T21-2263 Wurrumiyanga Environmental Assessment

DEPARTMENT OF INFRASTRUCTURE, PLANNING & LOGISTICS

DOCUMENT CONTROL RECORD

Job	EZ23143
Document ID	237258-24
Author	Sarah Ryan

DOCUMENT HISTORY

Rev	Reviewed by	Approved by	Issued to	Date	Changes
1	Glen Ewers	Glen Ewers	DIPL	29 April 2022	Minor edits
2	Glen Ewers	Glen Ewers	DIPL	20 May 2022	Minor edits
3	Glen Ewers	Simon Aylott	DIPL as part of Wurrumiyanga subdivision referral	19 April 2024	New PMST report and review of Section 3.
4	Britanny Crescentino	Glen Ewers	DIPL as part of Wurrumiyanga subdivision referral	22 April 2024	Section 3.1.3 added – explanation of gap analysis
5	Glen Ewers	Britanny Crescentino	DIPL as part of Wurrumiyanga subdivision referral	11 June 2024	New PMST report – species added to listings.

Recipients are responsible for eliminating all superseded documents in their possession.

EcOz Pty Ltd.
ABN: 81 143 989 039
Level 1, 70 Cavenagh Street
DARWIN NT 0800
GPO Box 381, Darwin NT 0800

Telephone: +61 8 8981 1100
Facsimile: +61 8 8981 1102
Email: ecoz@ecoz.com.au
Internet: www.ecoz.com.au

RELIANCE, USES and LIMITATIONS

This study, report and analyses have been based on the information available to EcOz Environmental Consultants at the time of preparation. EcOz Environmental Consultants accepts responsibility for the report and its conclusions to the extent that the information was sufficient and accurate at the time of preparation. EcOz Environmental Consultants does not take responsibility for errors and omissions due to incorrect information or information not available to EcOz Environmental Consultants at the time of preparation of the study, report or analyses.

EXECUTIVE SUMMARY

The Department of Infrastructure, Planning and Logistics (DIPL) is planning to construct a new residential subdivision on the western boundary of Wurrumiyanga, Bathurst Island. This development requires gravel and fill material, to be sourced from three nearby potential mineral extraction areas. DIPL engaged EcOz Environmental Consultants (EcOz) to undertake a terrestrial ecological assessment of the project area.

Following desktop and subsequent field surveys, significant environmental values were detected throughout the project area, at all proposed development sites. Impact to values can be mitigated through avoidance of areas with environmental values by remaining within the existing disturbance footprint.

Recommended mitigation measures to avoid impacts on environmental values are detailed in Section 4 and are summarised as:

- Confirm the identification of *Typhonium* plants detected through genetic testing
- Consult with DEPWS on the significance of the newly-detected *Typhonium* sub-population
- Avoid areas with significant environmental values in all potential extraction areas by reducing the proposed extraction footprint
- Apply buffer zones as per the *Land Clearing Guidelines* as a minimum buffer distance to all streams and drainage lines
- Implement weed management actions pre, post and during construction, including hygiene practices.
- Rehabilitate exhausted or closed extraction areas.

TABLE OF CONTENTS

Appendices

Tables

Figures

Acknowledgements

Thank you to the Tiwi Land and Marine Rangers – Willie Rioli, Colin Kerinaiua and Adam Tipiloura – for their assistance in the field surveys.

1 INTRODUCTION

The Department of Infrastructure, Planning and Logistics (DIPL) is planning to construct a new residential subdivision on the western boundary of Wurrumiyanga, Bathurst Island. This development requires gravel and fill material, to be sourced from three nearby potential extraction areas. Collectively, these areas are referred to throughout this report as the 'project area' – Figure 1.

DIPL has engaged EcOz Environmental Consultants (EcOz) to undertake a terrestrial ecological assessment of the project area to:

- Understand the existing environment of the project area, through locating, mapping and recording vegetation communities, flora and habitat for fauna, particularly threatened species.
- Identify potential impacts of the development on the terrestrial biodiversity (particularly on any threatened species and communities).
- Suggest mitigation measures to minimise impacts and identify constraints.
- Address legislative requirements including the *Environmental Protection and Biodiversity Conservation (EPBC) Act 1999*, the *Territory Parks and Wildlife Conservation Act 1976* and the *Environmental Protection Act 2019.*

The objectives of the terrestrial ecology assessment are to:

- Describe and characterise the existing biodiversity within, and adjacent to, the project area.
- Identify which threatened species are likely to occur within the project area.
- Present the methods and results of targeted threatened species surveys within the project area to determine the presence (or likely presence) of threatened species.
- Identify any other ecological values, particularly significant vegetation types.

This report aims to provide detailed ecological information that will underpin management decisions. It consolidates all matters of ecological significance identified from desktop research and field investigations, with particular consideration for priority species which may require management actions beyond the general minimal impact standards.

Path: Z:\01 EcOz_Documents\04 EcOz Vantage GIS\EZ21274 - T21-2263 -Wurrumiyanga - Environmental Assessment\01 Project Files\Fig 1 Project location.mxd

Figure 1. Map and location of the project area

2 EXISTING ENVIRONMENT

The existing environmental values within the project area are described in this section. This information will be used in Section 3 to inform the 'likelihood of occurrence' of threatened species, and as a basis for the design of the ecological surveys undertaken. The information for this section mostly comes from desktop databases and reports, and was supplemented by a site visit in February/ March 2022

2.1 Land use

There are four geographically-separated sites within the overall project area – Table 1.

Table 1. Sites within the project area

Site name	Area (ha)
Subdivision	60.3
Potential extraction area 1 (Extract 1)	2.5
Potential extraction area 2 (Extract 2)	72.4
Potential extraction area 3 (Extract 3)	9.2
Total	**144.3**

Land use within the project area varies across each site. Overall, the project area is highly disturbed, vegetation is comprised of grass weeds (17.5 ha) and regenerated native vegetation, with only a small proportion (5.4 ha) of remnant vegetation around the boundaries of each site. Specifically:

- The proposed subdivision development area is previously-disturbed vacant land. Past land uses have included a community swimming hole (C. Kerinaiua pers. comms), waste rock stockpiles and other signs of disturbance.
- The potential extraction areas 1 and 3 are old gravel pits that have not been used for an estimated 40 years in some areas (based on the large trees now established on top-soil stockpiles).
- Potential extraction area 2 encompasses the active township landfill, disturbed areas from previous gravel extraction, and areas of dumped domestic and construction waste.

2.2 Climate

The Tiwi Islands region has a tropical climate with a distinct dry season (approximately April to October) and wet season (November to April). The Tiwi Islands have the highest rainfall in the NT with an annual average rainfall in the region of 1,972 mm. The closest long-term Bureau of Meteorology (BOM) climate station on Bathurst Island is at Point Fawcett (station number 200731). Figure 2 shows average annual data for rainfall, maximum and minimum temperature.

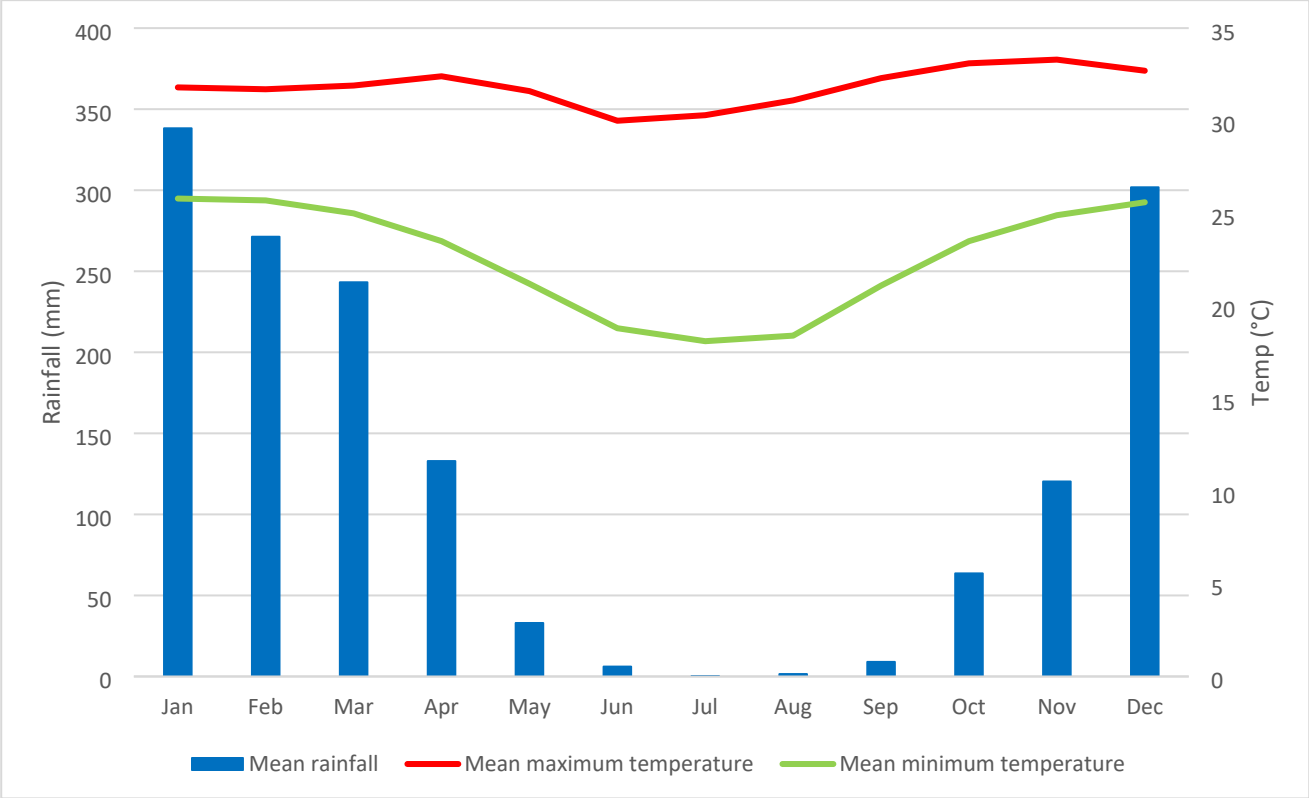


Figure 2. Long-term weather data for Point Fawcett to January 2022

2.3 Bioregion

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 (NSW 2003). NT bioregions are described in Baker et al. (2005).

The project area occurs within the Tiwi Coburg bioregion which is characterised by its coastal vegetation and tall Eucalyptus open forests on sandy lateritic plains and rises. The Tiwi Islands are home to a large number of endemic flora and fauna species.

2.4 Surface water

The project area lies over two catchments, one draining north and the other south to the coast – Figure 6. The proposed sub-division, potential extraction areas 1 and 2 are located in the northern catchment, and potential extraction area 3 is located in the southern catchment.

The site visit in March 2022 found:

- Flowing, first-order streams and drainage lines within potential extraction area 2, including run-off from the landfill – Figure 5. Some areas likely only contain flows after rainfall events.
- Man-made / previously-disturbed areas with standing water within the subdivision, and potential extraction areas 1 and 2 – as pictured in Figure 3, Figure 4 and Figure 5.
- Drainage land units (see Section 2.6) which were inundated within the subdivision, and potential extraction areas 1 and 2.
- A swimming hole within the proposed subdivision area used by the Wurrumiyanga community.

In accordance with the *Land Clearing Guidelines (DEPWS 2021a)* buffers of 25 m have been applied to both first order streams – Figure 9; however, a larger buffer is recommended for the stream in the north-west of potential extraction 2 due to the potential for erosion and land slips.

Man-made swamp – subdivision

Swimming hole – subdivision

Figure 3. Photographs of surface water within the subdivision

Figure 4. Photograph of surface water pooling in the disturbed area in potential extraction area 1

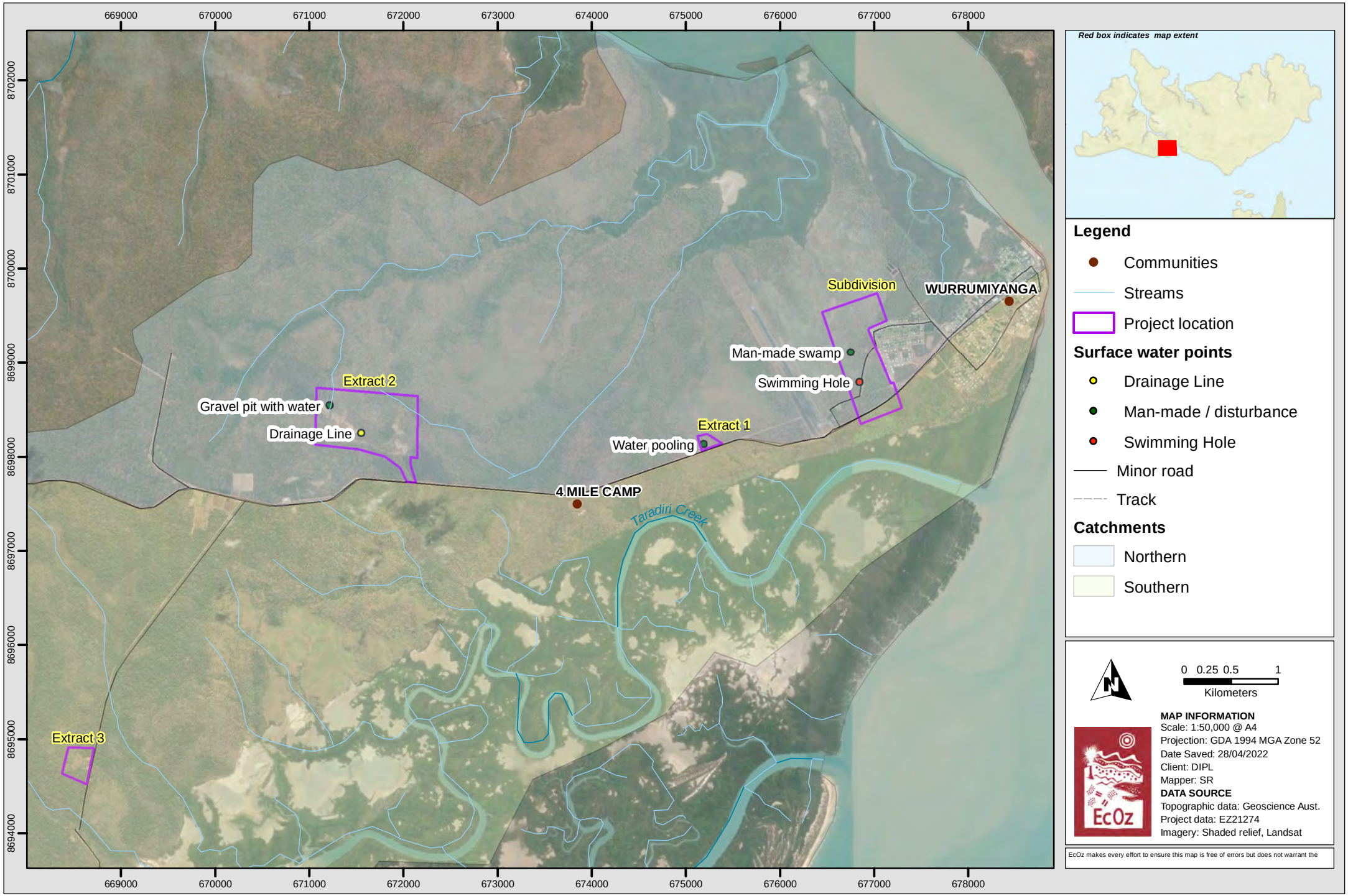
Gravel pit with water – potential extraction area 2

Drainage line – potential extraction area 2

North-east stream – potential extraction area 2

North-east stream – potential extraction area 2

Figure 5. Photographs of surface water within potential extraction area 2



Path: Z:\01 EcOz_Documents\04 EcOz Vantage GIS\EZ21274 - T21-2263 -Wurrumiyanga - Environmental Assessment\01 Project Files\Fig 6 Surface water.mxd

Figure 6. Map of drainage lines and surface water within the project areas

2.5 Significant areas

Sites of Conservation Significance

The NT Government has identified a number of Sites of Conservation Significance (SOCS) – the most important sites for biodiversity conservation for the NT. The project area is within the Tiwi Islands SOCS which covers the entire Tiwi Islands and is considered to be of international significance (Harrison et al. 2009). Due to the isolation and climatic extremes (high rainfall) the Tiwi Islands support a number of endemic and threatened terrestrial species. The isolation of the Tiwi Islands also provides protection from threats the same species and habitats encounter on the mainland.

Indigenous Protected Area (IPA)

In 2019, consultation began with Tiwi Islanders to consider the Tiwi Islands for inclusion within the National IPA network. Consultation for the IPA is ongoing, with plans to include 90% of the Tiwi Islands for conservation and cultural uses.

2.6 Land units

A land unit is a reasonably homogenous part of a land surface, distinct from surrounding terrain with consistent properties in landform, soil and vegetation (Jessop & King 1997). As such, each land unit has a characteristic pattern on aerial imagery. These are at a significantly smaller scale than a bioregion (i.e. bioregions constitute many different land systems). Their scale is useful for identifying habitat features that may support threatened species and sensitive vegetation types.

In this report, land units are used for the basis of the threatened species 'likelihood of occurrence' assessment. Land units provide a finer level of detail than any other type of regional mapping data.

Land unit mapping of the region was undertaken by Olsen (1980) at a scale of 1:50,000. Twelve land units are mapped as occurring within the project area. These were ground-truthed during the site visit. Rapid assessment sites were undertaken in each land unit – complemented by photo-point sites – to confirm the vegetation types and their extents. These sites were selected at points representative of the land unit within the project area – Figure 7. Features assessed at each rapid assessment site include:

- Landform – indicating topography of the land, aspect and slope (%).
- Soil and landform types based on surface characteristics (i.e. presence of surface gravel/rock outcrops or inundation areas) and digital photos of surface soils.
- Drainage potential (rapid, well or poor).
- Broad vegetation description for characterisation to a standard that is equivalent to Level 5 in the National Vegetation Information System, and in line with the *NT guidelines and field methodology for vegetation survey and mapping* (Brocklehurst et al. 2007). Within each stratum (upper, mid and ground), the three dominant species were recorded and general structure was noted.
- Disturbance – presence of weeds, fire history and signs of feral animals.

A total of 12 rapid vegetation assessments were undertaken within each twelve existing land units, and an additional 13 photo-points were visited during the survey – see Figure 7.

The survey results are summarised in Table 2 and their extents mapped in Figure 7. Full land unit descriptions based on field investigations can be found in Appendix E. Where remnant vegetation was intact, field observations were consistent with land unit mapping. In disturbed areas, there was inconsistency – e.g. in potential extraction area 2, land unit 7a1 was mapped but not found to occur; disturbance in potential extraction area 1 had altered the area to the point that a representative site was not within the area.

Table 3 shows the proportion of each land unit within all of the components of the project area. Construction of the housing development will primarily occur within land units 4c and gravel extraction from 3b.

Table 2. Summary of the land units relevant to the project area

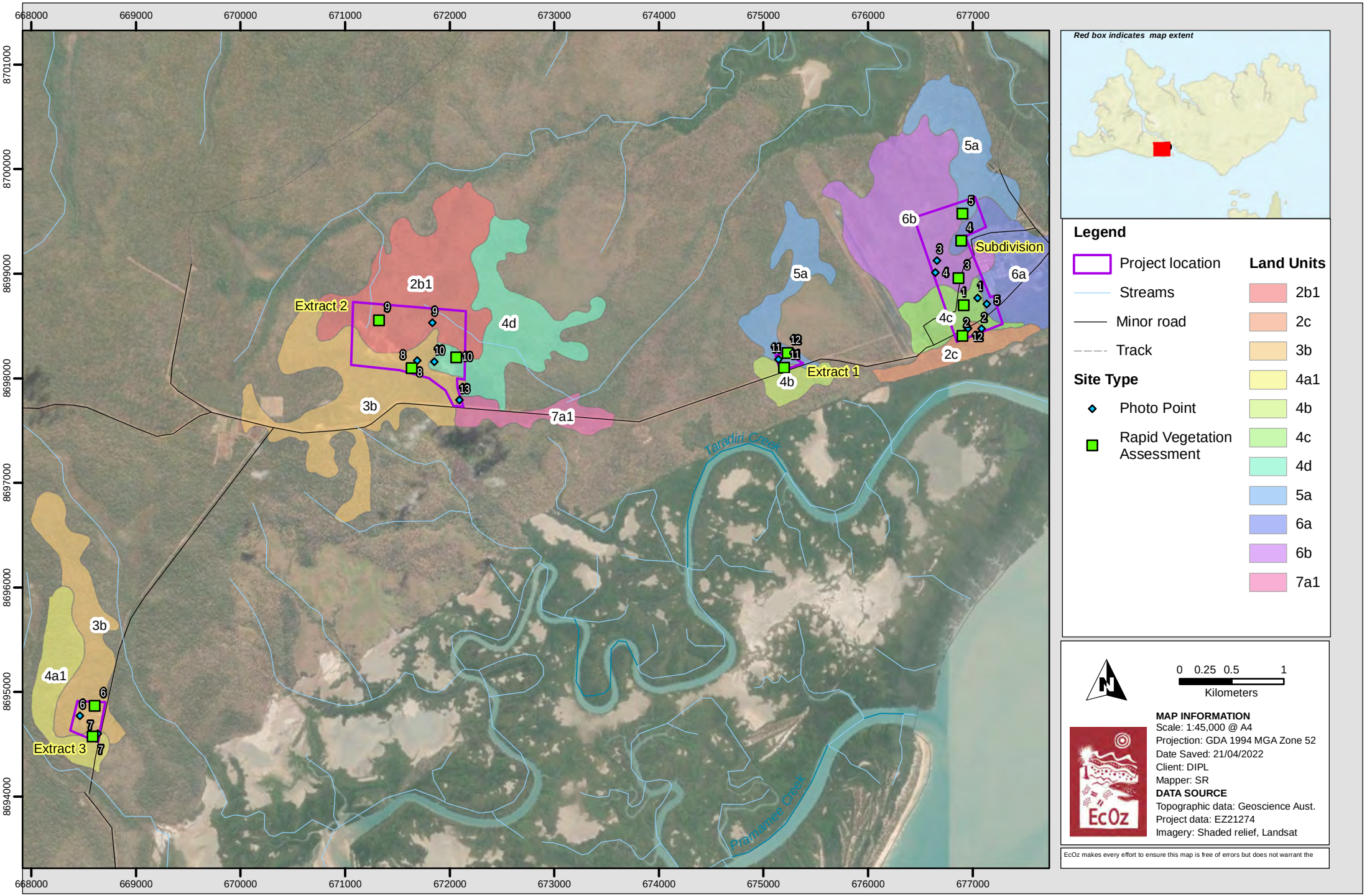
Land unit	Description	Landform	Soil	Vegetation	Field Observations
2b1	Low hills	• Ridges and associated slopes, relief to 50m • Slopes 5 – 15% • Common ferricrete outcrop, 20 – 80% surface gravels • Excessively well drained, rapid run-off	Kandosols	Woodland to open forest with *Eucalyptus tetrodonta, Eucalyptus miniata*, and *Corymbia bleeseri* dominant. Scattered occurrence of lower trees including *Corymbia polysciada, Erythrophleum chlorostachys* and *Terminalia ferdinandiana*. Shrubs include *Planchonia careya, Cycas armstrongii, Livistona humilis* and *Cochlospermum fraseri*. Grass species are *Chrysopogon latifolius, Aristida spp*. and *Sorghum plumosum*.	Consistent with land unit mapping.
2c	Low hills	• Rugged terrain above littoral area and below plateau surface • Slopes 5 – 15% • 0 – 5% surface gravel • Moderately well drained	Vertosols	Woodland with *Eucalyptus oligantha* as the dominant tree species, with occasional *Corymbia nesophila* and *Eucalyptus tetrodonta*. Other species include *Erythrophleum chlorostachys* and *Acacia sp*. Shrubs include *Planchonia careya, Brachychiton paradoxum* and *Grevillea spp*. Grasses include *Bothriochloa bladhii, Imperata cylindrica, Mnesithea rottboellioides* and *Chrysopogon latifolius*.	Consistent with land unit mapping.
3b	Rises	• Undulating terrain associate with the rugged areas, commonly broad rises between drainage lines below the plateau surface • Slopes less than 5% • Rare ferricrete outcrops, 10 – 60% surface gravels • Well to excessively well drained, rapid run-off	Kandosol	Open forest with *Eucalyptus miniata* usually dominant but *Eucalyptus tetrodonta* may be common in localised areas. Common associated species include *Corymbia nesophila, Corymbia bleeseri, Corymbia confertiflora* and *Erythrophleum chlorostachys*. Under-story of *Acacia spp., Corymbia foelscheana, Petalostigma pubescens, Planchonia careya* and *Pandas spp.* Grasses include *Chrysopogon latifolius* and *Eriachne triseta.*	Consistent with land unit mapping.
4a1	Plains	• Gentle colluvial slopes frequently abutting drainage lines or river/mangrove margins • Slopes less than 3% • No rocky outcrops or surface gravels • Well drained	Kandosol	Woodland to open forest with *Eucalyptus miniata* dominating with *Eucalyptus tetrodonta* less frequently. Understory of trees include *Petalostigma pubescens, Livistona humilis* and *Acacia spp.* Characteristic dense shrub layer of *Brachychiton paradoxum, Planchonia careya, Grevillea decurrens* and *Cycas armstrongii*. Grasses are *Chrysopogon latifolius* and *Sorghum plumosum*.	Consistent with land unit mapping.

Land unit	Description	Landform	Soil	Vegetation	Field Observations
4b	Plains	• Flat to gently sloping areas in similar site position to 4a1 units • Slopes less than 2% • Very rare rock outcrop, 20 – 80% surface gravels • Moderately well to well drained	Kandosol	Open forest dominated by *Eucalyptus miniata* and *Corymbia nesophila*. The understory is dominated by *Terminalia ferdinandiana, Erythrophleum chlorostachys, Grevillea pteridifolia, Pandanus spp.* and *Melaleuca spp*. Common grasses are *Eriachne triseta*, *Sorghum plumosum* and *Imperata cylindrica*.	Highly disturbed in potential extraction 1.
4c	Plains	• Gentle slopes, occasionally below rugged terrain • Slopes less than 3% • No surface gravels • Moderately well drained	Kandosol	Woodland with *Eucalyptus oligantha* dominant together with *Corymbia papuana*, *Eucalyptus grandifolia* and *Corymbia foelscheana*. Understory of *Brachychiton paradoxum, Cochlospermum fraseri* and *Planchonia careya*. Common grasses are *Mnesithea rottboellioides*, *Imperata cylindrica, Alloteropsis semialata, Bothriochloa bladhii, Chrysopogon fallax, Chrysopogon latifolius* and *Sorghum plumosum.*	Consistent with land unit mapping.
4d	Plains	• Long slopes found below 2b1, 2b2 and occasionally 3b land units. • Slopes less than 2% • 50 - 80% surface gravel • Imperfectly drained	Kandosol	Woodland of *Eucalyptus tetrodonta* dominant with *Corymbia nesophila* and *Eucalyptus miniata.* Sparse understory includes *Buchanania obovata* and *Acacia sp* as the main shrubs, also includes *Petalostigma pubescens, Pandanus sp, Planchonia careya* and *Grevillea sp*. Grasses are commonly *Chrysopogon latifolius, Chrysopogon fallax* and *Sorghum plumosum*.	Consistent with land unit mapping and extended into area mapped as 7a1.
5a	Plains	• Flat to gently sloping terrain lying between upland terrain and littoral areas or drainage lines, can be dissected by drainage channels • Slopes up to 3% • Very rare rock outcrop, 20 - 80% surface gravels • Poorly drained	Hydrosols	Woodland dominated by *Melaleuca sp*, commonly *Melaleuca viridiflora* with the occasional *Eucalyptus tetrodonta* and *Corymbia nesophila*. Other species include *Acacia sp* and *Planchonia careya*. *Sorghum plumosum* is the main grass species, others include *Imperata cylindrica*, *Chrysopogon fallax*, *Chrysopogon latifolius* and *Eriachne sp*.	Consistent with land unit mapping. High disturbed in potential extraction area 1.
6a	Drainage systems	• Broad drainage basins at low elevations in landscape • Slopes less than 1% • No surface gravels, slight debil debil surface condition • Poorly drained	Hydrosols	Woodland with *Melaleuca viridiflora* dominant with *Corymbia nesophila* and *Corymbia papuana* emergent as tall trees. Shrubs are rare except for *Pandanus spp.* The grasses are *Eragrostis sp. Eriachne sp*. and *Chrysopogon sp*.	Consistent with land unit mapping.

Land unit	Description	Landform	Soil	Vegetation	Field Observations
6b	Drainage system	• Broad drainage floors and basins at low elevations in landscape • Slopes less that 1% • 20 – 40% surface gravel in patches • Poorly drained	Hydrosols	Low open shrubland, dominated by *Melaleuca viridiflora*. Other species include *Brachychiton paradoxum*, *Eucalyptus sp* suckers are common, as are *Acacia sp*. *Chrysopogon fallax, Themeda australis, Cymbopogon bombycinus* and *Eriachne spp* are the main grasses.	Consistent with land unit mapping.
7a1	Drainage systems	• Drainage flats, associated creeks and drainage lines • Negligible slope • No rock outcrop or surface gravels, slight debil-debil surface appearance • Poor drainage, inundated for considerable periods during the wet season. Very slow run-off	Hydrosols	Woodland dominated by *Eucalyptus tetrodonta* with *Corymbia nesophila*, *Corymbia ptychocarpa* and *Lophostemon lactifluus* forming the understory of lower trees, dense in places. Grasses are *Aristida spp*, in open areas *Imperata cylindrica*.	Not present – area mapped as 7a1 was represented by 4d.

Table 3. Table of land units by area

Land Unit	Project Site	Area impacted (ha)	Land unit (ha)	% land unit impacted
2b1	Potential extraction area 2	40.1	155.6	25.8%
2c	Subdivision	2.5	30	8.3%
3b	Potential extraction area 2	23.7	157.3	15.0%
	Potential extraction area 3	8.1	81.4	9.9%
4a1	Potential extraction area 3	1.1	54.7	2.1%
4b	Potential extraction area 1	0.5	20.9	2.3%
4c	Subdivision	15.6	37.5	41.5%
4d	Potential extraction area 2	8.2	102.2	8.0%
5a	Potential extraction area 1	2.0	48.4	4.2%
	Subdivision	3.3	64.5	5.1%
6a	Subdivision	10.9	90.0	12.1%
6b	Subdivision	28.0	155.6	18.0%
7a1	Potential extraction area 2	0.4	32.1	1.3%
	Total	**144.3**	**1,030.2**	**14.0%**



Path: Z:\01 EcOz_Documents\04 EcOz Vantage GIS\EZ21274 - T21-2263 -Wurrumiyanga - Environmental Assessment\01 Project Files\Fig 7 Land Units and Veg Site.mxd

Figure 7. Map of land unit assessment with rapid assessment and photo-point sites

2.7 Sensitive vegetation types

In the NT, sensitive vegetation types are those considered significant under the *Land Clearing Guidelines* (DENR 2019) due to their unique and/or inherently high biodiversity values. They are rainforest, vine thicket, closed forest, riparian vegetation, mangroves, monsoon vine forest, sandsheet heath and vegetation containing large trees with hollows suitable for fauna.

Based on desktop analysis and the site visit in March 2022, the only sensitive and significant vegetation type occurring within the project area is large hollow-bearing trees / old growth forest.

Desktop analysis of the NT Government surface water dataset did not show any watercourses within the project area. However, as explained in Section 2.4, two first order streams were identified in potential extraction area 2 during the field visit – Figure 9. The vegetation in the surrounding areas was continuous up to the water's edge and around the watercourses, with no discernible change in vegetation structure or floristic composition. The stream in the north-western corner was within a deep gully line, with vegetation and land slips within the gully – Figure 8. Neither watercourse supports riparian vegetation.

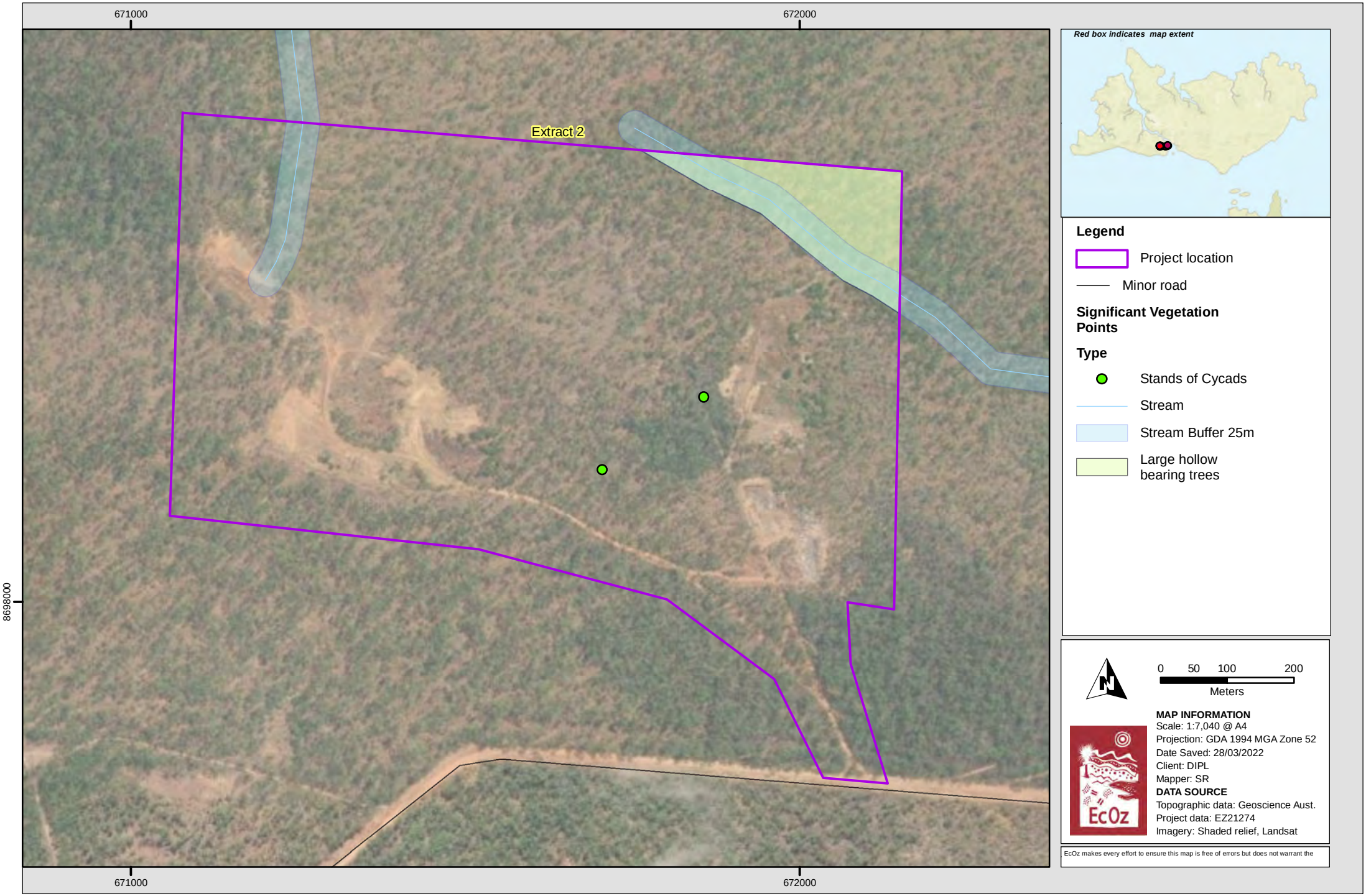
Figure 8. Photograph of north-west stream within the deep gully in potential extraction area 2.

Large hollow-bearing trees / old growth forest

Tree hollows provide valuable habitat for numerous fauna species. In the NT, a *Eucalypt* forest that has either five or more *Eucalypt* stems growing greater than 50 cm in diameter at breast height (DBH) per hectare, and/or 30 or more *Eucalypt* stems greater than 40 cm DBH per hectare is considered to be of high value for biodiversity (DENR 2018b).

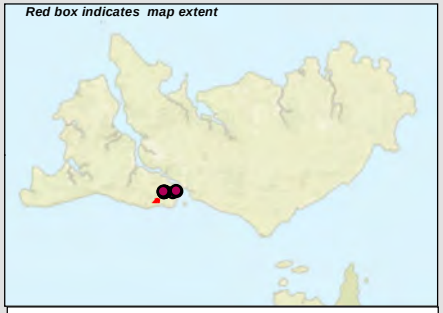
Areas with large trees that met the criteria for significant vegetation due to their high value for biodiversity were found within potential extraction areas 2 and 3 – Figure 9 and Figure 10 – totalling an area of 5.4 ha. Potential extraction area 2 contained an area of high value *Eucalypt* forest with more than five trees with a DBH >50 cm, as well as numerous trees DBH >40 cm. This area is considered significant due to the presence of large trees and was outside the areas previously-disturbed by gravel extraction and land fill. Potential extraction area 3 also contained large, hollow-bearing trees in two locations outside the area previously-disturbed.

Due to time constraints, the extent of this significant vegetation type was not quantified in the surrounding landscape; however, similar vegetation was not readily observed during the survey. The land units surrounding potential extraction area 3 continue to the south and north, as does the low fire history, suggesting that the presence of this significant vegetation type may continue outside the project area. This is not the case for potential extraction area 2, where the landscape to the north quickly changes to an open plain with the highest fire frequency on Bathurst Island – burnt 9 out of the last 10 years



Path: Z:\01 EcOz_Documents\04 EcOz Vantage GIS\EZ21274 - T21-2263 -Wurrumiyanga - Environmental Assessment\01 Project Files\Fig 9 Sig Vegetation.mxd

Figure 9. Map showing significant vegetation types in potential extraction area 2



Legend

- Project location
- Minor road
- Large hollow bearing trees

0 12.5 25 50
Meters

MAP INFORMATION
Scale: 1:2,760 @ A4
Projection: GDA 1994 MGA Zone 52
Date Saved: 28/03/2022
Client: DIPL
Mapper: SR

DATA SOURCE
Topographic data: Geoscience Aust.
Project data: EZ21274
Imagery: Shaded relief, Landsat

Path: Z:\01 EcOz_Documents\04 EcOz Vantage GIS\EZ21274 - T21-2263 -Wurrumiyanga - Environmental Assessment\01 Project Files\Fig 9 Sig Vegetation.mxd

Figure 10. Map showing significant vegetation types in potential extraction area 3

2.8 Threatening processes

There are a number of threatening processes to biodiversity as a consequence of human presence in the region. These are discussed below.

2.8.1 Fire

The northern savannas constitute the most fire-prone landscapes in Australia (Russell-Smith & Whitehead 2015), and regular fires have always been a natural part of the environment in the Top End. However, frequent fires can result in fewer flora species and reduced structural complexity (McKay 2017), both of which can also significantly diminish the habitat quality for fauna and facilitate weed invasion.

Fires are a regular occurrence in the bioregion. Regional fire history and fire scar mapping was obtained through the Northern Australia and Rangelands Fire Information website. In the past 10 years, the project area have all been infrequently burnt – see Figure 11.

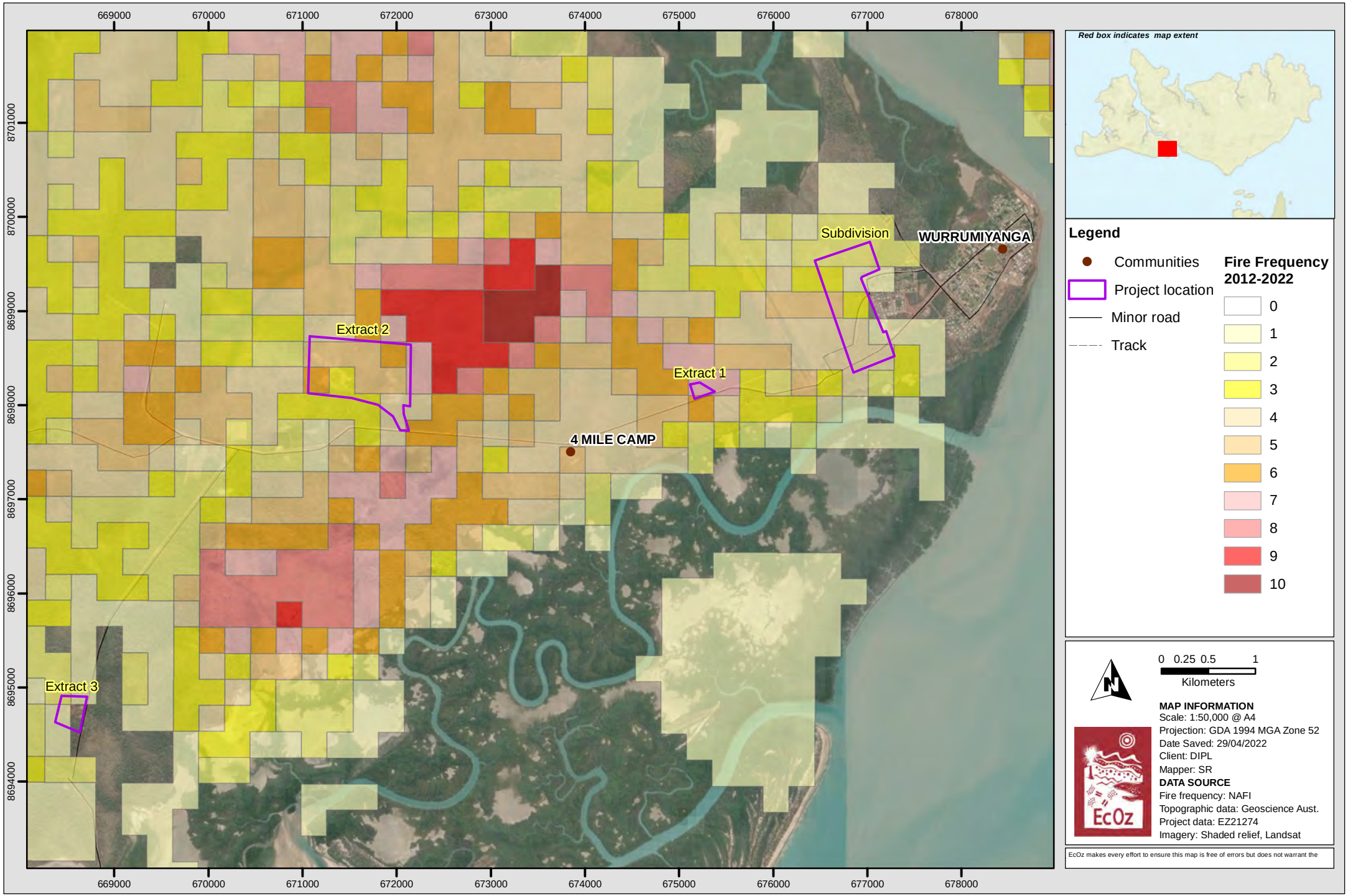
Late season fires (from August onwards) are typically hotter than those occurring earlier in the Dry season. They are often anthropogenic in origin (i.e. not caused by lightning), and their effect on native flora and fauna is usually more detrimental. These hotter, more intense fires affect not just the ground and mid strata, which have evolved to adapt to fire, but also the more fire-sensitive canopy stratum. As Figure 11 shows, three areas have been burnt more than four times since 2011, likely a consequence of the location and ease of access along the road, and their proximity to Wurrumiyanga township. The exception is potential extraction area 3 which has been burnt only 1 to 2 times in the last 10 years. In comparison to other open forest and woodland areas on the Tiwi Islands, the fire frequency of all these areas is low.

