Pilbara
ECOLOGICAL

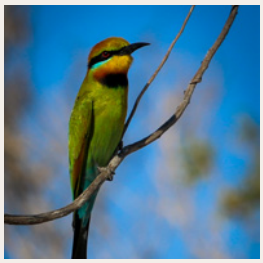
Exmouth M08/510 Biological Survey

Prepared for Hanson Australia

July 2024



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Executive Summary

Hanson Construction Materials Pty Ltd (Hanson) proposes to extract sand within mining tenement M08/510, situated 6.5 km north of Exmouth on the North West Cape. Hanson commissioned Pilbara Ecological to undertake a biological assessment of M08/510 (the Survey Area) to delineate key environmental values (vegetation, flora, fauna, soils and surface water) to support the clearing permit (and associated impact assessment) under Part V of the *Environmental Protection Act 1986* (EP Act). A detailed flora and vegetation survey, targeted flora survey and basic fauna survey were conducted on 21st June 2024.

The Survey Area consists of one polygon, totalling 7.45 ha and is located within the Carnarvon bioregion of Western Australia. Figure 2 illustrates the 7.45 ha Survey Area within tenement M08/510.

Key Results

- A total of 63 flora taxa (including species, subspecies, varieties and forms) representing 24 families and 49 genera were recorded in the Survey Area.
- No Threatened flora (EPBC Act or BC Act) were recorded. One Priority flora species was confirmed;
    - *Daviesia pleurophylla* (P2).
- A post-survey likelihood of occurrence assessment indicated that three Priority flora species may 'possibly' occur within the Survey Area:
    - *Verticordia serotina* (P2)
    - *Corchorus congener* (P3)
    - *Corynotheca flexuosissima* (P3)
- Three introduced taxa were recorded within the Survey Area, none listed as Weeds of National Significance (WoNS) or Declared Pests under the *Biosecurity and Agriculture Management Act 2007* (BAM Act).
- Two vegetation types were identified within the Survey Area. The VT01 vegetation type was dominant, comprising ~78% (5.82 ha) of the Survey Area and is described as: *Banksia ashbyi* subsp*. boreoscaia, Duboisia hopwoodii, Grevillea stenobotrya* tall sparse shrubland over *Triodia ?angusta* sparse hummock grassland.
- The vegetation types mapped within the Survey Area were not representative of any Commonwealth or State-listed Threatened or Priority Ecological Communities (TECs/PECs), however, vegetation type VT01 is considered to be locally significant due to its presence on a restricted landform (red sand dunes) and its provision of habitat for *Daviesia pleurophylla* (P2).
- Vegetation condition ranged from 'Poor' to 'Very Good' with approximately 0.56 ha (7.5%) of the Survey Area having been cleared of vegetation.
- No fauna species (or evidence) listed as significant were recorded during the field survey.
- A post-survey likelihood of occurrence assessment indicated one fauna species of significance was considered 'likely' to occur within the Survey Area;
    - *Aprasia rostrata,* Ningaloo worm lizard (P3), while an additional two significant species may 'possibly' occur within the Survey Area;
    - *Falco peregrinus,* Peregrine Falcon (OS)
    - *Pandion haliaetus,* Osprey (MI)
- The Survey Area is situated in an Environmentally Sensitive Area (ESA) (listed on the Register of the National Estate) and intersects the 'Cape Range Subterranean Waterways' wetland which is listed on the Directory of Important Wetlands of Australia.

1 Introduction

1.1 Project Background

Hanson Australia (Hanson) proposes to extract sand within the mining tenement M08/510. Hanson commissioned Pilbara Ecological to undertake a biological assessment of a 7.45 ha portion of mining tenement M08/510 (hereafter referred to as the Survey Area) for the following purposes:

1. Delineate key vegetation, flora, fauna, soils and surface water values within the Survey Area.
2. Support a clearing permit (and associated impact assessment) under Part V of the EP Act.

1.2 Spatial Scope and Terminology

The Survey Area consists of one polygon, totalling 7.45 ha, covering the proposed area for upgrade. The Survey Area is situated 6.5 km north of Exmouth on the North West Cape. The Study Area represents the 40 km buffer around the Survey Area where biological data was interrogated. Definitions for the spatial extents referenced in this report, and their associated level of survey effort are outlined in Table 1 and presented in Figure 1.

Table 1 Spatial Extents and Terminology

Terminology	Size (ha)	Definition of Spatial Extent	Survey Effort
Survey Area	7.45	Exmouth M08/510 (Figure 2).	• Detailed flora and vegetation survey and targeted flora survey. • Basic fauna survey
Study Area	504,320	A 40km buffer around the Survey Area.	• Desktop background information gathered from database sources.

1.3 Objectives

This report details the methods, results and key findings from the biological survey. The objectives of the biological survey were to delineate key flora and vegetation, fauna, soils and surface water values. The biological survey included mapping of vegetation condition, vegetation communities and fauna habitat within the Survey Area and delineating any significant flora, vegetation and fauna.

The specific objectives of this study were as follows:

1. Undertake a desktop assessment to:
    - collate existing records of significant flora, vegetation and fauna intercepting the Study Area using relevant databases and spatial datasets;
    - assess the likelihood of occurrence of significant flora and fauna species identified through the desktop assessment.
2. Undertake a field survey to:
    - complete sampling of vegetation within the Survey Area, including quadrat and/or relevé sampling;
    - map the dominant vegetation units in the Survey Area;

- map the vegetation condition using the EPA (2016a) condition rating scale;
- compile a list of vascular flora species recorded in the Survey Area;
- conduct targeted searches for Threatened and Priority flora within the Survey Area;
- identify any vegetation units of significance in the Survey Area;
- record locations of Weeds of National Significance (WoNS) and/or Declared Pests under the BAM Act;
- map fauna habitats for the survey and contextual area, based on the vegetation mapping, and identify habitats suitable for significant fauna; and,
- generate an inventory of all fauna observed (native and non-native), based on sightings, scats, tracks and other evidence.

3. Provide a comprehensive report outlining key findings from the biological survey.

4. Supply all supporting data to Hanson in the relevant data standards.

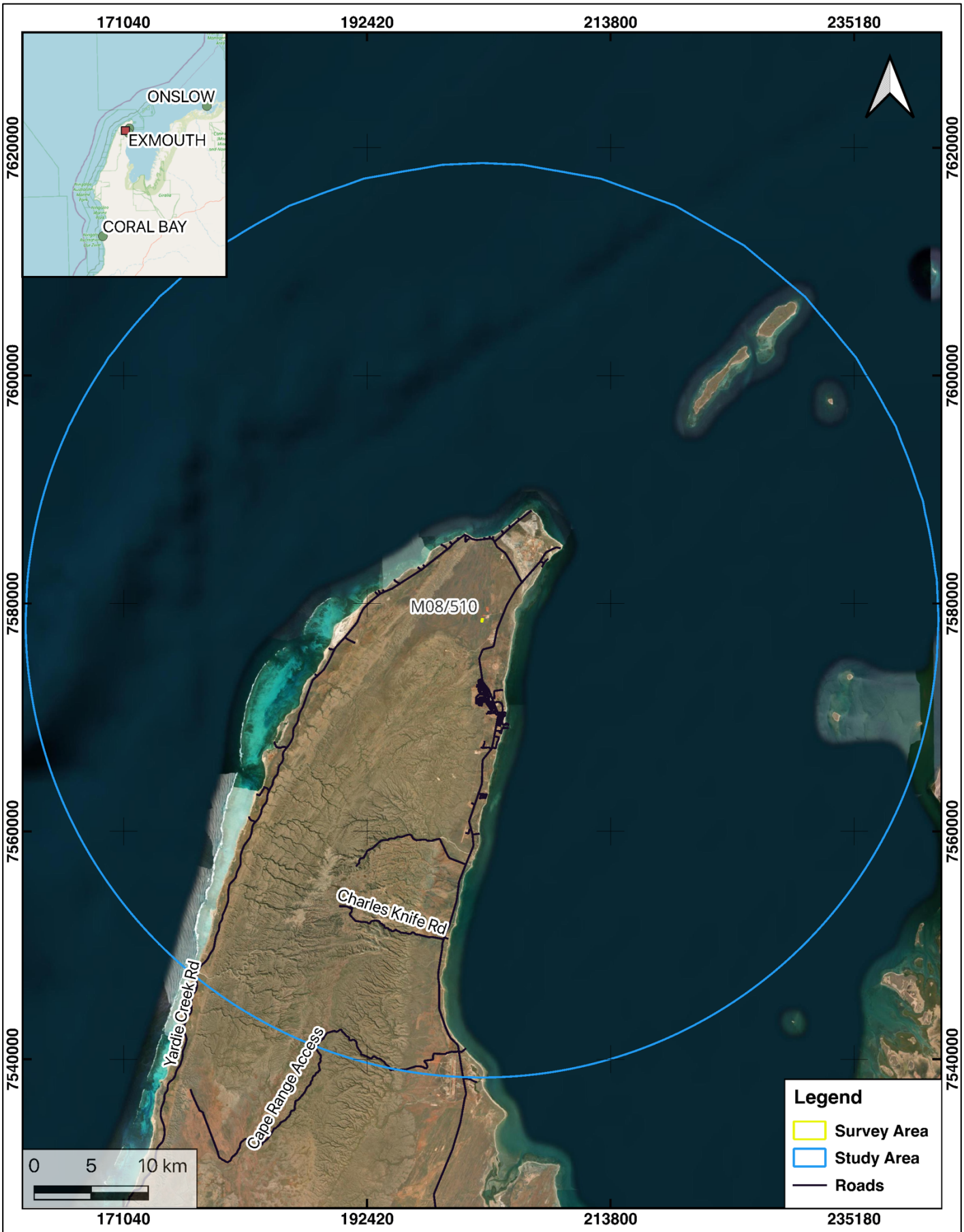

Figure 1 Location of Exmouth Study Area and Spatial Extents

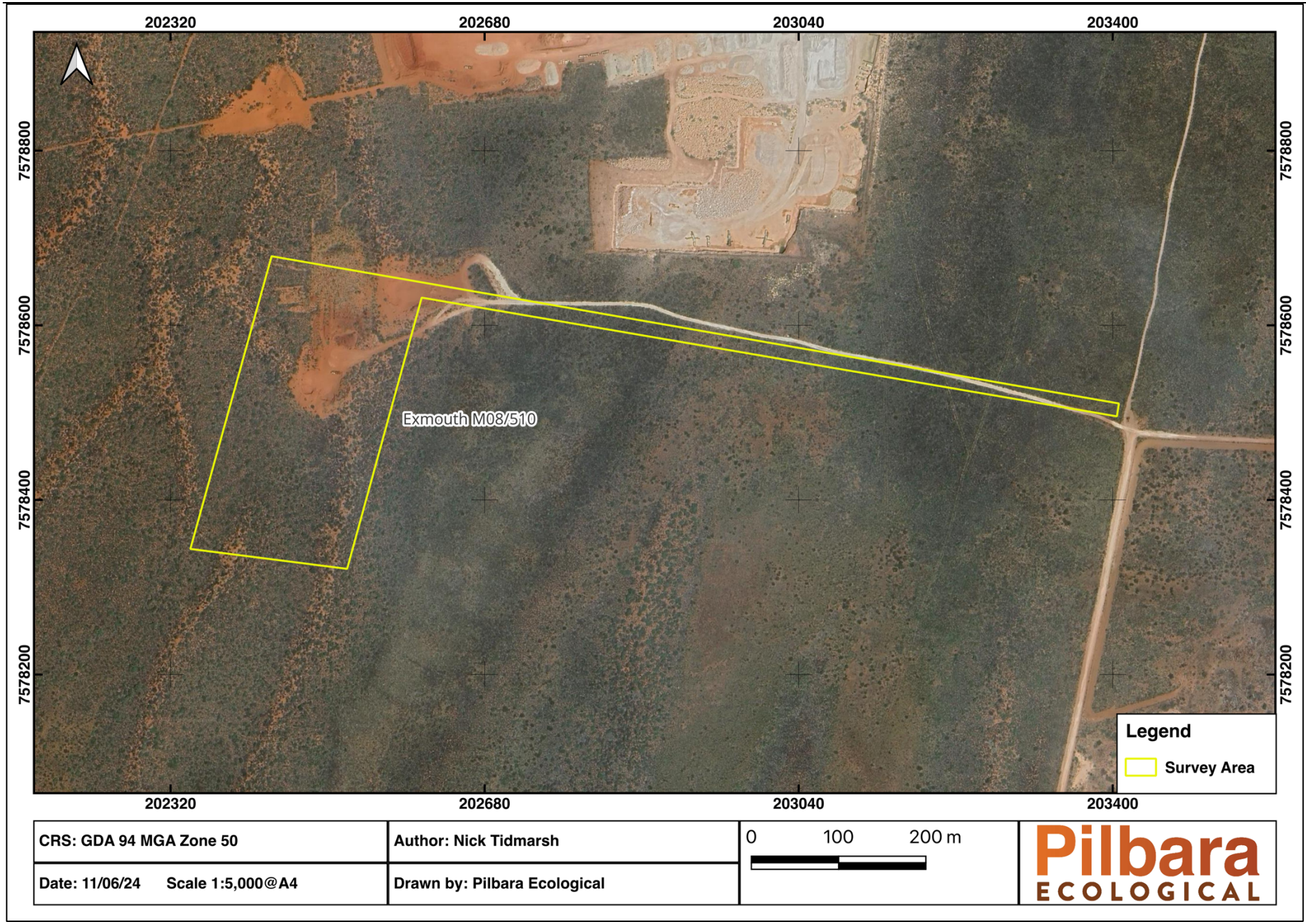

Figure 2 Exmouth M08/510 Survey Area

2 Methods

2.1 Desktop Study

Prior to conducting the field survey, a desktop study was conducted to identify significant ecological features and/or constraints within or surrounding the Survey Area. The following databases were reviewed:

- Department of Climate Change, Energy, the Environment and Water (DCCEEW) Protected Matters Search Tool (PMST) to identify communities/species listed under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) potentially occurring within the Study Area (40 km buffer) (Appendix 1) (DCCEEW 2024a).
- Department of Biodiversity, Conservation and Attraction's (DBCA) NatureMap database for flora and fauna previously recorded in the Study Area (40 km buffer) (Appendix 1) (DBCA 2024a).
- Database searches from DBCA's Species and Communities Branch (40 km buffer):
    - Threatened and Priority flora
    - Threatened and Priority fauna
    - Threatened Ecological Communities (TECs) and Priority Ecological Communities (PECs).
- Atlas of Living Australia (ALA) database (ALA 2024).
- Index of Biodiversity Surveys for Assessment database.
- Existing data sets containing pre-European vegetation, land systems, soils and hydrological considerations.

The methodology for the flora and vegetation survey component of the biological survey was consistent with 'Technical Guidance – Flora and Vegetation Surveys for Environmental Impact Assessment' (EPA 2016a) and 'Environmental Factor Guideline – Flora and Vegetation' (EPA 2016b).

The basic fauna survey was conducted according to 'Technical Guidance: Terrestrial Vertebrate Fauna Surveys for Environmental Impact Assessment Fauna' (EPA 2020) and 'Environmental Factor Guideline: Fauna' (EPA 2016c).

2.2 Likelihood of Occurrence Assessment

A pre-survey likelihood of occurrence assessment was conducted for flora and fauna species of significance identified during the desktop study. The likelihood of occurrence assessment was based on:

- The broad soil type or habitat usually associated with the species;
- The broad landforms usually associated with the species;
- Vegetation associations the species is commonly found in; and
- Distance of Survey Area to known records of the species.

The likelihood of occurrence tables are presented in Appendix 2a (Flora) and 2b (Fauna). The categories of likelihood of occurrence are presented in Table 2.

Table 2 Pre-survey Significant Flora and Fauna Likelihood of Occurrence Ratings

Likelihood Rating	Description
Recorded	Species has previously been recorded within the Survey Area.
Likely	There are existing records of the species in close proximity (less than 5 km) to the Survey Area and the Survey Area contains suitable habitat.
Possible	The Survey Area contains suitable habitat; however, the species is not recorded within close proximity to the Survey Area.
Unlikely	The Survey Area does not contain suitable habitat or contains only a small area of suitable habitat, and the species is not recorded within 20 km.
Highly Unlikely	The species is restricted to very specific habitats that are not present in the Survey Area.

2.3 Field Survey

Ecologists Nick Tidmarsh (FB62000254) and Brydie Brennan (Reg 62 Licence No FB62000660) conducted a detailed and targeted flora survey and basic fauna survey of the Survey Area on 21st June 2024. Following the field survey, the likelihood of occurrence assessments for significant flora and fauna species were updated considering the pre-survey assessments, ground truthing of soil, vegetation and habitats present within the Survey Area and consideration of survey effort and survey timing.

Survey data was recorded in the field in GDA 94 projection using Fulcrum on an Ipad (8th Gen.) supported by a Garmin GPS (+/- 2m).

2.3.1 Quadrats and Relevés

The field survey data was collected through a combination of three relevés, two 50m x 50m quadrats and traverses walked at approximately 25m distance apart. Mapping notes were also captured in the field to delineate ecological features further. Attributes recorded in the field are provided in Table 3. The relevé and quadrat raw data is provided in Appendix 3.

