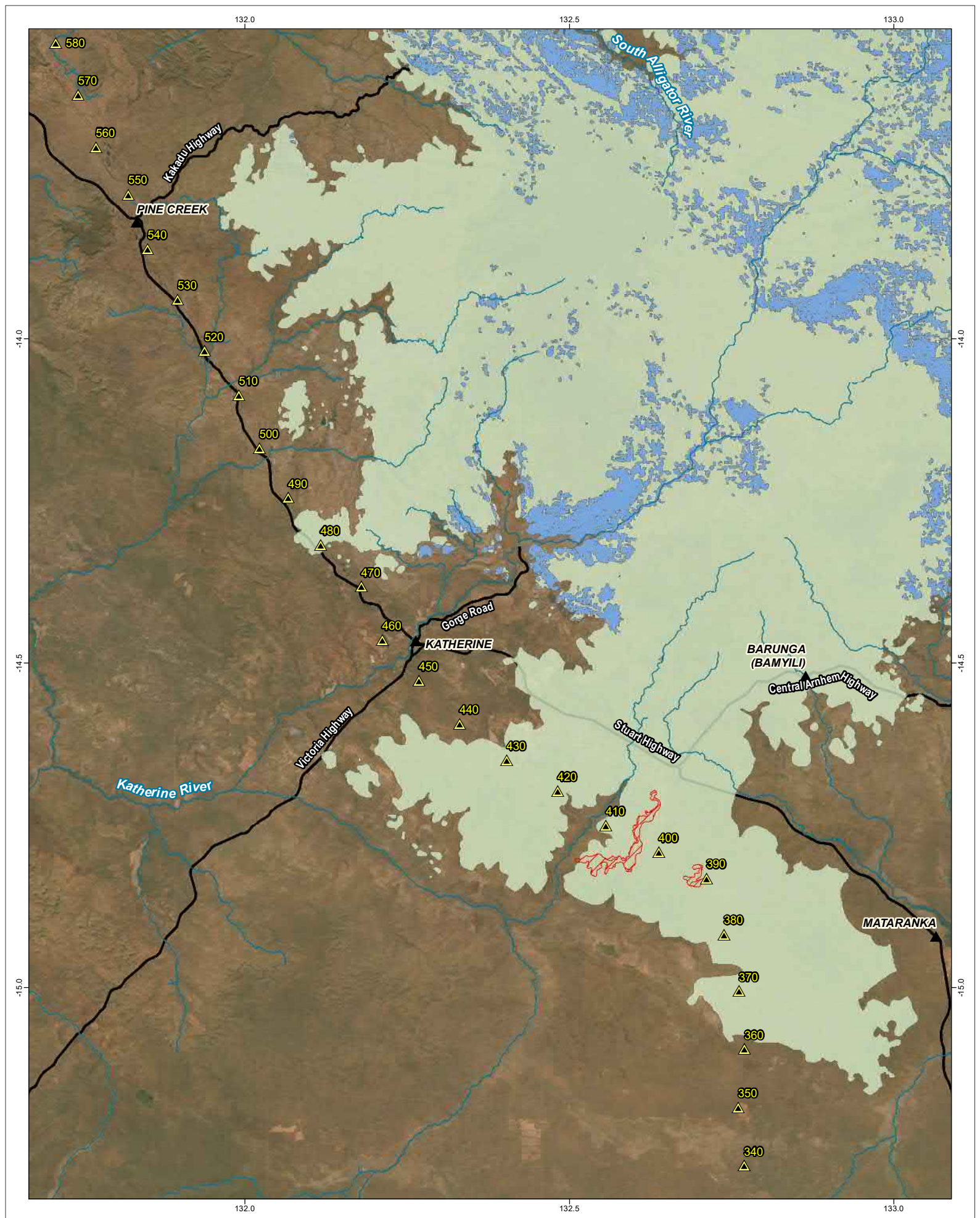
Overlay map shapes showing where the Arnhem Plateau Sandstone Shrubland Complex ‘is likely to occur’ with a geology spatial dataset – Surface Geology of Australia 1:1,000,000 (Raymond et al. 2012) and the land system spatial dataset – North 250 (DEPWS 2008). This process showed which

geology and land systems were present where the TEC is ‘likely to occur’ e.g., where the TEC is ‘likely to occur’, geology A and land system B were present.

The land system and geology spatial datasets where then interred to identify areas where both parameters (e.g., geology A and land system B) were present and occurred within the TEC ‘may occur’ mapping i.e., within the TEC ‘may occur’, areas where geology A and land system B are present.

Areas identified in b) – same geology and land system as where the TEC is ‘likely to occur’ within the ‘may occur’ areas – were then overlayed with the OHTL Corridor footprint i.e., where geology A and land system B occur within the ‘may occur’ habitat and intersect the OHTL footprint.

The result is Figure 5-43 which shows where the OHTL intersects areas that have both the same land system and geology as the TEC and are within the modelled extent of TEC ‘may’ occur. There are two areas south of Katherine – between KP 392 and 393, and KP 402 and 405.



- Towns
- KP
- Road
- Railway
- Major Drainage
- AAPowerLink infrastructure
- Modelled area

Arnhem Plateau Sandstone Complex

- Species or species habitat likely to occur
- Species or species habitat may occur

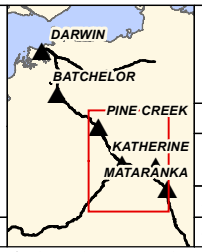


Figure 5-43. Map of potential areas of Arnhem Plateau Sandstone Shrubland Complex within the OHTL

Project: Australia-Asia PowerLink

0 10 20 Kilometres

Reference: M-Files ID 217502

Date: 18/11/2022 | Revision: 1

Scale: 1:800,000

Coordinate System: GDA2020 | A4

N

SUN CABLE AUSTRALIA-ASIA PowerLink

Source: Sun Cable, EcOz, NTG (NR Maps)

5.12.1.5 Gouldian Finch

The Department considers that the estimated loss or clearing of 9.86 ha and 12.45 ha of known core foraging and breeding habitat of Gouldian Finch, respectively, is likely to result in a significant impact on the species due to a real chance to reduce its AOO, disrupt a population's breeding cycle, and adversely affect habitat critical to its survival. The Department highly recommends conducting field vegetation and targeted surveys to confirm the actual quantity of ha of core foraging and breeding habitat of Gouldian Finch that will be directly impacted by the project. Additionally, the Department requests providing adequate avoidance and mitigation measures for the species, such as considering the timing of works to avoid the Gouldian Finch's breeding season, etc., and if necessary, provide proposed offsets to compensate for residual significant impacts.

5.12.1.6 Response

This comment has been considered in the significant impact assessment presented in Section 5.6.3.6.

5.12.1.7 Grey Falcon

The draft EIS states that there "is no current evidence of nest occurrence" of Grey Falcon within, or close to the Solar Precinct access roads, however, this evidence has not been ground-truthed. The Department requests including management measures for this vulnerable species such as the involvement of a specialist for preclearing searches to identify potential suitable nesting trees and avoid them during the unsealed road construction.

5.12.1.8 Response

This comment has been considered in the significant impact assessment presented in Section 5.6.3.24.

5.12.1.9 Greater Bilby

The Greater Bilby occurs in a wide range of habitat in the NT. The National recovery plan for the Greater Bilby considers the Tanami bioregion (west of the Stuart Highway) as potential critical habitat of the species and the NT Fauna Atlas indicates that this species can be present in Ashburton land systems, which are present in the unsurveyed Solar Precinct unsealed road located just west of the Stuart Highway. Therefore, to verify the presence/absence of this species, the Department highly recommends conducting a targeted ground survey for the Greater Bilby in the unsealed road area.

5.12.1.10 Response

This comment has been considered in the significant impact assessment presented in Section 5.6.3.23.

5.12.1.11 Migratory Shorebirds

The Department considers that the temporary disturbance of approximately 25 ha of important intertidal habitat for migratory shorebirds to construct the Cable Transition Facility at Gunn Point Beach is likely to have significant impacts on migratory shorebirds. This reasoning is based on the size of important habitat that will be disturbed and the lack of information on successful reinstatement of intertidal habitats after installing underground electric cables. Therefore, please provide scientific information and/or examples of successful intertidal habitat recovery, recovery timing and analysis of the permanent thermal radiation and electromagnetic fields' effects on the recovery of intertidal habitats. Please provide further avoidance and mitigation measures for migratory shorebirds' important habitat (e.g., construction should occur during the off-season for migratory shorebirds, etc.). If, after providing avoidance and mitigation measures for migratory shorebirds, there are still

residual significant impacts on their habitat, please provide a proposed offset strategy for migratory shorebirds.

5.12.1.12 Response

Gunn Point Beach forms part of the North Darwin SBA, and is one of 15 important shorebird sites in the NT. Shorebird surveys under BirdLife Australia's Shorebird Monitoring Program (formerly Shorebirds 2020) are conducted within designated 'SBAs' (SBAs) that have been recognised and mapped by BirdLife Australia from field experience extending back several decades. An SBA is intended to correspond with the non-breeding home range of a group of migratory shorebirds. SBAs vary in size, and within large SBAs, smaller 'Count Areas' have been defined and mapped to guide surveys. Count Areas generally correspond with known roosting and feeding areas within an SBA and can feasibly be counted in four hours or less by one or more observers. Tree Point, at the southern extent of Gunn Point Beach, forms one of these Count Areas within the North Darwin SBA. Due to its location, however, it is not surveyed with the same regularity as those Count Areas closer to Darwin. Data held within BirdLife Australia's Birdata database identifies North Darwin SBA as being of international significance and 'Important Habitat' for a suite of migratory shorebird species. Gunn Point Beach in isolation has supported internationally significant numbers of Great Knot (5 500 individuals), and nationally significant numbers of Bar-tailed Godwit (900), Black-tailed Godwit (700 individuals), Greater Sand Plover (700 individuals), Grey Plover (121 individuals), Lesser Sand Plover (925 individuals), Red knot (700 individuals), Ruddy Turnstone (160 individuals), Sharp-tailed Sandpiper (258 individuals), Terek Sandpiper (120 individuals) and Whimbrel (200 individuals). In addition to these species, Curlew Sandpiper have also been recorded along Gunn Point Beach, but not in numbers exceeding their national significance or 'Important Habitat' threshold.

On their southward migration, migratory shorebird species that migrate from the northern hemisphere reach 'staging areas' — such as the NT coastline — by mid-August. From these staging areas, some of the birds disperse further south across Australia, reaching the south-eastern states by September or October and spreading along the coastline. Smaller flocks — cumulatively numbering thousands of birds — sometimes take advantage of ephemeral wetlands across inland Australia. Through late February and into March, many species of migratory shorebirds that have previously dispersed around and across the country begin to gather again at staging areas, forming large flocks, and feeding around the clock to accumulate the energy reserves that will be required for their northward migration in March-May. At the majority of SBAs around Australia, while migratory shorebird numbers are highest during the summer months, a proportion of the summer population remains throughout the year. After their first southward migration, juvenile birds of most species often remain in Australia until they reach approximately two years old before embarking on their first northward migration (Clemens et al., 2016). Based on this, peaks in migratory shorebird abundance along Gunn Point Beach, and the broader North Darwin SBA are likely to occur during northward (late February through early April) and southward (September through October) migration each year, with maximum abundances for most species expected during the latter.

While Gunn Point beach is identified as Important Habitat for a range of migratory shorebird species, it is the southern extent of the beach which is of the most importance as a critical high tide roosting location – most of the high counts of the species noted above have come from this location. A range of migratory shorebird species can be reasonably expected to utilise intertidal foraging habitat along the extent of Gunn Point Beach, where they will be seeking various types of macroinvertebrate species within the sediment. Numbers of these shorebird species are likely to be dispersed along the intertidal parts of the complete beach extent at low tide such that any individual species would be unlikely to occur within or in proximity to the shoreline crossing location in numbers exceeding its respective significance threshold.

Potential impacts to migratory shorebirds at the shoreline crossing location includes a range of direct and indirect impact sources during construction and operational project phases. Most notably, these include:

Direct disturbance and potential modification to foraging habitat during construction activities

Disturbance to individuals causing an aversion to available foraging habitat at the shoreline crossing location

Potential changes to foraging resources as a result of EMF and Thermal Radiation during operation.

Gunn Point Beach is accessible by vehicle and is subject to various types of chronic anthropogenic disturbance. The proposed shoreline crossing location is situated approximately 6 km from the southern extent of Gunn Point Beach, and as such, any construction phase related disturbance impacts are unlikely to affect migratory shorebird behaviour at this location. The location of the shoreline crossing is also situated between two existing primary beach access points and approximately 2 km south of Gunn Point Beach campground, and as such is subject to heightened levels of disturbance than other parts of the beach.

The Cable Transition Facilities include the Underground Cable Corridor, the Land Sea Joint Station, and the Shore Crossing Site. Specific to the Gunn Point Beach shoreline, Subsea Cabling Systems will be installed through Gunn Point Beach and into Shoal Bay. This will include the excavation of two trenches, one for each cable system, and consist of an approximate construction corridor footprint width of 63 m. The preferred configuration for each of the two cable systems is a Bipole with Metallic Return, which involves three cables laid parallel: Positive pole (Pole 1), Negative pole (Pole 2) and a Metallic return. Lateral spacing between the cables in each trench will be approximately 4 m, within an approximate trench width of 13.5 m. Based on this specification, and a beach width of up to 300 m (relative to tidal state), the total construction footprint is approximately 1.9 ha, within the identified shoreline crossing location of 25 ha as shown on Figure 2-3. While there may be some disturbance related impacts from construction activities at the shoreline crossing location, i.e., aversion to the use of intertidal foraging area, no direct impacts to migratory shorebird species or their habitats are likely to occur outside of the 1.9 ha construction footprint.

Alternate methods to lay the cables within the Land Sea Joint Station have been investigated by the engineering team to minimise nearshore impacts, as described in Section 2.7.3 (Chapter 2) of the Draft EIS. There is a focus on reducing trench opening time and the associated potential for erosion and sediment transport impacts. Each trench will be approximately 2 m deep and is only expected to be exposed for approximately one week, subject to discovery and treatment of any PASS. Methodology for cable installation will be dependent on construction planning and availability of required resources which will be confirmed during detailed design. The duration of cable installation activities at the shore crossing location will be approximately 10-12 weeks for three HVAC cables and fibre optic, during optimal construction conditions (favourable tides and weather, absence of PASS etc.) If poles are not installed consecutively during one disturbance period, construction timeframes would reduce. For example, if only one pole plus fibre optic were installed initially construction timeframes may reduce to approximately four to six weeks. A second construction effort would be re-scheduled of an equivalent timeframe when pole 2 is installed. Construction timeframes may subsequently increase beyond the 10-12 weeks depending on extent of any PASS encountered. Cable depth at the Land Sea Joint Station will be between 1.5 – 2 m consistent with the Underground Cable Corridor and Shore crossing depths. There is no intent or requirement to fence any infrastructure from the boundary of the DCS to the low water mark in Shoal Bay, including the Land Sea Joint Station once construction is complete.

It is envisaged that all construction works within the shoreline crossing location can be scheduled and completed during the Austral winter season (end of May through to end of August), when the vast majority of migratory shorebirds are transiting to or from, or in their northern hemisphere breeding sites. This will minimise potential disturbance-related impacts arising from construction activities in the vicinity of the shoreline crossing location, noting that a small percentage (up to 30%) of the summer population of some migratory shorebird species remain in Australia and do not migrate.

Spoil from trench excavation will be stockpiled along the length of each trench alignment and be reinstated on top of each cable system once installed. No fill from external sources will be used to reinstate excavated trenches in order to expedite the recovery of extant benthic and intertidal macroinvertebrates. Following the installation of the cable systems and reinstatement of excavated trench spoil, natural restoration of existing conditions is expected to occur relatively quickly, especially in those areas subject to routine tidal inundation. There are multiple examples of successful habitat restoration for migratory shorebirds using primarily tidal influence, with minimal other interference or remediative action from both Australia and internationally. While it is anticipated that there will be an intertidal and beach infauna ecosystem recovery timeframe associated with excavation and reinstatement of the shoreline crossing cable system installation, areas subject to these actions are expected to be restored to pre-construction conditions largely via natural processes.

Once the construction phase is completed and all infrastructure is operational, the installed cable systems will transfer electricity from the solar precinct to both Darwin and ultimately, Singapore. When electric energy is transferred along cabling, a certain amount is lost to the surrounding environment as heat. For buried cables, this thermal radiation can lead to warming of the surrounding sediment, the severity of which varies with other parameters such as cable burial depth, cable tension, substrate type, sediment characteristics and current type (at equal transmission rates, AC cables produce more heat than DC cables). EMF are also generated by electrical current passing through cabling and consist of both an electric field and magnetic field. Electric fields increase in strength in association with increases in voltage but are generally encapsulated within insulated cabling.

EMF characteristics vary relative to the cable type, current, and installation. When buried, EMFs created by operational electrical cabling are not entirely eliminated, but the sediment layer reduces exposure to the strongest EMF in the immediate vicinity of the cable to the surrounding environment. Strength of both electric and magnetic fields increases with current and decreases significantly relative to the distance from the cable. Electric currents with intensities of 1600 Amp or more are common in submarine cables. In response, magnetic fields of approximately 3200 µT are generated, decreasing to 320 µT at 1 m distance from the cable, 110 µT at 4 m from the cable and from around 6 m, having a resultative magnetic field which resembles that of the terrestrial magnetic field (50 µT) (Bochert and Zettler, 2006).

T. Tricas and A. Gill (2011) undertook a literature review synthesizing information from offshore renewable energy facilities on the types of power cables and models the expected EMFs from representative cables. This included review of modelled magnetic fields for nine HVDC subsea cable systems associated with and found that magnetic fields from these systems decreased rapidly away from the cables, and most were equal to the Earth's geomagnetic field from 6 m away from the cables. It is noted that the measurement and modelling of EMF associated with subsea cable systems is complicated as these are influenced by a number of factors, including ambient magnetic fields (e.g., the Earth's magnetic field), current flow, burial depths, cable orientations and distance between cables. However, a common observation that is supported by more recent studies (such as Taormina et al. 2018) is that magnetic and induced electric fields rapidly decline with distance from the cable.

T. Tricas and A. Gill (2011) identifies strategies to reduce magnetic fields, including cable design, cable voltage, burial depth, cable armouring (e.g., concrete mattress or rocks) or additional cable sheathing. Cable designs suitable such as bipolar HVDC transmission systems (as is proposed for the Subsea Cable System) are identified more suitable to reducing magnetic fields (Taormina et al. 2018; T. Merck and R. Wasserthal, 2009). Additional cable sheathing rates has the lowest relative effectiveness in reducing magnetic fields compared the influence of burial depths and cable armouring (T. Tricas and A Gill, 2011). Whilst the review focused on subsea cable systems, the findings can be extrapolated to the Cable Transition Facilities.

