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DE GREY MINING LTD

HEMI GOLD DEPOSIT
TURNER RIVER FLORA AND VEGETATION ASSESSMENT

Mallina Gold Project

FINAL

November 2024

HEMI GOLD DEPOSIT
TURNER RIVER FLORA AND VEGETATION ASSESSMENT

Mallina Gold Project

FINAL

Prepared by
Umwelt (Australia) Pty Limited
on behalf of
De Grey Mining Limited

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Definitions

Term	Definition
ALA	Atlas of Living Australia
BAM Act	*Biosecurity and Agriculture Management Act 2007* (WA)
BC Act	*Biodiversity Conservation Act 2016* (WA)
BC Regs	Biodiversity Conservation Regulations 2018 (WA)
BoM	Bureau of Meteorology
cm	Centimetres
DBCA	Department of Biodiversity, Conservation and Attractions
DCCEEW	Department of Climate Change, Energy, the Environment and Water
De Grey	De Grey Mining Limited
DEC	Department of Environment and Conservation (now DBCA)
Desktop Study Area	Area encompassing the Survey Area with a 50 km buffer. Used for the purposes of elements of the desktop assessment, including interrogation of databases and searches for relevant literature
DSO	Direct Shipping Ore
DTM	Digital Terrain Model
Ecoscape	Ecoscape (Australia) Pty Limited
Ecoscape Study Area	Study area surveyed by Ecoscape for the Ecoscape survey. Incorporates multiple tenement areas, including Hemi
Ecoscape Survey	Mallina Gold Project: Flora and Vegetation Survey (Ecoscape, 2021)
EIA	Environmental Impact Assessment
EP Act	*Environmental Protection Act 1986* (WA)
EPA	Environmental Protection Authority
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999 (Cth)*
GDA2020	Geocentric Datum of Australia 2020
GDE	Groundwater Dependent Ecosystem
GDV	Groundwater Dependent Vegetation
Geowater	Geowater Consulting Pty Limited
GIS	Geographic Information System
GPS	Global Positioning System
ha	Hectares
IBRA	Interim Biogeographic Regionalisation for Australia
IBSA	Index of Biodiversity Surveys for Assessments
INDVAL	Indicator taxon value, a measure of taxon fidelity to a given VT
IUCN	International Union for Conservation of Nature
km	Kilometres
listed	Pertaining to listed taxa or vegetation – those that are formally listed as conservation significant under the EPBC or BC Act, and/or by DBCA. Refer to **Section 3.9.1** and **Section 3.9.2**
m	Metres

Term	Definition
m^2	Metres squared
mm	Millimetres
MNES	Matters of National Environmental Significance
NT	Northern Territory
NVIS	National Vegetation Information System
P	Denotes a taxon listed as Priority 1 to 4 by DBCA
PCA	Principal Component Analysis
PEC	Priority Ecological Community, listed by DBCA (DEC, 2013)
Project, the	Hemi Gold Deposit
Significant flora	As defined in **Section 1.3** and **Section 3.9.1**
Significant vegetation	As defined in **Section 1.3** and **Section 3.9.2**
SPRAT	Species Profile and Threats database – a database produced by DCCEEW to enable identification of MNES listed under the EPBC Act within a given area
Survey Area	Area within which the flora and vegetation assessment was conducted, approximately 2,949 ha in size.
T	Denotes a taxon listed as Threatened under the BC and/or EPBC Acts
TEC	Threatened Ecological Community, listed under the BC and/or EPBC Acts
TPFL	Threatened and Priority Flora Database
TSSC	Threatened Species Scientific Committee
Umwelt	Umwelt (Australia) Pty Limited
UPGMA	Unweighted Pair Group Method with Arithmetic Mean
VSA	Vegetation System Association
VT	Vegetation Type
WA	Western Australia
WA Herbarium, WA Herb	Western Australian Herbarium
WoNS	Weeds of National Significance

Executive Summary

De Grey Mining Limited (De Grey) are the proponent of the Mallina Gold Project, located across a series of tenements within the Pilbara region of Western Australia (WA). De Grey is investigating the development of the Hemi Deposit and associated infrastructure (the Project), located approximately 85 km south of Port Hedland, between the Yule and Turner Rivers. Flora and vegetation surveys for the Hemi Gold Project have been undertaken in 2021 (Ecoscape, 2021), 2022 and 2024 (Umwelt, 2024). De Grey is proposing to dewater an alluvium aquifer as part of the Project, which may result in surplus water being discharged into the Turner River. Modelling of the maximum extent of the wetted front has been undertaken by De Grey, which indicates that the wetted front may extend up to approximately 43 km downstream from the proposed point of discharge. The majority of the modelled wetted front area has not been the subject of flora and vegetation surveys to date; the southern-most portion was the subject of surveys by Ecoscape (2021) and Umwelt (2024).

De Grey commissioned Umwelt in 2024 to undertake a flora and vegetation survey of the modelled wetted front area that has not been the subject of previous surveys by Ecoscape (2021)and Umwelt (2024), to the requirements of EPA Technical Guidance.

The flora and vegetation field survey of the Survey Area involved sampling via quadrats, opportunistic searching, survey via drones and regional quadrat assessment, with the field survey undertaken over a single visit from 29 April to 9 May 2024. A total of 15 non-permanent flora and vegetation survey quadrats (each sampling an area of 2,500 m^2) were established in the Survey Area, with an additional eight regional quadrats assessed (located north or south of the Survey Area in the Turner River and to the west in the Yule River).

A total of 117 discrete vascular flora taxa and one formally-named hybrid (as per WA Herbarium, 1998-) were recorded in the Survey Area by the survey, including eight introduced flora taxa. The taxa and hybrids represent 36 families and 72 genera. Two significant flora taxa occur in the Survey Area, being *Abutilon* sp. *Pritzelianum* (S. van Leeuwen 5095) (Priority 3 (P3)) and *Gymnanthera cunninghamii* (P3). It is considered likely that more *Gymnanthera cunninghamii* (P3) locations would be present in the Survey Area, based on the habitat present. The population of *Abutilon* sp. Pritzelianum (S. van Leeuwen 5095) (P3) within the Survey Area is likely to be a transient one, with nearby records of this taxon occurring in much higher densities, typically on sandy plain habitat.

One Vegetation Type (VT 16) was defined and mapped in the Survey Area. VT 16 is not considered to represent any formally listed Threatened Ecological Communities (TEC) or any other Priority Ecological Communities (PEC), nor is it considered to be significant for reasons other than formal listing. VT 16 is considered to represent riparian vegetation that is reliant on surface water, and based on the shallow depth to groundwater and presence of obligate phreatophytes, VT 16 is considered to represent groundwater dependant vegetation (GDV).

The vegetation in the Survey Area was rated and mapped as being a mosaic of 'Very Good/Good' condition, with disturbance associated with cattle grazing observed, and several relatively serious weeds recorded throughout the Survey Area. The variable condition of the vegetation was primarily related to the level of cattle usage and level of weeds present, with associated impacts fluctuating between slight impacts to vegetation composition and structure to displaying more obvious signs of impacts.

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1.0 Introduction

1.1 Project Overview

De Grey Mining Limited (De Grey) are the proponents of the Mallina Gold Project (MGP), located across a series of tenements over an east-west distance of approximately 120 kilometres (km), from just south of Whim Creek in the west to just south-east of Port Hedland in the east, within the Pilbara region of Western Australia (WA). De Grey are currently investigating the development of the Hemi Deposit and associated infrastructure as the Hemi Gold Project (the Project), located approximately 85 km south of Port Hedland, between the Yule and Turner Rivers. Flora and vegetation surveys for the Project have been undertaken in 2021 (Ecoscape, 2021), 2022 and 2024 (Umwelt, 2024).

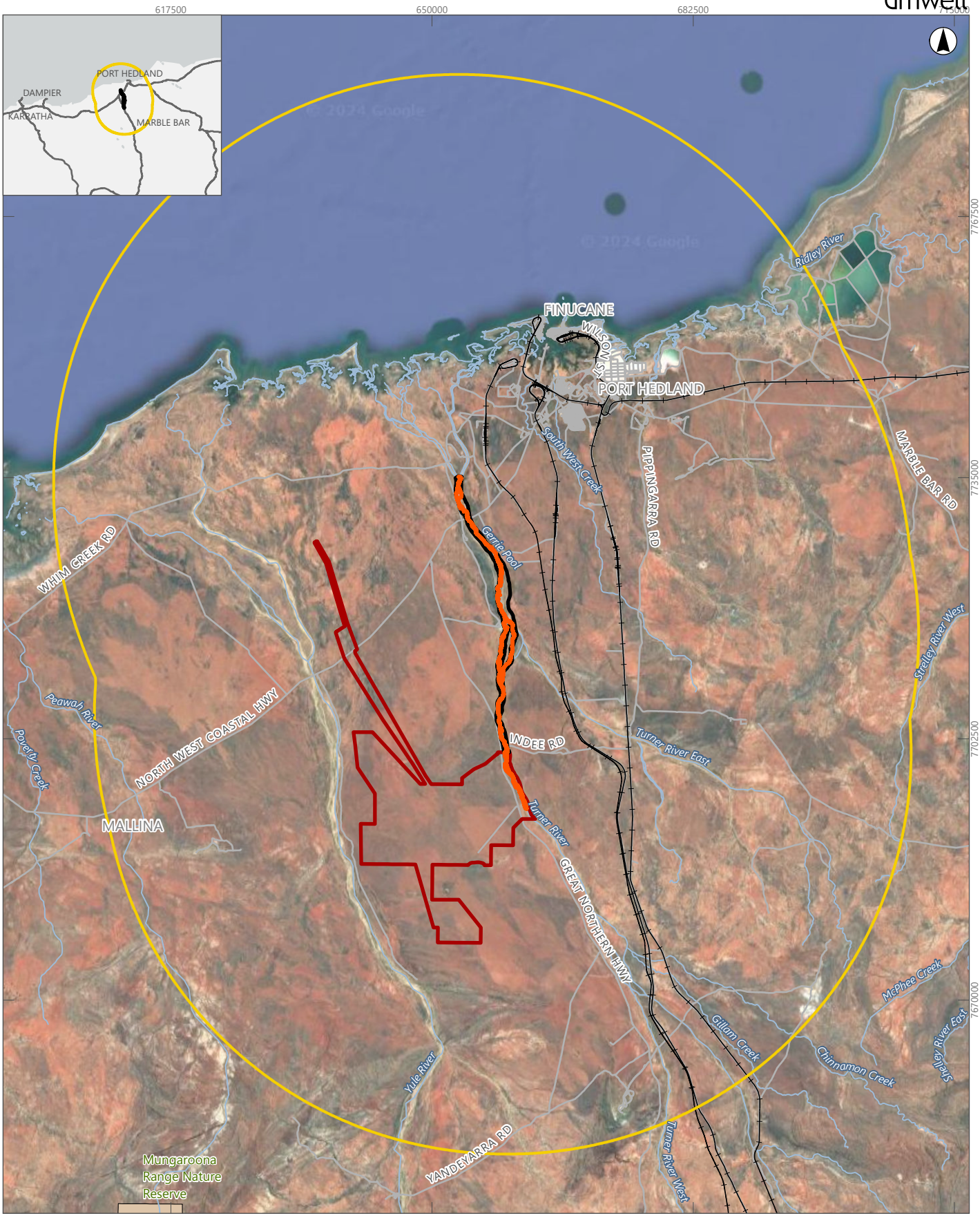
De Grey is proposing to dewater an alluvium aquifer as part of the Project, which may result in surplus water being discharged into the Turner River. Modelling of the maximum extent of the wetted front has been undertaken by De Grey, which indicates that the wetted front may extend up to approximately 43 km downstream from the proposed point of discharge. The majority of the modelled wetted front area has not been the subject of flora and vegetation surveys to date; although the southern-most portion was previously surveyed by Ecoscape (2021) and Umwelt (2024).

De Grey commissioned Umwelt in 2024 to undertake a flora and vegetation survey of the modelled wetted front area that has not been the subject of previous surveys by Ecoscape (2021) and Umwelt (2024), to the requirements of EPA Technical Guidance. This report documents the desktop assessment, methods and results of the wetted front area field survey of, building on the results of previous surveys for the Project by Ecoscape (2021)and Umwelt (2024).

1.2 Project Area Definitions

For the purposes of the flora and vegetation survey, a Survey Area has been defined as presented on **Figure 1.1**. The Survey Area is based on the modelled maximum wetted front; the modelled maximum wetted front is restricted to the channels of the Turner River from the proposed discharge point, downstream (north) for approximately 43 km. The Survey Area is approximately 2,949 hectares (ha) in size. The Survey Area does not include the very southern part of the modelled maximum wetted front (from the proposed discharge point north for approximately 7 km), which has been the subject of previous surveys by Ecoscape (2021) and Umwelt (2024); the area subject to these surveys is presented in **Figure 1.1**.

For the purposes of elements of the desktop assessment, including interrogation of databases and searches for relevant literature, a Desktop Study Area was defined. The Desktop Study Area encompasses the Survey Area with a 50 km buffer (**Figure 1.1**).



Scale: 1:650,000 at A4, GDA2020 MGA Zone 50

Legend

- Desktop Study Area
- Survey Area
- Modelled Maximum Wetted Front
- Hemi Gold Project Flora and Vegetation Survey Area (Umwelt 2024)
- Road
- Major Watercourse
- Nature Reserve

FIGURE 1.1

Survey Area Location

0 13 26

Kilometres

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Image Source: Landgate (2023) | **Data Source:** Landgate (2023), DBCA (2024), Umwelt (2023)

1.3 Aims and Objectives

The primary aim of this assessment was to characterise the flora and vegetation values of the Survey Area to the current regulatory standard.

The overall objectives of the assessment were to:

- Compile an inventory of vascular flora taxa that occur in the Survey Area.
- Record the following taxa (hereafter referred to as significant flora taxa) identified as occurring or potentially occurring within the Survey Area:
    - Listed Threatened species (T) under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) (Commonwealth).
    - Threatened flora (T) under the *Biodiversity Conservation Act 2016* (BC Act) (WA).
    - Priority flora taxa (P) as classified by the WA Department of Biodiversity, Conservation and Attractions (DBCA).
    - Other significant flora taxa as defined by EPA (2016a, 2016b).
- Record Weeds of National Significance (WoNS), or Declared Pests under the *Biosecurity and Agriculture Management Act 2007* (BAM Act).
- Identify, map and describe Vegetation Types (VTs) that occur within the Survey Area.
- Identify potential groundwater dependent vegetation (GDV) and groundwater dependent ecosystems (GDEs) in the Survey Area.
- Identify, map and describe vegetation that occurs within the Survey Area that is one of the following (hereafter referred to as significant vegetation), to provide context for EIA:
    - Listed Threatened Ecological Communities (TECs) under the EPBC Act.
    - TECs as classified by DBCA and endorsed by the WA Minister for the Environment.
    - Priority Ecological Communities (PECs) as classified by DBCA.
    - Other significant vegetation as defined by EPA (2016a, 2016b).
- Map the condition of the vegetation in accordance with EPA (2016b).

The survey and reporting works comply with the following documents:

- *Environmental Factor Guideline – Flora and Vegetation* (EPA, 2016a).
- *Technical Guidance – Flora and Vegetation Surveys for Environmental Impact Assessment* (EPA, 2016b).

1.4 Level of Assessment

The flora and vegetation survey of the Survey Area involved a Detailed Survey as defined in Section 4.3 of the *Technical Guidance for Flora and Vegetation Surveys for Environmental Impact Assessment* (EPA, 2016b). This is considered appropriate for the Survey Area, which is located in an area (the Pilbara) that is known to support a moderate diversity of flora and vegetation relative to other areas of the state, including significant flora taxa and vegetation types (EPA, 2016b).

As discussed in **Section 1.1**, this survey builds on the results of previous surveys undertaken by Ecoscape (2021) and Umwelt (2024) for the Project (**Section 5.1.3**).

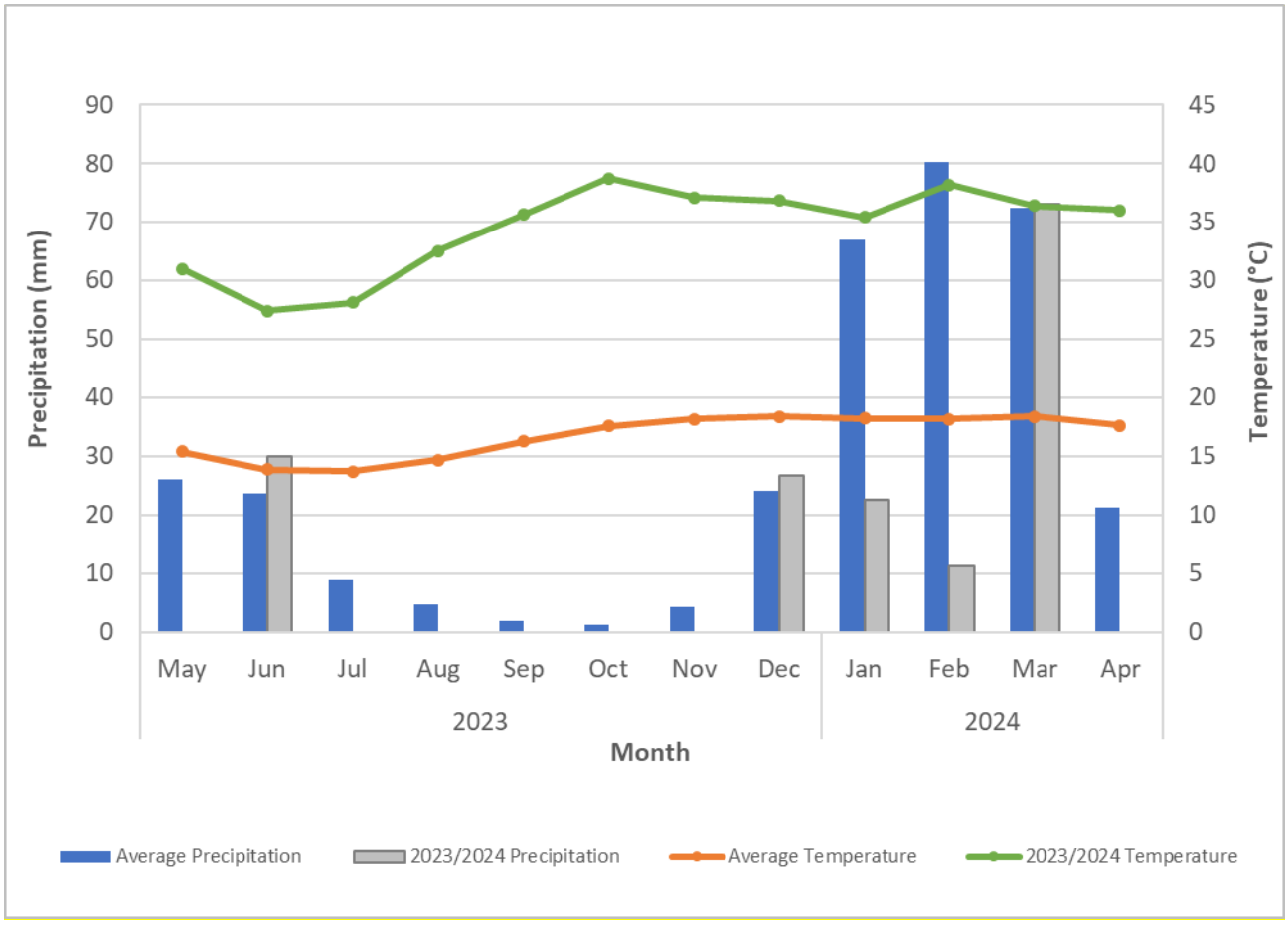
2.0 Background

2.1 Climate

The Survey Area is located in the Pilbara region (Fortescue Botanical District) as defined by Beard (1975, 2015). The climate of the Pilbara Bioregion is classified as arid (semi-desert) tropical, with precipitation received primarily over the summer months. Average annual precipitation is 250–300 millimetres (mm); this is generally slightly higher than most of the Eremaean Province of WA due to the influence of relatively frequent tropical cyclones that occur from November to April (Beard, 2015; BoM, 2024a).

Graph 2.1 displays monthly precipitation and monthly maximum temperature statistics for 2023 and 2024, as well as long-term average monthly maximum temperature and monthly precipitation data recorded at the Bureau of Meteorology (BoM) stations at Indee (precipitation) (station number 4016, data from 1909 to May 2024), and Port Hedland Airport (temperature) (station number 4032, data from 1942 to July 2024) (BoM, 2024a). These stations represent the most relevant meteorological stations to the Survey Area with long-term climate data, with Indee station being located approximately 6.5 km to the east and Port Hedland Airport station approximately 20 km to the north-east (note that Indee Station does not record temperature data).

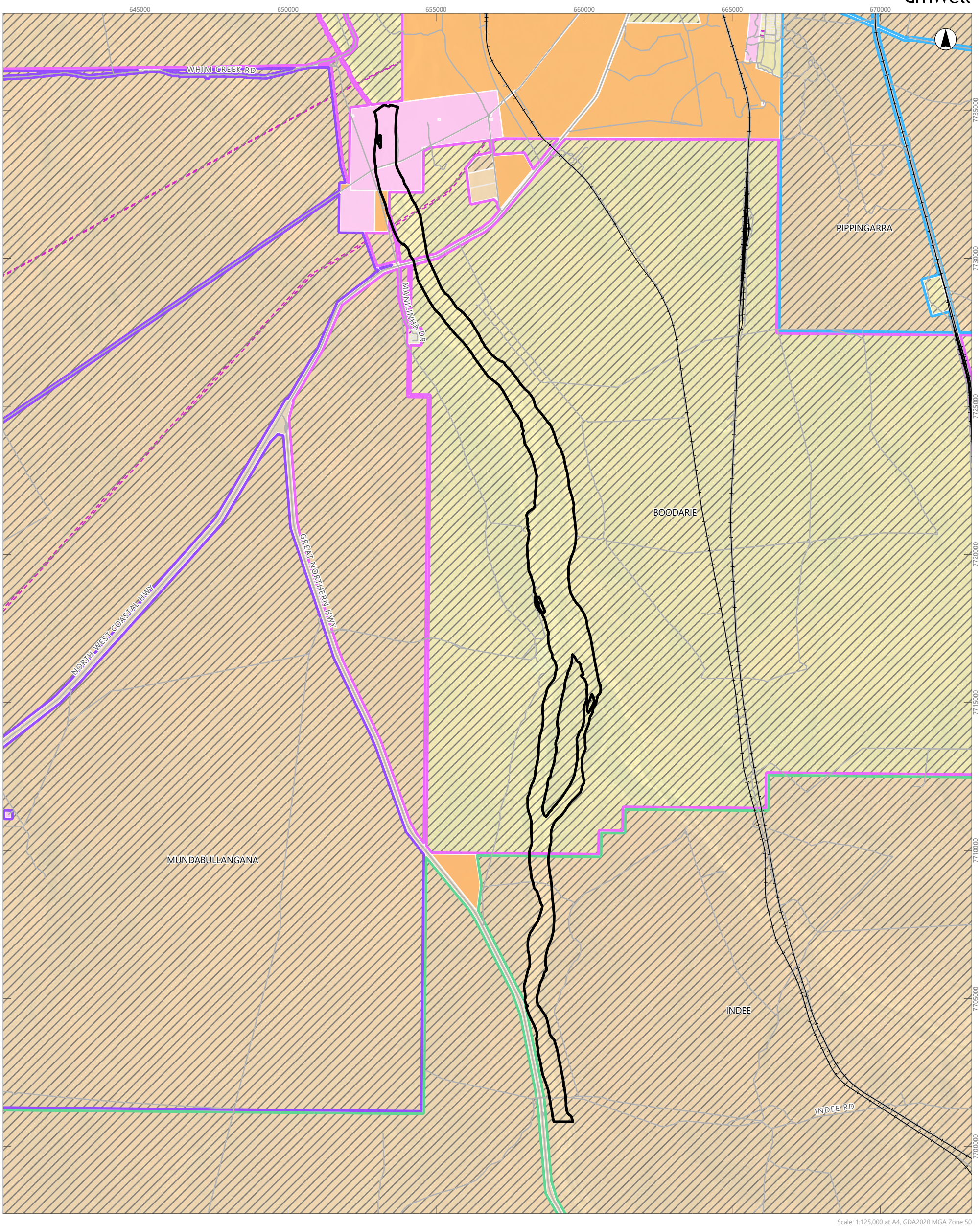
Long-term average monthly maximum temperatures at Port Hedland Airport peak from December to March (36.3 °C to 36.8 °C), and long-term average monthly precipitation peaks from January to March (a total of 219.7 mm received over this period on average at Indee Station) (**Graph 2.1**). The precipitation received at Indee Station in the six months preceding the start of the 2024 field survey (i.e. October 2023 to March 2024) (133.7 mm) was below the long-term average for this period (**Graph 2.1**). Temperatures at Port Hedland Airport were above average for the six months preceding the 2024 field survey (October 2023 to March 2024) (37.1 °C prior to the 2024 survey, compared to the long-term average of 36.3 °C) (**Graph 2.1**).



Graph 2.1 Climate Statistics for Indee Station (Precipitation) and Port Hedland Airport (Temperature) (BoM, 2024a)

2.2 Land Tenure

The Survey Area is primarily located on Boodarie and Indee pastoral stations, with smaller portions on crown reserve, unallocated crown land and road reserves, as presented on **Figure 2.1**. The nearest DBCA reserved land, Mungaroona Range Nature Reserve, is located approximately 65 km south-southwest of the Survey Area (DBCA, 2024a) as shown on **Figure 1.1**.



Scale: 1:125,000 at A4, GDA2020 MGA Zone 50

Legend

- Survey Area
- Railway
- Road
- Easements
- Other Interests
- Crown Lease
- Crown Reserve
- Public Road
- Unallocated Crown Land; Closed Road
- Crown Allotment (Type 2)
- Lot on Survey (Type 1)

Pastoral Station

- Boodarie
- Indee
- Mundabullangana
- Pippingarra

FIGURE 2.1

Land Tenure of the Survey Area

0 2.5 5

Kilometres

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3.0 Methods

3.1 Desktop Assessment Methods

Prior to commencement of the field surveys, a review of the most recent publicly available flora and vegetation data relevant to the Survey Area was undertaken. This included obtaining and reviewing copies of reports of previous biological surveys carried out within the Survey Area or within the vicinity of the Survey Area (where available), and interrogation of relevant databases and other sources as listed in **Table 3.1**. Where TECs or PECs were identified by the desktop assessment, appropriate nomination/listing descriptions and recovery plans of the TEC or PEC were also reviewed prior to field survey, as well as the 'Methods for survey and identification of Western Australian threatened ecological communities' report by the DBCA (2023c).

Table 3.1 Searches Undertaken for the Desktop Assessment of the Survey Area

Source	Search Attributes	Search Purpose
Department of Climate Change, Energy, the Environment and Water (DCCEEW)) Species Profile and Threats (SPRAT) Database (interrogated using the Protected Matters Search Tool) (DCCEEW, 2024)	Database interrogated using a 50 km buffer on the Desktop Study Area boundary	Identify Matters of National Environmental Significance (MNES), including Threatened flora and TECs listed under the EPBC Act, that occur or have the potential to occur within the Desktop Study Area
DBCA Threatened Ecological Community (TEC) and Priority Ecological Community (PEC) Database (DBCA, 2022a)	Database interrogated by in 2022 using Desktop Study Area boundary	Obtain records of DBCA-classified TECs and/or DBCA-classified PECs within or in proximity to the Survey Area
DBCA TEC and PEC records spatial data (DBCA-038) (DBCA, 2024c)	Review of mapped DBCA TECs and PECs within or in proximity to the Desktop Study Area	Identify whether there are any DBCA-classified TECs or PECs that could occur within the Desktop Study Area
DBCA TEC and PEC lists (DBCA, 2023d, 2023e)	Manual review of current DBCA TECs and PECs listed for the Pilbara region.	Identify whether there are any additional DBCA listed TECs or PECs that could occur within the Desktop Study Area
DBCA Significant Flora Databases (WA Herbarium specimen database and Threatened and Priority Flora (TPFL) database) (DBCA, 2022b)	Database interrogated in 2022 using Desktop Study Area boundary	Obtain records of listed significant flora within or in proximity to the Survey Area
IBSA database (DWER, 2024)	Database interrogated using approximate Desktop Study Area boundary (exact boundary cannot be used) in 2024	Obtain copies of reports and associated spatial data (where available) to identify records of significant flora and vegetation and introduced flora in the vicinity of the Survey Area
2018 Statewide Vegetation Statistics incorporating the CAR Reserve Analysis (DBCA, 2019) (Report 3b)	Survey Area	Identify extent of Vegetation System Associations within the Survey Area

3.2 Personnel and Licensing

Table 3.2 lists the personnel involved in fieldwork, plant identifications, and report preparation for the flora and vegetation assessment. The Project Manager has considerable previous experience (> 15 years), and botanist leading the survey has previous experience (> 5 years), in conducting flora and vegetation surveys in the Pilbara. Other personnel have previous experience in assisting with flora and vegetation surveys in the region.

All plant material was collected under the relevant *Flora Taking (Biological Assessment) Licence* (under Regulation 62 of the Biodiversity Conservation Regulations 2018 (BC Regs)) and *Authorisation to Take or Disturb Threatened Species* (pursuant to Section 40 of the BC Act) as outlined in **Table 3.2**. Personnel managing plant identifications have had extensive previous experience (> 15 years) in plant identifications of flora of the Pilbara and checked plant identifications undertaken by less experienced personnel for accuracy.