Table 3 Attributes Recorded in the Field

Data Type	Description
Collection attributes	Recorder, date, photographs, site ID
Location	Coordinates recorded by Garmin GPS (GDA 94) +/- 3m
Physical features	Soil, slope, landform
Vegetation condition	Vegetation condition was assessed using the Trudgen scale (1988) adapted for use in the Eremaean Province (EPA 2016b)
Flora	List of all species within the relevé/quadrat including maximum height and cover
Disturbance	Level and nature of disturbance e.g., weeds, clearing, grazing, fire age
Fauna	Record habitat, fauna observations

2.3.2 Targeted Flora Searches

Targeted flora searches were conducted across the Survey Area at approximately 25-50m intervals for significant flora identified during the desktop study. Information pertaining to the preferred habitats of significant flora was used to provide focus to the targeted searches. Where a flora species was considered to have the potential to be a significant species, the following information was collected:

- Location (GPS point for individuals, polygon for populations).
- Description of surrounding vegetation association/condition.
- Estimation of population size.
- Specimen for identification and vouchering.
- Photo of plant in situ.

2.3.3 Vegetation Type Mapping

Vegetation type mapping was conducted in the field using map notes created on Fulcrum and utilising ESRI satellite imagery (QGIS 3.16.6). Classification of vegetation types was based on dominant growth form, height, cover and a maximum of three species for the three traditional strata. (i.e., Upper, Mid and Ground) in reference to the Australian Vegetation Attribute Manual Version 7.0 (NVIS Technical Working Group 2017).

2.3.4 Vegetation Condition Mapping

Vegetation condition was mapped in the field using map notes created on Fulcrum based on the Trudgen scale (1988) adapted for use in the Eremaean Province (EPA 2016b). The vegetation condition scale is provided in Table 4. The vegetation condition ratings relate to vegetation structure, the level of disturbance and weed cover at each structural layer and the ability of the vegetation unit to regenerate. Vegetation condition ranges from 'Excellent', the highest rating, to 'Completely Degraded', the lowest. Areas completely devoid of vegetation were mapped as cleared.

Table 4 Vegetation Condition Rating Scale (Trudgen 1988, in EPA 2016b)

Vegetation Condition	Description
Excellent	Pristine or nearly so, no obvious signs of damage caused by human activities since European settlement.
Very Good	Some relatively slight signs of damage caused by human activities since European settlement. For example, some signs of damage to tree trunks caused by repeated fire, the presence of some relatively non-aggressive weeds, or occasional vehicle tracks.
Good	More obvious signs of damage caused by human activity since European settlement, including some obvious impact on the vegetation structure such as that caused by low levels of grazing or slightly aggressive weeds.
Poor	Still retains basic vegetation structure or ability to regenerate it after very obvious impacts of human activities since European settlement, such as grazing, partial clearing, frequent fires or aggressive weeds.
Degraded	Severely impacted by grazing, very frequent fires, clearing or a combination of these activities. Scope for some regeneration but not to a state approaching good condition without intensive management. Usually with a number of weed species present including very aggressive species.
Completely Degraded	Areas that are completely or almost completely without native species in the structure of their vegetation, i.e., areas that are cleared or 'parkland cleared' with their flora comprising weed or crop species with isolated native trees or shrubs.

2.3.5 Basic Fauna Survey and Habitat Mapping

A basic fauna survey and habitat mapping was conducted across the Survey Area. Observations of fauna, or evidence of fauna presence were noted opportunistically as well as in conjunction with the detailed and targeted flora surveys. A habitat assessment was conducted at each quadrat and relevé location. The assessment of fauna evidence included observations of tracks, scats, burrows and other traces of fauna habitation. Each habitat type present was photographed, mapped and assessed for its ecological values, including an assessment of:

- Soils and geology.
- Landforms such as flowlines, hill slopes and plains.
- Prescence of refuge including ground covers, rocks/boulders, fallen timber and/or hollow bearing trees.
- Habitat connectivity and presence of wildlife corridors.
- Evaluation of the habitat's value for significant fauna.

2.3.6 Limitations

In line with the EPA's Technical Guidance for 'Flora and Vegetation Surveys for Environmental Impact Assessment' (EPA 2016b) and 'Terrestrial Vertebrate Fauna Surveys for Environmental Impact Assessment' (EPA 2020), potential constraints and limitations of this biological survey are presented in Table 5.

Table 5 Limitations and Constraints

Limitations/Constraints	Limitation for this Survey	Comments
Availability of contextual information at a regional and local scale	No	The desktop review provided adequate contextual information.
Competency/experience of the team carrying out the survey	No	Nick Tidmarsh (14 years experience), Brydie Brennan (2 years), Pierre-Louis de Kock (Taxonomy) (17 years).
Proportion of flora identified, recorded and/or collected	No	All vascular flora observed within the Survey Area were recorded. Where species could not be conclusively identified in the field, collections were made. The majority of flora were able to be identified to the lowest level within the current taxonomic framework.
Scope and completeness	No	The Survey Area was able to be surveyed in full. Appendix 4 presents tracklogs showing survey effort.
Remoteness and/or access problems	No	The Survey Area was fully accessible.
Timing, weather, season, cycle	No	The biological survey was conducted during June 2024 which is within the optimal survey period for the region. Rainfall received in the three months prior to the field survey (April to June) was 107.2mm which was comparable with the long-term average for this same period (~105mm).
Disturbances which affected the results of the survey	No	0.56 ha of the Survey Area was cleared and therefore not mapped for vegetation or habitat values. The majority of the Survey Area was recently burnt at the time of assessment (6-12 months). The vegetation was in the early re-establishment phase and was considered a limitation.

3 Desktop Study Results

3.1 Physical Environment

3.1.1 Climate

The Survey Area is in the Gascoyne region of Western Australia. The Gascoyne experiences a moderate arid tropical, climate. The closest Bureau of Meteorology (BoM) weather recording station with monthly statistics is Exmouth town (Station No. 5051) located 6.5 km south of the Survey Area. Rainfall and temperature data from the 12 months prior to the survey were compared to long-term climate averages (1968-current) (Figure 3) (BoM 2024).

The field survey was undertaken in June 2024, which is within the recommended season for botanical surveys in the Eremaean Botanical Province (EPA 2016a). Rainfall received in the three months prior to the field survey (April to June) was 107.2mm (Figure 3). The conditions at the time of the survey were considered adequate for the collection of annual flora species. Temperatures leading up to the biological survey fluctuated around the long term mean.

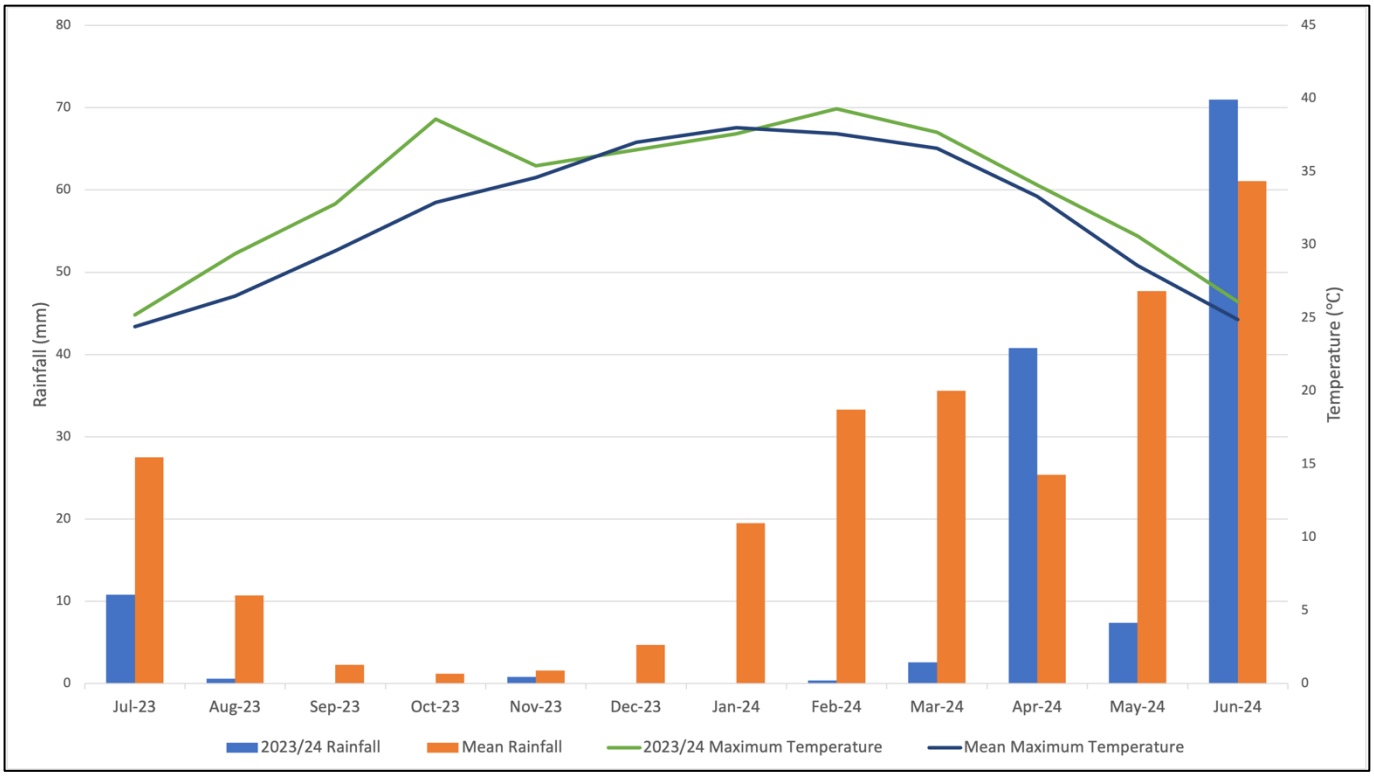

Figure 3 Climate Data Recorded from Exmouth Town (Station 5051)

3.1.2 Geology and Soils

The Survey Area is located across three regolith geological units;

- Er-WC: Eolian sandplain (majority of Survey Area);
- C-WCP: Colluvium derived from different rock types including gravel, sand, silt and clay; and
- M-WCP: Coral reef/bioherm (DEMIRS 2024).

The Australian Soil Resource Information System (CSIRO 2014) describes broad soil types (units). The Survey Area is located across two soil units (Fy2 and BB10), as described in Table 6 and presented in Figure 4.

Table 6 Description and Extents of Soil Units within the Survey Area (CSIRO 2014)

Soil Unit	Description	Extent in Survey Area	
		Area (ha)	Proportion (%)
Fy2	Rugged limestone ranges steeply dissected and with cliff faces forming their margins. The area is dominated by bare limestone and there are pockets of shallow calcareous loams (Um1.3)	6.32	84.83
BB10	Narrow coastal plain flanking unit Fy2; some saline flats and a few sand dunes: chief soils appear to be shallow loams on limestone (Um5. 11) and (Um5.5 l) with sands (Uc5.11) also overlying limestone. There are some red sands (Uc5.1) in dunes and a coastal fringe of recent shelly sand (Uc1.11)	1.13	15.17
TOTAL		**7.45**	**100%**

3.1.3 Land Systems

The Department of Agriculture Western Australia conducted land systems mapping and condition assessment of the Carnarvon Basin between 1980 and 1982 (Payne *et al,* 1987). Land systems were classified according to their topography, soils and vegetation. In total, 89 land systems have been described for the region.

The Survey Area intersects one land system; the Range Land System (Table 7 and Figure 5).

Table 7 Extent of Land Systems Present Within the Survey Area

Land System	Description	Extent in Survey Area	
		Area (ha)	Proportion (%)
Range Land System	Dissected limestone plateaux, hills and ridges with gorges and steep stony slopes supporting hard spinifex, sparse shrubs and eucalypts.	7.45	100%
TOTAL		**7.45**	**100%**

3.1.4 Hydrology and Hydrogeology

The Survey Area is located on the North West Cape within the Coastal hydrographic catchment of the Lyndon-Minilya Rivers Basin (DPIRD 2024). No surface water features (tributaries, streams etc) exist in the immediate area (DWER 2018a).

The Exmouth aquifer occupies the northern part of the Exmouth peninsula (North West Cape), underlying Cape Range and the adjacent coastal plains and extending south to Yardie Creek. The aquifer is fresh (salinity < 1000 mg/L TDS) under the central part of the Range and sits approximately 10 m above sea level. Groundwater extends to a depth much greater than 100 m below sea level. Under the adjacent coastal plains, the depth of the freshwater aquifer is reduced and it is underlain by seawater (Bennelongia 2008). The Survey Area lies within an area with a groundwater salinity level of 500 – 1000 mg/L TDS (DWER 2018b).