A wide array of marine species are sensitive to EMF, including elasmobranchs (rays and sharks), fish, mammals, marine turtles, and marine invertebrates. Many of these taxa are able to detect the Earth's geomagnetic field, and subsequently rely on it for orientation, navigation and various types of migration. EMF and thermal radiation emitted from operational project infrastructure is unlikely to directly interfere with the physiology or navigation of migratory shorebird species. However, migratory shorebirds are dependent on intertidal macroinvertebrate species as a primary foraging resource, with some species' diets solely comprising specific taxa that are only found in the marine intertidal zone. While not widely researched, there are many studies which investigate the effects of EMF and thermal radiation from subsea electrical cabling on various types of marine ecosystems and taxa. Less prevalent are studies which focus on benthic macroinvertebrates, and even less still, macroinvertebrates found in the intertidal zone. As such, findings from studies that have focused on EMF and thermal radiation impacts to benthic macroinvertebrates have been applied to intertidal environment as their sub-surface habits and response to both EMF and thermal radiation are likely to be similar. EMF and thermal radiation caused by cables in the intertidal zone may affect sensitive marine species through the following mechanisms:

Interference with natural predator/prey interactions

Behavioural, i.e., avoidance/aversion or attraction

Interference with species navigation, migration, or orientation

Physiological, reproductive, and/or developmental changes.

Behavioural responses by benthic macroinvertebrates to EMFs vary considerably between species and can include attraction (i.e., some species will prefer warmer sediment temperatures, others will retreat) and avoidance, repulsion, or aversion. Albert et al. (2020), while noting that EMF and thermal radiation impacts to benthic invertebrate species (i.e., mollusc, worms, crustaceans, and echinoderms) have been poorly studied, found that half of the studies reviewed reported an attraction towards magnetic fields by individuals of three crustacean species, whereas a third of the studies found no effects across a broad range of invertebrate taxa. Given the area of Gunn Point Beach and extent of the intertidal zone, the distributions of invertebrate species present are likely to comprise the entire area. Any potential impacts to benthic and intertidal invertebrates arising from EMF and thermal radiation emissions from the cable infrastructure will be restricted to the six linear cable alignments, which in the context of the extent of the broader Gunn Point Beach are negligible. Subsequently, the indirect impacts of EMF and thermal radiation to invertebrate abundance and diversity within such an acute geospatial area, relative to the rest of Gunn Point Beach, are considered highly unlikely to result in a measurable reduction of available foraging resources for migratory shorebirds.

Sections 5.6.3 and 5.6.3.15 outline the Significant Impact Assessment for *EPBC Act* listed species, Section 5.6.3.14 outlines the Significant Impact Assessment for *EPBC Act* migratory listed species. Based on the outcomes of these significant impact assessments, and information provided above, residual impacts of construction activities and subsequent subsea cable operation are expected to be negligible and as such an offset strategy for migratory shorebirds is not considered necessary.

5.12.1.13 Ghost Bat

The Conservation Advice of the Ghost bat indicates that this species is easily disturbed when roosting and may abandon sites where unregulated human visitation occurs. Currently, one of the largest colonies is located in Kohinoor Adit at Pine Creek. The Kohinoor Adit is a permanent maternity roost for the Ghost bat and is located approximately 400m to the west of the OHT Railway. The Department recommends reviewing updated information for the species to provide mitigation measures to minimise vibration and human disturbances during construction (e.g. defining exclusion/buffer zones surrounding the Kohoonir Adit, to avoid disturbance by human visitation to the cave during construction, imposing vibration limits, etc). Additionally, please clarify if temporary or permanent barbed fences will be utilised during the construction of the OHT Railway. If barbed fences will be used in the project, please provide mitigation measures to avoid the collision of Ghost bats on the barbed fences.

5.12.1.14 Response

This comment has been considered in the significant impact assessment presented in Section 5.6.3.22.

5.12.1.15 EMF

The project's operation will generate permanent electromagnetic fields (EMF) for approximately 70 years all along the terrestrial and marine components of the transmission lines. The Department considers that the effects of EMF's on EPBC Act threatened and migratory species have not been sufficiently addressed in the draft EIS. Therefore, the Department requires further analysis and discussion about the quantity, intensity, and distance of the emissions, long-term effects of these emissions on fauna behaviour, and cumulative impacts of the subsea cables on EPBC protected species. Please justify the conclusions with relevant scientific information and, if necessary, provide mitigation measures to reduce these impacts (e.g., suitable types of cables to reduce the emission of EMF).

5.12.1.16 Response

Information on potential effects of EMF on threatened species is provided in Section 5.12.1.12.

An assessment of potential impacts of EMF on marine ecosystems and marine fauna is outlined in Chapter 9 – Marine Ecosystems.

5.12.2 DEPWS Submission

5.12.2.1 Further Assessment, Information, and Monitoring

The DEPWS has assessed the information contained in the above application and provides the following comments:

Flora and Fauna Division

The Flora and Fauna Division reviewed the draft EIS and have provided comments in the attached table found at Appendix 1. It is recommended that the NT EPA request further information, additional monitoring, and further assessment of impacts to threatened species and significant and sensitive vegetation as described in the table.

5.12.2.2 Response

The following sections have been prepared to respond to the DEPWS comments provided in the DEPWS submission. The NT EPA has provided further direction, which are discussed in Section 5.13.

5.12.2.3 Lighting Impacts at Gunn Point

Given the topography on Gunn Point peninsula is relatively flat, light pollution from Sun Cable's infrastructure may impact on migratory and threatened species. The Flora and Fauna Division recommends that infrastructure design follows National Light Pollution Guidelines.

5.12.2.4 Response

Lighting will be required during construction activities at the DCS and Cable Transition Facilities. The Cable Transition Facilities include the Underground Cable Corridor, the Land Sea Joint Station, and the Shore Crossing. All lighting required during construction will be temporary, with anticipated duration of operation in line with scheduling and construction timeframes for the aforementioned respective project components.

It is envisaged that all construction works (and associated lighting) within the shoreline crossing location can be scheduled and completed during the Austral winter season (end of May through to end of August), when the vast majority of migratory shorebirds are transiting to or from, or in their northern hemisphere breeding sites. This will minimise potential lighting-related impacts arising from construction activities in the vicinity of the shoreline crossing location, noting that a small percentage (up to 30%) of the summer population of some migratory shorebird species remain in Australia and do not migrate. Once completed, all construction related infrastructure at the shoreline crossing will be removed. Only minimal, if any, permanent lighting is envisaged to be required at the Cable Transition Facilities components.

The DCS is proposed to be situated on a 124-ha site bound by Murrumujuk Road to the north and eastern boundary, and the Project Sea Dragon hatchery site (proposed) on the western boundary. The Shoal Bay Conservation Area is over 1.5 km from the southern boundary. Lighting will be required at this facility during both construction and operation phases. Due to the distance from coastal intertidal habitats, lighting from this facility may be visible in the surrounding area. However, this is unlikely to interfere with coastal obligate migratory shorebird species, which solely rely on coastal intertidal habitats and generally employ tactile foraging methods. Lighting at the DCS may attract more generalist migratory shorebird species, such as Greater Sand Plover and Lesser Sand Plover, and other species which rely on visual foraging methods, or have the ability to switch between visual and tactile methods in response to site (and lighting) conditions. Such species are routinely encountered along developed sites around the Exmouth Gulf and other parts of northern Australia, taking advantage of permanent artificial lighting fixtures to increase nocturnal foraging efficiency. Artificial lighting may also attract nocturnal predators, and lead to an increase in both native predatory species and exotic pests. Such situations may lead to increased predation of migratory bird species.

All temporary construction and permanent operational lighting infrastructure at the DCS and Cable Transition Facilities will be designed in accordance with the Principles of Best Practice Lighting Design, as outlined in the National Light Pollution Guidelines for Wildlife Including Marine Turtles, Seabirds and Migratory Shorebirds (DoEE, 2020). While all principles of best practice lighting will be used to guide the design of all required lighting infrastructure as far as practicable, operational safety and security lighting requirements will also need to be considered. The Principles of Best Practice Lighting Design, as outlined in the National Light Pollution Guidelines for Wildlife Including Marine Turtles, Seabirds and Migratory Shorebirds (DoEE, 2020), have been incorporated into the Project's mitigation commitments (refer Table 5-60).

5.12.2.5 Additional Footprint for AI

Is there additional clearing required for construction camps, borrow pits and the concrete batching plant beyond the facilities and OHTL footprints? If so, this may require additional assessment.

5.12.2.6 Response

Project refinements since the preparation of the Draft EIS are outlined in Chapter 2 – Project Refinement. Terrestrial Ecosystems aspects, including additional clearing required for the following refinements have been assessed in Sections 5.4 to Section 5.9 within this Chapter.

Powell Creek AI zone (including indicative locations for accommodation village, borrow pits and concrete batching plant)

DCS Electrode

Powell Creek Powell Creek Electrode

OHTL Corridor including:

- OHTL preferred route at Katherine
- OHTL preferred route at Adelaide Creek.

5.12.2.7 EPBC Significant Impact Criteria and Guidelines

In general, there is a lack of justification for the assessment of impacts on threatened fauna species. References are out of context or no evidence is provided for the statements being made. Potential impacts should be assessed against the EPBC significant impact criteria.

…….

The assessment of significant impacts to migratory species is not in line with the EPBC Significant Impact Guidelines. The migratory species that are also listed as threatened are not assessed in line with their threatened status under the EPBC Significant Impact Guidelines. The Flora and Fauna Division recommend that species are assessed consistent with the EPBC Significant Impact Guidelines.

5.12.2.8 Response

The Draft EIS presented an assessment of the impacts of the Project (using the EPBC Significant Guidelines Significant Guidelines) on all the threatened species considered as being inherently vulnerable to such. The assessments were justified – using all the information available – and acknowledged any data gaps (where relevant). The Proponent committed to undertaking additional survey work for presentation in the SEIS.

A large amount of survey work has been undertaken since the Draft SEIS, as reported in Appendix 5.1 and Appendix 5.2. Using the results, Sections 5.6.3 and 5.6.3.15 of this chapter present revised significant impact assessments undertaken in accordance with the EPBC Significant Impact Guidelines for 44 threatened species identified in comments received on the Draft EIS has being of interest to DEPWS and DCCEEW. This includes threatened shorebirds.

Migratory shorebirds were assessed in Section 16.4.2.1 of the Draft EIS against *EPBC Act* Policy Statement 3.21 – Industry guidelines for Avoiding, Assessing and Mitigating Impacts on *EPBC Act* Listed Migratory Shorebird Species.

5.12.2.9 Potential Trenching Impacts

There are several components for which there is a need for trenching, yet the impacts of trenching on fauna are not assessed. The Flora and Fauna Division recommends that the impact of trenching on fauna is assessed and management of risks are clearly defined.

5.12.2.10 Response

Trenching for the laying of the fibre optic cable along the length of the OHTL Corridor is no longer being considered (refer to Section 2.4 of Chapter 2). Also refer to Section 5.12.5 for similar discussion on undergrounding of the OHTL Corridor.

Trenching for the laying of the underground cable at the Cable Transition Facilities at Murrumujuk may present as a pitfall trap to small fauna during construction. The trenches will be excavated progressively to account for tidal differences, approximately one to two weeks. Cables will take two to three days to pull in. Once cables are winched into place, the trenches will be back filled with the excavated material. At most, the trench will be 500 m long and 13.5 m wide. To mitigate the potential impact on these species the trench will be checked every morning and evening, and any fauna trapped will be relocated safely away from the trench.

5.12.2.11 TOR Matters Not Dealt With

Impacts stated in the ToR that are not covered in the draft EIS assessment include:

Direct disturbance of fauna and fauna habitat as a result of clearing

Indirect impacts to fauna habitat due to changes to WQ, introduction or spread of weed or pathogens or pest species, fragmentation and edge effects

Indirect impacts to fauna as a result of reduced habitat availability

Direct impacts to fauna as a result of collision with OHTLs

Direct impacts to fauna as a result of collision with vehicles or equipment, including solar panels

Changes to fauna behaviours as a result of noise or lighting from proposal areas, including potential glare from solar panels or the 'lake effect' (solar farm mistaken for a water body).

The Flora and Fauna Division recommends that all impacts are assessed consistent with the ToR.

5.12.2.12 Response

Appendix A of the Draft EIS was prepared to provide cross-references as to where impacts stated in the TOR are addressed. This SEIS has been prepared to assess impacts stated in the TOR the Project Refinements and present information from studies undertaken since the Draft EIS. Similarly, a cross-reference table has been prepared for this SEIS to provide cross-references as to where impacts stated in the TOR are addressed (Appendix A1.2). Table 5-63 below provides a summary of cross-references relating to the TOR identified in this submission and where it is addressed in the Draft EIS or SEIS.

Significant impact assessments for threatened species have also been undertaken in Sections 5.6.3.15 and 5.6.3.

Table 5-63: TOR cross-reference table in response to DEPWS submission

TOR	Draft EIS Section	SEIS Section
Direct disturbance of fauna and fauna habitat as a result of clearing.	5.4.2.6	5.5.3.1
Indirect impacts to fauna habitat due to changes to WQ, introduction or spread of weed or pathogens or pest species, fragmentation, and edge effects.	5.4 5.4.2.2 (WQ) 5.4.2.4 (Weeds and Pests) 5.4.2.7 (Fragmentation and edge effects)	5.5.3 5.5.3.2 (WQ) 5.5.3.4 (Weeds and Pests) 5.5.3.7 (Fragmentation and edge effects)
Indirect impacts to fauna as a result of reduced habitat availability.	5.4.2.7	5.5.3.7
Direct impacts to fauna as a result of collision with OHTLs.	5.4.3.2	5.5.4.3
Direct impacts to fauna as a result of collision with vehicles or equipment, including solar panels.	5.4.3.2	5.5.4.2 (LEH)
Changes to fauna behaviours as a result of noise or lighting from proposal areas, including potential glare from solar panels or the 'lake effect' (solar farm mistaken for a water body).	5.4.2.8 (Construction) 5.4.3.4 (Operation)	5.5.3.8 (Construction) 5.5.4.5 (Operation) 5.5.4.2 (LEH)

5.12.2.13 Solar Array Impacts to Lake Woods

Section 5.4.1.2 states that because the usual extent of Lake Woods is over 10 km away, it is not considered to be within the area of influence. The ToR states that the 'lake effect' should be assessed as a potential impact. Waterbirds undertake regional movements between waterbodies within the NT and movements to waterbodies in other states, and move through the area during trans-continental migrations. The distance to Lake Woods is small in comparison to these movements and there is a high likelihood that waterbirds would regularly fly over the solar array. Therefore, it is suggested that Lake Woods is incorporated into the Area of Influence. Section 5.4.3.2 states that very few birds regularly migrate within Australia, as patterns are more 'boom and bust'. This does not fully characterise the dynamics of birds in the region of interest. As well as having high inter-annual variability ('boom and bust'), there is a seasonal component to surface water availability, and waterbird occurrence and abundance. The different reasons for movements of waterbirds in Australia to those in North America, where cited studies were undertaken, do not justify there being a lower risk to Australian species from solar arrays. The Flora and Fauna Division recommends that Lake Woods is incorporated into the Area of Influence, particularly in the context of waterbird movement to and from the lake over the solar array.

5.12.2.14 Response

This submission has been addressed in Section 5.5.4.2.

5.12.2.15 Additional water sources

Food waste is addressed as a potential cause of an increase in pest animals. Additional water sources can also increase the activity of pest animals, both predators and herbivores, and should be addressed in the draft EIS.

5.12.2.16 Response

There are many vertebrate pest animal species extant, consistent with similar areas throughout Australia. Potential pest animal species include:

Cane Toad (*Rhinella marina*)

Feral Cat (*Felis catus*)

Feral Horse (*Equus caballus*)

One-humped Camel (*Camelus dromedarius)*

House mouse (*Mus musculus*)

Donkey (*Equus asinus*).

It is therefore assumed that the proposal footprint is already populated by the array of vertebrate pest animal species likely to occur in the bioregion. As with food waste, any human activity in undeveloped areas has the potential to cause a proliferation of existing pest species by introducing additional water sources.

Additional water sources as a result of the construction of the Project include:

Services and utilities such as water and wastewater at the Solar Precinct, AI, DCS and Temporary Mobile Construction Camps

Water used for dust suppression

Water used for construction, primarily in for concrete batching.

Additional water sources as a result of the operation of the Project include:

Services and utilities such as water and wastewater at the Solar Precinct and DCS

Water for use in operational activities.

Solar Precinct

Water supply to the Solar Precinct and the associated infrastructure is planned to be sourced from the local groundwater supply. Groundwater bores will be installed by a licenced installer in accordance with a bore permit and an extraction licence will be obtained in accordance with NT Legislation. Water will be required during construction for dust suppression, wash down, concrete batching and to service the construction camps. At this time, the concept level forecast for construction water demand is up to 1,500 ML per annum.

The forecast operational water demand at the Solar Precinct is approximately 10 ML per annum. This calculation will be refined during detailed design. Operational water requirements will generally be limited to maintenance of the solar panels (i.e., cleaning if required), road maintenance and dust suppression. Potable water will be required for personnel camp operations (drinking water, cooking, showers, and toilets), and supply to the operations and maintenance facility. Water for fire-fighting purposes will be stored in tanks at the Solar Precinct, in line with the requirements under the *Bushfires Management Act 2016* (NT).

The supply and storage of water to service the Solar Precinct would occur within enclosed systems (such as piping and storage tanks) and would not be readily accessible to fauna. Fauna may be able access this water in the event of leaks or faults in the water supply system, such as from taps or piping, however this would be mitigated by timely and ongoing maintenance of the Solar Precinct as well as good housekeeping by staff.

Water used during construction for dust suppression, wash down and concrete batching would be subject to avoidance and mitigation measures regarding spills, ESCs as outlined in Chapter 17 - Environmental Management to contain spills entering the wider environment. As such, this water would be confined to a small footprint for short, intermittent durations of time during construction. Water used during construction and operation for maintenance and dust suppression would also be used intermittently for short durations within close proximity to activities. Availability and accessibility of this water to fauna would therefore be limited.

AI and Temporary Mobile Construction Camps

AI is required to facilitate the construction and operation of the Project at Powell Creek Station. Temporary infrastructure will be required for the construction period only, permanent infrastructure will also be required for the operation of the Project.

The following AI will be temporary and located outside of the Powell Creek Solar Precinct:

Construction offices (multiple)

Temporary Construction Accommodation

Utilities area

Batch plant.