Table 3.2 Personnel and Licensing Information

Personnel and Qualifications	Experience	Flora Collecting Licence/Permit	Role
David Coultas BSc (Environmental Biology) (Hons)	> 15 years	FB62000051-2 TFL 131-2122	Project Management Plant identifications (including review of identifications undertaken by less experienced staff)
Marco Pratissoli PostGrad. Dip. Sc. (Environmental Biology and Management)	6 years	FB62000057-2 TFL-2425-0035	Field survey (field team leader)
Jaroslav Hruban Mgr (Ecological and Evolutionary Biology)	4 years	FB62000251-3 TFL044-2122	Field survey (field team leader) Plant identifications
Diana Barrie BSc (Agricultural Science & Conservation Biology)	3 years	FB62000443-2 TFL 2223-0143	Field survey
Georgia Johnsen BSc (Marine Biology & Conservation Biology)	2 years	FB62000470 TFL 2223-0137	Field survey
Bethea Loudon BSc (Biology)	>15 years	FB62000049-2 TFL 140-2122	Plant identifications

3.3 Aerial Photography Interpretation and Survey Design

The design of the 2024 field survey complies with the requirements of EPA Technical Guidance (EPA, 2016b) and is consistent with the methods used for other similar flora and vegetation assessments conducted within the vicinity of the Survey Area (**Section 5.1.3**) and the wider Pilbara Bioregion.

Initial interpretation of ortho-rectified aerial photography at a scale of 1:10,000 was conducted to determine preliminary vegetation patterns present within the Survey Area (including areas of restricted or unusual landforms and types). This review considered the size of vegetated areas and visible vegetation patterns. Quadrat locations were proposed to ensure that a minimum of three quadrats sampled each major discernible vegetation pattern where possible; for smaller patterns, fewer quadrats were allocated based on the size of the pattern, while for widespread vegetation patterns, quadrats were allocated across their geographic range.

In addition, data specifically associated with the Turner River from the adjacent Ecoscape and Umwelt surveys (Ecoscape, 2021; Umwelt, 2024) was reviewed as part of the desktop assessment to inform survey design (**Section 5.1.3**).

3.4 Field Survey Methods

3.4.1 Survey Timing and Access

The flora and vegetation field survey was undertaken over a single site visit from 29 April to 9 May 2024.

The timing of the field survey was selected to coincide with what is considered to be the most appropriate time to survey in the Pilbara Bioregion; as per EPA Technical Guidance (2016b), this is approximately six to eight weeks post wet season (generally March to June) as most of the taxa in this region flower at this time. This includes the majority of significant taxa that potentially occur in the Survey Area (see **Section 5.1.4**).

The Survey Area was accessed by vehicle using existing access tracks/drill lines and via foot traverses. In addition, drones were utilised to verify vegetation types in parts of the Turner River which were not feasibly accessible by vehicle or on foot (see **Section 3.4.4**). Appropriate landholder/manager permissions were obtained prior to undertaking the field survey.

3.4.2 Sample Sites

A total of 15 non-permanent flora and vegetation survey quadrats were established and assessed in the Survey Area during the field survey. In addition, eight regional quadrats were established outside the Survey Area during the survey, including four quadrats within the Turner River and four quadrats within the Yule River (west of the Turner River).

The quadrat size utilised for the flora and vegetation survey of the Survey Area is the indicative size for flora and vegetation surveys in the Pilbara region, as outlined in Table 1 of the EPA Technical Guidance (EPA, 2016b). All quadrats encompassed a total area of 2,500 metres squared (m^2), and measured 50 m × 50 m. Quadrat boundaries were demarcated using handheld Global Positioning System (GPS) units and surveying tape measures. Quadrat locations were selected to ensure that at least three quadrats sampled each vegetation pattern initially identified from aerial photography interpretation, where possible (as per **Section 3.3**) and to ensure spatial coverage over the length of the Survey Area. Vegetation boundaries or transition zones were avoided. Additional quadrats were established in areas that were not identified by the initial aerial photography interpretation but were observed in the field to differ from pre-identified areas, or areas of unusual habitat.

The final quadrat locations were adjusted from the initial proposed locations where:

- variations in floristic patterning were observed, including placing additional quadrats in areas of unusual habitat;
- the vegetation had been obviously recently disturbed;
- the vegetation had been recently burnt (< 2 years) (where possible); or
- access or safety issues were encountered.

All vascular flora taxa (native and introduced) that were visually identifiable within each quadrat were recorded. At least one reference specimen of most taxa encountered (excluding common, distinctive taxa) was collected for verification and identification purposes (see **Section 3.5**).

The following information was recorded at each quadrat:

- personnel
- unique quadrat number
- survey date
- GPS coordinates at all four corners of the quadrat (recorded using handheld GPS units) (Geocentric Datum of Australia 1994 (GDA94), Zone 50)
- size and dimensions of quadrat
- site photograph, taken diagonally into quadrat from start corner
- compass bearing for two sides of quadrat that commence at start corner of quadrat
- topography (including landform type and slope class)
- soil colour and type (including the presence of any rock outcropping and surface stones)
- vegetation condition (as per EPA Technical Guidance (EPA, 2016b) for the Eremaean and Northern Provinces; scale presented in **Appendix A**) and a description of disturbances (where relevant)
- approximate time since fire
- foliage cover (%) (for each taxon, native and introduced, including cover within the quadrat of individuals rooted outside of the quadrat)
- height (m) (average for each taxon, native and introduced, excluding climbers/aerial shrubs)
- additional flora taxa present immediately outside of the quadrat.

3.4.3 Opportunistic Survey

Significant flora taxa, WoNS, Declared Pests, additional flora taxa not previously recorded and occurrences of significant vegetation were opportunistically recorded while traversing the Survey Area during the survey.

All significant taxa and vegetation identified by the desktop assessment as potentially occurring within the Survey Area were considered to be identifiable during the survey, and therefore all such taxa and vegetation were opportunistically recorded (**Section 5.1.4**). Information relating to identifying characteristics, flowering period and habitat of these taxa, and relating to dominant taxa, soil and landform characteristics for significant vegetation, was provided to all field team members prior to undertaking the field survey.

The following information was recorded where significant flora taxa, significant vegetation, WoNS and/or Declared Pests were encountered:

- Significant flora – location (including GPS coordinates and datum, recorded using handheld GPS units), taxon and count of any significant flora encountered at location within a radius of approximately 25 m from GPS coordinates.
- Significant vegetation – location (including GPS coordinates and datum, recorded using handheld GPS units), community name and extent of any significant vegetation encountered within a radius of approximately 25 m from GPS coordinates.
- WoNS and/or Declared Pests – comments on habitat, including landform and soils, vegetation condition, description of disturbances and any apparent correlation between vegetation and landform features, as necessary.

All traverses made during field survey are mapped as track logs on **Figure 3.1**, along with quadrat locations.

3.4.4 Drone Survey

Prior to the field survey, inspection of aerial photography indicated that there were some parts of the Survey Area which were not feasibly accessible by vehicle or on foot. Consequently, drones were utilised to verify vegetation types in these parts of the Survey Area. Both footage (videos) and still images were recorded. The images and videos were then utilised to verify the vegetation present including dominant taxa, landforms and other characteristics (e.g. inundation). Drone flight paths were recorded while video footage was being taken only. A selection of photos recorded by the drones are presented as photo point locations (D01 – D12) in **Appendix B**. Flight paths and photo point locations are presented in **Figure 3.1**.

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652000 654000 656000 658000 660000

7736000 7734000 7732000 7730000 7728000 7726000

WHIM CREEK RD

WMP03 WMP04

TURNER RIVER

DGJ06 DGJ07

WMP05

GREAT NORTHERN HWY

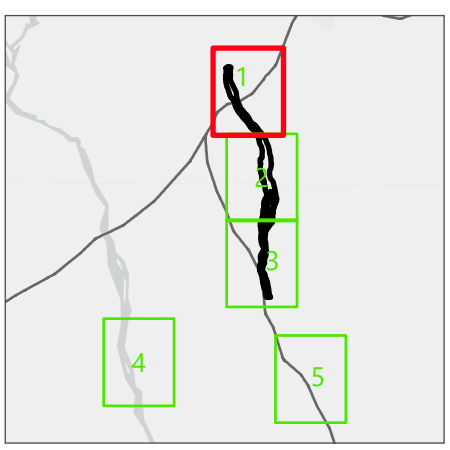
MANILINHA DR

DGJ09 DGJ08

D12 D11 D09 D10

Legend

- Survey Area
- Railway
- Road
- Watercourse
- Survey Track Logs
- Drone Flight Path
- Survey Area Quadrat
- Regional Quadrat
- Drone Photo Point Location



Scale: 1:40,000 at A4, GDA2020 MGA Zone 50

FIGURE 3.1

Track Logs and Sample Sites in the Survey Area (Sheet 1)

0 0.8 1.6

Kilometres

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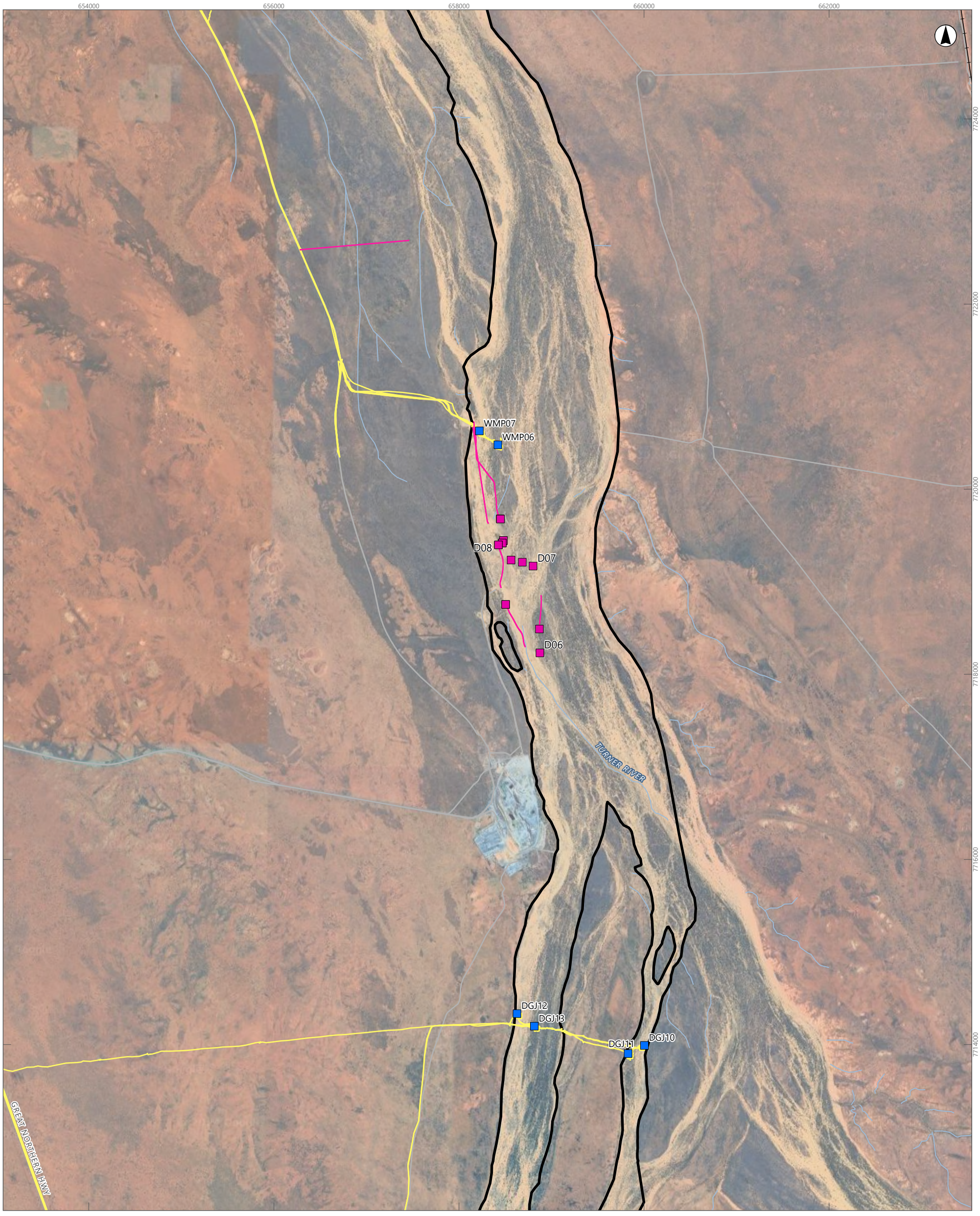
Image Source: Landgate (2023) | **Data Source:** Landgate (2024), Umwelt (2024)



Scale: 1:40,000 at A4, GDA2020 MGA Zone 50

Legend

- Survey Area
- Railway
- Road
- Watercourse
- Survey Track Logs
- Drone Flight Path
- Survey Area Quadrat
- Drone Photo Point Location

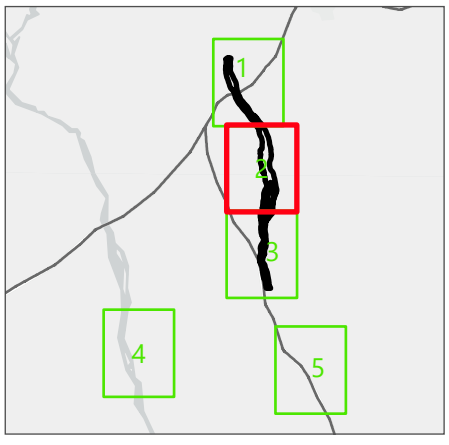


FIGURE 3.1

Track Logs and Sample Sites in the Survey Area (Sheet 2)

0 0.8 1.6

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654000 656000 658000 660000 662000

7712000 7710000 7708000 7706000 7704000 7702000 7700000

D05 D04 D03 D02 D01

DGJ02 DGJ03

WMP02 WFMP01

GREAT NORTHERN HWY

INDEE RD

Scale: 1:40,000 at A4, GDA2020 MGA Zone 50

Legend

- Survey Area
- Road
- Watercourse
- Survey Track Logs
- Drone Flight Path
- Survey Area Quadrat
- Drone Photo Point Location

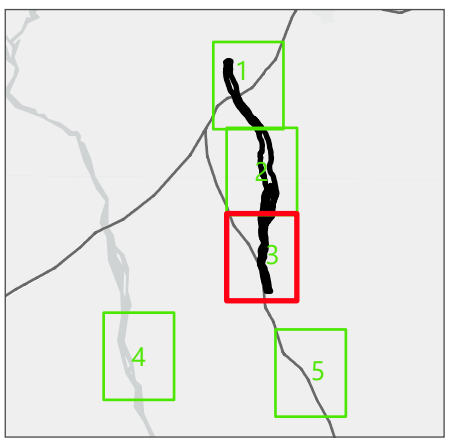

FIGURE 3.1

Track Logs and Sample Sites in the Survey Area (Sheet 3)

0 0.8 1.6

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636000 638000 640000 642000 644000

7696000 7694000 7692000 7690000 7688000 7686000

WE019

WMP13

WE021

DGJ01

YULE RIVER

Scale: 1:40,000 at A4, GDA2020 MGA Zone 50

Legend

- Road
- Watercourse
- Survey Track Logs
- Drone Flight Path
- Regional Quadrat

FIGURE 3.1

Track Logs and Sample Sites in the Survey Area (Sheet 4)

0 0.8 1.6

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Image Source: Landgate (2023) | **Data Source:** Landgate (2024), Umwelt (2024)

Scale: 1:40,000 at A4, GDA2020 MGA Zone 50

Legend

- Road
- Watercourse
- Survey Track Logs
- Drone Flight Path
- Regional Quadrat

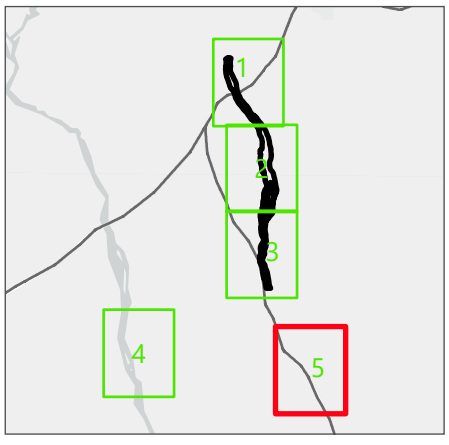

FIGURE 3.1

Track Logs and Sample Sites in the Survey Area (Sheet 5)

0 0.8 1.6

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3.5 Plant Collection and Identification

Specimens of any unknown flora taxa encountered during the field survey were collected and pressed as per Western Australian Herbarium (WA Herbarium) guidelines (WA Herbarium, 2020). Plant identifications were undertaken at the WA Herbarium and were overseen by a Principal Botanist with extensive previous experience (> 15 years) in identifications of the flora of the Pilbara (**Section 3.2**). The identification of all flora taxa (including significant taxa) used the most up to date information available, including taxonomic keys published in books, journals and online, comparison with herbarium specimens, and consultation with taxonomic experts. External experts of particular families or genera were consulted for any specimens considered to be difficult to identify or of taxonomic interest, including botanists at the WA Herbarium.

Taxon nomenclature generally follows Florabase (WA Herbarium, 1998-), with all names checked against the current DBCA Max database to ensure their validity. However, in cases where names of plant taxa have been published recently in scientific literature but have not yet been adopted on Florabase due to time constraints, nomenclature in the published literature is followed. The conservation status of each taxon was checked against Florabase, which provides the most up-to-date information regarding the conservation status of flora taxa in WA.

As per section 7.2 of EPA Technical Guidance (EPA, 2016b), specimens of interest, including significant flora taxa, taxa representing range extensions, potential new taxa, and key species in new occurrences of TECs and PECs, will be sent to the WA Herbarium for consideration for vouchering as soon as practicable. However, this process is via donation, and the WA Herbarium may not voucher all specimens, in accordance with its own requirements. The specimen vouchering will be supported by completed Threatened and Priority Flora Report Forms submitted to DBCA (Species and Communities Branch) in the case of listed significant flora (i.e. Threatened and Priority flora taxa).

3.6 Floristic Classification Analysis

Floristic classification analysis included quadrat data from the current survey, as well as quadrats located outside the Survey Area (located to the west and south of the Survey Area) as listed below. Overall, the analysis included a total of 315 quadrats to inform the definition of VTs in the Survey Area.

- 15 quadrats established within the Survey Area by the current survey
- 8 regional quadrats established in the Yule and Turner Rivers by the current survey
- 175 quadrats established for the Hemi Gold Deposit Project in 2022 by Umwelt (2024)
- 16 regional quadrats established for the Hemi Gold Deposit Project in 2024 by Umwelt (2024)
- 80 quadrats established in 2021 by Ecoscape (2021) located within the Hemi Gold Deposit Survey Area, including 48 quadrats that were revisited by Umwelt in 2022
- 21 quadrats established in 2010 for the Mount Dove project established by Woodman Environmental (2011), including 14 that were revisited in 2022 by Umwelt (2024).

Data from all historical quadrats was reviewed thoroughly for taxonomic currency (both in a nomenclature and conceptual context), with nomenclature updated where required.

The floristic classification analysis was undertaken by a botanist with considerable previous experience (> 8 years) in undertaking and interpreting floristic analysis results and was reviewed by a botanist with extensive previous experience (> 15 years) in Pilbara floristic classifications.

Taxa belonging to the below categories were removed prior to the classification analysis:

- Annual/ephemeral taxa – the presence of annual or ephemeral taxa is strongly influenced by seasonal conditions, and these taxa can be variably distributed across an area even after above-average rainfall. Furthermore, the presence of many annual or ephemeral taxa is linked to fire history, with greater taxa and individuals present in the first one or two years since fire. Therefore, if fire history is variable across an area, it may result in quadrat clustering being influenced by time since fire.
- Introduced taxa – introduced taxa were removed as their distributions are often defined by the presence of disturbance (e.g. clearing, animal movement) rather than natural ecological drivers (Umwelt field observations). Vegetation type must be determined independently of vegetation condition for the purposes of EIA; therefore, including weeds in the classification analysis may result in quadrat clustering being influenced by condition (presence/absence of introduced species) rather than native taxon presence/absence.
- Hybrids – hybrids are usually the result of random reproductive events that produce small numbers (often only one) of sterile offspring and are often not associated with particular habitat types.
- Taxa where identification was unclear – taxa were removed from the analysis where identification was unclear due to poor available material in the field. However, if such a taxon was known to be unique within the dataset (i.e. although not identifiable to species level, there was enough material to indicate it representing a unique taxon), and the taxon had multiple records in the dataset, it was included in the analysis.
- Singletons – taxa that occur only once in the dataset were removed, as published studies indicate that they provide little information in the dataset (e.g. Markey & Dillon (2008)).

All taxa removed from the classification analysis (excluding taxa belonging to the above-mentioned categories) are presented in **Appendix C**. Also presented in **Appendix C** are taxa that were amalgamated in the classification analysis; this was done, for example, where different infra-taxa could not be consistently positively identified at all quadrats due to inadequate material.

The final dataset contained 184 taxa following the removal and/or amalgamation of the above-mentioned taxa.

Prior to undertaking agglomerative hierarchical clustering, a principal components analysis (PCA) using R Statistical Software (R Core Team, 2022) was undertaken on a single-layer data matrix consisting of presence/absence species data. Two analyses were then undertaken to determine the optimal number of clusters, with the minimum of these two metrics being considered to capture the majority of variation in the quadrat data:

- The point where the principal components contribute 5% of the standard deviation and the principal components cumulatively contribute 90% of the standard deviation.
- The point where the percent change in variation between consecutive principal components is less than 0.1%.

The same presence-absence data matrix was then used in the classification analysis, with the classification and ordination analysis of the data matrix undertaken using the 'vegan' (Oksanen et al., 2020) and 'cluster' (Maechler et al., 2021) R packages using R Statistical Software (R Core Team, 2022). The Bray-Curtis coefficient was used to generate an association matrix for the classification analysis. This association matrix consisted of pairwise coefficients of similarities between quadrats based on floristic data. Agglomerative hierarchical clustering, using flexible Unweighted Pair Group Method with Arithmetic Mean (UPGMA) (ß = - 0.1), was used to generate a quadrat classification dendrogram using the 'factoextra' R package (Kassambara & Mundt, 2020).

In addition to the dendrogram, a cluster plot was generated using the 'factoextra' R package (Kassambara & Mundt, 2020). Prior to generating the cluster plot, PCA was performed to reduce the number of dimensions such that the data can be represented by clusters in a two-dimensional space. The data was then plotted according to the first two principal components that explain the majority of the variance in the dataset. This plot was utilised to assist in determining the feasibility of clusters and quadrat placement in the dendrogram.

3.7 Vegetation Type Definition, Mapping and Description

The classification analysis of the Survey Area floristic data aggregated quadrats and taxa into clusters according to the optimal number of cluster analysis (**Section 3.6**). The resulting dendrogram and taxon group matrix were initially examined at this level to determine the plausibility of groups with regard to taxon groups, in combination with field observations. This process determined a final number of groups, which were considered to represent VTs.

VT descriptions have been adapted from the National Vegetation Information System (NVIS) Australian Vegetation Attribute Manual Version 6.0 (ESCAVI, 2003), as stipulated by EPA Technical Guidance (EPA, 2016b). This model follows nationally-agreed guidelines to describe and represent VTs, so that comparable and consistent data are produced nation-wide. It should be noted that the NVIS system utilises vegetation descriptions derived from structural characteristics of the individual community units, while VTs presented in this report are defined based on the results of a floristic classification analysis, excluding any structural data. Such VTs therefore may include multiple structural types. Considering the effect of disturbance factors such as fire on vegetation structure, this approach is designed to provide a map of VTs that reflect taxon composition and the influences of the physical and chemical environment, rather than disturbance history.

It should also be noted that this report describes VTs at the NVIS Sub-Association level, rather than the Association level as recommended by EPA (2016b). This level is considered more appropriate for the vegetation of the Survey Area, as often the vegetation possessed one or more additional strata to the traditional three-stratum classification system used at the Association level.

For each VT, indicator taxa were defined via Indicator Taxon Analysis. This was conducted using PC-Ord (V6.08) (McCune & Mefford, 2011) via the method of Dufrêne and Legendre (1997). This generates indicator values (INDVAL) (a measure of taxon fidelity to a given VT) that range from 0 to 100; an INDVAL of 100 indicates that a taxon is present in all quadrats within a particular VT, and absent from all other quadrats included in the analysis. The INDVAL scores were then tested for significance of the indicator taxa using a Monte Carlo permutation test. Indicator taxa were defined as taxa with a significance *p* value of either < 0.05, < 0.01 or < 0.001. The same taxa amalgamations (as per **Appendix C**) and exclusions (i.e. annuals/ephemerals, introduced taxa, hybrids and singletons) were employed for the indicator species analysis as per the floristic classification analysis (**Section 3.6**).

Locations of quadrats within each VT were used in conjunction with aerial photograph interpretation and field notes taken during the field survey to develop VT mapping polygon boundaries. Mapping boundaries were developed using aerial photography on a scale of 1:10,000 and reflected changes in vegetation patterns visible at this scale. The VT mapping polygon boundaries were then digitised using Geographic Information System (GIS) software.

3.8 Vegetation Condition Mapping

Vegetation condition was described using the vegetation condition scale presented in EPA (2016b) for the Eremaean and Northern Botanical Provinces (as per **Appendix A**). Notes on vegetation condition were taken during the field survey during foot traverses undertaken within the Survey Area. Vegetation condition was also recorded at all quadrats. Vegetation condition category polygon boundaries were developed using this information in conjunction with introduced flora taxa location data and were digitised using GIS software as for VT polygon boundaries.

3.9 Significant Flora and Vegetation Definitions

3.9.1 Significant Flora Taxa

As per EPA definitions (EPA, 2016a, 2016b), flora taxa may be significant for a range of reasons, including, but not limited to the following:

- being identified as a Threatened or Priority species (formally listed significant taxa – includes taxa listed under both State and Commonwealth legislation, and classified as Priority by DBCA)
- being locally endemic or associated with a restricted habitat type (e.g. surface water or groundwater dependent ecosystems (GDEs))
- being a new species or having anomalous features that indicate a potential new species
- being representative of the range of a species (particularly at the extremes of range, recently discovered range extensions, or isolated outliers of the main range)
- being an unusual species, including restricted subspecies, varieties or naturally occurring hybrids
- having a relictual status, being representative of taxonomic groups that no longer occur widely in the broader landscape.

Significant flora taxa recorded within the Survey Area are discussed in **Section 5.2.2** with reference to the above categories. Data including point locations and individuals of significant flora taxa known from the Survey Area are also presented in this section.

DBCA (2020) presents conservation codes for DBCA-listed taxa. Further information about Commonwealth conservation categories is provided in Threatened Species Scientific Committee's (TSSC) 'Guidelines for assessing the conservation status of native species according to the *Environment Protection and Biodiversity Conservation Act 1999* and Environment Protection and Biodiversity Conservation Regulations 2000' (TSSC, 2021).

3.9.2 Significant Vegetation

As per EPA definitions (EPA, 2016a, 2016b), vegetation may be significant for a range of reasons, including, but not limited to the following:

- being identified as a TEC or PEC (formally listed significant vegetation – includes vegetation listed under Commonwealth or State legislation, or classified as a PEC by DBCA)
- having restricted distribution
- having a degree of historical impact from threatening processes
- playing a role as a refuge
- providing an important function required to maintain ecological integrity of a significant ecosystem.

To determine the presence of TECs and PECs defined from quadrat-derived data, EPA Technical Guidance (EPA, 2016b) requires comparison of the quadrat data with that of the survey in which the TEC or PEC was originally described. However, limited information is available for TECs and PECs of the Pilbara region. Generally, only broad descriptions are provided in the respective TEC and PEC lists to allow for diagnosis. The vegetation of the Survey Area was therefore manually compared to such descriptions to determine whether any vegetation may represent a TEC or PEC; specifically, comparisons of dominant taxa, soils, topography and geographical distribution of VTs were made to those of any relevant TEC or PEC. A similar process was followed for TECs listed under the EPBC Act, with comparisons made to the appropriate listing and conservation advice for any TECs likely to occur in the Survey Area.

The remaining significant vegetation criteria other than "being identified as a TEC and PEC" were applied to VTs mapped in the Survey Area to determine whether a VT was significant in a local or regional context. However, in a regional context, limited information is available for comparison with VTs in the Survey Area. This is discussed further in **Section 5.2.10**.

Definitions, categories and criteria for WA TECs and PECs are presented by the DBCA (2023a). Further information about Commonwealth conservation categories is provided in TSSC's 'Guidelines for nominating and assessing the eligibility for listing of ecological communities as threatened according to the *Environment Protection and Biodiversity Conservation Act 1999* and the EPBC Regulations 2000' (TSSC, 2017).

4.0 Adequacy and Limitations of Survey

4.1 Adequacy of Survey

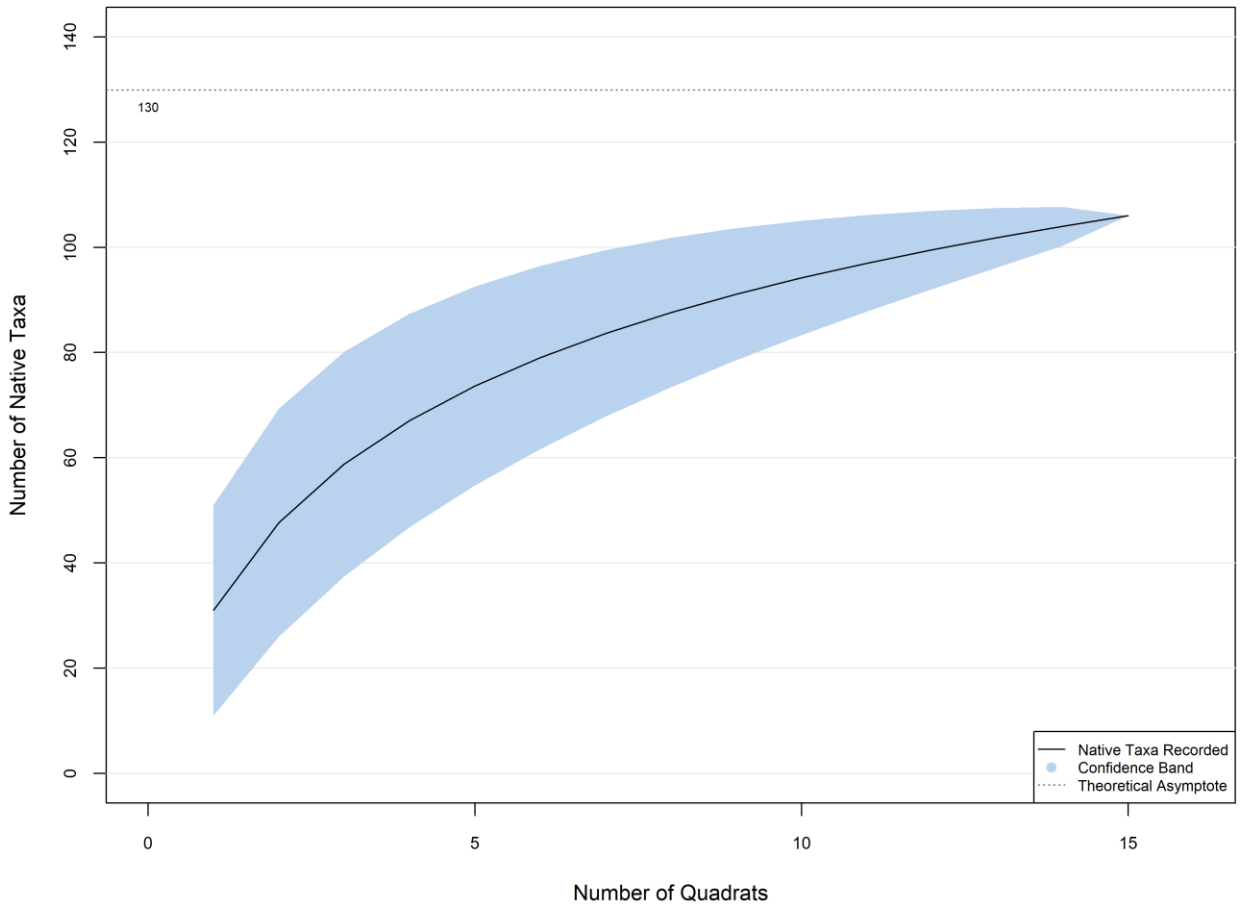
The Survey Area of 2,949 ha had 15 quadrats established within it during the 2024 field survey. Quadrats were established in all preliminary vegetation patterns discernible by initial aerial photograph interpretation (**Section 3.3** and **Section 3.4.2**), both to adequately sample variation in vegetation throughout the Survey Area and to ensure adequacy of sampling for vascular plant taxa.