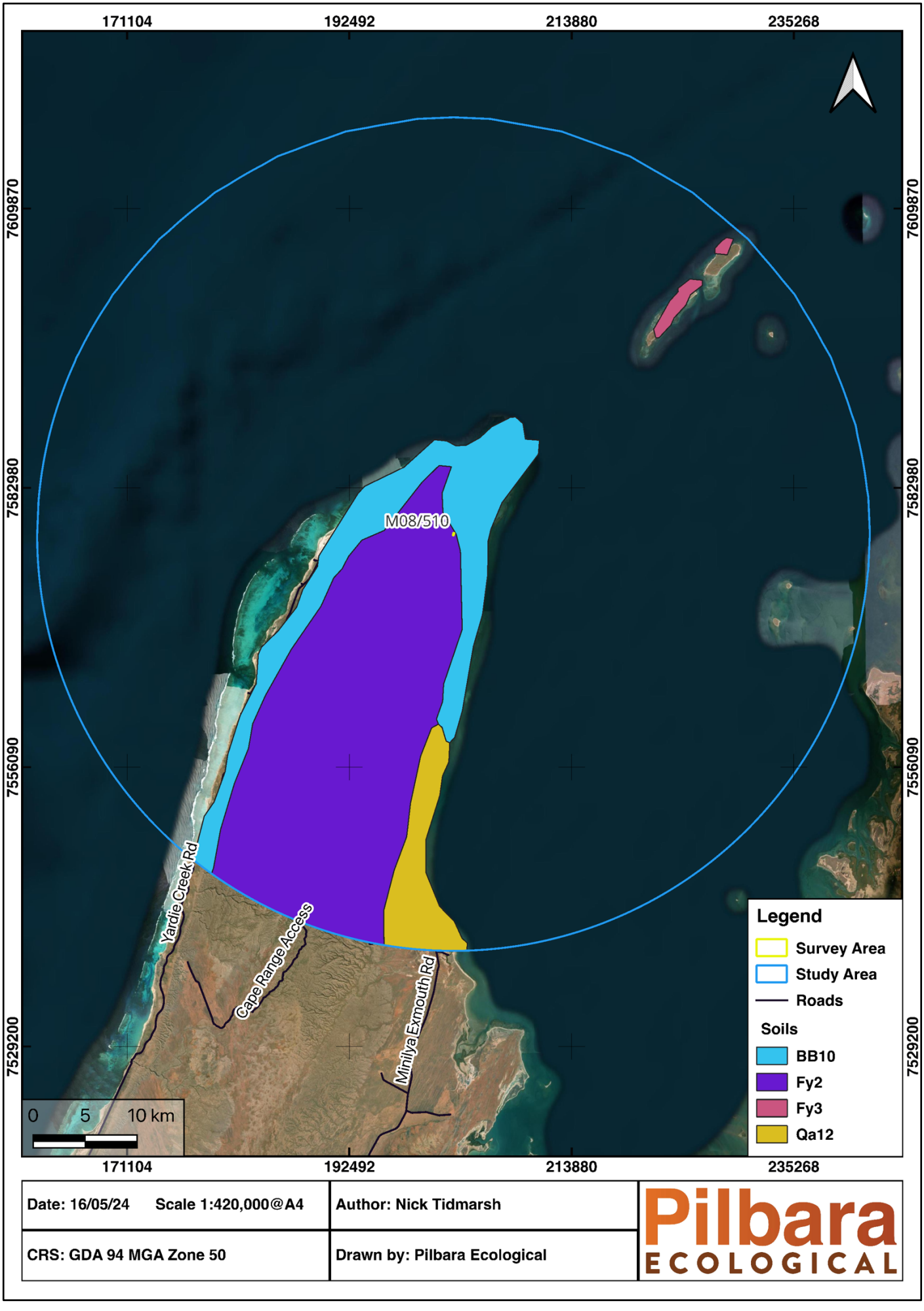

Figure 4 Soil Units of the Study Area

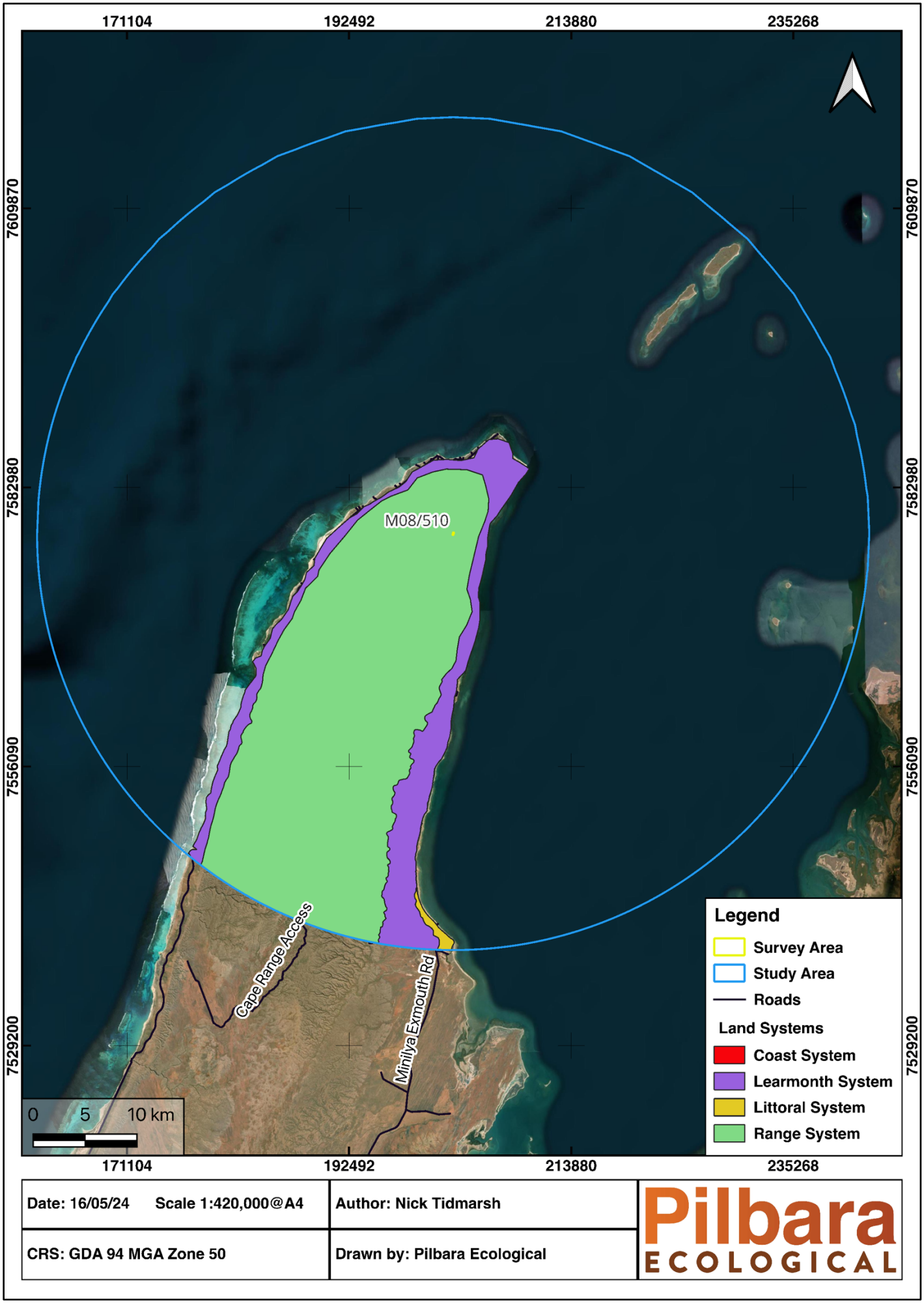

Figure 5 Land Systems of the Study Area

3.2 Biological Environment

3.2.1 Interim Biogeographic Regionalisation of Australia (IBRA)

The latest version of IBRA (IBRA7) classifies Australia's landscapes into 89 large geographically distinct bioregions based on common climate, geology, landform, native vegetation and species information. They were created to present the broad geophysical patterns across the Australian land mass (Thackway & Cresswell 1995). The 89 bioregions are further refined to form 419 subregions which are more localised and homogenous geomorphological units within each bioregion. The Survey Area is located within the Carnarvon bioregion and intersects with the Cape Range subregion (DAWE 2012).

The Cape Range subregion is 2,547,911ha in size and is comprised of the Cape Range and Giralia dunefields. Described as containing rugged tertiary limestone ranges and extensive areas of red aeolian dunefield, Quaternary coastal beach dunes and mud flats, the vegetation of the Cape Range subregion can be broadly categorised as:

- *Acacia* shrublands over *Triodia* on limestone (*Acacia stuartii* or *A. bivenosa*) and red dunefields;
- *Triodia* hummock grasslands with sparse *Eucalyptus* trees and shrubs on the Cape Range;
- extensive hummock grasslands (*Triodia*) on the Cape Range and eastern dune-fields;
- tidal mudflats of sheltered embayments of Exmouth Gulf supporting extensive mangrove;
- beach dunes with Spinifex communities; and
- extensive mosaic of saline alluvial plains with samphire and saltbush low shrublands along the eastern hinterland of Exmouth Gulf.

The Cape Range subregion contains several offshore islands. Islands of the Muiron, Barrow, Lowendal and Montebello groups are limestone-based. The climate is arid, semi-desert to subtropical, with variable summer and winter rainfall. Cyclonic activity can be significant, and cyclonic systems may affect the coast and hinterland annually. Dominant land use includes grazing, conservation, mining leases and urban (Kendrick 2003).

3.2.2 Beard Pre-European Vegetation

The pre-European vegetation mapping of Western Australia dataset maps original natural vegetation presumed to have existed prior to European settlement in Western Australia. The major sources of data in this database are the published and unpublished mapping of J.S. Beard at 1:250,000 scale (DPIRD, 2019). The Survey Area intersects with the Cape Range 662.10 vegetation association, as summarised in Table 8.

Table 8 Beard Pre-European Vegetation Associations within the Survey Area (DPIRD 2019)

Pre-European Vegetation Association	Description	Extent in Survey Area	
		Area (ha)	Proportion (%)
CAPE RANGE_662.10	Hummock grassland with scattered low trees over dwarf shrubs or mixed short grass and spinifex mixed species, *Triodia* spp.	7.45	100
TOTAL		**7.45**	**100%**

3.2.3 Threatened and Priority Ecological Communities

No Commonwealth listed (EPBC Act) TECs occur within the Study Area (DCCEEW 2024a). A review of DBCA's TEC/PEC database identified one PEC and one TEC as occurring within 40km of the Survey Area;

- Camerons Cave Troglobitic Community TEC (Critically Endangered); and
- Coastal dune tussock grassland dominated by *Whiteochloa airoides* PEC (Priority 3).

The 'Camerons Cave Troglobitic Community' TEC is located approximately 8.5 km south of the Survey Area. The nearest known record of 'Coastal dune tussock grassland dominated by *Whiteochloa airoides'* PEC is situated on South Muiron Island, approximately 29 km north-east of the Survey Area (Figure 6). A summary of these communities is presented in Table 9.

3.2.4 Significant Wetlands

There are no surface wetlands or waterways within or near the Survey Area. The Survey Area intersects the 'Cape Range Subterranean Waterways' which is listed under the Directory of Important Wetlands of Australia (DIWA) (DBCA 2024d). Included in this wetland are the subterranean waterways, sinkholes, general groundwater and artificial wells of the coastal plain and foothills of Cape Range north of a line between Norwegian Bay (at the foot of the peninsula on the west coast) and the Bay of Rest in Exmouth. It hosts a rich, entirely endemic stygofauna and is a good example of a subterranean karst wetland system, of which there are only two in northwestern Australia (Barrow Island hosting the other) (DCCEEW 2024b). The 'Exmouth Gulf East' wetland is approximately 37 km east of the Survey Area. Also DIWA listed, this site comprises wetlands in the eastern part of Exmouth Gulf from Giralia Bay to Urala Creek Locker Point (DCCEEW 2024c).

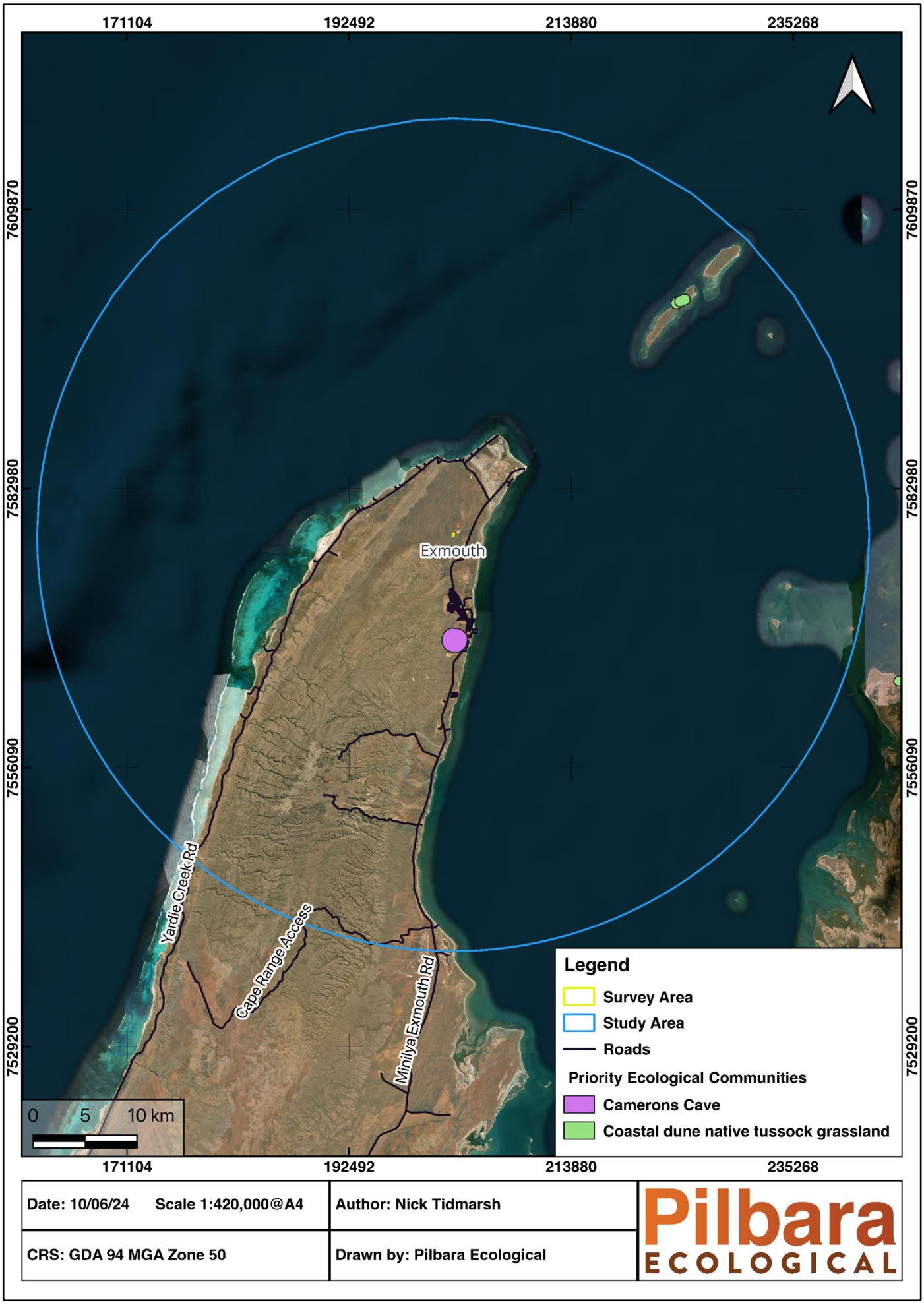

Figure 6 Priority Ecological Communities within the Study Area

Table 9 Significant Ecological Communities within the Study Area

Community Type	EPBC Act	DBCA	Description (DBCA, 2022b)	Comments
Coastal dune tussock grassland dominated by Whiteochloa airoides	N/A	Priority 3	Tussock grassland of *Whiteochloa airoides* occurs on the landward side of foredunes, hind dunes or remnant dunes with white or pinkish white medium sands with marine fragments. There may be occasional *Spinifex longifolius* tussock or *Triodia epactia* hummock grasses and scattered low shrubs of *Olearia dampieri* subsp. *dampieri* (now *Olearia* sp. Kennedy Range (G. Byrne 66)), *Scaevola spinescens*, *S. cunninghamii, Trianthema turgidifolium* and *Corchorus* species (*C. walcottii, C. laniflorus*).	Occurs on Barrow Island, Tent Island and possibly some unaffected littoral areas in west Pilbara. **Threats**: weed invasion (**Cenchrus ciliaris, *Aerva javanica*), altered fire regimes, grazing, basic raw material extraction
Camerons Cave Troglobitic Community	N/A	Critically endangered (BC Act)	The community is known from Camerons Cave on the Cape Range peninsula (North West Cape). It comprises a unique assemblage of species, at least eight of which are known only from this location. The threatened *species Stygiochiropus peculiaris* (Camerons Cave millipede; critically endangered) and *Indohya damocles* (Camerons Cave pseudoscorpion; critically endangered) (previously *Hyella* sp. BES 1154.2525, 1546, 2554) are endemic to Camerons Cave. *Milyeringa veritas* (blind gudgeon; vulnerable) and *Draculoides bramstokeri* (Barrow Island *draculoides*; vulnerable) also occur in the cave.	Occurs in Camerons Cave on the Cape Range peninsula. **Threats**: uncontrolled access to the cave and its surrounds, altered water levels or quality, pollution, and waste dumping in the cave.

3.2.5 Significant Flora

A total of 21 flora taxa of conservation significance were identified from database searches as having been recorded within the Study Area (DBCA 2024c; DCCEEW 2024a) (Figure 7). This included:

- Ten Priority 2 species
- Nine Priority 3 species
- Two Priority 4 species.

The pre-survey likelihood of occurrence assessment indicated five Priority flora species have the potential to occur within the Survey Area (Appendix 2a):

- Likely to occur:
  - *Daviesia pleurophylla* (P2)

- Possible to occur:
  - *Acanthocarpus rupestris* (P2)
  - *Verticordia serotina* (P2)
  - *Corchorus congener* (P3)
  - *Corynotheca flexuosissima* (P3)

These five species were subject to a targeted survey during the field assessment of the Survey Area.

3.2.6 Significant Fauna

A total of 80 fauna species of significance were identified from the database searches as being present/potentially present within the Study Area (DBCA 2024a, DCCEEW 2024a) (Figures 8-10). Species that are exclusively marine, inshore or aquatic have not been included in this report as these habitats are not present within the Study Area. The number of species within each conservation category (note some species are listed as migratory in addition to conservation ranking) is presented below:

- 25 Threatened species (T), ten of which are also migratory (MI)
- 57 migratory species (MI)
- Three Priority 2 species (P2)
- Two Priority 3 species (P3)
- Five Priority 4 species (P4)

The pre-survey likelihood of occurrence assessment indicated three significant fauna species have the potential to occur within the Survey Area (Appendix 2b):

- Likely to occur:
  - *Aprasia rostrata,* Ningaloo worm lizard (P3).
- Possible to occur:
  - *Falco peregrinus,* Peregrine Falcon (OS)
  - *Pandion haliaetus,* Osprey (MI)