The following AI will be associated with the operational life of the Project as seen as permanent (70 years) and located outside the Powell Creek Solar Precinct:

Landfill / Waste Management Area

Water Bores and storage

Wastewater treatment plant

Fuel facility

Workshop and maintenance area

Aerodrome with terminal, storage, and helipad

Intermodal Logistics Facility, inclusive of rail sidings and hardstands.

Temporary Mobile Construction Camps will provide temporary transportable accommodation and amenities for personnel. The camps will be self-supporting in terms of water, power, sewerage, and waste management as follows:

Water supply is planned to be trucked in to site tanks or sourced from existing bores (if potable), under agreement with licensed landowners

An onsite wastewater management system will be installed, the design, installation, and operation of which will to comply with NT Code of Practice for Wastewater Management

All wastes will be removed from site and disposed of at licensed facilities.

The supply and storage of water to service the AI and Temporary Mobile Construction Camps would occur within enclosed systems and would not be readily accessible to fauna. Fauna may be able access this water in the event of leaks or faults in the water supply system, such as from taps or piping, however this would be mitigated by timely and ongoing maintenance of AI and Temporary Mobile Construction Camps.

DCS

Water supply at the DCS will be limited to water required for potable needs and office ablutions. Water will be supplied from onsite groundwater bore subject to permit and licencing under the *Water Act 1992* (NT) or piped in from offsite sources under agreement with PowerWater or the relevant landowner.

The supply and storage of water to service the DCS would occur within enclosed systems (such as piping and storage tanks) and would not be readily accessible to fauna. Fauna may be able access this water in the event of leaks or faults in the water supply system, such as from taps or piping, however this would be mitigated by timely and ongoing maintenance of the Solar Precinct, as well as good housekeeping practiced by staff.

OHTL Corridor and Electrodes

Water will be required during the construction of the OHTL Corridor and Electrodes. Construction activities will include concrete batching and dust suppression. Water used during construction would be subject to avoidance and mitigation measures regarding spills, ESCs as outlined in Chapter 17 - Environmental Management to contain spills entering the wider environment. As such, this water would be confined to a small footprint for short, intermittent durations of time during construction. Water used during construction and operation for maintenance and dust suppression would also be used intermittently for short durations within close proximity to activities. Availability and accessibility of this water to fauna would therefore be limited.

Supply of water during the construction of the OHTL Corridor and Electrodes would most likely occur via vehicle transport in contained storage vessels. Availability and accessibility of this water to fauna would therefore be limited.

Very minimal water will be required during the operation of the OHTL Corridor and Electrodes and would primarily be associated with any required repairs and maintenance, the nature of which would largely be intermittent and localised.

5.12.2.17 Night Driving and Fauna Strike

It is not clear whether night driving will be required for the project. Night driving increases the risk of vehicle strike to the Greater Bilby and should be assessed/mitigated in parts of the development where this species occurs. Ideally, driving will be constrained to daylight hours.

5.12.2.18 Response

During construction, land-based works will operate during a standard day shift. In limited cases, night shift, or 24-hours operation may be needed depending on the construction activities.

As discussed in Section 5.4.2.6 of the Draft EIS, direct fauna mortality due to interactions with vehicles (‘fauna strike’) or construction equipment is a potential construction impact. Proposal activities will involve increased movement of vehicles, equipment and plant along highways, access tracks and within Powell Creek Solar Precinct and Electrode, AI zone.

A significant impact assessment for the Greater Bilby was undertaken using the criteria contained within the EPBC Significant Impact Guidelines 1.1 (DEWHA, 2013). The assessment includes assessment and mitigation of impacts from night driving and fauna strike to the Greater Bilby (refer to Section 5.6.3.23).

5.12.2.19 Noise and Lighting Impacts

It is stated that noise will meet residential criteria ~600 m from the works, but then states that the impacts of noise and lighting on fauna will likely be limited to a few hundred metres from the source. It is also stated that the DCS and Cable Transition Facilities footprints do not contain sensitive receptors to noise or lighting, and that desert landscapes are less likely to contain species that are sensitive to noise or lighting. These statements should be supported by literature and/or reference to project ecological studies.

5.12.2.20 Response

The NT EPA has raised similar comments regarding noise and lighting impacts. A response had been provided in Section 5.13.12.

5.12.2.21 OHTL and Avifauna/Bat Collision

The assessment is focused on the OHTL utilities corridor. There is no assessment of if/how the powerline may impact birds that are moving across the landscape to or from Lake Woods that may be susceptible to powerline collision. Given the proximity of Lake Woods to the powerline, and the numbers of waterbirds that it can support in flood, this risk of collision should be included in the assessment and the risk potentially reduced through mitigation.

…….

No reference to literature has been provided to support the statement that bats are too small and agile to have a negative interaction with powerlines. This statement forms the basis of the conclusions regarding this issue throughout the chapter. Bat collisions with barbed wire fences indicate that linear structures can lead to collisions. The Flora and Fauna Division recommends that the assessment of potential for bat impact with powerlines is evidence-based.

…….

As discussed in a previous comment, the assessment that ghost bats will not be impacted by collision with powerlines is not well justified. Ghost Bats are much larger than other Microchiroptera and less able to avoid collision. While further justification is required for all bat species assessed, it is worth particular attention for the Ghost Bat. See recent review paper on Ghost bats (Cramer et al. 2022 – https://doi.org/10.1071/AM21042) that discusses the collision of Ghost Bats with barbed wire fences. The Kohoonir Adit colony (400 m from the proposed OHTL route) is the largest known Ghost bat colony globally. If the project has significant impacts on this colony, the species is likely to be significantly impacted. Potential impacts from the OHTL include electrocution, collision and changes to flight patterns, predator and prey dynamics and foraging behaviour (although it is noted that the structure of the OHTL is planned to be such that electrocution should not be possible). Surveys undertaken by the Flora and Fauna Division around this colony have indicated that activity of ghost bats remains high at least 1 km from the adit. The large numbers of this species and their high activity around the roost increases the risk that the OHTL poses. There is sufficient information about the species in relation to this roost that further field surveys are not required. However, a more thorough assessment of impact, and appropriate and justified mitigation measures should be provided. The standard practice for mitigating impacts of collision with linear structures such as powerlines and fences is the use of a visual cue, such as white bunting. The potential impacts to the Ghost bat colony from construction activities should also be thoroughly assessed.

5.12.2.22 Response

It is noted that there is the potential for birds moving across the landscape to or from Lake Woods to collide with the OHTL. As noted in the Draft EIS, the Proponent will evaluate the need for powerline markers – or some such – in a Flora and Fauna Management Plan as part of adaptive monitoring and mitigation.

The fact that bats are known to get caught on barbed wire fences – where the wires are less than 20 cm apart – is of little relevance to the OHTL where the power lines are greater than 10 m apart. As noted in the Draft EIS, the operators of the high voltage transmissions lines between Katherine and Darwin have not noted any issue with bats hitting powerlines. Moreover, no mention is made of recovering bat carcasses in any of the bird collision studies that were considered for the Draft EIS.

The Darwin to Katherine powerlines are approximately 1.3 km from the Kohinoor Ghost Bat adit and 2.1 km from Kintore Caves (another known Ghost Bat site). In personal communications with DEPWS staff in the Flora and Fauna Division who have been radio-tracking Ghost Bats from these locations, they have not identified any clear evidence of a negative impact of the presence of powerlines proximate to these important Ghost Bat sites. Nevertheless, to minimise the chances of Ghost Bats colliding with powerlines, a visual cue such as white bunting will be applied to the powerlines along the length of the OHTL within 1 km of the Kohinoor adit. A complete significant impact assessment for the Ghost Bat is presented in Section 5.6.3.22.

5.12.2.23 Individual Species Assessments

No individual assessment is provided for the following threatened fauna species listed in the ToR: Painted Honeyeater, Princess Parrot, Night Parrot, Brush-tailed Mulgara, White-throated Grass wren, Masked Owl (northern mainland), Red Goshawk, Partridge Pigeon (eastern), Crested Shrike-tit (northern), Nabarlek (Top End), Northern Quoll, Arnhem Leaf-nosed Bat, Black-footed Tree-rat (Kimberley and mainland NT), Northern Brush-tailed Phascogale, Water Mouse, Fawn Antechinus, Arnhem Land Gorges Skink, and Plains Death Adder. Of particular note are the Black-footed Tree-rat (Kimberley and mainland NT), Fawn Antechinus and Masked Owl (northern mainland), which Stokeld et al. (2020; https://www.ntlis.nt.gov.au/mpds/get_file?file_id=8602) classify as high value species for the Gunn Point area. The Flora and Fauna Division recommends that individual impact assessments are described for all threatened fauna with a medium-high likelihood of occurrence within the project footprint.

5.12.2.24 Response

Significant impact assessments have been completed for all of these species, as cross-referenced below:

Painted Honeyeater – Section 5.6.3.29

Princess Parrot – Section 5.6.3.32

Night Parrot – Section 5.6.3.9

Brush-tailed Mulgara – no longer listed under the TPWC or *EPBC Act*s

White-throated Grass wren – Section 5.6.3.37

Masked Owl (northern mainland) – Section 5.6.3.26

Red Goshawk – Section 5.6.3.33

Partridge Pigeon (eastern) – Section 5.6.3.30

Crested Shrike-tit (northern) – Section 5.6.3.20

Nabarlek (Top End) – Section 5.6.3.8

Northern Quoll – Section 5.6.3.11

Arnhem Leaf-nosed Bat – Section 5.6.3.2

Black-footed Tree-rat (Kimberley and mainland NT) – Section 5.6.3.3

Northern Brush-tailed Phascogale – Section 5.6.3.10

Water Mouse – Section 5.6.3.36

Fawn Antechinus – Section 5.6.3.5

Arnhem Land Gorges Skink – Section 5.6.3.1

Plains Death Adder – Section 5.6.3.31.

5.12.2.25 Greater Bilby

No Greater Bilby sign was recorded during surveys of the Solar Precinct. However, there are known records of the species from the railway corridor in and close to the Solar Precinct footprint from 2008. An assessment based on one survey in the proposal footprint found that the Solar Precinct is unlikely to contain core habitat or support persistent/regular occurrence of the species, and that habitat suitability is 'marginal'. Based on the unpredictable movement ecology of bilbies and the proximity of the withheld records, the Flora and Fauna Division suggests that this species needs additional assessment. Given the previous records of Greater Bilbies at the Solar Precinct, the Flora and Fauna Division recommends that follow-up surveys of the Solar Precinct footprint and suitable habitat along the proposed access roads are undertaken immediately prior to construction. The Flora and Fauna Division also recommends that the surveys incorporate a broader area around the Solar Precinct for context. The EIS states that habitat suitability at the Solar Precinct is marginal, because of a lack of palaeodrainage habitats which are considered more persistently suitable for Greater Bilbies, based on findings by Southgate et al. (2018). However, Southgate et al. (2007) provide evidence of Greater Bilbies using a diversity of habitats including sand plain substrate in the northern part of the study area (Newcastle Waters) and in the south where they were more restricted to laterite/rock or drainage/calcrete. The statement used to justify the lack of habitat suitability at the Solar Precinct does not account for the differences in habitat use across the species distribution. A Greater Bilby population in this location is at the edge of the species range and is considered an important population regardless of the perceived habitat suitability. The proposed access roads also pass through potential Greater Bilby habitat, and the potential for vehicle collision should be assessed.

If Greater Bilbies are detected in any of the proposed project footprints the Flora and Fauna Division recommends that any burrows within the clearing footprint are avoided with a 20 m buffer until no longer occupied. Subsequent clearing in the surrounding area should give consideration to allowing Greater Bilbies to safely vacate the development area (e.g. delaying clearing until burrow verified as not in use). The Flora and Fauna Division also recommends that night driving is avoided in areas with confirmed Greater Bilby activity and night works are avoided in all potential bilby habitat.

5.12.2.26 Response

This comment has been considered in the significant impact assessment presented in Section 5.6.3.23.

5.12.2.27 Gouldian Finch

A juvenile Gouldian Finch was recorded south of Lake Woods during SREBA surveys in 2021, suggesting this species inhabits and may breed in the area. There is potential breeding habitat (Eucalyptus leucophloia woodland) in the Ashburton Range, along with permanent springs and pastoral dams that Gouldian Finches use as water sources. This suggests that the Gouldian Finch may be present along the proposed access roads to the Solar Precinct, and this species should be assessed in relation to impacts from this component of the project. The Gouldian Finch has been recorded in more locations in the vicinity of the OHTL during the GBA and SREBA projects (2020-2022). As such, the distribution of foraging and breeding habitat extends further south through the Sturt Plateau bioregion and past the southern edge of Lake Woods. There are also recent records from the coastal Top End. Proposed access roads at the Solar Precinct traverse potential Gouldian Finch breeding habitat (Eucalyptus leucophloia woodlands in the Ashburton Range). Gouldian Finch habitat is also present along the OHTL north of Pine Creek to Gunn Point. As Gouldian Finches are Endangered under the EPBC Act, any population is considered an important population under the EPBC Significant Impact Guidelines. Therefore the map of habitat provided in Figure 5-17 displays only part of the habitat requiring assessment for this project. The Flora and Fauna Division recommends that the assessment of significant impact for Gouldian Finches is undertaken to incorporate all potential Gouldian Finch habitat. The Flora and Fauna Division recommends that the cumulative impacts of habitat removal is assessed within a 20 km buffer of the project footprint.

5.12.2.28 Response

This comment has been considered in the significant impact assessment presented in Section 5.6.3.6.

5.12.2.29 Red Goshawk

It is stated that Red Goshawk nests are conspicuous. However, Red Goshawk nests can be confused with the nests of other large raptors if observers are unfamiliar with the differences. The Flora and Fauna Division recommends that any active raptor nests are avoided if possible. If avoidance is not an option, further steps should be taken to confirm the identity of any active raptor nest.

5.12.2.30 Response

This comment has been considered in the significant impact assessment presented in Section 5.6.3.33.

5.12.2.31 Monitors

It is unclear as to why Mertens' and Mitchell's Water Monitors are assessed here but Yellow-spotted Monitor is not. The Yellow-spotted monitor occurs along the entirety of the OHTL. The Flora and Fauna Division recommends that Yellow-spotted Monitors are also assessed.

5.12.2.32 Response

This comment has been considered in the significant impact assessment presented in Section 5.6.3.27.

5.12.2.33 Howard River Toadlet

The assessment of the potential for the proposal to lead to a long-term decrease in the size of an important population of the Howard River Toadlet only considers the impact of clearing within the footprint, not potential impacts from changed surface flow on habitat suitability. The mitigation measures covered under the criterion 'modify, destroy, remove, isolate or decrease the availability of quality of habitat to the extent that the species is likely to decline' do not specifically relate to Howard River Toadlet habitat. The Flora and Fauna Division recommends that additional information is provided on how much clearing of potential habitat is required and how any changes to surface flow will be mitigated.

For this species, Stokeld et al. (2020; https://www.ntlis.nt.gov.au/mpds/get_file?file_id=8602) state that this species is of high value and that outside of the Howard Sand Plains SoCS the disturbance of habitat should be avoided and that suitable habitat be retained and native vegetation buffers ≥250 m applied. Field surveys in areas with highly suitable habitat should be undertaken at an appropriate time if there is uncertainty in the occurrence of the species.

5.12.2.34 Response

This comment has been considered in the significant impact assessment presented in Section 5.6.3.25.

5.12.2.35 Ancillary Infrastructure

The documentation provided is not adequate to assess the potential impacts to biodiversity from ancillary construction activities, landfills, dangerous goods/hazardous chemicals storages and additional infrastructure associated with project (i.e., location of hardstands, lay-downs, warehousing, storage areas, additional compounds, weather stations etc. as outlined in Section 2.4.3.6 – Other ancillary facilities). These activities and construction potentially has a high likelihood of impacting surrounding biodiversity and the impact should be assessed prior to construction. The Flora and Fauna Division recommends that further information is provided in the Supplementary EIS regarding the location, extent and impact of the ancillary construction activities, landfills, dangerous goods/hazardous chemicals storages and additional infrastructure associated with the proposal. The potential impact on biodiversity along with avoidance and mitigation measures should be assessed for these activities.

5.12.2.36 Response

Further details on the AI are provided in Chapter 2 Project Refinements.

Contamination impacts to WQ from release of fuels hazardous chemicals, waste storage and disposal areas were assessed in Chapter 6 Hydrology and remain unchanged from the assessment completed as part of the Draft EIS. Waste storage and dangerous goods/hazardous chemical storages will be designed in accordance with AS/NZS and NT Guidelines and Regulations, which are proven effective in mitigating this risk.

Chapter 17 of the Draft EIS outlines mitigation measures and monitoring to be implemented for the Project. To manage and mitigate impacts on TEQ during construction, a Flora and Fauna Management sub-plan will be developed under the CEMP. The Plan will describe measures to avoid and mitigate potential impacts on TEQ necessary and related measures such as hazardous materials storage and handling will also be adopted (refer to Table 17-3 of the Draft EIS). Further mitigations for hydrological and environmental WQ that would be included in the CEMP are provided in Table 17-4 and Table 17-5 of the Draft EIS.

5.12.2.37 Assessment of OHTL Route

The Department acknowledges that the routes of the OHTL corridor through Katherine, Pine Creek and Adelaide River are yet to be determined due to several constraints and route obstacles.

While the Katherine and Pine Creek potential route deviations are within the 10km buffer of the OHTL corridor, the Adelaide River route deviation options are well over the 10km buffer (approx. 15km from the proposed OHTL corridor route in some places).

It is unclear from the mapping and the documentation provided in Chapter 5 whether the potential impact of these route deviations have been considered in the EIS. The route deviations for Adelaide River intersect the following biodiversity values (at least):

Cycas armstrongii

Stylidium ensatum potential habitat

Helicteres macrothrix potential habitat.

The route deviations for Pine Creek intersect the following biodiversity values (at least):

Acacia praetermissa record

Stylidium ensatum potential habitat.

The Flora and Fauna Division recommends that further information is provided in the Supplementary EIS regarding the impact of the route deviation options. The impact on biodiversity along with avoidance and mitigation measures should be assessed for these options.

5.12.2.38 Response

The OHTL preferred route at Katherine and Adelaide River have been assessed in this Chapter (refer to Sections 5.4 to 5.9) and further detailed in Supplementary Ecology Report - Part 2 (Appendix 5.2).

5.12.2.39 NT Land Clearing Guidelines

Clearance of sensitive and significant vegetation in the NT requires consideration of the NT Land Clearing Guidelines.