One quadrat was established per approximately 197 ha of Survey Area; this is considered to be acceptable given the low diversity of topography, soil types and preliminary vegetation types noted in the Survey Area. Drones were used to observe vegetation present in the Survey Area which could not be physically accessed by field personnel (as outlined in **Section 3.4.3**).

To provide an indication of the adequacy of this survey, a taxon accumulation curve was produced with the 'vegan' R package (Oksanen et al., 2020) using R Statistical Software (R Core Team, 2022). Taxon accumulation curves represent a theoretical model of the relationship between sampling intensity and taxon accumulation; when sampling intensity is increased, taxon accumulation is reduced, and the taxon accumulation curve becomes asymptotic.

The taxon accumulation curve for quadrat data in the Survey Area was generated using all native taxa (both annual and perennial) recorded within each quadrat. Taxon accumulation calculations were then undertaken using the 'SpadeR' R package (Chao et al., 2016), utilising the Chao-2 estimator for species richness (bias corrected form) (Chao, 1987) and compared to the actual number of taxa recorded in the Survey Area. This provides an indication as to whether sufficient quadrats were surveyed to adequately sample the species richness in the Survey Area. As the generation of taxon accumulation curves includes quadrat data only, and not opportunistically recorded taxa, the indication of adequacy of survey is considered to be conservative.

Graph 4.1 presents the taxon accumulation curve generated from quadrat data from the Survey Area. Using the Chao-2 estimator, the recorded number of taxa within quadrats (106 taxa) is equivalent to 81.6% of the estimated taxon richness in the Survey Area, indicating that the Survey Area was adequately sampled.



Graph 4.1 Survey Area Quadrat Data Taxon Accumulation Curve

Another adequacy of survey measure is that developed by Mueller-Dombois & Ellenberg (1974), who suggest that a cut-off point might be when a 10% increase in quadrats surveyed results in a ≤ 5% increase in taxa recorded. This measure was also calculated using all native flora taxa recorded within each quadrat. The number of quadrats established by the field survey satisfies this adequacy measure, with the final taxon increase value of 2.7% recorded following a 10% increase in quadrats.

4.2 Limitations of Survey

Table 4.1 presents the limitations of the 2024 flora and vegetation assessment of the Survey Area in accordance with EPA Technical Guidance (EPA, 2016b).

Table 4.1 Limitations of the Flora and Vegetation Survey

Limitation	Determination	Comment
Effort and extent	Potential minor limitation	A Detailed Survey was undertaken across the entire Survey Area. Fifteen quadrats were established in the Survey Area. The number of quadrats is considered adequate to characterise the flora and vegetation of the Survey Area, with over three quadrats allocated to each vegetation pattern identified pre-survey. Furthermore, given the relatively low diversity of topography and soil types noted in the Survey Area, combined with the use of drones to observe the vegetation in areas in the Survey Area which could not be physically accessed by field personnel, it is considered that the vegetation was well sampled. Adequacy of survey measures indicated that the Survey Area was adequately sampled. For the most part, no constraints prevented appropriate sampling techniques (quadrat establishment, foot traverses) being employed. However, some parts of the Survey Area were not feasibly accessible by vehicle or on foot, with limited access points to the Survey Area. This was partly overcome by the use of drones to observe vegetation in these parts of the Survey Area. Although this limited survey via quadrats to some extent, data reliability is still considered to be relatively high.
Competency / experience of the team carrying out the survey	Not a limitation	The Project Manager had > 15 years' experience conducting similar assessments in the Pilbara Region and conducting systematic sampling and analysis. Other field team leaders had previous experience (> 4 years) in conducting flora and vegetation surveys in the Pilbara Region, and field team personnel had previous experience assisting in flora and vegetation surveys in the Pilbara Region. Senior personnel provided guidance to less experienced botanists throughout the survey where necessary. Information relating to identifying characteristics, flowering period and habitat of significant flora taxa identified by the desktop assessment as potentially occurring in the Survey Area was provided to all field team members prior to undertaking the 2024 field survey, and all field personnel observed in situ locations of significant flora taxa known to occur in the Survey Area prior to surveys commencing. Personnel overseeing plant identifications have > 15 years' experience in plant identification in flora of the Pilbara Region. Relevant taxonomic experts (including botanists at the WA Herbarium) were consulted for any specimens considered to be difficult to identify or of taxonomic interest.
Proportion of flora recorded and/or collected and identified	Not a limitation	The field survey was conducted in April / May, within the period generally considered to be the ideal time to survey in the Pilbara Region. All vascular groups that were present in the Survey Area were sampled. At least one reference specimen of all taxa encountered (excluding common, distinctive taxa) was collected for verification and identification purposes during the 2024 field survey. All unknown vascular taxa were collected, and almost all flora taxa could be positively identified. A very small number of specimens could not be identified to species level due to inadequate material; however, none of these are considered likely to represent significant taxa. Adequacy of survey measures indicated that the Survey Area was adequately sampled.

Limitation	Determination	Comment
Sources of information e.g. previously available information (whether historic or recent) as distinct from new data	Not a limitation	Reasonable contextual information for the Survey Area was available prior to the 2024 field survey. Sources of information used included government databases (DCCEEW, DBCA) and numerous general sources pertaining to the climate, geomorphology, flora and vegetation of the Pilbara Region, all of which were considered to have high reliability. Previous reports and data from the vicinity of the Survey Area as summarised in **Section 5.1.3** were also considered to be generally reliable unless where stated. This includes the survey reports for the wider Hemi Gold Project, undertaken in 2021 (Ecoscape, 2021) and 2024 (Umwelt, 2024). Review of BoM climate data for Indee and Port Hedland Airport stations revealed a small number of gaps in the daily datasets for temperature and precipitation; however, this data was used in an indicative manner only.
Survey timing and weather/season/cycle	Potential minor limitation	The survey period was conducted within what is considered to be the most appropriate time to survey in the Pilbara Bioregion. As discussed above, all significant flora taxa identified during the desktop assessment were considered to be identifiable during the field survey. The rainfall received prior to the 2024 targeted field survey was below the long-term average. As a result, the abundance of ephemeral taxa was relatively low, although the vast majority of annual taxa were considered to be detectable but were present in lower frequencies than would normally be expected. All perennial taxa, including all perennial significant taxa known or potentially occurring in the Survey Area, were in a condition suitable for identification.
Disturbances (e.g. fire, flood, accidental human intervention etc.) that may have affected results of survey	Not a limitation	The Survey Area has been subject to cattle grazing and associated spread of weeds (see **Section 5.2.12**); however, this is not considered to have impacted the results of the survey. No recent fires were observed within the Survey Area, with the DBCA fire history dataset (DBCA, 2023b) indicating that the most recent fire within the Survey Area was in 2014.
Remoteness and/or access restrictions	Potential minor limitation	Prior to the survey, it was identified that some parts of the Survey Area were not feasibly accessible by vehicle or on foot, with aerial photography indicating that there were limited access points to the Survey Area. As a result, drones were utilised to observe vegetation types in parts of the Survey Area which were not feasibly accessible. The use of drones was useful in aiding verification of the VTs present. However, it is possible that additional flora taxa would have been recorded if quadrat establishment and opportunistic survey had been undertaken in such areas.

5.0 Results

5.1 Desktop Assessment

5.1.1 Regional Significant Flora

The interrogation of the DBCA WA Herbarium (WA Herb) specimen database and TPFL database search undertaken in 2022 (DBCA, 2022b) identified a total of 18 taxa with records within the Desktop Study Area. With the exception of *Seringia exastia* (Threatened – EPBC Act only) (discussed further below), all taxa returned from the DBCA database interrogations are DBCA-classified Priority flora. Note that *Eragrostis crateriformis* and *Goodenia nuda* (previously P3 and P4 respectively) were returned by the 2022 database searches; however, these taxa have since been removed from the Priority flora list by DBCA, and are therefore not discussed further in a conservation significance context. There were no taxa returned from the DBCA WA Herbarium and TPFL database interrogations which had records within the Survey Area itself.

Table 5.1 Listed Significant Flora Taxa Returned from DBCA Database Searches

Taxon	Status (WA)	Source	
		WA Herb	TPFL
***Abutilon* sp. Pritzelianum (S. van Leeuwen 5095)**	P3	x	x
Bulbostylis burbidgeae	P4	x	x
Euphorbia clementii	P3	x	x
Euploca mutica	P3	x	
Gomphrena cucullata	P3	x	x
Gomphrena leptophylla	P3	x	
Gomphrena pusilla	P2	x	
Gymnanthera cunninghamii	P3	x	x
Nicotiana umbratica	P3	x	
Ptilotus mollis	P4	x	x
Rothia indica* subsp. *australis	P3	x	
Seringia exastia	T*	x	
***Sida* sp. Barlee Range (S. van Leeuwen 1642)**	P3	x	
Stylidium weeliwolli	P3	x	
***Tephrosia rosea* var. Port Hedland (A.S. George 1114)**	P1	x	
Terminalia supranitifolia	P3	x	
Triodia chichesterensis	P3	x	
Vigna triodiophila	P3	x	

* *Seringia exastia* is no longer listed as Threatened under the WA BC Act, but remains listed under the Commonwealth EPBC Act.

Source: DBCA (2022a).

The interrogation of the DCCEEW SPRAT database for MNES listed under the EPBC Act, did not identify any flora taxa listed as Threatened Species under the EPBC Act, or habitat for such species, that are known, are likely to, or may occur within the Desktop Study Area. The full results of DCCEEW database search are presented in **Appendix D**.

5.1.2 Regional Vegetation

The Survey Area is located in the Pilbara Interim Biogeographic Regionalisation for Australia (IBRA) region, on the junction of the Roebourne and Chichester subregions (DCCEEW, 2023). The Chichester subregion is comprised of undulating Archaean granite and basalt plains with significant areas of basaltic ranges. Plains support a shrub steppe characterised by *Acacia inaequilatera* over *Triodia wiseana* hummock grasslands, while *Eucalyptus leucophloia* tree steppes occur on ranges. The climate of the Chichester subregion is semi-desert-tropical and receives 300 mm of rainfall annually. Drainage occurs to the north via numerous rivers including De Grey, Oakover, Nullagine, Shaw, Yule and Sherlock (Kendrick & McKenzie, 2001).
The Roebourne subregion is comprised of Quaternary alluvial and older colluvial coastal and sub-coastal plains with a grass savannah of mixed bunch and hummock grasses, and dwarf shrub steppe of *Acacia stellaticeps* or *Acacia pyrifolia* and *Acacia inaequilatera*. Uplands are dominated by Triodia hummock grasslands. Ephemeral drainage lines support *Eucalyptus victrix* or *Corymbia hamersleyana* woodlands. The climate of the Roebourne subregion is arid (semi-desert) tropical with highly variable rainfall, falling mainly in summer. Cyclonic activity is significant, with several systems affecting the coast and hinterland annually (Kendrick & Stanley, 2001).

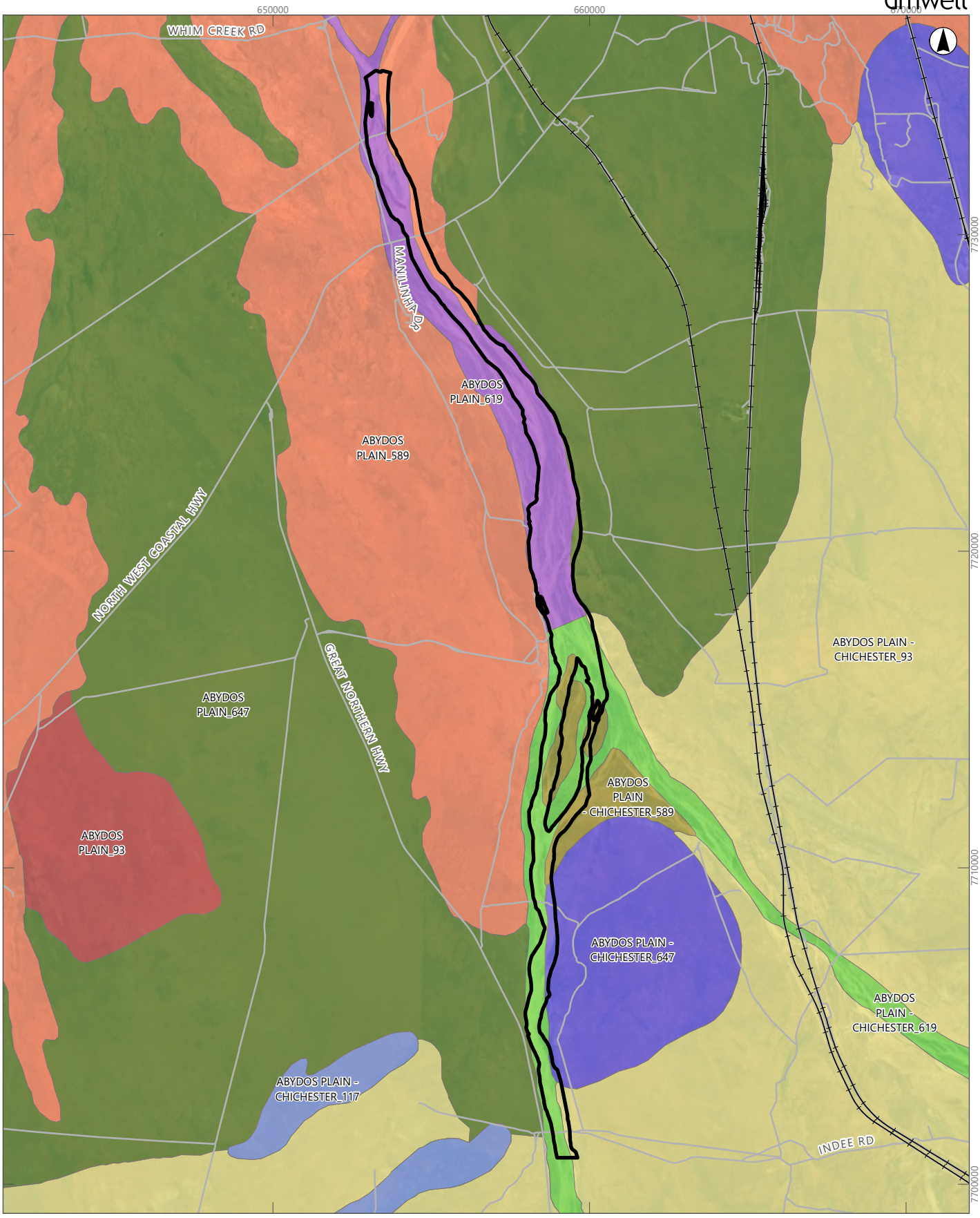
The vegetation of WA as it was presumed to have existed prior to European settlement has been mapped at a scale of 1:250,000 as vegetation system associations (VSAs), with the Pre-European Vegetation spatial database created (Beard et al., 2013; DPIRD, 2019). Seven VSAs occur in the Survey Area as summarised in **Table 5.2** and presented on **Figure 5.1**. **Table 5.2** also presents the current extent of each VSA in relation to its pre-European extent within the Chichester/Roebourne IBRA Subregions, and the percentage of the current extent of each VSA currently protected for conservation (as a proportion of the current extent) within the Chichester/Roebourne IBRA Subregions (DBCA, 2019). Note that as per DBCA (2019), protected areas in this context are considered to be any areas listed in DBCA-Legislated Lands and Waters dataset as either Crown reserves or lands managed under Section 8A of the *Conservation and Land Management Act 1984* that have an International Union for Conservation of Nature (IUCN) category of I to IV.

The majority of the Survey Area (approximately 78%) has been mapped as VSA Abydos Plain_619 and Abydos Plain - Chichester_619. All VSAs that occur within the Survey Area have almost all their pre-European extents remaining, but three VSAs have very small areas reserved for conservation in their respective subregions, with three of the VSAs not protected (**Table 5.2**).

Table 5.2 Vegetation System Associations of the Survey Area

IBRA Subregion	VSA	Description	Extent (ha)			Pre-European Extent Remaining (%)	Current Extent Protected for Conservation (%)
			Survey Area	Pre-European	Current		
Chichester	Abydos Plain - Chichester_93	Hummock grasslands, shrub steppe; kanji over soft spinifex	50.3	2,476,378	2,473,007	99.9	0.5
	Abydos Plain - Chichester_589	Mosaic: Short bunch grassland - savanna / grass plain (Pilbara) / Hummock grasslands, grass steppe; soft spinifex	255.4	45,142	45,142	100	1.5
	Abydos Plain - Chichester_619	Medium woodland; river gum (*Eucalyptus camaldulensis*)	840.9	70,656	70,633	100	0.3
	Abydos Plain - Chichester_647	Hummock grasslands, dwarf-shrub steppe; *Acacia translucens* over soft spinifex	102.6	6,933	6,911	99.7	0
Roebourne	Abydos Plain_589	Mosaic: Short bunch grassland - savanna / grass plain (Pilbara) / Hummock grasslands, grass steppe; soft spinifex	184.9	594,599	592,727	99.7	2.0
	Abydos Plain_619	Medium woodland; river gum (*Eucalyptus camaldulensis*)	1454.9	10,485	10,485	100	0
	Abydos Plain_647	Hummock grasslands, dwarf-shrub steppe; *Acacia translucens* over soft spinifex	59.8	188,716	184,590	97.8	0

Source: DBCA (2019), DPIRD (2019).



Scale: 1:165,000 at A4, GDA2020 MGA Zone 50

Legend

- Survey Area
- Road

Vegetation System Association

- ABYDOS PLAIN - CHICHESTER_93
- ABYDOS PLAIN - CHICHESTER_117
- ABYDOS PLAIN - CHICHESTER_589
- ABYDOS PLAIN - CHICHESTER_619
- ABYDOS PLAIN - CHICHESTER_647
- ABYDOS PLAIN_93
- ABYDOS PLAIN_589
- ABYDOS PLAIN_619
- ABYDOS PLAIN_647

FIGURE 5.1

Vegetation System Associations of the Survey Area

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Image Source: Landgate (2023) | **Data Source:** Landgate (2023), DPIRD (2019), Umwelt (2023)

In 2004, the Department of Agriculture described land systems (now referred to as soil landscape units) within the Pilbara IBRA Bioregion, considering general ecological information, vegetation physiognomy and composition, patterns of variation, conservation status, gradational association and land system representation (van Vreeswyk et al., 2004).

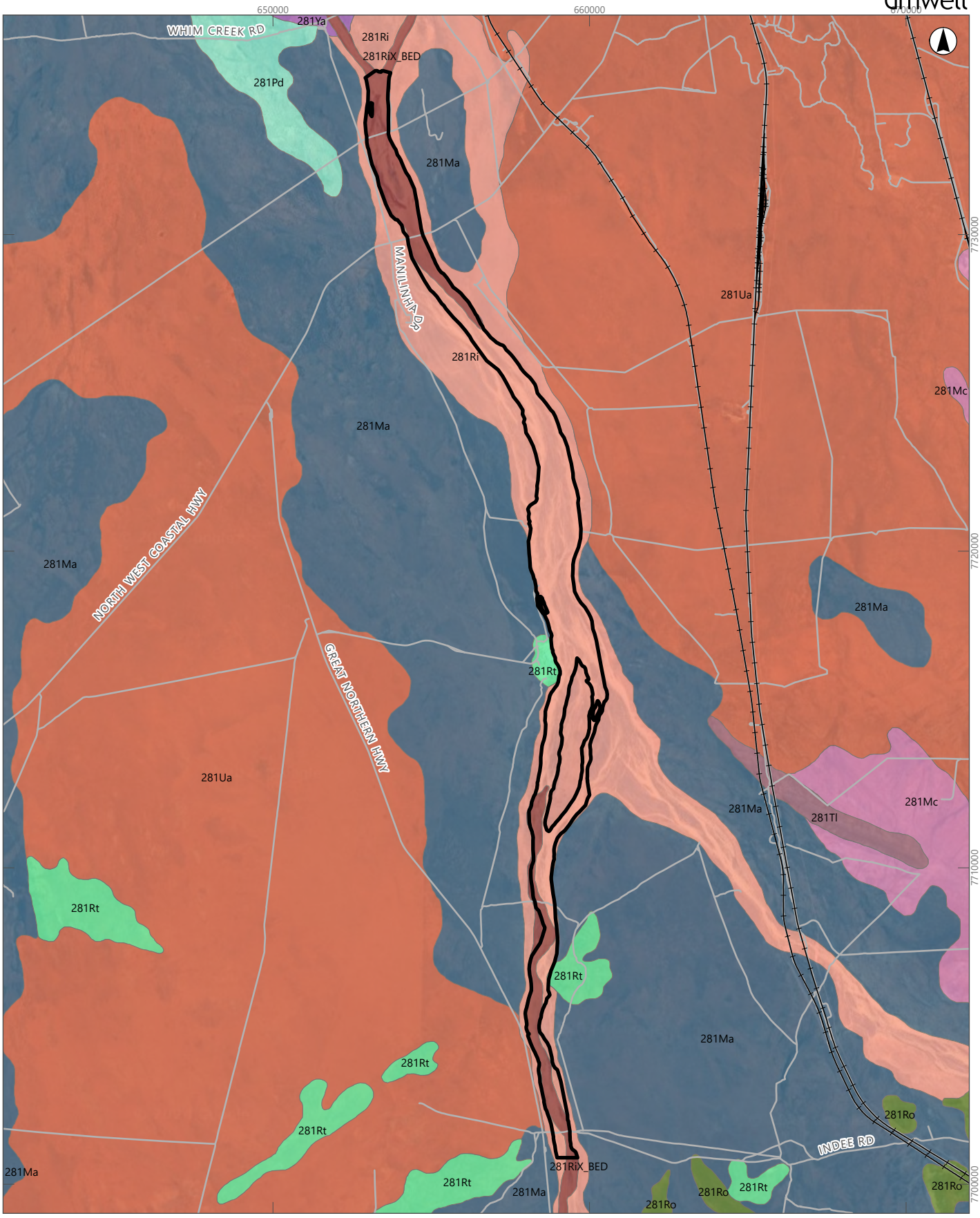
A total of four soil landscape units occur within the Survey Area as summarised in **Table 5.3** and presented on **Figure 5.2** (DPIRD, 2022; van Vreeswyk et al., 2004). The majority of the Survey Area occurs with soil landscape unit 281Ri (River System). None of these soil landscape units are listed as TECs or PECs.

Table 5.3 Soil Landscape Units of the Survey Area

Unit	Description	Mapped Extent (ha)	Extent Mapped in the Survey Area (ha)
281Ma: Mallina System	Sandy surfaced alluvial plains supporting soft spinifex grasslands and minor hard spinifex and tussock grasslands	6,331	9.7
281Ri: River System	Narrow, seasonally active flood plains and major river channels supporting moderately close, tall shrublands or woodlands of acacias and fringing communities of eucalypts sometimes with tussock grasses or spinifex	700	2,032.7
281RiX_BED: River bed phase	River bed with no vegetation	86	904.4
281Rt: Ruth System	Hills and ridges of volcanic and other rocks supporting shrubby hard spinifex and occasionally soft spinifex grasslands	226	2.1

Source: DPIRD (2022); van Vreeswyk et al. (2004).

The River and River Bed soil landscape units broadly correspond with the Abydos Plain - Chichester_619 VSA (corresponding to major drainage lines with *Eucalyptus camaldulensis*), while the remaining soil landscape units broadly correspond with the Abydos Plain - Chichester_93 VSA (corresponding to shrublands over *Triodia* hummock grasslands) (**Figure 5.1** and **Figure 5.2**).



Scale: 1:165,000 at A4, GDA2020 MGA Zone 50

Legend

- Survey Area
- Road

Soil Landscape Units

- 281Ma; Mallina system
- 281Mc; Macroy system
- 281Pd; Paradise system
- 281Ri; River system
- 281RiX_BED; River bed phase
- 281Ro; Robe system
- 281Rt; Ruth system
- 281Tl; Talga system
- 281Ua; Uaroo system
- 281Ya,Yamerina system

FIGURE 5.2

Soil Landscape Mapping of the Survey Area

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Image Source: Landgate (2023) | **Data Source:** Landgate (2023), DPIRD (2022), Umwelt (2023)

The interrogation of DBCA's TEC and PEC Database did not return any listed TECs, however one PEC was returned from the search; the Gregory Land System (P3) PEC (DBCA, 2022a). A review of current DBCA TEC and PEC lists (DBCA, 2023d, 2023e) did not identify any additional significant vegetation communities within, or having the potential to occur within, the Desktop Study Area. There were no records of significant vegetation communities within the Survey Area itself.

Searches of the DCCEEW SPRAT database for MNES listed under the EPBC Act (DCCEEW, 2024) did not identify any TECs as occurring, or potentially occurring within the vicinity of the Survey Area (report results presented in **Appendix D**).

5.1.3 Local Flora and Vegetation Surveys

Flora and vegetation surveys undertaken within and in the vicinity of the Survey Area that are relevant to the Survey Area are summarised in **Table 5.4**. Surveys which are relevant to the Survey Area are considered to be surveys which have been undertaken within, or partially cover, the Turner River.

Table 5.4 Summary of Results of Local Flora and Vegetation Surveys

Report Title and Author	Scope and Location	Key Findings
Vegetation and Flora Survey of the Proposed FMG Stage A Rail Corridor – Biota (2004)	• Detailed survey. • 97 quadrats surveyed. • Small portion of the rail corridor survey area overlaps the Survey Area.	• 762 taxa, 218 genera and 69 families recorded. • 21 significant flora recorded– none of which (currently listed taxa) were recorded within the Turner River. • 122 vegetation types described and mapped, 7 of which were recorded within he Turner River - Ac1, Ac2, Ac3,Ac4, Ac5, Ac6 and Ac7.
Mallina Gold Project: Flora and Vegetation Survey – Ecoscape (2021)	• Detailed and targeted survey. • Survey Area covered 31,447.10 ha. • 222 quadrats surveyed during the field survey. • Small portions of Ecoscape survey area overlap the Survey Area including mapping of the Turner River.	• 380 taxa, 152 genera and 51 families recorded. • 8 significant flora recorded, 1 of which was found within the Turner River, being *Gymnanthera cunninghamii* (P3). • 28 VTs described and mapped, 1 of which was mapped within the Turner River and Yule River – VT EcMaEvMW. • 1 PEC (Gregory Land System PEC (P3)) recorded; however, no significant vegetation recorded within the Turner River. • 1 VT considered to represent GDV – VT EcMaEvMW.
Hemi Gold Deposit Baseline Flora and Vegetation Assessment, Mallina Gold Project Umwelt (2024)	• Detailed and targeted survey. • Survey Area covered 29,518 ha. • 237 quadrats surveyed during the field survey. • Located immediately south of the Survey Area including mapping of the Turner River.	• 329 taxa recorded, 336 taxa, 145 genera and 53 families recorded following review of previous survey data. • 7 significant flora taxa recorded, 1 of which was found within the Turner River, being *Gymnanthera cunninghamii* (P3). • 17 VTs described and mapped, 1 of which was mapped within the Turner River – VT 16. • 1 PEC (Gregory Land System PEC (P3)) recorded; however, no significant vegetation recorded within the Turner River. • 1 VT considered to represent GDV – VT 16.
Indee Sand Quarry Level 1 Flora and Vegetation Survey - Astron (2013) cited in (DMIRS, 2017)	• Reconnaissance survey. • Clearing Aree covered 101 ha. • Overlaps small portion of the southern part of the Survey Area.	• No significant flora was recorded. • 8 VTs described and mapped via structural vegetation classification, occurring within and in close proximity to the Turner River. • No significant vegetation recorded.

5.1.4 Summary of Significant Flora Taxa

Table 5.5 presents a summary of listed significant flora taxa known to occur or potentially occurring within the Desktop Study Area. This list has been compiled from the results of searches of DBCA's TPFL and WA Herbarium databases and the results of local surveys, including relevant data specifically from the Turner River (as per **Section 5.1.3**). **Table 5.5** also presents the known flowering period and habitat for each taxon (WA Herbarium, 1998-).

A total of 18 listed significant flora taxa are known to occur or potentially occur within the Desktop Study Area. This includes one Threatened flora taxon listed under the EPBC Act and 17 DBCA-classified Priority flora (**Table 5.5**). The locations of these taxa are presented on **Figure 5.3** (subject to the availability of spatial data in the case of records from previous local surveys). One taxon has a record within the Survey Area (shaded in grey in **Table 5.5**).