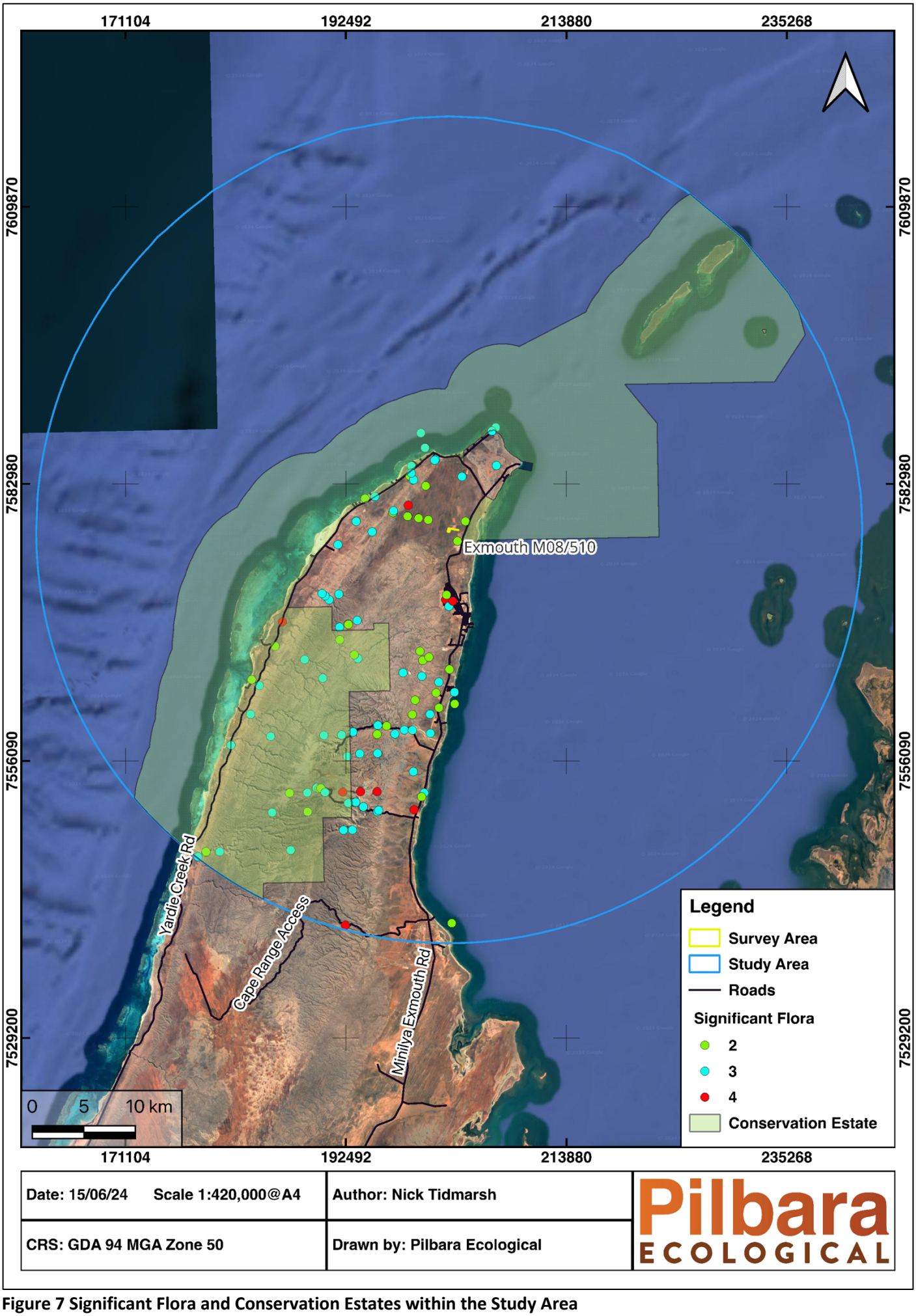

Figure 7 Significant Flora and Conservation Estates within the Study Area

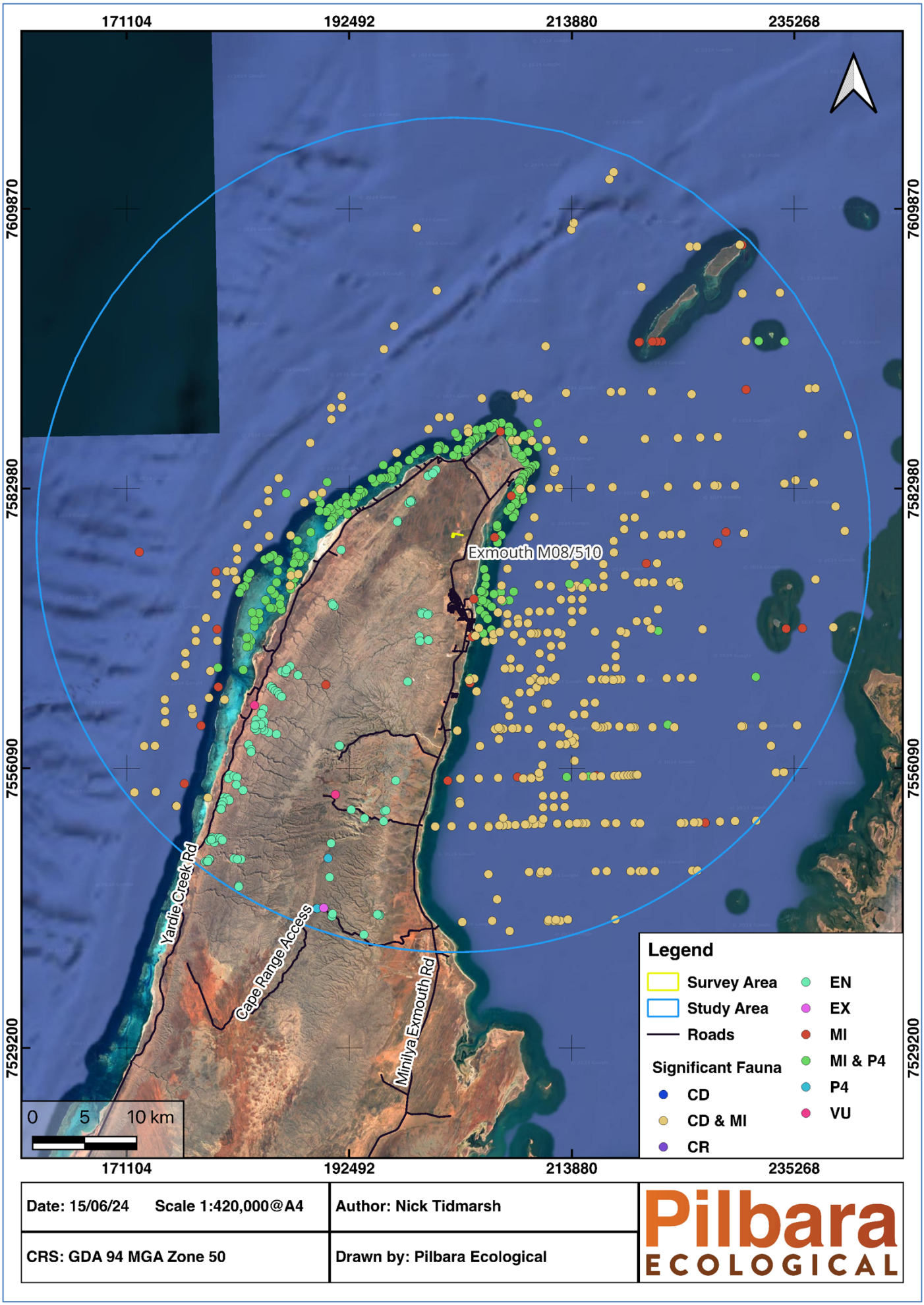

Figure 8 Significant Mammal Fauna within the Study Area

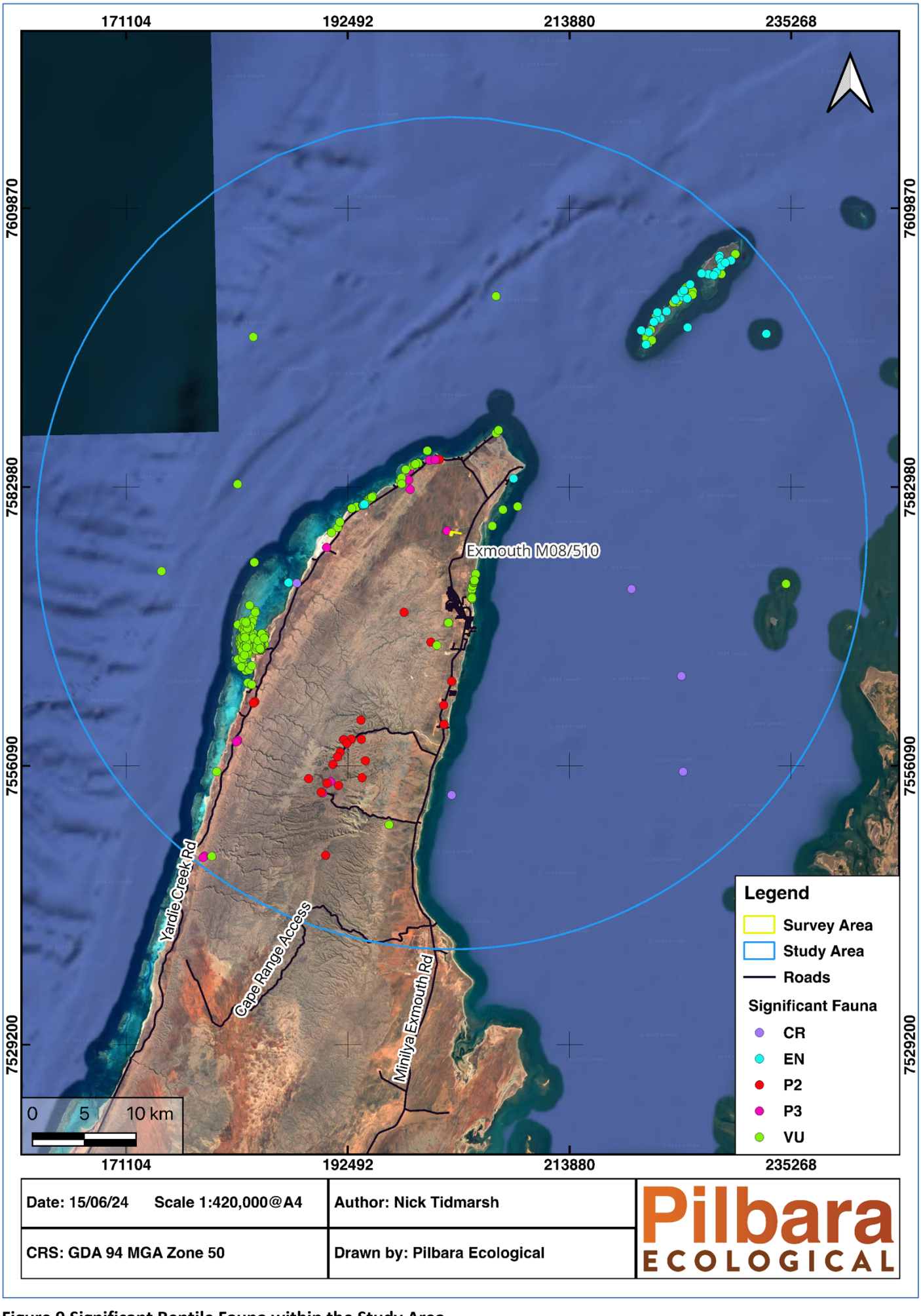

Figure 9 Significant Reptile Fauna within the Study Area

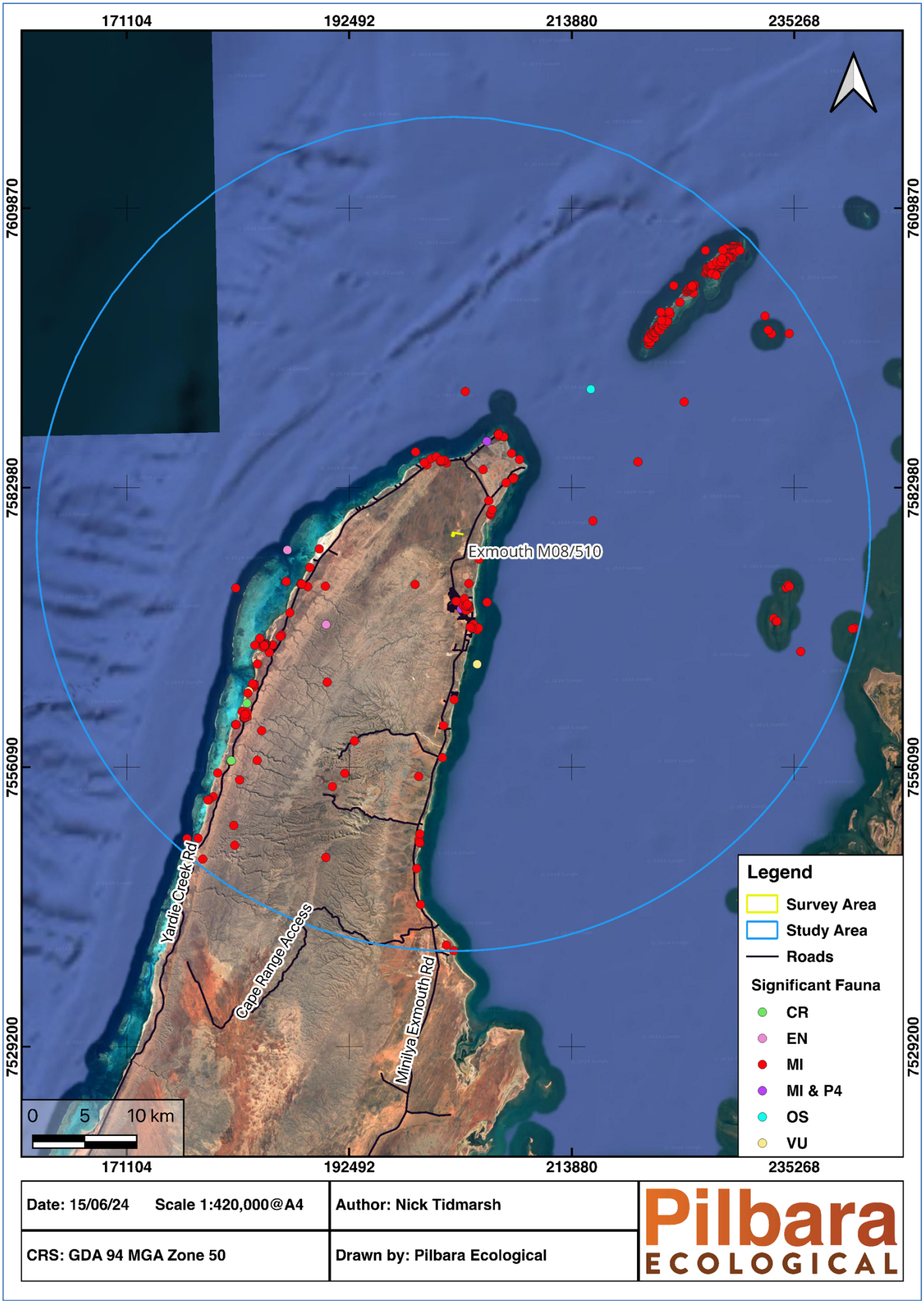

Figure 10 Significant Bird Fauna within the Study Area

3.2.7 Conservation Estate in the Region

Three conservation estates intersect the Study Area (Figure 7):

- Bundegi Coastal Park
- Cape Range National Park
- Jurabi Coastal Park

No conservation estates intersect the Survey Area. The nearest conservation estate is Bundegi Coastal Park, located 720m to the east. The Cape Range National Park is situated approximately 11 km south-west of the Survey Area. Areas in the conservation estate (and ESAs) located within the Study Area but situated offshore have been disregarded for the purpose of this desktop assessment.

3.2.8 Environmentally Sensitive Areas

The Survey Area is situated in an Environmentally Sensitive Area (ESA) as it lies in an area that was listed on the Register of the National Estate due to its geological and palaeontological features, biological attributes and cultural values (DCCEEW 2024d). The majority of the North West Cape lies within an ESA due to being located within the Ningaloo Coast World Heritage Area, being on the Register of the National Estate, or being in proximity to a significant wetland or TEC.

4 Field Survey Results

4.1 Flora Composition

A total of 63 flora taxa (including species, subspecies, varieties and forms) were recorded from within the Survey Area, representing 24 families and 49 genera, comprising 60 native taxa and 3 introduced taxa. Dominant families recorded in the Survey Area included:

- Poaceae (14 taxa)
- Fabaceae (11 taxa)
- Malvaceae (5 taxa)

The most common genera was *Acacia* (6 taxa) with nine other genera recording two taxa each.

A flora inventory for the Survey Area is provided in Appendix 5. The majority of specimens collected during the field survey were able to be identified to the lowest taxonomic level (90.62%). Other recorded taxa that could not be assigned to the lowest taxonomic level were a result of poor or insufficient material available.

4.2 Significant Flora

No Threatened flora (EPBC Act or BC Act) were recorded within the Survey Area. One Priority 2 flora species was located within the Survey Area: *Daviesia pleurophylla* (P2). This species is described as a divaricately branched shrub that typically grows to a height of up to 3m and has many ribbed branchlets (Plate 1). It's phyllodes are scattered, widely spreading, needle-shaped and sharply-pointed. *Daviesia pleurophylla* is endemic to the North West Cape where it is found on sand dunes. There are currently 16 vouchered specimens of this species (AVH 2024), 13 of which are located within the Study Area.

Within the Survey Area, a total of 72 individuals of *Daviesia pleurophylla* (P2) were recorded across vegetation type VT01. Locations of *Daviesia pleurophylla* are presented in Appendix 7.

Plate 1 *Daviesia pleurophylla* (P2) (ALA 2024)

Based on the post-survey likelihood of occurrence assessment, a further three Priority species are considered to 'possibly' occur within the Survey Area as suitable habitat is present:

- *Verticordia serotina* (P2)
- *Corchorus congener* (P3)
- *Corynotheca flexuosissima* (P3)

These species were not recorded during the extensive targeted survey of the area. However, since the site was recently burnt, there remains potential for them to occur during the re-establishment of vegetation.

4.3 Range Extensions

The interrogation of specimen data available through the Australian Virtual Herbarium (AVH) indicated seven species present within the Survey Area are range extensions (none are flora of conservation significance) (Table 10). While the range extensions are generally limited to < 150km, the most significant include that of *Polymeria lanata, Panicum australiense* var. *australiense* and *Urochloa holosericea* subsp. *velutina* as specimens recorded within the Survey Area mark the western range extent for these common northern Australian species.

Table 10 Range Extensions for Species Recorded within Survey Area (AVH 2024).