2.8.2 Pest animals

According to the NT Fauna Atlas, the introduced fauna species listed in Table 4 are present on Bathurst Island and likely to occur within the project area. The field visit in March 2022 detected the presence of Feral Pigs and Wild Dogs within the project area. Feral Cats and the Asian House Gecko are also likely to be present; however, they are harder to detect without targeted survey efforts.

Table 4. Pest animals that may occur within the project area (NT Atlas)

Common name	Scientific name	Habitats	Impacts
Feral Cattle	*Bos taurus*	Various	Erosion of soil and watercourses, weed spread, trampling and consumption of native flora, and sedimentation and increased nutrient levels in watercourses
Horse	*Equus caballus*	Grassland and shrubland	
Wild Dog	*Canis lupus*	Various	Prey on many species of native animals
Feral Cat	*Felis catus*	Various	
Feral Pig	*Sus scrofa*	Riparian areas and wetlands	Physical damage to wetlands
Asian House Gecko	*Hemidactylus frenatus*	Buildings and adjacent woodlands	Compete with, and predate upon, native species



Path: Z:\01 EcOz_Documents\04 EcOz Vantage GIS\EZ21274 - T21-2263 -Wurrumiyanga - Environmental Assessment\01 Project Files\Fig 11 Fire frequency.mxd

Figure 11. Map of fire frequency relevant to the project area

2.8.3 Weeds

Some species of introduced flora are declared to be weeds under the NT *Weeds Management Act* because of the environmental and/or economic harm they can cause. Class A weeds are to be eradicated by land owners and occupiers. Class B weeds must have their growth and spread controlled by land owners and occupiers. The remaining introduced flora species are referred to as *environmental weeds*. The Commonwealth Government has also categorised some species as Weeds of National Significance (WoNS).

Weed distribution is often related to environmental disturbances caused by the construction of roads and tracks and feral animals. Weeds are most prevalent within the Wurrumiyanga township, including a detection of Gamba Grass in 2020, which was considered to have been eradicated on Bathurst and Melville Islands.

A review of the NT Weed Branch weed dataset shows no weed records for the project area and 321 within a 100 km radius on Bathurst Island – probably related to low survey effort due to the remoteness of the site. Of the 80 species listed, 11 species are declared weeds – Table 5.

The site visit in March 2022 found weeds in disturbed areas of the subdivision, and potential extraction areas 1 and 2 – Table 5. The disturbed areas were characterised by thick grass mono-cultures on the gravel pits, roads and top soil stockpiles. Mission Grass species *(Cenchrus spp.*) were the most common with both Annual and Perennial species identified. Weed intrusions into the forest and surrounding areas were along drainage lines and roads, likely spread by water carrying seed from the disturbed areas. No weeds were detected in potential extraction area 3.

The project area lies within the *Darwin Regional Weed Strategy 2021-2026* (DRWS) (DEPWS 2021). This plan focusses on weeds that are most important to the region, categorising them as either:

- Category 1 – Priority weeds for eradication
- Category 2 – Priority weeds for strategic control (including eradication of outliers)
- Category 3 – Weeds of concern – prevent spread
- Category 4 – Hygiene or biosecurity weeds – prevent spread
- Category 5 – Alert weeds eradication on detection

Table 5. Weed species within the project area

Common name	Botanical name	Declared Class	WoNS	DRWS Category
Mission Grass - Annual	*Cenchrus pedicellatus*	-	-	3
Mission Grass - Perennial	*Cenchrus polystachios*	B	-	2
African Mahogany	*Khaya senegalensis*	-	-	3
Hyptis	*Mesosphaerum suaveolens*	B	-	4
Wild Passionfruit	*Passiflora foetida*	-	-	-
Senna	*Senna spp.*	B	-	4
Sida	*Sida spp.*	B	-	4

3 THREATENED SPECIES

This section outlines the procedure and results of the threatened species 'likelihood of occurrence' assessment conducted for this report. The assessment was undertaken using available desktop information, including databases of existing records and potential species and was supplemented by a field visit in March 2022.

The purpose of this assessment is to identify those species that may need to be included within the project's risk assessment, and those that can be reasonably excluded from further consideration because they are unlikely to occur within the project area.

Note: This process is not a risk assessment as it does not take into account project activities and their potential impacts.

The International Union for the Conservation of Nature nominates a set of criteria used to identify species at risk of extinction. These criteria are used to define categories of risk – Figure 12 – which are used by the NT Government to determine which threatened species are listed under the *Territory Parks and Wildlife Conservation Act* (*TPWC Act*), and by the Commonwealth Government to determine which threatened species are listed under the *Environment Protection and Biodiversity Conservation Act 1999* (*EPBC Act*). This report focusses on species that are listed as Vulnerable, Endangered or Critically Endangered under either Act. The *EPBC Act* also protects important habitat for, and significant occurrences of, migratory species. NT Atlas records and land unit mapping indicate that the project area contains neither.

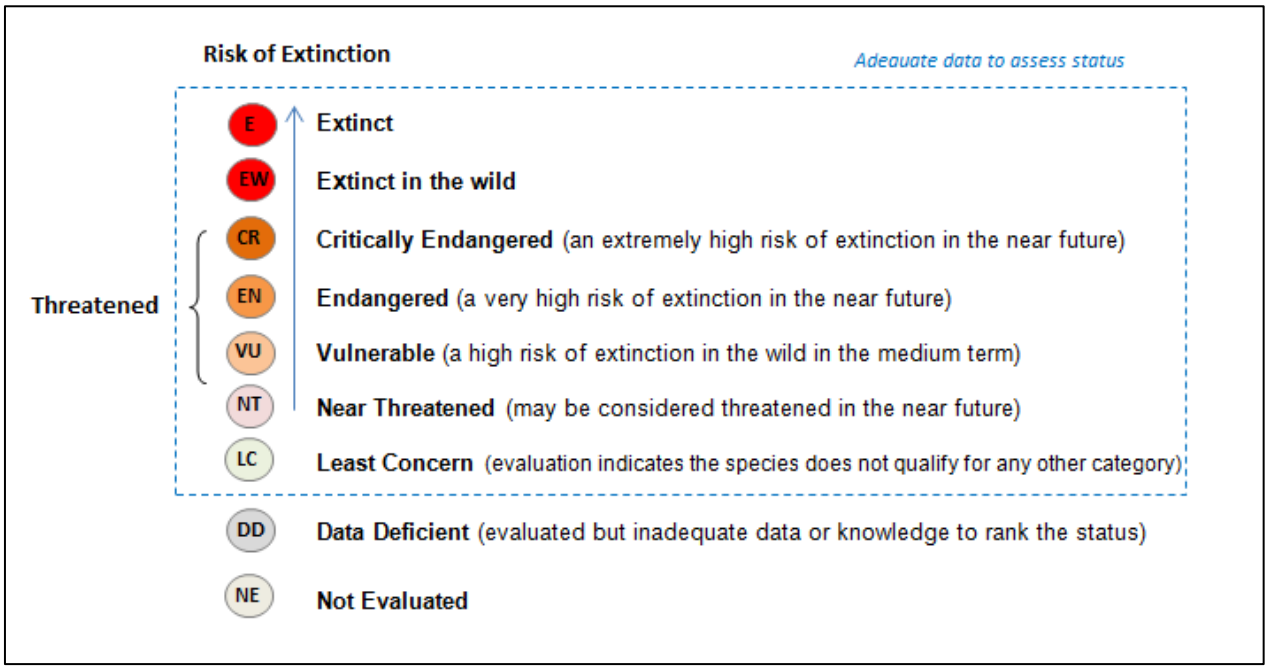


Figure 12. The IUCN categories of risk for species

3.1 Methodology

3.1.1 Desktop

The following procedure was used to determine which threatened species have the potential to occur in the project area:

- Species records from the latest version of the NT Atlas were clipped to within 20 km of the project area and to Bathurst Island. Usually, for these assessments, EcOz would clip the data to include species from a larger area (i.e. bioregion) because of the paucity of records in most parts of the NT. However, the project area is in a well-surveyed area for which there exist many fauna and flora records, and so a more localised list is adequate.
- EPBC Protected Matters Search Tool (PMST) was used to generate a report using a 20 km buffer from the project area. This PMST is an online enquiry tool managed by the Commonwealth Department of the Environment and Energy which interrogates a range of existing flora and fauna data, as well as predictive modelling to speculate on the presence of species within a search area. The PMST uses a grid system to determine which protected matters it encapsulates for a particular search. The PMST report (Appendix A) was generated on 7 February 2021.
- For each threatened species, the likelihood of it occurring within the project area was then assessed based on desktop information that relates to habitat requirements, distribution, number and dates of proximate records (obtained from NT Atlas and/or Atlas of Living Australia), and the ecological information described in Section 2. Likelihood ratings are defined in Table 6.

Table 6. Ratings for the desktop threatened species likelihood of occurrence assessment

Rating	Definition
HIGH	It is expected that this species occurs within the project area because there is core habitat and recent (post-2000) proximate records or knowledge that the species occurs in the local area.
MEDIUM	Species may occur within the project area because there is suitable habitat; however, there is evidence that lowers its likelihood of occurrence (known range contraction of the species in the region, no recent records within or close to the project area, substantial loss of habitat within the project area since previous records, species is naturally-rare or occurs at a low density etc.).
LOW	Species may occur, as a vagrant, within the project area; only marginally-suitable habitat is expected.
NONE	There is strong evidence that this species will not occur within the project area (i.e. there is no suitable habitat and/or the species is considered to be regionally-extinct).

A total of 33 threatened species were considered in the 'likelihood of occurrence' assessment. The results from the threatened species 'likelihood of occurrence' assessment are detailed in Appendix B, and summarised as follows: six species have a high likelihood of occurring, three species have a medium likelihood of occurring and the remainder have a low or no likelihood of occurring. This includes all migratory marine and wetland species as the project is confined to inland terrestrial environments.

Table 7. Desktop assessment likelihood of occurrence summary table

Likelihood	Species	Class	Status	
			EPBC	TPWC
HIGH	Masked Owl *(Tyto novaehollandiae melvillensis)*	Bird	EN	EN
	Brush-tailed Rabbit-rat *(Conilurus penicillatus)*	Mammal	VU	EN
	Northern Brushtail Possum *(Trichosurus vulpecula arnhemensis)*		VU	NT
	Darwin Cycad *(Cycas armstrongii)*	Plant	-	VU
	Typhonium jonesii		EN	EN
	Typhonium mirabile		EN	EN
MEDIUM	Red Goshawk *(Erythrotriorchis radiatus)*	Bird	VU	VU
	Partridge Pigeon (*Geophaps smithii smithii)*		VU	VU
	Butler's Dunnart *(Sminthopsis butleri)*	Mammal	VU	VU

3.1.2 Field

The results of the desktop assessment were then used to inform planning of field surveys for threatened species. Of the nine species with high or medium likelihood of occurrence, the following survey effort was applied:

- Five species – the Brush-tailed Rabbit-rat, Pale Field-rat, Northern Brushtail Possum, Butler's Dunnart and Partridge Pigeon – were not subjected to targeted surveys. Based on previous fauna surveys on Bathurst Island, knowledge of the species' habitat requirements, and the widespread distribution of the species on the Tiwi Islands, these species are all likely to occur wherever there is Eucalypt forest habitats – including in suitable habitat within the project area. Because they are so widespread, disturbing a small area of their habitat is unlikely to constitute a significant impact. Rather than undertaking costly trapping surveys, it is most time and cost effective to assume they are present and assess the potential impacts that the project may have on them.
- The two *Typhonium* species were subject to targeted surveys as these species have not been surveyed for in the project area, have restricted ranges, and cannot avoid potential impacts by moving away.
- A presence / absence survey for Masked Owl was undertaken because the survey methodology is straightforward, quick and the timing of the site visit coincided with the optimal timing for owl surveys – the new moon.
- Red Goshawk nests and Darwin Cycads are readily observable if present, and so will be detected as part of the vegetation assessment process.

This approach is in accordance with what was proposed by EcOz in the response schedule for this project.

Ecologists Nicole Clark and Sarah Ryan – both very familiar with the flora and fauna of the Tiwi Islands – completed a site visit to the project area from 28 February to 4 March 2022. Threatened flora species transects were walked with the assistance from the Tiwi Land Rangers.

3.1.3 Subsequent gap analysis

In November 2023, DIPL approached EcOz to prepare an environmental assessment referral report to be submitted for assessment under the *Environment Protection Act 2019 (EP Act)*, for the construction of the new residential subdivision. As a result, a gap analysis of the likelihood of occurrence assessment was undertaken to identify any additional species or protected matters listings to the PMST. An updated PMST is provided at Appendix C. Noting that the project area has been refined and an explanation is provided at Appendix D.

The gap analysis identified eleven species that required inclusion in the likelihood of occurrence assessment. The likelihood of occurrence assessment of these eleven species found that they had either no likelihood or a low likelihood of occurrence within the refined project area – they are therefore not considered further and no changes to Table 7 is required. The detailed likelihood of occurrence assessment for these eleven species is provided at Appendix D.

3.2 Red Goshawk (*Erythrotriorchis radiatus*)

3.2.1 Ecology

The Red Goshawk utilises a mix of vegetation types including tall open forest, woodland, lightly treed savannah and the edge of rainforest – but its preferred habitat is tall, open Eucalypt forest and riparian areas. (DoE 2022a). Red Goshawks forage across a broad range of Top End habitats, but 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 & Czechura 1988; Aumann & Baker-Gabb 1991). Core habitat for this species is common across the Tiwi Islands and the population is monitored annually with long term data sets on population trends.

In the Northern Territory, the Tiwi Islands are recognised as a stronghold for the species with around 15% of the total Australian population (Woinarski et al. 2000), or approximately 100 pairs of Red Goshawk. Species decline has occurred due to loss of habitat from land clearing, particularly on Melville Island (Woinarski et al. 2003; Woinarski et al. 2007). The Red Goshawk is of cultural significance to Indigenous peoples on the Tiwi Islands (TSSC 2015a).

The Red Goshawk constructs basket-shaped stick nests, typically in trees taller than 20 m and within 1 km of a watercourse (Aumann & Baker-Gabb 1991). The same nests are often reused by established breeding pairs in successive years. The nests are constructed from May with eggs laid from July to September and fledging occurring until December (Aumann and Baker-Gabb 1991). The home range of the Red Goshawk is thought to be up to 200 km^2 (Czechura & Hobson, 2000).

3.2.2 Likelihood of presence

The project area contains vegetation and large trees that are suitable for nesting by Red Goshawks – taller than 20 m and within 1 km of water. These trees are predominantly within the remnant vegetation around the edge of the project area; the previous land use and disturbance removed most of the trees for gravel pits and landfill. Red Goshawk are known to nest in areas of disturbance or high traffic – i.e. along roadsides and in corridors.

The area of open forest and woodland on Bathurst Island available for nesting use by the Red Goshawk is 111,559 ha. The Tiwi Land Rangers are responsible for annual survey and monitoring of Red Goshawk nests on Bathurst Island. The most recent nest found within 4 km of the project area was in 2008 on Melville Island; however, in 2021 there was an active, unsuccessful nest within 20 km of the project area on Melville Island (TLC 2022).

Senior Tiwi Land Ranger, Willie Rioli (pers. comms March 2022) confirmed there are no active Red Goshawk nests within the project area and no new nests had been found in the 2021 season. Field observations in March 2022 confirmed the absence of Red Goshawk nests within the project area.

While the project area has vegetation that may be suitable for Red Goshawk nesting, there are no records within it of nesting by Red Goshawks, likely due to the presence of higher quality habitat available in other parts of Bathurst Island.

3.3 Partridge Pigeon *(Geophaps smithii smithii)*

3.3.1 Ecology

The Partridge Pigeon is a medium-sized ground dwelling bird which forages, roosts and breeds entirely on the ground (Fraser 2000), rarely flying, except when flushed. The species is largely sedentary and typically occurs singly or in small family groups. Larger aggregations may occur around waterholes. The Partridge Pigeon nests on the ground, preferentially in lowland eucalypt open forests and woodlands at sites with relatively dense grass cover. This is in contrast to the relatively open (often burnt) areas the species prefers for feeding, which suggests that fire regimes may significantly affect the species. Nesting occurs mostly in the early dry season (DEPWS 2021d). Pigeons are multi-brooded in captivity and thought to be so wild; however, there is limited data available on incubation and success rates. Fraser (2000) observed most breeding to occur between May and August, with a fledgling 6 – 14 days after hatching. Young and parents remained around the nest for up to 5 weeks after fledging (Fraser 2000). Densities of this species on Melville Island remained similar from 2002 – 2019 at 0.30 birds/ha with occurrences in native forest and plantation areas observed (Garnett & Baker 2021). When this density is applied across the total 144 ha project area, ~43 birds could be present or 22 nesting pairs.

3.3.2 Likelihood of presence

As justified in Section 3.1.2, a targeted survey was not completed for Partridge Pigeons; however, they were easily observed during field surveys in March 2022 while walking *Typhonium* transects. Of the 144 ha of the project area, one land unit (6b – 28 ha) and the disturbed areas dominated by introduced perennial grasses (Fraser 2000) (17.5 ha) are unsuitable for Partridge Pigeons. Within the remaining 98.5 ha of suitable habitat, it is estimated up to 30 birds or 15 nesting pairs are highly likely to be present across the entire project area.

3.4 Tiwi Masked Owl *(Tyto novaehollandiae melvillensis)*

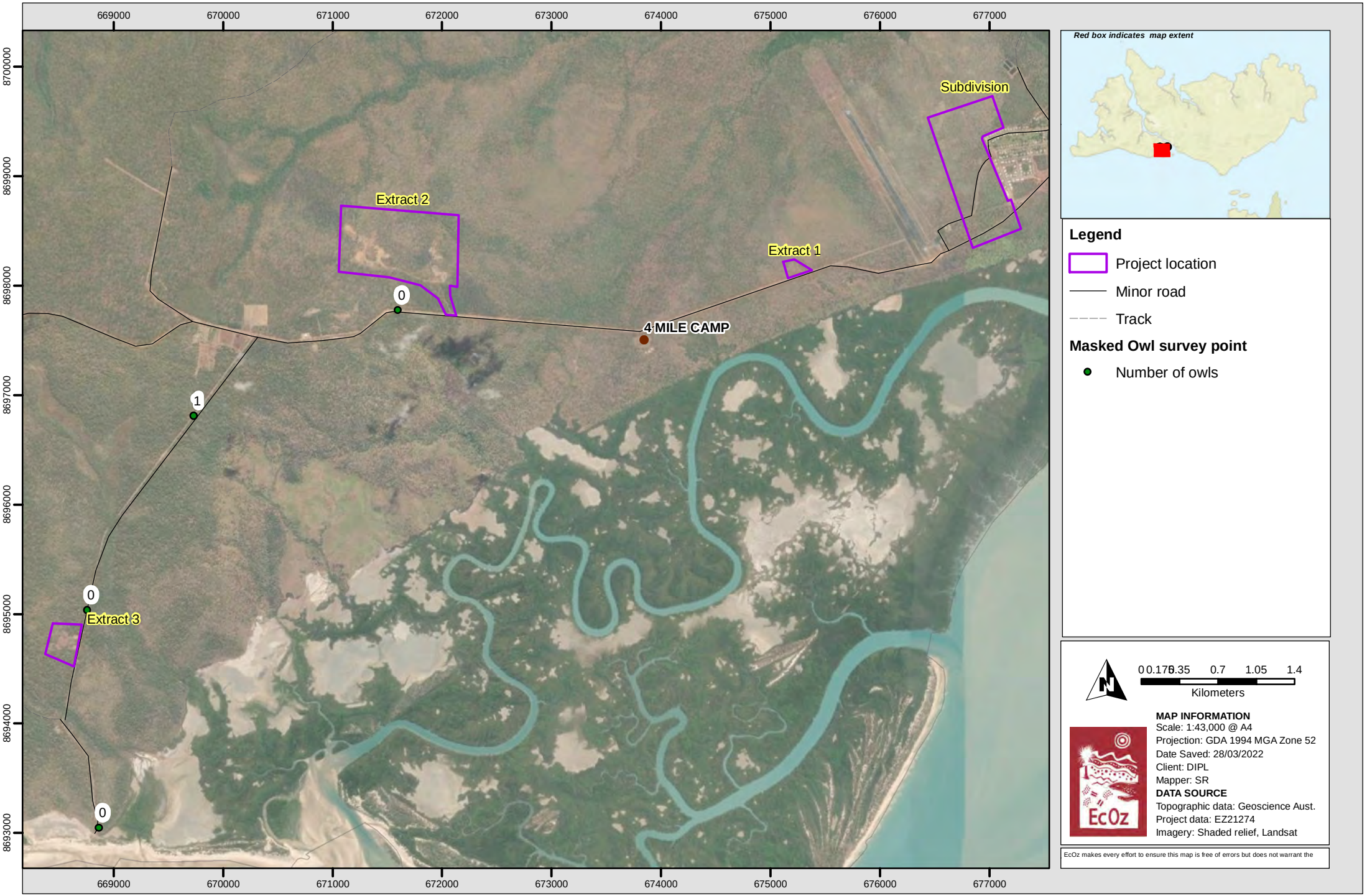
3.4.1 Ecology

The Tiwi Masked Owl is an endemic sub-species that only occurs on Melville and Bathurst Island, mainly within tall open Eucalypt forests, especially those dominated by Darwin Woollybutt *(Eucalyptus miniata)*, Darwin Stringybark *(E. tetrodonta)* and Melville Island Bloodwood *(Corymbia nesophila)* (Woinarski et al. 2003). The Tiwi Masked Owl is most commonly recorded in the higher rainfall areas of north-west Melville Island, where Eucalypt forests are tallest and there are many small patches of monsoon rainforest (Woinarski et al. 2003). Nesting takes place in large tree hollows (Higgins 1999) during the dry season (Ward 2010).

3.4.2 Likelihood of presence

On Bathurst Island, there is possibly 132,196 ha of habitat available for use by Tiwi Masked Owls (DEPWS 2000). Vegetation within the project area is Eucalypt forests and so there is a high likelihood of occurrence of the Tiwi Masked Owl. Of the 144 ha in the project area, 5.4 ha is high quality habitat likely to support large hollow bearing trees Tiwi Masked Owls could use for breeding. A survey for Tiwi Masked Owls was completed on 2 March 2022. The survey methodology was consistent with the methodology stipulated by DEPWS (Ward 2010). Calls were broadcast through the car stereo at four sites along the road from Tarintipi to Wurrumiyanga, with a minimum of 2 km between sites.

One owl was sighted, at the third playback site – see Figure 13. Analysis of the location of this sighting shows the the project area is within the home range of Tiwi Masked Owls (Higgins 1999).



Path: Z:\01 EcOz_Documents\04 EcOz Vantage GIS\EZ21274 - T21-2263 -Wurrumiyanga - Environmental Assessment\01 Project Files\Fig XX Owl_survey.mxd

Figure 13. Map of Tiwi Masked Owl survey points and results

3.5 Brush-tailed Rabbit-rat *(Conilurus penicillatus)*

3.5.1 Ecology

A medium-sized, partly arboreal rodent, the Brush-tailed Rabbit-rat is known to occur from the Kimberly to southern New Guinea, including on various NT islands. Recently, the range and records of the species has been reduced to the Coburg Peninsula, Groote Eylandt, Bathurst, Melville and Inglis islands (DEPWS 2021b). This species' preferred habitat is tall open Eucalypt forests (Firth et al. 2006), but is known to also occur in grasslands and woodlands. Brush-tailed Rabbit-rats shelter and den in tree hollows, crowns of pandanus or sand palms, but can be found foraging on the ground (DEPWS 2021b).

3.5.2 Likelihood of presence

A search of the NT Fauna Atlas found 242 records on Bathurst Island for Brush-tailed Rabbit-rats, including detections as recently as 2018 in south-eastern Bathurst Island. While targeted surveys have not been undertaken in the project area, due to the continuous intact Eucalypt forest and woodlands, and the presence of large, hollow-bearing trees found within the project area Brush-tailed Rabbit-rats are likely to be present within the entire 144 ha, including the disturbed areas with exotic grasses.

3.6 Butlers Dunnart *(Sminthopsis butleri)*

3.6.1 Ecology

Butlers Dunnart is a small, terrestrial, carnivorous mammal restricted to the Tiwi Islands. Butler's Dunnarts are thought to occur at low densities (DoE 2022b) across both Tiwi Islands in a range of habitats. Their preferred habitats are Eucalyptus open forests and woodlands dominated by *E. tetrodonta, E. miniata and Corymbia nesophila* (DEPWS 2021c). The main threats are loss of habitat from land clearing, altered fire regimes, increased spread of weeds, habitat changes from feral herbivores and predation by feral cats (DEPWS 2021e). Butler's Dunnarts are difficult to trap and there is a lack of information on this species (TSSC 2015c). There are no targeted survey records for Butler's Dunnarts within the project area, the nearest records in 2001 and 2013 from general fauna surveys by the NT Government.

3.6.2 Likelihood of presence

Of the 108 records of Butler's Dunnarts on the Tiwi Islands, 27 occur on Bathurst Island. Most records are incidental records from NT Government mammal surveys. The records indicate that targeted Butler's Dunnart surveys have not occurred within the project area, or nearby. Within the project area, 126.5 ha remains wooded and is likely to support Butler's Dunnarts. Historic and recent surveys on Melville Island indicate the presence of Butlers Dunnarts in their preferred habitat, including areas selected for use as gravel pits – some which were historic borrow areas (AECOM 2022). The project area contains the preferred habitat and it is also present in the surrounding areas, which indicates Butler's Dunnarts are likely to be present.

3.7 Northern Brushtail Possum *(Trichosurus vulpecula arnhemensis)*

3.7.1 Ecology

The northern sub-species of Brushtail Possum was listed as Vulnerable under the *EPBC Act* in May 2021 due to the decline of its populations in the Top End and reduction of its home range across the Northern Territory, mostly as a consequence of too frequent fire and predation by feral cats (Stobo-Wilson et al. 2019). This sub-species occurs continuously from the Gulf of Carpentaria hinterland near Borroloola, in the Northern Territory, to the Kimberley, in Western Australia (Morris et al. 2016). It mainly inhabits tall Eucalypt open forests with large hollow-bearing trees, particularly where the understorey includes some 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 2021). Populations of the Brushtail Possum remain healthy on the Tiwi Islands, with the Bathurst Island density high then Kakadu National Park after the species' decline there(Davies 2021).

3.7.2 Likelihood of presence

There is a total of 5,613 records on Bathurst Island for Northern Brushtail Possums, including detections as recently as 2018 in south-eastern Bathurst Island. Targeted live trapping mammal surveys were completed approximately 2.5 km from potential extraction area 2 in 2013 and detected over 500 instances of possums (DEPWS 2020). Davies et all (2021) found that possums on Bathurst Island occurred at a significantly higher density than on Melville Island – 1.06 per ha and 0.32 per ha respectively. Such records, the large area of contiguous intact Eucalypt forest and woodlands, and the presence of large, hollow-bearing trees found within the project area indicate that Northern Brushtail Possums are likely to be present.

3.8 Darwin Cycad (*Cycas armstrongii*)

3.8.1 Ecology

The Darwin Cycad is a small to medium-sized cycad with a slender trunk. The species occurs in open grassy woodlands where adequate draining appears to be a limiting factor. It also occurs on rocky outcrops, undulating hills and plains (Kerrigan et al. 2006). Prime cycad habitat has deep loamy, well-drained soil and the species is frequently associated with *Eucalyptus miniata* and *Eucalyptus tetrodonta* (Liddle 2009). Darwin Cycads are endemic to the Top End, with abundant populations occurring throughout the greater Darwin region, often forming dense stands (Kerrigan et al. 2006). Nevertheless, their long-term conservation has to 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 > 1,000 individuals per hectare (Watkinson & Powell 1997; Liddle 2004). Areas with high-density stands of cycads are important for maintaining the species' diversity and function (Hill 2020).

3.8.2 Likelihood of presence

Darwin Cycads were observed throughout the project area during field surveys in March 2022, with stands of numerous cycads recorded – see Figure 9. No areas of high density – i.e. >1,000 individuals per ha – were identified.

3.9 Typhonium species

For the purposes of impact assessment and reporting, and until generic identification has been confirmed, all *Typhonium* plants found have been assigned *Typhonium mirabile* following expert opinions sought, predominant habitat types and land units the plants were found in.

3.9.1 Ecology

Typhonium jonesii

Typhonium jonesii is a geophytic perennial herb with erect annual aerial parts and a starchy tuber. The flower emerges along with new season leaves in December (Kerrigan & Cowie 2006). The above-ground annual shoots are seasonally-dormant and die back in the dry season, making the species highly cryptic (DoE 2018). Pollination most likely occurs by insect vectors (Mayo et al. 1997), specifically Rove Beetles (Family *Staphylinidae*, as in the related *T. praetermissum*) (DENR 2018a). *T. jonesii* occurs in *Eucalyptus tetrodonta,*

E. miniata and *Corymbia nesophila* dominated open forest on deep, well-drained sandy soils supporting relatively sparse grass layer (Kerrigan and Cowie 2006; DENR 2018a).

Threatening processes for this species include the clearing of habitat for development; habitat degradation by feral buffalo, cattle and horses; and the invasion of exotic plants through increased activity, clearing, road development in the area around known populations (Kerrigan and Cowie 2006).

Typhonium jonesii is known only from the Tiwi Islands. According to DENR (2018a), prior to the surveys discussed in this report, there were approximately 669 records of *T. jonesii* associated with between 15 to 20 sub-populations.

Typhonium mirabile

Typhonium mirabile is a small tuberous herb with annual aerial parts. Flowering occurs in October and fruiting in December; the above-ground shoots are seasonally-dormant and die back during the dry season (Kerrigan et al. 2007). *T. mirabile* occurs in *Eucalyptus tetrodonta, E. miniata* and *Corymbia nesophila* dominated open forest on deep, well-drained sandy red-brown kandosol soils supporting relatively sparse grass layer (DENR 2018a). It is found sporadically in groups, often near the bases of young *Cycas* plants or in shade (Kerrigan et al. 2007).

Threatening processes for this species include the clearing of habitat for development; habitat degradation by feral buffalo, cattle and horses; and the invasion of exotic plants through increased activity, clearing, road development in the area around known populations (DoE 2022c).

Typhonium mirabile is restricted to the Bathurst Island and the western half of Melville Island. Targeted surveys on Melville Island have resulted in low numbers of new records, whereas *T. mirabile* is widespread and common in the northern Bathurst Island area (DENR 2018a). An estimate of the number of sub-populations on the Tiwi Islands is between 15 to 30 (DENR 2018a); however, this is a conservative estimate based on the difficulties in delineating sub-populations due to uncertainties surrounding the pollination and seed dispersal syndromes for the species and specific vectors involved. Prior to the surveys discussed in this report, the total number of records (consisting of one or more plants) held by the NT Flora Atlas was approximately 209.

3.9.2 Likelihood of presence

The NT Flora Atlas has no records of *Typhonium jonesii* and *Typhonium mirabile* within the project area. Desktop analysis of DEPWS habitat modelling showing the likelihood of occurrence of *Typhonium* species was used to identify areas to survey. High likelihood modelled habitat within the project area was selected for survey in accordance with the *Draft Typhonium Survey Guidelines 1.2* provided by DEPWS.

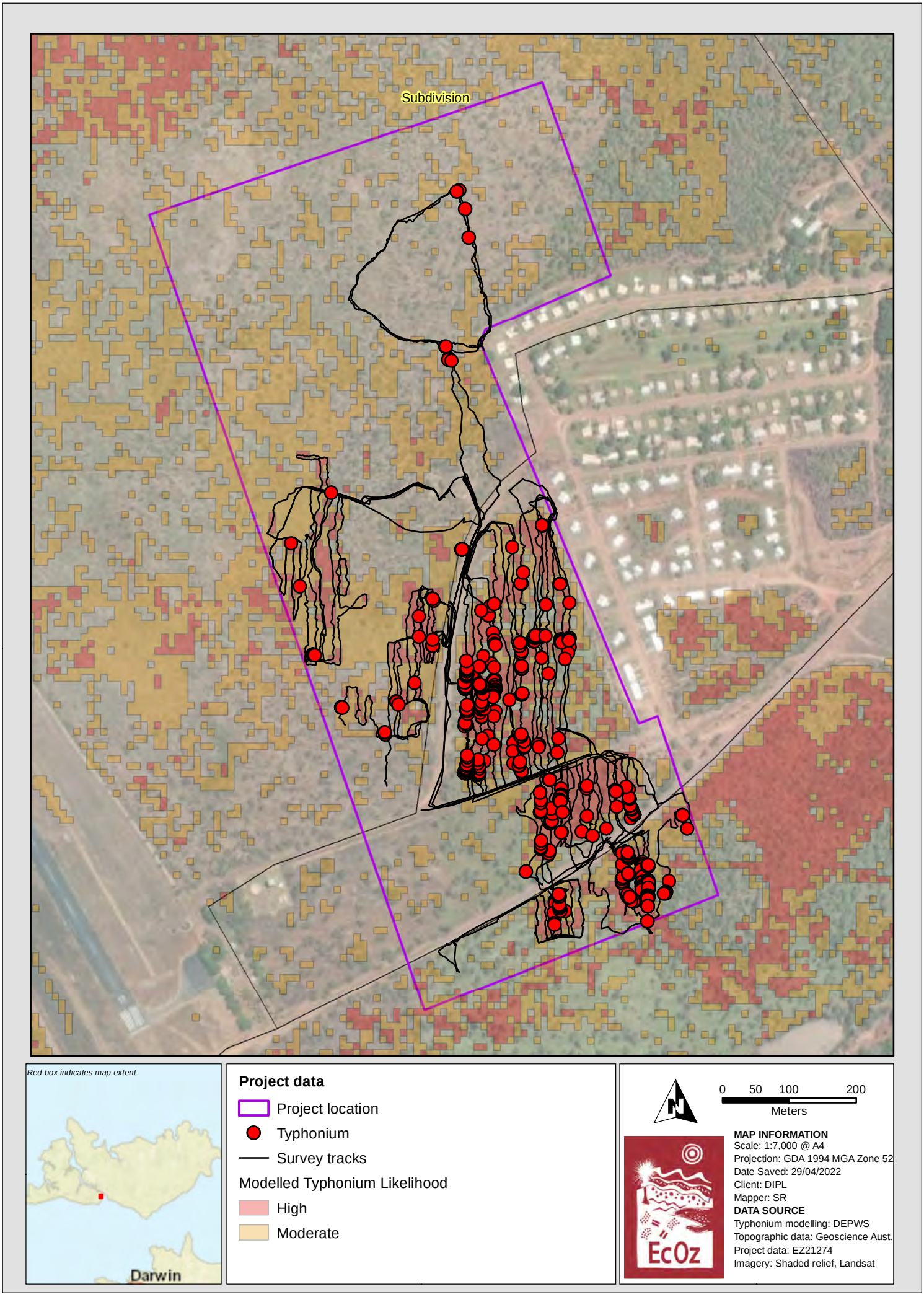
Due to time and access constraints from COVID-19 restrictions – combined with the remote location and logistics required to access the Tiwi Islands – the survey methodology was modified to undertake the abundance/density survey as the first and only survey method. This resulted in 10 m transect lines walked through all high likelihood modelled habitat, recording a GPS point for each individual plant detected. With the assistance of the Tiwi Rangers, 87 km of transects were surveyed over 5 days – Figure 14 to Figure 17.

Typhonium plants were detected in all areas excluding potential extraction area 3 – Figure 14 to Figure 17. A total of 730 plants were recorded – Table 8 and Appendix F. There is likely to be more plants undetected within the project area because visibility was somewhat reduced by long grass at the time of the survey. *Typhonium* plants were detected in areas of high, medium and no modelled likelihood. In addition to targeted surveys, many plants were also observed during rapid vegetation assessments and when walking to and from transects.

Genetic samples were taken in accordance *Typhonium praetermissum Population Genetic Sampling Guidelines* (provided by DEPWS) from plants within each project site and each land unit for genetic identification. Samples were sent to James Cook University for analysis on 14 March 2022. Results are expected by June 2022.