5.12.2.40 Response

The NT Land Clearing Guidelines (DENR, 2021) have been considered in the preparation of the EIA as identified in Section 5.2 of the Draft EIS. The guideline identifies sensitive and significant vegetation types, which are assessed Chapter 5 of the Draft EIS and identified in Section 5.4 of this Chapter. They are rainforest, vine thicket, closed forest or riparian vegetation, mangroves, monsoon vine forest, sandsheet heath and vegetation containing large trees with hollows suitable for fauna. Potential impacts to significant vegetation have been assessed in Section 5.5.3.2.

5.12.2.41 Sandsheet Heath

The Flora and Fauna Division notes the occurrence of highly Significant Sandsheet Heath (SSH) on the Howard Springs Sandplains. The Flora and Fauna Division recommends that information is provided on the types and extent of sensitive and significant vegetation proposed to be removed through the proposed development activities. The potential impacts on significant vegetation and proposed mitigation actions should also be outlined.

5.12.2.42 Response

Sandsheet heath vegetation and species have been addressed in detail in Supplementary Ecology Report - Part 1 - Threatened Species (Appendix 5.1). Potential impacts to Sandsheet heath vegetation and species have been addressed in this Chapter (refer to Sections 5.4 to 5.9).

5.12.2.43 Inconsistent Report References

There are inconsistencies in this table with respect to other chapters or appendices of this EIS. For example: the 'Value Rating' for DCS suggests that there are no threatened species within the impact footprint. Section 5.3.3 of Appendix P-3 indicates that Typhonium praetermissum is present within the DCS footprint. Additionally, the potential habitat for the threatened species Stylidium ensatum, Ptychosperma macarthurii, Cycas armstrongii, Helicteres macrothrix and Typhonium praetermissum have not been mentioned in any of the relevant locations. The Flora and Fauna Division recommends reviewing all topics of the EIA result table including residual impact ratings for all impacts on threatened flora species.

5.12.2.44 Response

The Proponent has recognised that the Draft EIS contains inconsistencies. As noted, the statement that there are no threatened species within the DCS is incorrect. Because threatened species are subject to a separate impact assessment process, the focus of the tables in Section 5.4 of the Draft EIS was on other terrestrial ecosystem values. The potential impact of Project activities to the threatened species that are present within the project footprint was assessed in the Draft EIS using all the information that was available at the time. In this SEIS, the results of targeted surveys and further desktop analysis have informed the revision of the significant impacts assessments for all relevant threatened species (refer to Sections 5.6.3 and 5.6.3.15).

5.12.2.45 Groundwater Dependent Ecosystems (GDEs)

The potential impact of hydrological changes on vegetation communities and threatened species due to construction has not been assessed. The Flora and Fauna Division recommends including an assessment of the impact of hydrological changes on groundwater-dependent ecosystems and threatened species.

5.12.2.46 Response

A Solar Precinct Groundwater Study (Appendix 6.1) was prepared for the SEIS to assess the potential impacts of sourcing water for construction and maintenance activities in and around the Solar Precinct from groundwater sources, including identification of potential GDEs.

Groundwater resources are proposed to be utilised from the Montejinni Limestone aquifer as they have the potential to meet the construction water requirement of the Solar Precinct. No GDEs have been identified in the Montejinni Limestone and the aquifer is unlikely to support GDEs because the watertable depth exceeds 20 mBGL.

A high potential for aquatic GDEs is mapped along Powell Creek, north of the Solar Precinct and a low potential along Hunter Creek and Burke Creek to the south. Billy Creek, Gleeson Creek, and Bull Creek, located around the proposed Access Tracks, are identified in the aquatic GDE layer but are unclassified.

The presence of aquatic GDEs along the eastern extents of these drainage lines is consistent with the location of inferred springs identified in the Draft EIS. All springs identified in the field mapping occur in the Proterozoic basement rocks. Groundwater levels in the spring areas are shallow (<5 m), which supports the presence of potential terrestrial and aquatic GDEs in these areas. Permanent

waterholes along Gleeson Creek, Powell Creek and nearby drainage lines have also been recorded. Water extraction for the Project from the Proterozoic basement rock aquifers is not proposed.

Drawdown impacts on GDE's are not expected as these occur in a separate aquifer system to the Montejinni Limestone aquifer. Groundwater extraction is not proposed at the other Project components.

Impacts associated with surface WQ and hydrology are assessed as part of significant impact assessments using the Significant Impact Guidelines 1.1 (DEWHA 2013) for threatened species. Preliminary significant impact assessments for threatened species were provided in Section 5.5 of the Draft EIS. Additional significant impact assessments for threatened species have been undertaken as part of this SEIS in Sections 5.6.3 and 5.6.3.15.

5.12.2.47 Stylidum ensatum

There is highly suitable habitat for Stylidium ensatum present within the OHTL corridor. The Department acknowledges the proponent's recommendation to undertake surveys for Stylidium ensatum. Appropriate survey times for Stylidium ensatum are during the mid-late Dry season when the plant is flowering/fruiting. Further evidence is required to support the statement: 'it is unlikely that minor additional gaps in habitat will cause fragmentation into more populations.' The Flora and Fauna Division recommends that, following surveys, avoidance and minimisation measures should be implemented for this species. The mitigation measures outlined in Table 5-11 should consider avoidance where possible.

5.12.2.48 Response

This comment has been considered in the significant impact assessment presented in Section 5.6.3.12.

5.12.2.49 Helicteres macrothrix

For Helicteres macrothrix the Flora and Fauna Division recommends:

Further substantiation is provided in the impact assessment for Helicteres macrothrix regarding impact of destruction/removal of plants/loss of habitat for criteria 'Fragment the existing population into two or more populations.'

Targeted surveys for Helicteres macothrix in the utilities corridor where there is modelled potentially suitable habitat.

5.12.2.50 Response

This comment has been considered in the significant impact assessment presented in Section 5.6.3.7.

5.12.2.51 Typhonium praetermissum

For Typhonium praetermissum the Flora and Fauna Division recommends:

Targeted surveys at the appropriate time of year to optimise detection to assess and contextualise the potential significant impacts on the Typhonium praetermissum at the subpopulation and species level.

Include the results of targeted survey in the supplementary EIS and assessment of significant impact on the population and species.

Provide information on whether the design of the OHTL footprint will be altered to avoid impacts on plants (or the proportion of individual plants) within the footprint.

Clarify proposed actions to mitigate impacts and minimise loss of plants within the footprint.

Clarify whether the project design will be modified to avoid the loss of Typhonium plants (75 individuals) and proposed mitigation actions if the plants are impacted.

Include and clarify the level of uncertainty in assessment of low risk of fragmentation.

……..

The Flora and Fauna Division recommends that the potential for cumulative impacts on the Typhonium praetermissum sub-population and species population be clearly outlined.

5.12.2.52 Response

This comment has been considered in the significant impact assessment presented in Section 5.6.3.34.

5.12.2.53 Cycas armstrongii

For Cycas armstrongii the Flora and Fauna Division recommends:

Targeted surveys to identify the extent of high density stands (>400 mature stems per ha) within the project footprint and to assess the impact of removal on the broader population. Mature stems are considered all of those greater or equal to 50 cm in height

Any proposed removal of plants should refer to the translocation guidelines for this species.

5.12.2.54 Response

This comment has been considered in the significant impact assessment presented in Section 5.6.3.21.

5.12.2.55 Darwin Palm

For Darwin palm Ptychosperma macarthuri the Flora and Fauna Division recommends:

Further substantiation is required on the impact assessment regarding impact of destruction/removal of plants/loss of habitat for criteria 'Fragment the existing population into two or more populations'

Targeted surveys are undertaken.

5.12.2.56 Response

This comment has been considered in the significant impact assessment presented in Section 5.6.3.4.

5.12.2.57 Bladderwort

For Utricularia dunstaniae 'General fieldwork' rather than targeted surveys is not suitable to detect this small and highly seasonal species which responds directly to wet season rainfall. The Flora and Fauna Division recommends the following for Utricularia dunstaniae:

Provide further substantiation is required on the impact assessment regarding impact of destruction/removal of plants/loss of habitat for criteria 'Fragment the existing population into two or more populations'

Undertake targeted surveys for Utricularia dunstaniae in the appropriate flowering season (i.e. January-May).

5.12.2.58 Response

This comment has been considered in the significant impact assessment presented in Section 5.6.3.35.

5.12.2.59 Cleome insolatas

For Cleome insolata 'General fieldwork' rather than targeted surveys is not suitable to detect this species. The Flora and Fauna Division recommends targeted surveys for Cleome insolata in the appropriate fruiting/seeding season (i.e., March-April).

5.12.2.60 Response

This comment has been considered in the significant impact assessment presented in Section 5.6.3.19.

5.12.2.61 Significant Vegetation within the Solar Precinct

The 'Avoidance' section of this table for 'Loss of vegetation and habitat' impact states that 'no significant vegetation types is contained within the Solar Precinct' followed by 'Micro-siting of transmission towers to avoid significant vegetation where possible'. It is unclear whether there is or is not significant vegetation within the Solar Precinct. The Flora and Fauna Division seeks clarification on whether there is significant vegetation within the Solar Precinct or not.

5.12.2.62 Response

As identified in Section 5.4.2.2 of the Draft EIS, significant vegetation was not recorded within the Solar Precinct.

5.12.2.63 Solar Precinct Clearing Management

The 'Monitoring' section of this table for 'Loss of vegetation and habitat' impact states 'visual inspections during clearing is within approved boundaries. Results recorded, along with any photographs.' The Flora and Fauna Division recommends the area to be cleared for the Solar Precinct is clearly flagged and marked on-ground so that it is clear to contractors where to clear and avoid clearing beyond approved boundaries.

5.12.2.64 Response

Commitments to mitigate impacts to 'Loss of vegetation and habitat' and 'Loss of significant vegetation' have been updated to incorporate flagging and marking on-ground so that it is clear to contractors where to clear and avoid clearing beyond approved boundaries (refer to Table 5-60).

5.12.2.65 Clearing Management and No-Go-Zones

The 'Avoidance' section of this table for 'Threatened species (restricted range)' impact states that 're-routing the access track to avoid local occurrences (if present)'. The Flora and Fauna Division recommends that any areas known to support threatened flora species are clearly flagged and signposted as 'No-Go Zones' for contractors to avoid.

5.12.2.66 Response

Commitments to mitigate impacts to 'Threatened species (restricted range)' have been updated to incorporate flagging and sign posting of areas known to support threatened flora species for contractors to avoid (refer to Table 5-60).

5.12.2.67 Acacia praetermissa

Records and potential habitat for Acacia praetermissa are found within the Pine Creek route deviation options. The Flora and Fauna Division recommends reassessing the impact of the proposal on Acacia pratermissa in the Supplementary EIS following route option decisions.

5.12.2.68 Response

This comment has been considered in the significant impact assessment presented in Section 5.6.3.16.

5.12.2.69 Typhonium taylorii

Records of Typhonium taylorii are found within 7km of the project footprint and potential habitat is likely to exist in the Howard Sand Plains. The Flora and Fauna Division recommends reassessing the likelihood of Typhonium taylorii presence in the Utilities corridor.

5.12.2.70 Response

This comment has been considered in the significant impact assessment presented in Section 5.6.3.13.

5.12.2.71 OHTL Impacts to Black Jungle

The overhead power lines in Black Jungle may affect:

Rainforest and associated threatened flora species such as Ptychosperma macarthurii

Large areas of modelled habitat for Typhonium praetermissum

Drainage lines, which have the potential to support Stylidium ensatum

Undefined Aboriginal cultural values and Sacred Sites.

5.12.2.72 Response

With regards to threatened species, this comment has been considered in the significant impact assessments presented in Sections 5.6.3.4, 5.6.3.34 and 5.6.3.12 respectively. Cultural values are discussed in Chapter 13 Culture and Heritage.

5.12.2.73 KTP

The Australian Government listed ecosystem degradation, habitat loss and species decline due to invasion of northern Australia by introduced gamba grass (Andropogon gayanus), para grass (Urochloa mutica), olive hymenachne (Hymenachne amplexicaulis), mission grass (Pennisetum polystachion) and annual mission grass (Pennisetum pedicellatum)' as a KTP under the Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act). This initiated the development of the Threat Abatement Plan (TAP) to reduce the impacts on northern Australia's biodiversity by the five listed grasses (TAP). All five species do or are likely to occur adjacent, upstream or within the OHTL and or Murrumujuk footprint.

5.12.2.74 Response

The Weed Management Plan (Appendix 5.3) has been updated to acknowledge and incorporate the TAP for the five listed grasses mentioned in this submission.

5.12.2.75 Weed Management Plan

This report states "The purpose of this report is to identify and describe the relevant threatened species, significant vegetation types and threatening processes to such a degree as to be able to identify the need for any further surveys and to inform an impact assessment". As such, section 2.2 Significant Vegetation - The 5 grasses listed as a KTP should be discussed as they pose a direct threat to all listed vegetation types in this section. As noted by the proponent in other sections, the EPBC Act allows for the listing of threatened ecological communities and that a significant threat to these communities is the KTP of the 5 listed grasses. DEPWS advises that the 5 listed grasses are also a threat to threatened ecological communities.… This should be noted.

Split declaration: Weed Management Plan does not have a clear definition of what a split weed declaration is and what it means for the plan. This is for Mimosa, Rubber bush and Gamba grass.

The plan covers a 120m buffer from the corridor centre along the railway line. However, it does not recognise any weeds outside this buffer area that may have an impact on the corridor (disturbed soils and vegetation). Weeds that occur on adjacent parcels or upstream of the subject area should be addressed. This includes prickly acacia on Murranji Stn, Siam weed in the Top End areas at a minimum.

Outside of the annual Weed Management Report, upon request from the NT Weed Management Branch all reports and or records pertaining to any specific weed related actions or incidents within the project areas should be made available within 5 business days.

The solar precinct and OHTL within the Tennant Creek region occupies areas which are relatively weed free. It is important that the proponent implements strict weed hygiene practices during all stages and areas of development and operation. To maintain weed free areas and prevent weed spread. Weed hygiene declarations should be considered for all vehicles entering the development area as well as activities that may increase the introduction of new weeds.

Lake Woods is recognised as wetland of international significance due to its wildlife aggregations and wetland values. To help protect these values Consolidated Pastoral Company who currently have the pastoral lease in which Lake Woods occupies, has an agreement with the NTG to implement a Conservation Management Plan. The proponent should be aware that Consolidated Pastoral Company was awarded over $1 million through the Cwth *Government's Biodiversity Fund in 2011. Funding was allocated to control parkinsonia around Lake Woods and Longreach Waterhole. The weed control work is ongoing and there has been a significant reduction in parkinsonia since the implementation of the control program. It is important that new weeds are not introduced or existing weeds spread within the lake system. Implementation of regular monitoring of*

tracks and roads that intersect creeks within the Lake Woods catchment should be implemented to ensure weeds do not establish and spread within the lake.

5.12.2.76 Response

The Weed Management Plan (Appendix 5.3) has been updated to acknowledge and incorporate all of concerns presented in the submission.

5.12.2.77 Buffel Grass

Buffel grass (Cenchrus ciliaris) is not declared in the NT but is of concern to some stakeholders in the Tennant Creek region. Addressing this species in the WMP is recommended as it is in the Tennant Creek Regional Weed Strategy 2021 -2026. The proponent should be aware of the fire risk to infrastructure from the introduction or spread of buffel grass in southern sections of the project. Buffel grass can be spread inadvertently, and effective weed hygiene practices will be required to prevent further spread.

5.12.2.78 Response

Buffel Grass has been addressed in the updated Weed Management Plan (Appendix 5.3).

5.12.3 CCGC Submission

CCGC has indicated its concerns regarding impacts on nesting raptors.

5.12.3.1 Response

Significant Impact Assessments undertaken in accordance with the Significant Impact Guidelines 1.1 – MNES for the nine species identified in the above NT EPA Direction are provided in the following sections:

Masked owl (northern mainland) – Section 5.6.3.26

Red goshawk – Section 5.6.3.33

Grey Falcon – Section 5.6.3.24.

The Significant Impact Assessments have concluded that because the proportion of habitats within the project footprint are very small and narrow – combined with the implementation of mitigation measures – the impacts to these species associated with the Project are unlikely to be significant.

5.12.4 ECNT Submission

5.12.4.1 Mitigations and Offsets

ECNT is concerned by the scant assessment provided of impacts of the projects on terrestrial biodiversity, and proposals to mitigate or offset these impacts. The project is one of the largest projects ever undertaken in the Territory in terms of its spatial footprint. The amount of land which will be cleared is vast, at approximately 13,800 ha (12,000 ha for the Solar Precinct, 1,734 ha for the OHTL, and 64.5 ha at the Darwin Converter and Cable Transition Facilities).

5.12.4.2 Response

As discussed in Section 5.3, the proponent had committed to undertaking further threatened species surveys at the DCS, OHTL Utilities Corridor and OHTL Railway Corridor. Furthermore, since the submission of the Draft EIS in April 2022, submissions during public consultation and direction from the NT EPA have been received requesting more information on the Terrestrial Ecosystems factor.

Details of further assessment undertaken are provided in Section 5.3. This includes:

Detail the findings of threatened species surveys from the Supplementary Ecology Report - Part 1 - Threatened Species (Appendix 5.1)

Detail the findings of the assessment of the Project Refinements found in Supplementary Ecology Report - Part 2 (Appendix 5.2)

Reassessment of prior Draft EIS findings where relevant to reflect Project refinements (this Chapter)

Submissions from public consultation of the Draft EIS (Section 5.12)

Comments from the NT EPA Direction (Section 5.13).

Details of mitigations and offsets are provided in Section 5.7 and 5.10 respectively.

5.12.4.3 Survey Work

Despite its size, the impacts of the Project on terrestrial biodiversity are, by and large, minimised in the EIS. In addition, it appears that in many case biodiversity surveys have not been undertaken at all, or are not yet complete. This makes it impossible to appraise the likely impacts of the Project on biodiversity, including Sun Cable's proposals to monitor, mitigate or offset these impacts.

…….

ECNT is also concerned by the paucity of biodiversity surveys undertaken by Sun Cable. For example, there appears to have been just one targeted survey undertaken in the Solar Precinct (of the Greater Bilby). In other cases, surveys are yet to be undertaken. For example, Chapter 5 states that: "There is currently insufficient spatial information available to confirm whether the proposal is likely to have a significant impact on eight threatened species. That information will be collected in first half of 2022, for inclusion in the Supplementary EIS. Preliminary significant impacts assessments in this chapter conclude that it is possible that the sub-population of Typhonium praetermissum within the DCS and Cable Transition Facilities could be impacted upon, with 6.8% of the subpopulation recorded within the direct disturbance footprint." (5-92). It is unclear why or how the EIS has been submitted in the absence of this information.