Species	Range Extension	Current Recorded Distribution
Alyogyne pinoniana var. *pinoniana*	~127km NW	184 records in Australia, 68 records for WA, 16 records for Carnarvon bioregion. Distribution extends from coastal WA across into central NT and SA. The nearest recorded specimen to the Survey Area is from Cane River Conservation Park. Not previously vouchered from the North West Cape. This record (from the Survey Area) marks the north-western range extent for the species.
Panicum australiense var. *australiense*	~93km WSW	40 records for WA. Two records for Carnarvon bioregion. Distribution extends across northern WA from Gascoyne to Kimberley bioregions. The nearest recorded specimen to the Survey Area is from ~18 km SSW of Onslow. Not previously vouchered from the North West Cape, this record marks the western range extent for the species.
Paractaenum refractum	~88km NW	524 records for Australia. 97 records for WA. 11 records for Carnarvon bioregion. The nearest recorded specimen to the Survey Area is from Giralia Station. Not previously vouchered from the North West Cape.
Olax aurantia	~33km N	39 records for WA. Four records for Carnarvon bioregion. Distribution extends from south of Jurien Bay to the North West Cape with specimens predominantly from the Geraldton Sandplains bioregion. The nearest recorded specimen to the Survey Area is from ~33 km south near the Learmonth Aerodrome. While not a significant range extension, the specimen from the Survey Area marks the northern range extent for the species.
Polymeria lanata	~162km W	90 records in Australia. 45 records for WA. Not recorded in Carnarvon bioregion. Distribution extends across northern Australia from WA to Queensland. The nearest recorded specimen to the Survey Area is from Cane River Conservation Park. Not previously vouchered from the North West Cape. This record (from the Survey Area) marks the western range extent for the species.
Setaria surgens	~135km N	Common and widespread species across northern half of Australia, particularly eastern Queensland. 1,183 records for

Species	Range Extension	Current Recorded Distribution
		Australia. 82 records for WA. Three records for Carnarvon bioregion. The nearest recorded specimen to the Survey Area is from 135 km south near Winning Pool. While Survey Area specimen is within the north-south range for the species, it has not previously been vouchered from the North West Cape.
Urochloa holosericea subsp. *velutina*	~100km	152 records in Australia. 45 records for WA. Not recorded in Carnarvon bioregion. Distribution extends across northern Australia from WA to Queensland. The nearest recorded specimen to the Survey Area is from ~16 km SSW of Onslow. Not previously vouchered from the North West Cape. This record (from the Survey Area) marks the western range extent for the species.

4.4 Introduced Flora

Three introduced flora species were recorded within the Survey Area:

- **Aerva javanica* (Kapok)
- **Cenchris ciliaris* (Buffel Grass)
- **Cenchrus setiger* (Birdwood Grass)

None are listed as Weeds of National Significance or Declared Plants under the *Biosecurity and Agriculture Management Act 2007*.

4.5 Vegetation Types

The total area of vegetation mapped within the Survey Area was 6.89 ha. A portion of the Survey Area (7.5%, 0.56 ha) had been previously cleared of vegetation. Two vegetation types across two landforms were identified within the Survey Area (Table 12; Appendix 6):

- **VT01**: *Banksia ashbyi* subsp. *boreoscaia*, *Duboisia hopwoodii, Grevillea stenobotrya* tall sparse shrubland over *Triodia ?angusta* sparse hummock grassland on red sand dunes.

- **VT02**: *Acacia sclerosperma* subsp. *sclerosperma*, *Acacia coriacea subsp. coriacea, Gyrostemon ramulosus* tall sparse shrubland over *Acacia gregorii* low sparse shrubland over *Triodia ?angusta* sparse hummock grassland on coastal sandplain.

The dominant vegetation type was VT01, which comprised approximately 78% (5.82 ha) of the Survey Area.

4.6 Vegetation of Significance

The vegetation types within the Survey Area are not representative of any known TEC (EPBC Act or BC Act) or PEC. While vegetation type VT01 does not hold any formal conservation significance, it could be considered locally significant due to it being confined to a restricted landform (red sand dunes) and providing habitat for the Priority 2 species *Daviesia pleurophylla.*

4.7 Vegetation Condition

The vegetation condition ranged from 'Poor' to 'Very Good' with the majority of the Survey Area classified as being in 'Very Good' condition (73.29%). Disturbances impacting the Survey Area include weeds (dominated by **Cenchris ciliaris*), established tracks and previous clearing. Areas of the Survey Area completely devoid of vegetation, including tracks or other cleared areas, were categorised as 'Cleared' and not assessed for vegetation condition. A significant portion of the Survey Area had been recently burnt (less than 12 months). Vegetation condition rating and extent are listed in Table 11 and presented in Appendix 8.

Table 11 Vegetation Condition Extents Within the Survey Area

Vegetation Condition	Extent (Ha)	Percentage of Survey Area (%)
Excellent	0	0
Very Good	5.46	73.29
Good	0.26	3.49
Poor	1.17	15.70
Degraded	0	0.00
Completely Degraded	0	0.00
Cleared	0.56	7.52
Total	**7.45**	**100**

Table 12 Vegetation Types Mapped within the Survey Area

Vegetation Type Description	Landform and Soils	Sample Sites and Extent in Survey Area	Representative Photograph
(VT01) *Banksia ashbyi* subsp. *boreoscaia*, *Duboisia hopwoodii, Grevillea stenobotrya* tall sparse shrubland over *Triodia ?angusta* sparse hummock grassland Associated Species: *Gyrostemon ramulosus, Scaevola sericophylla, Quoya paniculata, Exocarpos sparteus*	Red sand dunes	EQ01, EQ02 5.82 ha	
(VT02) *Acacia sclerosperma* subsp. *sclerosperma*, *Acacia coriacea subsp. coriacea, Gyrostemon ramulosus* tall sparse shrubland over *Acacia gregorii* low sparse shrubland over *Triodia ?angusta* sparse hummock grassland Associated Species: *Euploca glandulifera, Heliotropium crispatum, Stylobasium spathulatum, Senna artemisoides* subsp. *oligophylla*	Coastal sandplain	ER01, ER02, ER03 1.07 ha	

4.8 Fauna Habitat

Two broad fauna habitat types were recorded within the Survey Area:

- Tall shrubland on sand dunes (HT01)
- Tall shrubland on coastal plain (HT02)

Table 13 summarises these fauna habitat types, and Appendix 9 (fauna habitat mapping) provides their extent within the Survey Area.

Table 13 Habitat Types Including Allied Vegetation Types and Extents

Habitat Type	Vegetation Type	Notes	Total Area (ha)	Representative Photograph
(HT01) Tall shrubland on sand dunes	VT01	This habitat type includes dune crest and swale vegetated with sparse spinifex hummocks and shrubs. The tall shrubs provide habitat for small birds. The red sand dunes may provide habitat for *Aprasia rostrata*, Ningaloo worm lizard (P3) and other reptile species. This habitat type is considered of high value for fauna species of significance.	5.82 ha	
(HT01) Tall shrubland on coastal plain	VT02	This habitat type is charactarised by spinifex hummocks and tall shrubs. The tall shrubs provide habitat for small birds. The red sandy plain may provide habitat for *Aprasia rostrata*, Ningaloo worm lizard (P3) and other reptile species. This habitat type is considered of high value for fauna species of significance.	1.07 ha	

4.9 Recorded Fauna

A total of four fauna species were opportunistically recorded during the field survey (Table 14).

Table 14 Vertebrate Species Recorded During the Field Survey

Common Name	Species	Observation Type
Mammal		
Cow	*Bos taurus*	Scats
Emu	*Dromaius novaehollandiae*	Tracks
Birds		
Nankeen Kestrel	*Falco cenchroides*	Sighting
Rainbow Bee-eater (MA)	*Merops ornatus*	Sighting

4.10 Significant Fauna

No significant fauna species were sighted during the field survey nor was any evidence (burrows, diggings, tracks and scats) of such fauna noted.

Merops ornatus (Rainbow Bee-eater), which is listed as a Marine Species (EPBC Act), was recorded in the Survey Area.

A post-survey likelihood of occurrence assessment conducted for all significant fauna species identified during the desktop study (Appendix 2b) indicated three fauna species had the potential to occur within the Survey Area:

- Likely to occur
  - *Aprasia rostrata,* Ningaloo worm lizard (P3)
- Possible to occur
  - *Falco peregrinus,* Peregrine Falcon (OS)
  - *Pandion haliaetus,* Osprey (MI)

A summary of these three fauna species and the associated habitat types present within the Survey Area is provided in Table 15.

Table 15 Listed Significant Fauna Likely to or Possibly Occurring Within the Survey Area

Species and Status	Likelihood of Occurrence (Post Survey)	Comments	Potential Habitat Type in Survey Area
Birds			
Falco peregrinus **(Peregrine Falcon)** **OS**	Possible – foraging only	The Peregrine Falcon is a widespread species across Australia. This species can forage over a wide range of habitats and maintain a large home range. Suitable nesting habitat includes cliff ledges, granite outcrops, quarries and large trees with old raven or Wedge-tailed Eagle nests (Johnstone and Storr 1998). While there is no suitable nesting habitat within the Survey Area, it is possible this species forages over the Survey Area.	HT01, HT02
Pandion haliaetus **(Osprey)** **MI**	Possible – foraging only	Eastern Ospreys occur in littoral and coastal habitats and terrestrial wetlands of tropical and temperate Australia and offshore islands. Nests are constructed in a variety of natural and artificial sites including in dead or partly dead trees or bushes; on cliffs, rocks, rock stacks or islets; on the ground on rocky headlands, coral cays, deserted beaches, sandhills or saltmarshes; and on artificial nest platforms, pylons, jetties, lighthouses, navigation towers, cranes, exposed shipwrecks and offshore drilling rigs. There is no suitable nesting habitat within the Survey Area. It is possible this species forages over the Survey Area.	HT01, HT02
Reptiles			
Aprasia rostrata **(Ningaloo worm lizard)** **P3**	Likely	This species occupies a variety of sandy habitats including red and white sand dunes. Suitable habitat exists within the Survey Area and the nearest record is 400m from the Survey Area (2008).	HT01, HT02

5 Conclusion

5.1 Significant Flora

No Threatened flora (EPBC Act or BC Act) were recorded within the Survey Area. One Priority 2 flora species was located: *Daviesia pleurophylla* (P2). A total of 72 individuals of this species were recorded within the Survey Area across vegetation type VT01. This species is endemic to the North West Cape and has been previously recorded within the vicinity of the Survey Area.

Based on the post survey likelihood of occurrence assessment, a further three species are considered to 'possibly' occur within the Survey Area: *Verticordia serotina* (P2), *Corchorus congener* (P3) and *Corynotheca flexuosissima* (P3). While these species were not located during the targeted survey, there remains potential for them to occur during the post-fire re-establishment of vegetation across the Survey Area.

5.2 Significant Vegetation

The two vegetation types mapped within the Survey Area were not synonymous with any known TEC (EPBC Act or BC Act) or PEC. Vegetation type VT01 was located on red sand dunes and comprised approximately 78% of the Survey Area. This vegetation type does not hold any formal conservation significance; however, it could be considered locally significant due to it being confined to a restricted landform and providing habitat for the Priority 2 species *Daviesia pleurophylla.*

The Survey Area is situated in an Environmentally Sensitive Area (ESA; listed on the Register of the National Estate) and intersects the 'Cape Range Subterranean Waterways, a significant (subterranean) wetland listed on the Directory of Important Wetlands in Australia. There are no surface wetlands or waterways within or near the Survey Area.

5.3 Significant Fauna

No significant fauna species (or evidence of) were recorded during the field survey. Three fauna species of significance were identified as having the potential to occur in the Survey Area: *Aprasia rostrata,* Ningaloo worm lizard (P3) (likely to occur); *Falco peregrinus,* Peregrine Falcon (OS) – Foraging only (possible to occur); *Pandion haliaetus,* Osprey (MI) – Foraging only (possible to occur).

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Appendix 1. Database search Results

Appendix 2a. Likelihood of Occurrence Assessment (Significant Flora)

Taxon	Description (DBCA 2023x)	Habitat	Databases			Pre-survey Likelihood of Occurrence	Post-survey Likelihood of Occurrence
			NatureMap	DBCA TPFL	WA Herbarium		
Priority 2							
Acacia ryaniana	Low spreading shrub of 2 m diameter and 0.5 m high.	White or red sand. Coastal sand dunes	✓			Unlikely: No contemporary records within 40km of Survey Area.	Unlikely
Acanthocarpus rupestris	Prickly shrub. Rhizomatous, tufted perennial, herb, to 0.5 m high. Fl. white, May to Jun.	Red sand, limestone.	✓	✓	✓	Possible. NR 13km from Survey Area. Some suitable habitat exists in the Survey Area.	Unlikely
Calandrinia sp. Cape Range (F. Obbens FO 10/18)	Scrambling perennial herb. Single stemmed annual 0.2 m high. Flowers pink.	Rocky habitats, gullies, skeletal soils.	✓		✓	Unlikely: Suitable habitat does not exist in the Survey Area.	Unlikely
Cucumis sp. Barrow Island (D.W. Goodall 1264)	Herbaceous perennial vine. 5 flower fascicles per leaf axil, growing up to 2m tall.	Red sandy loams on sandplain swales, footslopes of basalt, limestone plateau and calcrete slopes.	✓		✓	Unlikely: Suitable habitat does not exist in the Survey Area.	Unlikely
Daviesia pleurophylla	Divaricately branched, broom like shrub to 3m. Petals yellow, flower centres orange.	Sand dunes.	✓	✓	✓	Likely: Suitable habitat is abundant and nearest record is 1km from Survey Area	Recorded

Taxon	Description (DBCA 2023x)	Habitat	Databases			Pre-survey Likelihood of Occurrence	Post-survey Likelihood of Occurrence
			NatureMap	DBCA TPFL	WA Herbarium		
Eremophila occidens	Shrub, to 1.5 m high. Fl. purple-violet, Aug to Sep.	Orange/brown sand. Limestone ranges, dunes.	✓	✓	✓	Unlikely: Mostly confined to the ranges.	Unlikely
Harnieria kempeana subsp. *rhadinophylla*	Sprawling perennial shrub 60 cm tall and 1 x 0.5 m across (other individuals more erect). Three lower corolla lobes magenta, the centre one with raised, white, herringbone markings at its base. The upper two lobes fused except for small tips, also magent.	Calcareous loam. Amongst limestone rocks, creek banks.	✓	✓	✓	Unlikely: Suitable habitat does not exist in the Survey Area.	Unlikely
Tephrosia sp. North West Cape (G. Marsh 81)	Smakk herb. shrub, 0.2 m high x 0.7 m wide. Flowers yellow, orange or white.	Orange sands and red-brown clay loam on limestone outcrops and rocks.	✓		✓	Unlikely: Suitable habitat does not exist in the Survey Area.	Unlikely
Tinospora esiangkara	Annual climbing compact twining climber 2.5 m high x 2 m wide. Flowers yellow.	Pebbly orange-brown calcareous loam. Limestone outcrops or ridges, near creek bank.	✓	✓	✓	Unlikely: Suitable habitat does not exist in the Survey Area.	Unlikely
Verticordia serotina	Low spreading shrub to 50 cm, flowers pink.	Red sand. Sand dunes.	✓		✓	Possible: NR is 15km from the Survey Area. Suitable habitat exists in the Survey Area.	Possible
Priority 3							

Taxon	Description (DBCA 2023x)	Habitat	Databases			Pre-survey Likelihood of Occurrence	Post-survey Likelihood of Occurrence
			NatureMap	DBCA TPFL	WA Herbarium		
Acacia alexandri	Open or moderately dense, sometimes wispy shrub, 1.5-3 m high. Fl. cream, Jun or Aug to Sep.	Limestone. Stony creeks, steep rocky slopes.	✓	✓	✓	Unlikely: Suitable habitat does not exist in the Survey Area.	Unlikely
Acacia startii	Dense, rounded, much-branched shrub, 1-2 m high, to 3 m wide. Fl. green-yellow, Jul to Aug.	Calcareous loam with limestone pebbles. Stony hills and watercourses.	✓		✓	Unlikely: Suitable habitat does not exist in the Survey Area.	Unlikely
Corchorus congener	Spreading shrub, to 0.6 m high. Fl. yellow, Apr to Jun or Aug to Nov.	Sand, red sandy loam with limestone. Sand dunes, plains.	✓	✓	✓	Possible: Suitable habitat is present in the Survey Area. NR is 5km from the survey area.	Possible
Corynotheca flexuosissima	Rhizomatous, much-branched perennial, herb or shrub, to 0.6 m high. Fl. white, Jan or May or Sep.	Red or white sand, limestone. Costal sand dunes.	✓		✓	Possible: Suitable habitat is present in the Survey Area. NR is 8km from the survey area.	Possible
Eremophila forrestii subsp. *capensis*	Sparsely to much-branched shrub, to 1.4 m high.	Brown rocky soils, limestone. Ridges.	✓		✓	Unlikely: Suitable habitat does not exist in the Survey Area.	Unlikely
Grevillea calcicola	Small straggly tree or shrub (several-stemmed), to 4 m high. Fl. cream-white, May or Jul to Aug.	Limestone hilltops.	✓	✓	✓	Unlikely: Suitable habitat does not exist in the Survey Area.	Unlikely

Taxon	Description (DBCA 2023x)	Habitat	Databases			Pre-survey Likelihood of Occurrence	Post-survey Likelihood of Occurrence
			NatureMap	DBCA TPFL	WA Herbarium		
Gymnanthera cunninghamii	Erect woody shrub with somewhat leathery, lanceolate to elliptic leaves. Milky exudate when injured.	Sandy soils surrounding permanent or semi-permanent water courses.	✓		✓	Unlikely: Suitable habitat does not exist in the Survey Area.	Unlikely
Lysiandra fuernrohrii	Low shrub that flowers in February or May to September	Sand over limestone	✓		✓	Unlikely: Suitable habitat does not exist in the Survey Area.	Unlikely
Stackhousia umbellata	Spreading perennial, herb, to 0.7 m high. Fl. yellow, May to Aug.	Sandy soils on limestone.	✓		✓	Unlikely: Suitable habitat does not exist in the Survey Area.	Unlikely
Priority 4							
Brachychiton obtusilobus	Tree ca 5 m tall. Bark smooth, pale grey. Leaves glossy green. Pods matte black, in clusters of up to 5.	Skeletal soils. Rocky limestone ranges, gorges, occasionally sandplains.	✓		✓	Unlikely: Suitable habitat does not exist in the Survey Area.	Unlikely
Eremophila youngii subsp. *lepidota*	Medium to large narrow leaved shrub to 4m high.	Stony red sandy loam on clay flats and floodplains, sometimes semi-saline.	✓		✓	Unlikely: Suitable habitat does not exist in the Survey Area.	Unlikely