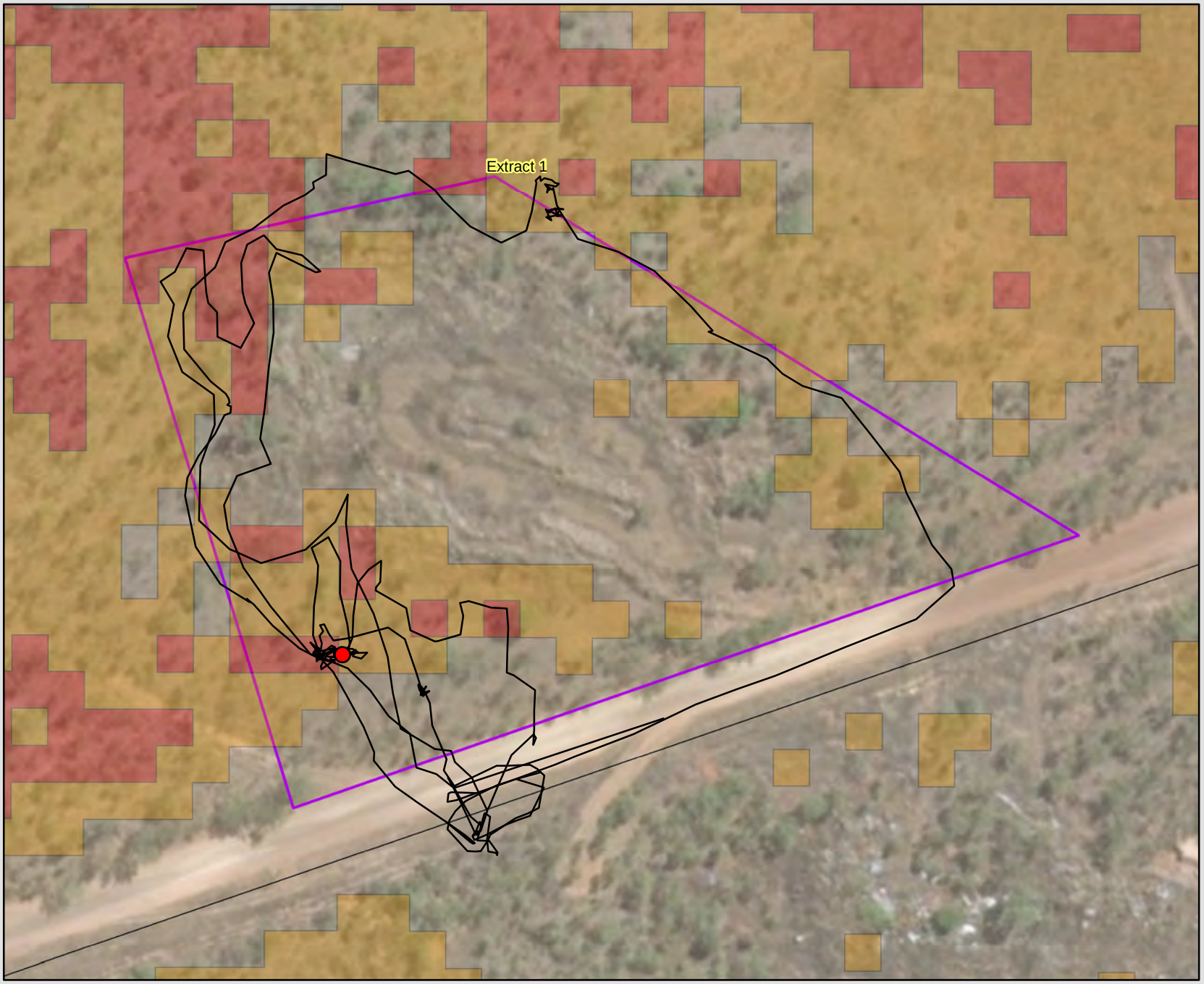
Table 8. *Typhonium* records from March 2022 survey

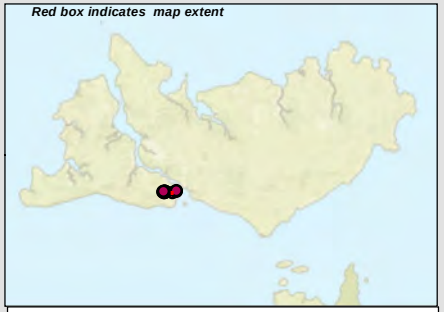
Project site	Land Unit	# of records – High likelihood	# of records – Moderate likelihood	# of records – elsewhere	Total records	# of genetic samples collected
Potential extraction area 1	4b	-	1	-	**1**	1
Potential extraction area 2	2b1	10	52	16	**78**	2
Subdivision	2c	9	14	-	**23**	-
	4c	220	138	80	**438**	2
	5a	-	2	2	**4**	1
	6a	8	22	18	**48**	-
	6b	68	36	34	**138**	3
Total		**315**	**260**	**155**	**730**	**9**



Path: Z:\01 EcOz_Documents\04 EcOz Vantage GIS\EZ21274 - T21-2263 -Wurrumiyanga - Environmental Assessment\01 Project Files\Fig X-X Typh_subdivision.mxd

Figure 14. Map of *Typhonium* plants detected in proposed subdivision area





Legend

- Project location
- Typhonium
- Survey tracks

Modelled Typhonium Likelihood

- High
- Moderate

0 12.5 25 50

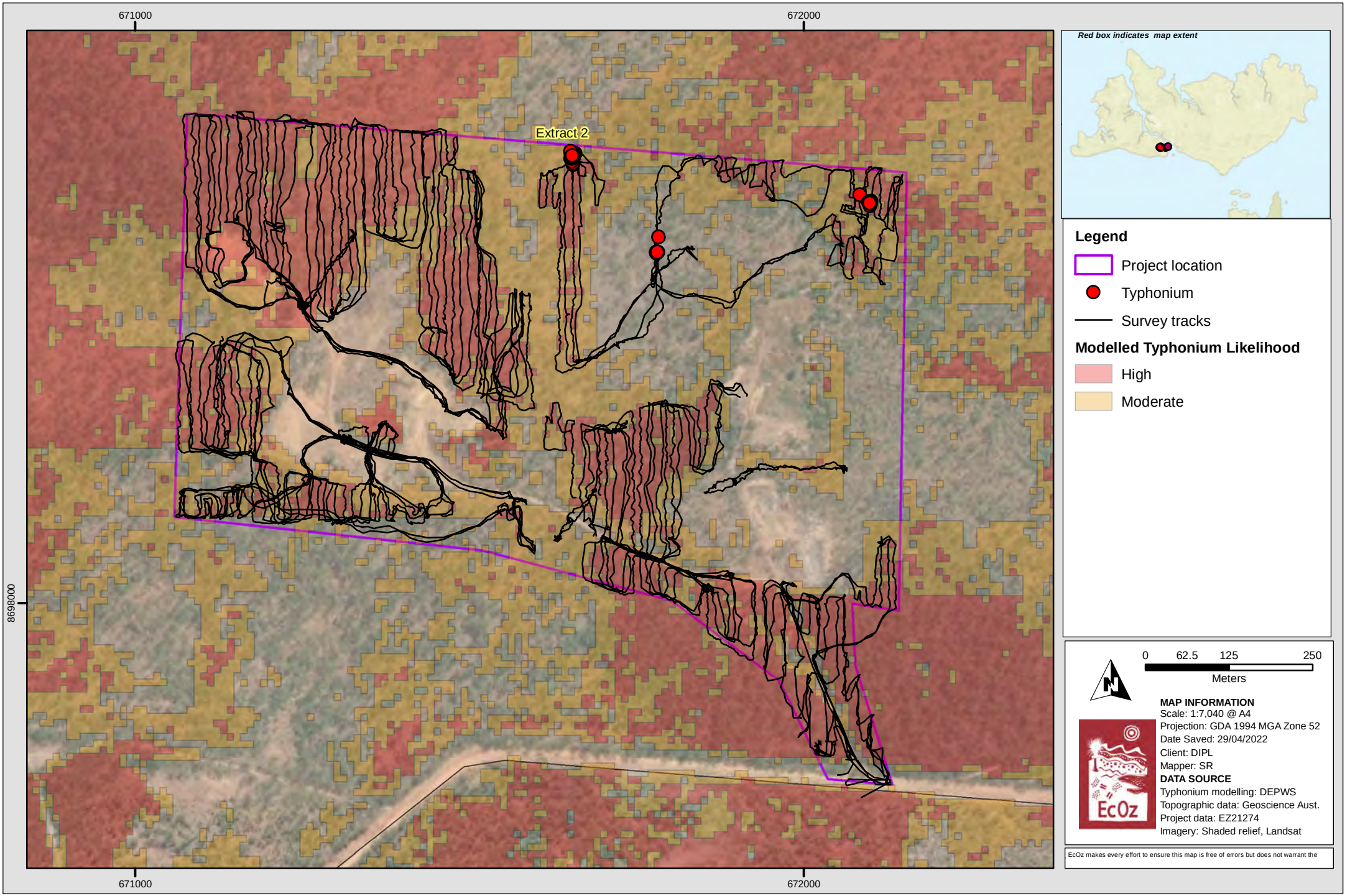
Meters

MAP INFORMATION
Scale: 1:1,510 @ A4
Projection: GDA 1994 MGA Zone 52
Date Saved: 29/04/2022
Client: DIPL
Mapper: SR

DATA SOURCE
Typhonium modelling: DEPWS
Topographic data: Geoscience Aust.
Project data: EZ21274
Imagery: Shaded relief, Landsat

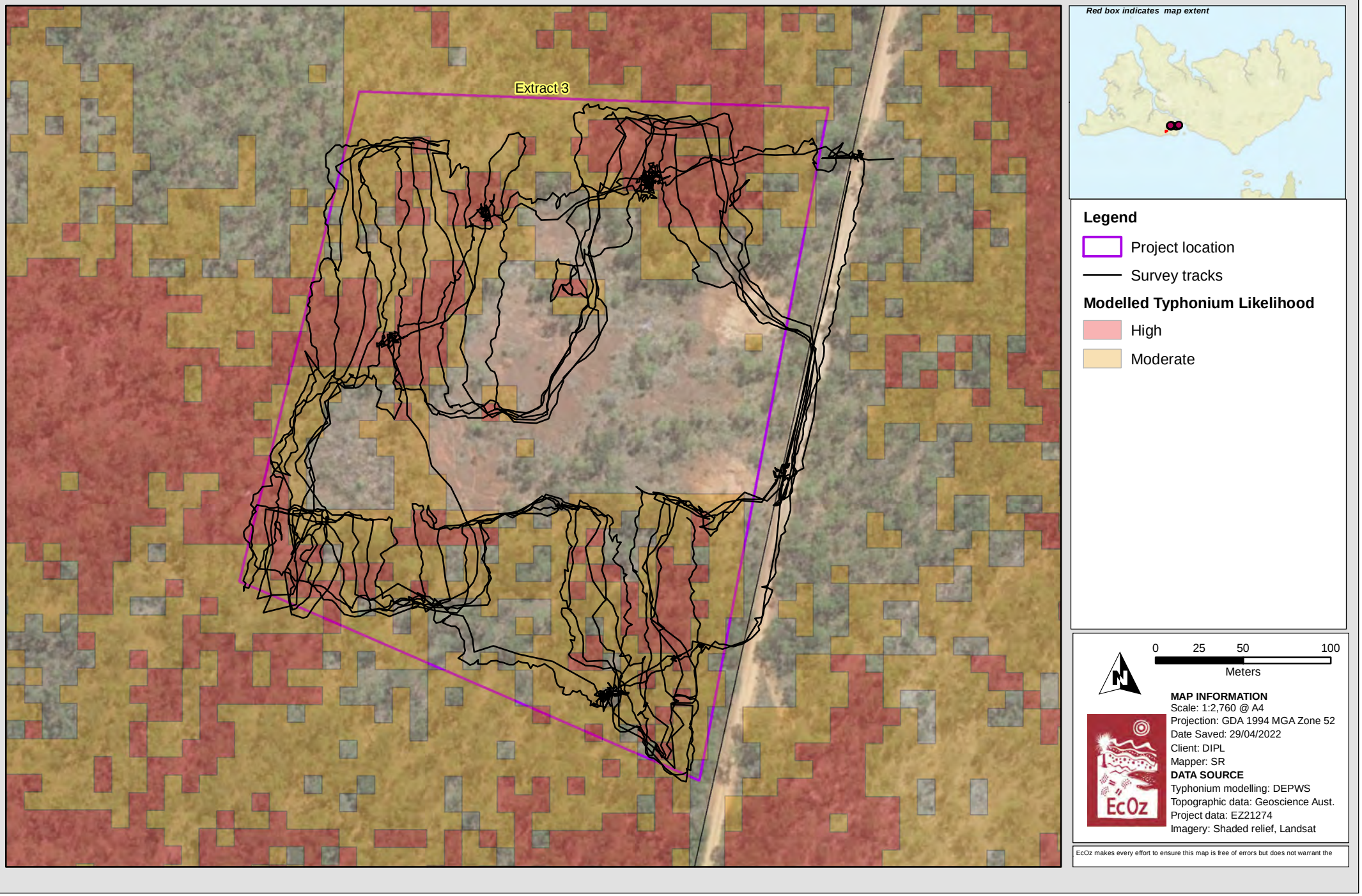
Path: Z:\01 EcOz_Documents\04 EcOz Vantage GIS\EZ21274 - T21-2263 -Wurrumiyanga - Environmental Assessment\01 Project Files\Fig XX Typh_found.mxd

Figure 15. Map of *Typhonium* plants detected in potential extraction area 1



Path: Z:\01 EcOz_Documents\04 EcOz Vantage GIS\EZ21274 - T21-2263 -Wurrumiyanga - Environmental Assessment\01 Project Files\Fig XX Typh_found.mxd

Figure 16. Map of *Typhonium* plants detected in potential extraction area 2



Path: Z:\01 EcOz_Documents\04 EcOz Vantage GIS\EZ21274 - T21-2263 -Wurrumiyanga - Environmental Assessment\01 Project Files\Fig XX Typh_found.mxd

Figure 17. Map of *Typhonium* survey effort in potential extraction area 3

Sub-population

As explained above, DENR (2018a) identified 15 to 30 sub-populations across the Tiwi Islands. The 2022 survey described in this report added 730 records and one new sub-population in south-eastern Bathurst Island. As the new records were all within approximately 5 km of each other, they have been assigned to one sub-population (DENR 2018a).

The new records found during this survey would indicate that this is a new, significant sub-population of *Typhonium*. While these records are isolated from previous records, due to the lack of survey effort in the surrounding area, there may be more records and additional sub-populations in the south-east of Bathurst Island.

Extent of Occupancy and Area of Occupancy

The Extent of Occurrence (EoO) and Area of Occupancy (AoO) are statistics used by the International Union for Conservation of Nature (IUCN) to assess the conservation significance of a species (IUCN 2012). The EoO is defined in IUCN (2021) as the area contained within the shortest continuous imaginary boundary which can be drawn to encompass all the known sites of present occurrence of a species. The AoO is a subset of the EoO and is the area which is actually occupied by the species (in acknowledgment that a species will not usually occur throughout the area of its EoO because it may contain unsuitable or unoccupied habitats).

The IUCN assessment process uses 2 km x 2 km grid cells (IUCN 2021) to assess AoO; if the grid cell contains individuals of the species, it is included in the AoO. Calculation of AoO is determined by multiplying the number of cells containing the species by the area of each cell. When setting the AoO for assessment against the threatened status of the species, the IUCN guidelines require the grid be positioned to intercept the minimum number of cells (IUCN 2021). GIS software has been used to calculate the EoO and AoO for this species.

In 2019, revised EoO's and AoO's for *Typhonium jonesii* and *T. mirabile* were calculated by the NT Herbarium using a new method with R-software. As DEPWS have not been consulted regarding the findings of this project, EoO and AoO have been calculated using GIS software following the older methodology as described by IUCN. To avoid discrepancies and comparison of calculations using different methods, the EoO and AoO in this report was also calculated with all available NT Flora Atlas records.

NT Flora Atlas data (DEPWS 2020b) indicated that prior to the 2022 surveys, the entire population of *T. mirabile* consisted of 209 records. Of these, 57 records are associated with 15 to 30 sub-populations known from northern Bathurst Island (DENR 2018a). Most *Typhonium* surveys have been associated with development and land clearing assessments, leaving large areas of High likelihood modelled habitat that have not been surveyed.

New records collected during the 2022 surveys increased both the EoO and known AoO for *T. mirabile*. Comparing NT Flora Atlas data and records from the surveys, GIS analysis found the EoO increased by 48 km^2 and the AoO by 16 km^2.

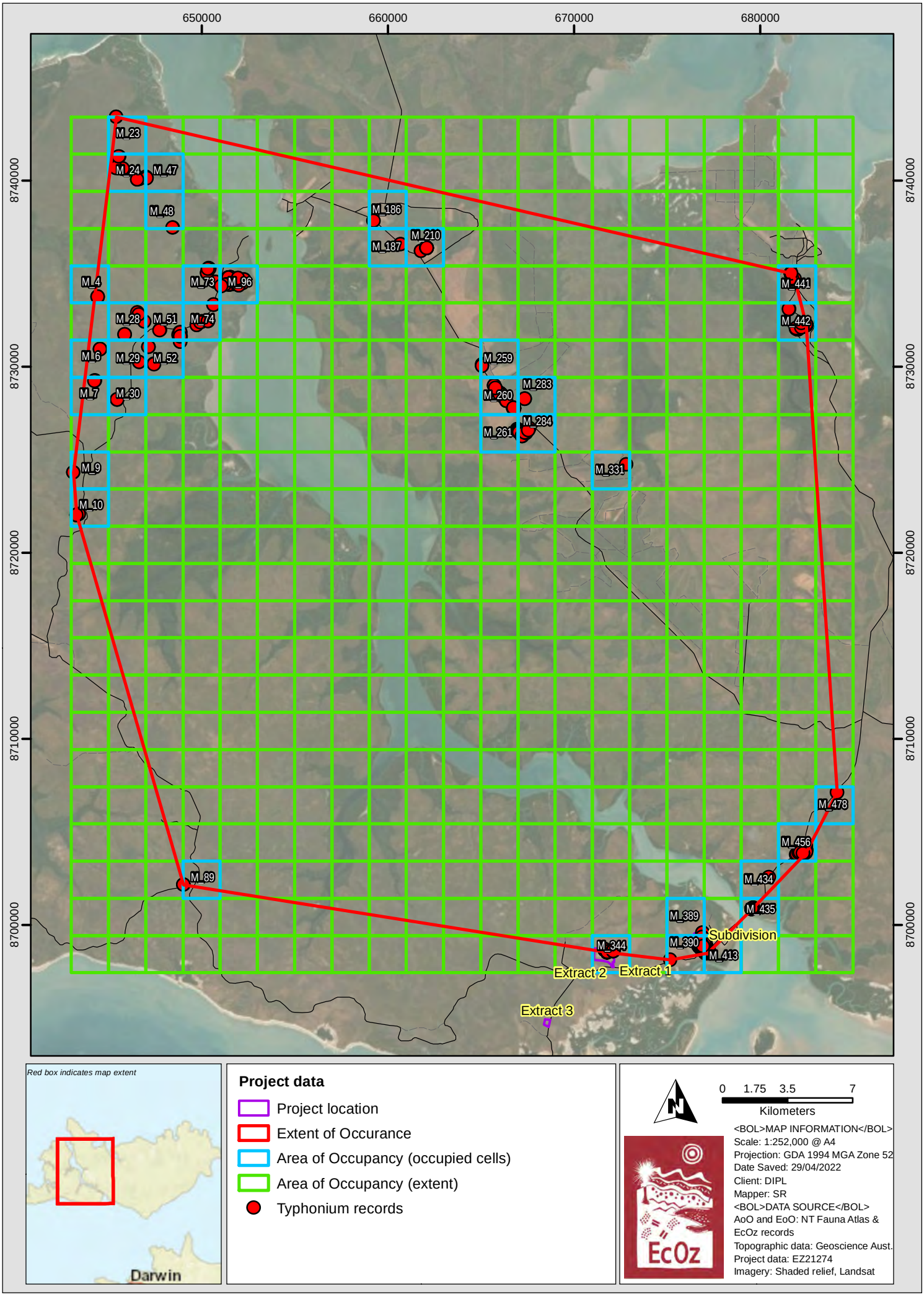
Table 9. Table of changes to *T. mirabile* EoO and AoO

Values calculated without 2022 records		Values calculated with 2022 records	
EoO	**AoO**	**EoO**	**AoO**
1,425 km^2	132 km^2 (33 cells)	1,473 km^2	148 km^2 (37 cells)

Across Bathurst Island, there remain large areas of potentially-suitable habitat within the EoO that may support additional individuals and/or sub-populations. Table 10 provides a summary of the area of High likelihood habitat that occur within the 4 km^2 AoO cells and the area that will be impacted by the project.

Table 10. Area of High likelihood habitat within *T. mirabile* cells intersected by the project area

AoO Cell	Area within cell (ha)	Area removed by project (ha)
M_344	162.1	21.9 (13.51%)
M_389	41.6	0
M_390	54.5	3.2 (5.87%)
M_413	21.9	3.9 (17.81%)
TOTAL	280.1	29.0 (10.35%)



Path: Z:\01 EcOz_Documents\04 EcOz Vantage GIS\EZ21274 - T21-2263 -Wurrumiyanga - Environmental Assessment\01 Project Files\Fig X-X Typh_AoO_EoO.mxd

Figure 18. Map of the updated EoO and AoO for *T. mirabile*

4 SUMMARY AND RECOMMENDATIONS

Significant environmental values were detected throughout the project area, at all proposed development sites. Impact to values can be mitigated through avoidance of areas with environmental values by remaining within the existing disturbance footprint.

Of the eight species identified in the desktop assessment as high or medium likelihood of occurrence, four species were confirmed present in the field assessment and the other four are considered highly likely to be present – Table 11. All other threatened species are now considered a low likelihood of occurrence due to the absence of suitable habitat and recent detections.

The population of *Typhonium* found within the subdivision is significant in area and number of records. The next nearest record is 4 km away and the next nearest population is on Melville Island. Prior to this survey, only 68 records of *Typhonium* existed for Bathurst Island.

Table 11. Threatened species 'likelihood of occurrence' assessment summary

Likelihood	Species	Class	Status	
			EPBC	TPWC
KNOWN	Masked Owl *(Tyto novaehollandiae melvillensis)*	Bird	EN	EN
	Partridge Pigeon (*Geophaps smithii smithii)*		VU	VU
	Darwin Cycad *(Cycas armstrongii)*	Plant	-	VU
	Typhonium jonesii or *Typhonium mirabile*		EN	EN
HIGH	Red Goshawk *(Erythrotriorchis radiatus)*	Bird	VU	VU
	Brush-tailed Rabbit-rat *(Conilurus penicillatus)*	Mammal	VU	EN
	Butler's Dunnart *(Sminthopsis butleri)*		VU	VU
	Northern Brushtail Possum *(Trichosurus vulpecula arnhemensis)*		VU	NT

CR = Critically Endangered; EN = Endangered; VU = Vulnerable

Recommended mitigation measures to avoid impact on environmental values are provided in Table 12:

Table 12. Table of recommended mitigation measures

Environmental value	Mitigation measures
Threatened species	• Confirm *Typhonium* identification though genetic testing. • Consult with DEPWS on the significance of the *Typhonium* sub-population detected in the proposed subdivision area. • Avoid areas with *Typhonium* records and significant vegetation in potential extraction areas 1, 2 and 3.
Significant vegetation	• Avoid areas with large hollow-bearing trees in potential extraction areas 2 and 3.
Surface water	• Apply buffer areas to avoid streams and drainage lines. o A buffer >25m is recommended for the stream in the north-west of potential extraction area 2 due to the potential for erosion and land slips. • Contain surface water run-off from landfill within landfill site. • Complete an erosion and sediment control plan prior to works to minimise erosion and sediment transportation off site.

Environmental value	Mitigation measures
Threatening processes	• Undertake pre-, post- and during construction weed control across all sites. • Maintain weed quarantine through a high level of hygiene on plant and equipment between proposed development sites. • Rehabilitate exhausted or closed gravel pits to minimise weeds, soil erosion and water ponding.

5 REFERENCES

AECOM (2022). *Paru Road Supplementary Environmental Report: Paru Road Upgrade*. Report prepared for Department of Infrastructure, Planning and Logistics, Darwin.

Aumann, T. and Baker-Gabb, D. (1991). *A Management Plan for the Red Goshawk.* RAOU Report 75, Royal Australasian Ornithologists Union, Melbourne.

Australian Wildlife Conservancy (AWC) (2012). *Wildlife Matters Issue 24*. Summer 2012/13. Subiaco East: Australian Wildlife Conservancy. http://www.australianwildlife.org/media/27964/AWC-Wildlife-Matters-Summer-2012-2013.pdf [Accessed 28 Mar 2022].

Baker, B., Price, O., Woinarski, J., Gold, S., Connors, G., Fisher, A. & Hempel, C. (2005). *Northern Territory Bioregions – Assessment of Key Biodiversity Values and Threat.* Palmerston: Department of Natural Resources, Environment and the Arts, Northern Territory Government.

Brocklehurst, P., Lewis, D., Napier, D. & Lynch, D. (2007). *Northern Territory Guidelines and Field Methodology for Vegetation survey and Mapping*

Czechura G.V. and Hobson R.G. (2000). *The Red Goshawk* Erythrotriorchis radiatus *in northern Queensland: status and distribution*. Report to Queensland Parks and Wildlife Service

Davies H.F., McCarthy M. A., Firth R.S.C, Woinarski J.C.Z., Gillespie G.R., Anderson A.N., Geyle H.M., Nicholson E., Murphy B.P. (2017) Top-down control of species distributions: feral cats driving the regional extinction of a threatened rodent in northern Australia. *Diversity & Distributions* 23, 272-283. doi:10.111/ddi.12522

Davies H.F., McCarthy M. A., Firth R.S.C, Woinarski J.C.Z., Gillespie G.R., Anderson A.N., Rioli W., Puruntatameri J,. Roberts W., Kerinaiua C., Kerinaiua V. (2018) Declining populations in one of the last refuges for threatened mammal species in northern Australia. *Austral Ecology* 43, 602-612. doi:10.111/aec.12596

Davies H.F., Tiwi Land Rangers, Nicholson, E. and Murphy B.P. (2021) Northern brown bandicoot (Isoodon macrourus) and common brushtail possum (Trichosurus vulpecula) density on the Tiwi Islands; insights and implications. *Pacific Conservation Biology*.

Davies H.F., Tiwi Land Rangers, Rees M.W., Stokeld, D., Miller, A. C., Gillespie G. R. and Murphy, B.P (2021a) Variation in feral cat density between two large adjacent islands in Australia's monsoon tropics. *Pacific Conservation Biology 2022, 28, pp 18 – 24.*

Debus, S. and Czechura, G. (1988). Field identification of the Red Goshawk *Erythrotriorchis radiatus. Australian Bird Watcher*, Vol. 12, pp. 154-159.

Department of the Environment (2022a). *Erythrotriorchis radiatus in Species Profile and Threats Database*, Department of the Environment, Canberra. Available at: https://www.environment.gov.au/sprat. [Accessed 21 Apr 2022]

Department of the Environment (DoE) (2022b). *Sminthopsis butleri in Species Profile and Threats Database*, Department of the Environment, Canberra. Available from: https://www.environment.gov.au/sprat. [Accessed 19 Apr 2022].

Department of the Environment (DoE) (2022c). *Typhonium mirabile in Species Profile and Threats Database*, Department of the Environment, Canberra. Available from: https://www.environment.gov.au/sprat. [Accessed 28 Mar 2022].

Department of the Environment (DoE) (2022d). *Tyto novaehollandiae melvillensis in Species Profile and Threats Database*, Department of the Environment, Canberra. Available from: https://www.environment.gov.au/sprat. [Accessed 14 Apr 2022]

Department of Environment and Natural Resources (DENR) (2018a). *Melville Island Typhonium field survey: GridConnect Project*, Unpublished report prepared for Power and Water Corporation

Department of Environment and Natural Resources (DENR) (2018b). *Sensitive Vegetation in the Northern Territory: Old-Growth Forest*. Northern Territory Government. Available at: https://nt.gov.au/__data/assets/pdf_file/0012/204213/sensitive-vegetation-old-growth-forest-english.pdf [Accessed 21 Apr 2022]

Department of the Environment, Water, Heritage and the Arts (DEWHA) (2013) *Significant Impact Guidelines 1.1 - Matters of National Environmental Significance*. Australian Government, Canberra.

Department of Environment, Parks and Water Security (2000), *Tiwi Islands Generalised Vegetation Cover Dataset*. Available at NT Maps. http://www.ntlis.nt.gov.au/metadata/export_data?type=html&metadata_id=2DBCB7711FA906B6E040CD9B0F274EFE [Accessed 27 Apr 2022]

Department of Environment, Parks and Wildlife Security (DEPWS) (2020a). *Fauna Atlas subset - Mammals*. Northern Territory Government. Available at: https://data.nt.gov.au/dataset/fauna-atlas-subset-mammals [Accessed 21 Apr 2022]

Department of Environment, Parks and Wildlife Security (DEPWS) (2020b). *NT Flora Atlas*. Northern Territory Government. Available at: https://data.nt.gov.au/dataset/nt-flora-atlas [Accessed 21 Apr 2022]

Department of Environment, Parks and Water Security (DEPWS) (2021) *Darwin Regional Weed Strategy 2021 – 2026*. Northern Territory Government.

Department of Environment, Parks and Water Security (DEPWS) (2021a). *Land Clearing Guidelines V1.3*. Northern Territory Government, Darwin.

Department of Environment, Parks and Water Security (DEPWS) (2021b). *Threatened species of the Northern Territory – Brush-tailed rabbit-rat*. Northern Territory Government. Available at: https://nt.gov.au/__data/assets/pdf_file/0016/205504/brush-tailed-rabbit-rat.pdf [Accessed 31 Jan 2022]

Department of Environment, Parks and Water Security (DEPWS). (2021c). *Threatened species of the Northern Territory – Butler's dunnart*. Northern Territory Government. Available at: https://nt.gov.au/__data/assets/pdf_file/0003/205518/butlers-dunnart.pdf [Accessed 19 Apr 2022]

Department of Environment, Parks and Water Security (DEPWS) (2021d). *Threatened species of the Northern Territory – Partridge pigeon.* Northern Territory Government. Available at: https://nt.gov.au/__data/assets/pdf_file/0003/206355/partridge-pigeon.pdf [Accessed 22 Apr 2022].

Department of Sustainability, Environment, Water, Population and Communities (DSEWPaC) (2011). *Invasive Species Fact Sheet: The Feral Pig (Sus scrofa)*, Canberra. https://www.awe.gov.au/biosecurity-trade/invasive-species/publications/factsheet-feral-pig-sus-scrofa [Accessed 28 Mar 2022]

Department of Sustainability, Environment, Water, Population and Communities (DSEWPaC) (2012). *Threat Abatement Plan to reduce impacts on Northern Australia's biodiversity by the five listed grasses*. Canberra. https://www.awe.gov.au/sites/default/files/documents/five-listed-grasses-tap.pdf [Accessed 12 Apr 2022]

Department of the Environment and Natural Resources (DENR) (2019). *Land Clearing Guidelines*. Darwin, Northern Territory.

Firth, R., Woinarski, J., Brennan, K., Hempel, C. (2006). Environmental relationships of the Brush-tailed Rabbit-rat *Conilurus penicillatus* and other small mammals on the Tiwi Islands, northern Australia. *Journal of* Biogeography*, 33*, pp. 1820– 1837.

Fraser, F.J. (2000). *The impacts of fire and grazing on the Partridge Pigeon: the ecological requirements of a declining tropical granivore*. PhD thesis. Australian National University, Canberra.

Garnett ST and Crowley GM (2000). *The Action Plan for Australian Birds 2000*. Environment Australia and Birds Australia: Canberra, ACT.

Garnett, S.T., Baker G.B. (2021) *The Action Plan for Australian Birds 2020* CSIRO Publishing, Melbourne.

Hamel, M., Bradshaw, C., Garnett, S. (2008) *Population viability analyses for the Red Goshawk (Erythrotriorchis radiatus) on the Tiwi Islands.* Charles Darwin University, unpublished report to Tiwi Land Council.

Harrison, L., McGuire, L., Ward, S. Fisher, A., Pavey, C., Fegan, M. and Lynch, B. (2009). *An inventory of sites of international and national significance for biodiversity values in the Northern Territory*. Department of Natural Resources, Environment, the Arts and Sport, Darwin, NT.

Higgins, P.J. (Ed.) (1999). *Handbook of Australian, New Zealand and Antarctic Birds*. Volume 4: Parrots to Dollarbird. Oxford University Press, Melbourne.

Hill, B. (2020). *Middle Arm Regional Environmental Assessment – Stage 2 Final Report – Appendix 2: Terrestrial Threatened and Significant Species*. Department of Environment and Natural Resources, Northern Territory Government.

IUCN (2021). *IUCN Red List Mapping Standards and Data Quality for the IUCN Red List Spatial Data: Version 1.9 (May 2021)*. Available at: https://www.iucnredlist.org/resources/mappingstandards#:~:text=The%20Mapping%20Standards%20and%20Data,version%201.19%20(May%202021).pdf [Accessed 13 Apr 2022].

Jessop P.J. King, D. (1997). The Land Resources of New Crown Station, NTG Technical Report No. TM96/18.

Kavanagh RP. Murray M. (1996) Home Range, Habitat and Behaviour of the Masked Owl Tyto novaehollandiae near Newcastle, New South Wales, *Emu - Austral Ornithology*, 96:4, 250-257, DOI: 10.1071/MU9960250

Kerrigan, R. Cowie, I. (2006). *Threatened Species of the Northern Territory: Typhonium jonesii*. Northern Territory Government.

Kerrigan, R., Cowie, I. and Woinarski, J. (2007). *Threatened Species of the Northern Territory: Typhonium mirabile*. Northern Territory Government.

Kerrigan, R., Cowie, I. and Liddle, D. (2012). Threatened Species of the Northern Territory - *Cycas armstrongii*. Department of Land Resource Management, Northern Territory Government.

Liddle D.T. (2004). The ecology of *Cycas armstrongii* and management of fire in Australia's tropical savannas. (PhD), Charles Darwin University, Darwin, NT.

Liddle, D. (2009). *Management program for Cycads in the Northern Territory of Australia 2009-2014*. Northern Territory Department of Natural Resources, Environment, the Arts and Sport. Darwin.

McKay, L. (2017). *A Guide to the Wildlife and Protected Areas of the Top End*, The Environment Centre NT, Darwin.

Morris, K., Woinarski, J., Friend, T., Foulkes, J., Kerle, A. & Ellis, M. (2016). *Trichosurus vulpecula. The IUCN Red List of Threatened Species 2016*: e.T40585A21952080. https://dx.doi.org/10.2305/IUCN.UK.2016-2.RLTS.T40585A21952080.en. [Accessed 14 Mar 2022]

NSW National Parks and Wildlife Service (NSW) (2003). *The Bioregions of New South Wales: their biodiversity, conservation and history.* NSW National Parks and Wildlife Service, Hurstville.

Olsen, C.J. (1980). *A report on the land resources of south east Bathurst Island*. Report No. LC 80/2 Land Conservation Unit, Conservation Committee of the Northern Territory, Darwin, NT.

Parks and Wildlife Commission of the Northern Territory and Environment Australia (1998). *The history and natural resources of the Tiwi Islands Northern Territory*. Available at: https://hdl.handle.net/10070/228664 [Accessed 4 Feb 2022]

Russell-Smith, J. and Whitehead, P.J. (2015). Reimagining fire management if fire-prone northern Australia. In Murphy, B.P., Edwards, A.C., Meyer, M. and Russell-Smith, J. (eds), *Carbon Accounting and Savanna Fire Management*, CSIRO, Clayton South, Victoria.

Smith, J., Dudgeon, I., Duncan, T. (2008a) Investigating the ecology of the Tiwi Masked Owl on Melville Island - Report 6, May 2008. Indicus Biological Consultants.

Smith, J., Dudgeon, I., Duncan, T. (2008b) Investigating the ecology of the Tiwi Masked Owl on Melville Island - Report 7, October 2008. Indicus Biological Consultants.

Stobo-Wilson A, Murphy B, & Cremona T (2019) Contrasting patterns of decline in two arboreal marsupials from Northern Australia. *Biodiversity Conservation* 28, 2951.

Threatened Species Scientific Committee (TSSC) (2015a). *Conservation Advice Erythrotriorchis radiatus red goshawk*. Canberra: Department of the Environment. Available from: http://www.environment.gov.au/biodiversity/threatened/species/pubs/942-conservation-advice-31102015.pdf [Accessed 21 Apr 2022]

Threatened Species Scientific Committee (TSSC) (2015b). *Conservation Advice Geophaps smithii smithii partridge pigeon (eastern).* Canberra: Department of the Environment. Available at: http://www.environment.gov.au/biodiversity/threatened/species/pubs/64441-conservation-advice-01102015.pdf. [Accessed 14 Apr 2022].

Threatened Species Scientific Committee (TSSC) (2015c). *Conservation Advice Sminthopsis butleri Butler's dunnart*. Canberra: Department of the Environment. Available from: http://www.environment.gov.au/biodiversity/threatened/species/pubs/302-conservation-advice-01102015.pdf. [Accessed 19 Apr 2022].

Threatened Species Scientific Committee (TSSC) (2015d). *Conservation Advice Tyto novaehollandiae melvillensis masked owl (Tiwi Islands)*. Canberra: Department of the Environment. Available at: http://www.environment.gov.au/biodiversity/threatened/species/pubs/26049-conservation-advice-01102015.pdf. [Accessed 14 Apr 2022].

Threatened Species Scientific Committee (TSSC) (2021). Conservation Advice *Trichosurus vulpecula arnhemensis* Northern Brushtail Possum. Canberra: Department of Agriculture, Water and the Environment. Available at: http://www.environment.gov.au/biodiversity/threatened/species/pubs/83091-conservation-advice-11052021.pdf [Accessed 21 Apr 2022]

Tiwi Land Council (TLC) (2022). *Threatened species datasets shared by Tiwi Land Council.*

Ward, S. (2010) *Survey protocol for masked owls in the NT Tyto novaehollandiae (north Australian mainland subspecies T. n. kimberli and Tiwi subspecies T. n. melvillensis*. [online] Available at: https://nt.gov.au/__data/assets/pdf_file/0005/423275/masked-owl-survey-protocol.pdf. [Accessed 14 Mar 2022].

Ward, S. and Woinarski, J. (2012) *Threatened species of the Northern Territory – Butler's dunnart Sminthopsis butleri*. Northern Territory Government, Department of Land Resource Management.

Watkinson A.R. and Powell J.C. (1997) The Life History and Population Structure of *Cycas armstrongii* in Monsoonal Northern Australia. Oecologia 111(3), 341–349.

Woinarski, J., Brennan, K., Firth, R., Watt, F. (2000). *Biodiversity conservation on the Tiwi islands: plants, vegetation types and terrestrial vertebrates on Melville Island.* Report to Tiwi Land Council, Darwin.

Woinarski, J., Pavey, C., Kerrigan, R., Cowie, I. and Ward, S. (Eds) (2007). *Lost from Our Landscape: Threatened Species of the Northern Territory*. Northern Territory Government, Darwin

Woinarski, J., Brennan, K., Hempel, C., Armstrong, M., Milne, D. and Chatto, R. (2003). *Biodiversity conservation on the Tiwi islands, Northern Territory. Part 2: Fauna*. Department of Infrastructure Planning and Environment, Darwin

Woinarski, J. and Westaway, J. (2008) *Hollow formation in the Eucalyptus miniata – E. tetrodonta open forests and savanna woodlands of tropical northern Australia*. Final report to Land and Water Australia (Native Vegetation Program). Project TRC-14.

Woolley, L. A., Murphy, B.P., Radford, I. J., Westaway, J., & Woinarski, J.C.Z (2018). Cyclones, fire, and termites: The drivers of tree hollow abundance in northern Australia's mesic tropical savanna. *Forest Ecology and Management, 419-420*, DOI: https://doi.org/10.1016/j.foreco.2018.03.034

APPENDIX A PROTECTED MATTERS SEARCH TOOL (PMST) REPORT (2022)

Australian Government
Department of Agriculture, Water and the Environment

EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected. Please see the caveat for interpretation of information provided here.