5.12.4.4 Response

Further biodiversity survey and assessment work undertaken since the Draft EIS has been outlined the previous response (Section 5.12.4.2).

5.12.4.5 Solar Precinct Clearing Impacts

ECNT notes that land clearing is a fundamental pressure on the environment. Land clearing causes *the loss, fragmentation and degradation of native vegetation, and a variety of impacts on soils (e.g., erosion, salinity, loss of nutrients and acidification) and disrupts essential ecosystem processes. Threats to biodiversity from land clearing and habitat loss are one of the greatest threats to threatened species in Australia, and to the environment more generally.*

Recent research which indicates that Northern Australia's tropical savannas are one of 19 ecosystems in Australia that meet the criteria of being under collapse.

Bergstrom et al state that it is imperative to understand how different threatening processes combine cumulatively (acting in what they term "threat webs") to further threaten Australia's collapsing ecosystems. As habitats become increasingly fragmented, populations become more vulnerable to other threatening processes, such as climate change, changes in stream flow regimes, predation by invasive species and destructive fires, and they lose the ability to recolonise suitable habitat.

The NTGs published guidance material makes clear that, while Northern Australia has the largest and most intact tropical savanna system in the world, this value could be "readily compromised by excessive removal of native vegetation."

Further, this guidance makes clear that the highly seasonal environment of northern Australia means that it is more important to retain a higher proportion of native vegetation in the landscape than for a less seasonal environment. The guidance refers to research undertaken for the Department in 2009 which showed significant impacts on biodiversity at a landscape scale (approximately 3000ha) if more than 50% of native vegetation is cleared. In particular, the research notes that clearing of this extent "may reduce the diversity of plants and animals to a point where some populations may fall to unsustainable levels."

Very little analysis is provided in the EIS of the biodiversity impacts of clearing 12,000ha of native vegetation at the Solar Precinct, beyond a statement that "the loss of such an area is likely to have a minor impact on regional diversity" (p 5-34). This is inadequate, and inconsistent with the research above.

The impacts of habitat fragmentation at the Solar Precinct are "not assessed".

5.12.4.6 Response

The research identified in the ECNT submission is in relation to tropical savanna ecosystems. The Solar Precinct does not contain any tropical savanna. Therefore, clearing of the Solar Precinct would not have any impact on tropical savanna and no habitat fragmentation of tropical savanna is expected. The Project footprint within this ecosystem is small and narrow, and largely adjacent to an existing railway line – meaning that habitat loss is minimal, and fragmentation has already occurred.

As discussed in Section 5.4.2.1 of the Draft EIS, the Solar Precinct occurs within Wycliffe subregion of the Tanami Desert bioregion, of which significantly less than 0.1 % is currently cleared (for tracks, bores and building footprints). There is no other broad acre clearing in the subregion. Clearing the Solar Precinct footprint will increase total clearing in the sub-bioregion by approximately 0.75 %[15]. The Redsan land system within which most of the Solar Precinct occurs is one of the largest land systems in southern Australia. Figure 5-3 of the Draft EIS shows the location of the Solar Precinct within the Redsan land system. The Solar Precinct footprint comprises 0.43% of that particular Redsan land system 'patch'. Whilst the area of land that will be cleared is large, it comprises a small portion of the available habitat and therefore is considered unlikely result in a decline in regional biodiversity.

As discussed in Section 5.4.2.7 of the Draft EIS, habitat fragmentation is considered to be the permanent process by which habitat loss results in the division of large, continuous habitats into smaller, more isolated remnants. These remnants are then subject to the complex processes of habitat degradation and island biogeography, leading to loss of species diversity – initially locally, but ultimately at the landscape scale. The Draft EIS concludes that habitat fragmentation will not be an issue for the Solar Precinct because it will be constructed in a footprint entirely surrounded by native vegetation.

Moreover, as part of this SEIS, significant impact assessments have been undertaken for threatened species identified as potentially occurring within the Solar Precinct – see Sections 5.6.3 and 5.6.3.15. One of the criteria for assessing significant impact to threatened species is whether a population is likely to be fragmented due to Project activities. The conclusion in all cases is that development of the Solar Precinct will not fragment the population of any threatened species.

[15] Calculated by dividing the footprint area by the area of Wycliffe sub-bioregion.

5.12.4.7 Solar Precinct Edge Effects

Similarly, there is no analysis given of the edge effects of clearing for the Project as a whole, except *for a statement that: "it is assumed that the open, sparsely vegetated habitats within the Solar Precinct footprint will not experience any significant or substantial edge effects – certainly not such that will impact at an ecosystem level" (p 5-38). This is an inadequate and likely incorrect assumption. As acknowledged by the Scientific Inquiry into Hydraulic Fracturing in the NT, next to nothing is known about "edge effects" of clearing in the NT. A proliferation of habitat edges can impact the abiotic environment (including microclimate, light and wind) for up to 500m or more from cleared areas, significantly increasing the area impacted by a project.*

5.12.4.8 Response

Edge effects were considered for the Project as a whole in Section 5.4.2.7 of the Draft EIS. Given what is known about edge effects, the assumption that they will not be pronounced in the open, sparsely vegetated habitat within which the Solar Precinct is located is reasonable. In such a landscape, micro-climates are at the scale of single trees / clumps of spinifex – and hence will not be influenced by the presence of a modified landscape nearby – and exposure to wind and light is already high. Any impacts from edge effects will be very localised.

This is supported by the Scientific Inquiry into Hydraulic Fracturing in the NT in which it was noted that:

The Panel's assessment is that it is not possible to determine the risks from habitat fragmentation and edge effects due to vegetation loss along linear corridors until there is a better understanding of the sensitivities and critical effects thresholds for NT vegetation types. However, the Panel believes that it will be considerably lower than in forest habitats.

5.12.4.9 Fracking Inquiry and Habitat Fragmentation

The Fracking Inquiry acknowledged this significant knowledge gap and recommended studies be undertaken regarding the impacts of habitat fragmentation on biodiversity. Baseline studies are thus currently underway as part of the Fracking Inquiry to understand the biodiversity baselines and projected impacts of proposed development in the region. A GISERA study is currently underway to understand and manage impacts to biodiversity from land clearing and edge effects associated with roads and pipelines in the Beetaloo Basin. Sun Cable should, at the very least, refer to this research and explain its relevance or otherwise to its Project

5.12.4.10 Response

The ECNT submission appears to reference the Biodiversity impacts from roads and pipelines in the Beetaloo Sub-basin project (GISERA, 2022, the GISERA study). At the time of writing this SEIS, the GISERA study (GISERA, 2022) is approximately 30% complete and is currently not available. The Proponent has not precluded consideration of the findings of the study to inform the design and management of the Project when it becomes available.

5.12.4.11 OHTL Intersection Areas of High Biodiversity Value

ECNT is concerned by Sun Cable's proposal for the OHTL to intersect (and therefore clear) the following areas of high biodiversity value and conservation significance (see page 5-34):

Manton Dam Recreation Area (18a)

Black Jungle Conservation Reserve (3.1 ha)

Shoal Bay Coastal Reserve (6.1 ha)

Yinberrie Hills Site of Conservation Significance (SOCS) (42ha)

Shoal Bay SOCS (18 ha)

Howard Sand Plains SOCS (18 ha)

Adelaide River coastal floodplain 13 ha).

Of note, the Project includes an area which has been categorised as "high risk" and "moderate" on biodiversity at Gunn Point (5-35).

5.12.4.12 Response

This submission is related to the ECNT response below in Section 5.12.4.11. A response has been provided in Section 5.12.4.12 which addresses this submission.

5.12.4.13 Avoidance, Mitigations, and Offsets

There is little in the EIS to demonstrate how biodiversity impacts will be avoided, mitigated or offset. No rationale is given for why some areas of high biodiversity value and conservation significance must be cleared, or what alternatives have been considered.

5.12.4.14 Response

An Alternative Analysis Summary has been provided in Chapter 2 which outlines the qualitative assessment approach undertaken to rank attributes of each alternative according to selected performance objectives was undertaken; performance objectives and their ratings are defined in Table 2-6. This includes consideration of environmental impacts.

Additional avoidance, mitigation and monitoring measures identified as a result of the EIA undertaken for this EIA have been outlined in Section 5.7. Offsets are discussed in Section 5.10. These are in addition to the avoidance, mitigation and monitoring measures identified in Chapter 5 and Chapter 17 of the Draft EIS.

5.12.4.15 Vegetation Buffers and Wildlife Corridors

There are few references to buffers being retained for sensitive vegetation or any assessment of indirect impacts given (for example in the high conservation significance areas of Gunn Point).

A one line explanation is given for why wildlife corridors that would provide connectivity at the Solar Precinct have not been pursued: "wildlife corridors were considered but were ruled out as a major fire risk for the proposal infrastructure and because they could cause shading of the arrays." These shortcomings must be interrogated and addressed.

5.12.4.16 Response

Wildlife corridors at the Solar Precinct have not been considered due to the risk of fire. Wildlife corridors can potentially be the source of fires, act as a route for external fires to enter into the Solar Precinct. Wildlife corridors may also act as route from which any incidents of fires within the Solar Precinct may spread.

Fires in solar facilities can potentially result in significant environmental impacts as a result of burning solar panels and the starting of bushfires. Smoke from burning of solar panels will likely be toxic and hazardous toxic. This not only results in significant impacts to air quality but can also potentially result in contamination of surfaces from the release or deposition of hazardous chemicals and materials from solar panel fires.

Fires at the Solar Precinct may also place additional pressure on emergency services in the region, necessitating increased staffing and enhanced infrastructure. As discussed in Appendix I SIA of the Draft EIS, the any incidents at the Powell Creek site would necessitate a long response time from Elliott or Tennant Creek, taking emergency services away from other duties. The Project would therefore be expected to be self-sufficient and not put further strain on limited firefighting resources (two permanent staff in Tennant Creek, volunteers, and pastoral workers).

Solar arrays would need to be offset from wildlife corridors to mitigate the risk of fires. However, this would potentially require increasing the disturbance footprint for the Solar Precinct. The presence of wildlife corridors may also potentially require a larger disturbance footprint for the Solar Precinct to reduce the operational impact of potential shading on solar arrays.

As discussed in Section 5.12.4.8, significant habitat fragmentation impacts are unlikely to occur at the Solar Precinct. For the above reasons, wildlife corridors have not been considered at the Solar Precinct.

5.12.4.17 Ghost Bat

ECNT is concerned about the risks to the Kohoonir Adit colony of ghost bats, which is the largest *known maternity site for Ghost Bat and will be located just 400m to the west of the OHTL. While Sun Cable accepts this is an important population, it makes assumptions about the impact of construction and operation of the Project (principally, the OHTLs) on this colony. For instance, Sun Cable states that the species is too small to have negative interaction with powerlines, and that the only way the proposal could have a negative impact is through noise disturbance during* construction. This assumption must be interrogated and substantiated.

5.12.4.18 Response

This comment has been considered in the significant impact assessment presented in Section 5.6.3.22. The potential impact of bats colliding with the OHTL is discussed in Section 5.12.2.21.

5.12.4.19 Baseline Data

ECNT submits that there must be baseline studies undertaken of native vegetation, threatened species and ecological communities, WQ and quantity, aquatic ecosystems, terrestrial ecosystems, and social and cultural studies, or integration of the baseline studies undertaken as part of the Strategic Regional Environmental Baseline Assessment into the EIS.

5.12.4.20 Response

The Strategic Regional Environmental Baseline Assessment was identified in the Section 5.8 Cumulative Impacts of the Draft EIS. The Proponent has not precluded consideration of the findings of the studies to inform the design and management of the Project when they become available. At the time of writing this SEIS, it is understood that the Strategic Regional Environmental Baseline Assessment studies are still in progress and the final report and database are yet to be finalised.

5.12.5 NT Field and Game Submission

NT Field and Game has taken a keen interest in this project from the time the final stage of its route was diverted from Livingstone to Gunn Point beach as much of this area is magpie goose and waterfowl habitat. Field and Game members are concerned that the OHTLs (OHTL) will pose fatal bird strike consequences for birds with large wingspans like magpie geese, brolga and jabiru, especially where it intersects Black Jungle Reserve and traditional flight paths from Quambi Lagoon and Melacca Swamp to the coastal floodplain of Shoal Bay Coastal Hunting reserve. We have contended that the variation from Litchfield to Gunn Point should be undergrounded creating a

utilities pipeline that would become a future asset that could also include water, power, communications infrastructure that the township of Murrumujuk could utilise in years to come. The 44m high towers will be an eyesore especially where they pass within 200m to 300m of Lambell's Lagoon. The sway of these cables can be quite extensive. This is what causes the major threat to our large birds as do wind turbines on brolgas in western Victoria. I am unsure if this sway has been mitigated by a reduction in the spans between towers as the corridor clearance seems to have been drastically reduced since our last meeting. I believe the undergrounding could also reduce the need to keep the corridor cleared for the next 70 years too. This ongoing disturbance will surely distribute weeds like gamba. This would reduce the ongoing costs of maintenance and the threat of cyclone damage to the OHTLs and towers. It appears that the subsea cable stretching from Gunn Point to Singapore, a distance of 4200 km will be buried in a trench, so it seems entirely feasible to me that undergrounding this 67km from Livingstone to Gunn Point is not too much of an ask by our government to save our large birds, visual amenity and prevent weed intrusion.

5.12.5.1 Response

The potential risk of avian collisions has been assessed in Section 5.4.3.2 of the Draft EIS for the OHTL Corridor and Section 5.5.4.3 for the Project Refinements. The Project will implement controls to mitigate impacts on bird mortality as a result of the OHTL Corridor as outlined in Chapter 17.

As discussed in Chapter 10 – Amenity, a Landscape and VIA (Appendix 10.1) was undertaken and included consideration of Viewpoint 7 which is adjacent to and representative of the visual amenity impacts at Lambell's Lagoon. The assessment concluded that the visual impact from this location is low as the vegetation will mostly screen the infrastructure.

Increased understanding of topography and route features indicates OHTL Infrastructure heights up to 60 m may be required to achieve optimal spans. This provides flexibility in spanning areas of significance and minimising the surface disturbance.

A utilities pipeline intended to accommodate potential future uses is likely to be impractical due to the strict engineering and safety standards and requirements that utilities are subject to. For instance, utilities such as communications and power require offsets from other utilities. Furthermore, housing multiple utilities introduces safety and operational risks. For instance, housing a water line within the same utilities pipeline as a power line introduces safety and operational risks in the event of utility faults or conduit leaks.

In order to meet the above requirements to house future proposed utilities within a utilities pipeline would therefore require a substantially large pipeline. This would therefore substantially increase the disturbance footprint of undergrounding the cable.

As discussed in Chapter 2 – Project Refinement, undergrounding of the transmission line was considered in the concept development of the Project and will not be used as a part of this project.

Undergrounding requires a trench to be installed along the OHTL Corridor route which involves significant ground penetration and potentially a larger footprint of disturbance. This is due to the need for safety consideration when completing deeper trenches, which dictate that a trench must be increased in width to allow for benching as excavations become deeper. A 67 km trench would not allow avoidance of any areas of significance as it would need to be continuous. By installing an above ground OHTL Infrastructure, there is more flexibility in spanning areas of significance and minimising the surface disturbance.

Trenching activities introduces the risk of fauna entrapment, causing physical trauma to fauna. For example, open trenches for underground utilities or other pits are known to be effective at trapping a wide variety of wildlife and often result in mortality (Ayres and Wallace, 1997; Doody et al., 2003; Woinarski et al., 2006).

A 67 km trench would require considerable excavation and earthworks which would potentially result in the following impacts:

Erosion and sedimentation impacts which can potentially impact aquatic environments

Dust and air quality impacts

Archaeological impacts due to excavation

Waste Management impacts from the large quantities of spoil produced which may not be able to be re-used

Increased GHG emissions from excavation and subsequent compacting activities

Proliferation of weeds due to ground disturbance, tracking of soils by plant traversing the corridor and potential spoil transportation.

Numerous operational factors were also considered in the concept development of the Project. Faults are more difficult to identify in the case of an underground system. It is important to conduct regular maintenance inspections of the whole line, and by undergrounding a system, this presents difficulties in being able to inspect all parts of the line. It also results in complex challenges around completing repairs if they are required. Excavation would be required to access the undergrounded cables.

An additional challenge with underground burial is that they may be impacted by flooding and soil saturation in areas where the rainfall is higher. Overhead towers are less susceptible to impacts due to flooding.

A Weed Management Plan (Appendix 5.3) has been prepared for the Project to avoid and mitigate risks of weed proliferation. This includes consideration of Gamba Grass.

5.12.6 Matthew James Farmer Submission

Risk to birds flying through the area in their natural migration route, personally I can account for 50-100 magpie geese, whistler ducks, Burdekin ducks, Jabiru's and other bird species who make my property home for large portions of the year in my paddocks, the proposed route would endanger this and have the potential to cause loss of birdlife due to collision to the lines/towers.

5.12.6.1 Response

The potential risk of avian collisions has been assessed in Section 5.4.3.2 of the Draft EIS for the OHTL and Section 5.5.4.3 for the Project Refinements. The Project will implement controls to mitigate impacts on bird mortality as a result of the OHTL as outlined in Chapter 17.

5.12.7 Michelle Nicholson Submission

There are many mango orchards which bring fruit bats and magpie geese and other critters to the area that enjoy the fruit. We currently experience regular power disruptions due to bat and bird impact on power lines. Bats hanging on these lines could cause major disruption to transmission.

5.12.7.1 Response

As discussed in Section 5.4.3.2 of the Draft EIS, a short circuit would occur where fauna are either touching two live wires, or a live and an earthed component. However, the very high voltage conductors are spread well apart (the distance between the closest is 12 m) and so the air gap between live components is considered too large to be bridged by any bird or bat species. Therefore, the hazard has not been considered any further and major disruption to transmission from bats hanging on powerlines is considered very unlikely.

5.12.8 Anonymous Submissions

5.12.8.1 Potential Impacts to Fauna

Anonymous community submissions were received regarding potential impacts to terrestrial fauna, which are summarised as follows:

Concern about OHTL impact on birds, particularly waterfowl between mango farms in the vicinity of Arnhem Highway and areas such as Lambells Lagoon, Black Jungle, Shoal Bay Coastal Reserve. Note that NT Field and Game have commented on EIS.

Concern about OHTL impacts on birdlife habitat and likelihood of birds colliding with lines/poles.

The following anonymous submissions were also received regarding potential impacts to terrestrial fauna:

What affect will these power lines and pylons erected for the OHTL have on birds, particularly waterfowl that flock between mango farms in the Arnhem Highway vicinity to areas such as Lambells Lagoon, Black Jungle, and Shoal Bay Coastal reserves? Hunting reserves at Lambells, Shoal Bay, and Howard Springs might be impacted. NT Field and Game have already made public comment on this concern.