Appendix 2b Likelihood of Occurrence Assessment (Significant Fauna)

Species	Conservation Status			Databases			Notes	Pre-survey Likelihood of Occurrence	Post-survey Likelihood of Occurrence
	EPBC Act	BC Act	DBCA	EPBC PMST	Nature Map	DBCA TFS			
Mammals									
Dasyurus hallucatus (Northern Quoll)	EN	EN		✓	✓	✓	Suitable den habitat includes rock caves/crevices, tree hollows and log hollows (van Dyck and Strahan 2008). Northern Quolls can also utilise holes in termite mounds for denning (Triggs 2014). Preferred general habitats include dissected rocky escarpments, gorges and boulder piles and will utilise gullies and drainage lines. Drainage habitats are known foraging and dispersal pathways for the Northern Quoll. Large rocky outcrops (with large patch area to edge ratio) surrounded by intact, unburnt spinifex is considered primary habitat for the Northern Quoll in the Pilbara (Moore et al. 2021). Proximity to permanent water is another important microhabitat feature (Woinarski et al. 2008).	Unlikely: NR is 34km south of the Survey Area. No suitable den habitat within Survey Area.	Unlikely
Isoodon auratus auratus (Golden Bandicoot (mainland), Wintarru)	VU	VU			✓	✓	This species is a small golden-brown marsupial. It previously occurred throughout central Australia, but is now restricted to Barrow Island (*Isoodon auratus barrowensis*) and the Kimberley (offshore islands and the mainland) and Marchinbar Island (offshore Arnhem Land) (*Isoodon auratus auratus*). During the day it rests in dense vegetation or other shelter. During the night it forages by digging for succulents, invertebrates and plant roots.	Unlikely: No recent records within the Study Area	Unlikely
Leporillus apicalis (Lesser Stick-nest Rat)	EX	EX			✓	✓	The Lesser Stick-nest Rat was a moderately sized native rodent (body mass 60 g) that differed from its larger relative, the Greater Stick-nest Rat, by the narrow brush of white hairs near the tip of its tail.	Unlikely: Presumed extinct	Unlikely

Species	Conservation Status			Databases			Notes	Pre-survey Likelihood of Occurrence	Post-survey Likelihood of Occurrence
	EPBC Act	BC Act	DBCA	EPBC PMST	Nature Map	DBCA TFS			
Macroderma gigas (Ghost Bat)	VU	VU		✓			This species can occur in a variety of habitats and requires deep caves or disused mines for maternal roosting sites (TSSC 2016a). Short-term transient roosts can include rock crevices, shallow caves and even the roots of fig trees (observed in Dales Gorge in Karijini National Park) (Armstrong and Anstee 2000). Preferred foraging habitat includes plains or riparian lines adjacent to gully or gorge systems less than 5km from the roost site (TSSC 2016a).	Unlikely: No records within the Study Area	Unlikely
Mesembriomys macrurus (Golden-backed Tree-rat)			P4		✓	✓	The Golden-backed Tree-rat is a large rodent weighing 207−330 g, with a head and body length of 188−245 mm and a tail length of 291−360 mm. It is midway in size between two other large semi-arboreal species in northern Australia, the smaller *Conilurus penicillatus* (Brush-tailed Rabbit-rat) and the larger *Mesembriomys gouldii* (Black-footed Tree-rat).	Unlikely: No contemporary records within the Study Area	Unlikely
Petrogale lateralis lateralis (Moororong)	EN	EN		✓	✓	✓	Suitable habitat includes permanent water or shelter (deep shade in rocky areas such as caves, cliffs, screes and rockpiles). Formerly widespread, this species is now restricted to offshore Pilbara Islands and Cape Range in the north west (Pentland 2014); (TSSC 2016b).	Unlikely: Nearest record is 5km form the Survey Area (2018). Preferred habitat does not occur within the Survey Area.	Unlikely
Rhinonicteris aurantia (Pilbara) (Pilbara leaf-nosed bat)	VU	VU	P4	✓	✓	✓	This species utilises deep caves and complex mines for roosting sites. Preferred foraging habitat for the species includes gorges with pools, gullies, rocky outcrops and major water courses. While this species may forage over open grassland and woodland, this is considered the lowest quality of foraging habitat (TSSC 2016c).	Unlikely: NR is 25km from the Survey Area (2006). Preferred habitat does not exist within the Survey Area.	Unlikely

Species	Conservation Status			Databases			Notes	Pre-survey Likelihood of Occurrence	Post-survey Likelihood of Occurrence
	EPBC Act	BC Act	DBCA	EPBC PMST	Nature Map	DBCA TFS			
Sminthopsis longicaudata (Long-tailed Dunnart)			P4		✓	✓	This species is a small carnivorous marsupial, about the size of a mouse with an extremely long tail terminating in a tuft. Its habitat includes Exposed rock and stony soils with hummock grasses and shrubs. Flat-topped hills, lateritic plateaus, sandstone ranges and breakaways. Sparse mulga over spinifex (WAM 2024).	Unlikely: No contemporary records within the Study Area.	Unlikely
Zyzomys pedunculatus (Central Rock-rat, Antina)	CR	CR			✓	✓	Rediscovered in 1996, the central rock-rat is restricted to the West MacDonnell Ranges of central Australia. The species has irruptive demography and is recorded in high densities following rainfall events. It occurs in a variety of rocky habitat. It mostly eats seeds and lesser amounts of leaves, stems and insects.	Unlikely: No contemporary records within the Study Area.	Unlikely
Birds									
Actitis hypoleucos (Common Sandpiper)	MI	MI		✓	✓	✓	This species utilises coastal wetlands and some inland wetlands.	Unlikely: No preferred habitat in the survey area.	Unlikely
Anous stolidus (Common Noddy)	MI	MI		✓	✓	✓	Restricted to inshore habitats and coastal islands.	Unlikely: No preferred habitat in the survey area.	Unlikely
Apus pacificus (Fork-tailed swift)	MI	MI		✓			This species is a non-breeding migrant to Australia. Prescence in Australia is predominantly aerial.	Unlikely	Unlikely

Species	Conservation Status			Databases			Notes	Pre-survey Likelihood of Occurrence	Post-survey Likelihood of Occurrence
	EPBC Act	BC Act	DBCA	EPBC PMST	Nature Map	DBCA TFS			
Ardenna carneipes (Flesh-footed Shearwater)	MI			✓			Restricted to marine or inshore habitats and islands.	Unlikely: No preferred habitat in the survey area. No records in the Study Area.	Unlikely
Ardenna pacifica (Wedge-Tailed Shearwater)	MI	MI		✓	✓	✓	Generally restricted to marine or inshore habitats and islands.	Unlikely: No preferred habitat in the survey area.	Unlikely
Arenaria interpres (Ruddy Turnstone)	MI/VU	MI			✓	✓	Generally restricted to marine or inshore habitats and islands.	Unlikely: No preferred habitat in the survey area.	Unlikely
Calidris acuminata (Sharp-tailed sandpiper)	MI	MI		✓	✓	✓	This species utilises lagoons, swamps, lakes, pools near the coast, dams, waterholes, soaks, bore drains and bore swamps, saltpans and hypersaline salt lakes inland.	Unlikely: No preferred habitat in the survey area.	Unlikely
Calidris alba (Sanderling)	MI	MI			✓	✓	Restricted to marine or inshore habitats or coastal estuaries.	Unlikely: No preferred habitat in the survey area.	Unlikely
Calidris canutus (Red knot)	EN/MI	EN		✓	✓	✓	Mainly inhabits intertidal mudflats, sandflats, sandy beaches of sheltered coasts, estuaries, bays, inlets, lagoons and harbours.	Unlikely: No preferred habitat in the survey area.	Unlikely

Species	Conservation Status			Databases			Notes	Pre-survey Likelihood of Occurrence	Post-survey Likelihood of Occurrence
	EPBC Act	BC Act	DBCA	EPBC PMST	Nature Map	DBCA TFS			
Calidris ferruginea (Curlew Sandpiper)	CR/MI	CR		✓	✓	✓	This species occurs on intertidal mudflats in sheltered coastal areas, such as estuaries, bays, inlets and lagoons, and also around non-tidal swamps, lakes and lagoons near the coast.	Unlikely: No preferred habitat in the survey area.	Unlikely
Calidris melanotos (Pectoral sandpiper)	MI	MI		✓			This species prefers shallow to fresh saline wetlands.	Unlikely: No preferred habitat in the survey area. No records in the Study Area.	Unlikely
Calidris ruficollis (Red-necked stint)	MI	MI			✓	✓	Restricted to marine or inshore habitats or coastal estuaries.	Unlikely: No preferred habitat in the survey area.	Unlikely
Calidris subminuta (Long-toed Stint)	MI	MI			✓	✓	Restricted to marine or inshore habitats or coastal wetlands.	Unlikely: No preferred habitat in the survey area.	Unlikely
Calonectris leucomelas (Streaked Shearwater)	MI	MI		✓			Restricted to marine or inshore habitats or coastal wetlands.	Unlikely: No preferred habitat in the survey area. No records in the Study Area.	Unlikely
Charadrius leschenaultii (Greater sand plover)	VU/MI	VU		✓	✓	✓	Restricted to marine or inshore habitats or coastal wetlands.	Unlikely: No preferred habitat in the survey area.	Unlikely

Species	Conservation Status			Databases			Notes	Pre-survey Likelihood of Occurrence	Post-survey Likelihood of Occurrence
	EPBC Act	BC Act	DBCA	EPBC PMST	Nature Map	DBCA TFS			
Charadrius mongolus (Lesser Sand Plover)	EN/MI	EN			✓	✓	Restricted to marine or inshore habitats or coastal wetlands.	Unlikely: No preferred habitat in the survey area.	Unlikely
Charadrius mongolus mongolus (Lesser Sand Plover (subsp. mongolus))	EN/MI	EN			✓	✓	In non-breeding grounds in Australia, this species usually occurs in coastal littoral and estuarine environments. It inhabits large intertidal sandflats or mudflats in sheltered bays, harbours and estuaries, and occasionally sandy ocean beaches, coral reefs, wave-cut rock platforms and rocky outcrops.	Unlikely: No preferred habitat in the survey area.	Unlikely
Charadrius veredus (Oriental Plover)	MI	MI		✓	✓	✓	Non-breeding migrant to Australia. This species usually forages among short grass or on hard stony bare ground. Roosting habitat includes soft wet mud, shallow water of beaches and tidal mudflats or salt marshes.	Unlikely: No preferred habitat in the survey area. Non breeding migrant.	Unlikely
Chlidonias leucopteris (White-winged black tern)	MI	MI			✓	✓	Restricted to marine or inshore habitats or coastal wetlands.	Unlikely: No preferred habitat in the survey area.	Unlikely
Erythrotriorchis radiatus (Red Goshawk)	EN			✓			The Red Goshawk occurs in coastal and sub-coastal areas in wooded and forested lands of tropical and warm-temperate Australia. Goshawk nests in large trees.	Unlikely: No preferred habitat in the survey area. No records within the study area.	Unlikely
Falco hypoleucos (Grey Falcon)	VU	VU		✓			The Grey Falcon is a widespread but rare species. This species requires larger trees such as River Red Gum (*Eucalyptus camaldulensis*) or Coolibah (*Eucalyptus victrix*) for nesting but can have a large foraging range extending from timbered plains into open grasslands (Sutton 2011). Tall trees along medium and major drainage habitats are likely to provide suitable nesting habitat for the species.	Unlikely: No suitable nesting habitat in the Survey Area. No records within the Study Area.	Unlikely

Species	Conservation Status			Databases			Notes	Pre-survey Likelihood of Occurrence	Post-survey Likelihood of Occurrence
	EPBC Act	BC Act	DBCA	EPBC PMST	Nature Map	DBCA TFS			
Falco peregrinus (Peregrine Falcon)		OS			✓	✓	The Peregrine Falcon is a widespread species across Australia. This species can forage over a wide range of habitats and can maintain a large home range. Suitable nesting habitat includes cliff ledges, granite outcrops, quarries and large trees with old raven or Wedge-tailed Eagle nests (Johnstone and Storr 1998).	Possible: NR is 7km from the Survey Area (2013).	Possible: No nesting habitat is present in the Survey Area but species may forage at times in the Survey Area.
Fregata ariel (Lesser frigatebird)	MI	MI		✓			Restricted to marine or inshore habitats or coastal wetlands.	Unlikely: No preferred habitat in the survey area.	Unlikely
Gallinago stenura (Pin-tailed snipe)	MI	MI			✓	✓	Non-breeding migrant from Siberia. This species occurs on the edges of shallow freshwater swamps, ponds and lakes with emergent, sparse to dense cover of grass/sedge or other vegetation.	Unlikely: No preferred habitat in the survey area.	Unlikely
Gelochelidon nilotica (Gull-billed tern)	MI	MI			✓	✓	Restricted to marine or inshore habitats or coastal wetlands.	Unlikely: No preferred habitat in the survey area.	Unlikely
Glareola maldivarum Oriental pratincole	MI	MI		✓	✓	✓	Non-breeding migrant to Australia. In Australia this species usually inhabits open plains, floodplains, short grassland often with extensive bare areas. Often found near water and also occurs on the coast.	Unlikely: No preferred habitat in the survey area.	Unlikely
Hirundo rustica (Barn Swallow)	MI	MI		✓			This species is an occasional non-breeding migrant to Australia. In Australia this species is recorded in open country in coastal lowlands, often near water and towns (Pizzey and Knight 2001). It is often seen perching on overhead wires. It has also been recorded in freshwater wetlands, paperbark *Melaleuca* woodland, mesophyll shrub thickets and tussock grassland (Schodde and Mason 1999).	Unlikely: No records within the Study Area.	Unlikely

Species	Conservation Status			Databases			Notes	Pre-survey Likelihood of Occurrence	Post-survey Likelihood of Occurrence
	EPBC Act	BC Act	DBCA	EPBC PMST	Nature Map	DBCA TFS			
Hydroprogne caspia (Caspian Tern)	MI	MI			✓	✓	This species is mostly found in sheltered coastal embayments such as harbours, lagoons, inlets, bays, estuaries and river deltas. Sometimes found around terrestrial water holes.	Unlikely: No preferred habitat in the survey area.	Unlikely
Limicola falcinellus (Broad-billed sandpiper)	MI	MI			✓	✓	Restricted to marine or inshore habitats and coastal estuaries.	Unlikely: No preferred habitat in the survey area.	Unlikely
Limnodromus semipalmatus (Asian Dowitcher)	MI	MI		✓			Non-breeding migrant to Australia. In Australia this species is restricted to marine or inshore habitats or coastal estuaries.	Unlikely: No preferred habitat in the survey area.	Unlikely
Limosa lapponica (Bar-tailed godwit)	MI	MI		✓	✓	✓	Non-breeding migrant to Australia. This species is found mainly in coastal habitats such as large intertidal sandflats, banks, mudflats, estuaries, inlets, harbours, coastal lagoons and bays.	Unlikely: No preferred habitat in the survey area.	Unlikely
Limosa limosa (Black-tailed godwit)	MI	MI			✓	✓	Predominantly inhabits marine or inshore habitats and coastal estuaries/wetlands.	Unlikely: No preferred habitat in the survey area.	Unlikely
Macronectes giganteus (Southern Giant-Petrel)	EN/MI	EN/MI		✓			Predominantly inhabits marine or inshore habitats and coastal estuaries/wetlands.	Unlikely: No preferred habitat in the survey area.	Unlikely
Motacilla cinerea (Grey Wagtail)	MI	MI		✓			This species is an uncommon non-breeding summer visitor to northern Australia. It is predominantly recorded in habitats with water present (Pizzey and Knight 2001).	Unlikely: No records within the Study Area.	Unlikely

Species	Conservation Status			Databases			Notes	Pre-survey Likelihood of Occurrence	Post-survey Likelihood of Occurrence
	EPBC Act	BC Act	DBCA	EPBC PMST	Nature Map	DBCA TFS			
Motacilla flava (Yellow Wagtail)	MI	MI		✓			Uncommon, non-breeding summer visitor from northeast Asia.	Unlikely: No records from the Study Area.	Unlikely
Numenius madagascariensis (Eastern curlew)	CR/MI	CR		✓	✓	✓	Non-breeding migrant to Australia. This species is most commonly associated with sheltered coasts, especially estuaries, bays, harbours, inlets and coastal lagoons.	Unlikely: No preferred habitat in the survey area.	Unlikely
Numenius minutus (Little curlew, little whimbrel)	MI	MI			✓	✓	Non-breeding migrant to Australia. In Australia it is often found feeding in short, dry grassland and sedgeland near water. Foraging sites are usually within 5 km of daytime roosting sites, as birds move between grassland and wetland.	Unlikely: No preferred habitat in the survey area.	Unlikely
Numenius phaeopus (Whimbrel)	MI	MI			✓	✓	Non-breeding migrant to Australia. In Australia this species is usually found on the intertidal mudflats of sheltered coasts. It is also found in harbours, lagoons, estuaries and river deltas, often those with mangroves,	Unlikely: No preferred habitat in the survey area.	Unlikely
Oceanites oceanicus (Wilson's storm-petrel)	MI	MI			✓	✓	Restricted to marine habitats.	Unlikely: No preferred habitat in the survey area.	Unlikely
Onychoprion anaethetus (Bridled tern)	MI	MI			✓	✓	Restricted to marine or inshore habitats or coastal estuaries.	Unlikely: No preferred habitat in the survey area.	Unlikely