Report created: 07-Feb-2022

Summary

Matters of National Environment Significance

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

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance (Ramsar	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	None
Listed Threatened Species:	40
Listed Migratory Species:	46

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place. Information on the new heritage laws can be found at http://www.environment.gov.au/heritage

A permit may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

Commonwealth Lands:	None
Commonwealth Heritage Places:	None
Listed Marine Species:	80
Whales and Other Cetaceans:	12
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	None
Habitat Critical to the Survival of Marine Turtles:	2

Extra Information

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

State and Territory Reserves:	None
Regional Forest Agreements:	None
Nationally Important Wetlands:	None
EPBC Act Referrals:	None
Key Ecological Features (Marine):	None
Biologically Important Areas:	1
Bioregional Assessments:	None
Geological and Bioregional Assessments:	None

Details

Matters of National Environmental Significance

Listed Threatened Species		[Resource Information]
Status of Conservation Dependent and Extinct are not MNES under the EPBC Act. Number is the current name ID.		
Scientific Name	Threatened Category	Presence Text
BIRD		
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat may occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat likely to occur within area
Erythrotriorchis radiatus Red Goshawk [942]	Vulnerable	Species or species habitat known to occur within area
Falco hypoleucos Grey Falcon [929]	Vulnerable	Species or species habitat known to occur within area
Geophaps smithii smithii Partridge Pigeon (eastern) [64441]	Vulnerable	Species or species habitat known to occur within area
Limosa lapponica baueri Nunivak Bar-tailed Godwit, Western Alaskan Bar-tailed Godwit [86380]	Vulnerable	Species or species habitat known to occur within area
Melanodryas cucullata melvillensis Tiwi Islands Hooded Robin, Hooded Robin (Tiwi Islands) [67092]	Critically Endangered	Species or species habitat likely to occur within area

Scientific Name	Threatened Category	Presence Text
[Numenius madagascariensis](#) Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area
[Rostratula australis](#) Australian Painted Snipe [77037]	Endangered	Species or species habitat may occur within area
[Tyto novaehollandiae melvillensis](#) Tiwi Masked Owl, Tiwi Islands Masked Owl [26049]	Endangered	Species or species habitat known to occur within area
MAMMAL		
[Antechinus bellus](#) Fawn Antechinus [344]	Vulnerable	Species or species habitat likely to occur within area
[Balaenoptera musculus](#) Blue Whale [36]	Endangered	Species or species habitat may occur within area
[Conilurus penicillatus](#) Brush-tailed Rabbit-rat, Brush-tailed Tree-rat, Pakooma [132]	Vulnerable	Species or species habitat known to occur within area
[Megaptera novaeangliae](#) Humpback Whale [38]	Vulnerable	Species or species habitat may occur within area
[Mesembriomys gouldii melvillensis](#) Black-footed Tree-rat (Melville Island) [87619]	Vulnerable	Species or species habitat likely to occur within area
[Phascogale pirata](#) Northern Brush-tailed Phascogale [82954]	Vulnerable	Species or species habitat likely to occur within area
[Saccolaimus saccolaimus nudicluniatus](#) Bare-rumped Sheath-tailed Bat, Bare-rumped Sheathtail Bat [66889]	Vulnerable	Species or species habitat may occur within area
[Sminthopsis butleri](#) Butler's Dunnart [302]	Vulnerable	Species or species habitat known to occur within area

Scientific Name	Threatened Category	Presence Text
Trichosurus vulpecula arnhemensis Northern Brushtail Possum [83091]	Vulnerable	Species or species habitat known to occur within area
Xeromys myoides Water Mouse, False Water Rat, Yirrkoo [66]	Vulnerable	Species or species habitat likely to occur within area
PLANT		
Burmannia sp. Bathurst Island (R.Fensham 1021) [82017]	Endangered	Species or species habitat likely to occur within area
Typhonium jonesii a herb [62412]	Endangered	Species or species habitat likely to occur within area
Typhonium mirabile a herb [79227]	Endangered	Species or species habitat likely to occur within area
Xylopia monosperma a shrub [82030]	Endangered	Species or species habitat likely to occur within area
REPTILE		
Acanthophis hawkei Plains Death Adder [83821]	Vulnerable	Species or species habitat may occur within area
Caretta caretta Loggerhead Turtle [1763]	Endangered	Species or species habitat known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Breeding known to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Breeding likely to occur within area
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Species or species habitat known to occur within area

Scientific Name	Threatened Category	Presence Text
Lepidochelys olivacea Olive Ridley Turtle, Pacific Ridley Turtle [1767]	Endangered	Breeding known to occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Breeding known to occur within area
SHARK		
Carcharodon carcharias White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat may occur within area
Glyphis garricki Northern River Shark, New Guinea River Shark [82454]	Endangered	Species or species habitat may occur within area
Glyphis glyphis Speartooth Shark [82453]	Critically Endangered	Species or species habitat may occur within area
Pristis clavata Dwarf Sawfish, Queensland Sawfish [68447]	Vulnerable	Species or species habitat known to occur within area
Pristis pristis Freshwater Sawfish, Largetooth Sawfish, River Sawfish, Leichhardt's Sawfish, Northern Sawfish [60756]	Vulnerable	Species or species habitat known to occur within area
Pristis zijsron Green Sawfish, Dindagubba, Narrowsnout Sawfish [68442]	Vulnerable	Species or species habitat known to occur within area
Rhincodon typus Whale Shark [66680]	Vulnerable	Species or species habitat may occur within area
Sphyrna lewini Scalloped Hammerhead [85267]	Conservation Dependent	Species or species habitat likely to occur within area

Listed Migratory Species		[Resource Information]
Scientific Name	Threatened Category	Presence Text
Migratory Marine Birds		
Anous stolidus Common Noddy [825]		Species or species habitat may occur within area

Scientific Name	Threatened Category	Presence Text
Apus pacificus		
Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Calonectris leucomelas		
Streaked Shearwater [1077]		Species or species habitat may occur within area
Fregata ariel		
Lesser Frigatebird, Least Frigatebird [1012]		Species or species habitat likely to occur within area
Fregata minor		
Great Frigatebird, Greater Frigatebird [1013]		Species or species habitat likely to occur within area
Migratory Marine Species		
Anoxypristis cuspidata		
Narrow Sawfish, Knifetooth Sawfish [68448]		Species or species habitat likely to occur within area
Balaenoptera edeni		
Bryde's Whale [35]		Species or species habitat may occur within area
Balaenoptera musculus		
Blue Whale [36]	Endangered	Species or species habitat may occur within area
Carcharhinus longimanus		
Oceanic Whitetip Shark [84108]		Species or species habitat may occur within area
Carcharodon carcharias		
White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat may occur within area
Caretta caretta		
Loggerhead Turtle [1763]	Endangered	Species or species habitat known to occur within area
Chelonia mydas		
Green Turtle [1765]	Vulnerable	Breeding known to occur within area

Scientific Name	Threatened Category	Presence Text
Crocodylus porosus Salt-water Crocodile, Estuarine Crocodile [1774]		Species or species habitat likely to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Breeding likely to occur within area
Dugong dugon Dugong [28]		Species or species habitat known to occur within area
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Species or species habitat known to occur within area
Lepidochelys olivacea Olive Ridley Turtle, Pacific Ridley Turtle [1767]	Endangered	Breeding known to occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Species or species habitat may occur within area
Mobula alfredi as Manta alfredi Reef Manta Ray, Coastal Manta Ray [90033]		Species or species habitat may occur within area
Mobula birostris as Manta birostris Giant Manta Ray [90034]		Species or species habitat may occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Breeding known to occur within area
Orcaella heinsohni Australian Snubfin Dolphin [81322]		Species or species habitat known to occur within area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat may occur within area
Pristis clavata Dwarf Sawfish, Queensland Sawfish [68447]	Vulnerable	Species or species habitat known to occur within area

Scientific Name	Threatened Category	Presence Text
Pristis pristis Freshwater Sawfish, Largetooth Sawfish, River Sawfish, Leichhardt's Sawfish, Northern Sawfish [60756]	Vulnerable	Species or species habitat known to occur within area
Pristis zijsron Green Sawfish, Dindagubba, Narrowsnout Sawfish [68442]	Vulnerable	Species or species habitat known to occur within area
Rhincodon typus Whale Shark [66680]	Vulnerable	Species or species habitat may occur within area
Sousa sahulensis as Sousa chinensis Australian Humpback Dolphin [87942]		Species or species habitat may occur within area
Tursiops aduncus (Arafura/Timor Sea populations) Spotted Bottlenose Dolphin (Arafura/Timor Sea populations) [78900]		Species or species habitat known to occur within area
Migratory Terrestrial Species		
Cecropis daurica Red-rumped Swallow [80610]		Species or species habitat may occur within area
Cuculus optatus Oriental Cuckoo, Horsfield's Cuckoo [86651]		Species or species habitat may occur within area
Hirundo rustica Barn Swallow [662]		Species or species habitat may occur within area
Rhipidura rufifrons Rufous Fantail [592]		Species or species habitat likely to occur within area
Migratory Wetlands Species		
Acrocephalus orientalis Oriental Reed-Warbler [59570]		Species or species habitat may occur within area
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat known to occur within area

Scientific Name	Threatened Category	Presence Text
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat may occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat likely to occur within area
Charadrius veredus Oriental Plover, Oriental Dotterel [882]		Species or species habitat may occur within area
Glareola maldivarum Oriental Pratincole [840]		Species or species habitat may occur within area
Limnodromus semipalmatus Asian Dowitcher [843]		Species or species habitat may occur within area
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat known to occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area
Pandion haliaetus Osprey [952]		Species or species habitat known to occur within area

Other Matters Protected by the EPBC Act

Listed Marine Species		[Resource Information]
Scientific Name	Threatened Category	Presence Text
Bird		
Acrocephalus orientalis Oriental Reed-Warbler [59570]		Species or species habitat may occur within area overfly marine area
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat known to occur within area
Anous stolidus Common Noddy [825]		Species or species habitat may occur within area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area overfly marine area
Bubulcus ibis as Ardea ibis Cattle Egret [66521]		Species or species habitat may occur within area overfly marine area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat may occur within area overfly marine area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area overfly marine area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area overfly marine area

Scientific Name	Threatened Category	Presence Text
Calonectris leucomelas Streaked Shearwater [1077]		Species or species habitat may occur within area
Cecropis daurica as Hirundo daurica Red-rumped Swallow [80610]		Species or species habitat may occur within area overfly marine area
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat likely to occur within area
Charadrius veredus Oriental Plover, Oriental Dotterel [882]		Species or species habitat may occur within area overfly marine area
Fregata ariel Lesser Frigatebird, Least Frigatebird [1012]		Species or species habitat likely to occur within area
Fregata minor Great Frigatebird, Greater Frigatebird [1013]		Species or species habitat likely to occur within area
Glareola maldivarum Oriental Pratincole [840]		Species or species habitat may occur within area overfly marine area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat likely to occur within area
Hirundo rustica Barn Swallow [662]		Species or species habitat may occur within area overfly marine area
Limnodromus semipalmatus Asian Dowitcher [843]		Species or species habitat may occur within area overfly marine area

Scientific Name	Threatened Category	Presence Text
Limosa lapponica		
Bar-tailed Godwit [844]		Species or species habitat known to occur within area
Merops ornatus		
Rainbow Bee-eater [670]		Species or species habitat may occur within area overfly marine area
Numenius madagascariensis		
Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area
Pandion haliaetus		
Osprey [952]		Species or species habitat known to occur within area
Rhipidura rufifrons		
Rufous Fantail [592]		Species or species habitat likely to occur within area overfly marine area
Rostratula australis as Rostratula benghalensis (sensu lato)		
Australian Painted Snipe [77037]	Endangered	Species or species habitat may occur within area overfly marine area
Fish		
Campichthys tricarinatus		
Three-keel Pipefish [66192]		Species or species habitat may occur within area
Choeroichthys brachysoma		
Pacific Short-bodied Pipefish, Short-bodied Pipefish [66194]		Species or species habitat may occur within area
Choeroichthys suillus		
Pig-snouted Pipefish [66198]		Species or species habitat may occur within area
Corythoichthys amplexus		
Fijian Banded Pipefish, Brown-banded Pipefish [66199]		Species or species habitat may occur within area

Scientific Name	Threatened Category	Presence Text
Corythoichthys flavofasciatus Reticulate Pipefish, Yellow-banded Pipefish, Network Pipefish [66200]		Species or species habitat may occur within area
Corythoichthys haematopterus Reef-top Pipefish [66201]		Species or species habitat may occur within area
Corythoichthys schultzi Schultz's Pipefish [66205]		Species or species habitat may occur within area
Doryrhamphus excisus Bluestripe Pipefish, Indian Blue-stripe Pipefish, Pacific Blue-stripe Pipefish [66211]		Species or species habitat may occur within area
Doryrhamphus janssi Cleaner Pipefish, Janss' Pipefish [66212]		Species or species habitat may occur within area
Festucalex cinctus Girdled Pipefish [66214]		Species or species habitat may occur within area
Halicampus brocki Brock's Pipefish [66219]		Species or species habitat may occur within area
Halicampus dunckeri Red-hair Pipefish, Duncker's Pipefish [66220]		Species or species habitat may occur within area
Halicampus grayi Mud Pipefish, Gray's Pipefish [66221]		Species or species habitat may occur within area
Halicampus spinirostris Spiny-snout Pipefish [66225]		Species or species habitat may occur within area
Haliichthys taeniophorus Ribboned Pipehorse, Ribboned Seadragon [66226]		Species or species habitat may occur within area

Scientific Name	Threatened Category	Presence Text
Hippichthys cyanospilos Blue-speckled Pipefish, Blue-spotted Pipefish [66228]		Species or species habitat may occur within area
Hippichthys parvicarinatus Short-keel Pipefish, Short-keeled Pipefish [66230]		Species or species habitat may occur within area
Hippichthys penicillus Beady Pipefish, Steep-nosed Pipefish [66231]		Species or species habitat may occur within area
Hippocampus histrix Spiny Seahorse, Thorny Seahorse [66236]		Species or species habitat may occur within area
Hippocampus kuda Spotted Seahorse, Yellow Seahorse [66237]		Species or species habitat may occur within area
Hippocampus planifrons Flat-face Seahorse [66238]		Species or species habitat may occur within area
Hippocampus spinosissimus Hedgehog Seahorse [66239]		Species or species habitat may occur within area
Micrognathus micronotopterus Tidepool Pipefish [66255]		Species or species habitat may occur within area
Solegnathus hardwickii Pallid Pipehorse, Hardwick's Pipehorse [66272]		Species or species habitat may occur within area
Solegnathus lettiensis Gunther's Pipehorse, Indonesian Pipefish [66273]		Species or species habitat may occur within area
Solenostomus cyanopterus Robust Ghostpipefish, Blue-finned Ghost Pipefish, [66183]		Species or species habitat may occur within area

Scientific Name	Threatened Category	Presence Text
[Syngnathoides biaculeatus](#) Double-end Pipehorse, Double-ended Pipehorse, Alligator Pipefish [66279]		Species or species habitat may occur within area
[Trachyrhamphus bicoarctatus](#) Bentstick Pipefish, Bend Stick Pipefish, Short-tailed Pipefish [66280]		Species or species habitat may occur within area
[Trachyrhamphus longirostris](#) Straightstick Pipefish, Long-nosed Pipefish, Straight Stick Pipefish [66281]		Species or species habitat may occur within area
Mammal		
[Dugong dugon](#) Dugong [28]		Species or species habitat known to occur within area
Reptile		
[Acalyptophis peronii](#) Horned Seasnake [1114]		Species or species habitat may occur within area
[Aipysurus duboisii](#) Dubois' Seasnake [1116]		Species or species habitat may occur within area
[Aipysurus eydouxii](#) Spine-tailed Seasnake [1117]		Species or species habitat may occur within area
[Aipysurus laevis](#) Olive Seasnake [1120]		Species or species habitat may occur within area
[Astrotia stokesii](#) Stokes' Seasnake [1122]		Species or species habitat may occur within area
[Caretta caretta](#) Loggerhead Turtle [1763]	Endangered	Species or species habitat known to occur within area
[Chelonia mydas](#) Green Turtle [1765]	Vulnerable	Breeding known to occur within area

Scientific Name	Threatened Category	Presence Text
Chitulia inornata as Hydrophis inornatus Plain Seasnake [87379]		Species or species habitat may occur within area
Chitulia ornata as Hydrophis ornatus Spotted Seasnake, Ornate Reef Seasnake [87377]		Species or species habitat may occur within area
Crocodylus porosus Salt-water Crocodile, Estuarine Crocodile [1774]		Species or species habitat likely to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Breeding likely to occur within area
Disteira kingii Spectacled Seasnake [1123]		Species or species habitat may occur within area
Disteira major Olive-headed Seasnake [1124]		Species or species habitat may occur within area
Enhydrina schistosa Beaked Seasnake [1126]		Species or species habitat may occur within area
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Species or species habitat known to occur within area
Hydrophis atriceps Black-headed Seasnake [1101]		Species or species habitat may occur within area
Hydrophis elegans Elegant Seasnake [1104]		Species or species habitat may occur within area
Hydrophis macdowelli as Hydrophis mcdowelli Small-headed Seasnake [75601]		Species or species habitat may occur within area

Scientific Name	Threatened Category	Presence Text
Lapemis curtus as Lapemis hardwickii Spine-bellied Seasnake [83554]		Species or species habitat may occur within area
Leioselasma coggeri as Hydrophis coggeri Black-headed Sea Snake, Slender-necked Seasnake [87373]		Species or species habitat may occur within area
Leioselasma pacifica as Hydrophis pacificus Large-headed Seasnake, Pacific Seasnake [87378]		Species or species habitat may occur within area
Lepidochelys olivacea Olive Ridley Turtle, Pacific Ridley Turtle [1767]	Endangered	Breeding known to occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Breeding known to occur within area
Parahydrophis mertoni Northern Mangrove Seasnake [1090]		Species or species habitat may occur within area
Pelamis platurus Yellow-bellied Seasnake [1091]		Species or species habitat may occur within area

Whales and Other Cetaceans		[Resource Information]
Current Scientific Name	Status	Type of Presence
Mammal		
Balaenoptera edeni Bryde's Whale [35]		Species or species habitat may occur within area
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat may occur within area
Delphinus delphis Common Dolphin, Short-beaked Common Dolphin [60]		Species or species habitat may occur within area
Grampus griseus Risso's Dolphin, Grampus [64]		Species or species habitat may occur within area

Current Scientific Name	Status	Type of Presence
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Species or species habitat may occur within area
Orcaella heinsohni as Orcaella brevirostris Australian Snubfin Dolphin [81322]		Species or species habitat known to occur within area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat may occur within area
Sousa sahulensis as Sousa chinensis Australian Humpback Dolphin [87942]		Species or species habitat may occur within area
Stenella attenuata Spotted Dolphin, Pantropical Spotted Dolphin [51]		Species or species habitat may occur within area
Tursiops aduncus Indian Ocean Bottlenose Dolphin, Spotted Bottlenose Dolphin [68418]		Species or species habitat likely to occur within area
Tursiops aduncus (Arafura/Timor Sea populations) Spotted Bottlenose Dolphin (Arafura/Timor Sea populations) [78900]		Species or species habitat known to occur within area
Tursiops truncatus s. str. Bottlenose Dolphin [68417]		Species or species habitat may occur within area

Habitat Critical to the Survival of Marine Turtles		
Scientific Name	Behaviour	Presence
Aug - Sep		
Natator depressus Flatback Turtle [59257]	Nesting	Known to occur
May - Jul		
Lepidochelys olivacea Olive Ridley Turtle [1767]	Nesting	Known to occur

Extra Information

Biologically Important Areas		
Scientific Name	Behaviour	Presence
Marine Turtles		
Natator depressus		
Flatback Turtle [59257]	Internesting	Likely to occur

Caveat

1 PURPOSE

This report is designed to assist in identifying the location of matters of national environmental significance (MNES) and other matters protected by the Environment Protection and Biodiversity Conservation Act 1999 (Cth) (EPBC Act) which may be relevant in determining obligations and requirements under the EPBC Act.

The report contains the mapped locations of:

- World and National Heritage properties;
- Wetlands of International and National Importance;
- Commonwealth and State/Territory reserves;
- distribution of listed threatened, migratory and marine species;
- listed threatened ecological communities; and
- other information that may be useful as an indicator of potential habitat value.

2 DISCLAIMER

This report is not intended to be exhaustive and should only be relied upon as a general guide as mapped data is not available for all species or ecological communities listed under the EPBC Act (see below). Persons seeking to use the information contained in this report to inform the referral of a proposed action under the EPBC Act should consider the limitations noted below and whether additional information is required to determine the existence and location of MNES and other protected matters.

Where data are available to inform the mapping of protected species, the presence type (e.g. known, likely or may occur) that can be determined from the data is indicated in general terms. It is the responsibility of any person using or relying on the information in this report to ensure that it is suitable for the circumstances of any proposed use. The Commonwealth cannot accept responsibility for the consequences of any use of the report or any part thereof. To the maximum extent allowed under governing law, the Commonwealth will not be liable for any loss or damage that may be occasioned directly or indirectly through the use of, or reliance

3 DATA SOURCES

Threatened ecological communities

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

Threatened, migratory and marine species

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

Where little information is available for a species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc.).

In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More detailed distribution mapping methods are used to update these distributions

4 LIMITATIONS

The following species and ecological communities have not been mapped and do not appear in this report:

- threatened species listed as extinct or considered vagrants;
- some recently listed species and ecological communities;
- some listed migratory and listed marine species, which are not listed as threatened species; and
- migratory species that are very widespread, vagrant, or only occur in Australia in small numbers.

The following groups have been mapped, but may not cover the complete distribution of the species:

- listed migratory and/or listed marine seabirds, which are not listed as threatened, have only been mapped for recorded
- seals which have only been mapped for breeding sites near the Australian continent

The breeding sites may be important for the protection of the Commonwealth Marine environment.

Refer to the metadata for the feature group (using the Resource Information link) for the currency of the information.

Acknowledgements

This database has been compiled from a range of data sources. The department acknowledges the following custodians who have contributed valuable data and advice:

-Office of Environment and Heritage, New South Wales
-Department of Environment and Primary Industries, Victoria
-Department of Primary Industries, Parks, Water and Environment, Tasmania
-Department of Environment, Water and Natural Resources, South Australia
-Department of Land and Resource Management, Northern Territory
-Department of Environmental and Heritage Protection, Queensland
-Department of Parks and Wildlife, Western Australia
-Environment and Planning Directorate, ACT
-Birdlife Australia
-Australian Bird and Bat Banding Scheme
-Australian National Wildlife Collection
-Natural history museums of Australia
-Museum Victoria
-Australian Museum
-South Australian Museum
-Queensland Museum
-Online Zoological Collections of Australian Museums
-Queensland Herbarium
-National Herbarium of NSW
-Royal Botanic Gardens and National Herbarium of Victoria
-Tasmanian Herbarium
-State Herbarium of South Australia
-Northern Territory Herbarium
-Western Australian Herbarium
-Australian National Herbarium, Canberra
-University of New England
-Ocean Biogeographic Information System
-Australian Government, Department of Defence
Forestry Corporation, NSW
-Geoscience Australia
-CSIRO
-Australian Tropical Herbarium, Cairns
-eBird Australia
-Australian Government – Australian Antarctic Data Centre
-Museum and Art Gallery of the Northern Territory
-Australian Government National Environmental Science Program
-Australian Institute of Marine Science
-Reef Life Survey Australia
-American Museum of Natural History
-Queen Victoria Museum and Art Gallery, Inveresk, Tasmania
-Tasmanian Museum and Art Gallery, Hobart, Tasmania
-Other groups and individuals

The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Please feel free to provide feedback via the Contact Us page.

Department of Agriculture Water and the Environment
GPO Box 858
Canberra City ACT 2601 Australia
+61 2 6274 1111

APPENDIX B 2022 DESKTOP THREATENED SPECIES 'LIKELIHOOD OF OCCURRENCE' ASSESSMENT

Name	Status		Summary	Likelihood of occurrence within the project area
	Cth	NT		
BIRDS				
Red Goshawk *Erythrotriorchis radiatus*	VU	VU	**Habitat:** Prefers tall, open Eucalypt forest and riparian areas. Nests in large trees, frequently the tallest and most massive in a tall stand, nest trees are invariably within 1 km of permanent water (Debus & Czechura 1988; Aumann & Baker-Gabb 1991). Rarely breeds in areas with fragmented native vegetation (Aumann & Baker-Gabb 1991; Czechura 2001). Home range of up to 200 km^2 (Czechura & Hobson 2000). **Distribution:** Solitary and secretive hawk that is sparsely distributed across much of northern Australia, from the Kimberley in WA to south-eastern Qld. Within this range, generally confined to taller forests characteristic of higher rainfall coastal and sub-coastal areas (Debus 1998), but there are some isolated records of wandering birds from central Australia (Woinarski 2006).	**MEDIUM** • Suitable habitat within project area • No recent records within the project area, but records within 20 km of the project area.
	Aumann, T. and Baker-Gabb, D. (1991). *A Management Plan for the Red Goshawk*. RAOU Report 75, Royal Australasian Ornithologists Union, Melbourne. Czechura G.V. and Hobson R.G. (2000). *The Red Goshawk* Erythrotriorchis radiatus *in northern Queensland: status and distribution*. Report to Queensland Parks and Wildlife Service. Czechura G.V. (2001). *The status and distribution of the Red Goshawk* Erythrotriorchis radiatus *on Cape York Peninsula, Queensland*. Unpublished report to Birds Australia. Debus, S. and Czechura, G. (1988). Field identification of the Red Goshawk *Erythrotriorchis radiatus. Australian Bird Watcher*, Vol. 12, pp. 154-159. Debus, S. (1998). *The Birds of Prey of Australia.* Oxford University Press, Melbourne. Department of the Environment (2022). *Erythrotriorchis radiatus* in Species Profile and Threats Database, Department of the Environment, Canberra. Available at: http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=942 [Accessed 27 Jan 2022] Woinarski, J. (2006). *Threatened Species of the Northern Territory - Red Goshawk - Erythrotriorchis radiatus*. Northern Territory Department of Environment and Natural Resources. [online] Available at: https://nt.gov.au/__data/assets/pdf_file/0018/206352/red-goshawk.pdf [Accessed 27 Jan 2022].		
Grey Falcon *Falco hypoleucos*	-	VU	**Habitat:** A generally solitary desert falcon that occurs in areas of lightly-timbered lowland plains, typically on inland drainage systems, where the average annual rainfall is less than 500 mm (Ward 2012). **Distribution:** Sparsely distributed through much of the arid and semi-arid regions of Australia but has been recorded from all mainland states and territories. In the NT, the majority of records are from the southern half, but there are records all the way up to Darwin (Ward 2012). A study of breeding records from 2003 to 2011 documented 38 breeding events – all within the hottest climate classes of Australia – with the northern-most record occurring south of Daly Waters (Schoenjahn 2013).	**LOW** • Suitable habitat does not occur within project area, however, does occur within 20km of the project area. • Considered to only occur as a vagrant on the Tiwi Islands • One record within 20 km of the project area in 2001.
	Schoenjahn, J. (2013), A hot environment and one type of prey: investigating why the Grey Falcon (Falco hypoleucos) is Australia's rarest falcon, *Emu*, Vol. 113, pp. 19-25. Department of Environment, Parks and Water Security (2021). *Threatened Species of the Northern Territory - Grey Falcon - Falco hypoleucos*. Northern Territory Government [online] Available at: https://nt.gov.au/__data/assets/pdf_file/0020/206354/grey-falcon.pdf [Accessed 27 Jan 2022].		

Name	Status		Summary	Likelihood of occurrence within the project area
	Cth	NT		
Partridge Pigeon (eastern subspecies) *Geophaps smithii smithii*	VU	VU	**Habitat:** Open forests and woodlands with an understorey of grasses (Woinarski 2006). Prefers woodland dominated by *Eucalyptus tetrodonta* and *E. miniata* (Braithwaite 1985; Garnett et al. 2011; Higgins & Davies 1996). According to Fraser (2001), favour a structurally-patchy savanna understorey at a relatively intricate scale. In all seasons, prefer to feed in areas that have an open ground layer (e.g. following fire); however, more likely to nest where there is dense vegetation cover. Require the seeds of certain perennial grasses and sedges that are available early in the wet season when seed is otherwise scarce, particular the perennial grass species *Alloteropsis semialata* and *Chrysopogon*. The presence of these grasses may be crucial for survival at this time (Fraser 2000). Largely sedentary; however, can travel distances of 5 to 10 km in the wet season on search of food and water resources (Fraser 2000). Home ranges vary seasonally between 8 – 31 hectares Fraser (2000). **Distribution:** Historically, across the Top End (from Kununurra in WA to Borroloola in the NT). Since early 20th century a severe range contraction from the western, eastern and southern parts of the former distribution (Higgins & Davies 1996; Woinarski et al. 2007). Currently, distribution is limited to sub-coastal NT from Yinberrie Hill in the south, Litchfield NP in the west and (western) Arnhem Land in the east (Garnett et al. 2011).	**MEDIUM** • Suitable habitat within the project area • No recent records within the project area, but one recent record within 20 km of the project area.
	Braithwaite, R.W. (1985). *The Kakadu fauna survey: an ecological survey of Kakadu National Park*. Australian National Parks & Wildlife Service, Canberra. Fraser, F. (2000). Species profile: Partridge Pigeon Geophaps smithii. *Northern Territory Naturalist* 16, 38-39. Fraser, F., Lawson V., Morrison S., Christophersen P., McGregor S. and Rawlinson M. (2003). Fire management experiment for the declining partridge pigeon, Kakadu National Park. *Ecological Management and Restoration* 4, 94–102. Garnett, S.T., Szabo, J.K. and Dutson, G. (2011). *The Action Plan for Australian Birds 2010*. Birds Australia, CSIRO Publishing, Melbourne. Higgins, P.J. and Davies S.J.J.F. (eds) (1996). *Handbook of Australian, New Zealand and Antarctic Birds. Volume Three: Snipe to Pigeons*. Oxford University Press. Melbourne, Victoria. Woinarski, J.C.Z. (2006). *Threatened Species of the Northern Territory - Partridge Pigeon (eastern subspecies) - Geophaps smithii*. Northern Territory Department of Environment and Natural Resources. [online] Available at: https://nt.gov.au/__data/assets/pdf_file/0003/206355/partridge-pigeon.pdf [Accessed 1 May 2018]. Woinarski, J., Pavey, C., Kerrigan, R., Cowie, I. and Ward, S. (Eds) (2007). *Lost from Our Landscape: Threatened Species of the Northern Territory*. Northern Territory Government, Darwin.			
Hooded Robin (Tiwi Islands' subspecies) *Melanodryas cucullata melvillensis*	CR	CR	**Habitat:** Eucalypt tall open forests, Acacia shrublands and treeless plains (Woinarski & Ward 2012). **Distribution:** Restricted to Melville and Bathurst Islands in the Tiwi Islands of the NT, where last recorded in December 1991 and January 1992 from two sites (one on each island) (Woinarski & Ward 2012).	**LOW** • Suitable habitat within the project area • No recent records within the project area or within 20 km of the project area – last record is from January 1992 outside the 20 km search area.
	Woinarski, J. and Ward, S. (2012). *Threatened species of the Northern Territory - Hooded Robin (Tiwi subspecies) - Melanodryas cucullata melvillensis*. Northern Territory Department of Environment and Natural Resources. [online] Available at: https://nt.gov.au/__data/assets/pdf_file/0015/206340/hooded-robin.pdf [Accessed 1 May 2018].			

Name	Status		Summary	Likelihood of occurrence within the project area
	Cth	NT		
Masked Owl (Tiwi Islands' subspecies) *Tyto novaehollandiae melvillensis*	EN	EN	**Habitat:** Mostly Eucalypt tall open forests, but often roosting in monsoon rainforests and foraging in open vegetation types (DEPWS 2021). Probably have large territory sizes (Woinarski et. al 2003) **Distribution:** Restricted to Melville and Bathurst Islands in the Tiwi Islands of the NT (Woinarski et. al 2003)	**HIGH** • Suitable habitat within project area • No recent records within the project area, but records within 20 km of the project area.
	Department of Environment, Parks and Wildlife Security (2021). *Threatened species of the Northern Territory – Masked owl (Tiwi).* Northern Territory Government. https://nt.gov.au/__data/assets/pdf_file/0020/206345/masked-owl-tiwi.pdf [Accessed 31 Jan 2022]. Woinarski, J.C.Z., Brennan, K., Hempel, C., Armstrong, M., Milne, D. and Chatto, R. (2003). *Biodiversity Conservation on the Tiwi Islands, Northern Territory Part 2 Fauna*. A report to the Tiwi Land Council, Parks and Wildlife Commission of the Northern Territory. Garnett, S.T., Baker GB (Eds) (2021). *The Action Plan for Australian Birds 2020*. CSIRO Publishing, Melbourne.			
MAMMALS (TERRESTRIAL)				
Brush-tailed Rabbit-rat *Conilurus penicillatus*	VU	EN	**Habitat:** Largely restricted to mixed *Eucalypt* open forest and woodland, or on dunes with *Casuarina* – seeming to prefer habitats that are not burnt annually, that have an understorey of predominantly perennial grasses and a sparse-to-moderate middle storey (Firth et al. 2006; Firth 2007; Kemper & Firth 2008). **Distribution:** Formerly widespread across northern Australia, but has declined extensively from Qld and lower rainfall areas of the Kimberley in WA and the Top End in the NT. No recent records from much of the historically-recorded NT range between near the mouth of Victoria River (in the west) and Sir Edward Pellew island group (in east). Most recently known from Cobourg Peninsula, Tiwi Islands, Groote Eylandt and a small area within Kakadu National Park (DEPWS 2021).	**HIGH** • Suitable habitat within project area • No recent records within the project area, but records within 20 km of the project area.
	Firth, R.S.C. (2007). *Ecology and conservation status of the brush-tailed rabbit-rat Conilurus penicillatus*. PhD thesis, Charles Darwin University, Darwin, Northern Territory. Firth, R.S.C., Woinarski, J.C.Z. and Noske, R.A. (2006). Home range and den characteristics of the brush-tailed rabbit-rat *Conilurus penicillatus* in the monsoonal tropics of the Northern Territory, Australia. *Wildlife Research*, Vol. 33, pp. 397-408. Kemper, C.M. and Firth, R.S.C. (2008). Brush-tailed Rabbit-rat. In: Van Dyck, S. and Strahan, R. (eds). *The Mammals of Australia*. Reed New Holland, Chatswood, NSW. Department of Environment, Parks and Water Security (2021). *Threatened Species of the Northern Territory - Brush-tailed rabbit-rat*. Northern Territory Government [online] Available at: https://nt.gov.au/__data/assets/pdf_file/0016/205504/brush-tailed-rabbit-rat.pdf [Accessed 3 Feb 2022].			
Black-footed Tree-rat (Melville Island subspecies) *Mesembriomys gouldii melvillensis*	VU	VU	**Habitat:** A range of habitats on Melville Island, but mostly in tall Eucalypt open forests and woodlands (TSSC 2015). Absent or at low densities in rainforests, coastal habitats (mangroves and dunes), and plantations of exotic trees (Firth et al. 2006). **Distribution:** Restricted to Melville Island, NT (TSSC 2015). Not on adjacent Bathurst Island.	**NONE** • Suitable habitat within project area. • No records within the project area or within 20 km of the project area. • This species is not known to occur on Bathurst Island.
	Firth, R.S.C., Woinarski, J.C.Z., Brennan, K.G. and Hempel, C. (2006). Environmental relationships of the brush-tailed rabbit-rat *Conilurus penicillatus* and other small mammals on the Tiwi Islands, northern Australia. *Journal of Biogeography,* Vol. 33, pp. 1820-1837.			

Name	Status		Summary	Likelihood of occurrence within the project area
	Cth	NT		
	Threatened Species Scientific Committee (2015). *Conservation Advice – Mesembriomys gouldii melvillensis - Black-footed tree-rat (Melville Island).* Canberra: Department of the Environment. In effect under the EPBC Act from 26-June-2015. [online] Available at: http://www.environment.gov.au/biodiversity/threatened/species/pubs/87619-conservation-advice.pdf [Accessed 1 May 2018].			
Pale Field-rat *Rattus tunneyi*	-	VU	**Habitat:** Historically occurred in a wide range of habitats, but now primarily in dense vegetation along creeks (Aplin et al. 2008). Fire regime seems to have little effect on population numbers; instead, the level of groundwater irrigating the riparian system and, to a lesser extent, current rainfall have a much stronger influence (Braithwaite & Griffiths 1996). **Distribution:** Higher rainfall areas of northern Australia, extending from Kimberley in WA to south-eastern Qld, including the Top End of the NT (Cole & Woinarski 2002, Braithwaite & Griffiths 1996). Previously widespread and patchily abundant, particularly in the north-west of the Top End, the Pale Field-rat appears to have declined in lower rainfall areas (Woinarski 2000).	**LOW** • Suitable habitat does not occur within project area, however, does occur within 20 km of the project area. • No recent records within the project area, but there is one recent record within 20 km of the project area. • Records on Bathurst Island from recent (2014) mammal surveys >20 km from the project area.
	Aplin, K., Braithwaite, R. and Baverstock, P. (2008). Pale Field-rat: *Rattus tunneyi*. In: Van Dyck, S. and Strahan, R. (eds.). *The Mammals of Australia (3rd Edition*). Reed New Holland, Sydney, NSW. Braithwaite, R. and Griffiths, A. (1996). The paradox of *Rattus tunneyi*: endangerment of a native pest. *Wildlife Research,* Vol. 23, pp. 1-21. Cole, J. and Woinarksi, J. (2002). *Field Guide to the Rodents and Dasyurids of the Northern Territory.* Surrey Beatty & Sons, Chpping Norton, NSW. Woinarski, J.C.Z. (2000). The conservation status of rodents in the monsoonal tropics of the Northern Territory. *Wildlife Research,* Vol. 27, pp. 421-435.			
Northern Brushtail Possum *Trichosurus vulpecula arnhemensis*	VU	NT	**Habitat:** In Northern Australia, mainly tall eucalypt open forests with large, hollow-bearing trees, some mangrove communities, rainforests and semi-urban areas (TSSC 2001). Found in higher abundance when shrub density is high, particularly shrubs that bear large, fleshy fruits (Stobo-Wilson 2019. Kerle 1985, Friend et al 1985). **Distribution:** Occurs from the Gulf of Carpentaria, NT to the Kimberley, WA. Also occurs on many NT islands, but not on any WA islands. Within its range, distribution is patchy (TSSC 2021). Recently, there have been broad-scale losses and reduction in extensive areas of the NT range (Woinarski 2004; Woinarski et al. 2011; Gibson & McKenzie 2012; Ziembicki et al. 2013; Stobo-Wilson et al. 2019).	**HIGH** • Suitable habitat within project area • No recent records within the project area, but records within 20 km of the project area. • Recent range restriction; however, Davies et al 2021 states that possums are in higher densities on Bathurst Island then Melville Island and Penton et al found possums persist on Melville Island in 2020.
	Davies H.F., Tiwi Land Rangers, Nicholson, E. and Murphy B.P. (2021) Northern brown bandicoot (Isoodon macrourus) and common brushtail possum (Trichosurus vulpecula) density on the Tiwi Islands; insights and implications. *Pacific Conservation Biology.* Friend G & Taylor J (1985) Habitat preferences of small mammals in tropical open-forest of the Northern Territory. *Australian Journal of Ecology 10*, 173-185. Gibson L & McKenzie N (2012) Occurrence of non-volant mammals on islands along the Kimberley coast of Western Australia. *Records of the Western Australian Museum supplement 81*, 15-39 Kerle J (1985) Habitat preference and diet of the northern brushtail possum *Trichosurus arnhemensis* in the Alligator Rivers Region, N.T. *Proceedings of the Ecological Society of Australia 13*, 161-176. Penton C.E., Woolley, L., Radford, I.J. and Murphy, B.P (2020). Overlapping den tree selection by three declining arboreal mammal species in an Australian tropical savanna. *Journal of Mammalogy*, 101(4), pp. 1165 – 1176. Stobo-Wilson A, Murphy B, & Cremona T (2019) Contrasting patterns of decline in two arboreal marsupials from Northern Australia. *Biodiversity Conservation 28*, 2951 Threatened Species Scientific Committee (2021). *Conservation Advice Trichosurus vulpecula arnhemensis Northern Brushtail Possum*. Canberra: Department of Agriculture, Water and the Environment. Available from http://www.environment.gov.au/biodiversity/threatened/species/pubs/83091-conservation-advice-11052021.pdf Woinarski, J.C.Z. (2004). In a land with few possums, even the common are rare: ecology, conservation and management of possums in the Northern Territory. In: Goldingay, R. and Jackson, S. (eds.). *The biology of Australian possums and gliding possums*. Surrey Beatty & Sons, Sydney: pp.51- 62.			

Name	Status		Summary	Likelihood of occurrence within the project area
	Cth	NT		
	Woinarski J, Ward S, Mahney T, Bradley J, Brennan K, Ziembicki M & Fisher A (2011) The mammal fauna of the Sir Edward Pellew Islands, Northern Territory: refuge and death-trap. *Wildlife Research 38*, 307-322. Ziembicki M, Woinarski J & Mackey B (2013) Evaluating the status of species using Indigenous knowledge: novel evidence for major native mammal declines in northern Australia. *Biological Conservation 157*, 78-92.			
False Water Rat *Xeromys myoides*	VU	-	**Habitat:** Utilises both intertidal and freshwater habitats, with most records from mangrove forests, saltmarsh, sedgelands, clay pans and freshwater *Melaleuca* wetlands (DoE 2021). **Distribution:** Three regions of coastal Australia: the NT, central south Qld and south-east Qld (DoE 2021). In the NT, known only from coastal Top End with ten records at six sites – South Alligator River in 1903, Daly River floodplain in 1972, two sites on the Tomkinson River in 1975, Melville Island in 1975 and Glyde River floodplain in 1998 and 1999 (Cole & Woinarski 2002, Woinarski 2006).	**LOW** • Suitable habitat does not occur within project area, however, does occur within 20 km of the project area. • No recent records within the project area or within 20 km of the project area.
	Cole, J. and Woinarksi, J. (2002). *Field Guide to the Rodents and Dasyurids of the Northern Territory.* Surrey Beatty & Sons, Chpping Norton, NSW. Department of the Environment (2021). *Xeromys myoides - Water Mouse, False Water Rat, Yirrkoo*. Species Profile and Threats Database, Department of the Environment, Canberra. Available at: http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=66 [Accessed 27 Jan 2022]. Woinarski, J.C.Z. (2006). *Threatened Species of the Northern Territory - False water-rat, Water mouse - Xeromys myoides*. Northern Territory Department of Environment and Natural Resources. [online] Available at: https://nt.gov.au/__data/assets/pdf_file/0008/376136/false-water-rat.pdf [Accessed 27 Jan 2022].			
Fawn Antechinus *Antechinus bellus*	VU	EN	**Habitat:** Mostly in open forests and woodlands dominated by *Eucalyptus miniata* and/or *E. tetrodonta*, particularly where these forests have a relatively dense shrubby understorey (Friend 1985; Friend & Taylor 1985). Declines in areas with frequent intense fires (Corbett et al. 2003) but not necessarily common in areas where fire has been excluded for long periods (>20 years; Woinarski et al. 2004). Breeding occurs mid-June to late August, after which a synchronous male die-off occurs (TSSC 2015). **Distribution:** Restricted to the Top End of the NT (Watson & Calaby 2008), with one record from Melville Island. Recent surveys have failed to record it across central and eastern Arnhem Land (TSSC 2015).	**LOW** • Suitable habitat within project area • No recent records within the project area or within 20 km of the project area. • Patterns of small mammal decline observed on the Tiwi Island similar to those observed in Kakadu and mainland Australia (Davies et al 2018).
	Corbett L. K., Andersen, A.N. and Muller, W.J. (2003). Terrestrial vertebrates. In: Andersen, A.N., Cook, G.D. and Williams, R.J. (eds.). *Fire in Tropical Savannas: The Kapalga Experiment*. Springer-Verlag, New York: pp. 126–152. Davies, H.F., McCarthy, M.A., Firth, R.S.C, Woinarski, J.C.Z, Gillespie, G.R, Anderson, A.N., Rioli, W., Puruntatameri, J., Roberts, W., Kerinaiua, C., Kerinauia, V., Brooks Womatakimi, K. and Murphy, B.P (2018). Declining populations in one of the last refuges for threatened mammal species in northern Australia. *Austral Ecology*, Vol 43, pp.602 -612. Friend, G.R. and Taylor, J.A. (1985). Habitat preferences of small mammals in tropical open-forest of the Northern Territory. *Australian Journal of Ecology,* Vol. 10, pp. 173-185. Friend, G.R. (1985). Ecological studies of a population of *Antechinus bellus* (Marsupalia: Dasyuridae) in tropical Australia. *Australian Wildlife Research*, Vol. 12 (No. 2), pp. 151-162. Threatened Species Scientific Committee (2015). *Approved Conservation Advice for Antechinus bellus – Fawn Antechinus*. Canberra: Department of the Environment. In effect under the EPBC Act from 03-Dec-2015. Available at: http://www.environment.gov.au/biodiversity/threatened/species/pubs/344-conservation-advice-2015123.pdf [Accessed 1 May 2018]. Watson, M.L. and Calaby, J.H. (2008). Fawn Antechinus: *Antechinus bellus*. In: Van Dyck, S. and Strahan, R. (eds.). *The Mammals of Australia: 3rd Edition.* Reed New Holland, Sydney. Woinarski, J.C.Z., Risler, J. and Kean, L. (2004). The response of vegetation and vertebrate fauna to 23 years of fire exclusion in a tropical Eucalyptus open forest, Northern Territory, Australia. *Austral Ecology,* Vol. 29, pp. 156–176.			

Name	Status		Summary	Likelihood of occurrence within the project area
	Cth	NT		
Northern Brush-tailed Phascogale *Phascogale pirata*	VU	EN	**Habitat:** No detailed studies, but ecology is probably similar to that reported for phascogales in southern Australia (Rhind 1998). Most records are from tall open forests dominated by *Eucalyptus miniata* and *E. tetrodonta* (Rhind et al. 2008). Brush-tailed Phascogales are primarily arboreal and seldom feed on the ground. Geyle et al (2020) detected *P. pirata* using camera traps on Melville Island and found detection is most likely on large (DBH >41.5cm) *Eucalyptus tetrodonta* trees during the wet season. **Distribution:** Probably occurs naturally in low densities (Woinarski et al. 2014). Very few records exist; reported from West Island, east Arnhem Land, Coburg Peninsula, Kakadu, Litchfield and the Tiwi Islands. In the last 10 years only recorded from Kakadu, Coburg Peninsula and the Tiwi Islands, despite many extensive wildlife surveys across regions of the Top End during that time (Woinarski et al. 2014).	**LOW** • Suitable habitat within project area • No recent records within the project area or within 20 km of the project area.
	Geyle, H.M., Woolley, L-A., Davies, H.F., Woinarski, J.C.Z. and Murphy, B.P. (2020). Targeted sampling successfully detects the cryptic and declining arboreal marsupial (Phascogale pirata) in northern Australia. *Pacific Conservation Biology*. DOI: 10.1071/PC20008. Rhind, S.G. (1998). *Ecology of the brush-tailed phascogale in jarrah forest of south-western Australia*. PhD thesis, Murdoch University, Perth, Western Australia. Rhind, S.G., Woinarski, J. and Aplin, K.P. (2008). Brush-tailed Phascogale. In: Van Dyck, S. and Strahan, R. (eds). *The Mammals of Australia*. Reed New Holland, Chatswood, NSW. Woinarski, J., Burbidge, A. and Harrison, P. (2014). *The Action Plan for Australian Mammals 2012*. CSIRO Publishing: pp. 125-127.			
Butler's Dunnart *Sminthopsis butleri*	VU	VU	**Habitat:** Little known – found in Eucalypt tall open forest. No apparent correlations between the habitats at the localities where collected, other than that all are within 20 km of the coast and most occur on sandy soils (Maxwell et al. 1996; Woinarski et al. 1996). **Distribution:** Only known from Melville and Bathurst Islands, NT. Targeted surveys on the mainland failed to detect this species (Ward & Woinarski 2012).	**MEDIUM** • Suitable habitat within project area • No recent records within the project area, but records within 20 km of the project area. • Difficult to detect and no recent targeted surveys for Butlers Dunnarts has occurred.
	Maxwell, S., Burbidge, A.A. and Morris, K. (1996). *The 1996 Action Plan for Australian Marsupials and Monotremes*. Report prepared for the Australian Marsupials and Monotremes Specialist Group, IUCN Survival Commission, Environment Australia, Endangered Species Program. Department of Ward, S. and Woinarski, J.C.Z. (2102). *Threatened Species of the Northern Territory - Butler's Dunnart - Sminthopsis butleri*. Northern Territory Department of Environment and Natural Resources. [online] Available at: https://nt.gov.au/__data/assets/pdf_file/0003/205518/butlers-dunnart.pdf [Accessed 1 May 2018]. Woinarski, J.C.Z., Woolley, P.A. and Van Dyck, S. (1996). The distribution of the Dunnart *Sminthopsis butleri*. *Australian Mammalogy*, Vol. 19, pp. 27-29.			
Bare-rumped Sheath-tailed Bat *Saccolaimus saccolaimus nudicluniatus*	VU	-	**Habitat:** In the NT, specimens have been collected from Pandanus woodland fringing the sedgelands of the South Alligator River and Eucalypt tall open forests (Friend & Braithwaite 1986; Churchill 1998) with more recent records from Howard Springs (Milne et al 2009). Most records occur within near-coastal habitats with one recent exception (Jasper Gorge) 150 km inland (Woinarski et al. 2014). **Distribution:** Widely distributed from India through south-east Asia to the Solomon Islands including north-eastern Qld and the NT. The north-eastern	**LOW** • Presence of suitable habitat within project area • No recent records within the project area or within 20 km of the project area. • Not known to occur on the Tiwi Islands.