To birds flying through the area in their natural migration route, personally I can account for 50-100 magpie geese, whistler ducks, Burdekin ducks, Jabiru's and other bird species who make my property home for large portions of the year in my paddocks, the proposed route would endanger this and have the potential to cause loss of birdlife due to collision to the lines/ towers.

I note that the Partridge Pigeon has been missed in much of the documentation, which is a vulnerable species, as has the Black Footed Tree Rat, both of which I have recorded on my property and in the woodland vicinity. I also note that the Howard River Toadlet is referred to as 'flora' in at least one table contained in the EIS.

Endangerment to the habitat of animal residents that live in the area such as the Northern Quoll, Antilopine Wallaroo, wallabies, native snakes, native lizards to name a few.

5.12.8.2 Response

The potential risk of avian collisions has been assessed in Section 5.4.3.2 of the Draft EIS for the OHTL and Section 5.5.4.3 for the Project Refinements. The Proponent will implement controls to mitigate impacts on bird mortality as a result of the OHTL Corridor as outlined in Section 5.7 combined with the commitments made in Chapter 17 – Environmental Management of the Draft EIS.

Significant Impact Assessments in accordance with the Significant Impact Guidelines 1.1 – MNES, have been undertaken for the following species mentioned in this submission:

1. Masked owl (northern mainland) (Medium OHTL) – Section 5.6.3.26
2. Red goshawk (Medium OHTL) – Section 5.6.3.33
3. Partridge pigeon (eastern) (Medium OHTL) – Section 5.6.3.30
4. Crested shrike-tit (northern) (Medium OHTL) – Section 5.6.3.20
5. Black-footed tree-rat (Kimberley and mainland NT) (Medium OHTL) – Section 5.6.3.3
6. Fawn antechinus (High OHTL) – Section 5.6.3.5
7. Arnhem Land gorges skink (*egernia*) (not addressed in the draft EIS) – Section 5.6.3.1

8. Plains death adder (High OHTL) – Section 5.6.3.31

9. Atlas moth (None OHTL) – Section 5.6.3.17.

The potential impacts of the OHTL Corridor on avian fauna has been assessed in Section 5.4.3.2 of the Draft EIS and refined in Section 5.5.4.3 of this Chapter.

The Constraints Planning and Field Development Procedure (Appendix 4.1) has been developed to minimise potential impacts to habitat of threatened species. This includes pre-clearance surveys to verify the presence of habitat or fauna, and micro-siting of Project Infrastructure to avoid or minimise (if avoidance is not possible) impacts to vegetation and habitat.

The preparation of a Flora and Fauna Management Plan forms part of the mitigation commitments for the Project as outlined in Chapter 17 – Environmental Management of the Draft EIS. This includes avoidance, mitigation, and monitoring commitments regarding potential impacts to fauna mortality, as assessed in Section 5.4.3.2 and 5.4.2.6 of the Draft EIS and Section 5.5.3.6 of this Chapter.

5.12.8.3 Land Clearing Impacts

An anonymous community submission was received regarding potential land clearing impacts, which is summarised as follows:

Notes that priority protected areas of Howard Sandplains and Black Jungle Conservation Reserve will be directly impacted by OHTL in utilities corridor. These areas are recognised as high biodiversity areas - NT Department of Environment recommends avoiding clearing or direct impacts and requires buffer zones.

The following anonymous submissions were also received regarding potential land clearing impacts:

Associated native vegetation land clearing and ground preparation during construction will negatively impact an extensive range of vulnerable and threatened species within the area of the OHTL section between Livingstone and Murrumujuk, and the converter precinct site itself. Some of these species' visit or grow, on or near, my property.

The area proposed is full of cycads and would require extensive destruction of these plant.

Given that Sun Cable acknowledge that the variation in the route of the OHTL corridor will involve significant clearing of a 66km stretch of predominantly native vegetation, 20m wide, and additional cleared area for each pylon of 100m x 60m. How will native vegetation be "reinstated" to ensure a reduced corridor following construction, of 6m wide, and 12m x 6m around each pylon?

The OHTL proposed in the Utilities corridor directly impacts the Priority Protection Area established in the Howard Sandplains SOCS, and Black Jungle Conservation Reserve. These areas are recognised as having high biodiversity value, and NT Department of Environment recommends avoiding clearing or direct impact in and around those areas, requiring mitigation with buffer zones.

5.12.8.4 Response

The section of the OHTL Corridor that is the focus of this comment is located in a Utilities Corridor that was established by the NTG for the purpose of supporting infrastructure such as OHTLs. The Proponent did not select the route of the Utilities Corridor. Thorough studies of the terrestrial ecosystem values within the Utilities Corridor section of the OHTL Corridor have been undertaken, and the Proponent has used the results to ensure that the design and construction of the OHTL Corridor will avoid impacting the most significant values present through the implementation of buffers and minimise impacts to the remainder. This includes the Darwin Cycad – see also Section 5.6.3.21. Information regarding reinstatement is provided in the OHTL Corridor Vegetation Management Framework (Appendix 5.4).

5.13 NT EPA Direction Responses

5.13.1 Further Supporting Information – Comment 1

The TOR includes matters to be addressed in the EIS, however the draft EIS deferred provision of some key information to the Supplement.

In general, further assessment and supporting information is required including (but not limited to):

terrestrial ecosystem environmental values (including matters considered under the EPBC Act)

water use and interference with a waterway

marine ecosystems

outcomes of stakeholder engagement, including how the information gaps identified in the draft EIS have been addressed.

5.13.1.1 Information Required in the Supplement

Provide an updated proposal description including a selected subsea cable corridor, OHTL route, electrode areas etc.

5.13.1.2 Response

Updated Project descriptions are provided in Chapter 2 Project Refinement. This Chapter outlines further assessment of terrestrial ecosystems undertaken for the SEIS. This includes assessment of the OHTL Route, DCS Electrode, Powell Creek Electrode and AI (refer to Sections 5.3 to 5.11).

5.13.2 Arnhem Plateau Sandstone Scrubland Complex – Comment 15

In relation to DCCEEW comment no. 4 with respect to Arnhem Plateau Sandstone Shrubland Complex TEC.

5.13.2.1 Information required in the supplement

Provide an assessment of the likelihood of occurrence of the Arnhem Plateau Sandstone Shrubland Complex TEC based on additional evidence including, but not limited to geological mapping combined with the land systems.

5.13.2.2 Response

This is addressed in Section 5.12.1.3.

5.13.3 Extent of Surveys and Assessment – Comment 16

The TOR listed a range of potential impacts and risks from the proposed action on terrestrial ecosystem values that have not been addressed by the draft EIS.

Additionally there are areas in the scope of the draft EIS that have not been assessed or surveyed, including but not limited to:

ground electrode area of 2 ha within a greater AOI comprising:

- *2500 ha of coastal area at the mouth of the Adelaide River*
- *22 500 ha west of the Solar Precinct*

railway corridor, 722 km (except for aerial survey of Bilby habitat in the southern 150 km)

route options deviating from the railway corridor at three locations

any clearing for AI.

5.13.3.1 Information required in the supplement

Provide further information about vegetation, habitat, flora and fauna values and justification of alternative and final location and extent of ground electrodes sites and other AI.

Identify the location of sensitive and significant vegetation and threatened species along the railway corridor based on ground truthing and survey results.

Provide an assessment of terrestrial ecosystem values and application of Part 2 of EP Act in locating final OHTL route.

5.13.3.2 Response

This is addressed in impact assessment in Sections 5.4 to 5.9.

5.13.4 Fibre Optic Cable Burial – Comment 17

The draft EIS talks about the option of burying the optic cable in a 1.2 m deep trench along the OHTL; however, no detail is provided in the draft EIS.

- *Excavation of a trench has the potential to act as a pitfall trap for fauna with direct mortality and indirect stressors on affected fauna.*

5.13.4.1 Information required in the supplement

Provide further information and impact assessment on any threatened fauna species from installation of the fibre optic cable, including, but not limited to:

1. *the proposed location, installation methods and timing of trenching*
2. *the duration and distance of open trenches*
3. *proposed impact avoidance and mitigation measures*
4. *proposed monitoring such as procedure for daily and general inspections and reporting.*

5.13.4.2 Response

This is addressed within the response in Section 5.12.2.9.

5.13.5 OHTL Collisions – Comment 18

The draft EIS suggests that both birds and bats can be impacted through collisions with suspended wires, with earth wires accounting for the majority of collisions involving transmission lines. Risk may be mitigated if earth wires are not used.

The draft EIS states the requirement to 'evaluate the need for markers in the Flora and Fauna Management Plan' as part of an adaptive monitoring and mitigation and to install markers/bird diverters on wires to reduce collisions in high risk areas, for example wetlands near Gunn Point.

The draft EIS provides an example of where bird and bat collision markers could occur with a focus on known wetlands in the northern section of the OHTL only – no detail is provided for potential bird and bat strikes outside the Litchfield municipality.

The DEPWS submission (Flora and Fauna, and Parks Divisions) identify bird species at particular risk: include migratory, threatened and recreationally important species within Shoal Bay Coastal Reserve and associated with Adelaide River wetlands near Gunn Point and Lake Woods near the Solar Precinct.

The draft EIS considers the risk of collision from the movements of large colonies of macro bats, black and little red flying foxes in the context that mitigation measures useful for reducing bird collisions will also benefit flying foxes. The draft EIS notes that the location of colonies is not well documented and that colonies may occur near towns.

5.13.5.1 Information required in the supplement

Provide information and assessment of the potential impacts to birds and bats from power line collisions, including but not limited to:

evidence based information about macro- and micro-bat movements and collision risk, including risk in the vicinity of the Kohinoor Adit (near Pine Creek)

location(s) of high potential collision with OHTL by birds and bats

proposed location and type of collision avoidance markers for birds and bats throughout the length of the OHTL and within the Solar Precinct

justification of impact avoidance and mitigation measures.

5.13.5.2 Response

This submission has been addressed in the DEPWS comment regarding OHTL avian collisions (Section 5.12.2.21). In addition to the response supplied at Section 5.12.2.21 and the significant impact assessment for the Ghost Bat presented in Section 5.6.3.22, a table presenting a desktop assessment of sections of the OHTL which could represent bird and/or bat collision hotspots is presented in Table 5-64. These sections of the OHTL – in addition to any sections that are identified during micro-siting as being proximate to flying fox roosts – will be the focus of adaptive monitoring and mitigation within the Flora and Fauna Management Plan.

Table 5-64: Potential bird / bat collision hotspots along the OHTL Corridor

KP	Features
0-70	Lake Woods
160-180	Ephemeral basins
195-215	Waiakbohn Waterhole
315-340	Unnamed waterway and wetlands
410-415	Unnamed waterway
450-460	Katherine River
470-475	Unnamed waterways
495-500	Ferguson River
510-520	Wardie Creek and tributaries
540-545	Pine Creek township wetlands
610-615	Unnamed wetlands
620-635	Unnamed waterways
655-660	Adelaide River
695-705	Manton Dam
740-787	Black Jungle, Shoal Bay Coastal Reserve

5.13.6 Lake Effect – Comment 19

The TOR states that the 'lake effect' should be assessed as a potential impact.

In the draft EIS, section 5.4.1.2 states that because the usual extent of Lake Woods is over 10 km away, it is not considered to be within the area of influence. The DEPWS Flora and Fauna Division submission provides context to the draft EIS statement and recommended that Lake Woods is incorporated into the Area of Influence.

Lake Woods is frequently referred to as an internationally important wetland. It is recognised under EPBC Act as a globally important wetland for waterbird migration, breeding and populations. Lake Woods is listed as a Nationally important wetland in the Directory of Important Wetlands in Australia (DIWA).

5.13.6.1 Information required in the supplement

Provide further information to adequately address the TOR including but not limited to:

1. *the assessment of the area surrounding the footprint that has potential to be impacted by the proposed action including the 'lake effect' on threatened and migratory birds caused by solar panels*
2. *relevant evidence and justification for any changes or commitments required.*

5.13.6.2 Response

This is addressed within the response in 5.12.2.14.

5.13.7 Weed Management Plan – Comment 20

Indirect impacts from introduction or spread of invasive flora, noting that not all invasive flora are classified as weeds under the Weed Management Act 2001.

The NT EPA is assessing the proposed action under an accredited process with the Australian Government, as such the Weed Management Plan must be consistent with the actions identified in the relevant TAPs.

The DEPWS Weed Management Branch submission provides comment about ongoing weed control, successes and requirements around Lake Woods and Longreach Waterhole as relevant to the proposed action.

5.13.7.1 Information required in the supplement

Provide further information relating to the potential for significant impact from invasive flora on biodiversity values, including but not limited to:

4. *assessment of relevant Terrestrial ecosystem values accounting for the five listed grasses*
5. *Australian Government TAP to reduce the impacts on northern Australia's biodiversity by the five listed grasses*
6. *the timing and implementation of weed monitoring of tracks and roads that intersect creeks and drainage lines within the area of influence on Lake Woods in the context of:*

DEPWS comments

Lakes Woods as a globally important wetland for waterbird migration, breeding and populations

existing weed control plan actions under NT agreement and Australian Government funding

5.13.7.2 Response

This is addressed in the updated Weed Management Plan (Appendix 5.3).

5.13.8 Individual Fauna Impact Assessments – Comment 21

The TOR required that the known, likely, and potential presence of threatened species under the EPBC Act and the TPWC Act be described. Appendices O and P provide a synopsis of desktop assessments of threatened species that are not further described in Chapter 5 of the draft EIS. The likelihood of occurrence of the following species has been assessed in the draft EIS as shown in brackets, the potential for impact on these species should be assessed in more detail in the supplement to the draft EIS:

1. *masked owl (northern mainland) (Medium OHTL)*
2. *red goshawk (Medium OHTL)*
3. *partridge pigeon (eastern) (Medium OHTL)*
4. *crested shrike-tit (northern) (Medium OHTL)*
5. *black-footed tree-rat (Kimberley and mainland NT) (Medium OHTL)*
6. *fawn antechinus (High OHTL)*

7. *Arnhem Land gorges skink (egernia) (not addressed in the draft EIS)*
8. *plains death adder (High OHTL)*
9. *Atlas moth (None OHTL).*

Appendix P of the draft EIS notes that the Atlas moth is not within the footprint of the proposal. However, the proposal may impact on this threatened species due to the close proximity of the cable transition facilities to its primary habitat. DEPWS records the Atlas moth from Tree Point Conservation Area adjacent to the proposal footprint. Habitat restoration is conducted by Larrakia Rangers due to the importance of the sensitive monsoon vine thicket habitat that occurs approximately 500 m south of the cable transition facilities.

5.13.8.1 Information required in the supplement

Provide information to address the TOR requirements:

1. *For the nine species listed in this direction including individual impact assessments*
2. *in accordance with submissions on the draft EIS and the NT EPA direction based on:*
   - *existing relevant information where noted in submissions*
   - *additional surveys in accordance with Table 2 of this direction.*

All species should be assessed against the impact criteria in the Significant Impact Guidelines 1.1 – MNES and relevant current literature.

5.13.8.2 Response

This Chapter has been prepared to address the TOR requirements for the terrestrial ecosystem aspect with regards to the Project Refinements outlined in Chapter 2. The EIS TOR Cross Reference Table (Appendix A1.6) has been prepared to detail where the TOR requirements have been addressed in this SEIS.

Additional surveys undertaken in accordance with Table 2 of the NT EPA Direction are outlined in Section 5.13.13 and detailed in the Supplementary Ecology Report - Part 1 - Threatened Species (Appendix 5.1).

Significant Impact Assessments undertaken in accordance with the Significant Impact Guidelines 1.1 – MNES for the nine species identified in the above NT EPA Direction are provided in the following sections:

1. Masked owl (northern mainland) (Medium OHTL) – Section 5.6.3.26
2. Red goshawk (Medium OHTL) – Section 5.6.3.33
3. Partridge pigeon (eastern) (Medium OHTL) – Section 5.6.3.30
4. Crested shrike-tit (northern) (Medium OHTL) – Section 5.6.3.20
5. Black-footed tree-rat (Kimberley and mainland NT) (Medium OHTL) – Section 5.6.3.3
6. Fawn antechinus (High OHTL) – Section 5.6.3.5
7. Arnhem Land gorges skink (*egernia*) (not addressed in the draft EIS) – Section 5.6.3.1
8. Plains death adder (High OHTL) – Section 5.6.3.31

9. Atlas moth (None OHTL) – Section 5.6.3.17.

Where existing relevant information is noted in submissions, relevant cross references to where they are discussed are provided in the submission response.

5.13.9 Impacts of Solar Precinct Infrastructure – Comment 21

Additional infrastructure associated with the Solar Precinct (identified in sections 2.4.3.3 to 2.4.3.6) are not adequately defined in the scope of the proposal such that limits assessment of potential impacts on biodiversity.

5.13.9.1 Information required in the supplement

Conduct impact assessment for relevant threatened species based on the location of additional infrastructure as directed at items #2 to #6.

5.13.9.2 Response

This is addressed in Sections 5.4 to 5.9.

5.13.10 Sensitive and Significant Vegetation – Comment 22

The draft EIS identifies significant vegetation in the proposal footprint comprising: rainforest, sand sheet heath, riparian, (coastal) vine thicket, mangroves and large trees with hollows suitable for fauna.

The location within the area of influence of some sensitive and significant vegetation has not been addressed in the draft EIS, these include, but are not limited to:

- *sand sheet heath south of the mapped area towards Edith River.*
- *coastal vine thicket at the Cable Transition Facilities*
- *riparian vegetation along waterways of stream order 3 and below.*

The draft EIS provides a land clearing commitment within boundaries approved under relevant permits, in accordance with the NT and Pastoral Land Clearing Guidelines.

Table 17-5 identifies avoidance and mitigation measures for the crossing of large rivers; however, does not include how clearing of riparian vegetation will be consistent or inconsistent with relevant land clearing guidelines.

5.13.10.1 Information required in the supplement

Provide detailed information about the location and extent of sensitive and significant vegetation in all areas proposed for land clearing including, but not limited to:

1. *works required for power pole pads, access tracks and any underground works*
2. *additional areas as defined in the scope*
3. *demonstrate consistency with the NT and Pastoral Land Clearing Guidelines, including all buffers for land clearing*
4. *where inconsistent with the land clearing guidelines demonstrate how the environment decision making hierarchy has been applied*
5. *reinstatement works required to improve the environmental condition of the utilities corridor following work undertaken at or near sensitive and significant vegetation.*

5.13.10.2 Response

The location and estimated extent of the requested sensitive and significant vegetation types are provided.