Table 5.5 Significant Flora Taxa Potentially Occurring Within the Desktop Study Area

Taxon	Status (WA)	Source*	Flowering Period^	Habitat^
***Abutilon* sp. Pritzelianum (S. van Leeuwen 5095)**	P3	DBCA, Ecoscape	Apr-Sep	Plains, floodplains, sand dunes. Red-brown or orange-brown sandy or loamy soil. Open Acacia shrubland over Triodia grassland.
Bulbostylis burbidgeae	P4	DBCA, Ecoscape	Jan-Jul	Brown loam or sand, granitic soils. Granite outcrops, cliff bases.
Euphorbia clementii	P3	DBCA	May-Jul	Flats/plains, rocky slopes, drainage lines. Red-brown or orange clay loam with ironstone gravel. Fire responder.
Euploca mutica	P3	DBCA, Ecoscape	Apr-Nov	Plains/sandplains. Brown to orange or red sand or sandy loam, sometimes with gravel.
Gomphrena cucullata	P3	DBCA	Feb-Jul	Flats and plains. Red, orange or brown loamy clay. Coastal and near-coastal areas.
Gomphrena leptophylla	P3	DBCA	May-Sep	Drainage lines, floodplains. Red sandy loam, sometimes granitic.
Gomphrena pusilla	P2	DBCA	Mar-Jun	Limestone ridges, coastal sand dunes. Calcareous sand, sandstone.
Gymnanthera cunninghamii	P3	DBCA, Ecoscape	Oct-May	Creek beds, drainage lines, on margins of mound springs. Sandy soils. Eucalyptus open woodland over Acacia shrubland over hummock/tussock grassland.
Nicotiana umbratica	P3	DBCA	Apr-Jun	Rocky outcrops with shallow soils. Usually granitic.
Ptilotus mollis	P4	DBCA	Jul-Sep	Steep stony hills and screes, often ironstone.
Rothia indica* subsp. *australis	P3	DBCA	Apr, Jul	Drainage areas and plains. Red-brown sandy loam.
Seringia exastia	T#	DBCA, Ecoscape	After significant rainfall	Various.
***Sida* sp. Barlee Range (S. van Leeuwen 1642)**	P3	DBCA	Mar-Apr, Aug-Oct	Rocky slopes, screes, gullies and breakaways. Skeletal red-brown soils.

Taxon	Status (WA)	Source*	Flowering Period^	Habitat^
Stylidium weeliwolli	P3	DBCA	Mar-Oct	Drainage lines, seepage areas, pools, sometimes granitic. Damp, gritty red/brown sand or clay soil.
***Tephrosia rosea* var. Port Hedland (A.S. George 1114)**	P1	DBCA	Mar, Jul-Sep	Sand dunes, predominately coastal. Orange to brown sand.
Terminalia supranitifolia	P3	DBCA	Mar-Oct	Drainage lines, cliffs, slopes, rocky outcrops. Red-brown clay loam or sandy soil.
Triodia chichesterensis	P3	DBCA, Ecoscape	Mar-May	Plains, low hills. Orange sandy soil or brown clay loam, sometimes gravelly.
Vigna triodiophila	P3	DBCA	Mar-Jul	Rocky hill slopes. Red-brown soil.

Note: grey shading indicates taxa with known records within the Survey Area.

[#] *Seringia exastia* is no longer listed as Threatened under the WA BC Act, but remains listed under the Commonwealth EPBC Act.

** Sources are: DBCA: DBCA (2022b) and Ecoscape: Ecoscape (2021).*

^ Source: WA Herbarium (1998-).

Scale: 1:650,000 at A4, GDA2020 MGA Zone 50

Legend

- Desktop Study Area
- Survey Area
- Road
- Major Watercourse
- Nature Reserve

FIGURE 5.3

Existing Significant Flora Records in the Desktop Study Area

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Image Source: Landgate (2023) | **Data Source:** Landgate (2023), DBCA (2022, 2024)

Significant Flora (DBCA, 2022)

- AbspPr *Abutilon* sp. Pritzelianum (S. van Leeuwen 5095) (P3)
- Bubu *Bulbostylis burbidgeae* (P4)
- Eucl *Euphorbia clementii* (P3)
- Eumu *Euploca mutica* (P3)
- Gocu *Gomphrena cucullata* (P3)
- Gole *Gomphrena leptophylla* (P3)
- Gopu *Gomphrena pusilla* (P2)
- Gycu *Gymnanthera cunninghamii* (P3)
- Nium *Nicotiana umbratica* (P3)
- Ptmo *Ptilotus mollis* (P4)
- Roina *Rothia indica* subsp. *australis* (P3)
- SispBR *Sida* sp. Barlee Range (S. van Leeuwen 1642) (P4)
- Stwe *Stylidium weeliwolli* (P3)
- TeroPH *Tephrosia rosea* var. Port Hedland (A.S. George 1114) (P1)
- Tesu *Terminalia supranitifolia* (P3)
- Trch *Triodia chichesterensis* (P3)
- Vitr *Vigna triodiophila* (P3)

FIGURE 5.3

LEGEND: Existing Significant Flora Records in the Desktop Study Area

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Image Source: Landgate (2023) | **Data Source:** Landgate (2023), DBCA (2022, 2024)

5.1.5 Summary of Significant Vegetation

Table 5.6 presents a summary of listed significant vegetation known from the Survey Area and surrounds. This list has been compiled from the results of searches of DBCA's TEC and PEC Database (DBCA, 2022a), DBCA's TEC and PEC lists (DBCA, 2023d, 2023e), and the results of local surveys (**Section 5.1.3**).

No vegetation listed as significant under the EPBC Act or BC Act was identified as being known to occur or likely to occur within the Desktop Study Area. One DBCA-classified PEC was returned by the desktop assessment (**Table 5.6**); the Gregory Land System PEC (P3). The nearest location of this PEC is approximately 16 km south-west of the Survey Area. The locations of significant vegetation (represented by DBCA-applied buffer polygons) from the results of the 2022 DBCA TEC and PEC Database search (DBCA, 2022a) are presented on **Figure 5.4**.

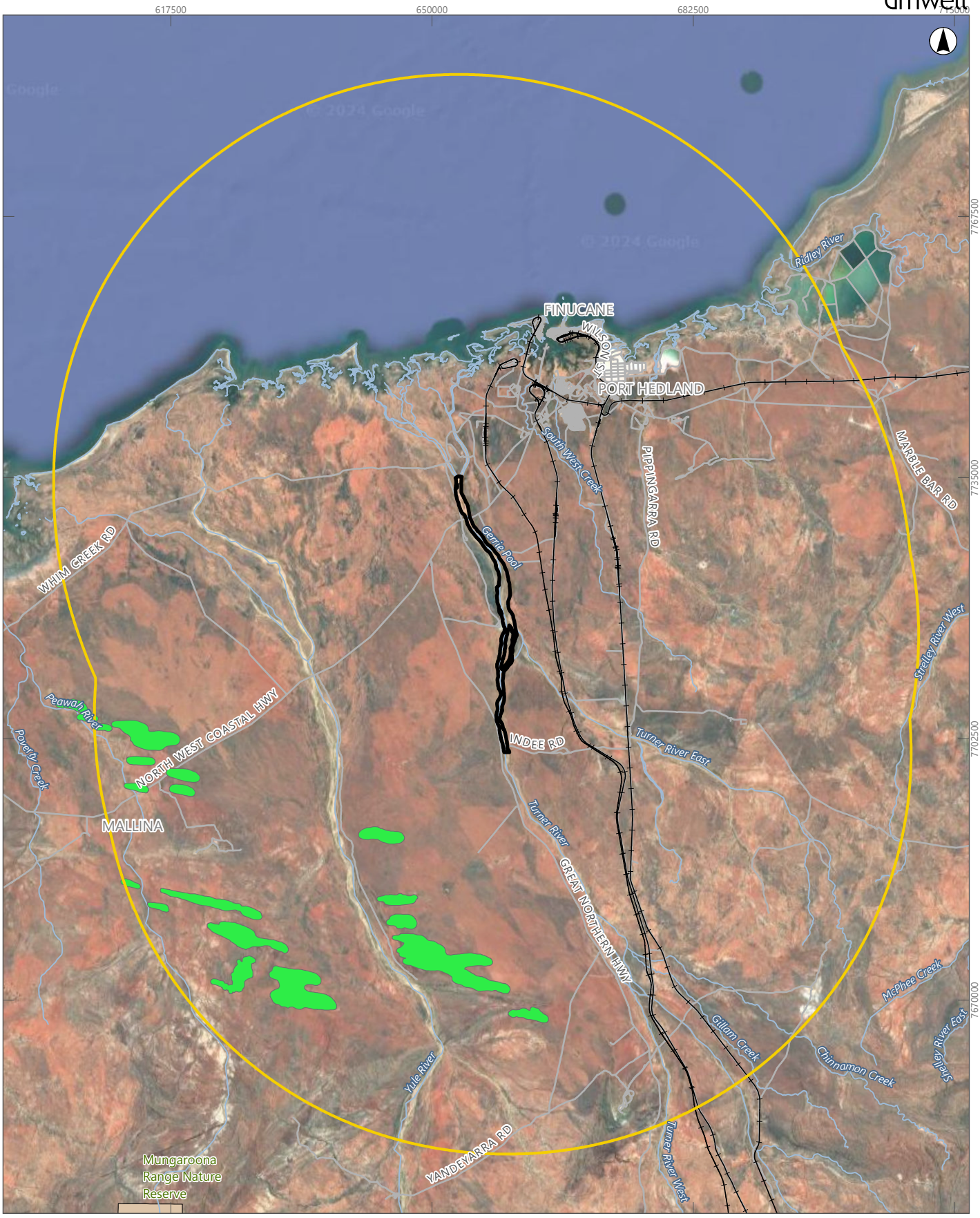
Table 5.6 Significant Vegetation Potentially Occurring Within the Desktop Study Area

Community	Status (WA)	Description*	Distance to Survey Area^	Source
Gregory Land System	PEC (P3)	Linear dunes and restricted sandplains supporting shrubby hard spinifex (and occasionally soft spinifex) grasslands	16 km to south	DBCA, Ecoscape

Note: grey shading indicates vegetation communities with known records within the Survey Area.

** Sources are: DBCA (2022a) and Ecoscape: Ecoscape (2021).*

^ Source: DBCA (2017).



Scale: 1:650,000 at A4, GDA2020 MGA Zone 50

Legend

- Desktop Study Area
- Survey Area
- Road
- Major Watercourse
- Nature Reserve

Significant Vegetation (DBCA, 2022)

- Gregory Land System PEC (P3)

FIGURE 5.4

DBCA Significant Vegetation Records in the Desktop Study Area

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Image Source: Landgate (2023) | **Data Source:** Landgate (2023), DBCA (2022, 2024), Umwelt (2023)

5.1.6 Groundwater and Surface Water Values

The Survey Area is located within the Turner River which has a catchment area of 2,225 km² (Surface Water Solutions, 2022). The Turner River headwaters are near Pullcunah Hill (SSE of the Survey Area), flowing north to Port Hedland. The watercourse levels recorded at Pincunah station (station number 709010) generally peak in February and March, reaching a maximum level of up to 0.76 m, with the lowest maximum level recorded in October and November of -0.006 m (BoM, 2024c).

The search of the DCCEEW SPRAT Database with regard to MNES listed under the EPBC Act (DCCEEW, 2024) did not identify any Nationally Important Wetlands or Wetlands of International Importance within the interrogation area.

Aquatic GDEs are described as 'ecosystems that rely on the surface expression of groundwater – this includes surface water ecosystems which may have a groundwater component, such as rivers, wetlands and springs' (BoM, 2024b). According to the Bureau of Meteorology 'Groundwater Dependent Ecosystems Atlas' (BoM, 2024b), the Survey Area includes a Moderate potential aquatic GDE in the southern part of the Turner River, and a High potential aquatic GDE in the northern part of the Turner River.

Groundwater characteristics have been investigated for the Survey Area by Geowater Consulting Pty Limited (Geowater). The water table in the Turner River is typically 2 m to 4 m below the shallowest parts of the riverbed during the dry season periods. There was an absence of river pools observed in recent times, within parts of the Turner River east of the Hemi Gold Project Survey Area (in close proximity to the discharge location) (Geowater, 2022, 2023).

5.1.7 Groundwater Dependent Vegetation

Phreatophytes are usually deep-rooted perennial taxa that rely on groundwater sources for water uptake. These taxa are often (but not always) found within the riparian zones of permanent and ephemeral rivers, creeks and wetlands where water tables are often very close to the ground surface. Phreatophytes are divided into two main groups:

- Obligate: taxa are completely reliant on access to groundwater to survive. This reliance can be continual, seasonal or episodic and is often highly sensitive to alterations in groundwater regimes. Obligate phreatophytes occur in areas where the land surface is close to the groundwater table and directly access groundwater all year round.
- Facultative: taxa that rely on groundwater only during extended periods of drought and are generally deep-rooted species occurring on floodplains and higher in the landscape away from very shallow groundwater aquifers. These species tend to be less sensitive to changes in groundwater regimes, however, may suffer stress during prolonged periods of drought. Such taxa can include those with shallow root systems that can survive periods of dryness, as well as periods of inundation and waterlogged soils, or those that can survive on soil moisture when available and utilise groundwater only during drier periods or higher elevations (phreatic facultative phreatophytes).

GVD is known to occur in the Pilbara and is generally indicated by the presence of one or several phreatophytic taxa. These are:

- *Melaleuca argentea*: obligate phreatophyte (Graham (2001); cited in Loomes & Braimbridge (2010)). Studies by Graham (2001) indicate that this taxon has a shallow planiform root system adapted to areas of very shallow groundwater (2–3 m below ground level) and has difficulties adjusting to short periods of dry conditions (Loomes & Braimbridge, 2010). Studies undertaken by Woodward-Clyde (1997) for BHP indicate that a decline in groundwater level of 0.5 m may result in decreased vigour of plants and that a decline of 1 m or more may result in plant death.

- *Eucalyptus camaldulensis*: obligate or facultative phreatophyte, depending on the specific hydrological characteristics of a site (Loomes & Braimbridge, 2010). It is likely that this taxon is phreatophytic when groundwater is present within 10 m of the surface and may be sensitive when groundwater drawdown occurs at a rapid rate in these areas.

- *Sesbania formosa*: likely to be an obligate phreatophyte (Loomes & Braimbridge, 2010).

- *Acacia ampliceps*, *Atalaya hemiglauca*, *Melaleuca glomerata* and *Melaleuca linophylla*: likely facultative phreatophytes, primarily based on their presence in major river channels where groundwater is known to be close to the surface (Loomes, 2010a, 2010b; Loomes & Braimbridge, 2010). No impacts through groundwater drawdown have been noted for these taxa based on observations by Woodman Environmental (2019), indicating that these taxa have a low likelihood of being phreatophytes in most situations, and are generally likely to be vadophytes (i.e. taxa that rely on water from the unsaturated soil profile (vadose zone)).

- *Eucalyptus victrix*: suggested to be facultative phreatophyte in some situations (AQ2, 2015; Eastham, 2015; Loomes, 2010a; Loomes & Braimbridge, 2010)); however, it is generally considered to be a vadophyte (AQ2, 2015). Monitoring at the Ridley River (Pardoo) observed no significant long-term impacts or mortalities of *Eucalyptus victrix* trees surrounding a bore over three years of extraction and over five years after extraction cessation (Woodman Environmental, 2019).

All of the above-listed taxa occur in the Turner River (Ecoscape, 2021; Umwelt, 2024), indicating that the vegetation in the Turner River is groundwater dependent.

Depth-to-groundwater can be used as a potential indicator of groundwater dependence by vegetation. Studies in the Pilbara have shown that there is reduced reliance on groundwater by vegetation where depth to groundwater exceeds 10 m (CSIRO, 2015; Loomes & Braimbridge, 2010; Woodward-Clyde, 1997).

5.2 Field Survey Results

5.2.1 Flora Census

A total of 117 discrete vascular flora taxa and one formally-named hybrid (as per WA Herbarium (1998-)) were recorded in the Survey Area during the 2024 survey. The taxa and hybrid represent 36 families and 72 genera. The most well-represented families were Fabaceae (21 discrete taxa, one known hybrid), Poaceae (21 taxa) and Malvaceae (9 taxa). A total of eight taxa are introduced (6.8% of taxa) (see **Section 5.2.6**).

Within quadrats established in the Survey Area, average native taxon (excluding hybrids) richness per quadrat was 31.1 (± 10.5), with the greatest number of taxa recorded in a single quadrat being 47 (WMP06), and the lowest number being 18 (WMP07).

A full list of flora taxa recorded by the 2024 survey in the Survey Area is presented in **Appendix E**. Raw quadrat data is presented in **Appendix F**.

Note that several collections could not be identified to species level due to poor material. Some are known to be distinct taxa relative to other taxa recorded by the survey and therefore have been included in the totals presented above and in **Appendix E** (e.g. *Opuntia* sp.). Other collections may represent distinct taxa relative to other taxa recorded by the survey; however, it is more likely that they represent taxa already recorded elsewhere, with the quality of the material such that this distinction cannot be made (e.g., *Eriachne* ?*benthamii*). Such collections are not included in the totals above or presented in **Appendix E**. None of these collections are considered to represent significant flora taxa.

5.2.2 Summary of Significant Flora Taxa

One significant flora taxon was recorded in the Survey Area during the survey; *Abutilon* sp. Pritzelianum (S. van Leeuwen 5095) (P3). One location of *Abutilon* sp. Pritzelianum (S. van Leeuwen 5095) (P3), consisting of a single individual, was recorded in the Survey Area during the survey. Although this taxon was recorded within VT 16, this is not considered to be typical habitat for this taxon (discussed further in **Section 5.2.3.1**).

In addition, one location of *Gymnanthera cunninghamii* (P3) was recorded in the Survey Area by Ecoscape (2021), with one individual recorded. This individual was recorded opportunistically by Ecoscape, with the individual located approximately 0.3 km east of the Ecoscape survey area, adjacent to the Turner River crossing leading to Indee Station homestead, with Umwelt (2024) also confirming this taxon to be present at this location. VT 16 is considered to be typical habitat of *Gymnanthera cunninghamii* (P3) (see **Section 5.2.3.2**).

Locations of significant flora taxa recorded in the Survey Area (including the locations recorded by the 2024 survey and the Ecoscape (2021) location) are presented on **Figure 5.5**. A detailed description and summary of information for each taxon recorded in the Survey Area is provided in **Section 5.2.3**, and specific location details are presented in **Appendix G** (data from the current survey only). As discussed in **Section 3.4.3**, survey for significant flora was only undertaken opportunistically while traversing the Survey Area. Targeted survey was not undertaken as part of the survey, and therefore it is likely that additional locations of significant taxa could occur in the Survey Area.

Scale: 1:165,000 at A4, GDA2020 MGA Zone 50

Legend

- Survey Area
- Road
- Major Watercourse

Significant Flora (Umwelt 2024)

- *Abutilon* sp. Pritzelianum (S. van Leeuwen 5095)

Significant Flora (Ecoscape 2021)

- *Gymnanthera cunninghamii*

FIGURE 5.5

Significant Flora Taxa of the Survey Area

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Image Source: Landgate (2023) | **Data Source:** Landgate (2024), Umwelt (2024), Ecoscape (2021)

5.2.3 Listed Significant Flora Taxa

5.2.3.1 *Abutilon* sp. Pritzelianum (S. van Leeuwen 5095) (P3)

Abutilon sp. Pritzelianum (S. van Leeuwen 5095) (P3) is an upright, perennial shrub growing to 1.5 m high with grey felty leaves and yellow flowers (**Photo 5.1**) that occurs on red-brown or orange-brown sandy or loamy soil on plains, floodplains and sand dunes (WA Herbarium, 1998-). This taxon is not listed under the EPBC Act or BC Act, but is classified as P3 by DBCA (2024b). *Abutilon* sp. Pritzelianum (S. van Leeuwen 5095) (P3) appears to be endemic to the Pilbara, Carnarvon and Murchison IBRA regions (ALA, 2024) occurring over a range of approximately 760 km from ex-Muggon Station in the south, north to near Carnarvon, and further north to Mulga Downs and Port Hedland (WA Herbarium, 1998-). This taxon is known from 51 WA Herbarium records, potentially representing approximately 35 regional populations, one of which occurs within DBCA-managed tenure, being Muggon National Park (WA Herbarium, 1998-).

This taxon has been recorded to the west and south of the Survey Area by Umwelt (2024) and Ecoscape (2021), with a total of 6,579 individuals and 655 point locations recorded by these surveys. This taxon was also recorded in high numbers during surveys for Atlas Iron undertaken for the expansion works for the Great Northern Highway, to the west and east of the Survey Area, with over 7,000 individuals recorded at 520 point locations (all being adjacent to Great Northern Highway (Woodman Environmental, 2013).

This taxon was searched for opportunistically during the 2024 survey, with one individual recorded at one point location in the Survey Area (**Figure 5.5**), within VT 16 (see **Section 5.2.8** for VT description). VT 16 is not considered to be preferred habitat for *Abutilon* sp. Pritzelianum (S. van Leeuwen 5095) (P3), with this taxon typically occurring on plains, floodplains and sand dunes rather than river channels (WA Herbarium, 1998-); the population in the Survey Area is therefore likely to be a transient one. Umwelt (2024) considered this taxon's typical habitat to be VTs 5 and 14. Broadly, these VTs are Acacia shrublands on plains and flats, with such habitat not considered to occur in the Survey Area. Woodman Environmental (2013) recorded *Abutilon* sp. Pritzelianum (S. van Leeuwen 5095) (P3) across four VTs, all of which were similar habitat (Acacia shrublands on plains) to that described by Umwelt (2024). Umwelt (2024) described this taxon as a likely disturbance opportunist, with locations recorded from cleared land and areas of disturbance in many instances, including burnt areas, along tracks and roads, and on drill pad and sump windrows. The occurrence in the Survey Area is likely a function of the disturbance opportunist nature of the taxon, with water movement into the Turner River likely transporting seed to the survey area, and also disturbing ground within the river channel, which has facilitated germination. Nearby records of this taxon (as recorded by Woodman Environmental (2013)) outside the Survey Area in what is considered typical habitat indicate that the taxon is present at much higher densities.

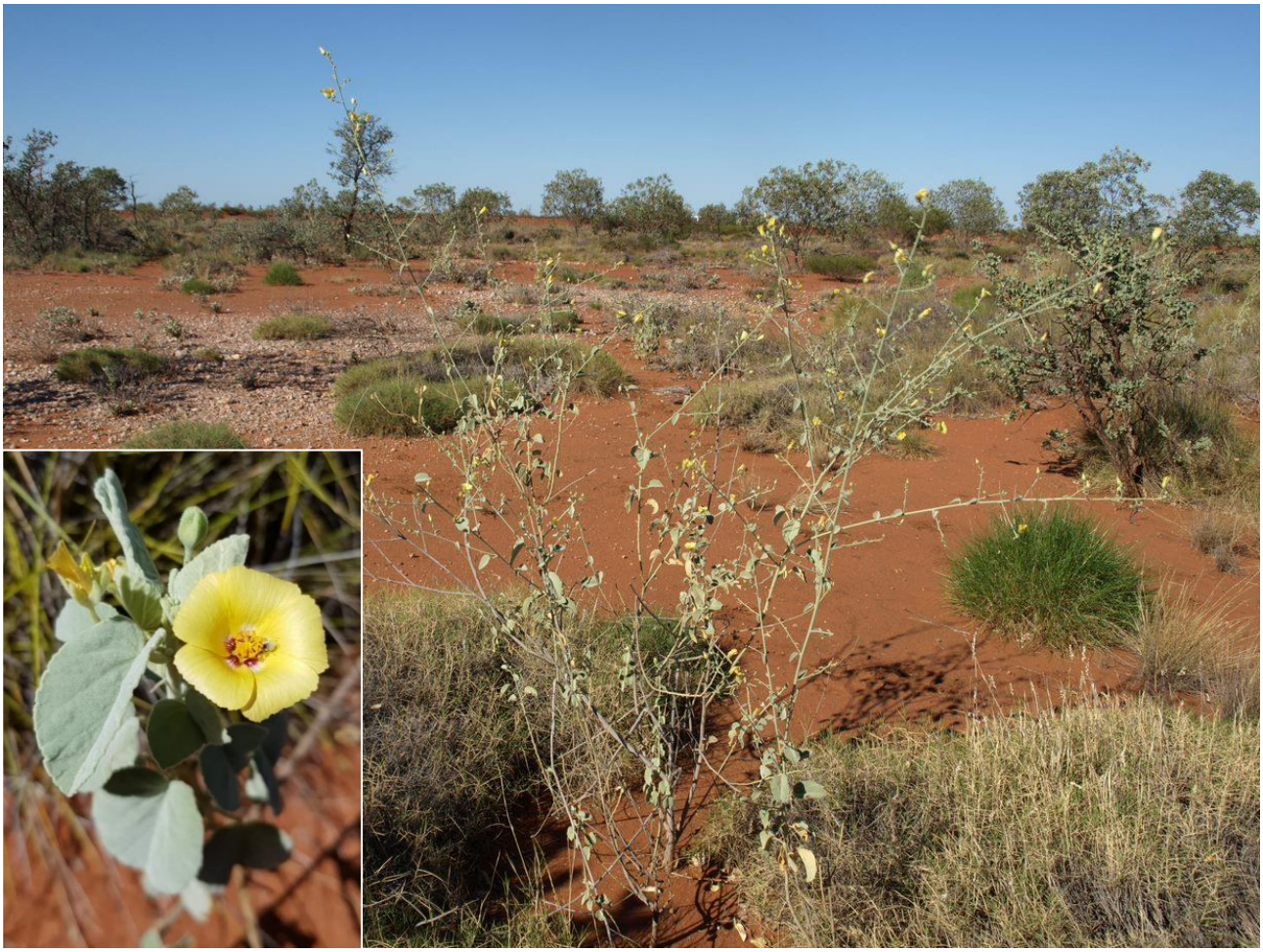


Photo 5.1 *Abutilon* sp. Pritzelianum (S. van Leeuwen 5095) (P3) (Photos: Umwelt – Boodarie Station (main), Hemi (inset))

5.2.3.2 Gymnanthera cunninghamii (P3)

Gymnanthera cunninghamii (P3) is an erect, multi-stemmed perennial shrub growing to 1-2 m high (**Photo 5.2**), that generally occurs in sandy creek beds (WA Herbarium, 1998-). This taxon is not listed under the EPBC Act or BC Act, but is classified as P3 by DBCA (2024b). *Gymnanthera cunninghamii* (P3) has a wide range across northern Australia, occurring from Kennedy Range in WA, between Alice Springs and Tennant Creek in NT, east to near Mount Isa in Queensland (ALA, 2024). Within WA, the taxon has a range of approximately 870 km from Kennedy Range to Eighty Mile Beach (WA Herbarium, 1998-). There are 43 records of this taxon in WA in DBCA databases, representing approximately 37 regional populations, five of which occur within DBCA-managed tenure (Kennedy Range National Park, Walyarta Conservation Park and unnamed nature reserves R 36909 and R 36915) (WA Herbarium, 1998-).

This taxon has been recorded to the south of the Survey Area by Umwelt (2024) and Ecoscape (2021), with a total of 116 individuals and 51 point locations recorded by these surveys. All previous records of this taxon were restricted to the channels of the Turner River, with all records occurring within VT 16 as described by Umwelt (2024).

This taxon was opportunistically searched for during the 2024 survey. Although no individuals were recorded by the 2024 survey, a known record of this taxon (recorded by Ecoscape (2021) and verified by Umwelt (2024)) is located within the Survey Area, immediately north of the access track to the De Grey camp village, where the track crosses the Turner River (**Figure 5.5**). This record occurs within VT 16 as described by the current survey (see **Section 5.2.8**), which is considered to be the preferred habitat for this taxon. This VT is equivalent to VT 16 mapped by the Hemi Project assessment by Umwelt (2024) (see **Section 5.2.8**).

Photo 5.2 ***Gymnanthera cunninghamii*** **(P3) (Photo: Umwelt, 2010 (Turner River))**

5.2.4 Distribution Extensions and Distribution Gaps

Table 5.7 presents taxa where collections from the Survey Area represent extensions to the known distribution of such taxa, or otherwise fill gaps within their known distributions, according to Florabase (WA Herbarium, 1998-). Collections of four taxa made in the Survey Area represent range extensions or fill gaps within their known distributions. Specimen material from these taxa will be lodged at the WA Herbarium by Umwelt as per the requirements of EPA (2016b), where such material is of sufficient quality.

Note that although collections of taxa that are 'representative of the range of a species (particularly, at the extremes of range, recently discovered range extensions, or isolated outliers of the main range)' can be considered significant taxa as per EPA (2016a, 2016b), none of the taxa listed in **Table 5.7** are considered to be significant taxa in this context. All such taxa have wide distributions, and the recording of these taxa is considered to be a function of the limited previous survey undertaken in the Survey Area and surrounds.

Table 5.7 Native Taxa Where Collections Represent Range Extensions or Fill Distribution Gaps

Taxon	Description	Record Location
Aristida hygrometrica	Locality hole	Survey Area quadrat
Chloris pectinata	Locality hole	Survey Area quadrat
Microstachys chamaelea	Locality hole	Survey Area quadrat
Paspalidium reflexum	Range extension to the north-west	Survey Area quadrat

5.2.5 Likelihood of Occurrence of Further Significant Flora Taxa

As discussed in **Section 5.1.4**, a total of 18 significant flora taxa were identified as occurring (or potentially occurring) within the Desktop Study Area prior to the survey, including two taxa listed as Threatened under the EPBC and BC Acts. Two of these, occur within the Survey Area (**Section 5.2.2**). **Table 5.8** presents an assessment of the likelihood of the remaining 16 taxa occurring in the Survey Area. This assessment considered whether a taxon was identifiable at the time of survey, the known range of the taxon and proximity of known records to the Survey Area when determining the potential for a taxon to occur in the Survey Area.