Name	Status		Summary	Likelihood of occurrence within the project area
	Cth	NT		
			Australian population is described as the subspecies *S. s. nudicluniatus*, although it is not clear whether this should be applied to NT populations (Milne & Woinarski 2006).	
	Churchill, S. (1998). *Australian Bats*. Reed New Holland, Sydney. Friend, G.R. and Braithwaite, R.W. (1986). Bat fauna of Kakadu National Park, Northern Territory. *Australian Mammalogy*, Vol. 9, pp. 43-52. Milne, D.J., Jackling, F.C., Sidhu, M., and Appleton, B.R. (2009). Shedding new light on old species identifications: morphological and genetic evidence suggest a need for conservation status review of the critically endangered bat, Saccolaimus saccolaimus. Wildlife Research36: 496–508. Milne, D. and Woinarski, J. (2006). *Threatened Species of the Northern Territory - Bare-rumped Sheathtail Bat - Saccolaimus saccolaimus*. Northern Territory Department of Environment and Natural Resources. https://nt.gov.au/__data/assets/pdf_file/0007/376117/bare-rumped-sheathtail-bat.pdf [Accessed 1 May 2018]. Woinarski, J., Burbidge, A. and Harrison, P. (2014). *The Action Plan for Australian Mammals 2012*. CSIRO Publishing: pp. 511-514.			
REPTILES				
Plains Death Adder *Acanthophis hawkei*	VU	VU	**Habitat:** Floodplains in the Top End and cracking soil plains inland (Webb et al. 2002). **Distribution**: Habitat mapping suggests the potential geographic range extends from western Qld, across the sub-coastal north of the NT to the north-eastern Kimberley of WA. Fragmented populations occur in the Mitchell Grass Downs of western Qld, the Barkly Tablelands on the NT/Qld border and east of Darwin (Fogg Dam) in the NT (TSSC 2012; Wuster et al. 2005). Susceptible to ingesting toxic Cane Toads (Phillips et al. 2009).	**LOW** • Suitable habitat does not occur within project area, however, does occur within 20 km of the project area. • No recent records within the project area or within 20 km of the project area.
	Phillips, B.L., Greenlees, M.J., Brown, G.P. and Shine R (2010). Predator behaviour and morphology mediates the impact of an invasive species: cane toads and death adders in Australia. *Animal Conservation*, Vol. 13, pp. 53-59. Webb, J.K., Christian, K.A. and Fisher, P. (2002). Fast growth and early maturation in a viviparous sit-and-wait predator, the northern death adder (*Acanthophis praelongus*) from tropical Australia. *Journal of Herpetology*, Vol. 36, no. 3, pp. 505-509. Wuster, W., Dumbrell, A.J., Hay, C., Pook, C.E., Williams, D.J. and Fry, B.G. (2005). Snakes across the Strait: trans-Torresian phylogeographic relationships in three genera of Australasian snakes (Serpentes: Elapidae: *Acanthophis*, *Oxyuranus*, and *Pseudechis*). *Molecular Phylogenetics and Evolution*, Vol. 34. pp. 1-14. Threatened Species Scientific Committee (2015). *Approved Conservation Advice – Acanthophis hawkei – Plains Death Adder.* Canberra: Department of the Environment. [online] Available at: http://www.environment.gov.au/biodiversity/threatened/species/pubs/83821-conservation-advice.pdf [Accessed 1 May 2018].			
Mertens' Water Monitor *Varanus mertensi*	*EN*[1]	VU	**Habitat:** Semi-aquatic, occupying edges of freshwater watercourses and lagoons, but seldom seen far from water (Christian 2004). **Distribution:** Across far northern Australia from the western Cape York Peninsula in Qld to the Kimberley in WA (Christian 2004). Widespread in the NT, occupying all of the Top End river systems (Ward et al. 2006). The more common water monitor in greater Darwin (outside of Darwin suburbs and coastal area). Susceptible to ingesting toxic Cane Toads resulting in reduced abundance (Griffiths & McKay 2007).	**LOW** • Suitable habitat does not occur within project area, however, does occur within 20 km of the project area. • No recent records within the project area or within 20 km of the project area.
	Christian, K. (2004). Varanus mertensi. In: Pianka et al. (eds.). *Varanoid lizards of the world*. Indiana University Press, Bloomington, Indianapolis. ~~Griffiths, A.D. and~~ McKay (2007). Cane toads reduce the abundance and site occupancy of Merten's water monitor (Varanus mertensi). *Wildlife Research,* Vol. 34, pp. 609-615.			

[1] *Added to threated species listing under the EPBC Act January 2024.*

Name	Status		Summary	Likelihood of occurrence within the project area
	Cth	NT		
	Ward, S., Woinarski, J., Griffiths, T. and McKay, L. (2006). *Threatened Species of the Northern Territory - Mertens Water Monitor - Varanus mertensi*. Northern Territory Department of Environment and Natural Resources. [online] Available at: https://nt.gov.au/__data/assets/pdf_file/0018/206460/mertens-water-monitor.pdf [Accessed 1 May 2018].			
Floodplain Monitor *Varanus panoptes*	-	VU	**Habitat:** Broad range of habitats from coastal beaches to savannah woodlands (Christian 2004). Also common throughout floodplains grasslands and a variety of native woodlands (Ward et al. 2012). **Distribution:** Across northern Australia from the Kimberley in WA to Cape York Peninsula, and southwards through most of Qld. In the NT, recorded across most of the Top End and the Gulf Region (Christian 2004). Highly susceptible to Cane Toad poisoning (Ujvari & Madsen 2009) and has experienced significant declines (Doody et al. 2009).	**LOW** • Suitable habitat does not occur within project area, however, does occur within 20 km of the project area. • No recent records within the project area or within 20 km of the project area.
	Christian, K. (2004). Varanus panoptes. In: Pianka et al. (eds). *Varanoid lizards of the world*. Indiana University Press, Bloomington, Indianapolis. Doody, J.S., Green, B., Rhind, D., Castellano, C., Sims, R. and Robinson, T. (2009). Population-level declines in Australian predators caused by an invasive species. *Animal Conservation*, Vol. 12, pp. 46-53. Ujvari, B. & Madsen, T. (2009). Increased mortality of naïve varanid lizards after the invasion of non-native cane toads (*Bufo marinus*). *Herpetological Conservation and Biology*, Vol. 4, pp. 248-251. Ward, S., Woinarski, J., Griffiths, T. & McKay, L. (2012). *Threatened Species of the Northern Territory - Yellow Spotted Monitor, Northern Sand Goanna, Floodplain Monitor - Varanus panoptes.* Northern Territory Department of Environment and Natural Resources. [online] Available at: https://nt.gov.au/__data/assets/pdf_file/0006/206466/floodplain-monitor.pdf [Accessed 1 May 2018].			
INVERTEBRATES				
Cognate Land Snail *Amphidromous cognatus*	-	VU	**Habitat:** Monsoon rainforest, most commonly reported in trees and woody vine (*Opilia amentacea*) (Wilson et al. 2006). **Distribution:** Endemic to the NT. Originally described in 1907 from three specimens collected at Port Essington on the Coburg Peninsula in 1850. Not recorded since in this area. Other records are from Bathurst and Melville islands collected 1976-80 (Wilson et al. 2006).	**LOW** • Suitable habitat does not occur within project area, however, does occur within 20 km of the project area. • No recent records within the project area or within 20 km of the project area.
	Wilson, C., Woinarski, J., Kessner, V. and Braby, M. (2006). *Threatened Species of the Northern Territory - Cognate Land Snail - Amphidromus cognatus*. Northern Territory Department of Environment and Natural Resources. [online] Available at: https://nt.gov.au/__data/assets/pdf_file/0003/206517/amphidromus-cognatus.pdf [Accessed 27 Jan 2022].			
Atlas Moth *Attacus wardi*	-	VU	**Habitat:** Coastal monsoon vine forest, where the larval stages feed on the plant *Croton habrophyllus* at the edges of the forest (Lane et al. 2010). **Distribution:** The Top End of the NT, with records from Tiwi and Melville Islands, Darwin, Black Point and Cobourg Peninsula. Also records from Lesuer Island in WA (Braby & Nielsen 2011).	**LOW** • Suitable habitat does not occur within project area, however, does occur within 20 km of the project area. • No recent records within the project area or within 20 km of the project area.
	Braby, M.F. and Nielsen, J. (2011). Review of the conservation status of the Atlas Moth, *Attacus wardi* Rothschild, 1910 (Lepidoptera: Saturniidae) from Australia. *Journal of Insect Conservation*, Vol. 15, pp. 603-608. Lane, D., Martin, G. and Weir, R.P. (2010). The life history of *Attacus wardi* Rothschild (Lepidoptera: Saturniidae) from the Northern Territory, Australia. *Australian Entomology*, Vol. 37, pp. 115-127.			
FLORA				
a saprophyte	EN	EN	**Habitat:** Very little known, although recorded growing out of damp peat in wet spring-fed rainforest areas, often in slightly raised areas (Kerrigan et al. 2007).	**LOW** • Suitable rainforest habitat does not occur within project area, however, does occur within 20 km of the project area.

Name	Status		Summary	Likelihood of occurrence within the project area
	Cth	NT		
Burmannia sp. Bathurst Island			**Distribution:** Only known from Bathurst Island where recorded in five separate rainforest patches in the north (Kerrigan et al. 2007).	• No recent records within the project area, but records within 20 km of the project area all within rainforest habitat.
	Kerrigan, R., Cowie, I. and Liddle, D. (2007). *Threatened Species of the Northern Territory - Burmannia sp., Bathurst Island*. Northern Territory Department of Environment and Natural Resources. https://nt.gov.au/__data/assets/pdf_file/0018/208422/burmannia.pdf [Accessed 27 Jan 2022].			
Darwin Cycad *Cycas armstrongii*	-	VU	**Habitat:** Open grassy woodland where adequate drainage appears to be a limiting factor (Kerrigan et al. 2006). Prime habitat has deep loamy soil (Liddle 2009). Separate male and female plants, with males flowering in August, and females from March-Nov (Holmes et al. 2007) **Distribution:** Restricted to the Top End of the NT – from Gunn Point to Hayes Creek, west to within 50km of the coastline and east to the Wildman River catchment (Kerrigan et al. 2006). Also on the Tiwi Islands and Cobourg Peninsula.	**HIGH** • Presence of suitable habitat within project area • Relevant proximate records within 20 km search area
	Holmes, J., Bisa, D., Hill, A. and Crase, B. (2007). *A Guide to the Threatened, Near Threatened and Data Deficient Plants in the Litchfield Shire of the Northern Territory*. WWF-Australia, Darwin. Kerrigan, R., Cowie, I. and Liddle, D. (2006). *Threatened Species of the Northern Territory - Cycas armstrongii*. Northern Territory Department of Environment and Natural Resources. https://nt.gov.au/__data/assets/pdf_file/0017/208430/cycas-armstrongii.pdf [Accessed 27 Jan 2022]. Liddle, D.T. (2009). *Management Program for Cycads in the Northern Territory of Australia 2009-2014*. Northern Territory Department of Natural Resources, Environment, the Arts and Sport, Darwin. http://www.territorystories.nt.gov.au/jspui/bitstream/10070/265358/1/Management%20program%20for%20cycads%20in%20the%20Northern%20Territory%20of%20Australia%202009%20to%202014.pdf [Accessed 1 May 2018].			
vine or shrub *Dendromyza reinwardtiana*	-	VU	**Habitat:** Perennial wet rainforest, where usually hosted by *Calophyllum soulattri* and *Syzygium eucalyptoides subsp. bleeseri* (Dunlop et al. 1995). **Distribution:** Sumatra through to Papua New Guinea. In Australia, known from Cape York Peninsula and the NT, where only found on Bathurst (3 sites) and Melville (4 sites) Islands (Woinarski et al. 2003).	**LOW** • Suitable rainforest habitat does not occur within project area, however, does occur within 20 km of the project area. • No recent records within the project area or within 20 km of the project area.
	Dunlop, C.R., Leach, G.J. and Cowie, I.D. (1995). *Flora of the Darwin Region Vol 2*. Conservation Commission of the Northern Territory, Darwin. Kerrigan, R. and Cowie, I. (2006). *Threatened Species of the Northern Territory - Dendromyza reinwardtiana*. Northern Territory Department of Environment and Natural Resources. [online] Available at: https://nt.gov.au/__data/assets/pdf_file/0018/208431/dendromyza-reinwardtiana.pdf [Accessed 27 Jan 2022]. Woinarski, J., Brennan, K., Cowie, I., Kerrigan, R. and Hempel, C. (2003). *Biodiversity conservation on the Tiwi islands, Northern Territory*. Part 1 - Plants and environments. Department of Infrastructure Planning and Environment, Darwin, pp.144.			
Native Walnut *Endiandra limnophila*	-	VU	**Habitat:** Well-developed spring-fed rainforests on swampy or very wet substrates along creek margins (Kerrigan & Cowie 2006). **Distribution:** Endemic to Australia – far north of Cape York Peninsula in Qld, and the Tiwi Islands and Channel point in the NT (Kerrigan & Cowie 2006). In the NT, recorded at approximately 22 locations with no more than 6 individuals at any one locality (Liddle et al. 1994). Extensive survey of the Tiwi Islands in 2000-02 yielded no further populations (Woinarski et al. 2003).	**LOW** • Suitable rainforest habitat does not occur within project area, however, does occur within 20 km of the project area. • No recent records within the project area or within 20 km of the project area.
	Kerrigan, R. and Cowie, I. (2006). *Threatened Species of the Northern Territory - Endiandra limnophila*. Northern Territory Department of Environment and Natural Resources. https://nt.gov.au/__data/assets/pdf_file/0003/208434/endiandra-limnophila.pdf [Accessed 27 Jan 2022].			

Name	Status		Summary	Likelihood of occurrence within the project area
	Cth	NT		
	Liddle, D.T., Russell-Smith, J., Brock, J., Leach, G.J. and Connors, G.T. (1994). *Atlas of the vascular rainforest plants of the Northern Territory*. Flora of Australia Supplementary Series No. 3, Australian Biological Resources Study, Canberra. Woinarski, J., Brennan, K., Cowie, I., Kerrigan, R., and Hempel, C. (2003). *Biodiversity conservation on the Tiwi islands, Northern Territory. Part 1. Plants and environments*. Department of Infrastructure Planning and Environment, Darwin.			
Narrow-leaf Climbing Pandan *Freycinetia excelsa*	-	VU	**Habitat:** Wet lowland rainforest and spring-fed rainforests in sandstone gullies (Kerrigan & Cowie 2006). **Distribution:** Known from Papua New Guinea, coastal Qld, and in the NT from seven locations between Bathurst Island and the Arafura Swamp (Kerrigan & Cowie 2006).	**LOW** • Suitable rainforest habitat does not occur within project area, however, does occur within 20 km of the project area. • No recent records within the project area or within 20 km of the project area.
	Kerrigan, R. and Cowie, I. (2006). *Threatened Species of the Northern Territory - Freycinetia excelsa*. Northern Territory Department of Environment and Natural Resources. https://nt.gov.au/__data/assets/pdf_file/0018/208440/freycinetia-excelsa.pdf [Accessed 27 Jan 2022].			
a climber *Freycinetia percostata*	-	VU	**Habitat:** Wet lowland rainforest and spring-fed rainforests in sandstone gullies (Woinarski et al. 2003). **Distribution:** New Guinea, the Solomon Islands and Australia (Stone 1982). In the NT, recorded from localities on Bathurst Island and the Arafura Swamp (Kerrigan & Cowie 2006). Further surveys are recommended (Kerrigan & Cowie 2006).	**LOW** • Suitable rainforest habitat does not occur within project area, however, does occur within 20 km of the project area. • No recent records within the project area or within 20 km of the project area.
	Kerrigan, R. and Cowie, I. (2006). *Threatened Species of the Northern Territory - Freycinetia percostata*. Northern Territory Department of Environment and Natural Resources. [online] Available at: https://nt.gov.au/__data/assets/pdf_file/0019/208441/freycinetia-percostata.pdf [Accessed 27 Jan 2022]. Stone, B.C. (1982). The Australian species of Freycinetia (Pandanaceae). *Brunonia,* Vol. 5, pp. 79-94. Woinarski, J., Brennan, K., Cowie, I., Kerrigan, R. and Hempel, C. (2003). *Biodiversity conservation on the Tiwi islands, Northern Territory*. Part 1. Plants and environments. Department of Infrastructure Planning and Environment, Darwin, pp. 144.			
a vine *Hoya australis oramicola*	VU	VU	**Habitat:** Coastal monsoon rainforest on red laterite dunes (Kerrigan & Cowie 2006). **Distribution:** Thought to be endemic to the NT, only known from Bathurst and Melville Islands. Only collected from five sites within the islands (Kerrigan & Cowie 2006). Considered adequately surveyed, based on extensive surveys on the Tiwi Islands and rainforest habitats across the Top End (Kerrigan & Cowie 2006).	**LOW** • Suitable rainforest habitat does not occur within project area, however, does occur within 20 km of the project area. • No recent records within the project area or within 20 km of the project area.
	Department of the Environment (2016). *Hoya australis subsp. Oramicola.* Species Profile and Threats Database, Department of the Environment, Australian Government, Canberra. [online] Available at: http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=55436 [Accessed 1 May 2018]. Kerrigan, R. and Cowie, I. (2006). *Threatened Species of the Northern Territory - Hoya australis subsp. Oramicola*. Northern Territory Department of Environment and Natural Resources. https://nt.gov.au/__data/assets/pdf_file/0004/208453/hoya-australis-oramicola.pdf [Accessed 1 May 2018].			
a sedge *Mapania macrocephala*	-	VU	**Habitat:** Spring-fed rainforests in damp and wet areas (Kerrigan & Cowie 2006). **Distribution:** Known from only four locations in the NT; two on Bathurst Island, one on Melville Island and one from north east Arnhem Land (Kerrigan & Cowie 2006). Also occurs in coastal north Qld, Papua New	**LOW** • Suitable rainforest habitat does not occur within project area, however, does occur within 20 km of the project area. • No recent records within the project area or within 20 km of the project area..

Name	Status		Summary	Likelihood of occurrence within the project area
	Cth	NT		
			Guinea and South-East Asia. Extensive surveys in 2003 (Tiwi Islands and Arafura Swamp area) only located one additional population (Kerrigan & Cowie 2006).	
	Kerrigan, R. and Cowie, I. (2006). *Threatened Species of the Northern Territory - Mapania macrocephala*. Northern Territory Department of Environment and Natural Resources. https://nt.gov.au/__data/assets/pdf_file/0008/208475/mapania-macrocephala.pdf [Accessed 27 Jan 2022].			
a vine *Mitrella tiwiensis*	VU	VU	**Habitat:** Deeply-shaded monsoonal rainforest in areas heavily covered with moist leaf litter. These areas are often associated with perennial springs and groundwater seepages (DoE 2022). **Distribution:** Known from a number of locations across both Bathurst and Melville Island. Thought to be endemic to the NT with different localities considered geographically distinct sub-populations (DoE 2022). Considered adequately surveyed, based on extensive surveys on the Tiwi Islands and rain forest habitats across the Top End (Russell- Smith 1991; Fensham and Woinarski 1992; Woinarski et al. 2003.).	**LOW** • Suitable rainforest habitat does not occur within project area, however, does occur within 20 km of the project area. • No recent records within the project area or within 20 km of the project area.
	Department of the Environment (2022). *Mitrella tiwiensis*. Species Profile and Threats Database, Department of the Environment, Australian Government, Canberra. [online] Available at: http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=82029 [Accessed 27 Jan 2022]. Fensham, R.J. and Woinarski, J.C.Z. (1992). *Yawulama: the ecology and conservation of monsoon forest on the Tiwi Islands*. Report to DASET. Conservation Commission of the Northern Territory, Darwin. Kerrigan, R. and Cowie, I. (2006). *Threatened Species of the Northern Territory - Mitrella tiwiensis.* Northern Territory Department of Environment and Natural Resources. [online] Available at: https://nt.gov.au/__data/assets/pdf_file/0011/208478/mitrella-tiwiensis.pdf [Accessed 27 Jan 2022]. Russell-Smith, J. (1991). Classification, species richness, and environmental relations of monsoon rain forest in northern Australia. *Journal of Vegetation Science,* Vol. 2, pp. 259-278. Woinarski, J., Brennan, K., Cowie, I., Kerrigan, R. and Hempel, C. (2003). *Biodiversity conservation on the Tiwi islands, Northern Territory*. Part 1 - Plants and environments. Department of Infrastructure Planning and Environment, Darwin, pp. 144.			
a tree *Tarennoidea wallichii*	-	EN	**Habitat:** Drier areas within complex evergreen monsoonal rainforests (Kerrigan & Cowie 2006). **Distribution:** Widespread in South-East Asia, extending at least as far as India**.** In the NT, known from only a small set of monsoonal rainforests on Melville Island (Kerrigan & Cowie 2006). Across the NT, preferred habitat has been well sampled (Russell-Smith 1991), and the Tiwi Islands have also been comparatively well sampled (Kerrigan & Cowie 2006).	**LOW** • Suitable rainforest habitat does not occur within project area, however, does occur within 20 km of the project area. • No recent records within the project area or within 20 km of the project area.
	Department of the Environment (2022). *Tarennoidea wallichii* in Species Profile and Threats Database, Department of the Environment, Canberra. Available at: http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=65173 [Accessed 27 Jan 2022]. Kerrigan, R. and Cowie, I. (2006). *Threatened Species of the Northern Territory - Tarennoidea wallichii.* Northern Territory Department of Environment and Natural Resources. https://nt.gov.au/__data/assets/pdf_file/0010/208495/tarennoidea-wallichii.pdf [Accessed 27 Jan 2022].			
an orchid *Thrixspermum congestum*	-	VU	**Habitat:** Lowland rainforests and on mangroves in humid, airy situations, often in exposed positions on small branches (Kerrigan & Cowie 2006). **Distribution:** New Guinea, Queensland and the NT (Jones 1988); where known only from the Tiwi Islands (Kerrigan & Cowie 2006). No further populations were uncovered during extensive surveys on the Tiwi Islands	**LOW** • Suitable rainforest habitat does not occur within project area, however, does occur within 20 km of the project area. • No recent records within the project area or within 20 km of the project area.

Name	Status		Summary	Likelihood of occurrence within the project area
	Cth	NT		
			between 1998-2001 (Woinarski et al. 2003). Rainforest habitat has been well sampled (Russell-Smith 1991; Liddle et al. 1994), suggesting apparent restriction may be real. There is an element of data deficiency with flowers recorded as lasting only about 10 hours (Kerrigan & Cowie 2006).	
	Jones, D.L. (1988). *Native Orchids of Australia*. Reed, Sydney. Kerrigan, R. and Cowie, I. (2006). *Threatened Species of the Northern Territory - Thrixspermum congestum*. Northern Territory Department of Environment and Natural Resources. https://nt.gov.au/__data/assets/pdf_file/0011/208496/thrixspermum-congestum.pdf [Accessed 27 Jan 2022]. Liddle, D.T., Russell-Smith, J., Brock, J., Leach, G.J. and Connors, G.T. (1994). *Atlas of the vascular rainforest plants of the Northern Territory*. Flora of Australia Supplementary Series No. 3. ABRS, Canberra. Russell-Smith, J. (1991). Classification, species richness, and environmental relations of monsoon rain forest in northern Australia. *Journal of Vegetation Science,* Vol. 2, pp. 259-278. Woinarski, J., Brennan, K., Cowie, I., Kerrigan, R. and Hempel, C. (2003). *Biodiversity conservation on the Tiwi islands, Northern Territory*. Part 1. Plants and environments. Department of Infrastructure Planning and Environment, Darwin, pp. 144.			
a herb *Typhonium jonesii*	EN	EN	**Habitat:** Rocky iron rich soils located on hills in Eucalypt woodlands and wet rainforest environments (Kerrigan & Cowie 2006). **Distribution:** Endemic to the NT, known from western Bathurst Island and eastern Melville Island (Kerrigan & Cowie 2006). In 2017, a targeted Typhonium survey relocated the known populations and uncovered new populations near Milikapiti (DENR 2017)	**HIGH** • Presence of suitable habitat within project area • Relevant proximate records within 20 km search area • DENR modelling has 'high likelihood' habitat within the project area.
	Department of the Environment and Natural Resource (DENR) (2017). *Melville Island Typhonium Field Survey: Lot 411 Townsite of Milikapiti*. Prepared for Power and Water Corporation Department of the Environment (2022). *Typhonium jonesii* in Species Profile and Threats Database, Department of the Environment, Canberra. Available at: http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=62412 [Accessed 27 Jan 2022] Kerrigan, R. and Cowie, I. (2006). *Threatened Species of the Northern Territory - Typhonium jonesii*. Northern Territory Department of Environment and Natural Resources. https://nt.gov.au/__data/assets/pdf_file/0015/208500/typhonium-jonesii.pdf [Accessed 27 Jan 2022].			
a herb *Typhonium mirabile*	EN	EN	**Habitat:** Very sporadically in groups in Eucalypt woodland on lateritic and sandy soils, and in patches where the leaf litter is sparse or absent, mainly near the bases of young Cycas plants or in shade, on hillslopes and ridges (Kerrigan et al. 2007). **Distribution:** Endemic to the NT, only found on the western half of Melville Island. In 2017, a targeted Typhonium survey relocated the known populations and uncovered a new population near Milikapiti (DENR 2017).	**HIGH** • Suitable habitat within project area • No recent records within the project area or within 20 km of the project area. • DENR modelling indicates 'high likelihood' habitat within the project area.
	Department of the Environment and Natural Resource (DENR) (2017). *Melville Island Typhonium Field Survey: Lot 411 Townsite of Milikapiti*. Prepared for Power and Water Corporation Report title. Department of the Environment (2022). *Typhonium mirabile* in Species Profile and Threats Database, Department of the Environment, Canberra. Available at: http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=79227 [Accessed 27 Jan 2022]. Kerrigan, R., Cowie, I. and Woinarski, J. (2007). *Threatened Species of the Northern Territory - Typhonium mirabile*. Northern Territory Department of Environment and Natural Resources. [online] Available at: https://nt.gov.au/__data/assets/pdf_file/0016/208501/typhonium-mirabile.pdf [Accessed 27 Jan 2022].			
a shrub / sapling	EN	EN	**Habitat:** Around natural springs and wet rainforest areas (Kerrigan & Cowie 2006).	**LOW** • Suitable rainforest habitat does not occur within project area, however, does occur within 20 km of the project area.

Name	Status		Summary	Likelihood of occurrence within the project area
	Cth	NT		
Xylopia monosperma			**Distribution:** Thought to be endemic to the NT; only known from five localities across the Tiwi Islands, two on Bathurst and three on Melville Islands (Kerrigan & Cowie 2006). Considered adequately surveyed, based on extensive surveys on the Tiwi Islands and is relatively visible when present (Kerrigan & Cowie 2006).	• No recent records within the project area or within 20 km of the project area.
	Department of the Environment (2022). *Xylopia monosperma* in Species Profile and Threats Database, Department of the Environment, Canberra. Available at: http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=82030 Accessed 27 Jan 2022. Kerrigan, R. and Cowie, I. (2006). *Threatened Species of the Northern Territory - Xylopia sp. Melville Island*. Northern Territory Department of Environment and Natural Resources. https://nt.gov.au/__data/assets/pdf_file/0005/208508/xylopia.pdf [Accessed 27 Jan 2022].			

APPENDIX C UPDATED PROTECTED MATTERS SEARCH TOOL (PMST) REPORT (JUNE 2024)

For the purpose of the gap analysis, and refinement of the project area.

EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected. Please see the caveat for interpretation of information provided here.

Report created: 05-Jun-2024

Summary

Matters of National Environment Significance

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

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance (Ramsar	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	None
Listed Threatened Species:	50
Listed Migratory Species:	49

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place. Information on the new heritage laws can be found at https://www.dcceew.gov.au/parks-heritage/heritage

A permit may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

Commonwealth Lands:	None
Commonwealth Heritage Places:	None
Listed Marine Species:	83
Whales and Other Cetaceans:	12
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	None
Habitat Critical to the Survival of Marine Turtles:	1

Extra Information

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

State and Territory Reserves:	None
Regional Forest Agreements:	None
Nationally Important Wetlands:	None
EPBC Act Referrals:	1
Key Ecological Features (Marine):	None
Biologically Important Areas:	1
Bioregional Assessments:	None
Geological and Bioregional Assessments:	None

Details

Matters of National Environmental Significance

Listed Threatened Species			[Resource Information]
Status of Conservation Dependent and Extinct are not MNES under the EPBC Act. Number is the current name ID.			
Scientific Name	Threatened Category	Presence Text	Buffer Status
BIRD			
Calidris acuminata Sharp-tailed Sandpiper [874]	Vulnerable	Species or species habitat may occur within area	In feature area
Calidris canutus Red Knot, Knot [855]	Vulnerable	Species or species habitat may occur within area	In feature area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area	In feature area
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Erythrotriorchis radiatus Red Goshawk [942]	Endangered	Species or species habitat known to occur within area	In feature area
Falco hypoleucos Grey Falcon [929]	Vulnerable	Species or species habitat known to occur within area	In feature area
Geophaps smithii smithii Partridge Pigeon (eastern) [64441]	Vulnerable	Species or species habitat known to occur within area	In feature area
Limnodromus semipalmatus Asian Dowitcher [843]	Vulnerable	Species or species habitat may occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Limosa lapponica baueri Nunivak Bar-tailed Godwit, Western Alaskan Bar-tailed Godwit [86380]	Endangered	Species or species habitat known to occur within area	In feature area
Melanodryas cucullata melvillensis Tiwi Islands Hooded Robin, Hooded Robin (Tiwi Islands) [67092]	Critically Endangered	Species or species habitat known to occur within area	In feature area
Mirafra javanica melvillensis Horsfield's Bushlark (Tiwi Islands) [81011]	Vulnerable	Species or species habitat known to occur within area	In buffer area only
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area	In feature area
Rostratula australis Australian Painted Snipe [77037]	Endangered	Species or species habitat may occur within area	In feature area
Tringa nebularia Common Greenshank, Greenshank [832]	Endangered	Species or species habitat likely to occur within area	In buffer area only
Tyto novaehollandiae melvillensis Tiwi Masked Owl, Tiwi Islands Masked Owl [26049]	Endangered	Species or species habitat known to occur within area	In feature area
FISH			
Thunnus maccoyii Southern Bluefin Tuna [69402]	Conservation Dependent	Species or species habitat may occur within area	In buffer area only
MAMMAL			
Antechinus bellus Fawn Antechinus [344]	Vulnerable	Species or species habitat known to occur within area	In feature area
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat may occur within area	In buffer area only
Conilurus penicillatus Brush-tailed Rabbit-rat, Brush-tailed Tree-rat, Pakooma [132]	Vulnerable	Species or species habitat known to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Macroderma gigas Ghost Bat [174]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Mesembriomys gouldii melvillensis Black-footed Tree-rat (Melville Island) [87619]	Vulnerable	Species or species habitat known to occur within area	In buffer area only
Phascogale pirata Northern Brush-tailed Phascogale [82954]	Vulnerable	Species or species habitat known to occur within area	In feature area
Saccolaimus saccolaimus nudicluniatus Bare-rumped Sheath-tailed Bat, Bare-rumped Sheathtail Bat [66889]	Vulnerable	Species or species habitat may occur within area	In feature area
Sminthopsis butleri Butler's Dunnart [302]	Vulnerable	Species or species habitat known to occur within area	In feature area
Trichosurus vulpecula arnhemensis Northern Brushtail Possum [83091]	Vulnerable	Species or species habitat known to occur within area	In feature area
Xeromys myoides Water Mouse, False Water Rat, Yirrkoo [66]	Vulnerable	Species or species habitat likely to occur within area	In feature area
PLANT			
Burmannia championii listed as Burmannia sp. Bathurst Island (R.Fensham 1021) [93461]	Endangered (listed as Burmannia sp. Bathurst Island	Species or species habitat likely to occur within area	In feature area
Elaeocarpus miegei [65147]	Endangered	Species or species habitat may occur within area	In buffer area only
Mitrella tiwiensis a vine [82029]	Vulnerable	Species or species habitat likely to occur within area	In buffer area only
Tarennoidea wallichii [65173]	Endangered	Species or species habitat likely to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Typhonium jonesii a herb [62412]	Endangered	Species or species habitat known to occur within area	In feature area
Typhonium mirabile a herb [79227]	Endangered	Species or species habitat likely to occur within area	In feature area
Xylopia monosperma a shrub [82030]	Endangered	Species or species habitat likely to occur within area	In feature area
REPTILE			
Acanthophis hawkei Plains Death Adder [83821]	Vulnerable	Species or species habitat may occur within area	In feature area
Caretta caretta Loggerhead Turtle [1763]	Endangered	Species or species habitat known to occur within area	In buffer area only
Chelonia mydas Green Turtle [1765]	Vulnerable	Breeding known to occur within area	In buffer area only
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Breeding likely to occur within area	In buffer area only
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Species or species habitat known to occur within area	In buffer area only
Lepidochelys olivacea Olive Ridley Turtle, Pacific Ridley Turtle [1767]	Endangered	Foraging, feeding or related behaviour known to occur within area	In buffer area only
Natator depressus Flatback Turtle [59257]	Vulnerable	Breeding known to occur within area	In buffer area only
Tiliqua scincoides intermedia Northern Blue-tongued Skink [89838]	Critically Endangered	Species or species habitat likely to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Varanus mertensi			
Mertens' Water Monitor, Mertens's Water Monitor [1568]	Endangered	Species or species habitat likely to occur within area	In feature area
SHARK			
Carcharodon carcharias			
White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Glyphis garricki			
Northern River Shark, New Guinea River Shark [82454]	Endangered	Species or species habitat may occur within area	In buffer area only
Glyphis glyphis			
Speartooth Shark [82453]	Critically Endangered	Species or species habitat may occur within area	In buffer area only
Pristis clavata			
Dwarf Sawfish, Queensland Sawfish [68447]	Vulnerable	Species or species habitat known to occur within area	In buffer area only
Pristis pristis			
Freshwater Sawfish, Largetooth Sawfish, River Sawfish, Leichhardt's Sawfish, Northern Sawfish [60756]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Pristis zijsron			
Green Sawfish, Dindagubba, Narrowsnout Sawfish [68442]	Vulnerable	Species or species habitat known to occur within area	In buffer area only
Rhincodon typus			
Whale Shark [66680]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Sphyrna lewini			
Scalloped Hammerhead [85267]	Conservation Dependent	Species or species habitat likely to occur within area	In buffer area only

Listed Migratory Species			[Resource Information]
Scientific Name	Threatened Category	Presence Text	Buffer Status
Migratory Marine Birds			
Anous stolidus			
Common Noddy [825]		Species or species habitat may occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area	In feature area
Calonectris leucomelas Streaked Shearwater [1077]		Species or species habitat may occur within area	In buffer area only
Fregata ariel Lesser Frigatebird, Least Frigatebird [1012]		Species or species habitat likely to occur within area	In buffer area only
Fregata minor Great Frigatebird, Greater Frigatebird [1013]		Species or species habitat likely to occur within area	In buffer area only
Phaethon lepturus White-tailed Tropicbird [1014]		Species or species habitat may occur within area	In feature area
Sternula albifrons Little Tern [82849]		Breeding known to occur within area	In buffer area only
Migratory Marine Species			
Anoxypristis cuspidata Narrow Sawfish, Knifetooth Sawfish [68448]		Species or species habitat likely to occur within area	In buffer area only
Balaenoptera edeni Bryde's Whale [35]		Species or species habitat may occur within area	In buffer area only
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat may occur within area	In buffer area only
Carcharhinus longimanus Oceanic Whitetip Shark [84108]		Species or species habitat may occur within area	In buffer area only
Carcharodon carcharias White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat may occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Caretta caretta Loggerhead Turtle [1763]	Endangered	Species or species habitat known to occur within area	In buffer area only
Chelonia mydas Green Turtle [1765]	Vulnerable	Breeding known to occur within area	In buffer area only
Crocodylus porosus Salt-water Crocodile, Estuarine Crocodile [1774]		Species or species habitat likely to occur within area	In feature area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Breeding likely to occur within area	In buffer area only
Dugong dugon Dugong [28]		Species or species habitat known to occur within area	In buffer area only
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Species or species habitat known to occur within area	In buffer area only
Lepidochelys olivacea Olive Ridley Turtle, Pacific Ridley Turtle [1767]	Endangered	Foraging, feeding or related behaviour known to occur within area	In buffer area only
Megaptera novaeangliae Humpback Whale [38]		Species or species habitat may occur within area	In buffer area only
Mobula alfredi as Manta alfredi Reef Manta Ray, Coastal Manta Ray [90033]		Species or species habitat may occur within area	In buffer area only
Mobula birostris as Manta birostris Giant Manta Ray [90034]		Species or species habitat may occur within area	In buffer area only
Natator depressus Flatback Turtle [59257]	Vulnerable	Breeding known to occur within area	In buffer area only
Orcaella heinsohni Australian Snubfin Dolphin [81322]		Species or species habitat likely to occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Orcinus orca Killer Whale, Orca [46]		Species or species habitat may occur within area	In buffer area only
Pristis clavata Dwarf Sawfish, Queensland Sawfish [68447]	Vulnerable	Species or species habitat known to occur within area	In buffer area only
Pristis pristis Freshwater Sawfish, Largetooth Sawfish, River Sawfish, Leichhardt's Sawfish, Northern Sawfish [60756]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Pristis zijsron Green Sawfish, Dindagubba, Narrowsnout Sawfish [68442]	Vulnerable	Species or species habitat known to occur within area	In buffer area only
Rhincodon typus Whale Shark [66680]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Sousa sahulensis as Sousa chinensis Australian Humpback Dolphin [87942]		Species or species habitat known to occur within area	In buffer area only
Tursiops aduncus (Arafura/Timor Sea populations) Spotted Bottlenose Dolphin (Arafura/Timor Sea populations) [78900]		Species or species habitat known to occur within area	In buffer area only
Migratory Terrestrial Species			
Cecropis daurica Red-rumped Swallow [80610]		Species or species habitat may occur within area	In feature area
Cuculus optatus Oriental Cuckoo, Horsfield's Cuckoo [86651]		Species or species habitat may occur within area	In feature area
Hirundo rustica Barn Swallow [662]		Species or species habitat may occur within area	In feature area
Rhipidura rufifrons Rufous Fantail [592]		Species or species habitat known to occur within area	In feature area
Migratory Wetlands Species			

Scientific Name	Threatened Category	Presence Text	Buffer Status
Acrocephalus orientalis Oriental Reed-Warbler [59570]		Species or species habitat may occur within area	In feature area
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat known to occur within area	In feature area
Calidris acuminata Sharp-tailed Sandpiper [874]	Vulnerable	Species or species habitat may occur within area	In feature area
Calidris canutus Red Knot, Knot [855]	Vulnerable	Species or species habitat may occur within area	In feature area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area	In feature area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area	In feature area
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Charadrius veredus Oriental Plover, Oriental Dotterel [882]		Species or species habitat may occur within area	In feature area
Glareola maldivarum Oriental Pratincole [840]		Species or species habitat may occur within area	In feature area
Limnodromus semipalmatus Asian Dowitcher [843]	Vulnerable	Species or species habitat may occur within area	In feature area
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat known to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Numenius madagascariensis			
Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area	In feature area
Pandion haliaetus			
Osprey [952]		Species or species habitat known to occur within area	In feature area
Tringa nebularia			
Common Greenshank, Greenshank [832]	Endangered	Species or species habitat likely to occur within area	In buffer area only