Sand sheet heath

Sand sheet heath is a restricted vegetation community that occurs around the Greater Darwin Region. The mapped extent of sand sheet health habitat available on the NTG database does not extend south of Elizabeth River proximate to Livingstone. The Draft EIS included mapping using the publicly available NTG dataset and thus any potential community south from that point was not considered based on the available dataset and EcOz consultants previous experience and expert knowledge of the region. If there is a potential for sand sheet health habitat to occur in the Project OHTL Corridor footprint these patches would be associated with mapped wetland areas and would be identified through pre-construction surveys as per the Appendix 4.1 Constraints Planning and Field Development Procedure. In addition, if sand sheet health was identified, appropriate mitigation measures for this habitat consistent with those committed to for the same habitat type in the Utilities Corridor would be applied as necessary. These will be specified in the Project's EMP and are re-stated in Table 5-65.

Table 5-65: Terrestrial ecosystems – Avoidance, mitigation, monitoring, and reporting commitments (with relevance to sand sheet health)

Impact	Avoidance	Mitigation	Monitoring	Reporting
Loss of vegetation and habitat **Loss of significant vegetation**	Significant vegetation and threatened species habitat will be assigned an appropriate constraint rating and managed in accordance with the Constraints Planning and Field Development Produce (Appendix 4.1). Micro-siting of OHTL structures to avoid significant vegetation where possible. Preferential use of existing cleared areas where possible for temporary construction requirements such as access tracks, laydown areas and construction camps.	Clearance only within the boundaries approved in licences obtained to clear native vegetation as per the *Planning Act* 1999 (NT) and/or the *Pastoral Land Act 1992* (NT). Re-instatement of all temporary construction footprints and follow-up weed control post-construction. Post-operations rehabilitation of cleared areas as per the Decommissioning and Rehabilitation Plan.	Visual inspections during clearing to ensure clearing is within approved boundaries. Results recorded, along with any photographs. Rehabilitation inspections following first wet season post-construction or until vegetation is established and sites are stable.	Records of clearing undertaken External reporting in accordance with environmental approval conditions

Coastal vine thicket

Coastal vine thicket proximate to the Cable Transition Facilities was recorded during field surveys conducted by EcOz between 27 September and 5 October 2021. The results were detailed in Appendix P of the Draft EIS. Vine thicket patches were observed within land unit 9c[16] which supports coastal dune formation. Whilst no thicket occurs within the direct disturbance footprint of the Underground Cable Corridor, a few patches were nearby (20 m from boundary of corridor) (Figure 5-44).

Figure 5-44: Photograph of dunes with minor patches of monsoon vine thicket within land unit 9c

As specified in this SEIS Chapter 2, the Underground Cable Corridor has since reduced in size from 70 m width to 63 m width which places this habitat at a further distance from the construction footprint of 35 m width which will be sited within the corridor. The construction of the Underground Cable Corridor is temporary with an estimated time frame of less than 12 months. As assessed in the Draft EIS, the potential impacts to the area of influence adjacent to the trenching works relate to dust deposition modelled to affect an area of approximately 100 – 380 m away, and erosion/ top soil migration as runoff. The short-term duration of dust deposition will be washed off the vegetation during the wet season and is unlikely to harm these thicket patches. As specified in the Draft EIS Chapter 4 and re-stated in Table 5-66, the mitigation measure commitments are routine and proven effective to ensure residual impacts to the monsoon vine thicket patches are minor.

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Land Unit	Landform class	Landform description	Vegetation
9c	Marine	Dunes and beach ridges	Grassland of *Sporobolus virginicus*; some pockets of monsoon vine thickets.

Table 5-66: TEQ – Commitments (Draft EIS Chapter 4)

Impact	Avoidance	Mitigation	Monitoring	Reporting
Erosion and topsoil migration caused by disturbance of soils	Solar Precinct and DCS footprint is located and flat land above the maximum flood extent of 0.01% AEP (i.e., 1-in-1000-year flood event). Stormwater system design criteria is for discharge at similar rates to existing conditions. OHTL structures will be micro sited to avoid watercourses or drainage lines, or in areas where surface drainage could be affected. Roadside drainage and culverts will be installed in accordance with accepted road design standards.	Implementation of site-specific ESCP, which will be commensurate with the risk of erosion in each location. Reinstatement of OHTL Corridor and Cable Transition Facilities footprints post-construction with native vegetation species and erosion controls.	Annual post wet season monitoring of rehabilitation success until disturbed areas stabilised. Visual inspections of drainage structures, discharge points and site boundaries following rain events. Post-wet season inspections of footprint and maintenance of emerging erosion issues.	Internal record keeping and reporting in accordance with ESCP.

In considering the NT Land Clearing Guidelines suggested buffers for significant vegetation, the field survey results indicate that these patches are low value as they are discrete and fragmented. In this case, the suggested buffer of 50 m cannot be implemented as the footprint is less than 50 m distance. However, considering the potential impacts can be adequately managed with mitigation measures and direct disturbance is avoided, the residual impact to monsoon vine thicket is considered minor.

Riparian vegetation

The following information presented has been derived from Appendix 5.5 Memorandum: Riparian Vegetation Assessment.

The revised OHTL Corridor crosses 128 watercourses over the entire 783 km length. One hundred and seven watercourses crossed by the OHTL are ‘minor’ intermittent streams and the remaining 21 are ‘major’ watercourses of creeks and rivers. Table 5-67 provides the classifications of the watercourses including their stream orders and associated recommended buffers under the NT Land Clearing Guidelines (NTG, 2021).

Table 5-67: Classifications associated with watercourse crossings along the OHTL Corridor as per the definitions in the NT Land Clearing Guidelines (NTG, 2021)

Riparian Class	Hierarchy # Minor	Hierarchy # Major	Total # Watercourse Crossings	Stream Order	Recommended Buffers (m)
Intermittent streams	60	1	61	1	25
Intermittent streams	31	0	31	2	50
Creeks	11	2	13	3	100
Creeks	0	11	11	4	100
Rivers	0	11	11	5	250
Rivers	0	1	1	6	250

It is not possible to completely avoid clearance in the riparian area and the recommended buffer area due to the need for accessibility for construction and ongoing operation/maintenance (i.e., an access track is permanent and is needed for operations/maintenance activities). However, there may be opportunities to reduce impacts to riparian vegetation by implementing avoidance and mitigation measures.

The Draft EIS and SEIS makes the avoidance commitment that OHTL structures (poles and lattice towers) will not be placed in any of the 128 watercourses that are crossed to avoid permanent disturbances of hydrological flows and riparian vegetation if present. For 21 watercourses classified as 'major,' the OHTL will span these watercourses and riparian vegetation to avoid direct disturbance during construction and operation of the OHTL. The OHTL conductor wires can span approximately 200 m to 450 m lengths depending on the locations wind loading safety requirements. Spanning can be used to avoid disturbances at watercourse crossings at much as possible, however there may be locations where access for constructability may be required. In addition, depending on the total width of the watercourse and riparian vegetation extent, the outer edges of a riparian area may be disturbed and/or buffer requirements under the NT Land Clearing Guidelines may not always be able to be adhered to. Appropriate ESC measures set out in an Erosion Sediment Control Plan and Environmental Management Plan will mitigate any impacts to riparian vegetation impacted by such conditions. Engineering solution may be sort where appropriate to enable spanning of significant vegetation type, i.e., placing OHTL structures closer together to get higher conductor wire clearance to span taller significant vegetation.

For the 107 minor watercourses, the required temporary clearing of a 22 m wide construction corridor including a permanent 6 m wide access track designed in accordance with Austroads standards will transect the watercourse. Where possible, existing access tracks that transect the watercourse or that route around the watercourse will be used. Where significant habitats exist, the Draft EIS commits to avoiding disturbance by spanning these and siting infrastructure to the maximum distance possible to mitigate impacts. All areas disturbed during construction at watercourse crossings will be reinstated to encourage the recolonisation of riparian habitat and only a 6 m wide access track retained.

To ensure electrical safety clearances are maintained during the operation of the OHTL, vegetation management is required along an approximate 38 m wide corridor in accordance with the OHTL Vegetation Management Framework (Appendix 5.4). As a result, vegetation management may be required at watercourse crossings where riparian vegetation exceeds the electrical safety clearance height and the level of risk to riparian vegetation habitat is low.

To provide clarity on the estimated extent of riparian vegetation undergoing land clearing for the construction of the OHTL, Appendix 5.5 Memorandum: Riparian Vegetation Assessment was prepared. This memorandum employed a remote sensing rapid assessment approach using normalised difference vegetation index (NDVI) to map the modelled extent of riparian vegetation within the OHTL Corridor and estimated the amount of disturbance based on the construction and operations footprints. The method employed was based on the methodology presented in Alaibakhsh et al., 2017 and is consistent with the NT Guidelines and Field Methodology for Vegetation Survey and Mapping (Brocklehurst et al., 2007). See Appendix 5.5 for an explanation for the detailed methodology and limitations of the modelling.

The outcome of the evaluation was the modelled NDVI area indicative of estimated riparian vegetation (hereinafter 'riparian vegetation') at each watercourse crossing in the OHTL Corridor (see Appendix 5.5 Appendix A). The results of the estimated extent of riparian vegetation in different Project footprint including when the EIS avoidance/mitigation commitments are applied are presented in (Table 5-68).

Table 5-68: Estimated total modelled NDVI areas indicative of riparian vegetation at watercourse crossings within the OHTL Corridor and 250 m buffer. Note: Footprints can overlap per figure above.

Estimated Extent of Riparian Area Disturbance (ha)							
Hierarchy	**# Watercourse Crossings**	**Total Estimated NDVI Riparian Area (ha) at Watercourse Crossings**	**Construction Footprint**	**Construction Footprint with EIS commitments**	**Operation Footprint**	**Operations Footprint with EIS commitments**	**Vegetation Management Footprint**
Minor	107	23.27	13.5	8.84	2.79	2.33	12.57
Major	21	20.03	11.62	0	2.4	0	10.82
Total	**128**	**43.3**	**25.11**	**8.84**	**5.2**	**2.33**	**23.38**

The results show that applying the EIS commitments can reduce the disturbance extent by up to 20 % for 'minor' watercourses and 100 % for 'major' watercourse as a best-case scenario (i.e., riparian vegetation can be spanned with no disturbance).

The calculations of the percentage of riparian vegetation in the OHTL Corridor compared with riparian vegetation in the surrounding 250 m buffer area at all watercourse crossings were also evaluated. The average percentage of riparian vegetation in the OHTL Corridor compared to the surroundings is approximately 9.87 %. and median is approximately 6 %. This is without the consideration of direct disturbance footprints and EIS avoidance commitments which would reduce all percentage values significantly.

The clearing of land for the OHTL will result in a loss of a small extent of riparian vegetation, however, as the OHTL footprint is narrow, the proportion of habitats that will be impacted in any given area is very small. The nature of the OHTL disturbance is also relatively small-scale, localised and there is some flexibility as to where disturbance occurs.

The estimated riparian vegetation requiring clearing will be subject to permit applications under the *Planning Act 1999* (NT) and *Pastoral Land Act 1992* (NT) and will adhere to the NT Land Clearing Guidelines. Where inconsistencies with the Guidelines occur, such as in the case that buffers are not able to be implemented, mitigation and monitoring measures as specified in the Environmental Management Plan will be adopted to minimise impacts to the surrounding areas.

The results of the memorandum verify the following impact assessment conclusions presented in the Draft EIS and SEIS considering habitat fragmentation and loss or deterioration of significant vegetation in Table 5-69.

Table 5-69: Summary of EIA for the OHTL Construction Impacts relevant to riparian vegetation.

Impact	Likelihood	Scale	Duration	Magnitude	Value rating	Certainty	Residual Rating
Loss of vegetation and habitat	**Likely** Loss will occur	**Limited** Narrow 22 m wide linear corridor	**Medium Term** Land cleared during construction will be reinstated with native vegetation, excepting for a 6m wide access track.	**Minor** Narrow zone of disturbance. Structure placement will be used to avoid clearing riparian vegetation.	**Medium** Riparian vegetation, sandsheet heath, and monsoon rainforest present in corridor is locally important.	**High** Ecological surveys undertaken in Utilities Corridor section where key values are present.	**Moderate**
Habitat fragmentation	**Possible** OHTL Utilities Corridor will traverse intact habitats	**Limited** Fauna in proximity to the corridor may be affected but no wider impact to viability of fauna populations.	**Long Term** Vegetation cleared for construction will gradually regrow, but fragmentation will persist for an extended period.	**Moderate** Narrow unfenced corridor will not limit movement for most species.	**Medium** Sensitive values present in footprint are riparian, sand sheet heath, rainforest, and the Black Jungle Reserve.	**High** Ecological surveys undertaken.	**Minor**

5.13.11 Offsets – Comment 23

The TOR require offsets to be identified and demonstrated to be consistent with the NT Offset framework and the EPBC Act environmental offsets policy where residual impact remains.

The draft EIS recognises the restricted range species and those with localised core habitat which are known or have potential to occur in the OHTL corridor or surrounding areas and provides a commitment to survey these species to inform micro-siting of poles avoidance of features such as isolated patches of threatened plants, significant vegetation or active nests.

Further, the draft EIS identifies that adoption of the precautionary principle, the impact of the proposed action to threatened species biodiversity values, and any requirement for offsets. Results of surveys being conducted during the preparation of the draft EIS will be used to re-assess residual impacts from the proposed action before making any final conclusions in relation to meeting the NT EPA's objective for Terrestrial ecosystems and any offset requirements.

5.13.11.1 Information required in the supplement

Provide the results of surveys and impact assessment regarding threatened species and land clearing of sensitive or significant vegetation with justification of residual impact. Identify any requirements for offsets with consideration the NT Offset framework and EPBC Act environmental offsets policy.

5.13.11.2 Response

Comprehensive significant impact assessments are presented in Sections 5.6.3 and 5.6.3.15 for more than 40 threatened species. The conclusion is that development of the Project will not have a significant impact on any threatened species. Moreover, impacts to sensitive or significant vegetation will be avoided except when it is not possible to do so at a few river crossings (as discussed in Section 5.5.3.2). The residual impact to threatened species and significant vegetation will be minimal, and consequently these values do not require offsets.

5.13.12 Noise and Lighting Impacts to Fauna – Comment 26

Changes to marine fauna behaviours as a result of noise or lighting from proposal areas are described in the draft EIS.

*The draft EIS considers the impact from lighting to be low based on the absence of important turtle breeding habitat on Gunn Point and within 20 km from the proposed action using criteria from the National Light Pollution Guidelines for Wildlife Including Marine turtles, Seabirds and Migratory Shorebirds (*Cwth *of Australia 2020).*

Based on threatened species data held on NR Maps, turtle species (flatback and green turtles) are recorded within the intertidal zone and less than 200 m from the shore crossing site.

The DEPWS Flora and Fauna Division submission notes the low topography of the Darwin convertor site and cable transition facilities and recommends that infrastructure design follows National Light Pollution Guidelines.

The draft EIS concludes that noise impacts as a result of cable laying and burial are likely to have a short-term deterrent impact on marine animals, but are unlikely to result in any significant impacts to the marine ecosystem. The impact from noise from construction of the shore crossing facilities has not been assessed.

5.13.12.1 Information required in the supplement

Provide information about noise and lighting impacts during construction and operational stages of the DCS and Cable Transition Facilities, based on referenced literature and ecological project reports as relevant.

5.13.12.2 Response

Noise and lighting impacts to the marine ecosystems, including a response to this NT EPA direction comment is addressed in Chapter 9 Marine Ecosystems.

A significant impact assessment for Migratory Birds has been undertaken in Chapter 15 – MNES. A significant impact assessment specific to Critically Endangered, Endangered and Vulnerable Migratory Shorebird species has been undertaken in Section 5.6.3.14. Consideration of noise and lighting impacts are included for both these significant impact assessments.

Any impacts to do with light and noise in the operational phase of the project are minimal and infrequent.

5.13.13 Table 2 Additional information to be included in the Supplement to the draft EIS in accordance with regulation 136(1)(b) - Survey requirements

#	Species	Advice and clarification about whether surveys are required for the Supplement to draft EIS. Note that pre-clearance surveys may also be required pending the environmental assessment.	Response
Flora			
1.	*Cycas armstrongii*	DEPWS modelling for high density cycad stands is available for Gunn Point. Areas south of this study area have not been modelled and the presence of high density stands (>400 stems/ha) should be clarified by the proponent through modelling or survey of the clearing footprint. If high density stands are identified within the clearing footprint, additional surveys are required to clarify the significance of the stand from a local and regional context.	This comment has been considered in the significant impact assessment presented in Section 5.6.3.21.
2.	*Ptychosperma macarthurii*	This species is confined to spring-fed rainforests and has been well surveyed in the NT. Surveys are not required and impacts to known sites containing the species should be avoided.	This comment has been considered in the significant impact assessment presented in Section 5.6.3.4.
3.	*Typhonium praetermissum*	The Draft EIS mentions “a total of 75 *Typhonium praetermissum* plants (~6.8% of the sub-population) are within the DCS and Cable Transition Facilities direct disturbance footprints and will be lost during construction; and that there may be some capacity to modify the design locally to minimise this loss.” Clarify whether the project design will be modified to avoid the loss of Typhonium plants (75 individuals) and proposed mitigation actions if the plants are impacted. The draft EIS mentions that *T. praetermissum* surveys of the OHTL footprint were conducted at a time the species was not detectable and so relied on the modelling information and experience for its assessment. The draft EIS provided a commitment to a follow-up targeted flora survey to verify presence/absence of *T. praetermissum* and inform the Supplement to the draft EIS. Targeted surveys to assess and contextualise the potential significant impacts on the *T. praetermissum* at the subpopulation and species level. These surveys must be undertaken at the appropriate time of year to optimise detection	This comment has been considered in the significant impact assessment presented in Section 5.6.3.34.