It is considered that all of the 16 taxa were identifiable during the survey, either because the survey period coincides with the taxon's flowering period, or the taxon can be identified reliably when in fruit or sterile. All 16 taxa are considered unlikely to occur in the Survey Area, primarily as no suitable habitat is considered to be present. The habitat within the Survey Area is very specific, being a major river channel; the only taxon known from the Desktop Study Area with records within major rivers (including the Yule and Turner River), and whose typical habitat is considered to be major river channels, is *Gymnanthera cunninghamii* (P3) (based on DBCA data (DBCA, 2022b) and previous surveys undertaken within the area). This taxon is known from the Survey Area and is discussed in **Section 5.2.3.2**.

Table 5.8 Likelihood of Occurrence of Further Significant Flora Taxa in the Survey Area

Taxon	Status (WA)	Flowering Period*	Habitat*	Identifiable During Survey?	Nearest Known Location to Survey Area^	Likelihood of Occurrence
Bulbostylis burbidgeae	P4	Jan-Jul	Brown loam or sand, in crevices or under overhangs. Almost exclusively granite outcrops	Y	Approx. 10 km south-east	Unlikely Survey Area occur just west of known range. Habitat not considered to be present.
Euphorbia clementii	P3	May-Jul	Flats/plains, rocky slopes, drainage lines. Red-brown or orange sand or clay loam with ironstone gravel. Fire responder	Y	Approx. 11 km south-east	Unlikely Survey Area occurs just west of known range. Apparent preferred habitat (sandy flowlines in stony outwash areas) not present in the Survey Area
Euploca mutica	P3	Apr-Nov	Plains/sandplains. Brown to orange or red sand or sandy loam, sometimes with gravel	Y	Approx. 10 km east	Unlikely Habitat not considered to be present.
Gomphrena cucullata	P3	Feb-Jul	Flats and plains. Red, orange or brown loamy clay. Coastal and near-coastal areas	Y	Approx. 41 km west	Unlikely Survey Area occurs south of known range. Habitat not considered to be present.
Gomphrena leptophylla	P3	May-Sep	Drainage lines, floodplains. Red sandy loam, sometimes granitic	Y	Approx. 12 km north	Unlikely Habitat not considered to be present.
Gomphrena pusilla	P2	Mar-Jun	Limestone ridges, coastal sand dunes. Calcareous sand, sandstone	Y	Approx. 14 km north	Unlikely Survey Area occurs south of known range. Habitat not considered to be present.
Nicotiana umbratica	P3	Apr-Jun	Rocky outcrops with shallow soils, in crevices or under overhangs. Almost exclusively granite outcrops	Y	Approx. 41 km south-east	Unlikely Survey Area occurs north of known range. Habitat not considered to be present.
Ptilotus mollis	P4	Jul-Sep	Steep stony hills and screes, often ironstone	Y	Approx. 5 km east	Unlikely Habitat not considered to be present.
Rothia indica* subsp. *australis	P3	Apr, Jul	Drainage areas and plains. Red-brown sandy loam	Y	Approx. 6 km east	Unlikely Habitat not considered to be present.

Taxon	Status (WA)	Flowering Period*	Habitat*	Identifiable During Survey?	Nearest Known Location to Survey Area^	Likelihood of Occurrence
Seringia exastia	T#	After significant rainfall	Various	Y	Approx. 22 km north-east	Unlikely Habitat not considered to be present.
***Sida* sp. Barlee Range (S. van Leeuwen 1642)**	P3	Mar-Apr, Aug-Oct	Rocky slopes, screes, gullies and breakaways. Skeletal red-brown soils	Y	Approx. 2 km west	Unlikely Habitat not considered to be present. Closest known record is very disjunct from main distribution, with most known records occurring south of Karijini National Park, approximately 160 km south of the Survey Area
Stylidium weeliwolli	P3	Mar-Oct	Drainage lines, seepage areas, pools, sometimes granitic. Damp, gritty red/brown sand or clay soil	Y	Approx. 23 km southeast	Unlikely Survey Area occurs north of known range. Habitat not considered to be present.
***Tephrosia rosea* var. Port Hedland (A.S. George 1114)**	P1	Mar, Jul-Sep	Sand dunes, predominately coastal. Orange to brown sand	Y	Approx. 9 km north	Unlikely Survey Area occurs on the southern edge of known range. Habitat not considered to be present.
Terminalia supranitifolia	P3	Mar-Oct	Drainage lines, cliffs, slopes, rocky outcrops. Red-brown clay loam or sandy soil over ironstone or metamorphic rock	Y	Approx. 48 km southeast	Unlikely Habitat not considered to be present.
Triodia chichesterensis	P3	Mar-May	Plains, low hills. Orange sandy soil or brown clay loam, sometimes gravelly	Y	Approx. 6 km east	Unlikely Habitat not considered to be present.
Vigna triodiophila	P3	Apr-Jun	Almost exclusively basalt rockpiles with shallow soils.	Y	Approx. 44 km south-southeast	Unlikely Habitat not considered to be present

** Source: WA Herbarium (1998-).*

^ Source: DBCA (2022b).

5.2.6 Introduced Flora Taxa

A total of eight introduced flora taxa were recorded by the 2024 survey within the Survey Area. These taxa are listed in **Table 5.9**, together with location information, and comments regarding the significance of each taxon, including ecological impact and invasiveness ratings under the Ecological Impact and Invasiveness Ratings from the Department of Parks and Wildlife for the Pilbara Region (DBCA, 2014).

One taxon listed as a WoNS and as a Declared Pest under the BAM Act (*Opuntia* sp.), and one additional Declared Pest (*Calotropis procera*) were recorded in the Survey Area by the 2024 survey (**Table 5.9**). While *Calotropis procera* has not been rated for ecological impact and invasiveness by DBCA (2014) (**Table 5.9**), it is considered a widespread, serious weed (Hussey et al., 2007).

Five introduced flora taxa recorded in the Survey Area are rated as having 'High' ecological impact, with the remainder either unknown or not rated (**Table 5.9**). Taxa with High ecological impact rating are considered significant weeds capable of causing acute disruption of ecological processes, as well as dominating and/or significantly altering the vegetation structure, composition and function of ecosystems (DBCA, 2014). Of these, *Aerva javanica* and *Cenchrus ciliaris* were most common in the Survey Area (**Table 5.9**), particularly in areas impacted by cattle.

Five of the introduced taxa recorded in the Survey Area are rated as having 'Rapid' invasiveness in native vegetation (**Table 5.9**) (DBCA, 2014). These taxa are typically disturbance opportunists and are relatively common around disturbance areas, as well as along drainage lines and other areas of periodic inundation. The remainder were either Moderate or not assessed.

Locations of introduced flora taxa recorded by the 2024 survey are presented in **Appendix G**.

Table 5.9 Summary of Introduced Flora Taxa within the Survey Area

Taxon	Common Name	Number of Locations	Legislative Significance	Ecological Impact^	Invasiveness^	Risk Assessment – Pilbara Region (Webber et al., 2017)
Aerva javanica	Kapok Bush	6		High	Rapid	Priority for research to determine environmental impact
Calotropis procera	Calotrope	3	Declared Pest – no control category	Priority Alert Species[$] -not assessed	Priority Alert Species[$] -not assessed	Widespread and probably beyond containment, management should focus on asset protection
Cenchrus ciliaris	Buffel Grass	8		High	Rapid	Widespread and probably beyond containment, management should focus on asset protection
Cenchrus setiger	Birdwood Grass	2		High	Rapid	Widespread and probably beyond containment, management should focus on asset protection
Citrullus amarus	Pie Melon	2		Unknown	Moderate	Unlikely to cause environmental impact or at the upper limit of their ecoclimatic acclimatisation in the Pilbara region
Eragrostis minor	Smaller Stinkgrass	4		Not assessed	Not assessed	Prospect for containment to one or two sub-regions within the Pilbara IBRA region
***Opuntia* sp.[#]**	Prickly Pear	3	Weed of National Significance. Declared Pest – C3 control category (management / restricted)	High	Rapid	Requires management under legislation
Passiflora foetida* var. *hispida	Stinking Passion Flower	1		High	Rapid	Widespread and probably beyond containment, management should focus on asset protection

[$] Priority alert species – at the time of publication, the species was either not found in WA, not found in the DBCA's Pilbara Region but known to exist in an adjacent region or found in the region but not on DBCA managed lands or waters.

[#] Two *Opuntia* species (*O. stricta* and *O. elata*) have been recorded in the vicinity of the Survey Area and are difficult to distinguish from each other – the taxon observed in the Survey Area could not be confidently assigned to either but appears more likely to be *O. stricta*. Both species are considered equivalent in an environmental impact and management context.

^ Source: DBCA (2014).

5.2.7 Floristic Classification Results

PCA determined that seven clusters may be appropriate to capture the majority of the variation in the quadrat dataset (including all quadrats assessed, the majority of which are not within the Survey Area). The dendrogram and taxon group matrix were therefore initially examined at this level, to determine the plausibility of clusters with regard to taxon groups as well as field observations. In addition, the floristic classification dendrogram was examined to determine the similarity of the classification of the Survey Area quadrats to the floristic classification presented by Umwelt (2024). This examination found that the Umwelt (2024) classification result was largely maintained when considering all the quadrats included within the analysis.

All Survey Area quadrats were classified in a single cluster together with all Umwelt (2024) quadrats that represented VT 16 (as described by Umwelt (2024)). Additionally, all regional quadrats established by this current assessment, including four quadrats in the Turner River (north or south of the Survey Area) and four quadrats undertaken in the Yule River, were classified in this cluster. It was therefore determined that this cluster represents a single VT in the Survey Area.

Appendix H presents an excerpt of the dendrogram showing the Survey Area and regional quadrats. **Appendix I** presents the taxon group matrix.

5.2.8 Vegetation Types of the Survey Area

As described above, a single VT was defined in the Survey Area via floristic composition classification and subsequent examination of quadrat data collected by the survey, with this VT considered to be analogous to VT 16, as mapped and described by Umwelt (2024). The additional quadrats established in the Survey Area have necessitated modification of the description of VT 16 relative to that presented in Umwelt (2024); however, the VT code presented in Umwelt (2024) (VT 16) has been maintained in this current assessment.

As also outlined above, floristic composition classification and subsequent examination of quadrat data confirmed that all regional quadrats represent VT 16; therefore, VT 16 is considered to occur at these locations. However, no mapping of vegetation at these locations was undertaken, as this was beyond the scope of this assessment.

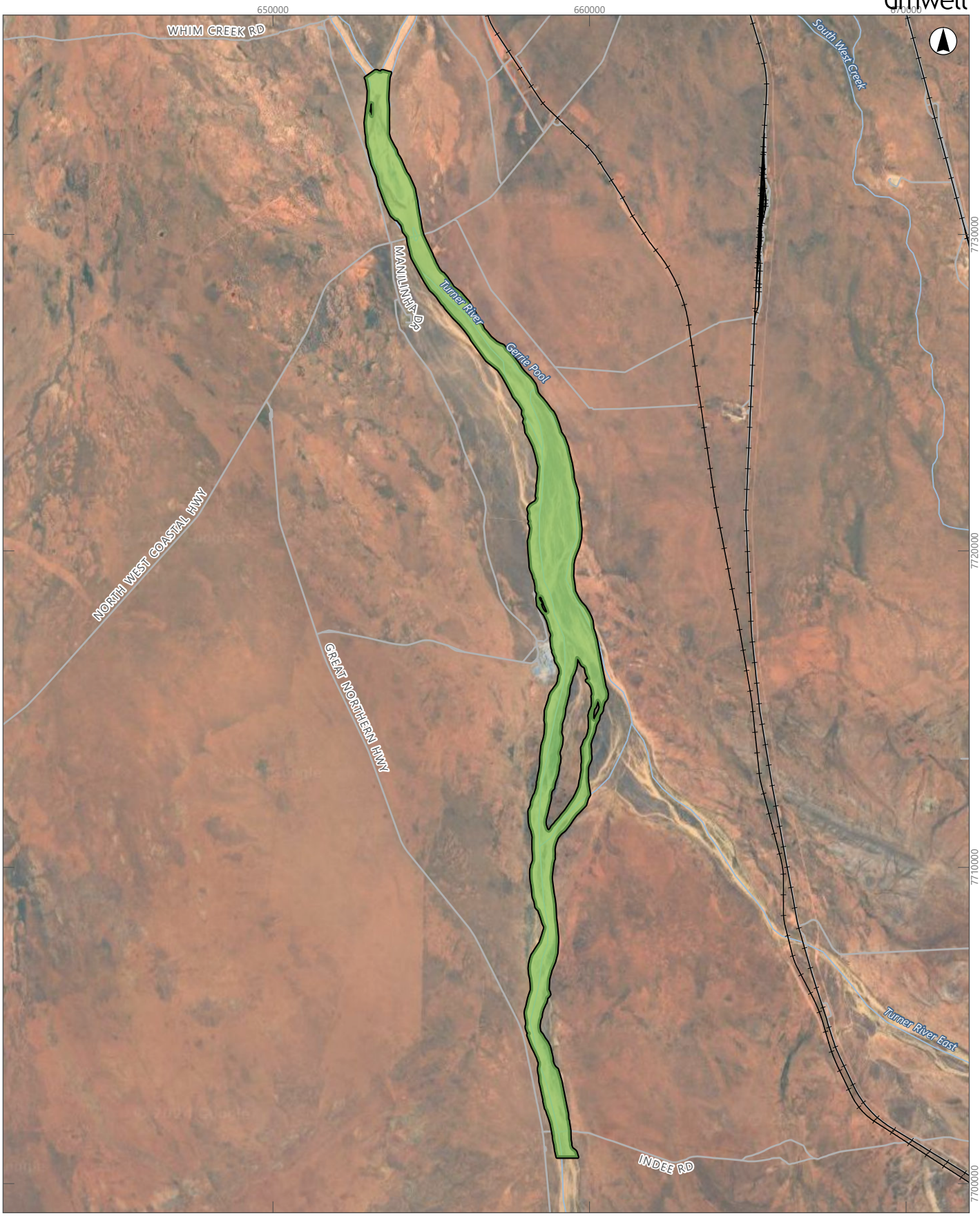
Table 5.10 presents the revised description of VT 16, including location, area mapped, sampling regime, significant flora recorded ('^' denotes preferred habitat for a significant taxon), average taxon richness and a description of variation found within the VT. **Figure 5.6** presents an overview of the distribution of the VT. Raw quadrat data and parameters are presented in **Appendix F**. **Appendix J** presents a taxon-VT matrix and **Appendix K** presents the results of the indicator taxa analysis. **Appendix B** presents a subset of photos and GPS locations recorded via the use of drones.

Table 5.10 Summary of the VT Described in the Survey Area

VT	Summary	Representative Photo
16	**Description:** Mid to low open woodland dominated by *Eucalyptus camaldulensis* subsp. *refulgens* and *Melaleuca argentea* over tall sparse shrubland dominated by *Melaleuca glomerata, Melaleuca linophylla, Acacia coriacea* subsp. *pendens* and *Acacia trachycarpa* over mid to low sparse shrubland dominated by *Acacia pyrifolia, Crotalaria cunninghamii* and *Corchorus incanus* subsp. *incanus* over low sparse hummock grassland dominated by *Triodia epactia* over low sparse sedgeland dominated by *Cyperus vaginatus* on pale red or brown sand with colluvial stones in river channels **Area Mapped (Proportion of Survey Area):** 2,949 ha (100%) **Sample Sites:** 15 Survey Area quadrats (DGJ02, DGJ03, DGJ06, DGJ07, DGJ08, DGJ09, DGJ10, DGJ11, DGJ12. DGJ13, WFMP01, WMP02, WMP05, WMP06, WMP07), 8 regional quadrats (DGJ01, DGJ04, DGJ05, WE019, WE021, WMP03, WMP04, WMP13), 5 quadrats from the Umwelt (2024) Survey Area (M21023, HJ01, HM05, HD03, M21142) **Indicator Taxa:** *Acacia ampliceps*, *Acacia coriacea* subsp. *pendens, Acacia pyrifolia, Acacia trachycarpa, Cajanus cinereus, Corynotheca pungens, Crotalaria cunninghamii, Cynanchum floribundum, Cyperus ixiocarpus, Cyperus vaginatus, Dentella asperata, Eucalyptus camaldulensis* subsp. *refulgens, Eulalia aurea, Goodenia lamprosperma, Melaleuca argentea, Melaleuca glomerata, Melaleuca linophylla, Microstachys chamaelea, Nellica maderaspatensis, Rhynchosia minima, Tephrosia* sp. B Kimberley Flora (C.A. Gardner 7300), *Tribulus occidentalis*, *Triumfetta propinqua* **Significant Taxa:** *Abutilon* sp. Pritzelianum (S. van Leeuwen 5095) (P3), *Gymnanthera cunninghamii* (P3)^ **Average Taxon Richness per Quadrat:** 31.1 ± 10.5 **Variation:** In some areas where high water flow volumes appear to occur regularly, the shrubland and hummock grassland strata were reduced to isolated plants or were absent entirely. In these areas, *Melaleuca argentea* was generally the only tree present in the tree stratum; in areas that apparently do not receive regular water flows, this species was absent and *Eucalyptus camaldulensis* subsp. *refulgens* was dominant.	 **Photo 5.3 VT 16 (Quadrat DGJ06)** **Photo 5.4 VT 16 variant – shrubland strata reduced or absent; Melaleuca argentea-dominated tree stratum (Quadrat DGJ07)**

VT	Summary	Representative Photo
	Occasionally a mid to low sparse tussock grassland dominated by *Eriachne benthamii* and *Eulalia aurea*, and an ephemeral low sparse tussock grassland, forbland and sedgeland of a variety of taxa, were present.	**Photo 5.5 VT 16 variant – mid to low sparse tussock grassland dominated by Eriachne benthamii and Eulalia aurea and other taxa (Quadrat WMP05)**

^ Designates preferred habitat for significant flora taxon, based on proportional location representation and landforms/soils.



Scale: 1:165,000 at A4, GDA2020 MGA Zone 50

Legend

- Survey Area
- Road
- Major Watercourse

Vegetation Type

16 Mid to low open woodland dominated by *Eucalyptus camaldulensis* subsp. *refulgens* and *Melaleuca argentea* over tall sparse shrubland dominated by *Melaleuca glomerata*, *Acacia coriacea* subsp. *pendens* and *Acacia trachycarpa* over mid to low sparse shrubland dominated by *Acacia pyrifolia* var. *pyrifolia*, *Crotalaria cunninghamii* and *Corchorus incanus* subsp. *incanus* over low sparse hummock grassland dominated by *Triodia epactia* over low sparse sedgeland dominated by *Cyperus vaginatus* on pale red or brown sand with patchy mixed stones in river channels

FIGURE 5.6

Vegetation Types of the Survey Area

0 4 8

Kilometres

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Image Source: Landgate (2023) | **Data Source:** Landgate (2024), Umwelt (2024)

5.2.9 Listed Significant Vegetation

The 2024 survey did not identify any vegetation considered to represent any formally listed TECs or PECs within the Survey Area. As discussed in **Section 5.1.5**, the desktop assessment identified one DBCA-listed PEC that has records within the Desktop Study Area, the 'Gregory Land System' PEC. This PEC is not listed under the EPBC Act however is classified by DBCA as a P3 PEC (DBCA, 2023e).

According to DBCA (2023e), the 'Gregory Land System' PEC (P3) consists of linear dunes and restricted sandplains supporting shrubby hard spinifex (and occasionally soft spinifex) grasslands. Little information is available for this PEC, but the Gregory Land System has been mapped by the Department of Agriculture in 2004 (DPIRD, 2022; van Vreeswyk et al., 2004), and therefore it is assumed that the Gregory Land System as mapped by van Vreeswyk et al. (2004) is analogous to the listed PEC of the same name.

This PEC is not considered to be present in the Survey Area. The Survey Area landform consists entirely of the Turner River channel; no dunes or sandplains are present, nor is the vegetation present similar to that of the PEC (as described by van Vreeswyk et al. (2004)). The nearest known location of the PEC is approximately 16 km to the south-west of the Survey as per DBCA records and previous survey data (DBCA, 2022a; Ecoscape, 2021; Umwelt, 2024). No other listed vegetation is considered to occur in the Survey Area.

5.2.10 Other Vegetation of Significance

The VT described by this current assessment is not considered to represent potentially significant vegetation under any of the categories outlined by EPA (2016a, 2016b), or for any other reason. VT 16 has been mapped over a large spatial area and based on the results of the analysis, it occurs in both the Yule River and the Turner River north / south of the Survey Area (as represented by regional quadrats). In addition, it is likely that similar vegetation occurs within other rivers and major creeks in the wider region. VT 16 is not considered to represent preferred habitat for any significant flora taxa that have especially restricted distributions.

As no Pilbara-wide vegetation dataset defined at the same scale at which the Survey Area VT was defined is available, it is not possible to conclusively assess the significance of VT 16 in a regional context. However, as discussed above, it is likely that similar vegetation would be relatively widespread in the general region surrounding the Survey Area. River landforms (e.g. De Grey, Oakover, Nullagine, Shaw, Yule, Sherlock rivers) and associated vegetation (similar to VT 16) are known to occur widely in the region (**Section 5.1.2**).

Ecoscape (2021) described VT EcMaEvMW within the Turner River, south of the Survey Area, which is equivalent to VT 16 in this assessment. Ecoscape considered VT EcMaEvMW to be potentially significant (in the context of EPA (2016a, 2016b)) due to the vegetation being groundwater dependent, as well as occupying a small extent, having a degree of historical impact from grazing and representing a refuge habitat for wildlife. VT 16 is discussed in more detail with respect to groundwater and surface water in **Section 5.2.11**; while it is clear that the groundwater and surface water dependence of VT 16 is a management issue for the Project, particularly in the context of the potential discharge of surplus water, VT 16 is not considered to represent significant vegetation based on groundwater or surface water dependence.

As discussed above, it is likely that this VT is widely distributed in the region over relatively large areas based on previous survey experience. It is also not considered that VT 16 has been significantly impacted by threatening processes. VT 16 has undoubtedly been subject to impact from grazing and weed invasion in some areas; however, this is consistent with many vegetation types in the wider Pilbara region, where pastoralism has been the predominant land use since European colonisation, and there are large areas of VTs that are considered to be relatively intact compared to their pre-European state.

5.2.11 Groundwater and Surface Water Dependent Vegetation

Riparian vegetation is defined as plant communities occurring in association with watercourses, both ephemeral and permanent, and is therefore considered to be dependent on surface water flows and/or groundwater. The VT mapped in the Survey Area is considered to represent riparian vegetation, with VT 16 being mapped within the Turner River channel. VT 16 is considered to be at least partially or totally dependent on surface water flows for survival.

Groundwater dependent vegetation is known to occur in the Pilbara and is generally indicated by the presence of one or several phreatophytic taxa (**Section 5.1.7**), and by shallow (no more than 10 m below ground level) depth to groundwater. The obligate phreatophytes *Melaleuca argentea* and *Eucalyptus camaldulensis* subsp. *refulgens*, and the potential facultative phreatophytes *Acacia ampliceps*, *Eucalyptus victrix*, *Melaleuca glomerata* and *Melaleuca linophylla* were recorded in the Survey Area by the survey in the Turner River, which is a known GDE (BoM, 2024b). As noted in **Section 5.1.6**, the depth to groundwater may be as shallow as 2 m in this area. Based on the presence of obligate phreatophytes in the Turner River, particularly *Melaleuca argentea*, and the shallow depth to groundwater, the vegetation of the Turner River, and therefore the entirety of the Survey Area, is considered to represent GDV.

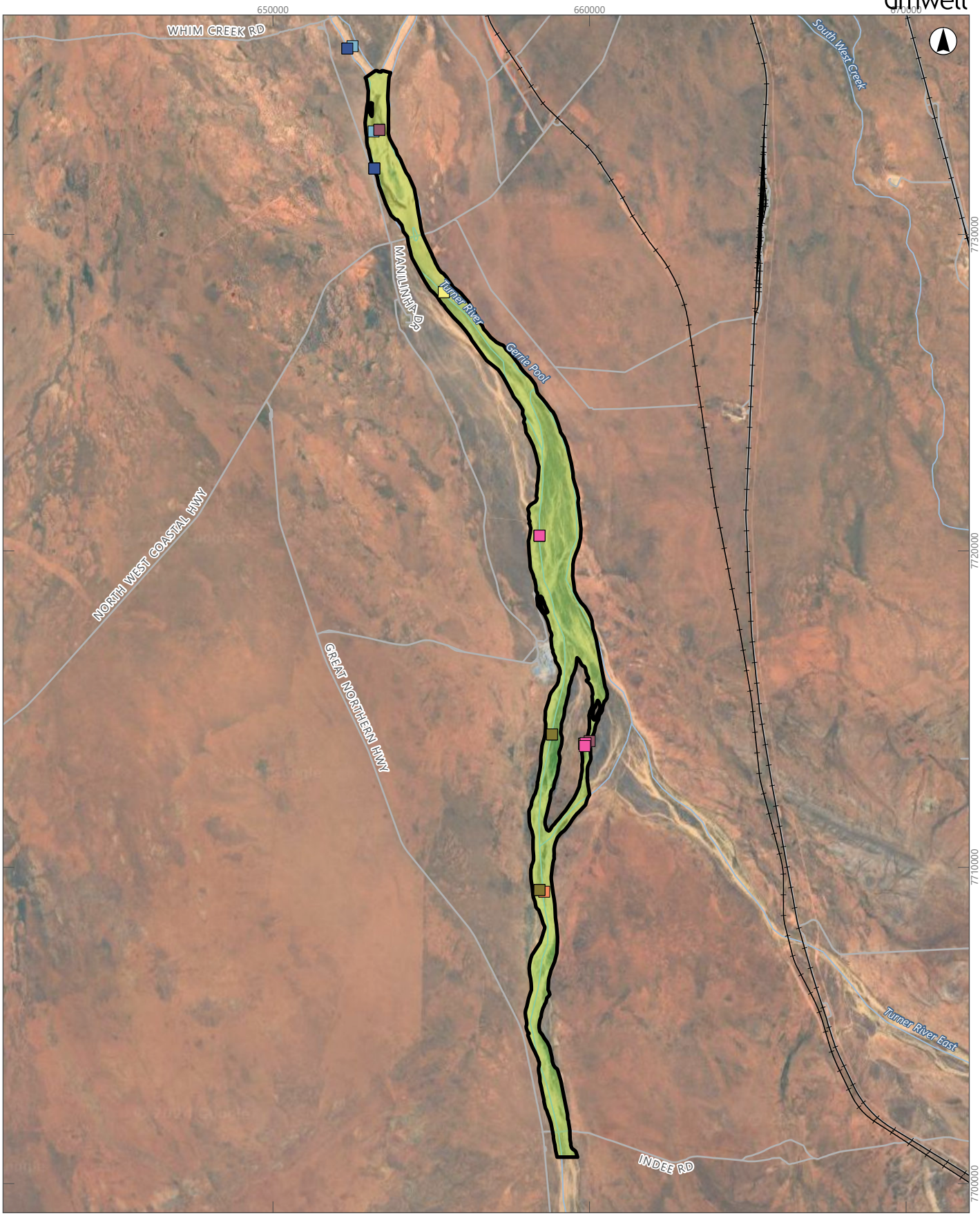
5.2.12 Vegetation Condition

Vegetation condition mapping was assessed at quadrat locations and opportunistically over the Survey Area. The entirety of the Survey Area (2,949 ha) was rated as a mosaic of 'Very Good/Good' condition (**Figure 5.7**). The vegetation has been impacted by moderate levels of cattle activity in the area, and establishment of weed taxa, particularly *Cenchrus ciliaris* and *Cenchrus setiger.* The variable condition of the vegetation was primarily related to the level of cattle usage and level of weeds present, with associated impacts fluctuating between slight impacts to vegetation composition and structure to displaying more obvious signs of impacts to vegetation structure and species composition. However, there were no obvious boundaries between areas of Good to Very Good vegetation.

It should be noted that a number of sand extraction operations occur in the Turner River channel in the Survey Area, however, such areas could not be visited to assess vegetation condition. Such areas have provisionally been included in the single condition polygon mapped over the Survey Area; however, it is possible they may be in poorer condition.

Additionally, minor tracks and other areas of disturbance were not mapped separately because of the scale of mapping presented.

Vegetation condition mapping is presented in **Figure 5.7**.



Scale: 1:165,000 at A4, GDA2020 MGA Zone 50

Legend

- Survey Area
- Road
- Major Watercourse

Vegetation Condition

- Very Good/Good

Introduced Species

- *Aerva javanica*
- *Calotropis procera*
- *Cenchrus ciliaris*
- *Cenchrus setiger*
- *Citrullus amarus*
- *Eragrostis minor*
- *Opuntia* sp.
- *Passiflora foetida* var. *hispida*

FIGURE 5.7

Vegetation Condition of the Survey Area

0 4 8

Kilometres

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Image Source: Landgate (2023) | **Data Source:** Landgate (2024), Umwelt (2024)

6.0 Discussion and Conclusions

The Survey Area is considered to have moderate diversity in terms of taxon richness (117 discrete vascular flora taxa), given the Survey Area was restricted to the channels of the Turner River. As such, many flora taxa that would be typically recorded in the Pilbara (on plains and ranges) were not recorded during this survey. Likewise, the mapping of only a single VT was not unexpected given previous surveys nearby also mapped a single VT in the Turner River (Ecoscape, 2021; Umwelt, 2024)

Two significant flora taxa are known to occur in the Survey Area; *Abutilon* sp. Pritzelianum (S. van Leeuwen 5095) (P3) (recorded during the current survey) and *Gymnanthera cunninghamii* (P3) (recorded during previous surveys), with the latter being the only taxon that is considered to prefer the habitat present in the Survey Area. Although only a single individual of *Gymnanthera cunninghamii* (P3) is currently known from the Survey Area (Ecoscape, 2021; Umwelt, 2024), more locations of this taxon would likely be present, based on the habitat present in the Survey Area. *Gymnanthera cunninghamii* (P3) is known from a large number of records and a wide distribution that spans across other states in northern Australia, while the distribution of *Abutilon* sp. Pritzelianum (S. van Leeuwen 5095) (P3) is relatively wide but is restricted to WA (ALA, 2024; WA Herbarium, 1998-). The population of *Abutilon* sp. Pritzelianum (S. van Leeuwen 5095) (P3) within the Survey Area is likely a transient one, with nearby records of this taxon occurring in much higher densities, typically on sandy plain habitat (Woodman Environmental (2013)).