Other Matters Protected by the EPBC Act

Listed Marine Species			[Resource Information]
Scientific Name	Threatened Category	Presence Text	Buffer Status
Bird			
Acrocephalus orientalis			
Oriental Reed-Warbler [59570]		Species or species habitat may occur within area overfly marine area	In feature area
Actitis hypoleucos			
Common Sandpiper [59309]		Species or species habitat known to occur within area	In feature area
Anous stolidus			
Common Noddy [825]		Species or species habitat may occur within area	In buffer area only
Apus pacificus			
Fork-tailed Swift [678]		Species or species habitat likely to occur within area overfly marine area	In feature area
Bubulcus ibis as Ardea ibis			
Cattle Egret [66521]		Species or species habitat may occur within area overfly marine area	In feature area
Calidris acuminata			
Sharp-tailed Sandpiper [874]	Vulnerable	Species or species habitat may occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Calidris canutus Red Knot, Knot [855]	Vulnerable	Species or species habitat may occur within area overfly marine area	In feature area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area overfly marine area	In feature area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area overfly marine area	In feature area
Calonectris leucomelas Streaked Shearwater [1077]		Species or species habitat may occur within area	In buffer area only
Cecropis daurica as Hirundo daurica Red-rumped Swallow [80610]		Species or species habitat may occur within area overfly marine area	In feature area
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Charadrius veredus Oriental Plover, Oriental Dotterel [882]		Species or species habitat may occur within area overfly marine area	In feature area
Fregata ariel Lesser Frigatebird, Least Frigatebird [1012]		Species or species habitat likely to occur within area	In buffer area only
Fregata minor Great Frigatebird, Greater Frigatebird [1013]		Species or species habitat likely to occur within area	In buffer area only
Glareola maldivarum Oriental Pratincole [840]		Species or species habitat may occur within area overfly marine area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat likely to occur within area	In feature area
Hirundo rustica Barn Swallow [662]		Species or species habitat may occur within area overfly marine area	In feature area
Limnodromus semipalmatus Asian Dowitcher [843]	Vulnerable	Species or species habitat may occur within area overfly marine area	In feature area
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat known to occur within area	In feature area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area overfly marine area	In feature area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area	In feature area
Pandion haliaetus Osprey [952]		Species or species habitat known to occur within area	In feature area
Phaethon lepturus White-tailed Tropicbird [1014]		Species or species habitat may occur within area	In feature area
Rhipidura rufifrons Rufous Fantail [592]		Species or species habitat known to occur within area overfly marine area	In feature area
Rostratula australis as Rostratula benghalensis (sensu lato) Australian Painted Snipe [77037]	Endangered	Species or species habitat may occur within area overfly marine area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
[Sternula albifrons as Sterna albifrons](#) Little Tern [82849]		Breeding known to occur within area	In buffer area only
[Tringa nebularia](#) Common Greenshank, Greenshank [832]	Endangered	Species or species habitat likely to occur within area overfly marine area	In buffer area only
Fish			
[Campichthys tricarinatus](#) Three-keel Pipefish [66192]		Species or species habitat may occur within area	In buffer area only
[Choeroichthys brachysoma](#) Pacific Short-bodied Pipefish, Short-bodied Pipefish [66194]		Species or species habitat may occur within area	In buffer area only
[Choeroichthys suillus](#) Pig-snouted Pipefish [66198]		Species or species habitat may occur within area	In buffer area only
[Corythoichthys amplexus](#) Fijian Banded Pipefish, Brown-banded Pipefish [66199]		Species or species habitat may occur within area	In buffer area only
[Corythoichthys flavofasciatus](#) Reticulate Pipefish, Yellow-banded Pipefish, Network Pipefish [66200]		Species or species habitat may occur within area	In buffer area only
[Corythoichthys haematopterus](#) Reef-top Pipefish [66201]		Species or species habitat may occur within area	In buffer area only
[Corythoichthys schultzi](#) Schultz's Pipefish [66205]		Species or species habitat may occur within area	In buffer area only
[Doryrhamphus excisus](#) Bluestripe Pipefish, Indian Blue-stripe Pipefish, Pacific Blue-stripe Pipefish [66211]		Species or species habitat may occur within area	In buffer area only
[Doryrhamphus janssi](#) Cleaner Pipefish, Janss' Pipefish [66212]		Species or species habitat may occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Festucalex cinctus Girdled Pipefish [66214]		Species or species habitat may occur within area	In buffer area only
Halicampus brocki Brock's Pipefish [66219]		Species or species habitat may occur within area	In buffer area only
Halicampus dunckeri Red-hair Pipefish, Duncker's Pipefish [66220]		Species or species habitat may occur within area	In buffer area only
Halicampus grayi Mud Pipefish, Gray's Pipefish [66221]		Species or species habitat may occur within area	In buffer area only
Halicampus spinirostris Spiny-snout Pipefish [66225]		Species or species habitat may occur within area	In buffer area only
Haliichthys taeniophorus Ribboned Pipehorse, Ribboned Seadragon [66226]		Species or species habitat may occur within area	In buffer area only
Hippichthys cyanospilos Blue-speckled Pipefish, Blue-spotted Pipefish [66228]		Species or species habitat may occur within area	In buffer area only
Hippichthys parvicarinatus Short-keel Pipefish, Short-keeled Pipefish [66230]		Species or species habitat may occur within area	In buffer area only
Hippichthys penicillus Beady Pipefish, Steep-nosed Pipefish [66231]		Species or species habitat may occur within area	In buffer area only
Hippocampus histrix Spiny Seahorse, Thorny Seahorse [66236]		Species or species habitat may occur within area	In buffer area only
Hippocampus kuda Spotted Seahorse, Yellow Seahorse [66237]		Species or species habitat may occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Hippocampus planifrons Flat-face Seahorse [66238]		Species or species habitat may occur within area	In buffer area only
Hippocampus spinosissimus Hedgehog Seahorse [66239]		Species or species habitat may occur within area	In buffer area only
Micrognathus micronotopterus Tidepool Pipefish [66255]		Species or species habitat may occur within area	In buffer area only
Solegnathus hardwickii Pallid Pipehorse, Hardwick's Pipehorse [66272]		Species or species habitat may occur within area	In buffer area only
Solegnathus lettiensis Gunther's Pipehorse, Indonesian Pipefish [66273]		Species or species habitat may occur within area	In buffer area only
Solenostomus cyanopterus Robust Ghostpipefish, Blue-finned Ghost Pipefish, [66183]		Species or species habitat may occur within area	In buffer area only
Syngnathoides biaculeatus Double-end Pipehorse, Double-ended Pipehorse, Alligator Pipefish [66279]		Species or species habitat may occur within area	In buffer area only
Trachyrhamphus bicoarctatus Bentstick Pipefish, Bend Stick Pipefish, Short-tailed Pipefish [66280]		Species or species habitat may occur within area	In buffer area only
Trachyrhamphus longirostris Straightstick Pipefish, Long-nosed Pipefish, Straight Stick Pipefish [66281]		Species or species habitat may occur within area	In buffer area only
Mammal			
Dugong dugon Dugong [28]		Species or species habitat known to occur within area	In buffer area only
Reptile			
Aipysurus duboisii Dubois' Sea Snake, Dubois' Seasnake, Reef Shallows Sea Snake [1116]		Species or species habitat may occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
[Aipysurus laevis](#) Olive Sea Snake, Olive-brown Sea Snake [1120]		Species or species habitat may occur within area	In buffer area only
[Aipysurus mosaicus as Aipysurus eydouxii](#) Mosaic Sea Snake [87261]		Species or species habitat may occur within area	In buffer area only
[Caretta caretta](#) Loggerhead Turtle [1763]	Endangered	Species or species habitat known to occur within area	In buffer area only
[Chelonia mydas](#) Green Turtle [1765]	Vulnerable	Breeding known to occur within area	In buffer area only
[Crocodylus porosus](#) Salt-water Crocodile, Estuarine Crocodile [1774]		Species or species habitat likely to occur within area	In feature area
[Dermochelys coriacea](#) Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Breeding likely to occur within area	In buffer area only
[Eretmochelys imbricata](#) Hawksbill Turtle [1766]	Vulnerable	Species or species habitat known to occur within area	In buffer area only
[Hydrophis atriceps](#) Black-headed Sea Snake [1101]		Species or species habitat may occur within area	In buffer area only
[Hydrophis coggeri](#) Cogger's Sea Snake [25925]		Species or species habitat may occur within area	In buffer area only
[Hydrophis elegans](#) Elegant Sea Snake, Bar-bellied Sea Snake [1104]		Species or species habitat may occur within area	In buffer area only
[Hydrophis hardwickii as Lapemis hardwickii](#) Spine-bellied Sea Snake [93516]		Species or species habitat may occur within area	In buffer area only
[Hydrophis inornatus](#) Plain Sea Snake [1107]		Species or species habitat may occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Hydrophis kingii as Disteira kingii Spectacled Sea Snake [93511]		Species or species habitat may occur within area	In buffer area only
Hydrophis macdowelli as Hydrophis mcdowelli MacDowell's Sea Snake, Small-headed Sea Snake, [75601]		Species or species habitat may occur within area	In buffer area only
Hydrophis major as Disteira major Olive-headed Sea Snake [93512]		Species or species habitat may occur within area	In buffer area only
Hydrophis ornatus Spotted Sea Snake, Ornate Reef Sea Snake [1111]		Species or species habitat may occur within area	In buffer area only
Hydrophis pacificus Pacific Sea Snake, Large-headed Sea Snake [1112]		Species or species habitat may occur within area	In buffer area only
Hydrophis peronii as Acalyptophis peronii Horned Sea Snake [93509]		Species or species habitat may occur within area	In buffer area only
Hydrophis platura as Pelamis platurus Yellow-bellied Sea Snake [93746]		Species or species habitat may occur within area	In buffer area only
Hydrophis stokesii as Astrotia stokesii Stokes' Sea Snake [93510]		Species or species habitat may occur within area	In buffer area only
Hydrophis zweiffei as Enhydrina schistosa Australian Beaked Sea Snake [93514]		Species or species habitat may occur within area	In buffer area only
Lepidochelys olivacea Olive Ridley Turtle, Pacific Ridley Turtle [1767]	Endangered	Foraging, feeding or related behaviour known to occur within area	In buffer area only
Natator depressus Flatback Turtle [59257]	Vulnerable	Breeding known to occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Parahydrophis mertoni Arafura Smooth Sea Snake, Northern Mangrove Sea Snake [1090]		Species or species habitat may occur within area	In buffer area only

Whales and Other Cetaceans [Resource Information]

Current Scientific Name	Status	Type of Presence	Buffer Status
Mammal			
Balaenoptera edeni Bryde's Whale [35]		Species or species habitat may occur within area	In buffer area only
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat may occur within area	In buffer area only
Delphinus delphis Common Dolphin, Short-beaked Common Dolphin [60]		Species or species habitat may occur within area	In buffer area only
Grampus griseus Risso's Dolphin, Grampus [64]		Species or species habitat may occur within area	In buffer area only
Megaptera novaeangliae Humpback Whale [38]		Species or species habitat may occur within area	In buffer area only
Orcaella heinsohni Australian Snubfin Dolphin [81322]		Species or species habitat likely to occur within area	In buffer area only
Orcinus orca Killer Whale, Orca [46]		Species or species habitat may occur within area	In buffer area only
Sousa sahulensis Australian Humpback Dolphin [87942]		Species or species habitat known to occur within area	In buffer area only
Stenella attenuata Spotted Dolphin, Pantropical Spotted Dolphin [51]		Species or species habitat may occur within area	In buffer area only

Current Scientific Name	Status	Type of Presence	Buffer Status
Tursiops aduncus			
Indian Ocean Bottlenose Dolphin, Spotted Bottlenose Dolphin [68418]		Species or species habitat likely to occur within area	In buffer area only
Tursiops aduncus (Arafura/Timor Sea populations)			
Spotted Bottlenose Dolphin (Arafura/Timor Sea populations) [78900]		Species or species habitat known to occur within area	In buffer area only
Tursiops truncatus s. str.			
Bottlenose Dolphin [68417]		Species or species habitat may occur within area	In buffer area only

Habitat Critical to the Survival of Marine Turtles			[Resource Information]
Scientific Name	Behaviour	Presence	Buffer Status
Aug - Sep			
Natator depressus			
Flatback Turtle [59257]	Nesting	Known to occur	In buffer area only

Extra Information

EPBC Act Referrals				[Resource Information]
Title of referral	Reference	Referral Outcome	Assessment Status	Buffer Status
Controlled action				
Hardwood Plantation	2001/229	Controlled Action	Post-Approval	In buffer area only

Biologically Important Areas			[Resource Information]
Scientific Name	Behaviour	Presence	Buffer Status
Marine Turtles			
Natator depressus			
Flatback Turtle [59257]	Internesting	Likely to occur	In buffer area only

Caveat

1 PURPOSE

This report is designed to assist in identifying the location of matters of national environmental significance (MNES) and other matters protected by the Environment Protection and Biodiversity Conservation Act 1999 (Cth) (EPBC Act) which may be relevant in determining obligations and requirements under the EPBC Act.

The report contains the mapped locations of:

- World and National Heritage properties;
- Wetlands of International and National Importance;
- Commonwealth and State/Territory reserves;
- distribution of listed threatened, migratory and marine species;
- listed threatened ecological communities; and
- other information that may be useful as an indicator of potential habitat value.

2 DISCLAIMER

This report is not intended to be exhaustive and should only be relied upon as a general guide as mapped data is not available for all species or ecological communities listed under the EPBC Act (see below). Persons seeking to use the information contained in this report to inform the referral of a proposed action under the EPBC Act should consider the limitations noted below and whether additional information is required to determine the existence and location of MNES and other protected matters.

Where data are available to inform the mapping of protected species, the presence type (e.g. known, likely or may occur) that can be determined from the data is indicated in general terms. It is the responsibility of any person using or relying on the information in this report to ensure that it is suitable for the circumstances of any proposed use. The Commonwealth cannot accept responsibility for the consequences of any use of the report or any part thereof. To the maximum extent allowed under governing law, the Commonwealth will not be liable for any loss or damage that may be occasioned directly or indirectly through the use of, or reliance

3 DATA SOURCES

Threatened ecological communities

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

Threatened, migratory and marine species

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

Where little information is available for a species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc.).

In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More detailed distribution mapping methods are used to update these distributions

4 LIMITATIONS

The following species and ecological communities have not been mapped and do not appear in this report:

- threatened species listed as extinct or considered vagrants;
- some recently listed species and ecological communities;
- some listed migratory and listed marine species, which are not listed as threatened species; and
- migratory species that are very widespread, vagrant, or only occur in Australia in small numbers.

The following groups have been mapped, but may not cover the complete distribution of the species:

- listed migratory and/or listed marine seabirds, which are not listed as threatened, have only been mapped for recorded
- seals which have only been mapped for breeding sites near the Australian continent

The breeding sites may be important for the protection of the Commonwealth Marine environment.

Refer to the metadata for the feature group (using the Resource Information link) for the currency of the information.

Acknowledgements

This database has been compiled from a range of data sources. The department acknowledges the following custodians who have contributed valuable data and advice:

-Office of Environment and Heritage, New South Wales
-Department of Environment and Primary Industries, Victoria
-Department of Primary Industries, Parks, Water and Environment, Tasmania
-Department of Environment, Water and Natural Resources, South Australia
-Department of Land and Resource Management, Northern Territory
-Department of Environmental and Heritage Protection, Queensland
-Department of Parks and Wildlife, Western Australia
-Environment and Planning Directorate, ACT
-Birdlife Australia
-Australian Bird and Bat Banding Scheme
-Australian National Wildlife Collection
-Natural history museums of Australia
-Museum Victoria
-Australian Museum
-South Australian Museum
-Queensland Museum
-Online Zoological Collections of Australian Museums
-Queensland Herbarium
-National Herbarium of NSW
-Royal Botanic Gardens and National Herbarium of Victoria
-Tasmanian Herbarium
-State Herbarium of South Australia
-Northern Territory Herbarium
-Western Australian Herbarium
-Australian National Herbarium, Canberra
-University of New England
-Ocean Biogeographic Information System
-Australian Government, Department of Defence
Forestry Corporation, NSW
-Geoscience Australia
-CSIRO
-Australian Tropical Herbarium, Cairns
-eBird Australia
-Australian Government – Australian Antarctic Data Centre
-Museum and Art Gallery of the Northern Territory
-Australian Government National Environmental Science Program
-Australian Institute of Marine Science
-Reef Life Survey Australia
-American Museum of Natural History
-Queen Victoria Museum and Art Gallery, Inveresk, Tasmania
-Tasmanian Museum and Art Gallery, Hobart, Tasmania
-Other groups and individuals

The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Please feel free to provide feedback via the Contact us page.

Department of Climate Change, Energy, the Environment and Water
GPO Box 3090
Canberra ACT 2601 Australia
+61 2 6274 1111

APPENDIX D UPDATED DESKTOP THREATENED SPECIES 'LIKELIHOOD OF OCCURRENCE' ASSESSMENT

An original likelihood of occurrence assessment was conducted as part of the environmental assessment by EcOz in May 2022, and provided at Appendix B.. For the environmental assessment referral prepared in 2024, a review of the likelihood of occurrence assessment was undertaken to identify any additional species or protected matters listings that needed to be considered. Noting that as the detailed designs for the project has developed, the project area has been refined from the broader proposed subdivision area that was the subject of this terrestrial environmental assessment (including the targeted species survey footprint) to a proposed development area that is the subject of the environmental assessment referral report.

A map proving a comparison of the larger, previously proposed subdivision area and the proposed development area is provided at Figure 1 below.

The updated PMST report (generated in 05 June 2024) is provided in Appendix C. A gap analysis was undertaken and identified eleven species that required a likelihood of occurrence assessment.

The following procedure was used to determine which threatened species have the potential to occur in the proposed development area, to be included in this likelihood of occurrence assessment:

- Species records from the latest version of the NT Atlas were clipped to within 20 km of the proposed development area and to Bathurst Island. Usually, for these assessments, EcOz would clip the data to include species from a larger area (i.e. bioregion) because of the paucity of records in most parts of the NT. However, the proposed development area is in a well-surveyed area for which there exist many fauna and flora records, and so a more localised list is adequate.
- EPBC Protected Matters Search Tool (PMST) was used to generate a report using a 20 km buffer from the proposed development area. This PMST is an online enquiry tool managed by the Commonwealth Department of the Environment and Energy which interrogates a range of existing flora and fauna data, as well as predictive modelling to speculate on the presence of species within a search area. The PMST uses a grid system to determine which protected matters it encapsulates for a particular search. The PMST report (Appendix C) was generated on 5 June 2024.
- A gap analysis of the NT Atlas records and EPBC PMST from 7 February 2022 and the updated PMST report 05 June 2024 was undertaken. As a result, eleven species were identified as requiring a likelihood of occurrence assessment. Listed and migratory marine species were excluded in this likelihood of occurrence assessment based on the fact that no marine habitats occur in the proposed development area and the likelihood of the proposal impacting marine habitats is low.

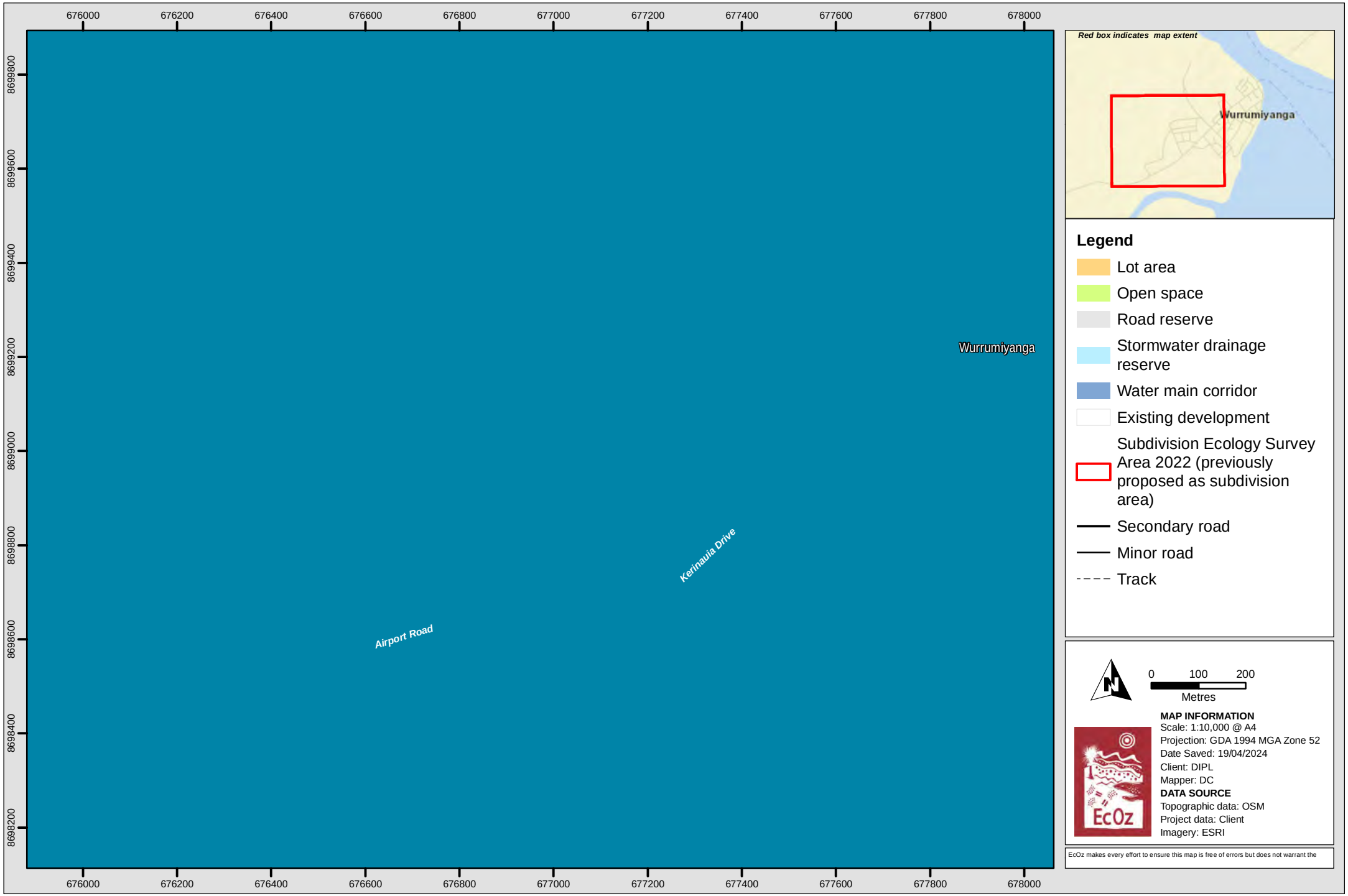
  For each of the eleven threatened species, the likelihood of it occurring within the proposed development area was then assessed based on desktop information that relates to habitat requirements, distribution, number and dates of proximate records (obtained from NT Atlas and/or Atlas of Living Australia), and the ecological information described in Section 2.

Likelihood ratings and key for species listing are defined below:

Rating	Definition
HIGH	It is expected that this species occurs within the proposed development area because there is core habitat and recent (post-2000) proximate records or knowledge that the species occurs in the local area.
MEDIUM	Species may occur within the proposed development area because there is suitable habitat; however, there is evidence that lowers its likelihood of occurrence (known range contraction of the species in the region, no recent records within or close to the proposed development area, substantial loss of habitat within the area since previous records, species is naturally rare or occurs at a low density etc.).
LOW	Species may occur, as a vagrant, within the proposed development area; only marginally suitable habitat is expected.
NONE	There is strong evidence that this species will not occur within the proposed development area (i.e. there is no suitable habitat and/or the species is considered to be regionally-extinct).

Key of species listing

VU	Vulnerable	CR	Critically Endangered
NT	Near Threatened	UA	Under assessment under the relevant Act
EN	Endangered	-	Not listed under the relevant Act



Path: Z:\01 EcOz_Documents\04 EcOz Vantage GIS\EZ23143 - Wurrumiyanga Subdivision Referral\1. Project Files\2. Report Maps\Map of broader ecology survey area and proposed development area.mxd

Figure 1 - Map of broader ecology survey area (as surveyed as part of this environmental assessment) and refined proposed development area subject of the referral.

Name	Status		Summary	Likelihood of occurrence
	Cth	NT		
THREATENED SPECIES - BIRDS				
Asian Dowitcher	VU	-	**Habitat:** Intertidal mudflats – roosting on nearby beaches and coastal lagoons (Geering et al. 2007). Rarely away from the coast. **Distribution:** A summer migrant from the northern hemisphere; some birds remain in Australia during the winter. Rare around the northern Australian coast, seldom in the south (Garnett al. 2011). In the NT, reported in small numbers in the Darwin region, central coastal Arnhem Land, Blue Mud Bay and the Port McArthur region (Chatto 2003). Probably at a number of other locations on the NT coast, but never in large numbers (Chatto 2003).	**LOW** • No suitable habitat for roosting and foraging in proposed development area, may be sighted in surrounding area to the south (mangrove/ intertidal mudflats).
	Chatto, R. (2003). The distribution and status of shorebirds around the coast and coastal wetlands of the Northern Territory. Technical Report 73, Parks and Wildlife Commission of the Northern Territory, Darwin. [online] Available at: https://dtc.nt.gov.au/__data/assets/pdf_file/0008/279917/2003_shorebirds_rpt76.pdf [Accessed 1 May 2018]. Garnett, S.T., Szabo, J.K. and Dutson, G. (2011). The Action Plan for Australian Birds 2010. CSIRO Publishing. Collingwood, Australia. Geering, A., Agnew, L. and Harding, S. (2007). Shorebirds of Australia. CSIRO Publishing, Collingwood, Australia.			
Common Greenshank *Tringa nebularia*	VU	-	**Habitat**: Coastal and estuarine areas with tidal mudflats. May roost during high tide on nearby beaches. May also be found at near-coastal swamps and lakes. **Distribution**: Mostly widespread around the northern Australian coast, with few inland records. This species is common across Australia. Every year these species breed in the northern hemisphere in the summer and migrate to Australia for the southern hemisphere (austral) summer. Some birds, primarily juveniles, remain in Australia during the winter.	**LOW** • No primary suitable habitat for foraging in proposed development area, may be sighted in surrounding area to the south (mangrove/ intertidal mudflats).
	Chatto, R. (2003). *The distribution and status of shorebirds around the coast and coastal wetlands of the Northern Territory*. Technical Report 73, Parks and Wildlife Commission of the Northern Territory, Darwin. https://dtc.nt.gov.au/__data/assets/pdf_file/0008/279917/2003_shorebirds_rpt76.pdf [Accessed 21 June 2022]. Garnett, S.T. and Baker, G,B. (Eds) (2021). *The Action Plan for Australia Birds 2020*. Birds Australia, CSIRO Publishing, Melbourne. Geering, A., Agnew, L. and Harding, S. (2007). *Shorebirds of Australia*. CSIRO Publishing, Collingwood, Australia. Lilleyman, A. and Garnett, S.T. (2021). *Migratory shorebird monitoring in Darwin Harbour, Northern Territory.* A report to the Flora and Fauna Division, Department of Environment Parks and Water Security, Northern Territory Government. By Research Institute for the Environment and Livelihoods, Charles Darwin University. Menkhorst, P. Rogers, D. and Clarke, R. (2017). The Australian Bird Guide. CSIRO Publishing: p. 160.			

Name	Status		Summary	Likelihood of occurrence
	Cth	NT		
Horsfield's Bushlark (Tiwi Islands) *Mirafra javanica melvillensis*	VU	VU	**Habitat:** Perennial tussock grasslands with rank cover; becoming less numerous as tree-cover increases (DEPWS 2021). **Distribution:** Restricted to the Tiwi Islands in the NT, and all records so far have come from Melville Island (Garnett et al. 2011).	**NONE** • No suitable habitat in proposed development area, dominantly woodland and low open shrubland habitat. • No known records on Bathurst Island, this subspecies is only known to occur on Melville Island.
	Garnett, S., Szabo, J. and Dutson, G. (2011). *The Action Plan for Australian Birds 2010*. CSIRO Publishing. Collingwood, Australia. Department of Environment, Parks and Water Security (DEPWS). (2021). *Threatened species of the Northern Territory – Horsfield's Bushlark (Tiwi Island subspecies), Singing Bushlark – Mirafra javanica melvillensis*. Northern Territory Department of Environment and Natural Resources. [online] Available at https://nt.gov.au/__data/assets/pdf_file/0006/373551/horsfields-bushlark-tiwi.pdf [Accessed 20 Nov 2023].			
Sharp-tailed Sandpiper *Calidris acuminata*	VU	-	**Habitat:** Prefers muddy edges of shallow fresh or brackish wetlands, with inundated or emergent sedges, grass, saltmarsh or other low vegetation. This includes lagoons, swamps, lakes and pools near the coast, and dams, waterholes, soaks, bore drains and bore swamps, saltpans and hypersaline saltlakes inland. They also occur in saltworks and sewage farms. They use flooded paddocks, sedgelands and other ephemeral wetlands, but leave when they dry. They use intertidal mudflats in sheltered bays, inlets, estuaries or seashores, and also swamps and creeks lined with mangroves. They tend to occupy coastal mudflats mainly after ephemeral terrestrial wetlands have dried out, moving back during the wet season. They may be attracted to mats of algae and water weed either floating or washed up around terrestrial wetlands, and coastal areas with much beachcast seaweed. Sometimes they occur on rocky shores and rarely on exposed reefs (Higgins & Davies 1996). **Distribution:** In the Northern Territory (NT) they mostly occur in the north coastal regions, generally east to Groote Eylandt and Gove Peninsula, but also around McArthur River and east of Borroloola. Widely but sparsely scattered inland records occur south to northern Tanami Desert, and in south Northern Territory, from Alice Springs, north to Napabie Lakes and south to Uluru National Park (Higgins & Davies 1996).	**LOW** • No suitable habitat in proposed development area, may be sighted in surrounding area to the south (mangrove/ intertidal mudflats).
	Higgins, P.J. & S.J.J.F. Davies, eds (1996). *Handbook of Australian, New Zealand and Antarctic Birds. Volume Three - Snipe to Pigeons.* Melbourne, Victoria: Oxford University Press.			
THREATENED SPECIES - MAMMALS				
Ghost Bat *Macroderma gigas*	VU	-	**Habitat:** Ranging from the arid Pilbara of WA to tropical savanna woodlands and north Qld. rainforests (TSSC 2016). Permanent roost sites are generally deep natural caves or disused mines (TSSC 2016).	**NONE** • No suitable roosting or breeding habitat known on Bathurst Island. • No known records occur on Bathurst Island.

Name	Status		Summary	Likelihood of occurrence
	Cth	NT		
			Move between a number of caves seasonally or as dictated by weather conditions, and require a range of cave sites (Hutson et al. 2001). Most breeding sites are caves with multiple entrances (TSSC 2016). **Distribution:** Geographically-disjunct colonies occur in the Pilbara and Kimberley in WA, NT north of approximately 17° latitude (including Elcho Island and Groote Eylandt), the Gulf of Carpentaria, eastern Qld from Cape York to near Rockhampton, and western Qld (including Riversleigh and Camooweal districts) (TSSC 2016). Distribution likely influenced by the availability of suitable caves and mines for roost sites (Ward & Milne 2016). Only 14 breeding sites known (Worthington Wilmer 2012). Disperse widely when not breeding (TSSC 2016). In arid Australia, including southern NT until the early 1960's (Ward & Milne 2016).	
	Hutson, A. M., Mickleburgh, S. P. & Racey, P. A. (2001) Microchiropteran Bats - Global Status Survey and Conservation Action Plan. IUCN/SSC Chiroptera Specialist Group, Gland, Switzerland and Cambridge, U.K. Milne, D. and Ward, S. (2016). *Threatened Species of the Northern Territory – Ghost Bat - Macroderma gigas*. Northern Territory Department of Environment and Natural Resource. [online] Available at: https://nt.gov.au/__data/assets/pdf_file/0010/376138/ghost-bat.pdf [Accessed 1 May 2018]. Threatened Species Scientific Committee (2016). *Approved Conservation Advice for Macroderma gigas (ghost bat).* Canberra: Department of the Environment. Available at:http://www.environment.gov.au/biodiversity/threatened/species/pubs/174-conservation-advice-05052016.pdf [Accessed 1 May 2018]. Worthington Wilmer, J. (2012). Ghost Bat *Macroderma gigas*. In: Curtis et al. (eds.). *Queensland's Threatened Animals*. CSIRO, Canberra: pp. 382-383.			
THREATENED SPECIES - REPTILE				
Northern Blue-tongued Skink *Tiliqua scincoides intermedia*	CR	-	**Habitat:** Occurs in may varied habitats, though tends to avoid closed-canopy forest (Jolly et al. 2023). **Distribution:** Throughout the Top End south to about Elliott. Once common in suburban Darwin. Very few records of *T.s. intermedia* exist in the NT and it appears to be quite uncommon. *T.s. intermedia* is now rarely encountered due to Cane Toad impacts (Jolly et al. 2023).	**LOW** • Marginally suitable habitat in the proposed development area. • Main threatening process of the species is Cane Toads, which do not occur on Bathurst Island. • Likely naturally rare on Bathurst Island due to there being very few records despite the relatively high amount of effort put into historic surveys that could have detected the species.
	Jolly, C., Schembri, B., Macdonald, S. (2023), *Field Guide to the Reptiles of the Northern Territory.* CSIRO Publishing, Collingwood, Victoria.			
THREATENED SPECIES - FLORA				
A tree *Elaeocarpus miegei*	-	CR	**Habitat:** Moist permanently wet soils in rainforest patches (Kerrigan & Cowie 2006). **Distribution:** In Australia, only recorded on Tiwi island from six rainforest patches (Kerrigan & Cowie 2006). No records since 1989, despite concerted search efforts on the Tiwi Islands in 1998-2001. Also known	**NONE** • No suitable habitat in proposed development area, suited to permanently wet soils in rainforest patches.

Name	Status		Summary	Likelihood of occurrence
	Cth	NT		
			from New Guinea, Malesia and the Solomon Islands (Kerrigan & Cowie 2006).	• Known records of the species are located in the northern section of Bathurst Island, approximately >30km northwest of the proposed development area.
	Kerrigan, R. and Cowie, I. (2006*). Threatened Species of the Northern Territory - Elaeocarpus miegei*. Northern Territory Department of Environment and Natural Resources. https://nt.gov.au/__data/assets/pdf_file/0019/208432/elaeocarpus-miegei.pdf [Accessed 20 November 2023].			
A vine *Mitrella tiwiensis*	VU	VU	**Habitat:** Deeply-shaded monsoonal rainforest in areas heavily covered with moist leaf litter. These areas are often associated with perennial springs and groundwater seepages (DoE 2017). **Distribution:** Known from a number of locations across both Bathurst and Melville Island. Thought to be endemic to the NT with different localities considered geographically distinct subpopulations (DoE 2017). Considered adequately surveyed, based on extensive surveys on the Tiwi Islands and rain forest habitats across the Top End (Russell- Smith 1991; Fensham and Woinarski 1992; Woinarski et al. 2003.). *Recovery plan available for this species.*	**NONE** • No suitable habitat or perennial water sources in proposed development area, suited to monsoonal rainforest and perennial springs. • Potential species habitat approximately >40km north-west and >30 km west of the proposed development area.
	Department of the Environment (2017). *Mitrella tiwiensis. Species Profile and Threats Database,* Department of the Environment, Australian Government, Canberra. [online] Available at: http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=82029 [Accessed 1 May 2018]. Fensham, R.J. and Woinarski, J.C.Z. (1992). *Yawulama: the ecology and conservation of monsoon forest on the Tiwi Islands*. Report to DASET. Conservation Commission of the Northern Territory, Darwin. Kerrigan, R. and Cowie, I. (2006). T*hreatened Species of the Northern Territory - Mitrella tiwiensis.* Northern Territory Department of Environment and Natural Resources. [online] Available at: https://nt.gov.au/__data/assets/pdf_file/0011/208478/mitrella-tiwiensis.pdf [Accessed 1 May 2018]. Russell-Smith, J. (1991). *Classification, species richness, and environmental relations of monsoon rain forest in northern Australia*. Journal of Vegetation Science, Vol. 2, pp. 259-278. Woinarski, J., Brennan, K., Cowie, I., Kerrigan, R. and Hempel, C. (2003). *Biodiversity conservation on the Tiwi islands,* Northern Territory. Part 1 - Plants and environments. Department of Infrastructure Planning and Environment, Darwin, pp. 144.			
Tarennoidea wallichii	-	EN	**Habitat**: Drier areas within complex evergreen monsoonal rainforests (Kerrigan & Cowie 2006). **Distribution**: Widespread in South-East Asia, extending at least as far as India. In the NT, known from only a small set of monsoonal rainforests on Melville Island (Kerrigan & Cowie 2006). Across the NT, preferred habitat has been well sampled (Russell-Smith 1991), and the Tiwi Islands have also been comparatively well sampled (Kerrigan & Cowie 2006).	**NONE** • No suitable habitat in proposed development area, only known to occur in rainforest habitats of Bathurst and Melville Islands. • Species habitat is approximately >50km north west of the proposed development area in monsoonal rainforest habitat.
	Kerrigan, R. and Cowie, I. (2021). *Threatened Species of the Northern Territory - Tarennoidea wallichii.* Northern Territory Department of Environment and Natural Resources.[online], Available at: https://nt.gov.au/__data/assets/pdf_file/0010/208495/tarennoidea-wallichii.pdf [Accessed 21 November 2023].			

MIGRATORY SPECIES				
White-tailed Tropicbird *Phaethon lepturus*	-	-	**Habitat:** Ideal breeding habitat is on tropical island on the ground or on a cliff ledge. Variety of habitats are used for nesting, including bare sandy ground, closed-canopy rainforest, rocky cliffs and quarries (DCCEEaW 2023) **Distribution:** Common visitor to the seas off northern WA, and occasionally sighted close to the WA mainland (DCCEEaW 2023). *Note: Phaethon lepturus lepturus is one of two Australian subspecies of the species, it is difficult to differentiate between the subspecies due to similar appearance. At a species level the distribution range is a very large area* (DCCEEaW 2023).	**NONE** • No suitable habitat in proposed development area. • Varant species with undetermined large range area.
	DCCEEaW (2023) *Species Profile and Threats Database – Phaethon lepturus lepturus– White-tailed Tropicbird* [online] Available at: http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=66986#:~:text=At%20the%20species%20level%2C%20the%20White%2Dtailed%20Tropicbird%20breeds%20on,(Marchant%20%26%20Higgins%201990). [Accessed 21 November 2023].			
Little Tern *Sternula albifrons*	-	-	**Habitat:** Variety of sheltered sandy coastal settings – namely lagoons, estuaries, river mouths, lakes and inlets – with a preference for exposed sandbanks and exposed ocean beaches, as well as mangrove-mudflat habitats (DoE 2022). Not recorded on wetlands more than 1 km from the coastline (Chatto 2001). **Distribution:** Widespread in Australia. Records occur in coastal waters extending from north-western WA, along northern and eastern coastline to Adelaide (Garnett et al. 2021). In NT, widespread along coastline and islands off NT coast; a small number are known to breed along northern Australia coast (DoE 2022). Movement after breeding is not known but assumed to remain in Australian waters (Garnett et al. 2021) *Note: nominated for listing under the EPBC Act as Vulnerable*	**LOW** • No suitable habitat in proposed development area. • May be sighted in surrounding area to the south (mangrove/ intertidal mudflats).
	Department of the Environment (DoE). (2022). *Sternula albifrons in Species Profile and Threats Database*, Department of the Environment, Canberra. Available from: https://www.environment.gov.au/sprat. Chatto, R. (2001). *The distribution and status of colonial breeding seabirds in the Northern Territory*. Parks & Wildlife Commission of the NT Technical Report. 70. Garnett, S., Barden, P., Burbridge, A., Carey, M. (2021). *Indo-Pacific Little Tern Sternula albifrons sinensis.* In The Action Plan for Australian Birds 2020. (Eds ST Garnett and GB Baker) pp. 322-325.			

APPENDIX E RAPID VEGETATION ASSESSMENT

<table>
<tr><td>Survey sites</td><td>VS1, PP1</td><td>Land unit</td><td>4c</td><td>Slope</td><td><2 %</td><td>Area (ha)</td><td>37.5</td></tr>
<tr><td>Vegetation type</td><td colspan="3">Mid open woodland of Eucalyptus oligantha with a mid open shrubland of Erythrophleum chlorostachys, Buchanania obovata with occasional Planchonia careya, over Sorghum plumosum, Chrysopogon fallax, Mnesithea rottboellioides mid tussock grassland. Other species present.</td><td colspan="4" rowspan="3"> 
VS1 Surface soil</td></tr>
<tr><td>Vegetation</td><td>Upper stratum</td><td>Mid stratum</td><td>Ground stratum</td></tr>
<tr><td>Dominant species</td><td>Eucalyptus oligantha</td><td>Erythrophleum chlorostachys,
Buchanania obovata
Planchonia careya</td><td>Sorghum plumosum
Chrysopogon fallax
Mnesithea rottboellioides</td></tr>
<tr><td>Soil description</td><td colspan="7">Relatively flat; poorly drained (seasonal waterlogging/inundation expected). Hydrosols; Brownish/grey clayey sand– some yellow mottling present</td></tr>
<tr><td>Other site notes</td><td colspan="7">Small gravel mounds present; north east aspect</td></tr>
<tr><td colspan="8">Site photos and location</td></tr>
</table>


VS1 - south


VS1 – west (PP)


VS1 - north

Survey sites	VS2, PP2, PP12	**Land unit**	2c	**Slope**	1-3 %	**Area (ha)**	30.0

Vegetation type	Low to mid open woodland of *Eucalyptus oligantha, Corymbia foelscheana* and occasional *Eucalyptus nesophila* with a mid open shrubland of *Planchonia careya, Brachychiton paradoxus and Acacia sp.,* over *Chrysopogon fallax*, *Imperata cylindrica* and *Themeda sp*. mid tussock grassland.		
Vegetation	**Upper stratum**	**Mid stratum**	**Ground stratum**
Dominant species	*Eucalyptus oligantha* *Corymbia foelscheana* *Eucalyptus nesophila*	*Planchonia careya* *Brachychiton paradoxus* *Acacia sp.* *Hakea arborescens (occasional)*	*Chrysopogon fallax* *Imperata cylindrica* *Themeda sp*.