Species	Conservation Status			Databases			Notes	Pre-survey Likelihood of Occurrence	Post-survey Likelihood of Occurrence
	EPBC Act	BC Act	DBCA	EPBC PMST	Nature Map	DBCA TFS			
Pandion haliaetus Osprey	MI	MI		✓	✓	✓	Eastern Ospreys occur in littoral and coastal habitats and terrestrial wetlands of tropical and temperate Australia and offshore islands. Nest are constructed in a variety of natural and artificial sites including in dead or partly dead trees or bushes; on cliffs, rocks, rock stacks or islets; on the ground on rocky headlands, coral cays, deserted beaches, sandhills or saltmarshes; and on artificial nest platforms, pylons, jetties, lighthouses, navigation towers, cranes, exposed shipwrecks and offshore drilling rigs	Possible: NR less than 4km form Survey Area (2018).	Possible: No suitable nesting habitat. It Is possible this species forages in the Survey Area at times.
Pezoporus occidentalis (Night Parrot)	EN	CR		✓			Most previous records have been within Spinifex (*Triodia*) grassland and/or chenopod shrubland. It was previously recorded near the Fortescue Marshes in 2005 (Davis and Metcalf 2008). While the habitat preferences of this species are still not well known it is extremely uncommon and considered unlikely to occur.	Unlikely: This species is uncommon and has not been recorded within the Study Area.	Unlikely
Phaethon lepturus (White-tailed Tropicbird)	MI	MI		✓	✓	✓	This species occupies marine habitats in tropical waters with sea-surface temperatures of more than 22°C. The tropicbird breeds on islands and atolls, where it nests in a variety of habitats including on bare sandy ground, in closed-canopy rainforest, on rocky cliffs and in quarries.	Unlikely: No preferred habitat in the survey area.	Unlikely
Phaethon rubricauda (Red-tailed Tropicbird)	MI	MI	P4		✓	✓	This species prefers marine or inshore habitats, coastal estuaries and offshore islands.	Unlikely: No preferred habitat in the survey area.	Unlikely
Plegadis falcinellus (Glossy ibis)	MI	MI			✓	✓	This species preferred habitat for foraging and breeding are fresh water marshes at the edges of lakes and rivers, lagoons, floodplains, wet meadows, swamps, reservoirs, sewage ponds, rice-fields and cultivated areas under irrigation.	Unlikely: No preferred habitat in the survey area. No contemporary records within the Study Area.	Unlikely

Species	Conservation Status			Databases			Notes	Pre-survey Likelihood of Occurrence	Post-survey Likelihood of Occurrence
	EPBC Act	BC Act	DBCA	EPBC PMST	Nature Map	DBCA TFS			
Pluvialis fulva (Pacific golden plover)	MI	MI			✓	✓	This species usually inhabits coastal habitats, though it occasionally occurs around inland wetlands.	Unlikely: No preferred habitat in the survey area.	Unlikely
Pluvialis squatarola (Grey plover)	MI	MI			✓	✓	This species occurs almost entirely in coastal areas, where they usually inhabit sheltered embayments, estuaries and lagoons with mudflats and sandflats, and occasionally on rocky coasts with wave-cut platforms or reef-flats, or on reefs within muddy lagoons. They also occur around terrestrial wetlands such as near-coastal lakes and swamps, or salt-lakes.	Unlikely: No preferred habitat in the survey area.	Unlikely
Pterodroma mollis (Soft-plumaged Petrel)	VU			✓			The species is mainly coastal but occasionally occurs inland.	Unlikely: No preferred habitat in the survey area. No records within the study aera.	Unlikely
Puffinus huttoni (Hutton's shearwater)		EN			✓	✓	Restricted to marine or inshore habitats, coastal estuaries and offshore islands.	Unlikely: No preferred habitat in the survey area.	Unlikely
Rostratula australis (Australian Painted Snipe)	EN	EN		✓			This species inhabits shallow terrestrial freshwater (occasionally brackish) wetlands, including temporary and permanent lakes, swamps and claypans.	Unlikely: No preferred habitat in the survey area.	Unlikely
Sternula albifrons (Little Tern)	MI	MI		✓			In Australia, Little Terns inhabit sheltered coastal environments, including lagoons, estuaries, river mouths and deltas, lakes, bays, harbours and inlets, especially those with exposed sandbanks or sand-spits, and also on exposed ocean beaches	Unlikely: No preferred habitat in the survey area. No records within the Study Area.	Unlikely

Species	Conservation Status			Databases			Notes	Pre-survey Likelihood of Occurrence	Post-survey Likelihood of Occurrence
	EPBC Act	BC Act	DBCA	EPBC PMST	Nature Map	DBCA TFS			
Sterna dougallii (Roseate tern)	MI	MI			✓	✓	Restricted to marine or inshore habitats, coastal estuaries and offshore islands. Listed Marine	Unlikely: No preferred habitat in the survey area.	Unlikely
Sterna dougallii gracilis (Roseate Tern (subsp. gracilis))	MI	MI			✓	✓	The species inhabits rocky and sandy beaches, coral reefs, sand cays and offshore islands.	Unlikely: No preferred habitat in the survey area.	Unlikely
Sterna Hirundo (Common tern)	MI	MI			✓	✓	Restricted to marine or inshore habitats, coastal estuaries and offshore islands.	Unlikely: No preferred habitat in the survey area.	Unlikely
Sternula albifrons (Little tern)	MI	MI			✓	✓	Restricted to marine or inshore habitats, coastal estuaries and offshore islands. Listed Marine.	Unlikely: No preferred habitat in the survey area.	Unlikely
Sternula nereis nereis (Fairy tern)	VU	VU		✓	✓	✓	Restricted to marine or inshore habitats and offshore islands.	Unlikely: No preferred habitat in the survey area.	Unlikely
Thalassarche carteri (Indian Yellow-nosed Albatross*)*	MI/VU			✓			Restricted to marine or inshore habitats and offshore islands.	Unlikely: No preferred habitat in the survey area.	Unlikely

Species	Conservation Status			Databases			Notes	Pre-survey Likelihood of Occurrence	Post-survey Likelihood of Occurrence
	EPBC Act	BC Act	DBCA	EPBC PMST	Nature Map	DBCA TFS			
Thalassarche chlororhynchos (Atlantic yellow-nosed albatross)	MI	VU			✓	✓	Restricted to marine or inshore habitats and offshore islands.	Unlikely: No preferred habitat in the survey area.	Unlikely
Thalassarche impavida (Campbell Albatross, Campbell Black-browed Albatross)	MI/VU			✓			Restricted to marine or inshore habitats and offshore islands.	Unlikely: No preferred habitat in the survey area.	Unlikely
Thalasseus bergii (Crested tern)	MI	MI			✓	✓	Restricted to marine or inshore habitats and offshore islands.	Unlikely: No preferred habitat in the survey area.	Unlikely
Tringa brevipes (Grey-tailed tattler)	MI	MI	P4		✓	✓	Restricted to marine or inshore habitats, coastal estuaries and offshore islands.	Unlikely: No preferred habitat in the survey area.	Unlikely
Tringa glareola (Wood sandpiper)	MI	MI			✓	✓	This species uses well-vegetated, shallow, freshwater wetlands, such as swamps, billabongs, lakes, pools and waterholes.	Unlikely: No preferred habitat in the survey area.	Unlikely
Tringa nebularia (Common Greenshank, greenshank)	MI	MI		✓	✓	✓	This species uses a wide variety of inland wetlands and sheltered coastal habitats of varying salinity. It occurs in sheltered coastal habitats, typically with large mudflats and saltmarsh, mangroves or seagrass. Habitats include embayments, harbours, river estuaries, deltas and lagoons and are recorded less often in round tidal pools, rock-flats and rock platforms.	Unlikely: No preferred habitat in the survey area.	Unlikely

Species	Conservation Status			Databases			Notes	Pre-survey Likelihood of Occurrence	Post-survey Likelihood of Occurrence
	EPBC Act	BC Act	DBCA	EPBC PMST	Nature Map	DBCA TFS			
Tringa stagnatilis (Marsh sandpiper, little greenshank)	MI	MI			✓	✓	The Marsh Sandpiper lives in permanent or ephemeral wetlands of varying salinity, including swamps, lagoons, billabongs, saltpans, saltmarshes, estuaries, pools on inundated floodplains, and intertidal mudflats and also regularly at sewage farms and saltworks.	Unlikely: No preferred habitat in the survey area.	Unlikely
Xenus cinereus (Terek sandpiper)	MI	MI			✓	✓	The Terek Sandpiper mostly forages in the open, on soft wet intertidal mudflats or in sheltered estuaries, embayments, harbours or lagoons. The species has also been recorded on islets, mudbanks, sandbanks and spits, and near mangroves and occasionally in samphire (*Halosarcia* spp.)	Unlikely: No preferred habitat in the survey area.	Unlikely
Reptiles									
Aipysurus apraefrontalis (Short-nosed Seasnake)	CR	CR		✓	✓	✓	The Short-nosed Seasnake is a fully aquatic, small, rather slender snake with a small head and pointed snout.	Unlikely: This species is aquatic; no aquatic habitat exists in the Survey Area.	Unlikely
Anilios splendidus (Splendid Blind Snake (North West Cape))			P2		✓	✓	Little known species recorded from shrubland on limestone with a thin veneer of sand.	Unlikely: Only recorded once in the Study Area, 25km from the Survey Area (1995).	Unlikely
Aprasia rostrata (Ningaloo worm lizard)			P3		✓	✓	Occupies a variety of sandy habitats including red and white sand dunes.	Likely: NR is 400m from the Survey Area (2008). Suitable habitat exists in the Survey Area.	Likely

Species	Conservation Status			Databases			Notes	Pre-survey Likelihood of Occurrence	Post-survey Likelihood of Occurrence
	EPBC Act	BC Act	DBCA	EPBC PMST	Nature Map	DBCA TFS			
Crenadactylus tuberculatus (Cape Range clawless gecko)			P2		✓	✓	Mainly associated with spinifex on limestone, can occur on coastal dunes.	Unlikely: Closest contemporary record is 8km from Survey Area (2008). Preferred habitat doesn't exist in Survey Area.	Unlikely
Diplodactylus capensis (Cape Range stone gecko)			P2		✓	✓	Restricted to the rocky northern end of Cape Range.	Unlikely: NR is 8.5km from Survey Area. Preferred habitat does not exist in Survey Area.	Unlikely
Lerista allochira (Cape Range Slider)			P3		✓	✓	Present in dissected limestone gorges and plateaux on North West Cape.	Unlikely: Suitable habitat does not exist in Survey Area.	Unlikely

Appendix 3. Relevé and Quadrat Data

Appendix 4. Survey Effort

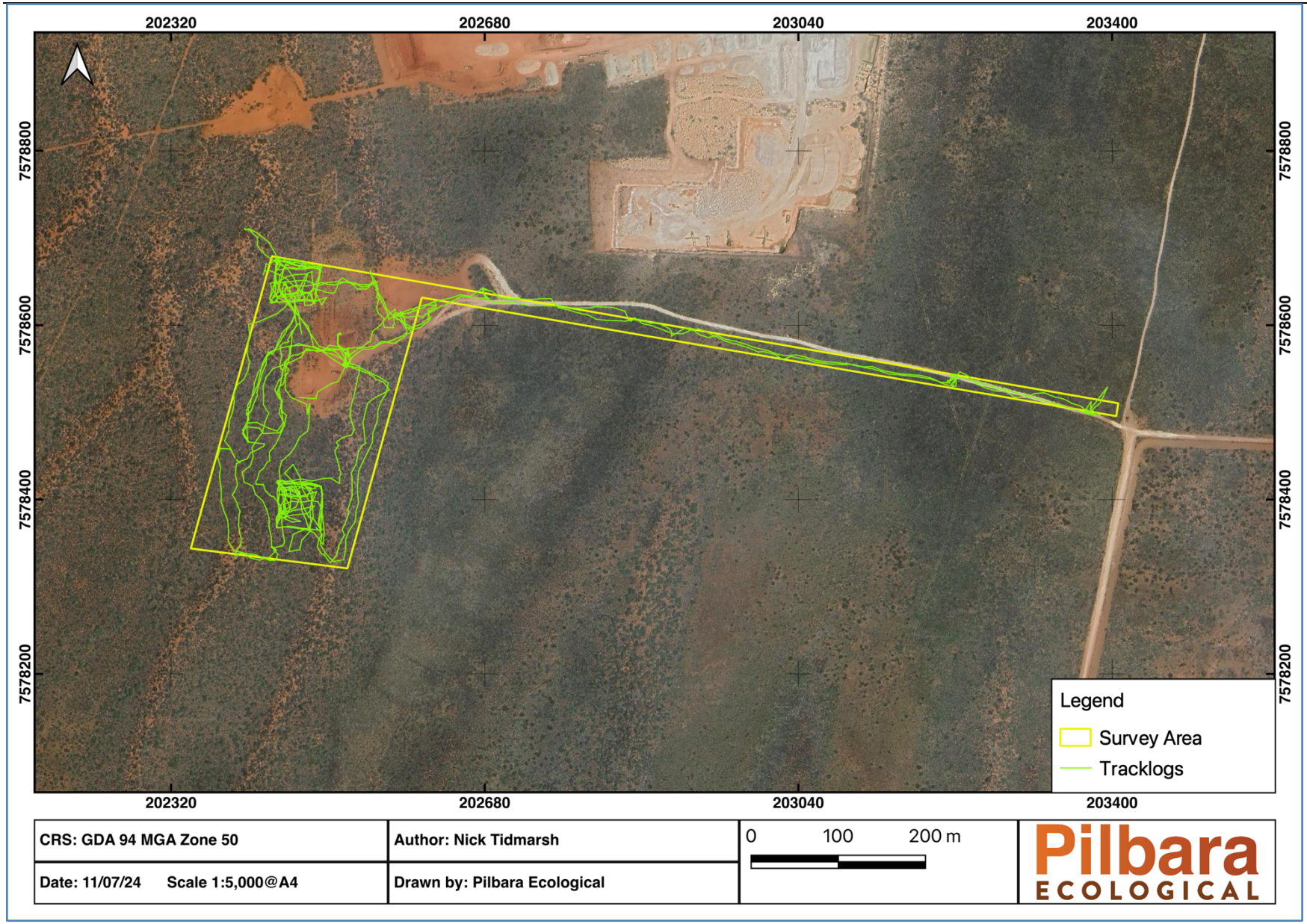

Figure 11 Survey Effort

Appendix 5. List of Flora Species Recorded During the Survey

Family	Species	Status
Aizoaceae	*Trianthema pilosum*	
Amaranthaceae	**Aerva javanica*	Weed
Amaranthaceae	*Ptilotus polystachyus*	
Asparagaceae	*Thysanotus exfimbriatus*	
Boraginaceae	*Euploca glandulifera*	
Boraginaceae	*Heliotropium crispatum*	
Boraginaceae	*Trichodesma zeylanicum* var. *indet.*	
Chenopodiaceae	*Enchylaena tomentosa*	
Chenopodiaceae	*Salsola australis*	
Convolvulaceae	*Ipomoea polymorpha*	
Convolvulaceae	*Polymeria lanata*	
Emblingiaceae	*Emblingia calceoliflora*	
Euphorbiaceae	*Euphorbia myrtoides*	
Euphorbiaceae	*Euphorbia tannensis* subsp. *eremophila*	
Fabaceae	*Acacia ?sericophylla*	
Fabaceae	*Acacia coriacea* subsp. *coriacea*	
Fabaceae	*Acacia gregorii*	
Fabaceae	*Acacia sclerosperma* subsp. *sclerosperma*	
Fabaceae	*Acacia spathulifolia*	
Fabaceae	*Acacia tetragonophylla*	
Fabaceae	*Daviesia pleurophylla*	P2
Fabaceae	*Indigofera boviperda* subsp. *boviperda*	
Fabaceae	*Senna artemisioides* subsp. *oligophylla*	
Fabaceae	*Senna notabilis*	
Fabaceae	*Tephrosia rosea* var. *clementii*	
Goodeniaceae	*Scaevola pulchella*	
Goodeniaceae	*Scaevola sericophylla*	
Gyrostemonaceae	*Gyrostemon ramulosus*	
Hemerocallidaceae	*Corynotheca pungens*	
Lamiaceae	*Quoya paniculata*	
Malvaceae	*Alyogyne pinoniana* var. *pinoniana*	
Malvaceae	*Corchorus ?elachocarpus*	
Malvaceae	*Seringia hermanniifolia*	
Malvaceae	*Sida ?arsiniata*	
Malvaceae	*Sida rohlenae* subsp. *rohlenae*	
Myrtaceae	*Corymbia zygophylla*	
Myrtaceae	*Verticordia forrestii*	
Olacaceae	*Olax aurantia*	
Oleaceae	*Jasminum didymum* subsp. *lineare*	
Poaceae	*Eriachne aristidea*	
Poaceae	*Eriachne helmsii*	
Poaceae	*Panicum australiense* var. *australiense*	
Poaceae	**Cenchrus ciliaris*	Weed