The floristic classification analysis included a total of 315 quadrats to inform definition of VTs in the Survey Area, including quadrats assessed as part of previous surveys (Ecoscape, 2021; Umwelt, 2024; Woodman Environmental, 2011), as well as 23 quadrats assessed during the current survey (15 in the Survey Area and eight regional quadrats). The results of the floristic classification analysis and subsequent examination of data collected from quadrats in the Survey Area resulted in a single VT (VT 16) being defined and mapped in the Survey Area.

VT 16 is not considered to represent any formally listed TECs or any other PECs, nor is it considered to be significant for reasons other than formal listing (**Section 3.9.2**). VT 16 is considered to represent riparian vegetation that is dependent on surface and groundwater, with the latter indicated by the presence of obligate phreatophytes, particularly *Melaleuca argentea*.

The vegetation in the Survey Area was mapped as being a mosaic of 'Very Good/Good' condition, with disturbance associated with cattle and the presence of several relatively serious weeds. The variable condition of the vegetation was primarily related to the level of cattle usage and level of weeds present, with associated impacts fluctuating between slight impacts to vegetation composition and structure to displaying more obvious signs of impacts.

There were no survey limitations that are considered to have significantly influenced the results of the current survey. However, some parts of the Survey Area were not feasibly accessible by vehicle or on foot, with limited access points to the Survey Area. This was largely overcome by the use of drones to observe vegetation in these parts. Adequacy of survey measures indicated that the Survey Area was adequately sampled.

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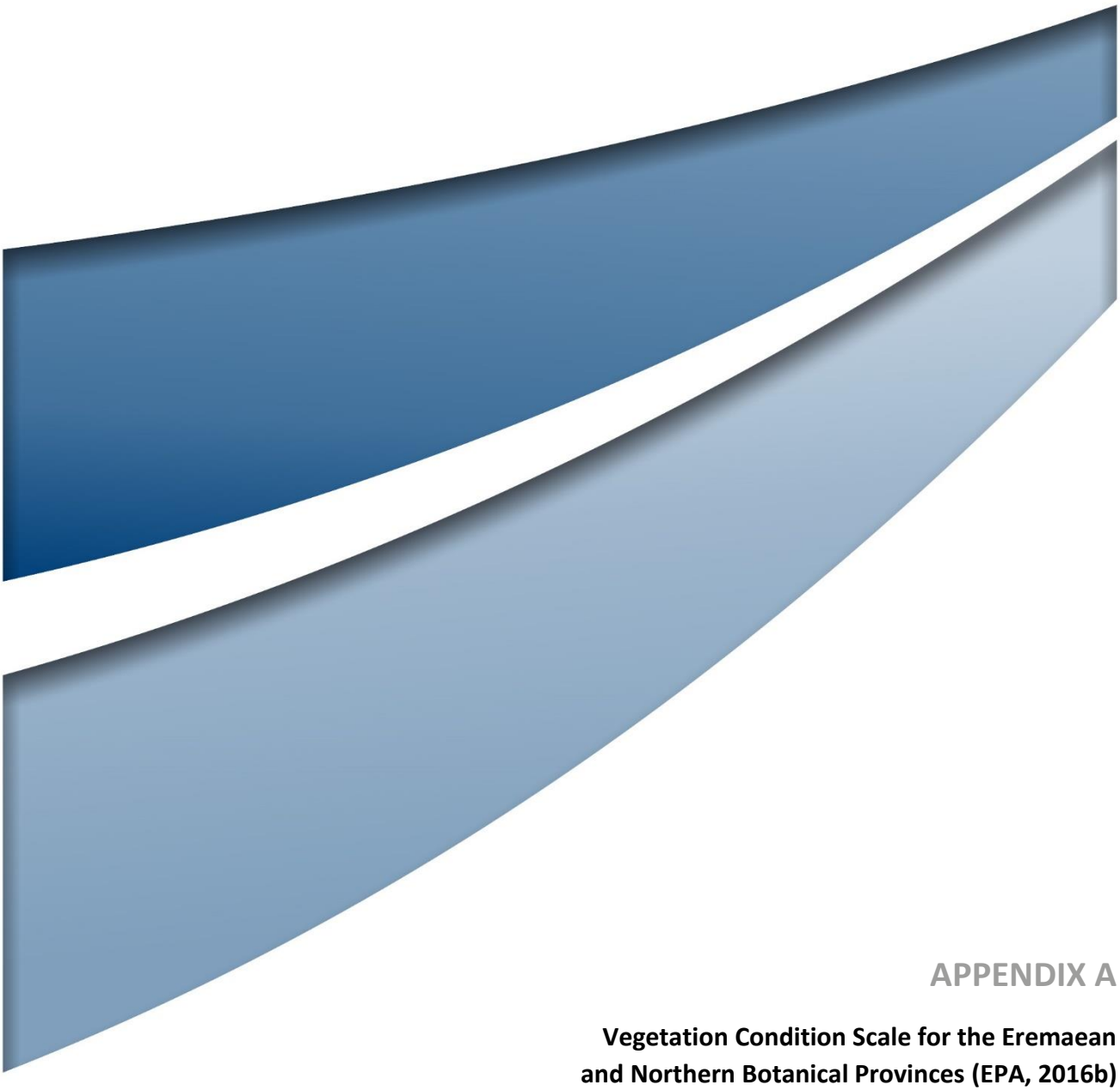


APPENDIX A

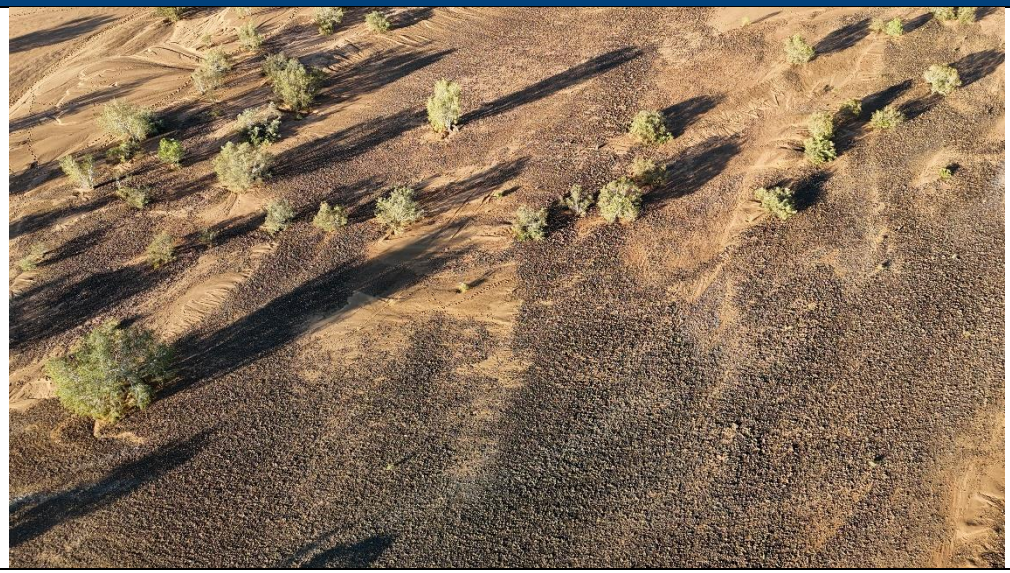
Vegetation Condition Scale for the Eremaean and Northern Botanical Provinces (EPA, 2016b)

Condition Ranking	Description
Excellent (E)	Pristine or nearly so, no obvious signs of damage caused by human activities since European settlement.
Very Good (VG)	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 (G)	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 (P)	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 (D)	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 (CD)	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.

APPENDIX B

Photographs Recorded via Drones in the Survey Area

Details	Photo
Photo Point: D01 **Photo Reference:** DJI_20240509072254_0057_D **Location**: 658433, 7705449 (GDA2020, Zone 50)	
Photo Point: D02 **Photo Reference:** DJI_20240509071829_0050_D **Location:** 658335, 7706997 (GDA2020, Zone 50)	

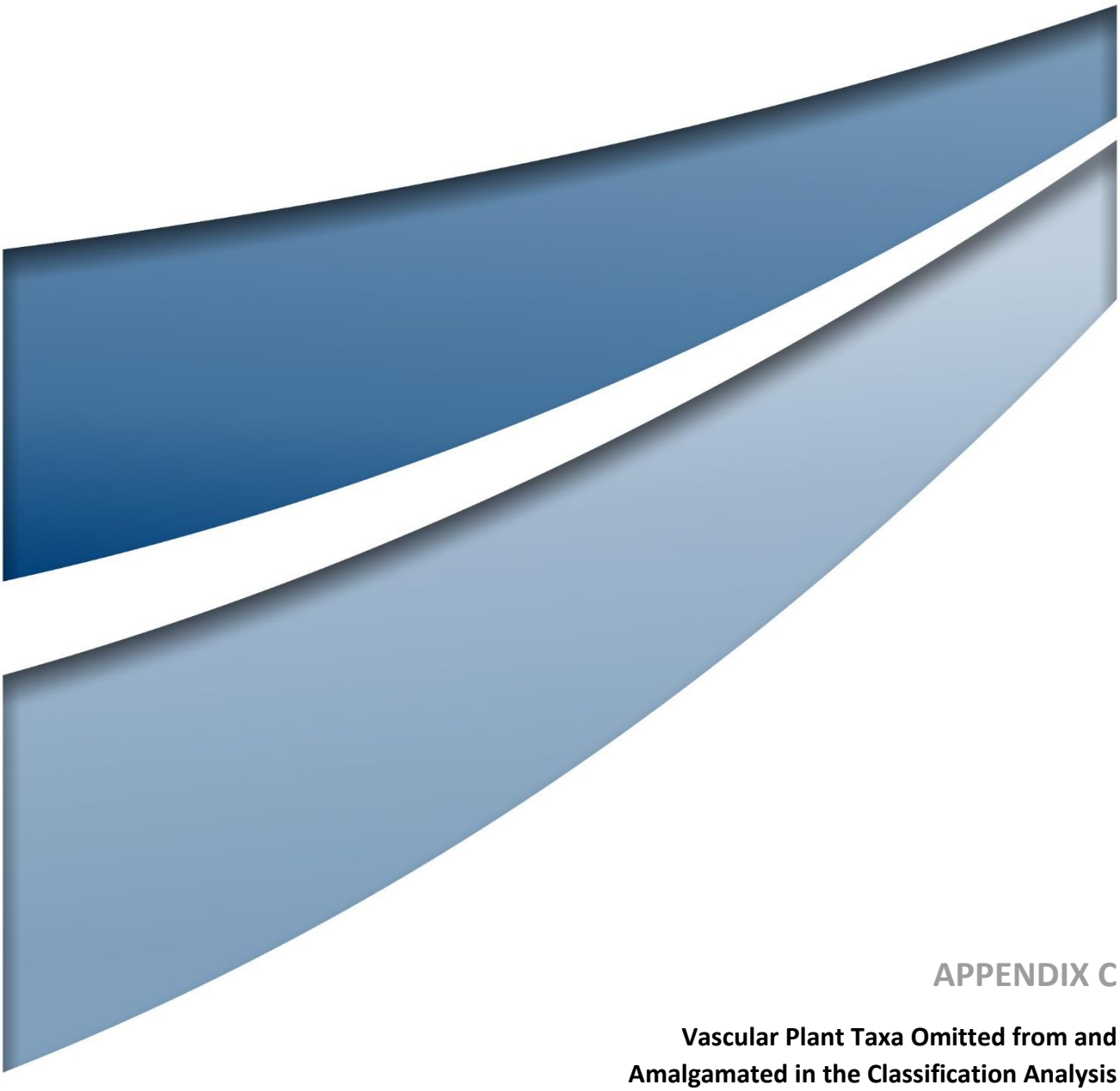
Details	Photo
Photo Point: D03 **Photo Reference:**DJI_20240509071700_0048_D **Location:** 658632, 7707554	
Photo Point: D04 **Photo Reference:** DJI_20240509071334_0043_D **Location:** 658877, 7707982 (GDA2020, Zone 50)	

Details	Photo
Photo Point: D05 **Photo Reference:** DJI_20240507163322_0003_D **Location:** 658970, 7711064 (GDA2020, Zone 50)	
Photo Point: D06 **Photo Reference:** DJI_20240508100808_0049_D **Location:** 658874, 7718231 (GDA2020, Zone 50)	

Details	Photo
Photo Point: D07 **Photo Reference:** DJI_20240508100549_0046_D **Location:** 658800, 7719169 (GDA2020, Zone 50)	
Photo Point: D08 **Photo Reference:** DJI_20240508101104_0054_D **Location:** 658426, 7719398 (GDA2020, Zone 50)	

Details	Photo
Photo Point: D09 **Photo Reference:** DJI_20240508080214_0031_D **Location:** 656992, 7725841	
Photo Point: D10 **Photo Reference:** DJI_20240508075812_0020_D **Location:** 657480, 7725942 (GDA2020, Zone 50)	

Details	Photo
Photo Point: D11 **Photo Reference:** DJI_20240508080247_0032_D **Location:** 656834, 7725999 (GDA2020, Zone 50)	
Photo Point: D12 **Photo Reference:** DJI_20240508080441_0035_D **Location:** 656692, 7726380 (GDA2020, Zone 50)	



APPENDIX C

Vascular Plant Taxa Omitted from and Amalgamated in the Classification Analysis

Note: this table does not include taxa belonging to the following categories that were removed prior to the classification analysis (as per **Section 3.6**):

- Annual/ephemeral taxa
- Introduced taxa
- Hybrids
- Taxa with incomplete identification
- Singletons.

Action	Taxa	Reasoning	Year Taxa Recorded
Amalgamated	*Acacia pyrifolia var. morrisonii* *Acacia pyrifolia var. pyrifolia*	Variants could not be consistently positively identified due to inadequate material	2024
	Acacia sericophylla *Acacia ?sericophylla*	Likely represent the same entity	2024
	Clerodendrum tomentosum *Clerodendrum tomentosum* var. *tomentosum*	Ecoscape (2021) did not identify this entity to variant level	2022
	Corchorus tectus *Corchorus ?tectus*	Likely represent the same entity	2024
	Corymbia candida *Corymbia candida* subsp. *candida*	Ecoscape (2021) did not identify this entity to subspecies level	2022
	Eriachne benthamii *Eriachne ?benthamii*	Likely represent the same entity	2024
	Eriachne obtusa *Eriachne ?obtusa*	Likely represent the same entity	2022
	Euploca pachyphylla *Euploca ?pachyphylla*	Likely represent the same entity	2022
	Evolvulus alsinoides var. *decumbens* *Evolvulus alsinoides* var. *villosicalyx*	Variants could not be consistently positively identified due to inadequate material	2022
	Grevillea wickhamii *Grevillea wickhamii* subsp. *aprica* *Grevillea wickhamii subsp. macrodonta*	Ecoscape (2021) did not identify this entity to subspecies level	2022, 2024
	Marsilea hirsuta *Marsilea ?hirsuta*	Likely represent the same entity	2022
	Portulaca filifolia *Portulaca ?filifolia*	Likely represent the same entity	2022
	Sida arenicola *Sida ?arenicola*	Likely represent the same entity	2024

Action	Taxa	Reasoning	Year Taxa Recorded
	Sida clementii *Sida ?clementii*	Likely represent the same entity	2024
	Sida echinocarpa *Sida ?echinocarpa*	Likely represent the same entity	2022
	Solanum cleistogamum *Solanum ?cleistogamum*	Likely represent the same entity	2022
	Tephrosia rosea var. *clementii* *Tephrosia rosea* var. *rosea*	Variants could not be consistently positively identified due to inadequate material	2022
Amalgamated cont.	*Triumfetta propinqua* *Triumfetta ?propinqua*	Likely represent the same entity	2024
	Waltheria indica *Waltheria ?indica*	Likely represent the same entity	2022
Omitted	*Indigofera trita* / *Indigofera trita* subsp. *trita*	Short-lived perennial	2022
	Panicum australiense var. *australiense*	Short-lived perennial	2022
	Ptilotus exaltatus	Short-lived perennial	2022

APPENDIX D

Results of Search of the Department of Climate Change, Energy, the Environment and Water Species Profile and Threats Database (DCCEEW, 2024)

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: 02-Oct-2024

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

Caveat
Acknowledgements

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:	2
Listed Threatened Ecological Communities:	None
Listed Threatened Species:	41
Listed Migratory Species:	67

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:	73
Commonwealth Heritage Places:	None
Listed Marine Species:	106
Whales and Other Cetaceans:	13
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:	1
EPBC Act Referrals:	52
Key Ecological Features (Marine):	None
Biologically Important Areas:	9
Bioregional Assessments:	None
Geological and Bioregional Assessments:	None

Details

Matters of National Environmental Significance

Commonwealth Marine Area [Resource Information]

Approval is required for a proposed activity that is located within the Commonwealth Marine Area which has, will have, or is likely to have a significant impact on the environment. Approval may be required for a proposed action taken outside a Commonwealth Marine Area but which has, may have or is likely to have a significant impact on the environment in the Commonwealth Marine Area.

Feature Name	Buffer Status
Commonwealth Marine Areas (EPBC Act)	In buffer area only
Commonwealth Marine Areas (EPBC Act)	In buffer area only

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			
Arenaria interpres Ruddy Turnstone [872]	Vulnerable	Species or species habitat known to occur within area	In buffer area only
Calidris acuminata Sharp-tailed Sandpiper [874]	Vulnerable	Species or species habitat known to occur within area	In feature area
Calidris canutus Red Knot, Knot [855]	Vulnerable	Species or species habitat known to occur within area	In buffer area only
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area	In feature area
Calidris tenuirostris Great Knot [862]	Vulnerable	Species or species habitat known to occur within area	In buffer area only
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat known to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Charadrius mongolus Lesser Sand Plover, Mongolian Plover [879]	Endangered	Species or species habitat known to occur within area	In buffer area only
Erythrotriorchis radiatus Red Goshawk [942]	Endangered	Species or species habitat may occur within area	In feature area
Falco hypoleucos Grey Falcon [929]	Vulnerable	Species or species habitat known to occur within area	In feature area
Limnodromus semipalmatus Asian Dowitcher [843]	Vulnerable	Species or species habitat known to occur within area	In buffer area only
Limosa lapponica menzbieri Northern Siberian Bar-tailed Godwit, Russkoye Bar-tailed Godwit [86432]	Endangered	Species or species habitat known to occur within area	In buffer area only
Limosa limosa Black-tailed Godwit [845]	Endangered	Species or species habitat known to occur within area	In buffer area only
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may 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
Pezoporus occidentalis Night Parrot [59350]	Endangered	Species or species habitat may occur within area	In feature area
Phaethon lepturus fulvus Christmas Island White-tailed Tropicbird, Golden Bosunbird [26021]	Endangered	Species or species habitat may occur within area	In buffer area only
Phaethon rubricauda westralis Red-tailed Tropicbird (Indian Ocean), Indian Ocean Red-tailed Tropicbird [91824]	Endangered	Species or species habitat likely to occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
[Pluvialis squatarola](#) Grey Plover [865]	Vulnerable	Species or species habitat known to occur within area	In buffer area only
[Polytelis alexandrae](#) Princess Parrot, Alexandra's Parrot [758]	Vulnerable	Species or species habitat may occur within area	In buffer area only
[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 known to occur within area	In feature area
[Xenus cinereus](#) Terek Sandpiper [59300]	Vulnerable	Species or species habitat known to occur within area	In buffer area only
MAMMAL			
[Balaenoptera musculus](#) Blue Whale [36]	Endangered	Species or species habitat likely to occur within area	In buffer area only
[Dasyurus hallucatus](#) Northern Quoll, Digul [Gogo-Yimidir], Wijingadda [Dambimangari], Wiminji [Martu] [331]	Endangered	Species or species habitat known to occur within area	In feature area
[Macroderma gigas](#) Ghost Bat [174]	Vulnerable	Species or species habitat known to occur within area	In feature area
[Macrotis lagotis](#) Greater Bilby [282]	Vulnerable	Species or species habitat known to occur within area	In feature area
[Rhinonicteris aurantia (Pilbara form)](#) Pilbara Leaf-nosed Bat [82790]	Vulnerable	Species or species habitat known to occur within area	In feature area
REPTILE			
[Aipysurus apraefrontalis](#) Short-nosed Sea Snake, Short-nosed Seasnake [1115]	Critically Endangered	Species or species habitat likely to occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
[Aipysurus foliosquama](#) Leaf-scaled Sea Snake, Leaf-scaled Seasnake [1118]	Critically Endangered	Species or species habitat known to occur within area	In buffer area only
[Caretta caretta](#) Loggerhead Turtle [1763]	Endangered	Foraging, feeding or related behaviour 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	Breeding known to occur within area	In buffer area only
[Liasis olivaceus barroni](#) Pilbara Olive Python [66699]	Vulnerable	Species or species habitat likely to occur within area	In feature area
[Natator depressus](#) Flatback Turtle [59257]	Vulnerable	Breeding known to occur within area	In buffer area only
SHARK			
[Carcharodon carcharias](#) White Shark, Great White Shark [64470]	Vulnerable	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 may occur within area	In buffer area only
[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

Scientific Name	Threatened Category	Presence Text	Buffer Status
[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
[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 likely to occur within area	In buffer area only
[Fregata ariel](#) Lesser Frigatebird, Least Frigatebird [1012]		Species or species habitat known to occur within area	In buffer area only
[Macronectes giganteus](#) Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area	In buffer area only
[Phaethon lepturus](#) White-tailed Tropicbird [1014]		Species or species habitat likely to occur within area	In buffer area only
[Sternula albifrons](#) Little Tern [82849]		Species or species habitat may 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

Scientific Name	Threatened Category	Presence Text	Buffer Status
[Balaenoptera musculus](#) Blue Whale [36]	Endangered	Species or species habitat likely to 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
[Carcharias taurus](#) Grey Nurse Shark [64469]		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
[Caretta caretta](#) Loggerhead Turtle [1763]	Endangered	Foraging, feeding or related behaviour 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	Breeding known to occur within area	In buffer area only
[Isurus oxyrinchus](#) Shortfin Mako, Mako Shark [79073]		Species or species habitat likely to occur within area	In buffer area only
[Isurus paucus](#) Longfin Mako [82947]		Species or species habitat likely to occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Megaptera novaeangliae Humpback Whale [38]		Breeding known to occur within area	In buffer area only
Mobula alfredi as Manta alfredi Reef Manta Ray, Coastal Manta Ray [90033]		Species or species habitat known to occur within area	In buffer area only
Mobula birostris as Manta birostris Giant Manta Ray [90034]		Species or species habitat likely to 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
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 may occur within area	In buffer area only
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 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

Scientific Name	Threatened Category	Presence Text	Buffer Status
Migratory Terrestrial Species			
[Cuculus optatus](#) Oriental Cuckoo, Horsfield's Cuckoo [86651]		Species or species habitat may occur within area	In buffer area only
[Hirundo rustica](#) Barn Swallow [662]		Species or species habitat known to occur within area	In feature area
[Motacilla cinerea](#) Grey Wagtail [642]		Species or species habitat may occur within area	In feature area
[Motacilla flava](#) Yellow Wagtail [644]		Species or species habitat known to occur within area	In feature area
Migratory Wetlands Species			
[Actitis hypoleucos](#) Common Sandpiper [59309]		Species or species habitat known to occur within area	In feature area
[Arenaria interpres](#) Ruddy Turnstone [872]	Vulnerable	Species or species habitat known to occur within area	In buffer area only
[Calidris acuminata](#) Sharp-tailed Sandpiper [874]	Vulnerable	Species or species habitat known to occur within area	In feature area
[Calidris alba](#) Sanderling [875]		Species or species habitat known to occur within area	In buffer area only
[Calidris canutus](#) Red Knot, Knot [855]	Vulnerable	Species or species habitat known to occur within area	In buffer area only
[Calidris ferruginea](#) Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area	In feature area
[Calidris melanotos](#) Pectoral Sandpiper [858]		Species or species habitat known to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Calidris ruficollis Red-necked Stint [860]		Species or species habitat known to occur within area	In buffer area only
Calidris subminuta Long-toed Stint [861]		Species or species habitat known to occur within area	In buffer area only
Calidris tenuirostris Great Knot [862]	Vulnerable	Species or species habitat known to occur within area	In buffer area only
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat known to occur within area	In feature area
Charadrius mongolus Lesser Sand Plover, Mongolian Plover [879]	Endangered	Species or species habitat known to occur within area	In buffer area only
Charadrius veredus Oriental Plover, Oriental Dotterel [882]		Species or species habitat known to occur within area	In feature area
Glareola maldivarum Oriental Pratincole [840]		Species or species habitat known to occur within area	In feature area
Limicola falcinellus Broad-billed Sandpiper [842]		Species or species habitat known to occur within area	In buffer area only
Limnodromus semipalmatus Asian Dowitcher [843]	Vulnerable	Species or species habitat known to occur within area	In buffer area only
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat known to occur within area	In buffer area only
Limosa limosa Black-tailed Godwit [845]	Endangered	Species or species habitat known to occur within area	In buffer area only

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
Numenius minutus Little Curlew, Little Whimbrel [848]		Species or species habitat known to occur within area	In buffer area only
Numenius phaeopus Whimbrel [849]		Species or species habitat known to occur within area	In buffer area only
Pandion haliaetus Osprey [952]		Breeding known to occur within area	In buffer area only
Phalaropus lobatus Red-necked Phalarope [838]		Species or species habitat known to occur within area	In buffer area only
Pluvialis fulva Pacific Golden Plover [25545]		Species or species habitat known to occur within area	In buffer area only
Pluvialis squatarola Grey Plover [865]	Vulnerable	Species or species habitat known to occur within area	In buffer area only
Tringa brevipes Grey-tailed Tattler [851]		Species or species habitat known to occur within area	In buffer area only
Tringa glareola Wood Sandpiper [829]		Species or species habitat known to occur within area	In buffer area only
Tringa nebularia Common Greenshank, Greenshank [832]	Endangered	Species or species habitat known to occur within area	In feature area
Tringa stagnatilis Marsh Sandpiper, Little Greenshank [833]		Species or species habitat known to occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Xenus cinereus			
Terek Sandpiper [59300]	Vulnerable	Species or species habitat known to occur within area	In buffer area only

Other Matters Protected by the EPBC Act

Commonwealth Lands [Resource Information]

The Commonwealth area listed below may indicate the presence of Commonwealth land in this vicinity. Due to the unreliability of the data source, all proposals should be checked as to whether it impacts on a Commonwealth area, before making a definitive decision. Contact the State or Territory government land department for further information.