VS2 Surface soil

Soil description	Low rounded hills; well drained. Dark brown sandy clay soils with lateritic gravels on surface in some areas
Other site notes	-
Site photos and location	


VS2 - south


VS2 - west


VS2 – east (PP)

Survey sites	VS3, PP3, PP4	**Land unit**	6b		**Slope**	<2 %	**Area (ha)**	155.6
Vegetation type	Low open woodland of *Melaleuca viridiflora* and *Acacia auriculiformis* with a mid high shrubland of *Melaleuca viridiflora, Brachychiton paradoxus and Petalostigma pubescens.,* over *Themeda sp*., *Sorghum plumosum* and *Eulalia mackinlayi* mid tussock grassland. Other shrubs present include *Buchanania obovata, Corymbia foelscheana, Pandanus spiralis, Wrightia saligna, Cochlospermum fraseri*						
Vegetation	**Upper stratum**		**Mid stratum**	**Ground stratum**			
Dominant species	*Melaleuca viridiflora* *Acacia auriculiformis*		*Melaleuca viridiflora* *Brachychiton paradoxus* *Petalostigma pubescens* *Buchanania obovata* *Corymbia foelscheana* *Pandanus spiralis*	*Themeda sp* *Sorghum plumosum* *Eulalia mackinlayi*			
Soil description	Drainage area; poorly drained (wet-season water logging expected). Dark brown/grey sandy clay soils; Hydrosols						
Other site notes	Some pooling of water present at the time of survey within the *Melaleuca* swamp						


VS3 Surface soil

Site photos and location		
 VS3 - north	 VS3 - west	 VS3 – north (PP1)

Survey sites	VS4, PP5	**Land unit**	6a		**Slope**	1-2 %	**Area (ha)** 89.5
Vegetation type	Low open mixed woodland of *Eucalyptus tetrodonta* and *Wrightia saligna* with a mid high shrubland of *Terminalia ferdinandiana, Planchonia careya, Petalostigma pubescens* and occasional *Cochlospermum fraseri,* over *Sorghum plumosum, Chrysopogon fallax* and *Imperata cylindrica* mid tussock grassland. Other shrubs present include *Brachychiton paradoxum*, *Cycas armstrongii,* Native grape vine, *Tacca, Spermacoce sp., Themeda sp.*				 *VS4 Surface soil*		
Vegetation	**Upper stratum**		**Mid stratum**	**Ground stratum**			
Dominant species	*Eucalyptus tetrodonta* *Wrightia saligna*		*Terminalia ferdinandiana* *Planchonia careya* *Petalostigma pubescens* *Cochlospermum fraseri (occasional)*	*Sorghum plumosum* *Chrysopogon fallax* *Imperata cylindrica*			
Soil description	Drainage area; poorly drained (wet-season water logging expected). Dark brown/grey sandy clay soils; Hydrosols						

Other site notes	Aspect is north; *Cycas armstrongii* also present here

Site photos and location

VS4 - south

VS4 - west

VS4 – west (PP)

Survey sites	VS5	**Land unit**	5a		**Slope**	1-2 %	**Area (ha)**	64.1
Vegetation type	Low open woodland of *Melaleuca viridiflora, Terminalia ferdinandiana* and *Acacia auriculiformis* with a mid high shrubland of *Planchonia careya, Petalostigma pubescens* and *Terminalia ferdinandiana* over unidentified grass sp 1, *Imperata cylindrica* and *Eriachne sp.* mid tussock grassland.						
Vegetation	**Upper stratum**		**Mid stratum**		**Ground stratum**		
Dominant species	*Melaleuca viridiflora* *Terminalia ferdinandiana* *Acacia auriculiformis*		*Planchonia careya* *Petalostigma pubescens* *Terminalia ferdinandiana*		unidentified grass sp 1 *Imperata cylindrica* *Eriachne sp.*		

VS5 Surface soil

Soil description	Drainage area; poorly drained (wet-season water logging expected). Dark brown/grey sandy clay soils; Hydrosols
Other site notes	Some debil debils also present – soils were moist at the time of the survey

Site photos and location

VS5 - south

VS5 - north

VS5 – west

Survey sites	VS6, PP6	**Land unit**	3b	**Slope**	1-2 %	**Area (ha)**	81.4
Vegetation type	Mid high woodland to open forest of *Eucalyptus miniata, Eucalyptus nesophila* and *Eucalyptus tetrodonta* with a mid high shrubland of *Acacia auriculiformis* over *Chrysopogon fallax, Alphitonia excelsa, Grevillea subsp.*						
Vegetation	**Upper stratum**		**Mid stratum**		**Ground stratum**		
Dominant species	*Eucalyptus miniata* *Eucalyptus nesophila* *Eucalyptus tetrodonta*		*Acacia auriculiformis*		*Chrysopogon fallax* *Alphitonia excelsa* *Grevillea subsp.*		

				VS6 Surface soil
Soil description	Slightly undulating, well drained. Yellowish-brown sandy loams; Brown kandosols			
Other site notes	Fire disturbance present, large >40cm DBH trees present			
Site photos and location				

VS6 - south

VS6 - west

VS6 – south (PP)

Survey sites	VS7, PP7	**Land unit**	4a1		**Slope**	1-2 %	**Area (ha)**	54.7
Vegetation type	Mid high woodland to open forest of *Eucalyptus miniata, Eucalyptus nesophila* and *Eucalyptus tetrodonta* with a mid high open shrubland of *Erythrophleum chlorostachys, Acacia auriculiformis* and *Cycas armstrongii* over *Chrysopogon latifolia, Ampelocissus acetosa* and *Brachychiton paradoxum.*						
Vegetation	**Upper stratum**		**Mid stratum**		**Ground stratum**		

Dominant species	*Eucalyptus miniata* *Eucalyptus nesophila* *Eucalyptus tetrodonta*	*Erythrophleum chlorostachys* *Acacia auriculiformis* *Cycas armstrongii*	*Chrysopogon latifolia* *Ampelocissus acetosa*	 *VS7 Surface soil*
Soil description	Slightly undulating, well drained. Yellowish-brown sandy clay loams; Brown kandosols			
Other site notes	Fire disturbance present, large >40cm DBH trees present			
Site photos and location				
 VS7 - east	 VS7 - south	 VS7 – east (PP)		

Survey sites	VS8, PP8	Land unit	3b	Slope	1-2 %	Area (ha)	81.4
Vegetation type	Mid high woodland of *Eucalyptus miniata, Eucalyptus nesophila* and *Eucalyptus tetrodonta* with a mid high open shrubland of *Cycas armstrongii, Buchanania obovata* over *Sorghum plumosum Chrysopogon latifolia, Mnesithea rottboellioides* mid tussock grassland.						
Vegetation	**Upper stratum**	**Mid stratum**	**Ground stratum**				
Dominant species	*Eucalyptus miniata* *Eucalyptus nesophila* *Eucalyptus tetrodonta*	*Buchanania obovata* *Cycas armstrongii*	*Sorghum plumosum* *Mnesithea rottboellioides* *Chrysopogon latifolia*				
Soil description	Slightly undulating, well drained. Brownish/red sandy clay loams; Brown kandosols						
Other site notes	Fire disturbance present						

VS8 Surface soil

Site photos and location

VS8 - west

VS8 - south

VS8 – south (PP)

Survey sites	VS9, PP9	Land unit	2b1	Slope	1-3 %	Area (ha)	155.6
Vegetation type	Mid high woodland of *Eucalyptus tetrodonta* and *Corymbia bleeseri* with a mid high open shrubland of *Grevillea decurrens* and *Gardenia megasperma* over *Chrysopogon latifolia, Eriachne sp.* and *Indigofera saxicola* mid tussock grassland. Other ground cover species include *Eulalia mackinlayi, Petalostigma quadriloculare.*						
Vegetation	**Upper stratum**	**Mid stratum**	**Ground stratum**				
Dominant species	*Eucalyptus tetrodonta* *Corymbia bleeseri*	*Grevillea decurrens* *Gardenia megasperma*	*Chrysopogon latifolia* *Eriachne sp.* *Indigofera saxicola*				
Soil description	Rounded, rocky hills, well drained. Brownish sandy clay loams; Brown kandosols						
Other site notes	Fire disturbance present						

VS9 Surface soil

Site photos and location

VS9 - west

VS9 - south

VS9 – south (PP)

Survey sites	VS10, PP10, PP13	Land unit	4d	Slope	<2 %	Area (ha)	102.2
Vegetation type	Mid high woodland of *Eucalyptus tetrodonta, Corymbia bleeseri* and occasional *Eucalyptus nesophila* with a mid high open shrubland of *Gardenia megasperma, Petalostigma pubescens* and Planchonia careya over *Eriachne sp. Sorghum plumosum, Themeda sp.* mid tussock grassland.			 *VS10 Surface soil*			
Vegetation	**Upper stratum**	**Mid stratum**	**Ground stratum**				
Dominant species	*Eucalyptus tetrodonta* *Corymbia bleeseri* *Eucalyptus nesophila*	*Gardenia megasperma* *Petalostigma pubescens* *Planchonia careya*	*Sorghum plumosum* *Eriachne sp.* *Imperata cylindrica* *Themeda sp.*				
Soil description	Plains, relatively well drained. Brownish sandy clay loams with high lateritic surface gravels; Brown kandosols						
Other site notes	Fire disturbance present; aspect is east						

Site photos and location


VS10 - north


VS10 - south


VS10 – east

Survey sites	VS11, PP11	Land unit	4b	Slope	<2 %	Area (ha)	20.9
Vegetation type	Low open woodland of *Eucalyptus tetrodonta* and *Eucalyptus nesophila* with a mid high open shrubland of *Eucalyptus tetrodonta, Erythrophleum chlorostachys* and *Grevillea decurrens* over *Sorghum plumosum, Themeda sp.* and *Eriachne sp,* mid tussock grassland. Other shrubs include *Cochlospermum fraseri, Persoonia falcata, Hakea arborescens* and *Buchanania obovata*						
Vegetation	**Upper stratum**	**Mid stratum**	**Ground stratum**				
Dominant species	*Eucalyptus tetrodonta* *Eucalyptus nesophila*	*Eucalyptus tetrodonta* *Erythrophleum chlorostachys* *Grevillea decurrens* *Cochlospermum fraseri* *Persoonia falcata* *Hakea arborescens* *Buchanania obovata*	*Sorghum plumosum* *Themeda sp.* *Eriachne sp.* *Sehima nervosa*				
Soil description	Slightly undulating. Reddish/ brown sandy clay with high lateritic surface gravels; Brown kandosols						
Other site notes	High level of disturbance, large gravel pit adjacent to site						

VS11 Surface soil

Site photos and location

VS11 - north

VS11 - south

VS11 – east

Survey sites	VS12	Land unit	5a	Slope	<2 %	Area (ha)	48.42
Vegetation type	Low woodland of *Eucalyptus foelscheana* and *Melaleuca viridiflora* with a mid high open shrubland of *Planchonia careya, Cochlospermum fraseri* and *Pandanus spiralis* over *Mnesithea rottboellioides, Imperata cylindrica,* and *Chrysopogon latifolia,* mid tussock grassland. Other shrubs include *Cochlospermum fraseri, Persoonia falcata, Hakea arborescens* and *Buchanania obovata*						
Vegetation	**Upper stratum**	**Mid stratum**	**Ground stratum**				
Dominant species	*Eucalyptus foelscheana* *Melaleuca viridiflora*	*Planchonia careya* *Cochlospermum fraseri* *Pandanus spiralis*	*Mnesithea rottboellioides,* *Imperata cylindrica* *Chrysopogon latifolia* *Sehima nervosa*				
Soil description	Drainage depression. Dark brown clay soils; poorly drained (wet season water logging), Hydrosols						
Other site notes	High level of disturbance, large gravel pit adjacent to site						

VS12 Surface soil

Site photos and location

VS12 - north

VS12 - south

VS12 – east

Rapid vegetation assessment sites and photo points

Survey site	Longitude (GDA94)	Latitude (GDA94)
VS1	130.6236083	-11.76698789
VS2	130.6234913	-11.76965289
VS3	130.6231313	-11.76465189
VS4	130.6233363	-11.76140389
VS5	130.6234543	-11.75907789
VS6	130.5475653	-11.80203789
VS7	130.5473863	-11.80471389
VS8	130.5751863	-11.77270689
VS9	130.5723133	-11.76858989
VS10	130.5791093	-11.77176889
VS11	130.6078813	-11.77250189
VS12	130.6081593	-11.77121789
PP1	130.6248063	-11.76636489
PP2	130.6251853	-11.76903289
PP3	130.6212343	-11.76314389
PP4	130.6210913	-11.76418189
PP5	130.6256333	-11.76689089
PP6	130.5462733	-11.80291989
PP7	130.5478273	-11.80446189
PP8	130.5756923	-11.77204189
PP9	130.5769773	-11.76877989
PP10	130.5771863	-11.77212889
PP11	130.6073853	-11.77178189
PP12	130.6240013	-11.76899389
PP13	130.5794083	-11.77545089

APPENDIX F LOCATIONS OF TYPHONIUM PLANTS

Observer	Date	Latitude (GDA94)	Longitude (GDA94)	Site ID	Likelihood	Land Unit
Sarah Ryan	28/02/2022	-11.772411	130.607674	Extract_1	Moderate	4b
Colin Kerinaiua	2/03/2022	-11.766988	130.623766	Subdivision	-	4c
Colin Kerinaiua	2/03/2022	-11.766976	130.623768	Subdivision	-	4c
Colin Kerinaiua	2/03/2022	-11.766975	130.623766	Subdivision	-	4c
Colin Kerinaiua	2/03/2022	-11.76651	130.6238	Subdivision	High	4c
Colin Kerinaiua	2/03/2022	-11.76651	130.6238	Subdivision	High	4c
Colin Kerinaiua	2/03/2022	-11.76623	130.62379	Subdivision	High	4c
Colin Kerinaiua	2/03/2022	-11.76612	130.62378	Subdivision	High	4c
Colin Kerinaiua	2/03/2022	-11.76611	130.6238	Subdivision	High	4c
Colin Kerinaiua	2/03/2022	-11.76611	130.62381	Subdivision	High	4c
Colin Kerinaiua	2/03/2022	-11.76611	130.62383	Subdivision	High	4c
Colin Kerinaiua	2/03/2022	-11.76606	130.6238	Subdivision	High	4c
Colin Kerinaiua	2/03/2022	-11.76605	130.62378	Subdivision	High	4c
Colin Kerinaiua	2/03/2022	-11.7659	130.6238	Subdivision	High	4c
Colin Kerinaiua	2/03/2022	-11.76591	130.62381	Subdivision	High	4c
Colin Kerinaiua	2/03/2022	-11.7654	130.623808	Subdivision	High	6b
Colin Kerinaiua	2/03/2022	-11.76581	130.6238	Subdivision	High	6b
Colin Kerinaiua	2/03/2022	-11.76581	130.6238	Subdivision	High	6b
Colin Kerinaiua	2/03/2022	-11.76581	130.6238	Subdivision	High	6b
Colin Kerinaiua	2/03/2022	-11.76581	130.6238	Subdivision	High	6b
Colin Kerinaiua	2/03/2022	-11.7658	130.6238	Subdivision	High	6b
Colin Kerinaiua	2/03/2022	-11.766914	130.623766	Subdivision	Moderate	4c
Colin Kerinaiua	2/03/2022	-11.766887	130.623766	Subdivision	Moderate	4c
Colin Kerinaiua	2/03/2022	-11.766887	130.623766	Subdivision	Moderate	4c
Colin Kerinaiua	2/03/2022	-11.766886	130.623766	Subdivision	Moderate	4c
Colin Kerinaiua	2/03/2022	-11.766843	130.623742	Subdivision	Moderate	4c
Colin Kerinaiua	2/03/2022	-11.766795	130.623746	Subdivision	Moderate	4c
Colin Kerinaiua	2/03/2022	-11.76622	130.62379	Subdivision	Moderate	4c
Colin Kerinaiua	2/03/2022	-11.76616	130.623773	Subdivision	Moderate	4c
Colin Kerinaiua	2/03/2022	-11.76602	130.62379	Subdivision	Moderate	4c
Colin Kerinaiua	2/03/2022	-11.765773	130.623746	Subdivision	Moderate	6b
Colin Kerinaiua	2/03/2022	-11.76583	130.62379	Subdivision	Moderate	6b
Colin Kerinaiua	2/03/2022	-11.76583	130.62379	Subdivision	Moderate	6b
Colin Kerinaiua	2/03/2022	-11.76582	130.62378	Subdivision	Moderate	6b
Colin Kerinaiua	2/03/2022	-11.7658	130.623773	Subdivision	Moderate	6b
Colin Kerinaiua	2/03/2022	-11.76578	130.62376	Subdivision	Moderate	6b
Nicole Clark	2/03/2022	-11.766998	130.623753	Subdivision	-	4c
Nicole Clark	2/03/2022	-11.767001	130.623754	Subdivision	-	4c
Nicole Clark	2/03/2022	-11.767	130.623753	Subdivision	-	4c

Observer	Date	Latitude (GDA94)	Longitude (GDA94)	Site ID	Likelihood	Land Unit
Nicole Clark	2/03/2022	-11.767002	130.623754	Subdivision	-	4c
Nicole Clark	2/03/2022	-11.767	130.623758	Subdivision	-	4c
Nicole Clark	2/03/2022	-11.766996	130.623757	Subdivision	-	4c
Nicole Clark	2/03/2022	-11.766999	130.623766	Subdivision	-	4c
Nicole Clark	2/03/2022	-11.765697	130.623661	Subdivision	-	6b
Nicole Clark	2/03/2022	-11.765697	130.623665	Subdivision	-	6b
Nicole Clark	2/03/2022	-11.768157	130.579401	Extract_2	High	2b1
Nicole Clark	2/03/2022	-11.76816	130.579404	Extract_2	High	2b1
Nicole Clark	2/03/2022	-11.768158	130.57941	Extract_2	High	2b1
Nicole Clark	2/03/2022	-11.768164	130.579409	Extract_2	High	2b1
Nicole Clark	2/03/2022	-11.766982	130.623588	Subdivision	High	4c
Nicole Clark	2/03/2022	-11.766982	130.623591	Subdivision	High	4c
Nicole Clark	2/03/2022	-11.766982	130.623613	Subdivision	High	4c
Nicole Clark	2/03/2022	-11.766967	130.623597	Subdivision	High	4c
Nicole Clark	2/03/2022	-11.766965	130.623609	Subdivision	High	4c
Nicole Clark	2/03/2022	-11.766973	130.62355	Subdivision	High	4c
Nicole Clark	2/03/2022	-11.766986	130.623561	Subdivision	High	4c
Nicole Clark	2/03/2022	-11.766476	130.623878	Subdivision	High	4c
Nicole Clark	2/03/2022	-11.766477	130.623876	Subdivision	High	4c
Nicole Clark	2/03/2022	-11.765907	130.623866	Subdivision	High	4c
Nicole Clark	2/03/2022	-11.765887	130.623927	Subdivision	High	4c
Nicole Clark	2/03/2022	-11.765889	130.623927	Subdivision	High	4c
Nicole Clark	2/03/2022	-11.765889	130.623919	Subdivision	High	4c
Nicole Clark	2/03/2022	-11.765877	130.623913	Subdivision	High	4c
Nicole Clark	2/03/2022	-11.765751	130.623929	Subdivision	High	4c
Nicole Clark	2/03/2022	-11.765748	130.623929	Subdivision	High	4c
Nicole Clark	2/03/2022	-11.767582	130.57535	Extract_2	Moderate	2b1
Nicole Clark	2/03/2022	-11.767587	130.575341	Extract_2	Moderate	2b1
Nicole Clark	2/03/2022	-11.767592	130.575321	Extract_2	Moderate	2b1
Nicole Clark	2/03/2022	-11.767588	130.575303	Extract_2	Moderate	2b1
Nicole Clark	2/03/2022	-11.767616	130.575339	Extract_2	Moderate	2b1
Nicole Clark	2/03/2022	-11.767603	130.575338	Extract_2	Moderate	2b1
Nicole Clark	2/03/2022	-11.767606	130.575338	Extract_2	Moderate	2b1
Nicole Clark	2/03/2022	-11.767604	130.575338	Extract_2	Moderate	2b1
Nicole Clark	2/03/2022	-11.767595	130.575328	Extract_2	Moderate	2b1
Nicole Clark	2/03/2022	-11.767571	130.575329	Extract_2	Moderate	2b1
Nicole Clark	2/03/2022	-11.767589	130.575326	Extract_2	Moderate	2b1
Nicole Clark	2/03/2022	-11.767595	130.575323	Extract_2	Moderate	2b1
Nicole Clark	2/03/2022	-11.767515	130.575368	Extract_2	Moderate	2b1
Nicole Clark	2/03/2022	-11.767522	130.575367	Extract_2	Moderate	2b1
Nicole Clark	2/03/2022	-11.767524	130.575364	Extract_2	Moderate	2b1
Nicole Clark	2/03/2022	-11.767543	130.575359	Extract_2	Moderate	2b1

Observer	Date	Latitude (GDA94)	Longitude (GDA94)	Site ID	Likelihood	Land Unit
Nicole Clark	2/03/2022	-11.767545	130.575357	Extract_2	Moderate	2b1
Nicole Clark	2/03/2022	-11.768054	130.579275	Extract_2	Moderate	2b1
Nicole Clark	2/03/2022	-11.768147	130.579407	Extract_2	Moderate	2b1
Nicole Clark	2/03/2022	-11.76681	130.623836	Subdivision	Moderate	4c
Sarah Ryan	2/03/2022	-11.767497	130.575317	Extract_2	-	2b1
Sarah Ryan	2/03/2022	-11.767499	130.575309	Extract_2	-	2b1
Sarah Ryan	2/03/2022	-11.767495	130.575315	Extract_2	-	2b1
Sarah Ryan	2/03/2022	-11.767491	130.575301	Extract_2	-	2b1
Sarah Ryan	2/03/2022	-11.767491	130.575302	Extract_2	-	2b1
Sarah Ryan	2/03/2022	-11.768866	130.576492	Extract_2	-	2b1
Sarah Ryan	2/03/2022	-11.768862	130.576493	Extract_2	-	2b1
Sarah Ryan	2/03/2022	-11.768858	130.576488	Extract_2	-	2b1
Sarah Ryan	2/03/2022	-11.768844	130.576487	Extract_2	-	2b1
Sarah Ryan	2/03/2022	-11.768844	130.576488	Extract_2	-	2b1
Sarah Ryan	2/03/2022	-11.768847	130.576515	Extract_2	-	2b1
Sarah Ryan	2/03/2022	-11.768845	130.576502	Extract_2	-	2b1
Sarah Ryan	2/03/2022	-11.768847	130.576503	Extract_2	-	2b1
Sarah Ryan	2/03/2022	-11.768846	130.576502	Extract_2	-	2b1
Sarah Ryan	2/03/2022	-11.76864	130.576518	Extract_2	-	2b1
Sarah Ryan	2/03/2022	-11.76864	130.576517	Extract_2	-	2b1
Sarah Ryan	2/03/2022	-11.768203	130.57942	Extract_2	High	2b1
Sarah Ryan	2/03/2022	-11.768178	130.579428	Extract_2	High	2b1
Sarah Ryan	2/03/2022	-11.768151	130.579434	Extract_2	High	2b1
Sarah Ryan	2/03/2022	-11.768152	130.579418	Extract_2	High	2b1
Sarah Ryan	2/03/2022	-11.768156	130.579397	Extract_2	High	2b1
Sarah Ryan	2/03/2022	-11.768168	130.57941	Extract_2	High	2b1
Sarah Ryan	2/03/2022	-11.767668	130.575339	Extract_2	Moderate	2b1
Sarah Ryan	2/03/2022	-11.767666	130.575338	Extract_2	Moderate	2b1
Sarah Ryan	2/03/2022	-11.767658	130.575339	Extract_2	Moderate	2b1
Sarah Ryan	2/03/2022	-11.767618	130.575322	Extract_2	Moderate	2b1
Sarah Ryan	2/03/2022	-11.767629	130.575319	Extract_2	Moderate	2b1
Sarah Ryan	2/03/2022	-11.767585	130.575321	Extract_2	Moderate	2b1
Sarah Ryan	2/03/2022	-11.767578	130.575317	Extract_2	Moderate	2b1
Sarah Ryan	2/03/2022	-11.767575	130.575318	Extract_2	Moderate	2b1
Sarah Ryan	2/03/2022	-11.76757	130.575326	Extract_2	Moderate	2b1
Sarah Ryan	2/03/2022	-11.767571	130.575322	Extract_2	Moderate	2b1
Sarah Ryan	2/03/2022	-11.767569	130.575319	Extract_2	Moderate	2b1
Sarah Ryan	2/03/2022	-11.767559	130.575329	Extract_2	Moderate	2b1
Sarah Ryan	2/03/2022	-11.767555	130.575338	Extract_2	Moderate	2b1
Sarah Ryan	2/03/2022	-11.767545	130.575336	Extract_2	Moderate	2b1
Sarah Ryan	2/03/2022	-11.767569	130.575349	Extract_2	Moderate	2b1
Sarah Ryan	2/03/2022	-11.767558	130.57534	Extract_2	Moderate	2b1

Observer	Date	Latitude (GDA94)	Longitude (GDA94)	Site ID	Likelihood	Land Unit
Sarah Ryan	2/03/2022	-11.767549	130.575339	Extract_2	Moderate	2b1
Sarah Ryan	2/03/2022	-11.767538	130.575345	Extract_2	Moderate	2b1
Sarah Ryan	2/03/2022	-11.767542	130.575328	Extract_2	Moderate	2b1
Sarah Ryan	2/03/2022	-11.767541	130.575324	Extract_2	Moderate	2b1
Sarah Ryan	2/03/2022	-11.76754	130.575319	Extract_2	Moderate	2b1
Sarah Ryan	2/03/2022	-11.767535	130.57532	Extract_2	Moderate	2b1
Sarah Ryan	2/03/2022	-11.767526	130.575323	Extract_2	Moderate	2b1
Sarah Ryan	2/03/2022	-11.767515	130.575317	Extract_2	Moderate	2b1
Sarah Ryan	2/03/2022	-11.767513	130.575319	Extract_2	Moderate	2b1
Sarah Ryan	2/03/2022	-11.76751	130.575314	Extract_2	Moderate	2b1
Sarah Ryan	2/03/2022	-11.767545	130.57531	Extract_2	Moderate	2b1
Sarah Ryan	2/03/2022	-11.767513	130.575311	Extract_2	Moderate	2b1
Sarah Ryan	2/03/2022	-11.767512	130.575312	Extract_2	Moderate	2b1
Sarah Ryan	2/03/2022	-11.767547	130.575321	Extract_2	Moderate	2b1
Sarah Ryan	2/03/2022	-11.767548	130.575324	Extract_2	Moderate	2b1
Sarah Ryan	2/03/2022	-11.767548	130.575324	Extract_2	Moderate	2b1
Sarah Ryan	2/03/2022	-11.768138	130.579433	Extract_2	Moderate	2b1
Willy Rioli	2/03/2022	-11.765696	130.62365	Subdivision	-	6b
Willy Rioli	2/03/2022	-11.765697	130.623651	Subdivision	-	6b
Willy Rioli	2/03/2022	-11.765697	130.62364	Subdivision	-	6b
Willy Rioli	2/03/2022	-11.765692	130.623639	Subdivision	-	6b
Willy Rioli	2/03/2022	-11.765686	130.62363	Subdivision	-	6b
Willy Rioli	2/03/2022	-11.765682	130.623646	Subdivision	-	6b
Willy Rioli	2/03/2022	-11.765697	130.623691	Subdivision	-	6b
Willy Rioli	2/03/2022	-11.765696	130.623686	Subdivision	-	6b
Willy Rioli	2/03/2022	-11.765695	130.623686	Subdivision	-	6b
Willy Rioli	2/03/2022	-11.765693	130.623667	Subdivision	-	6b
Willy Rioli	2/03/2022	-11.765692	130.623664	Subdivision	-	6b
Willy Rioli	2/03/2022	-11.765698	130.623662	Subdivision	-	6b
Willy Rioli	2/03/2022	-11.765702	130.623656	Subdivision	-	6b
Willy Rioli	2/03/2022	-11.765701	130.623634	Subdivision	-	6b
Willy Rioli	2/03/2022	-11.7657	130.623633	Subdivision	-	6b
Willy Rioli	2/03/2022	-11.765701	130.623637	Subdivision	-	6b
Willy Rioli	2/03/2022	-11.765704	130.623633	Subdivision	-	6b
Willy Rioli	2/03/2022	-11.765697	130.62363	Subdivision	-	6b
Willy Rioli	2/03/2022	-11.765693	130.623634	Subdivision	-	6b
Willy Rioli	2/03/2022	-11.765693	130.623634	Subdivision	-	6b
Willy Rioli	2/03/2022	-11.765685	130.623658	Subdivision	-	6b
Willy Rioli	2/03/2022	-11.765682	130.623638	Subdivision	-	6b
Willy Rioli	2/03/2022	-11.765685	130.62364	Subdivision	-	6b
Willy Rioli	2/03/2022	-11.765702	130.623666	Subdivision	-	6b
Willy Rioli	2/03/2022	-11.765701	130.623668	Subdivision	-	6b

Observer	Date	Latitude (GDA94)	Longitude (GDA94)	Site ID	Likelihood	Land Unit
Willy Rioli	2/03/2022	-11.765702	130.623672	Subdivision	-	6b
Willy Rioli	2/03/2022	-11.765674	130.623674	Subdivision	-	6b
Willy Rioli	2/03/2022	-11.765709	130.623678	Subdivision	-	6b
Willy Rioli	2/03/2022	-11.765686	130.623645	Subdivision	-	6b
Willy Rioli	2/03/2022	-11.766805	130.623642	Subdivision	High	4c
Willy Rioli	2/03/2022	-11.766801	130.623637	Subdivision	High	4c
Willy Rioli	2/03/2022	-11.766801	130.623634	Subdivision	High	4c
Willy Rioli	2/03/2022	-11.765673	130.623677	Subdivision	High	6b
Willy Rioli	2/03/2022	-11.766945	130.623692	Subdivision	Moderate	4c
Willy Rioli	2/03/2022	-11.766942	130.623693	Subdivision	Moderate	4c
Willy Rioli	2/03/2022	-11.766943	130.6237	Subdivision	Moderate	4c
Willy Rioli	2/03/2022	-11.766942	130.623691	Subdivision	Moderate	4c
Willy Rioli	2/03/2022	-11.76694	130.62369	Subdivision	Moderate	4c
Willy Rioli	2/03/2022	-11.766937	130.623688	Subdivision	Moderate	4c
Willy Rioli	2/03/2022	-11.76694	130.623688	Subdivision	Moderate	4c
Willy Rioli	2/03/2022	-11.766947	130.623682	Subdivision	Moderate	4c
Willy Rioli	2/03/2022	-11.766946	130.62368	Subdivision	Moderate	4c
Willy Rioli	2/03/2022	-11.766945	130.623679	Subdivision	Moderate	4c
Willy Rioli	2/03/2022	-11.766943	130.623678	Subdivision	Moderate	4c
Willy Rioli	2/03/2022	-11.766879	130.62367	Subdivision	Moderate	4c
Willy Rioli	2/03/2022	-11.766887	130.623664	Subdivision	Moderate	4c
Colin Kerinaiua	3/03/2022	-11.76543	130.624931	Subdivision	-	4c
Colin Kerinaiua	3/03/2022	-11.768358	130.626009	Subdivision	-	4c
Colin Kerinaiua	3/03/2022	-11.768362	130.626009	Subdivision	-	4c
Colin Kerinaiua	3/03/2022	-11.768364	130.626006	Subdivision	-	4c
Colin Kerinaiua	3/03/2022	-11.768436	130.626002	Subdivision	-	4c
Colin Kerinaiua	3/03/2022	-11.768446	130.625993	Subdivision	-	4c
Colin Kerinaiua	3/03/2022	-11.768444	130.625997	Subdivision	-	4c
Colin Kerinaiua	3/03/2022	-11.768433	130.626008	Subdivision	-	4c
Colin Kerinaiua	3/03/2022	-11.768439	130.626005	Subdivision	-	4c
Colin Kerinaiua	3/03/2022	-11.768439	130.626008	Subdivision	-	4c
Colin Kerinaiua	3/03/2022	-11.768438	130.626006	Subdivision	-	4c
Colin Kerinaiua	3/03/2022	-11.768437	130.626014	Subdivision	-	4c
Colin Kerinaiua	3/03/2022	-11.768438	130.626011	Subdivision	-	4c
Colin Kerinaiua	3/03/2022	-11.768436	130.626011	Subdivision	-	4c
Colin Kerinaiua	3/03/2022	-11.768437	130.626011	Subdivision	-	4c
Colin Kerinaiua	3/03/2022	-11.76844	130.626007	Subdivision	-	4c
Colin Kerinaiua	3/03/2022	-11.76844	130.626006	Subdivision	-	4c
Colin Kerinaiua	3/03/2022	-11.768495	130.625995	Subdivision	-	4c
Colin Kerinaiua	3/03/2022	-11.768496	130.625995	Subdivision	-	4c
Colin Kerinaiua	3/03/2022	-11.768495	130.625994	Subdivision	-	4c
Colin Kerinaiua	3/03/2022	-11.768515	130.625999	Subdivision	-	4c

Observer	Date	Latitude (GDA94)	Longitude (GDA94)	Site ID	Likelihood	Land Unit
Colin Kerinaiua	3/03/2022	-11.768391	130.625723	Subdivision	-	4c
Colin Kerinaiua	3/03/2022	-11.768378	130.625738	Subdivision	-	4c
Colin Kerinaiua	3/03/2022	-11.768833	130.624947	Subdivision	High	2c
Colin Kerinaiua	3/03/2022	-11.765166	130.624868	Subdivision	High	4c
Colin Kerinaiua	3/03/2022	-11.765174	130.624863	Subdivision	High	4c
Colin Kerinaiua	3/03/2022	-11.765184	130.624866	Subdivision	High	4c
Colin Kerinaiua	3/03/2022	-11.765184	130.62487	Subdivision	High	4c
Colin Kerinaiua	3/03/2022	-11.765192	130.624864	Subdivision	High	4c
Colin Kerinaiua	3/03/2022	-11.765189	130.624861	Subdivision	High	4c
Colin Kerinaiua	3/03/2022	-11.765191	130.624865	Subdivision	High	4c
Colin Kerinaiua	3/03/2022	-11.765192	130.624868	Subdivision	High	4c
Colin Kerinaiua	3/03/2022	-11.765194	130.624861	Subdivision	High	4c
Colin Kerinaiua	3/03/2022	-11.765195	130.624886	Subdivision	High	4c
Colin Kerinaiua	3/03/2022	-11.765205	130.624872	Subdivision	High	4c
Colin Kerinaiua	3/03/2022	-11.765206	130.624873	Subdivision	High	4c
Colin Kerinaiua	3/03/2022	-11.765206	130.62488	Subdivision	High	4c
Colin Kerinaiua	3/03/2022	-11.766692	130.624828	Subdivision	High	4c
Colin Kerinaiua	3/03/2022	-11.767647	130.624734	Subdivision	High	4c
Colin Kerinaiua	3/03/2022	-11.767633	130.624741	Subdivision	High	4c
Colin Kerinaiua	3/03/2022	-11.767623	130.624758	Subdivision	High	4c
Colin Kerinaiua	3/03/2022	-11.767451	130.624747	Subdivision	High	4c
Colin Kerinaiua	3/03/2022	-11.767065	130.624727	Subdivision	High	4c
Colin Kerinaiua	3/03/2022	-11.767065	130.624727	Subdivision	High	4c
Colin Kerinaiua	3/03/2022	-11.767065	130.624727	Subdivision	High	4c
Colin Kerinaiua	3/03/2022	-11.767065	130.624727	Subdivision	High	4c
Colin Kerinaiua	3/03/2022	-11.767065	130.624727	Subdivision	High	4c
Colin Kerinaiua	3/03/2022	-11.767065	130.624727	Subdivision	High	4c
Colin Kerinaiua	3/03/2022	-11.767065	130.624727	Subdivision	High	4c
Colin Kerinaiua	3/03/2022	-11.767065	130.624727	Subdivision	High	4c
Colin Kerinaiua	3/03/2022	-11.767065	130.624727	Subdivision	High	4c
Colin Kerinaiua	3/03/2022	-11.767065	130.624727	Subdivision	High	4c
Colin Kerinaiua	3/03/2022	-11.767065	130.624727	Subdivision	High	4c
Colin Kerinaiua	3/03/2022	-11.767065	130.624727	Subdivision	High	4c
Colin Kerinaiua	3/03/2022	-11.767065	130.624727	Subdivision	High	4c
Colin Kerinaiua	3/03/2022	-11.767065	130.624727	Subdivision	High	4c
Colin Kerinaiua	3/03/2022	-11.767065	130.624727	Subdivision	High	4c
Colin Kerinaiua	3/03/2022	-11.767065	130.624727	Subdivision	High	4c
Colin Kerinaiua	3/03/2022	-11.767065	130.624727	Subdivision	High	4c
Colin Kerinaiua	3/03/2022	-11.767065	130.624727	Subdivision	High	4c
Colin Kerinaiua	3/03/2022	-11.767065	130.624727	Subdivision	High	4c
Colin Kerinaiua	3/03/2022	-11.767065	130.624727	Subdivision	High	4c
Colin Kerinaiua	3/03/2022	-11.768166	130.625998	Subdivision	High	4c

Observer	Date	Latitude (GDA94)	Longitude (GDA94)	Site ID	Likelihood	Land Unit
Colin Kerinaiua	3/03/2022	-11.768197	130.626003	Subdivision	High	4c
Colin Kerinaiua	3/03/2022	-11.768221	130.626013	Subdivision	High	4c
Colin Kerinaiua	3/03/2022	-11.768516	130.626001	Subdivision	High	4c
Colin Kerinaiua	3/03/2022	-11.768516	130.626001	Subdivision	High	4c
Colin Kerinaiua	3/03/2022	-11.768538	130.625998	Subdivision	High	4c
Colin Kerinaiua	3/03/2022	-11.768704	130.625902	Subdivision	High	4c
Colin Kerinaiua	3/03/2022	-11.768702	130.625886	Subdivision	High	4c
Colin Kerinaiua	3/03/2022	-11.768695	130.625855	Subdivision	High	4c
Colin Kerinaiua	3/03/2022	-11.768049	130.625729	Subdivision	High	4c
Colin Kerinaiua	3/03/2022	-11.767202	130.625639	Subdivision	High	6a
Colin Kerinaiua	3/03/2022	-11.7672	130.625626	Subdivision	High	6a
Colin Kerinaiua	3/03/2022	-11.767211	130.625635	Subdivision	High	6a
Colin Kerinaiua	3/03/2022	-11.767212	130.625637	Subdivision	High	6a
Colin Kerinaiua	3/03/2022	-11.765545	130.623767	Subdivision	High	6b
Colin Kerinaiua	3/03/2022	-11.765539	130.623758	Subdivision	High	6b
Colin Kerinaiua	3/03/2022	-11.764785	130.623776	Subdivision	High	6b
Colin Kerinaiua	3/03/2022	-11.764417	130.624851	Subdivision	High	6b
Colin Kerinaiua	3/03/2022	-11.764422	130.624852	Subdivision	High	6b
Colin Kerinaiua	3/03/2022	-11.76519	130.624496	Subdivision	Moderate	4c
Colin Kerinaiua	3/03/2022	-11.765193	130.624488	Subdivision	Moderate	4c
Colin Kerinaiua	3/03/2022	-11.765191	130.624485	Subdivision	Moderate	4c
Colin Kerinaiua	3/03/2022	-11.765192	130.62449	Subdivision	Moderate	4c
Colin Kerinaiua	3/03/2022	-11.765182	130.624487	Subdivision	Moderate	4c
Colin Kerinaiua	3/03/2022	-11.765179	130.624481	Subdivision	Moderate	4c
Colin Kerinaiua	3/03/2022	-11.765182	130.624474	Subdivision	Moderate	4c
Colin Kerinaiua	3/03/2022	-11.765184	130.624473	Subdivision	Moderate	4c
Colin Kerinaiua	3/03/2022	-11.765184	130.624473	Subdivision	Moderate	4c
Colin Kerinaiua	3/03/2022	-11.765186	130.624475	Subdivision	Moderate	4c
Colin Kerinaiua	3/03/2022	-11.765188	130.624473	Subdivision	Moderate	4c
Colin Kerinaiua	3/03/2022	-11.765178	130.624491	Subdivision	Moderate	4c
Colin Kerinaiua	3/03/2022	-11.765175	130.624495	Subdivision	Moderate	4c
Colin Kerinaiua	3/03/2022	-11.765175	130.624496	Subdivision	Moderate	4c
Colin Kerinaiua	3/03/2022	-11.765173	130.624495	Subdivision	Moderate	4c
Colin Kerinaiua	3/03/2022	-11.765187	130.624501	Subdivision	Moderate	4c
Colin Kerinaiua	3/03/2022	-11.765188	130.624503	Subdivision	Moderate	4c
Colin Kerinaiua	3/03/2022	-11.765193	130.624509	Subdivision	Moderate	4c
Colin Kerinaiua	3/03/2022	-11.765193	130.624511	Subdivision	Moderate	4c
Colin Kerinaiua	3/03/2022	-11.765155	130.62452	Subdivision	Moderate	4c
Colin Kerinaiua	3/03/2022	-11.76515	130.624506	Subdivision	Moderate	4c
Colin Kerinaiua	3/03/2022	-11.765149	130.624505	Subdivision	Moderate	4c
Colin Kerinaiua	3/03/2022	-11.765137	130.624504	Subdivision	Moderate	4c
Colin Kerinaiua	3/03/2022	-11.76514	130.624508	Subdivision	Moderate	4c