Family	Species	Status
Poaceae	**Cenchrus setiger*	Weed
Poaceae	*Aristida contorta*	
Poaceae	*Chrysopogon fallax*	
Poaceae	*Dactyloctenium radulans*	
Poaceae	*Paractaenum refractum*	
Poaceae	*Paspalidium clementii*	
Poaceae	*Setaria surgens*	
Poaceae	*Triodia ?angusta*	
Poaceae	*Triodia* sp. indet.	
Poaceae	*Urochloa holosericea* subsp. *velutina*	
Proteaceae	*Banksia ashbyi* subsp. *boreoscaia*	
Proteaceae	*Grevillea gordoniana*	
Proteaceae	*Grevillea stenobotrya*	
Santalaceae	*Exocarpos sparteus*	
Scrophulariaceae	*Eremophila ?forrestii*	
Solanaceae	*Solanum diversiflorum*	
Solanaceae	*Solanum lasiophyllum*	
Solanaceae	*Duboisia hopwoodii*	
Surianaceae	*Stylobasium spathulatum*	
Zygophyllaceae	*Tribulus macrocarpus*	

Appendix 6. Vegetation Type Mapping

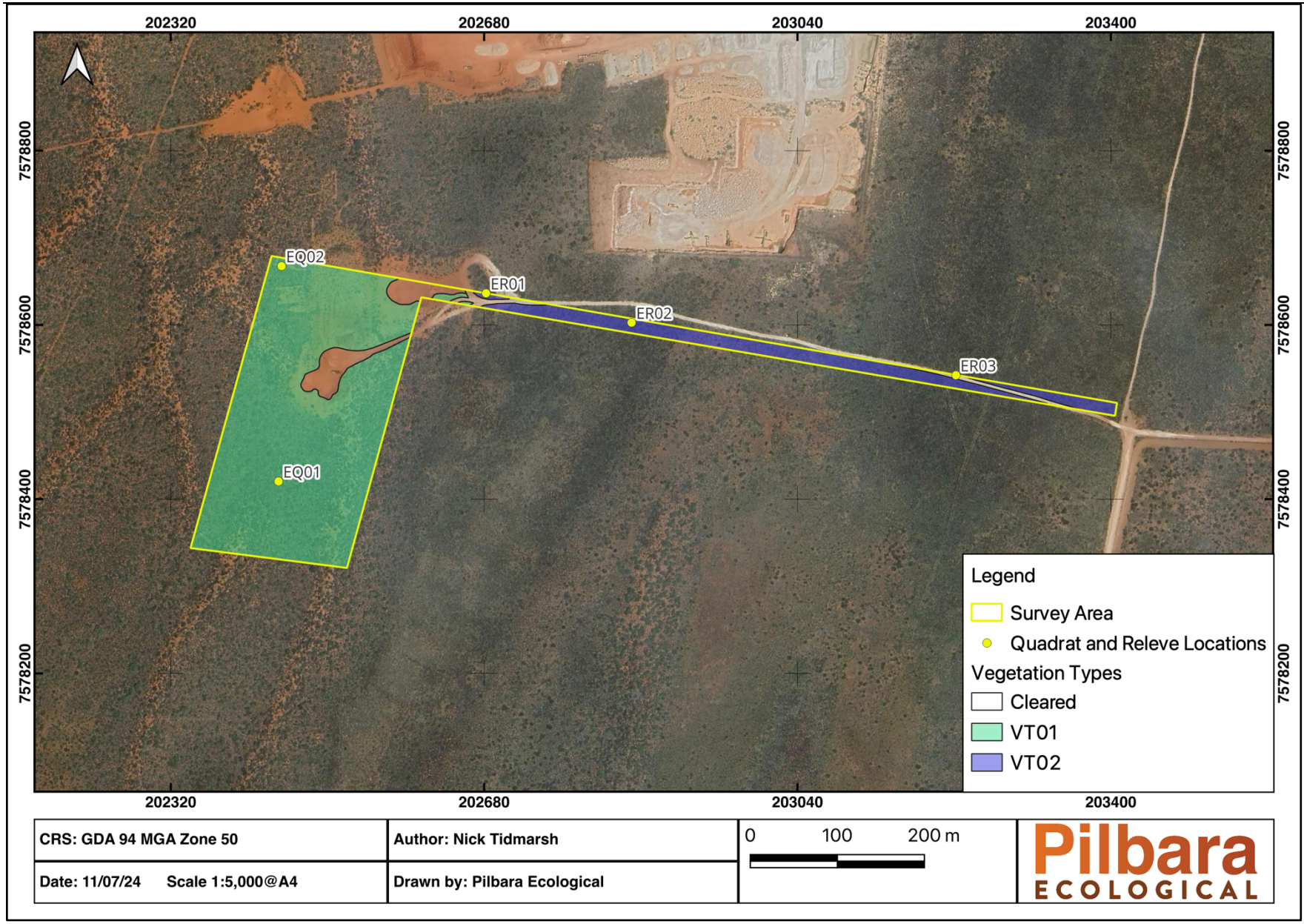

Figure 12 Vegetation Type Mapping

Appendix 7. Maps Showing Location of Significant Flora

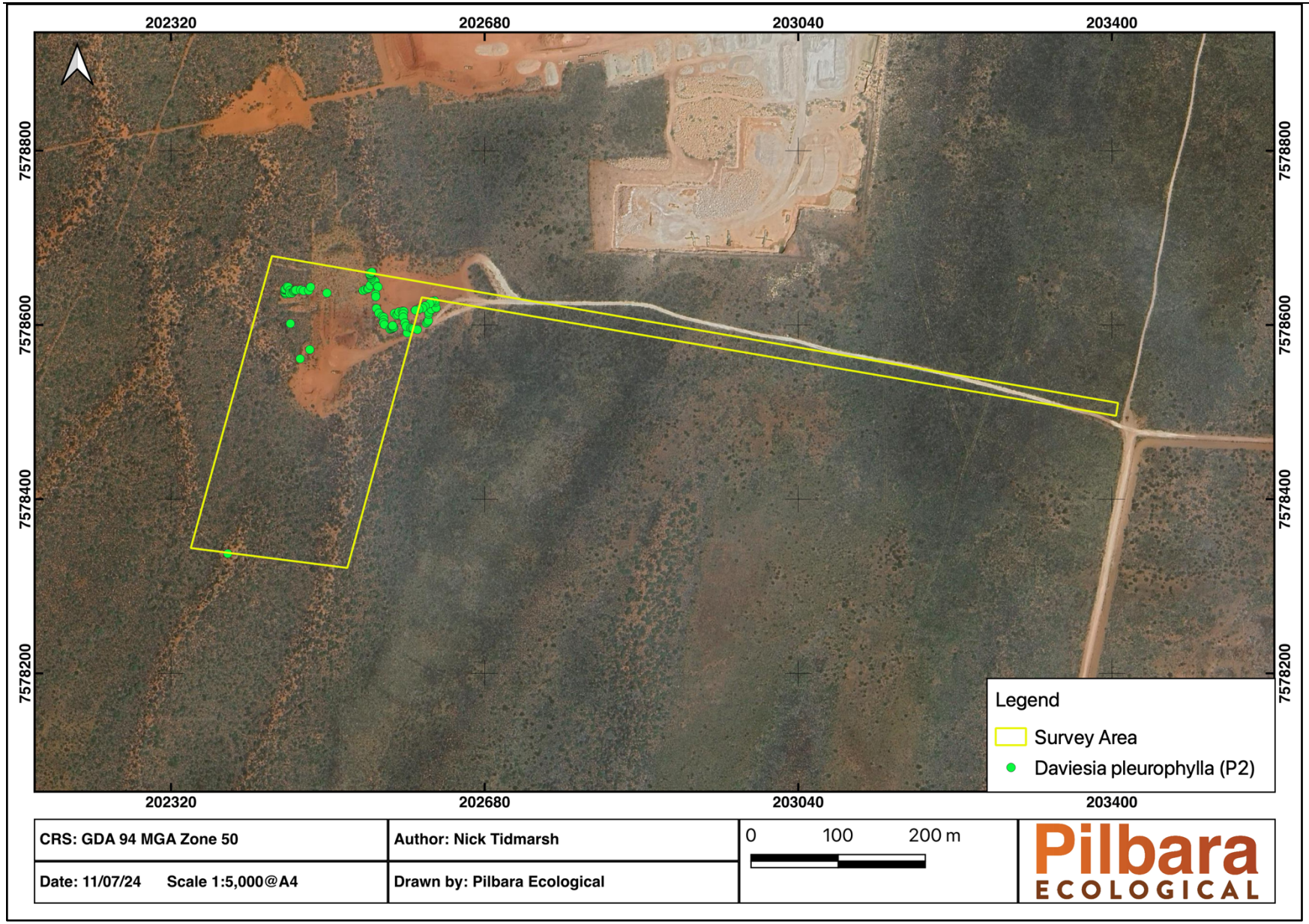

Figure 13 Location of Significant Flora

Appendix 8. Vegetation Condition Mapping

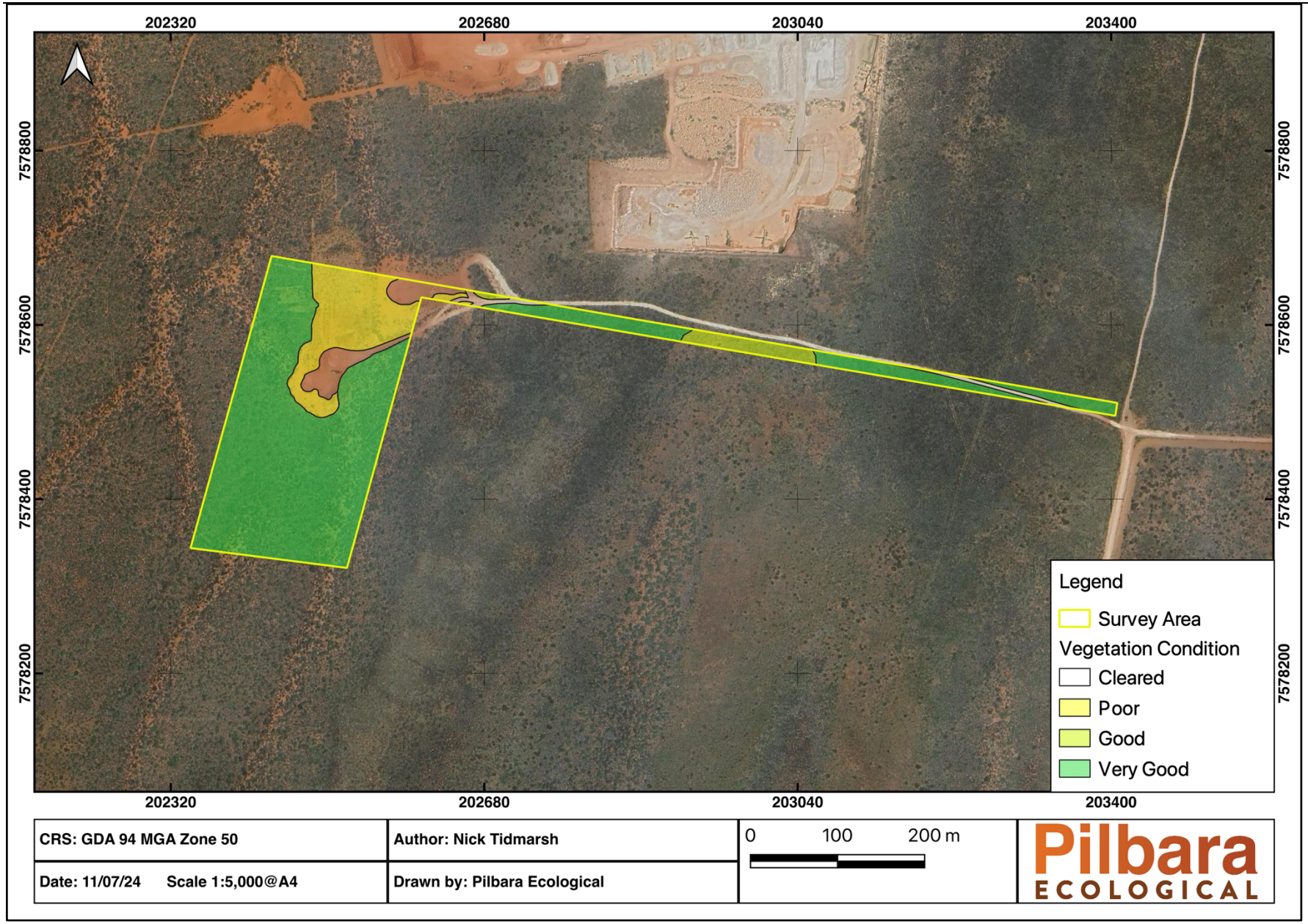

Figure 14 Vegetation Condition Mapping

Appendix 9. Fauna Habitat Mapping

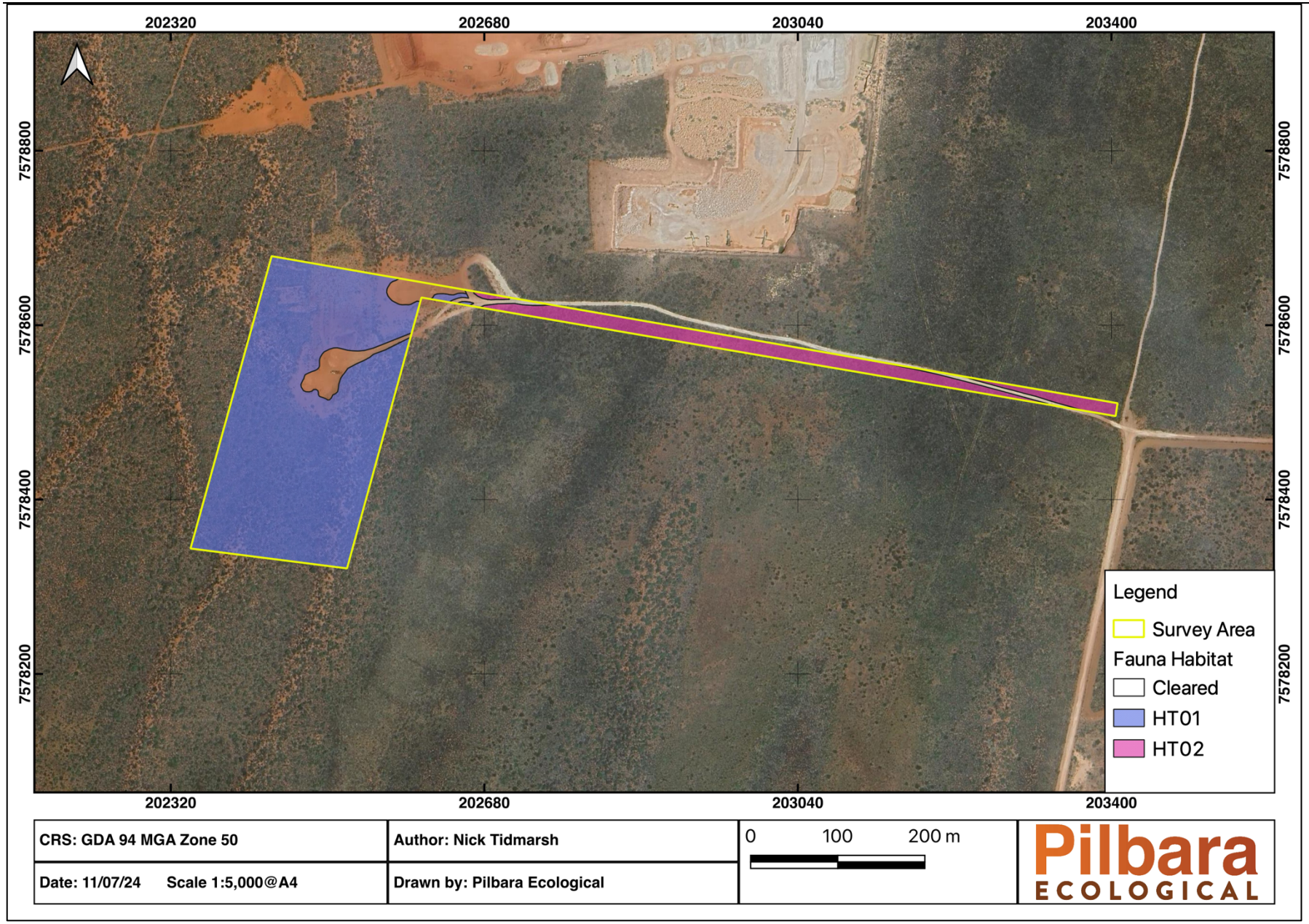

Figure 15 Fauna Habitat Mapping