Commonwealth Land Name	State	Buffer Status
Unknown		
Commonwealth Land - [51688]	WA	In buffer area only
Commonwealth Land - [51690]	WA	In buffer area only
Commonwealth Land - [51403]	WA	In buffer area only
Commonwealth Land - [51049]	WA	In buffer area only
Commonwealth Land - [51048]	WA	In buffer area only
Commonwealth Land - [51678]	WA	In buffer area only
Commonwealth Land - [51676]	WA	In buffer area only
Commonwealth Land - [51679]	WA	In buffer area only
Commonwealth Land - [51674]	WA	In buffer area only
Commonwealth Land - [51677]	WA	In buffer area only
Commonwealth Land - [51054]	WA	In buffer area only
Commonwealth Land - [51711]	WA	In buffer area only
Commonwealth Land - [51718]	WA	In buffer area only
Commonwealth Land - [50349]	WA	In buffer area only
Commonwealth Land - [51692]	WA	In buffer area only
Commonwealth Land - [51691]	WA	In buffer area only
Commonwealth Land - [51666]	WA	In buffer area only

Commonwealth Land Name	State	Buffer Status
Commonwealth Land - [50324]	WA	In buffer area only
Commonwealth Land - [51681]	WA	In buffer area only
Commonwealth Land - [50325]	WA	In buffer area only
Commonwealth Land - [50359]	WA	In buffer area only
Commonwealth Land - [50326]	WA	In buffer area only
Commonwealth Land - [51683]	WA	In buffer area only
Commonwealth Land - [50327]	WA	In buffer area only
Commonwealth Land - [51682]	WA	In buffer area only
Commonwealth Land - [51684]	WA	In buffer area only
Commonwealth Land - [51685]	WA	In buffer area only
Commonwealth Land - [51686]	WA	In buffer area only
Commonwealth Land - [51687]	WA	In buffer area only
Commonwealth Land - [51689]	WA	In buffer area only
Commonwealth Land - [51713]	WA	In buffer area only
Commonwealth Land - [51710]	WA	In buffer area only
Commonwealth Land - [51712]	WA	In buffer area only
Commonwealth Land - [51717]	WA	In buffer area only
Commonwealth Land - [51714]	WA	In buffer area only
Commonwealth Land - [51719]	WA	In buffer area only
Commonwealth Land - [51716]	WA	In buffer area only
Commonwealth Land - [51700]	WA	In buffer area only
Commonwealth Land - [51050]	WA	In buffer area only
Commonwealth Land - [51715]	WA	In buffer area only
Commonwealth Land - [51706]	WA	In buffer area only
Commonwealth Land - [51707]	WA	In buffer area only
Commonwealth Land - [51404]	WA	In buffer area only
Commonwealth Land - [50323]	WA	In buffer area only

Commonwealth Land Name	State	Buffer Status
Commonwealth Land - [51051]	WA	In buffer area only
Commonwealth Land - [51429]	WA	In buffer area only
Commonwealth Land - [51709]	WA	In buffer area only
Commonwealth Land - [51708]	WA	In buffer area only
Commonwealth Land - [51669]	WA	In buffer area only
Commonwealth Land - [51705]	WA	In buffer area only
Commonwealth Land - [51704]	WA	In buffer area only
Commonwealth Land - [51703]	WA	In buffer area only
Commonwealth Land - [51702]	WA	In buffer area only
Commonwealth Land - [51052]	WA	In buffer area only
Commonwealth Land - [51668]	WA	In buffer area only
Commonwealth Land - [51720]	WA	In buffer area only
Commonwealth Land - [51947]	WA	In buffer area only
Commonwealth Land - [51667]	WA	In buffer area only
Commonwealth Land - [51671]	WA	In buffer area only
Commonwealth Land - [51670]	WA	In buffer area only
Commonwealth Land - [51673]	WA	In buffer area only
Commonwealth Land - [51672]	WA	In buffer area only
Commonwealth Land - [51675]	WA	In buffer area only
Commonwealth Land - [51697]	WA	In buffer area only
Commonwealth Land - [51698]	WA	In buffer area only
Commonwealth Land - [51695]	WA	In buffer area only
Commonwealth Land - [51696]	WA	In buffer area only
Commonwealth Land - [51680]	WA	In buffer area only
Commonwealth Land - [51053]	WA	In buffer area only
Commonwealth Land - [51699]	WA	In buffer area only
Commonwealth Land - [51055]	WA	In buffer area only

Commonwealth Land Name	State	Buffer Status
Commonwealth Land - [51694]	WA	In buffer area only
Commonwealth Land - [51693]	WA	In buffer area only

Listed Marine Species [Resource Information]

Scientific Name	Threatened Category	Presence Text	Buffer Status
Bird			
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
Arenaria interpres Ruddy Turnstone [872]	Vulnerable	Species or species habitat known to occur within area	In buffer area only
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 known to occur within area	In feature area
Calidris alba Sanderling [875]		Species or species habitat known to occur within area	In buffer area only
Calidris canutus Red Knot, Knot [855]	Vulnerable	Species or species habitat known to occur within area overfly marine area	In buffer area only
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area overfly marine area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat known to occur within area overfly marine area	In feature area
Calidris ruficollis Red-necked Stint [860]		Species or species habitat known to occur within area overfly marine area	In buffer area only
Calidris subminuta Long-toed Stint [861]		Species or species habitat known to occur within area overfly marine area	In buffer area only
Calidris tenuirostris Great Knot [862]	Vulnerable	Species or species habitat known to occur within area overfly marine area	In buffer area only
Calonectris leucomelas Streaked Shearwater [1077]		Species or species habitat likely to occur within area	In buffer area only
Chalcites osculans as Chrysococcyx osculans Black-eared Cuckoo [83425]		Species or species habitat known to occur within area overfly marine area	In feature area
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat known to occur within area	In feature area
Charadrius mongolus Lesser Sand Plover, Mongolian Plover [879]	Endangered	Species or species habitat known to occur within area	In buffer area only
Charadrius ruficapillus Red-capped Plover [881]		Species or species habitat known to occur within area overfly marine area	In buffer area only
Charadrius veredus Oriental Plover, Oriental Dotterel [882]		Species or species habitat known to occur within area overfly marine area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Fregata ariel Lesser Frigatebird, Least Frigatebird [1012]		Species or species habitat known to occur within area	In buffer area only
Glareola maldivarum Oriental Pratincole [840]		Species or species habitat known to occur within area overfly marine area	In feature area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat known to occur within area	In feature area
Himantopus himantopus Pied Stilt, Black-winged Stilt [870]		Species or species habitat known to occur within area overfly marine area	In buffer area only
Hirundo rustica Barn Swallow [662]		Species or species habitat known to occur within area overfly marine area	In feature area
Limicola falcinellus Broad-billed Sandpiper [842]		Species or species habitat known to occur within area overfly marine area	In buffer area only
Limnodromus semipalmatus Asian Dowitcher [843]	Vulnerable	Species or species habitat known to occur within area overfly marine area	In buffer area only
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat known to occur within area	In buffer area only
Limosa limosa Black-tailed Godwit [845]	Endangered	Species or species habitat known to occur within area overfly marine area	In buffer area only
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area overfly marine area	In feature area
Motacilla cinerea Grey Wagtail [642]		Species or species habitat may occur within area overfly marine area	In feature area
Motacilla flava Yellow Wagtail [644]		Species or species habitat known to 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
Numenius minutus Little Curlew, Little Whimbrel [848]		Species or species habitat known to occur within area overfly marine area	In buffer area only
Numenius phaeopus Whimbrel [849]		Species or species habitat known to occur within area	In buffer area only
Pandion haliaetus Osprey [952]		Breeding known to occur within area	In buffer area only
Phaethon lepturus White-tailed Tropicbird [1014]		Species or species habitat likely to occur within area	In buffer area only
Phaethon lepturus fulvus Christmas Island White-tailed Tropicbird, Golden Bosunbird [26021]	Endangered	Species or species habitat may occur within area	In buffer area only
Phalaropus lobatus Red-necked Phalarope [838]		Species or species habitat known to occur within area	In buffer area only
Pluvialis fulva Pacific Golden Plover [25545]		Species or species habitat known to occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Pluvialis squatarola Grey Plover [865]	Vulnerable	Species or species habitat known to occur within area overfly marine area	In buffer area only
Recurvirostra novaehollandiae Red-necked Avocet [871]		Species or species habitat known to occur within area overfly marine area	In buffer area only
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
Sternula albifrons as Sterna albifrons Little Tern [82849]		Species or species habitat may occur within area	In buffer area only
Stiltia isabella Australian Pratincole [818]		Species or species habitat known to occur within area overfly marine area	In buffer area only
Tringa brevipes as Heteroscelus brevipes Grey-tailed Tattler [851]		Species or species habitat known to occur within area	In buffer area only
Tringa glareola Wood Sandpiper [829]		Species or species habitat known to occur within area overfly marine area	In buffer area only
Tringa nebularia Common Greenshank, Greenshank [832]	Endangered	Species or species habitat known to occur within area overfly marine area	In feature area
Tringa stagnatilis Marsh Sandpiper, Little Greenshank [833]		Species or species habitat known to occur within area overfly marine area	In buffer area only
Xenus cinereus Terek Sandpiper [59300]	Vulnerable	Species or species habitat known to occur within area overfly marine area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Fish			
Acentronura larsonae Helen's Pygmy Pipehorse [66186]		Species or species habitat may occur within area	In buffer area only
Bulbonaricus brauni Braun's Pughead Pipefish, Pug-headed Pipefish [66189]		Species or species habitat may occur within area	In buffer area only
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 latispinosus Muiron Island Pipefish [66196]		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
Doryrhamphus dactyliophorus Banded Pipefish, Ringed Pipefish [66210]		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
Doryrhamphus multiannulatus Many-banded Pipefish [66717]		Species or species habitat may occur within area	In buffer area only
Doryrhamphus negrosensis Flagtail Pipefish, Masthead Island Pipefish [66213]		Species or species habitat may occur within area	In buffer area only
Festucalex scalaris Ladder Pipefish [66216]		Species or species habitat may occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Filicampus tigris Tiger Pipefish [66217]		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 grayi Mud Pipefish, Gray's Pipefish [66221]		Species or species habitat may occur within area	In buffer area only
Halicampus nitidus Glittering Pipefish [66224]		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 penicillus Beady Pipefish, Steep-nosed Pipefish [66231]		Species or species habitat may occur within area	In buffer area only
Hippocampus angustus Western Spiny Seahorse, Narrow-bellied Seahorse [66234]		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
Hippocampus planifrons Flat-face Seahorse [66238]		Species or species habitat may occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Hippocampus trimaculatus Three-spot Seahorse, Low-crowned Seahorse, Flat-faced Seahorse [66720]		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
Phoxocampus belcheri Black Rock Pipefish [66719]		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 apraefrontalis Short-nosed Sea Snake, Short-nosed Seasnake [1115]	Critically Endangered	Species or species habitat likely to occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Aipysurus duboisii Dubois' Sea Snake, Dubois' Seasnake, Reef Shallows Sea Snake [1116]		Species or species habitat may occur within area	In buffer area only
Aipysurus foliosquama Leaf-scaled Sea Snake, Leaf-scaled Seasnake [1118]	Critically Endangered	Species or species habitat known to occur within area	In buffer area only
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
Aipysurus tenuis Brown-lined Sea Snake, Mjoberg's Sea Snake [1121]		Species or species habitat may occur within area	In buffer area only
Caretta caretta Loggerhead Turtle [1763]	Endangered	Foraging, feeding or related behaviour 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
Emydocephalus annulatus Eastern Turtle-headed Sea Snake [1125]		Species or species habitat may occur within area	In buffer area only
Ephalophis greyae as Ephalophis greyi Mangrove Sea Snake [93738]		Species or species habitat may occur within area	In buffer area only
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Breeding known to occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Hydrelaps darwiniensis Port Darwin Sea Snake, Black-ringed Mangrove Sea Snake [1100]		Species or species habitat may occur within area	In buffer area only
Hydrophis czeblukovi Fine-spined Sea Snake [59233]		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 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 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
Natator depressus Flatback Turtle [59257]	Vulnerable	Breeding known to occur within area	In buffer area only

Whales and Other Cetaceans			[Resource Information]
Current Scientific Name	Status	Type of Presence	Buffer Status
Mammal			

Current Scientific Name	Status	Type of Presence	Buffer Status
Balaenoptera acutorostrata Minke Whale [33]		Species or species habitat may 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 likely to 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]		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
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 likely 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
Tursiops aduncus Indian Ocean Bottlenose Dolphin, Spotted Bottlenose Dolphin [68418]		Species or species habitat likely to occur within area	In buffer area only

Current Scientific Name	Status	Type of Presence	Buffer Status
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

Nationally Important Wetlands		[Resource Information]
Wetland Name	State	Buffer Status
Leslie (Port Hedland) Saltfields System	WA	In buffer area only

EPBC Act Referrals				[Resource Information]
Title of referral	Reference	Referral Outcome	Assessment Status	Buffer Status
East Pilbara Network Stage 1	2024/09933		Referral Decision	In feature area
Hemi Gold Project	2023/09556		Referral Decision	In feature area
Lynas Find Project	2023/09471		Assessment	In buffer area only
Port Hedland Green Steel Project - Stage 1	2023/09764		Assessment	In buffer area only
Port Hedland Solar Project	2022/09241		Post-Approval	In buffer area only
Ridley Magnetite Project	2023/09477		Referral Decision	In buffer area only
Wilga Quarry Expansion	2020/8726		Completed	In buffer area only
Controlled action				
Additional Rail Infrastructure between Herb Elliott Port Facility and Cloudbreak Mine Site	2010/5513	Controlled Action	Post-Approval	In buffer area only

Title of referral	Reference	Referral Outcome	Assessment Status	Buffer Status
Controlled action				
Development of a Quarry Operation to extract gravel, sand and pindan material	2012/6636	Controlled Action	Post-Approval	In buffer area only
Development of the Wodgina Direct Shipping Ore Project, Stage 2	2011/5975	Controlled Action	Post-Approval	In buffer area only
Great Northern Pipeline - 630 km buried gas pipeline	2009/5257	Controlled Action	Completed	In buffer area only
Mt Dove Direct Shipping Ore Project	2011/5848	Controlled Action	Post-Approval	In buffer area only
North Star Hematite Project	2012/6530	Controlled Action	Post-Approval	In buffer area only
North Star Magnetite Project	2012/6689	Controlled Action	Post-Approval	In buffer area only
Poondano Iron Ore Project	2010/5759	Controlled Action	Post-Approval	In buffer area only
Port Hedland Outer Harbour Development and associated marine and terrestrial in	2008/4159	Controlled Action	Post-Approval	In buffer area only
Port Hedland Spoilbank Marina, WA	2019/8520	Controlled Action	Post-Approval	In buffer area only
Roy Hill to Port Hedland Rail Line and Associated Infrastructure	2010/5424	Controlled Action	Post-Approval	In buffer area only
Wodgina Direct Shipping Ore Project	2009/5167	Controlled Action	Post-Approval	In buffer area only
Not controlled action				
150m Boodarie Gas Lateral Pipeline	2014/7116	Not Controlled Action	Completed	In buffer area only
Construction of a Commodities Berth, Wharf and Associated Infrastructure	2008/4129	Not Controlled Action	Completed	In buffer area only
Development of iron ore resources in eastern Pilbara region, including port at P	2004/1562	Not Controlled Action	Completed	In buffer area only
Expansion of the Talison Minerals Storage Facility, Wodgina Mine	2008/4675	Not Controlled Action	Completed	In buffer area only
Horizon Power South Hedland Transmission Line, WA	2012/6551	Not Controlled Action	Completed	In buffer area only
Improving rabbit biocontrol: releasing another strain of RHDV, sthrn two thirds of Australia	2015/7522	Not Controlled Action	Completed	In feature area

Title of referral	Reference	Referral Outcome	Assessment Status	Buffer Status
Not controlled action				
Iron Bridge Port Facility, Port Hedland, WA	2015/7565	Not Controlled Action	Completed	In buffer area only
Pilbara Bulk Ore Transport System Project, WA	2016/7637	Not Controlled Action	Completed	In buffer area only
Pilbara Transmission Project, Pilbara, WA	2018/8349	Not Controlled Action	Completed	In buffer area only
Pippingarra Quarry Expansion Works	2012/6461	Not Controlled Action	Completed	In buffer area only
Port Hedland Channel Risk and Optimisation Project, WA	2017/7915	Not Controlled Action	Completed	In buffer area only
Port Hedland Power Station Conversion Project	2011/6080	Not Controlled Action	Completed	In buffer area only
Project Highclere Geophysical Survey	2021/9023	Not Controlled Action	Completed	In buffer area only
Rail and Port Facilities	2001/474	Not Controlled Action	Completed	In buffer area only
Relocation of approx. 670m of the Pilbara Energy Pipeline	2013/6756	Not Controlled Action	Completed	In buffer area only
South Hedland Power Station WA	2011/5929	Not Controlled Action	Completed	In buffer area only
Telfer Gold Mine Project - Mine and Borefield Extensions and Upgrade of Storage	2002/787	Not Controlled Action	Completed	In buffer area only
Telfer Gold Mine Project - Power Supply and Infrastructure Corridor	2002/786	Not Controlled Action	Completed	In buffer area only
Walkway Lighting Upgrade	2009/4965	Not Controlled Action	Completed	In buffer area only
Wodgina Lithium Mine Expansion, Pilbara, NT	2018/8194	Not Controlled Action	Completed	In buffer area only
Not controlled action (particular manner)				
Additional Rail Infrastructure	2012/6314	Not Controlled Action (Particular Manner)	Post-Approval	In buffer area only
Atlas Boodarie Link Project, WA	2012/6506	Not Controlled Action (Particular Manner)	Post-Approval	In buffer area only
Dredging of marine sediment to enable construction of eight berths and a turnin	2010/5678	Not Controlled Action (Particular Manner)	Post-Approval	In buffer area only

Title of referral	Reference	Referral Outcome	Assessment Status	Buffer Status
Not controlled action (particular manner)				
Marine Geotechnical Drilling Program	2008/4012	Not Controlled Action (Particular Manner)	Post-Approval	In buffer area only
Mine the Hercules Deposit under the Wodgina Direct Shipping Ore Project Stage 3	2013/6789	Not Controlled Action (Particular Manner)	Post-Approval	In buffer area only
Nelson Point Dredging	2009/4920	Not Controlled Action (Particular Manner)	Post-Approval	In buffer area only
Offshore Fibre Optic Cable Network Construction & Operation, Port Hedland WA to Darwin NT	2014/7223	Not Controlled Action (Particular Manner)	Post-Approval	In buffer area only
Port Headland Outer Harbour Pre-construction Pilling program	2012/6341	Not Controlled Action (Particular Manner)	Post-Approval	In buffer area only
Port of Port Hedland channel marker replacement project, WA	2017/8010	Not Controlled Action (Particular Manner)	Post-Approval	In buffer area only
Realignment of the Great Northern Highway	2010/5793	Not Controlled Action (Particular Manner)	Post-Approval	In buffer area only
upgrade of 3 community recreation sites	2005/2349	Not Controlled Action (Particular Manner)	Post-Approval	In buffer area only
Referral decision				
Mine the Hercules Deposit under the Wodgina Direct Shipping Ore Project ??? Stage 3	2013/6777	Referral Decision	Completed	In buffer area only
Outer Harbour Development and associated marine and terrestial infrastructure	2008/4148	Referral Decision	Completed	In buffer area only

Biologically Important Areas			[Resource Information]
Scientific Name	Behaviour	Presence	Buffer Status
Marine Turtles			
Caretta caretta			
Loggerhead Turtle [1763]	Foraging	Known to occur	In buffer area only

Scientific Name	Behaviour	Presence	Buffer Status
Chelonia mydas Green Turtle [1765]	Foraging	Known to occur	In buffer area only
Eretmochelys imbricata Hawksbill Turtle [1766]	Foraging	Known to occur	In buffer area only
Natator depressus Flatback Turtle [59257]	Foraging	Known to occur	In buffer area only
Natator depressus Flatback Turtle [59257]	Internesting buffer	Known to occur	In buffer area only
Natator depressus Flatback Turtle [59257]	Nesting	Known to occur	In buffer area only
Seabirds			
Ardenna pacifica Wedge-tailed Shearwater [84292]	Breeding	Known to occur	In feature area
Fregata ariel Lesser Frigatebird [1012]	Breeding	Known to occur	In buffer area only
Whales			
Megaptera novaeangliae Humpback Whale [38]	Migration (north and south)	Known 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.

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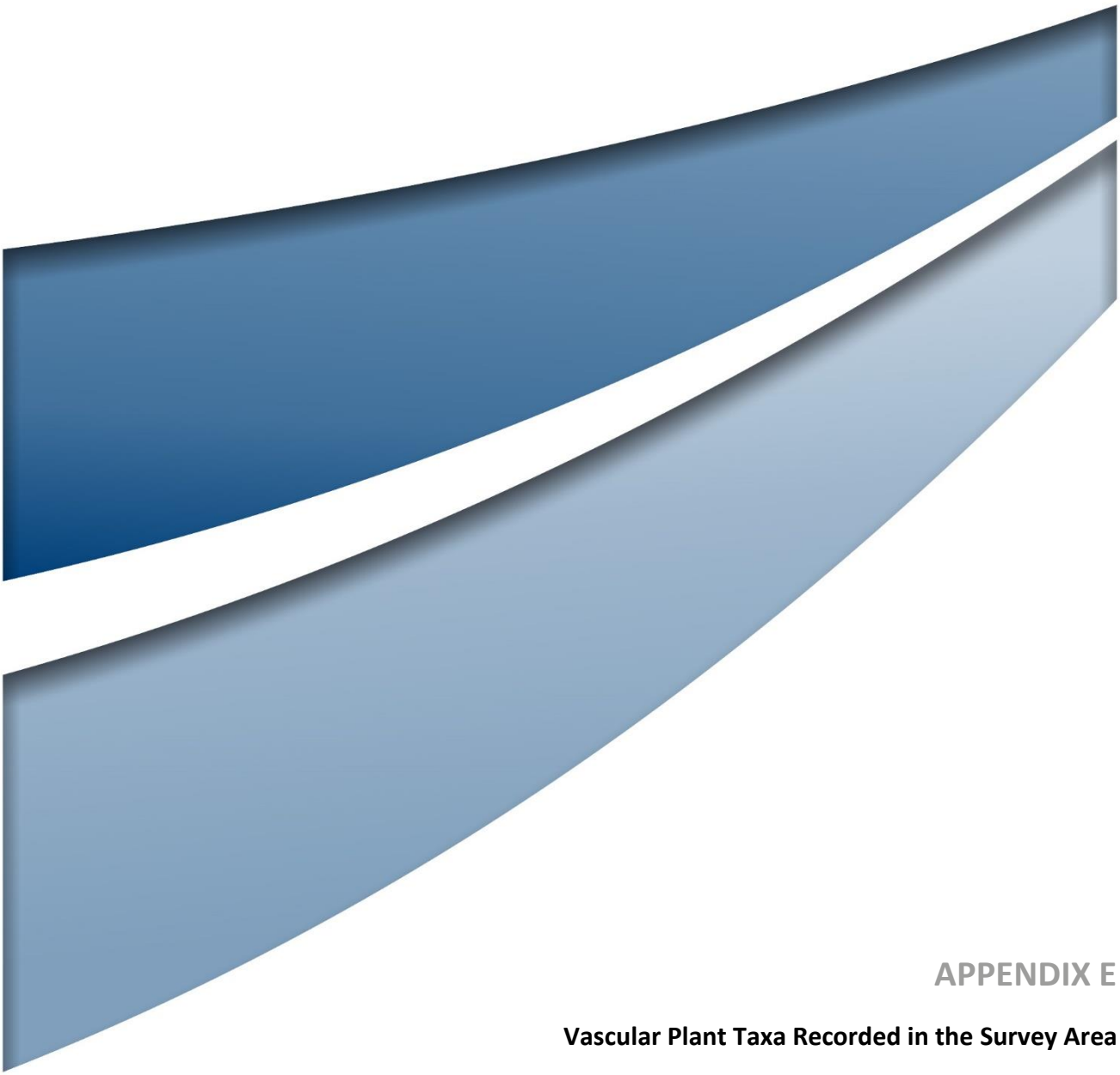


APPENDIX E

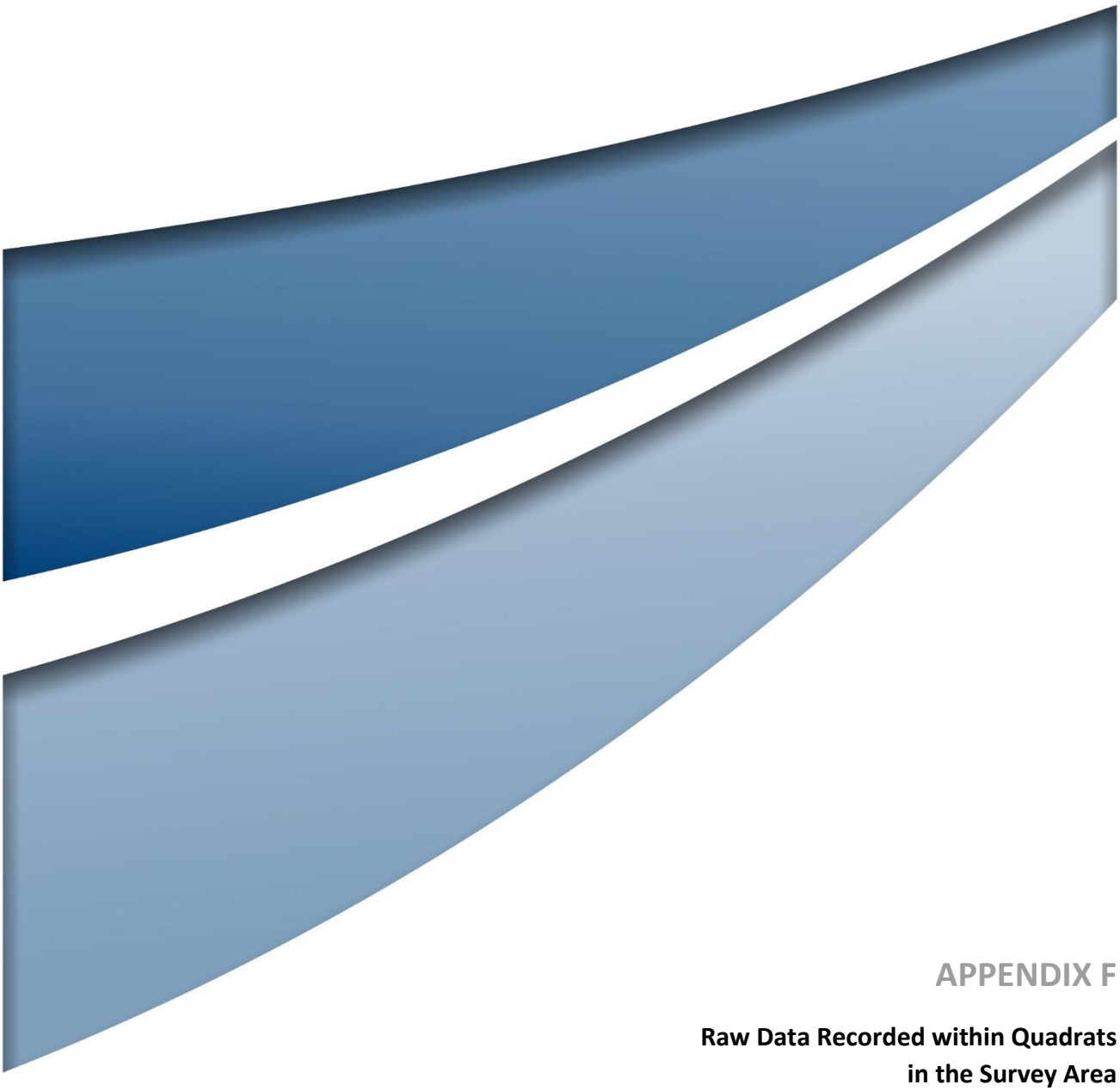
Vascular Plant Taxa Recorded in the Survey Area

*denotes weed taxa

Family	Taxon
Aizoaceae	*Trianthema pilosum*
Amaranthaceae	**Aerva javanica*
	Ptilotus fusiformis
Apocynaceae	**Calotropis procera*
	Cynanchum floribundum
	Cynanchum viminale
Asteraceae	*Pluchea ferdinandi-muelleri*
	Pluchea rubelliflora
	Pluchea tetranthera
	Pterocaulon sphacelatum
Boraginaceae	*Ehretia saligna*
	Trichodesma zeylanicum
Cactaceae	**Opuntia* sp.
Campanulaceae	*Wahlenbergia tumidifructa*
Chenopodiaceae	*Dysphania rhadinostachya*
Cleomaceae	*Arivela uncifera*
	Arivela viscosa
Convolvulaceae	*Bonamia alatisemina*
	Bonamia media
	Evolvulus alsinoides var. *decumbens*
	Evolvulus alsinoides var. *villosicalyx*
	Ipomoea muelleri
	Ipomoea polymorpha
Cucurbitaceae	**Citrullus amarus*
	Cucumis variabilis
Cyperaceae	*Bulbostylis barbata*
	Cyperus blakeanus
	Cyperus ixiocarpus
	Cyperus leptocarpus
	Cyperus vaginatus
Droseraceae	*Drosera finlaysoniana*
Euphorbiaceae	*Euphorbia australis* var. *subtomentosa*
	Euphorbia myrtoides
	Euphorbia tannensis subsp. *eremophila*
	Euphorbia trigonosperma
	Microstachys chamaelea
Fabaceae	*Acacia ampliceps*
	Acacia colei
	Acacia coriacea subsp. *pendens*

Family	Taxon
Fabaceae cont.	*Acacia orthocarpa*
	Acacia pyrifolia var. *morrisonii*
	Acacia pyrifolia var. *pyrifolia*
	Acacia sericophylla
	Acacia trachycarpa
	Acacia trachycarpa x tumida var. pilbarensis
	Acacia tumida var. *pilbarensis*
	Cajanus cinereus
	Crotalaria cunninghamii
	Indigofera colutea
	Indigofera linnaei
	Petalostylis labicheoides
	Rhynchosia minima
	Senna artemisioides subsp. *oligophylla*
	Senna notabilis
	Senna venusta
	Sesbania cannabina
	Tephrosia sp. B Kimberley Flora (C.A. Gardner 7300)
	Vigna lanceolata var. *lanceolata*
Goodeniaceae	*Goodenia lamprosperma*
	Goodenia microptera
Gyrostemonaceae	*Codonocarpus cotinifolius*
Hemerocallidaceae	*Corynotheca pungens*
Lauraceae	*Cassytha capillaris*
	Cassytha filiformis
Malvaceae	*Abutilon* sp. Pritzelianum (S. van Leeuwen 5095) (P3)
	Corchorus incanus subsp. *incanus*
	Corchorus tridens
	Hibiscus sturtii var. *campylochlamys*
	Sida clementii
	Sida rohlenae subsp. *rohlenae*
	Sida sp. Rabbit Flat (B.J. Carter 626)
	Triumfetta propinqua
	Waltheria indica
Menispermaceae	*Tinospora smilacina*
Molluginaceae	*Hypertelis cerviana*
	Trigastrotheca molluginea
Montiaceae	*Calandrinia tepperiana*
Moraceae	*Ficus aculeata* var. *indecora*
Myrtaceae	*Eucalyptus camaldulensis* subsp. *refulgens*

Family	Taxon
Myrtaceae cont.	*Eucalyptus victrix*
	Melaleuca argentea
	Melaleuca glomerata
	Melaleuca linophylla
Nyctaginaceae	*Boerhavia coccinea*
Passifloraceae	**Passiflora foetida* var. *hispida*
Phyllanthaceae	*Nellica maderaspatensis*
Plantaginaceae	*Stemodia grossa*
	Stemodia viscosa
Poaceae	*Aristida holathera* var. *holathera*
	Aristida hygrometrica
	**Cenchrus ciliaris*
	**Cenchrus setiger*
	Chloris pectinata
	Dactyloctenium radulans
	Eragrostis cumingii
	Eragrostis eriopoda
	**Eragrostis minor*
	Eriachne aristidea
	Eriachne benthamii
	Eriachne obtusa
	Eriachne tenuiculmis
	Eulalia aurea
	Panicum australiense var. *australiense*
	Paspalidium clementii
	Paspalidium rarum
	Paspalidium reflexum
	Perotis rara
	Triodia epactia
	Triodia lanigera
Portulacaceae	*Portulaca oleracea*
Proteaceae	*Grevillea wickhamii*
Rubiaceae	*Dentella asperata*
Solanaceae	*Solanum cleistogamum*
	Solanum phlomoides
Violaceae	*Afrohybanthus aurantiacus*
Zygophyllaceae	*Tribulopis angustifolia*
Zygophyllaceae cont.	*Tribulus hirsutus*
	Tribulus occidentalis



APPENDIX F

Raw Data Recorded within Quadrats in the Survey Area

GOVERNMENT AGENCY REFERENCE ONLY
NOT FOR PUBLIC DISSEMINATION
CONTAINS LOCATIONS OF SIGNIFICANT FLORA TAXA

Site Name:	DGJ01
Site Type:	QUADRAT
Dimensions:	50m x 50m
Survey Date:	30/04/2024
GPS Location:	GDA94 Zone 50 639155.58E 7687983.64N
Orientation:	180, 270
Landform Type:	Drainage Line
Slope Class:	Gently Inclined (3°)
Soil Type:	Sand
Soil Colour:	Orange
Soil Condition:	Dry - Partial inundation in quadrat
Rock Outcrop:	No bedrock exposed
CF Abundance:	50-90%
CF Sizes:	2-6mm, 6-20mm, 20-60mm, 60-200mm
CF Types:	Dolerite, Quartz, Colluvium
Vegetation Condition:	Combined Vegetation Condition - VG - Very Good
Disturbance:	Animal - Cattle, (other) - Vehicle tracks
Fire:	>10
Habitat:	Melaleuca argentea low isolated clumps of trees