Observer	Date	Latitude (GDA94)	Longitude (GDA94)	Site ID	Likelihood	Land Unit
Colin Kerinaiua	3/03/2022	-11.765136	130.624503	Subdivision	Moderate	4c
Colin Kerinaiua	3/03/2022	-11.765122	130.62451	Subdivision	Moderate	4c
Colin Kerinaiua	3/03/2022	-11.76512	130.624507	Subdivision	Moderate	4c
Colin Kerinaiua	3/03/2022	-11.765117	130.624516	Subdivision	Moderate	4c
Colin Kerinaiua	3/03/2022	-11.765117	130.624523	Subdivision	Moderate	4c
Colin Kerinaiua	3/03/2022	-11.766499	130.624842	Subdivision	Moderate	4c
Colin Kerinaiua	3/03/2022	-11.768058	130.624724	Subdivision	Moderate	4c
Colin Kerinaiua	3/03/2022	-11.768017	130.624726	Subdivision	Moderate	4c
Colin Kerinaiua	3/03/2022	-11.767526	130.62477	Subdivision	Moderate	4c
Colin Kerinaiua	3/03/2022	-11.768193	130.625988	Subdivision	Moderate	4c
Colin Kerinaiua	3/03/2022	-11.768256	130.626003	Subdivision	Moderate	4c
Colin Kerinaiua	3/03/2022	-11.768273	130.625984	Subdivision	Moderate	4c
Colin Kerinaiua	3/03/2022	-11.768455	130.625741	Subdivision	Moderate	4c
Colin Kerinaiua	3/03/2022	-11.768458	130.625728	Subdivision	Moderate	4c
Colin Kerinaiua	3/03/2022	-11.768425	130.625723	Subdivision	Moderate	4c
Colin Kerinaiua	3/03/2022	-11.768202	130.625728	Subdivision	Moderate	4c
Colin Kerinaiua	3/03/2022	-11.768062	130.625757	Subdivision	Moderate	4c
Colin Kerinaiua	3/03/2022	-11.767422	130.625647	Subdivision	Moderate	6a
Colin Kerinaiua	3/03/2022	-11.76396	130.623504	Subdivision	Moderate	6b
Colin Kerinaiua	3/03/2022	-11.76396	130.623504	Subdivision	Moderate	6b
Colin Kerinaiua	3/03/2022	-11.76396	130.623504	Subdivision	Moderate	6b
Colin Kerinaiua	3/03/2022	-11.76396	130.623504	Subdivision	Moderate	6b
Colin Kerinaiua	3/03/2022	-11.76396	130.623506	Subdivision	Moderate	6b
Colin Kerinaiua	3/03/2022	-11.76396	130.623506	Subdivision	Moderate	6b
Colin Kerinaiua	3/03/2022	-11.76396	130.623506	Subdivision	Moderate	6b
Colin Kerinaiua	3/03/2022	-11.76396	130.623506	Subdivision	Moderate	6b
Colin Kerinaiua	3/03/2022	-11.76396	130.623506	Subdivision	Moderate	6b
Colin Kerinaiua	3/03/2022	-11.76396	130.623506	Subdivision	Moderate	6b
Colin Kerinaiua	3/03/2022	-11.76396	130.623506	Subdivision	Moderate	6b
Colin Kerinaiua	3/03/2022	-11.76396	130.623506	Subdivision	Moderate	6b
Colin Kerinaiua	3/03/2022	-11.76396	130.623506	Subdivision	Moderate	6b
Colin Kerinaiua	3/03/2022	-11.76396	130.623506	Subdivision	Moderate	6b
Colin Kerinaiua	3/03/2022	-11.76576	130.622871	Subdivision	Moderate	6b
Nicole Clark	3/03/2022	-11.766543	130.624244	Subdivision	-	4c
Nicole Clark	3/03/2022	-11.766568	130.624231	Subdivision	-	4c
Nicole Clark	3/03/2022	-11.766591	130.62458	Subdivision	-	4c
Nicole Clark	3/03/2022	-11.766622	130.624576	Subdivision	-	4c
Nicole Clark	3/03/2022	-11.765274	130.624994	Subdivision	-	4c
Nicole Clark	3/03/2022	-11.767719	130.625508	Subdivision	-	4c
Nicole Clark	3/03/2022	-11.767532	130.62585	Subdivision	-	6a
Nicole Clark	3/03/2022	-11.767558	130.62585	Subdivision	-	6a
Nicole Clark	3/03/2022	-11.767558	130.625849	Subdivision	-	6a

Observer	Date	Latitude (GDA94)	Longitude (GDA94)	Site ID	Likelihood	Land Unit
Nicole Clark	3/03/2022	-11.767572	130.625845	Subdivision	-	6a
Nicole Clark	3/03/2022	-11.767529	130.625893	Subdivision	-	6a
Nicole Clark	3/03/2022	-11.767529	130.625893	Subdivision	-	6a
Nicole Clark	3/03/2022	-11.767528	130.625892	Subdivision	-	6a
Nicole Clark	3/03/2022	-11.767527	130.625893	Subdivision	-	6a
Nicole Clark	3/03/2022	-11.767511	130.625876	Subdivision	-	6a
Nicole Clark	3/03/2022	-11.767507	130.625872	Subdivision	-	6a
Nicole Clark	3/03/2022	-11.767456	130.625853	Subdivision	-	6a
Nicole Clark	3/03/2022	-11.767449	130.625857	Subdivision	-	6a
Nicole Clark	3/03/2022	-11.767437	130.625846	Subdivision	-	6a
Nicole Clark	3/03/2022	-11.766588	130.624568	Subdivision	High	4c
Nicole Clark	3/03/2022	-11.765413	130.624607	Subdivision	High	4c
Nicole Clark	3/03/2022	-11.765129	130.624604	Subdivision	High	4c
Nicole Clark	3/03/2022	-11.765349	130.624971	Subdivision	High	4c
Nicole Clark	3/03/2022	-11.767758	130.625172	Subdivision	High	4c
Nicole Clark	3/03/2022	-11.764668	130.624987	Subdivision	High	6a
Nicole Clark	3/03/2022	-11.767152	130.625779	Subdivision	High	6a
Nicole Clark	3/03/2022	-11.767147	130.625777	Subdivision	High	6a
Nicole Clark	3/03/2022	-11.767531	130.626548	Subdivision	High	6a
Nicole Clark	3/03/2022	-11.765499	130.623913	Subdivision	High	6b
Nicole Clark	3/03/2022	-11.76485	130.623884	Subdivision	High	6b
Nicole Clark	3/03/2022	-11.764852	130.623879	Subdivision	High	6b
Nicole Clark	3/03/2022	-11.764854	130.623874	Subdivision	High	6b
Nicole Clark	3/03/2022	-11.764854	130.623874	Subdivision	High	6b
Nicole Clark	3/03/2022	-11.764724	130.623902	Subdivision	High	6b
Nicole Clark	3/03/2022	-11.763632	130.624606	Subdivision	High	6b
Nicole Clark	3/03/2022	-11.763628	130.624602	Subdivision	High	6b
Nicole Clark	3/03/2022	-11.763626	130.624603	Subdivision	High	6b
Nicole Clark	3/03/2022	-11.763624	130.624604	Subdivision	High	6b
Nicole Clark	3/03/2022	-11.765984	130.624173	Subdivision	Moderate	4c
Nicole Clark	3/03/2022	-11.766681	130.624221	Subdivision	Moderate	4c
Nicole Clark	3/03/2022	-11.766843	130.624232	Subdivision	Moderate	4c
Nicole Clark	3/03/2022	-11.765117	130.624603	Subdivision	Moderate	4c
Nicole Clark	3/03/2022	-11.765111	130.624611	Subdivision	Moderate	4c
Nicole Clark	3/03/2022	-11.765111	130.624611	Subdivision	Moderate	4c
Nicole Clark	3/03/2022	-11.765115	130.624602	Subdivision	Moderate	4c
Nicole Clark	3/03/2022	-11.765117	130.624599	Subdivision	Moderate	4c
Nicole Clark	3/03/2022	-11.765114	130.624599	Subdivision	Moderate	4c
Nicole Clark	3/03/2022	-11.765197	130.624983	Subdivision	Moderate	4c
Nicole Clark	3/03/2022	-11.768302	130.624409	Subdivision	Moderate	4c
Nicole Clark	3/03/2022	-11.76842	130.62637	Subdivision	Moderate	4c
Nicole Clark	3/03/2022	-11.768563	130.626335	Subdivision	Moderate	4c

Observer	Date	Latitude (GDA94)	Longitude (GDA94)	Site ID	Likelihood	Land Unit
Nicole Clark	3/03/2022	-11.768564	130.626336	Subdivision	Moderate	4c
Nicole Clark	3/03/2022	-11.768582	130.626322	Subdivision	Moderate	4c
Nicole Clark	3/03/2022	-11.768583	130.626324	Subdivision	Moderate	4c
Nicole Clark	3/03/2022	-11.768586	130.626326	Subdivision	Moderate	4c
Nicole Clark	3/03/2022	-11.768588	130.626324	Subdivision	Moderate	4c
Nicole Clark	3/03/2022	-11.768593	130.626322	Subdivision	Moderate	4c
Nicole Clark	3/03/2022	-11.768595	130.626301	Subdivision	Moderate	4c
Nicole Clark	3/03/2022	-11.765149	130.62499	Subdivision	Moderate	6a
Nicole Clark	3/03/2022	-11.765155	130.624985	Subdivision	Moderate	6a
Nicole Clark	3/03/2022	-11.765155	130.624984	Subdivision	Moderate	6a
Nicole Clark	3/03/2022	-11.765153	130.62498	Subdivision	Moderate	6a
Nicole Clark	3/03/2022	-11.765149	130.624989	Subdivision	Moderate	6a
Nicole Clark	3/03/2022	-11.765159	130.624986	Subdivision	Moderate	6a
Nicole Clark	3/03/2022	-11.765181	130.624984	Subdivision	Moderate	6a
Nicole Clark	3/03/2022	-11.765182	130.624984	Subdivision	Moderate	6a
Nicole Clark	3/03/2022	-11.767188	130.625815	Subdivision	Moderate	6a
Nicole Clark	3/03/2022	-11.767337	130.625809	Subdivision	Moderate	6a
Nicole Clark	3/03/2022	-11.767411	130.625833	Subdivision	Moderate	6a
Nicole Clark	3/03/2022	-11.767406	130.62583	Subdivision	Moderate	6a
Nicole Clark	3/03/2022	-11.767313	130.625828	Subdivision	Moderate	6a
Nicole Clark	3/03/2022	-11.767313	130.625826	Subdivision	Moderate	6a
Nicole Clark	3/03/2022	-11.767313	130.625824	Subdivision	Moderate	6a
Nicole Clark	3/03/2022	-11.7673	130.625816	Subdivision	Moderate	6a
Nicole Clark	3/03/2022	-11.7673	130.625817	Subdivision	Moderate	6a
Nicole Clark	3/03/2022	-11.76771	130.626615	Subdivision	Moderate	6a
Nicole Clark	3/03/2022	-11.767532	130.626547	Subdivision	Moderate	6a
Nicole Clark	3/03/2022	-11.767532	130.626547	Subdivision	Moderate	6a
Nicole Clark	3/03/2022	-11.763921	130.624197	Subdivision	Moderate	6b
Nicole Clark	3/03/2022	-11.764656	130.62312	Subdivision	Moderate	6b
Sarah Ryan	3/03/2022	-11.766949	130.623593	Subdivision	-	4c
Sarah Ryan	3/03/2022	-11.766939	130.623587	Subdivision	-	4c
Sarah Ryan	3/03/2022	-11.766941	130.623586	Subdivision	-	4c
Sarah Ryan	3/03/2022	-11.766942	130.623586	Subdivision	-	4c
Sarah Ryan	3/03/2022	-11.76694	130.623572	Subdivision	-	4c
Sarah Ryan	3/03/2022	-11.766934	130.623569	Subdivision	-	4c
Sarah Ryan	3/03/2022	-11.766931	130.623572	Subdivision	-	4c
Sarah Ryan	3/03/2022	-11.76692	130.623578	Subdivision	-	4c
Sarah Ryan	3/03/2022	-11.766916	130.623577	Subdivision	-	4c
Sarah Ryan	3/03/2022	-11.766917	130.623587	Subdivision	-	4c
Sarah Ryan	3/03/2022	-11.766917	130.623587	Subdivision	-	4c
Sarah Ryan	3/03/2022	-11.766912	130.623582	Subdivision	-	4c
Sarah Ryan	3/03/2022	-11.766909	130.623582	Subdivision	-	4c

Observer	Date	Latitude (GDA94)	Longitude (GDA94)	Site ID	Likelihood	Land Unit
Sarah Ryan	3/03/2022	-11.766886	130.623594	Subdivision	-	4c
Sarah Ryan	3/03/2022	-11.766883	130.623598	Subdivision	-	4c
Sarah Ryan	3/03/2022	-11.766882	130.623598	Subdivision	-	4c
Sarah Ryan	3/03/2022	-11.766882	130.623598	Subdivision	-	4c
Sarah Ryan	3/03/2022	-11.766871	130.623594	Subdivision	-	4c
Sarah Ryan	3/03/2022	-11.766869	130.623594	Subdivision	-	4c
Sarah Ryan	3/03/2022	-11.766868	130.623589	Subdivision	-	4c
Sarah Ryan	3/03/2022	-11.766867	130.62359	Subdivision	-	4c
Sarah Ryan	3/03/2022	-11.766868	130.62359	Subdivision	-	4c
Sarah Ryan	3/03/2022	-11.766868	130.62359	Subdivision	-	4c
Sarah Ryan	3/03/2022	-11.766826	130.624314	Subdivision	-	4c
Sarah Ryan	3/03/2022	-11.76682	130.624318	Subdivision	-	4c
Sarah Ryan	3/03/2022	-11.766548	130.624368	Subdivision	-	4c
Sarah Ryan	3/03/2022	-11.766543	130.624371	Subdivision	-	4c
Sarah Ryan	3/03/2022	-11.766544	130.624372	Subdivision	-	4c
Sarah Ryan	3/03/2022	-11.765122	130.62466	Subdivision	-	4c
Sarah Ryan	3/03/2022	-11.76563	130.624703	Subdivision	-	4c
Sarah Ryan	3/03/2022	-11.767814	130.625319	Subdivision	-	4c
Sarah Ryan	3/03/2022	-11.76841	130.626084	Subdivision	-	4c
Sarah Ryan	3/03/2022	-11.76841	130.62608	Subdivision	-	4c
Sarah Ryan	3/03/2022	-11.768416	130.626077	Subdivision	-	4c
Sarah Ryan	3/03/2022	-11.768433	130.626083	Subdivision	-	4c
Sarah Ryan	3/03/2022	-11.76844	130.626086	Subdivision	-	4c
Sarah Ryan	3/03/2022	-11.768451	130.626086	Subdivision	-	4c
Sarah Ryan	3/03/2022	-11.768451	130.626087	Subdivision	-	4c
Sarah Ryan	3/03/2022	-11.768513	130.626084	Subdivision	-	4c
Sarah Ryan	3/03/2022	-11.768344	130.625821	Subdivision	-	4c
Sarah Ryan	3/03/2022	-11.768339	130.625819	Subdivision	-	4c
Sarah Ryan	3/03/2022	-11.76523	130.623959	Subdivision	-	6b
Sarah Ryan	3/03/2022	-11.765245	130.623974	Subdivision	-	6b
Sarah Ryan	3/03/2022	-11.766987	130.623583	Subdivision	High	4c
Sarah Ryan	3/03/2022	-11.766968	130.623608	Subdivision	High	4c
Sarah Ryan	3/03/2022	-11.766968	130.623607	Subdivision	High	4c
Sarah Ryan	3/03/2022	-11.766811	130.623603	Subdivision	High	4c
Sarah Ryan	3/03/2022	-11.76677	130.623597	Subdivision	High	4c
Sarah Ryan	3/03/2022	-11.76674	130.623597	Subdivision	High	4c
Sarah Ryan	3/03/2022	-11.76635	130.623559	Subdivision	High	4c
Sarah Ryan	3/03/2022	-11.766324	130.623587	Subdivision	High	4c
Sarah Ryan	3/03/2022	-11.76632	130.623579	Subdivision	High	4c
Sarah Ryan	3/03/2022	-11.766282	130.623566	Subdivision	High	4c
Sarah Ryan	3/03/2022	-11.766285	130.623565	Subdivision	High	4c
Sarah Ryan	3/03/2022	-11.7663	130.623564	Subdivision	High	4c

Observer	Date	Latitude (GDA94)	Longitude (GDA94)	Site ID	Likelihood	Land Unit
Sarah Ryan	3/03/2022	-11.766174	130.623596	Subdivision	High	4c
Sarah Ryan	3/03/2022	-11.766142	130.62359	Subdivision	High	4c
Sarah Ryan	3/03/2022	-11.765712	130.623957	Subdivision	High	4c
Sarah Ryan	3/03/2022	-11.765711	130.623959	Subdivision	High	4c
Sarah Ryan	3/03/2022	-11.765721	130.62396	Subdivision	High	4c
Sarah Ryan	3/03/2022	-11.76572	130.623961	Subdivision	High	4c
Sarah Ryan	3/03/2022	-11.765715	130.623962	Subdivision	High	4c
Sarah Ryan	3/03/2022	-11.76572	130.623967	Subdivision	High	4c
Sarah Ryan	3/03/2022	-11.765733	130.623959	Subdivision	High	4c
Sarah Ryan	3/03/2022	-11.765789	130.62397	Subdivision	High	4c
Sarah Ryan	3/03/2022	-11.765813	130.623975	Subdivision	High	4c
Sarah Ryan	3/03/2022	-11.765846	130.623975	Subdivision	High	4c
Sarah Ryan	3/03/2022	-11.765861	130.623971	Subdivision	High	4c
Sarah Ryan	3/03/2022	-11.76586	130.623972	Subdivision	High	4c
Sarah Ryan	3/03/2022	-11.765878	130.623959	Subdivision	High	4c
Sarah Ryan	3/03/2022	-11.765878	130.623959	Subdivision	High	4c
Sarah Ryan	3/03/2022	-11.765898	130.623953	Subdivision	High	4c
Sarah Ryan	3/03/2022	-11.765905	130.62395	Subdivision	High	4c
Sarah Ryan	3/03/2022	-11.765906	130.623949	Subdivision	High	4c
Sarah Ryan	3/03/2022	-11.765906	130.623946	Subdivision	High	4c
Sarah Ryan	3/03/2022	-11.765937	130.623952	Subdivision	High	4c
Sarah Ryan	3/03/2022	-11.765939	130.623949	Subdivision	High	4c
Sarah Ryan	3/03/2022	-11.76594	130.623946	Subdivision	High	4c
Sarah Ryan	3/03/2022	-11.76594	130.623945	Subdivision	High	4c
Sarah Ryan	3/03/2022	-11.765938	130.623945	Subdivision	High	4c
Sarah Ryan	3/03/2022	-11.765939	130.623945	Subdivision	High	4c
Sarah Ryan	3/03/2022	-11.765939	130.623944	Subdivision	High	4c
Sarah Ryan	3/03/2022	-11.765938	130.623946	Subdivision	High	4c
Sarah Ryan	3/03/2022	-11.765938	130.623945	Subdivision	High	4c
Sarah Ryan	3/03/2022	-11.765938	130.623946	Subdivision	High	4c
Sarah Ryan	3/03/2022	-11.765938	130.623946	Subdivision	High	4c
Sarah Ryan	3/03/2022	-11.765936	130.623944	Subdivision	High	4c
Sarah Ryan	3/03/2022	-11.766141	130.623979	Subdivision	High	4c
Sarah Ryan	3/03/2022	-11.76621	130.623958	Subdivision	High	4c
Sarah Ryan	3/03/2022	-11.766479	130.624332	Subdivision	High	4c
Sarah Ryan	3/03/2022	-11.76647	130.624319	Subdivision	High	4c
Sarah Ryan	3/03/2022	-11.766453	130.624331	Subdivision	High	4c
Sarah Ryan	3/03/2022	-11.765919	130.624336	Subdivision	High	4c
Sarah Ryan	3/03/2022	-11.765902	130.624347	Subdivision	High	4c
Sarah Ryan	3/03/2022	-11.765901	130.624346	Subdivision	High	4c
Sarah Ryan	3/03/2022	-11.764697	130.624661	Subdivision	High	4c
Sarah Ryan	3/03/2022	-11.764695	130.62466	Subdivision	High	4c

Observer	Date	Latitude (GDA94)	Longitude (GDA94)	Site ID	Likelihood	Land Unit
Sarah Ryan	3/03/2022	-11.764695	130.624661	Subdivision	High	4c
Sarah Ryan	3/03/2022	-11.764695	130.624662	Subdivision	High	4c
Sarah Ryan	3/03/2022	-11.767991	130.624614	Subdivision	High	4c
Sarah Ryan	3/03/2022	-11.767997	130.624614	Subdivision	High	4c
Sarah Ryan	3/03/2022	-11.767975	130.624611	Subdivision	High	4c
Sarah Ryan	3/03/2022	-11.76797	130.624613	Subdivision	High	4c
Sarah Ryan	3/03/2022	-11.767928	130.62461	Subdivision	High	4c
Sarah Ryan	3/03/2022	-11.767885	130.624619	Subdivision	High	4c
Sarah Ryan	3/03/2022	-11.767501	130.624599	Subdivision	High	4c
Sarah Ryan	3/03/2022	-11.767501	130.624598	Subdivision	High	4c
Sarah Ryan	3/03/2022	-11.767506	130.624599	Subdivision	High	4c
Sarah Ryan	3/03/2022	-11.767505	130.6246	Subdivision	High	4c
Sarah Ryan	3/03/2022	-11.767488	130.624609	Subdivision	High	4c
Sarah Ryan	3/03/2022	-11.767485	130.624608	Subdivision	High	4c
Sarah Ryan	3/03/2022	-11.767491	130.624612	Subdivision	High	4c
Sarah Ryan	3/03/2022	-11.767489	130.624608	Subdivision	High	4c
Sarah Ryan	3/03/2022	-11.767378	130.624608	Subdivision	High	4c
Sarah Ryan	3/03/2022	-11.767336	130.624608	Subdivision	High	4c
Sarah Ryan	3/03/2022	-11.767231	130.624602	Subdivision	High	4c
Sarah Ryan	3/03/2022	-11.767181	130.624886	Subdivision	High	4c
Sarah Ryan	3/03/2022	-11.767263	130.624885	Subdivision	High	4c
Sarah Ryan	3/03/2022	-11.767276	130.624886	Subdivision	High	4c
Sarah Ryan	3/03/2022	-11.767275	130.624885	Subdivision	High	4c
Sarah Ryan	3/03/2022	-11.76729	130.624874	Subdivision	High	4c
Sarah Ryan	3/03/2022	-11.767333	130.624862	Subdivision	High	4c
Sarah Ryan	3/03/2022	-11.767331	130.624859	Subdivision	High	4c
Sarah Ryan	3/03/2022	-11.76735	130.624872	Subdivision	High	4c
Sarah Ryan	3/03/2022	-11.767356	130.624878	Subdivision	High	4c
Sarah Ryan	3/03/2022	-11.767352	130.624876	Subdivision	High	4c
Sarah Ryan	3/03/2022	-11.767496	130.624903	Subdivision	High	4c
Sarah Ryan	3/03/2022	-11.7675	130.624903	Subdivision	High	4c
Sarah Ryan	3/03/2022	-11.767763	130.624895	Subdivision	High	4c
Sarah Ryan	3/03/2022	-11.767768	130.624891	Subdivision	High	4c
Sarah Ryan	3/03/2022	-11.767768	130.624891	Subdivision	High	4c
Sarah Ryan	3/03/2022	-11.767547	130.625243	Subdivision	High	4c
Sarah Ryan	3/03/2022	-11.76718	130.625234	Subdivision	High	4c
Sarah Ryan	3/03/2022	-11.767144	130.62524	Subdivision	High	4c
Sarah Ryan	3/03/2022	-11.768224	130.626082	Subdivision	High	4c
Sarah Ryan	3/03/2022	-11.768228	130.626083	Subdivision	High	4c
Sarah Ryan	3/03/2022	-11.768215	130.626072	Subdivision	High	4c
Sarah Ryan	3/03/2022	-11.768209	130.626075	Subdivision	High	4c
Sarah Ryan	3/03/2022	-11.768202	130.626081	Subdivision	High	4c

Observer	Date	Latitude (GDA94)	Longitude (GDA94)	Site ID	Likelihood	Land Unit
Sarah Ryan	3/03/2022	-11.768522	130.626089	Subdivision	High	4c
Sarah Ryan	3/03/2022	-11.768521	130.626088	Subdivision	High	4c
Sarah Ryan	3/03/2022	-11.768521	130.626088	Subdivision	High	4c
Sarah Ryan	3/03/2022	-11.76862	130.626068	Subdivision	High	4c
Sarah Ryan	3/03/2022	-11.768621	130.626066	Subdivision	High	4c
Sarah Ryan	3/03/2022	-11.768621	130.626066	Subdivision	High	4c
Sarah Ryan	3/03/2022	-11.768621	130.626066	Subdivision	High	4c
Sarah Ryan	3/03/2022	-11.768621	130.626066	Subdivision	High	4c
Sarah Ryan	3/03/2022	-11.768621	130.626066	Subdivision	High	4c
Sarah Ryan	3/03/2022	-11.76862	130.626077	Subdivision	High	4c
Sarah Ryan	3/03/2022	-11.76862	130.626082	Subdivision	High	4c
Sarah Ryan	3/03/2022	-11.768622	130.626083	Subdivision	High	4c
Sarah Ryan	3/03/2022	-11.768631	130.626083	Subdivision	High	4c
Sarah Ryan	3/03/2022	-11.768636	130.626082	Subdivision	High	4c
Sarah Ryan	3/03/2022	-11.768636	130.626082	Subdivision	High	4c
Sarah Ryan	3/03/2022	-11.768636	130.626082	Subdivision	High	4c
Sarah Ryan	3/03/2022	-11.768633	130.626084	Subdivision	High	4c
Sarah Ryan	3/03/2022	-11.768649	130.626076	Subdivision	High	4c
Sarah Ryan	3/03/2022	-11.768663	130.626077	Subdivision	High	4c
Sarah Ryan	3/03/2022	-11.768665	130.626079	Subdivision	High	4c
Sarah Ryan	3/03/2022	-11.768964	130.626076	Subdivision	High	4c
Sarah Ryan	3/03/2022	-11.768962	130.626073	Subdivision	High	4c
Sarah Ryan	3/03/2022	-11.768643	130.625822	Subdivision	High	4c
Sarah Ryan	3/03/2022	-11.768642	130.62582	Subdivision	High	4c
Sarah Ryan	3/03/2022	-11.768625	130.625824	Subdivision	High	4c
Sarah Ryan	3/03/2022	-11.768625	130.625823	Subdivision	High	4c
Sarah Ryan	3/03/2022	-11.7686	130.625808	Subdivision	High	4c
Sarah Ryan	3/03/2022	-11.768639	130.625831	Subdivision	High	4c
Sarah Ryan	3/03/2022	-11.768637	130.625832	Subdivision	High	4c
Sarah Ryan	3/03/2022	-11.768055	130.625809	Subdivision	High	4c
Sarah Ryan	3/03/2022	-11.768039	130.625806	Subdivision	High	4c
Sarah Ryan	3/03/2022	-11.768039	130.625805	Subdivision	High	4c
Sarah Ryan	3/03/2022	-11.76583	130.623563	Subdivision	High	6b
Sarah Ryan	3/03/2022	-11.765827	130.623559	Subdivision	High	6b
Sarah Ryan	3/03/2022	-11.765837	130.62356	Subdivision	High	6b
Sarah Ryan	3/03/2022	-11.765839	130.623563	Subdivision	High	6b
Sarah Ryan	3/03/2022	-11.765831	130.623558	Subdivision	High	6b
Sarah Ryan	3/03/2022	-11.765828	130.623556	Subdivision	High	6b
Sarah Ryan	3/03/2022	-11.765817	130.62357	Subdivision	High	6b
Sarah Ryan	3/03/2022	-11.765817	130.623569	Subdivision	High	6b
Sarah Ryan	3/03/2022	-11.765805	130.62358	Subdivision	High	6b
Sarah Ryan	3/03/2022	-11.765812	130.623561	Subdivision	High	6b

Observer	Date	Latitude (GDA94)	Longitude (GDA94)	Site ID	Likelihood	Land Unit
Sarah Ryan	3/03/2022	-11.765813	130.623566	Subdivision	High	6b
Sarah Ryan	3/03/2022	-11.765752	130.623562	Subdivision	High	6b
Sarah Ryan	3/03/2022	-11.765753	130.623556	Subdivision	High	6b
Sarah Ryan	3/03/2022	-11.765754	130.623554	Subdivision	High	6b
Sarah Ryan	3/03/2022	-11.765754	130.623552	Subdivision	High	6b
Sarah Ryan	3/03/2022	-11.765754	130.623553	Subdivision	High	6b
Sarah Ryan	3/03/2022	-11.765666	130.623584	Subdivision	High	6b
Sarah Ryan	3/03/2022	-11.765668	130.623579	Subdivision	High	6b
Sarah Ryan	3/03/2022	-11.76565	130.623577	Subdivision	High	6b
Sarah Ryan	3/03/2022	-11.765647	130.623589	Subdivision	High	6b
Sarah Ryan	3/03/2022	-11.765648	130.623588	Subdivision	High	6b
Sarah Ryan	3/03/2022	-11.765636	130.62358	Subdivision	High	6b
Sarah Ryan	3/03/2022	-11.765605	130.623585	Subdivision	High	6b
Sarah Ryan	3/03/2022	-11.765605	130.623585	Subdivision	High	6b
Sarah Ryan	3/03/2022	-11.765601	130.623586	Subdivision	High	6b
Sarah Ryan	3/03/2022	-11.765601	130.623584	Subdivision	High	6b
Sarah Ryan	3/03/2022	-11.765602	130.623582	Subdivision	High	6b
Sarah Ryan	3/03/2022	-11.765579	130.62358	Subdivision	High	6b
Sarah Ryan	3/03/2022	-11.765558	130.623588	Subdivision	High	6b
Sarah Ryan	3/03/2022	-11.765466	130.623575	Subdivision	High	6b
Sarah Ryan	3/03/2022	-11.76469	130.623951	Subdivision	High	6b
Sarah Ryan	3/03/2022	-11.764693	130.62395	Subdivision	High	6b
Sarah Ryan	3/03/2022	-11.76555	130.623957	Subdivision	High	6b
Sarah Ryan	3/03/2022	-11.764266	130.624347	Subdivision	High	6b
Sarah Ryan	3/03/2022	-11.766118	130.623576	Subdivision	Moderate	4c
Sarah Ryan	3/03/2022	-11.766124	130.623585	Subdivision	Moderate	4c
Sarah Ryan	3/03/2022	-11.766056	130.62359	Subdivision	Moderate	4c
Sarah Ryan	3/03/2022	-11.765949	130.623943	Subdivision	Moderate	4c
Sarah Ryan	3/03/2022	-11.765949	130.623943	Subdivision	Moderate	4c
Sarah Ryan	3/03/2022	-11.766592	130.623959	Subdivision	Moderate	4c
Sarah Ryan	3/03/2022	-11.766947	130.62434	Subdivision	Moderate	4c
Sarah Ryan	3/03/2022	-11.766948	130.624338	Subdivision	Moderate	4c
Sarah Ryan	3/03/2022	-11.766881	130.624306	Subdivision	Moderate	4c
Sarah Ryan	3/03/2022	-11.766875	130.624303	Subdivision	Moderate	4c
Sarah Ryan	3/03/2022	-11.766625	130.624366	Subdivision	Moderate	4c
Sarah Ryan	3/03/2022	-11.766618	130.624373	Subdivision	Moderate	4c
Sarah Ryan	3/03/2022	-11.766615	130.624377	Subdivision	Moderate	4c
Sarah Ryan	3/03/2022	-11.766616	130.624377	Subdivision	Moderate	4c
Sarah Ryan	3/03/2022	-11.766613	130.624376	Subdivision	Moderate	4c
Sarah Ryan	3/03/2022	-11.765565	130.624333	Subdivision	Moderate	4c
Sarah Ryan	3/03/2022	-11.765559	130.62434	Subdivision	Moderate	4c
Sarah Ryan	3/03/2022	-11.765556	130.62434	Subdivision	Moderate	4c

Observer	Date	Latitude (GDA94)	Longitude (GDA94)	Site ID	Likelihood	Land Unit
Sarah Ryan	3/03/2022	-11.76553	130.62433	Subdivision	Moderate	4c
Sarah Ryan	3/03/2022	-11.765355	130.624328	Subdivision	Moderate	4c
Sarah Ryan	3/03/2022	-11.765326	130.624333	Subdivision	Moderate	4c
Sarah Ryan	3/03/2022	-11.765258	130.624303	Subdivision	Moderate	4c
Sarah Ryan	3/03/2022	-11.765263	130.624303	Subdivision	Moderate	4c
Sarah Ryan	3/03/2022	-11.765264	130.624303	Subdivision	Moderate	4c
Sarah Ryan	3/03/2022	-11.765216	130.62431	Subdivision	Moderate	4c
Sarah Ryan	3/03/2022	-11.765216	130.62431	Subdivision	Moderate	4c
Sarah Ryan	3/03/2022	-11.767232	130.6246	Subdivision	Moderate	4c
Sarah Ryan	3/03/2022	-11.767237	130.624598	Subdivision	Moderate	4c
Sarah Ryan	3/03/2022	-11.768761	130.626078	Subdivision	Moderate	4c
Sarah Ryan	3/03/2022	-11.768759	130.626081	Subdivision	Moderate	4c
Sarah Ryan	3/03/2022	-11.768758	130.626079	Subdivision	Moderate	4c
Sarah Ryan	3/03/2022	-11.768758	130.626079	Subdivision	Moderate	4c
Sarah Ryan	3/03/2022	-11.768758	130.626079	Subdivision	Moderate	4c
Sarah Ryan	3/03/2022	-11.768758	130.626078	Subdivision	Moderate	4c
Sarah Ryan	3/03/2022	-11.768621	130.6258	Subdivision	Moderate	4c
Sarah Ryan	3/03/2022	-11.768319	130.62581	Subdivision	Moderate	4c
Sarah Ryan	3/03/2022	-11.768324	130.625815	Subdivision	Moderate	4c
Sarah Ryan	3/03/2022	-11.768325	130.625811	Subdivision	Moderate	4c
Sarah Ryan	3/03/2022	-11.768112	130.625825	Subdivision	Moderate	4c
Sarah Ryan	3/03/2022	-11.768112	130.625826	Subdivision	Moderate	4c
Sarah Ryan	3/03/2022	-11.768112	130.625826	Subdivision	Moderate	4c
Sarah Ryan	3/03/2022	-11.768105	130.62581	Subdivision	Moderate	4c
Sarah Ryan	3/03/2022	-11.768104	130.625808	Subdivision	Moderate	4c
Sarah Ryan	3/03/2022	-11.768103	130.625805	Subdivision	Moderate	4c
Sarah Ryan	3/03/2022	-11.768083	130.625808	Subdivision	Moderate	4c
Sarah Ryan	3/03/2022	-11.768082	130.625809	Subdivision	Moderate	4c
Sarah Ryan	3/03/2022	-11.76508	130.623938	Subdivision	Moderate	6b
Sarah Ryan	3/03/2022	-11.765181	130.623954	Subdivision	Moderate	6b
Sarah Ryan	3/03/2022	-11.764418	130.624326	Subdivision	Moderate	6b
Sarah Ryan	3/03/2022	-11.764417	130.624328	Subdivision	Moderate	6b
Sarah Ryan	3/03/2022	-11.764417	130.624322	Subdivision	Moderate	6b
Sarah Ryan	3/03/2022	-11.764416	130.62432	Subdivision	Moderate	6b
Sarah Ryan	3/03/2022	-11.764417	130.624315	Subdivision	Moderate	6b
Sarah Ryan	3/03/2022	-11.764417	130.624314	Subdivision	Moderate	6b
Willy Rioli	3/03/2022	-11.765648	130.623653	Subdivision	High	6b
Willy Rioli	3/03/2022	-11.765647	130.623658	Subdivision	High	6b
Colin Kerinaiua	4/03/2022	-11.766014	130.622618	Subdivision	High	4c
Colin Kerinaiua	4/03/2022	-11.76602	130.622625	Subdivision	High	4c
Colin Kerinaiua	4/03/2022	-11.7654	130.62148	Subdivision	Moderate	4c
Colin Kerinaiua	4/03/2022	-11.76539	130.62148	Subdivision	Moderate	4c

Observer	Date	Latitude (GDA94)	Longitude (GDA94)	Site ID	Likelihood	Land Unit
Colin Kerinaiua	4/03/2022	-11.7654	130.62148	Subdivision	Moderate	4c
Colin Kerinaiua	4/03/2022	-11.76539	130.62147	Subdivision	Moderate	4c
Colin Kerinaiua	4/03/2022	-11.76539	130.62148	Subdivision	Moderate	4c
Colin Kerinaiua	4/03/2022	-11.7654	130.62149	Subdivision	Moderate	4c
Colin Kerinaiua	4/03/2022	-11.7654	130.6215	Subdivision	Moderate	4c
Nicole Clark	4/03/2022	-11.759362	130.623522	Subdivision	-	5a
Nicole Clark	4/03/2022	-11.761377	130.62331	Subdivision	-	6a
Nicole Clark	4/03/2022	-11.76139	130.62331	Subdivision	-	6a
Nicole Clark	4/03/2022	-11.761401	130.623309	Subdivision	-	6a
Nicole Clark	4/03/2022	-11.761223	130.623265	Subdivision	-	6a
Nicole Clark	4/03/2022	-11.761222	130.623272	Subdivision	-	6a
Nicole Clark	4/03/2022	-11.759111	130.62344	Subdivision	Moderate	5a
Nicole Clark	4/03/2022	-11.761418	130.62335	Subdivision	Moderate	6a
Nicole Clark	4/03/2022	-11.764468	130.621292	Subdivision	Moderate	6b
Nicole Clark	4/03/2022	-11.763895	130.621168	Subdivision	Moderate	6b
Sarah Ryan	4/03/2022	-11.759128	130.623411	Subdivision	-	5a
Sarah Ryan	4/03/2022	-11.763205	130.621712	Subdivision	-	6b
Sarah Ryan	4/03/2022	-11.768997	130.624799	Subdivision	High	2c
Sarah Ryan	4/03/2022	-11.76902	130.624806	Subdivision	High	2c
Sarah Ryan	4/03/2022	-11.768814	130.624878	Subdivision	High	2c
Sarah Ryan	4/03/2022	-11.768815	130.624878	Subdivision	High	2c
Sarah Ryan	4/03/2022	-11.768818	130.624878	Subdivision	High	2c
Sarah Ryan	4/03/2022	-11.768823	130.624885	Subdivision	High	2c
Sarah Ryan	4/03/2022	-11.768794	130.624873	Subdivision	High	2c
Sarah Ryan	4/03/2022	-11.768792	130.624869	Subdivision	High	2c
Sarah Ryan	4/03/2022	-11.766057	130.622649	Subdivision	High	4c
Sarah Ryan	4/03/2022	-11.766464	130.622472	Subdivision	High	4c
Sarah Ryan	4/03/2022	-11.766464	130.622471	Subdivision	High	4c
Sarah Ryan	4/03/2022	-11.76644	130.622466	Subdivision	High	4c
Sarah Ryan	4/03/2022	-11.766437	130.622468	Subdivision	High	4c
Sarah Ryan	4/03/2022	-11.766103	130.621867	Subdivision	High	4c
Sarah Ryan	4/03/2022	-11.766098	130.621869	Subdivision	High	4c
Sarah Ryan	4/03/2022	-11.765262	130.623109	Subdivision	High	6b
Sarah Ryan	4/03/2022	-11.765261	130.623109	Subdivision	High	6b
Sarah Ryan	4/03/2022	-11.765256	130.623114	Subdivision	High	6b
Sarah Ryan	4/03/2022	-11.765258	130.623112	Subdivision	High	6b
Sarah Ryan	4/03/2022	-11.765258	130.623113	Subdivision	High	6b
Sarah Ryan	4/03/2022	-11.76526	130.623113	Subdivision	High	6b
Sarah Ryan	4/03/2022	-11.765261	130.623111	Subdivision	High	6b
Sarah Ryan	4/03/2022	-11.765262	130.62311	Subdivision	High	6b
Sarah Ryan	4/03/2022	-11.765181	130.623115	Subdivision	High	6b
Sarah Ryan	4/03/2022	-11.764865	130.622925	Subdivision	High	6b

Observer	Date	Latitude (GDA94)	Longitude (GDA94)	Site ID	Likelihood	Land Unit
Sarah Ryan	4/03/2022	-11.76869	130.624814	Subdivision	Moderate	2c
Sarah Ryan	4/03/2022	-11.768714	130.624808	Subdivision	Moderate	2c
Sarah Ryan	4/03/2022	-11.768728	130.624811	Subdivision	Moderate	2c
Sarah Ryan	4/03/2022	-11.768858	130.62479	Subdivision	Moderate	2c
Sarah Ryan	4/03/2022	-11.768784	130.624868	Subdivision	Moderate	2c
Sarah Ryan	4/03/2022	-11.768776	130.624868	Subdivision	Moderate	2c
Sarah Ryan	4/03/2022	-11.768768	130.624872	Subdivision	Moderate	2c
Sarah Ryan	4/03/2022	-11.768764	130.624871	Subdivision	Moderate	2c
Sarah Ryan	4/03/2022	-11.768745	130.624865	Subdivision	Moderate	2c
Sarah Ryan	4/03/2022	-11.76864	130.624863	Subdivision	Moderate	2c
Sarah Ryan	4/03/2022	-11.768636	130.624863	Subdivision	Moderate	2c
Sarah Ryan	4/03/2022	-11.768631	130.62487	Subdivision	Moderate	2c
Sarah Ryan	4/03/2022	-11.768605	130.624864	Subdivision	Moderate	2c
Sarah Ryan	4/03/2022	-11.768603	130.624862	Subdivision	Moderate	2c
Sarah Ryan	4/03/2022	-11.766108	130.62188	Subdivision	Moderate	4c
Sarah Ryan	4/03/2022	-11.759748	130.623577	Subdivision	Moderate	5a
Sarah Ryan	4/03/2022	-11.764628	130.623106	Subdivision	Moderate	6b
Sarah Ryan	4/03/2022	-11.764631	130.623111	Subdivision	Moderate	6b
Sarah Ryan	4/03/2022	-11.765138	130.622926	Subdivision	Moderate	6b

EcOz Environmental Consultants

EcOz Pty Ltd.
ABN 81 143 989 039

Level 1, 70 Cavenagh St,
GPO Box 381,
Darwin, NT 0801

T: +61 8 8981 1100
E: ecoz@ecoz.com.au

www.ecoz.com.au