#	Species	Advice and clarification about whether surveys are required for the Supplement to draft EIS. Note that pre-clearance surveys may also be required pending the environmental assessment.	Response
4.	*Acacia praetermissa*	Records and potential habitat for *Acacia praetermissa* are found in the Pine Creek route deviation options and targeted survey is required in those areas.	This comment has been considered in the significant impact assessment presented in Section 5.6.3.16.
5.	*Cleome insolata*	Targeted surveys are required for *Cleome insolata* in the appropriate fruiting/seeding season (i.e., March-April).	This comment has been considered in the significant impact assessment presented in Section 5.6.3.19.
6.	*Utricularia dunstaniae*	The NT EPA requires reassessment of the likelihood of *Utricularia dunstaniae* presence in the OHTL Corridor. If suitable habitat (sand sheet heath) for the species is found to occur within the OHTL Corridor then surveys at an appropriate time of year are required to confirm if the species is present.	This comment has been considered in the significant impact assessment presented in Section 5.6.3.35.
7.	*Typhonium taylori*	Records of *Typhonium taylori* are found within 7km of the project footprint and potential habitat is likely to exist in the Howard Sand Plains. The NT EPA requires reassessment of the likelihood of *T. taylori* presence in the OHTL Corridor. If suitable habitat for the species is found to occur within the OHTL Corridor, then surveys are required to confirm if the species is present.	This comment has been considered in the significant impact assessment presented in Section 5.6.3.13.
8.	*Stylidium ensatum*	DEPWS has undertaken surveys for this species and identified patches of *Stylidium ensatum* within the OHTL route at Gunn Point. The area south of Arnhem Highway contains areas modelled at having a high-moderate likelihood of supporting the species. The model shows high-moderate likelihood habitat within the deviations at Adelaide River. Furthermore, the DCCEEW database (SPRAT) shows that the species distribution is likely to occur south of Darwin to Hayes Creek. Surveys for this species are required (June to August) where the deviation overlaps with DEPWS modelling and DCCEEW species distribution information. The Katherine and Pine Creek deviations are not modelled as having a high-moderate likelihood of supporting the species and surveys are not required in these areas.	This comment has been considered in the significant impact assessment presented in Section 5.6.3.12.

#	Species	Advice and clarification about whether surveys are required for the Supplement to draft EIS. Note that pre-clearance surveys may also be required pending the environmental assessment.	Response
9.	*Helicteres macrothrix*	The model shows high likelihood habitat for *Helicteres macrothrix* within the deviations at Adelaide River. Surveys for this species are required where the deviation overlaps with DEPWS high likelihood habitat modelling and the species distribution shown in the DCCEEW database (SPRAT). The Katherine and Pine Creek deviations are not modelled as being "highly likely" to support the species and surveys are not required in these areas.	This comment has been considered in the significant impact assessment presented in Section 5.6.3.7.
Fauna			
10.	Howard River Toadlet (*Uperoleia daviesae*)	The NT EPA requires reassessment of the likelihood of *Uperoleia daviesae* presence in the OHTL Corridor. If suitable habitat (sand sheet heath) for the species is found to occur within the OHTL Corridor, then surveys are required to confirm if the species is present. Surveys need to be conducted at the appropriate time when conditions are suitable at the site, indicated by presence of the species at a known local reference site for species detection.	This comment has been considered in the significant impact assessment presented in Section 5.6.3.25.
11.	Plains death adder *(Acanthophis hawkei)*	DEPWS does not have likelihood modelling for this species. Habitat for this species in the Top End is associated with black soil floodplains with cracking clay soils. Suitable habitat for the species occurs east of the OHTL alignment north of Goode Road, Wak. The OHTL alignment is located approximately 1.8km from the nearest area of habitat within Black Jungle Conservation Reserve. As habitat for this species is not expected to occur within the alignment, surveys are not required. However, the DCCEEW database shows that known distribution for this species occurs east and west of the OHTL Corridor on its north portion and overlaps with the OHTL Corridor in the Manton Dam recreation area. A suitable habitat and species likelihood assessment in those areas are required to determine whether important population or habitat critical for the species will be impacted by the project.	This comment has been considered in the significant impact assessment presented in Section 5.6.3.31.

#	Species	Advice and clarification about whether surveys are required for the Supplement to draft EIS. Note that pre-clearance surveys may also be required pending the environmental assessment.	Response
12.	Gouldian finch (*Erythrura gouldiae)*	The NT EPA requires that the assessment of significant impact for Gouldian finches is undertaken to incorporate all potential Gouldian finch habitat, including core foraging and breeding habitat within 20 km of the proposal. This should include the size (e.g., ha) of Gouldian finch habitat that will be directly impacted by the project. The assessment results are to inform whether suitable foraging and nesting habitat is likely to be present or absent and whether surveys of hollow bearing trees in those areas of habitat are required. Significant impact assessments under the *EPBC Act* must be in accordance with the *EPBC Act* Significant Impact Guidelines 1.1, while surveys should be in accordance with Survey guidelines for Australia's threatened birds: Guidelines for detecting birds listed as threatened under the *EPBC Act*.	This comment has been considered in the significant impact assessment presented in Section 5.6.3.6.
13.	Grey falcon (*Falco hypoleucos)*	Grey falcon will nest on tall infrastructure. Identify nests through surveys, report the locations in the Supplement, realign infrastructure to > 300m from active nests and avoid activities within 300m if the nest has activity. If avoidance is not proposed, demonstrate how the environment decision-making hierarchy has been addressed and assess the potential impact.	This comment has been considered in the significant impact assessment presented in Section 5.6.3.24.
14.	Red goshawk (*Erythrotriorchis radiatus)*	Red goshawks will nest in large trees close to water. If clearing is required in riparian vegetation near water, surveys are required to identify nests, report the locations in the Supplement, realign infrastructure to > 100m from active nests and avoid activities within 100m if the nest has activity. If avoidance is not proposed, demonstrate the environment decision-making hierarchy has been addressed and assess the potential impact.	This comment has been considered in the significant impact assessment presented in Section 5.6.3.33.

#	Species	Advice and clarification about whether surveys are required for the Supplement to draft EIS. Note that pre-clearance surveys may also be required pending the environmental assessment.	Response
15.	Masked owl (northern mainland) (*Tyto novaehollandiae kimberli*)	Masked owls nest in large trees in Eucalyptus miniata/E. tetrodonta open woodland and rainforest vegetation. If clearing is required in suitable habitat (woodland with large hollow bearing trees, rainforest and riparian vegetation), surveys are required to inform micro siting structures avoids to large trees and active nests. If avoidance is not proposed, demonstrate the environment decision-making hierarchy has been addressed and assess the potential impact.	This comment has been considered in the significant impact assessment presented in Section 5.6.3.26.
16.	Crested shrike-tit (*Falcunculus frontatus whitei)*	The TOR required the known, likely, and potential presence of this species to be described in the draft EIS. The assessment should inform whether suitable nesting habitat is likely to be present and whether surveys of large trees in those areas of habitat are required (most likely around Katherine and Sturt Plateau). The presence of suitable habitat (extensive patches of woodland with bigger trees and healthier canopy) may be determined by desktop or require ground surveys depending on data availability. If the proponent determines surveys are required, discuss the survey method with Flora and Fauna Division and DCCEEW prior to commencement.	This comment has been considered in the significant impact assessment presented in Section 5.6.3.20.
17.	Bare-rumped sheath-tailed bat (*Saccolaimus nudicluniatus)*	DCCEEW's database shows the Bare-rumped sheath-tailed bat (vulnerable species under the *EPBC Act*) is likely to occur in the north portion of the OHTL from Gunn point to Adelaide River. Surveys are not required but avoidance and mitigation measures for the species should be provided. For instance, pre-clearance surveys of active roost trees (large trees with hollows) should be carried out prior to clearing to avoid eliminating such trees and no-go zones should be implemented around those trees to avoid disruption during breeding. Surveys are not required for the Partridge pigeon as these species occur in low densities in woodland habitats. The clearing will remove some habitat but does not require extensive areas of habitat to be removed or fragmented significantly. DCCEEW's database shows the Northern brushtail possum (vulnerable species under the *EPBC Act*) is likely to occur in the north portion of the OHTL from Gunn point to Elsey	This comment has been considered in the significant impact assessment presented in Section 5.6.3.18.
18.	Partridge pigeon (eastern subspecies) (*Geophaps smithii smithii*)		This comment has been considered in the significant impact assessment presented in Section 5.6.3.30.
19.	Northern brushtail possum (*Trichosurus vulpecula arnhemensis*)		This comment has been considered in the significant impact assessment presented in Section 5.6.3.28.

#	Species	Advice and clarification about whether surveys are required for the Supplement to draft EIS. Note that pre-clearance surveys may also be required pending the environmental assessment.	Response
20.	Black-footed tree-rat (*Mesembriomys gouldii gouldii)*	Creek and known distribution of the species overlaps the OHTL in the Black Jungle deviation. Surveys are not required but avoidance and mitigation measures for the species must be provided. The Northern brushtail possum depends on large hollow-bearing trees for nesting. Therefore, pre-clearance surveys for suitable trees should be undertaken before clearing to avoid destruction of nesting habitat. DCCEEW's database shows the Black-footed tree-rat (endangered species under the *EPBC Act*) is likely and known to occur in the north portion of the OHTL from Gunn point to Katherine. A suitable habitat assessment for the species is required. Surveys are to be conducted where suitable habitat is identified, to determine whether the OHTL, or associated infrastructure will clear areas of occupancy of the species and to inform how much of this area will be directly impacted by the clearing. DCCEEW's database shows that the Fawn antechinus (vulnerable species under the *EPBC Act*) is likely to occur in the north portion of the OHTL from Gunn point to Katherine. Surveys of this species are required to confirm whether an important population of this species will be impacted by the project.	This comment has been considered in the significant impact assessment presented in Section 5.6.3.3.
21.	Fawn antechinus (*Antechinus bellus*)		This comment has been considered in the significant impact assessment presented in Section 5.6.3.5.
22.	Northern quoll (*Dasyurus hallucatus)*	Northern quolls have been recently recorded near the OHTL and there is a high likelihood individuals will move through the corridor. The proposal, however poses a low risk to the species as it does not exacerbate existing threats (cane toads). DCCEEW's database shows that the Northern quoll (endangered species under the *EPBC Act*) is likely and known to occur in the north portion of the OHTL from Gunn point to Elsey Creek. While northern quolls do not have highly specific habitat requirements, the National Recovery Plan for the Northern Quoll notes habitat critical to survival is that where northern quolls are least exposed to threats or least likely to be in the future. Therefore, surveys of the species are required to determine whether: The OHTL will clear AOO of the species and how much of this area will be directly impacted by the clearing, and Habitat critical for the species overlaps with the OHTL and associated infrastructure.	This comment has been considered in the significant impact assessment presented in Section 5.6.3.11.

#	Species	Advice and clarification about whether surveys are required for the Supplement to draft EIS. Note that pre-clearance surveys may also be required pending the environmental assessment.	Response
23.	Greater bilby (*Macrotis lagotis)*	The electrode AOI contains suitable habitat for the greater bilby and requires assessment by the proponent. Surveys of the electrode area (and any other areas in the potentially suitable habitat that are proposed to be cleared such as construction camps that haven't been surveyed) are required to confirm presence/absence and measures to avoid impacts on individuals. The NT EPA requires surveys for this species in areas where potential suitable habitat intersects with OTHL structures and associated infrastructure to determine whether the OHTL will directly impact on an important Greater bilby population or habitat critical for the species. Pre-clearance surveys of the solar precinct and electrode area may also be required to determine if individuals are using the area prior to any works commencing. The supplement must include protocols and measures in the case greater bilbies are found during pre-clearance surveys.	This comment has been considered in the significant impact assessment presented in Section 5.6.3.23.
24.	Nabarlek (*Petrogale concinna canescens)*	This closest population of this species is restricted to east Arnhem Land. The DCCEEW database shows that the likely distribution of the species overlaps with the OHTL between Hughes and Fergusson River. A suitable habitat assessment and likely surveys of the species are suggested to determine whether the OHTL and associated infrastructure will clear areas of occupancy of the species and, if so, the area impacted.	This comment has been considered in the significant impact assessment presented in Section 5.6.3.8.
25.	Arnhem Land gorges skink (*Bellatorias obiri)*	Table 5 of the TOR required the known, likely, and potential presence of this species to be described in the draft EIS. The draft EIS does not mention this species at all. The closest known population of this species is restricted to the sandstone gorges of Nitmiluk National Park. The OHTL and deviations will not impact any habitat for this species. No surveys are required.	This comment has been considered in the significant impact assessment presented in Section 5.6.3.1.
26.	Atlas moth *(Atticus wardi)*	Table 5 of the TOR required the known, likely, and potential presence of this species to be described in the draft EIS. The draft EIS identified 'none' likelihood of occurrence in proposal footprint; however, the species is known to occur in the sensitive and significant vegetation, vine thicket, identified by the draft EIS as occurring ~350 m from the cable transition facility at Gunn Point Beach. Key threats are fire and incursions of grassy weeds. No surveys are required.	This comment has been considered in the significant impact assessment presented in Section 5.6.3.17.

#	Species	Advice and clarification about whether surveys are required for the Supplement to draft EIS. Note that pre-clearance surveys may also be required pending the environmental assessment.	Response
Sensitive or significant vegetation			
27.	Rainforest	Relevant mapping was used to identify and avoid mapped rainforest patches. No surveys are required.	Noted.
28.	Sand sheet heath	Mapped sand sheet heath occurs within and downstream of the utilities corridor and extends south beyond the range of mapping towards Edith River and may occur in the proposal footprint along the railway corridor. Surveys of this vegetation are required along the railway corridor near Edith River and any proposed deviations, to inform the location and extent of vegetation, avoidance and minimisation measures and minimisation measures to avoid or justify any land clearing required.	Subsequent correspondence with DEPWS clarified that their concern was that mapping in the Draft EIS did not show the entire extent of sandsheet heath mapping to near 'Elizabeth River' (i.e., not 'Edith River', which is near Katherine and well beyond the distribution of sandsheet heath). The full extent of sandsheet heath mapping – and its relevance to the project footprint – has been included in Appendix 5.1.
29.	Riparian vegetation	The draft EIS identifies 154 watercourse crossings (Table 6-2) and significant riparian vegetation at 14 crossings (Table 5-4). The draft EIS identifies land clearing of a 22 m services corridor along the majority of the OHTL (s2.5.3.3) and survey requirements for the avoidance measure of micro-siting OHTL structures to avoid significant vegetation where possible (2.5.2.3) and mitigation through conducting land clearing within boundaries approved under relevant permits. The NT Land Clearing Guidelines have riparian buffer requirements for all stream orders ranging from 25 to 250 m. Riparian vegetation occurs along the OHTL associated with perennial and ephemeral waterways and the draft EIS has not identified how land clearing buffers would be applied to construction of the services corridor. Surveys are required to determine the extent of riparian vegetation along the OHTL, including any proposed deviations. Survey results should inform measures to avoid, minimise or offset potential impacts.	The interactions between riparian vegetation and the project footprint are discussed in Section 5.5.3.2.

#	Species	Advice and clarification about whether surveys are required for the Supplement to draft EIS. Note that pre-clearance surveys may also be required pending the environmental assessment.	Response
30.	Vine thicket	Coastal vine thicket occurs within and adjacent to the proposed shore crossing footprint. The draft EIS includes results of surveys of the area proposed to be cleared. No surveys are required.	Noted.
31.	Mangroves	Mangroves occur adjacent to the AOI for ground electrodes. The NT Land Clearing Guidelines specify a buffer to mangroves. The draft EIS does not discuss whether the electrode footprint avoids mangroves and the recommended buffer. Confirm that impacts to mangroves and the recommended buffer are avoided, or if it cannot be avoided, demonstrate the environment decision-making hierarchy has been considered and discuss the residual impact.	The DCS Electrode Site avoids disturbing mangroves and is beyond the recommended buffer.
32.	Vegetation containing large trees with hollows suitable for fauna	A number of threatened fauna identified above require large trees with hollows, the NT Land Clearing Guidelines recognise "that the development of hollows and the size of trees which are suitable for use by fauna will be dependent on the climate and species of tree and fauna using hollows". As stated in the TOR, all clearing of native vegetation should complete the NT Land Clearing Guidelines. Assess the potential impacts of the proposed action against section 4.4.6 of the NT Land Clearing Guidelines. Surveys may be required to determine the extent of vegetation containing large trees with hollows suitable for fauna in the proposal footprint OHTL, including any proposed deviations. Survey results should inform measures to avoid, minimise or offset potential impacts.	Measures to minimise impacts to trees containing large hollows are summarised in Section 5.5.3.2 and discussed in detail in Appendix 4.1 Constraint Planning and Field Development Procedure.

#	Species	Advice and clarification about whether surveys are required for the Supplement to draft EIS. Note that pre-clearance surveys may also be required pending the environmental assessment.	Response
Marine ecosystems			
33.	Benthic communities and habitats (BCH) (seagrass, hard corals, macroalgae, filter feeder and bare seafloor habitats)	The proponent's modelling by predictive benthic habitat mapping tool requires site-specific mapping to ground truth BCH to validate the modelled predictions. The proponent has committed to undertake benthic surveys for the proposed cable route (either option A or B) to verify predicted modelling outputs. Include the details of the timing, method and benthic habitat surveys results in the Supplement. Ensure the survey and assessment: Includes collection of underwater video transect data at a sufficient density to accurately map the extent of benthic habitats within the cable corridor, the predicted zone of impact and the zone of influence at an appropriate scale (see guidance below). identifies and describes the type and spatial extent of benthic substrates and biota within the zone of impact and zone of influence provides sufficient ground-truth data to assess the accuracy of the DEPWS predictive benthic habitat model is undertaken in accordance with the following guidance: National Environmental Science Program Field Manuals for Marine Sampling to Monitor Australian Waters National Intertidal/Subtidal Benthic (NISB) Habitat Classification Scheme Collaborative and Annotation Tools for Analysis of Marine Imagery and Video (CATAMI) classification scheme. Includes feasibility assessment of confining cable laying in nearshore waters to the late wet season.	These are addressed above under Chapter 9 - Marine Ecosystems

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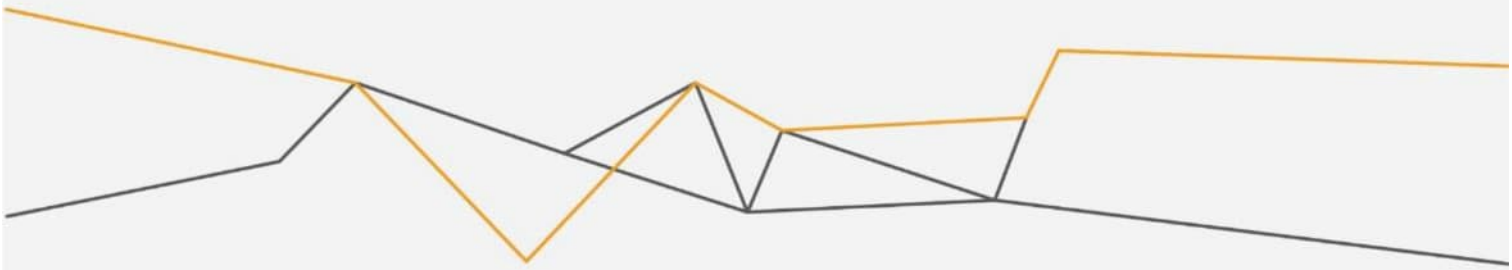

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