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Acacia ampliceps	1.3	0.1
Acacia pyrifolia var. *pyrifolia*	0.3	0.1
Acacia trachycarpa	1.2	0.1
Ammannia baccifera	0.1	0.1
Arivela viscosa	0.1	0.1
Calandrinia tepperiana	0.1	0.1
Corchorus tectus		
Cynanchum viminale	0.5	0.1
Cyperus squarrosus	0.1	0.1
Cyperus vaginatus	1.5	0.1
?*Dentella asperata*	0.1	0.1
Dysphania plantaginella	0.1	0.1
Eriachne obtusa	0.4	0.1
Euphorbia australis var. *subtomentosa*	0.1	0.1
Euphorbia trigonosperma	0.1	0.1
Fimbristylis microcarya	0.1	0.1
Goodenia lamprosperma		
Melaleuca argentea	6	4.5
Paspalidium rarum	0.1	0.1
?*Schoenoplectus subulatus*	0.1	0.1
Sesbania formosa	0.4	0.1
Solanum phlomoides	0.2	0.1
Triodia epactia		

PHOTOS

Site Name:	DGJ02
Site Type:	QUADRAT
Survey Date:	01/05/2024
GPS Location:	GDA94 Zone 50 658417.881254767E 7709281.45482109N
Orientation:	90, 180
Landform Type:	Drainage Line
Slope Class:	Very Gently Inclined (1°)
Aspect:	N
Soil Type:	Sand
Soil Colour:	Orange
Soil Condition:	Dry
Rock Outcrop:	No bedrock exposed
CF Abundance:	2-10%
CF Sizes:	2-6mm, 6-20mm, 20-60mm, 60-200mm
CF Types:	Dolerite, Quartz, Colluvium
Fire:	>10yrs
Habitat:	Melaleuca argentea low isolated clumps of trees over Acacia trachycarpa and Melaleuca glomerata tall isolated clumps of shrubs over Triodia epactia low isolated clumps of hummock grasses

SITE POINTS

Label	Easting	Northing	Comments
Corner 1	658418	7709281	
Corner 2	658468	7709282	
Corner 3	658467	7709232	
Corner 4	658418	7709232	

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Acacia colei	3.2	0.1
Acacia coriacea subsp. *pendens*	4	0.1
Acacia pyrifolia var. *morrisonii*	1.9	0.1
Acacia pyrifolia var. *pyrifolia*	2.5	0.1
Acacia trachycarpa	4	2
**Aerva javanica*	0.5	0.1
Afrohybanthus aurantiacus	0.2	0.1
Aristida holathera var. *holathera*	0.3	0.1
Arivela viscosa	0.2	0.1
Boerhavia coccinea	0.1	0.1
Bonamia alatisemina	0.1	0.1
Bulbostylis barbata	0.1	0.1
Cajanus cinereus	1.9	0.1
Cassytha filiformis		0.1
**Cenchrus ciliaris*	0.2	0.1

Taxon Name	Avg. Height	Cover Alive
Corchorus incanus subsp. *incanus*	0.9	0.4
Corynotheca pungens	0.5	0.1
Crotalaria cunninghamii	1.8	0.1
Cucumis variabilis	0.1	0.1
Cynanchum viminale	0.4	0.1
Dentella asperata	0.1	0.1
Dysphania sp.	0.1	0.1
**Eragrostis minor*	0.1	0.1
Eriachne obtusa	0.3	0.1
Eucalyptus victrix	8	0.1
Euphorbia australis var. *subtomentosa*	0.1	0.1
Euphorbia tannensis subsp. *eremophila*	0.5	0.1
Euphorbia trigonosperma	0.1	0.1
Goodenia lamprosperma	0.4	0.1
Hypertelis cerviana	0.1	0.1
Ipomoea polymorpha	0.1	0.1
Melaleuca argentea	6	1.6
Melaleuca glomerata	2.5	4
Microstachys chamaelea	0.1	0.1
Paspalidium clementii	0.2	0.1
Paspalidium reflexum	0.3	0.1
Perotis rara	0.1	0.1
Ptilotus fusiformis	0.2	0.1
Senna notabilis	0.1	0.1
Tephrosia sp. B Kimberley Flora (C.A. Gardner 7300)	0.9	0.1
Tinospora smilacina	0.1	0.1
Trianthema pilosum	0.1	0.1
Tribulopis angustifolia	0.2	0.1
Tribulus occidentalis	0.1	0.1
Trigastrotheca molluginea	0.1	0.1
Triodia epactia	0.5	2
Triodia lanigera	0.5	1
Triumfetta propinqua	1.6	0.1

PHOTOS

Site Name:	DGJ03
Site Type:	QUADRAT
Dimensions:	50m x 50m
Survey Date:	01/05/2024
GPS Location:	GDA94 Zone 50 658620.0857E 7709394.248N
Orientation:	0,90
Landform Type:	Drainage Line
Slope Class:	Very Gently Inclined (1°)
Aspect:	N
Soil Type:	Sand
Soil Colour:	Orange
Soil Condition:	Dry
Rock Outcrop:	No bedrock exposed
CF Abundance:	20-50%
CF Sizes:	2-6mm, 6-20mm, 20-60mm, 60-200mm
CF Types:	Dolerite, Ironstone, Quartz, Colluvium
Vegetation Condition:	Northern Vegetation Condition - VG - Very Good
Disturbance:	Animal - Cattle
Fire:	<10yrs
Habitat:	Melaleuca argentea low isolated clumps of trees over Melaleuca linophylla tall isolated clumps of shrubs

SITE POINTS

Label	Easting	Northing	Comments
Corner 1	658620	7709394	
Corner 2	658669	7709394	
Corner 3	658672	7709444	
Corner 4	658623	7709445	

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Afrohybanthus aurantiacus	0.6	0.1
Arivela viscosa	0.1	0.1
Boerhavia coccinea	0.1	0.1
Bonamia alatisemina	0.1	0.1
Cajanus cinereus	2	0.1
Corchorus incanus subsp. *incanus*	0.4	0.1
Crotalaria cunninghamii	0.5	0.1
Cucumis variabilis	0.1	0.1
Cynanchum floribundum		0.1
Cyperus vaginatus	0.3	0.1
Eucalyptus victrix		
Euphorbia australis var. *subtomentosa*	0.1	0.1

Taxon Name	Avg. Height	Cover Alive
Euphorbia trigonosperma	0.4	0.1
Goodenia lamprosperma	0.4	0.1
Goodenia microptera	0.4	0.1
Melaleuca argentea	4	2
Melaleuca glomerata		
Melaleuca linophylla	2.5	4
Microstachys chamaelea	0.1	0.1
Ptilotus fusiformis		
Senna notabilis	0.2	0.1
Triodia epactia	0.4	0.1

PHOTOS

Site Name:	DGJ04
Site Type:	QUADRAT
Dimensions:	50m x 50m
Survey Date:	01/05/2024
GPS Location:	GDA94 Zone 50 665769.0906E 7688765.636N
Orientation:	180, 270
Landform Type:	Drainage Line
Slope Class:	Very Gently Inclined (1°)
Aspect:	N
Soil Type:	Sand
Soil Colour:	Orange
Soil Condition:	Dry
Rock Outcrop:	Granite, <2% bedrock exposed
CF Abundance:	10-20%
CF Sizes:	2-6mm, 6-20mm, 20-60mm, 60-200mm
CF Types:	Granite, Dolerite, Quartz, Colluvium
Vegetation Condition:	Northern Vegetation Condition - VG - Very Good
Disturbance:	Animal - Cattle
Fire:	>10
Habitat:	Melaleuca argentea low isolated clumps of trees over Melaleuca glomerata mid isolated clumps of shrubs

SITE POINTS

Label	Easting	Northing	Comments
Corner 1	665769	7688766	
Corner 2	665719	7688766	
Corner 3	665719	7688716	
Corner 4	665765	7688718	

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Acacia ampliceps		
Acacia colei	4	0.1
Acacia coriacea subsp. *pendens*	2.2	0.1
Afrohybanthus aurantiacus	0.3	0.1
Arivela viscosa	0.2	0.1
Calandrinia tepperiana	0.1	0.1
Corchorus incanus subsp. *incanus*	0.5	0.1
Crotalaria cunninghamii	0.7	0.1
Cynanchum floribundum		0.1
Cyperus ixiocarpus	0.5	0.2
Cyperus vaginatus	0.6	0.1
Drosera finlaysoniana		

Taxon Name	Avg. Height	Cover Alive
Eriachne benthamii	0.7	0.1
Eulalia aurea		
Euphorbia australis var. *subtomentosa*	0.1	0.1
Goodenia lamprosperma	0.3	0.1
Ipomoea muelleri		
Melaleuca argentea	3.5	2
Melaleuca glomerata	1.5	0.3
Melaleuca linophylla	1.8	1
Microstachys chamaelea	0.3	0.1
Nellica maderaspatensis	0.1	0.1
Paspalidium clementii	0.1	0.1
Ptilotus fusiformis	0.2	0.1
Stemodia grossa	0.1	0.1
Triodia epactia	0.5	0.1

PHOTOS

Site Name:	DGJ05
Site Type:	QUADRAT
Dimensions:	50m x 50m
Survey Date:	01/05/2024
GPS Location:	GDA94 Zone 50 665573.1314E 7688666.386N
Orientation:	90, 180
Landform Type:	Drainage Line
Slope Class:	Very Gently Inclined (1°)
Aspect:	N
Soil Type:	Sand
Soil Colour:	Orange
Soil Condition:	Dry
Rock Outcrop:	No bedrock exposed
CF Abundance:	<2%
CF Sizes:	2-6mm, 6-20mm
CF Types:	Colluvium
Vegetation Condition:	Northern Vegetation Condition - VG - Very Good
Disturbance:	Animal - Cattle
Fire:	>10yrs
Habitat:	Melaleuca glomerata, Acacia coriace subsp. pendens and Acacia trachycarpa tall sparse shrubland over Triodia epactia sparse hummock grassland

SITE POINTS

Label	Easting	Northing	Comments
Corner 1	665573	7688666	
Corner 2	665574	7688617	
Corner 3	665623	7688618	
Corner 4	665624	7688667	

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Acacia coriacea subsp. *pendens*	5	0.5
Acacia pyrifolia var. *pyrifolia*	0.5	0.1
Acacia trachycarpa	3.5	2
Afrohybanthus aurantiacus	0.7	0.1
Alternanthera nodiflora	0.1	0.1
Ammannia baccifera	0.1	0.1
Arivela viscosa	0.4	0.1
Boerhavia coccinea	0.1	0.1
Bulbostylis barbata	0.1	0.1
Calandrinia stagnensis	0.1	0.1
Calandrinia tepperiana	0.1	0.1
Cassytha filiformis		0.1

Taxon Name	Avg. Height	Cover Alive
**Cenchrus ciliaris*	0.3	0.1
Chrysopogon fallax	0.4	0.1
Corchorus incanus subsp. *incanus*	0.8	0.1
Corchorus tridens	0.1	0.1
Crotalaria cunninghamii	0.1	0.1
Cucumis variabilis		0.1
Cynanchum viminale	0.1	0.1
Cyperus leptocarpus	0.1	0.1
Cyperus squarrosus	0.1	0.1
Dentella asperata	0.1	0.1
Drosera finlaysoniana	0.1	0.1
Dysphania plantaginella	0.1	0.1
Eragrostis cumingii	0.2	0.1
Eragrostis dielsii	0.1	0.1
Eragrostis tenellula	0.1	0.1
Eulalia aurea	1.5	0.1
Euphorbia australis var. *subtomentosa*	0.1	0.1
Euphorbia trigonosperma	0.2	0.1
Evolvulus alsinoides var. *villosicalyx*	0.1	0.1
Fimbristylis microcarya	0.1	0.1
Gonocarpus ephemerus	0.1	0.1
Goodenia lamprosperma	0.3	0.1
Grevillea wickhamii	0.1	0.1
Hypertelis cerviana	0.1	0.1
Indigofera colutea	0.1	0.1
Ipomoea muelleri		0.1
Marsilea hirsuta	0.1	0.1
Melaleuca glomerata	2.5	6
Panicum australiense var. *australiense*	0.1	0.1
Paspalidium rarum	0.1	0.1
Perotis rara	0.1	0.1
Pluchea rubelliflora	0.1	0.1
Portulaca oleracea	0.1	0.1
Pterocaulon sphacelatum	0.1	0.1
Rhynchosia minima		0.1
Scleromitrion galioides	0.1	0.1
Sida rohlenae subsp. *rohlenae*	0.1	0.1
Sida ?sp. Rabbit Flat (B.J. Carter 626)	0.2	0.1
?Stemodia viscosa	0.1	0.1
Synaptantha tillaeacea var. *tillaeacea*	0.1	0.1
Tephrosia sp. B Kimberley Flora (C.A. Gardner 7300)	0.8	0.1
Tinospora smilacina		0.1
Tribulopis angustifolia	0.2	0.1
Tribulus occidentalis	0.1	0.1
Trichodesma zeylanicum	0.1	0.1
Triodia epactia	0.5	5
Triumfetta propinqua	1.2	0.1
Waltheria indica	0.1	0.1

PHOTOS

Site Name:	DGJ06
Site Type:	QUADRAT
Dimensions:	50m x 50m
Survey Date:	02/05/2024
GPS Location:	GDA94 Zone 50 653359.8758E 7733301.546N
Orientation:	270, 0
Landform Type:	Drainage Line
Slope Class:	Very Gently Inclined (1°)
Aspect:	N
Soil Type:	Sand
Soil Colour:	Orange
Soil Condition:	Dry - Soil image taken at 8.07am on JH's phone
Rock Outcrop:	No bedrock exposed
CF Abundance:	<2%
CF Sizes:	2-6mm, 6-20mm, 20-60mm
CF Types:	Colluvium
Vegetation Condition:	Northern Vegetation Condition - VP - Very Poor
Disturbance:	Weeds, Animal - Cattle
Fire:	>10yrs
Habitat:	Eucalyptus camaldulensis mid isolated clumps of trees over Melaleuca argentea low isolated clumps of trees over Melaleuca glomerata tall isolated clumps of shrubs over Corynotheca pungens low isolated clumps of shrubs over Aristida hollathera isolated clumps of tussock grasses.

SITE POINTS

Label	Easting	Northing	Comments
Corner 1	653360	7733302	
Corner 2	653360	7733350	
Corner 3	653310	7733350	
Corner 4	653309	7733301	

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Acacia trachycarpa	2.3	0.3
Acacia tumida var. *pilbarensis*	4	3
**Aerva javanica*	0.6	0.1
Afrohybanthus aurantiacus	0.3	0.1
Aristida holathera var. *holathera*	0.5	1.5
Arivela viscosa	0.1	0.1
Boerhavia coccinea	0.1	0.1
Bonamia alatisemina	0.1	0.1
Cajanus cinereus	1.6	0.1
Cassytha filiformis		0.8

Taxon Name	Avg. Height	Cover Alive
**Cenchrus ciliaris*	0.3	0.2
**Citrullus amarus*	0.1	0.1
Corchorus incanus subsp. *incanus*	0.8	0.1
Corynotheca pungens	0.6	0.8
Crotalaria cunninghamii	1.3	0.1
Cynanchum floribundum		0.1
Eragrostis eriopoda	0.4	0.1
Eriachne aristidea	0.3	0.1
Eucalyptus camaldulensis subsp. *refulgens*	11	1.5
Euphorbia myrtoides	0.2	0.2
Ipomoea muelleri	0.1	0.1
Ipomoea polymorpha	0.1	0.1
Melaleuca argentea	6	4
Melaleuca glomerata	4.5	0.8
Melaleuca linophylla	1	0.1
Paspalidium reflexum	0.2	0.1
Rhynchosia minima		0.1
Senna venusta	2	0.1
Sida rohlenae subsp. *rohlenae*	0.6	0.1
Sida sp. Rabbit Flat (B.J. Carter 626)	0.2	0.1
Tephrosia sp. B Kimberley Flora (C.A. Gardner 7300)	1.3	0.1
Tinospora smilacina		0.1
Triodia epactia	0.4	0.2
Triodia lanigera	0.5	0.2
Triumfetta propinqua	1.4	0.1

PHOTOS

Site Name:	DGJ07
Site Type:	QUADRAT
Dimensions:	50m x 50m
Survey Date:	02/05/2024
GPS Location:	GDA94 Zone 50 653177.8489E 7733254.472N
Orientation:	90, 180
Landform Type:	Drainage Line
Aspect:	N
Soil Type:	Sand
Soil Colour:	Orange
Soil Condition:	Dry
Rock Outcrop:	No bedrock exposed
CF Abundance:	20-50%
CF Sizes:	2-6mm, 6-20mm, 20-60mm, 60-200mm
CF Types:	Dolerite, Ironstone, Quartz, Colluvium
Vegetation Condition:	Northern Vegetation Condition - VG - Very Good
Disturbance:	Animal - Cattle
Fire:	>10yrs
Habitat:	Melaleuca argentea low isolated clumps of trees over Melaleuca linophylla mid isolated shrubs

SITE POINTS

Label	Easting	Northing	Comments
Corner 1	653178	7733254	
Corner 2	653228	7733254	
Corner 3	653228	7733204	
Corner 4	653179	7733205	

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Acacia ampliceps	1.2	0.1
Acacia colei	2	0.1
Acacia trachycarpa	3	0.1
Acacia tumida var. *pilbarensis*	0.2	0.1
Afrohybanthus aurantiacus	0.4	0.1
Aristida holathera var. *holathera*	0.3	0.1
Arivela uncifera	0.2	0.1
Arivela viscosa	0.1	0.1
Bonamia alatisemina	0.2	0.1
Cajanus cinereus	1.4	0.1
**Cenchrus ciliaris*	0.3	0.1
Codonocarpus cotinifolius	0.2	0.1
Corchorus incanus subsp. *incanus*		

Taxon Name	Avg. Height	Cover Alive
Corynotheca pungens	0.2	0.1
Crotalaria cunninghamii	1	0.1
Cynanchum floribundum		0.1
Cyperus vaginatus	0.7	0.1
Dentella asperata	0.1	0.1
Eriachne aristidea	0.3	0.1
Eriachne benthamii	0.7	0.1
Eulalia aurea	0.3	0.1
Eulalia aurea	0.6	0.1
Euphorbia australis var. *subtomentosa*	0.2	0.1
Euphorbia trigonosperma	0.3	0.1
Goodenia lamprosperma	0.3	0.2
Melaleuca argentea	4.5	4
Melaleuca glomerata		
Melaleuca linophylla	1.9	0.2
Microstachys chamaelea	0.2	0.1
Nellica maderaspatensis	0.1	0.1
Petalostylis labicheoides	0.1	0.1
Pluchea rubelliflora	0.5	0.1
Pterocaulon sphacelatum	0.4	0.1
Ptilotus fusiformis	0.4	0.1
Senna notabilis		
Solanum phlomoides	0.6	0.1
Tephrosia sp. B Kimberley Flora (C.A. Gardner 7300)	1	0.1
Triodia epactia	0.4	0.1
Wahlenbergia tumidifructa	0.3	0.1

PHOTOS

Site Name:	DGJ08
Site Type:	QUADRAT
Dimensions:	50m x 50m
Survey Date:	02/05/2024
GPS Location:	GDA94 Zone 50 655396.8267E 7728173.567N
Orientation:	180, 270
Landform Type:	Drainage Line
Slope Class:	Very Gently Inclined (1°)
Aspect:	N
Soil Type:	Sand
Soil Colour:	Orange
Soil Condition:	Dry
Rock Outcrop:	No bedrock exposed
CF Abundance:	<2%
CF Sizes:	2-6mm, 6-20mm
CF Types:	Dolerite, Ironstone, Quartz, Colluvium
Vegetation Condition:	Northern Vegetation Condition - VG - Very Good
Disturbance:	Weeds - A. javanica and C. cilliaris, Animal - Cattle
Fire:	>10yrs
Habitat:	Eucalyptus camaldulensis mid isolated clumps of trees over Melaleuca glomerata, Acacia trachycarpa and Melaleuca linophylla tall, isolated clumps of shrubs over Triodia epactia low isolated clumps of hummock grasses with Cenchrus cilliaris isolated clumps of tussock grasses

SITE POINTS

Label	Easting	Northing	Comments
Corner 1	655397	7728174	
Corner 2	655346	7728174	
Corner 3	655347	7728124	
Corner 4	655397	7728123	

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Acacia ampliceps	2.6	0.2
Acacia colei	2.2	0.1
Acacia pyrifolia var. *morrisonii*	1.6	0.2
Acacia trachycarpa	4.5	2
Acacia trachycarpa x tumida var. pilbarensis	1.6	0.1
Acacia tumida var. *pilbarensis*	3.5	0.5
**Aerva javanica*	0.7	0.1
Afrohybanthus aurantiacus	0.7	0.1
Arivela uncifera	0.3	0.1
Arivela viscosa	0.1	0.1

Taxon Name	Avg. Height	Cover Alive
Cajanus cinereus	1.6	0.1
Cassytha filiformis		0.1
**Cenchrus ciliaris*	0.2	2.5
**Cenchrus setiger*	0.4	0.5
Corchorus incanus subsp. *incanus*	1.1	0.2
Crotalaria cunninghamii	1.4	0.1
Cucumis variabilis		0.1
Cynanchum floribundum	0.6	0.1
Cyperus vaginatus	0.6	0.1
Eucalyptus camaldulensis subsp. *refulgens*	11	3.8
Euphorbia australis var. *subtomentosa*	0.1	0.1
Euphorbia trigonosperma	0.2	0.1
Ipomoea polymorpha	0.1	0.1
Melaleuca argentea	6	0.6
Melaleuca glomerata	4.5	3
Melaleuca linophylla	2	1
Paspalidium reflexum	0.4	0.1
Petalostylis labicheoides		
Rhynchosia minima		0.1
Sida rohlenae subsp. *rohlenae*	0.7	0.1
Tephrosia sp. B Kimberley Flora (C.A. Gardner 7300)	0.8	0.1
Tinospora smilacina		0.1
Triodia epactia	0.4	4.5

PHOTOS

Site Name:	DGJ09
Site Type:	QUADRAT
Dimensions:	50m x 50m
Survey Date:	02/05/2024
GPS Location:	GDA94 Zone 50 655485.5181E 7728270.73N
Orientation:	180,270
Landform Type:	Drainage Line
Aspect:	N
Soil Type:	Sand
Soil Colour:	Orange
Soil Condition:	Dry
Rock Outcrop:	No bedrock exposed
CF Abundance:	10-20%
CF Sizes:	2-6mm, 6-20mm, 20-60mm, 60-200mm
Vegetation Condition:	Northern Vegetation Condition - VG - Very Good
Disturbance:	Animal - Cattle, Logs cut with chainsaw (other)
Fire:	>10yrs
Habitat:	Melaleuca argentea low isolated clumps of trees over Melaleuca linophylla tall isolated shrubs

SITE POINTS

Label	Easting	Northing	Comments
Corner 1	655486	7728271	
Corner 2	655436	7728273	
Corner 3	655435	7728223	
Corner 4	655485	7728223	

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Acacia pyrifolia var. *morrisonii*	0.8	0.1
Afrohybanthus aurantiacus		
Cassytha filiformis		
Cynanchum floribundum		0.1
Cyperus ixiocarpus	0.3	0.1
Cyperus vaginatus	0.5	0.2
Dentella asperata	0.1	0.1
Eriachne benthamii	0.5	0.1
Eulalia aurea	0.5	0.1
Euphorbia australis var. *subtomentosa*	0.1	0.1
Euphorbia trigonosperma	0.2	0.1
Goodenia lamprosperma	0.3	0.1
Goodenia lamprosperma	0.4	0.2
Melaleuca argentea	5	3.5
Melaleuca linophylla	2	0.3

Taxon Name	Avg. Height	Cover Alive
Microstachys chamaelea	0.3	0.1
Nellica maderaspatensis	0.6	0.1
Pluchea rubelliflora	0.4	0.1
Ptilotus fusiformis		
Stemodia grossa	0.9	0.1
Stemodia viscosa	0.5	0.1
Tephrosia sp. B Kimberley Flora (C.A. Gardner 7300)	1	0.1
Wahlenbergia tumidifructa	0.2	0.1

PHOTOS

Site Name:	DGJ10
Site Type:	QUADRAT
Dimensions:	50m x 50m
Survey Date:	03/05/2024
GPS Location:	GDA94 Zone 50 660002.98E 7713988.33N
Orientation:	180, 270
Landform Type:	Drainage Line
Slope Class:	Very Gently Inclined (1°)
Aspect:	N
Soil Type:	Sand
Soil Colour:	Orange
Soil Condition:	Dry
Rock Outcrop:	No bedrock exposed
CF Abundance:	20-50%
CF Sizes:	2-6mm, 6-20mm, 20-60mm, 60-200mm
CF Types:	Granite, Dolerite, Ironstone, Quartz, Colluvium
Vegetation Condition:	Northern Vegetation Condition - VG - Very Good
Disturbance:	Animal - Cattle
Habitat:	Melaleuca argentea low isolated clumps of trees over Melaleuca linophylla tall, isolated clumps of shrubs over Cyperus vaginatus isolated clumps of sedges

SITE POINTS

Label	Easting	Northing	Comments
Corner 1	660003	7713988	
Corner 2	659953	7713989	
Corner 3	659953	7713940	
Corner 4	660003	7713939	

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Acacia coriacea subsp. *pendens*	2.5	0.1
Acacia pyrifolia var. *morrisonii*	2.2	0.1
Acacia trachycarpa	2.4	0.1
Aristida holathera var. *holathera*	0.4	
Arivela viscosa	0.7	0.1
Bonamia alatisemina	0.1	0.1
**Citrullus amarus*	0.1	0.1
Corchorus incanus subsp. *incanus*		
Crotalaria cunninghamii	1.6	0.1
Cynanchum floribundum	0.1	0.1
Cyperus ixiocarpus	0.4	0.1
Cyperus vaginatus	0.5	1.2
Dentella asperata	0.1	0.2

Taxon Name	Avg. Height	Cover Alive
Eriachne benthamii	0.7	0.1
Eulalia aurea	0.6	0.1
Euphorbia trigonosperma	0.5	0.1
Goodenia lamprosperma	0.4	0.2
Melaleuca argentea	6	4.5
Melaleuca glomerata	0.4	0.1
Melaleuca linophylla	2.8	0.7
Microstachys chamaelea	0.1	0.1
Nellica maderaspatensis	0.5	0.1
Petalostylis labicheoides		
Pluchea rubelliflora	0.4	0.1
Ptilotus fusiformis		
Rhynchosia minima		0.1
Senna notabilis		
Solanum cleistogamum	0.1	0.1
Stemodia grossa	0.6	0.2
Trichodesma zeylanicum	0.1	0.1
Triodia epactia	0.4	0.1

PHOTOS

Site Name:	DGJ11
Site Type:	QUADRAT
Dimensions:	50m x 50m
Survey Date:	03/05/2024
GPS Location:	GDA94 Zone 50 659826.1668E 7713900.662N
Orientation:	90,180
Landform Type:	Drainage Line
Slope Class:	Very Gently Inclined (1°)
Aspect:	N
Soil Type:	Sandy Clay
Soil Colour:	Red-Brown
Soil Condition:	Dry
Rock Outcrop:	No bedrock exposed
CF Abundance:	<2%
CF Sizes:	2-6mm, 6-20mm
CF Types:	Ironstone
Disturbance:	Weeds, Animal - Cattle
Habitat:	Melaleuca argentea and Eucalyptus camaldulensis low isolated clumps of trees over Melaleuca glomerata, tall sparse shrubland over Triodia epactia sparse hummock grassland

SITE POINTS

Label	Easting	Northing	Comments
Corner 1	659826	7713901	
Corner 2	659827	7713851	
Corner 3	659877	7713852	
Corner 4	659876	7713901	

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Acacia coriacea subsp. *pendens*	7.5	0.4
Acacia trachycarpa	1	0.1
Acacia tumida var. *pilbarensis*		
**Aerva javanica*	0.5	0.2
Afrohybanthus aurantiacus	0.3	0.1
Aristida holathera var. *holathera*	0.3	0.1
Arivela viscosa	0.2	0.1
Boerhavia coccinea	0.1	0.1
Bulbostylis barbata	0.1	0.1
**Cenchrus ciliaris*	0.3	0.3
Chloris pectinata	0.1	0.1
Corchorus incanus subsp. *incanus*	0.6	0.1
Corchorus tridens	0.1	0.1
Crotalaria cunninghamii	0.6	0.1

Taxon Name	Avg. Height	Cover Alive
Cucumis variabilis		0.1
Cynanchum floribundum	0.2	0.1
Cyperus vaginatus	0.5	0.1
Dactyloctenium radulans	0.1	0.1
Dysphania rhadinostachya	0.1	0.1
Eragrostis cumingii	0.1	0.1
**Eragrostis minor*	0.1	0.1
Eucalyptus camaldulensis subsp. *refulgens*	10	0.8
Euphorbia australis var. *subtomentosa*	0.1	0.1
Euphorbia trigonosperma	0.4	0.1
Evolvulus alsinoides var. *villosicalyx*	0.2	0.1
Goodenia lamprosperma	0.3	0.1
Hypertelis cerviana	0.1	0.1
Indigofera colutea	0.2	0.1
Ipomoea muelleri	0.1	0.1
Ipomoea polymorpha	0.1	0.1
Melaleuca argentea	5	1.8
Melaleuca glomerata	3	14
Melaleuca linophylla	2.4	0.6
Paspalidium clementii	0.2	0.1
Paspalidium rarum	0.1	0.1
Paspalidium reflexum	0.4	0.1
Perotis rara	0.1	0.1
Portulaca oleracea	0.1	0.1
Ptilotus fusiformis	0.3	0.1
Rhynchosia minima		0.1
Senna artemisioides subsp. *oligophylla*	1.4	0.1
Senna notabilis	0.1	0.1
Sida rohlenae subsp. *rohlenae*	0.1	0.1
Sida sp. Rabbit Flat (B.J. Carter 626)	0.2	0.1
Solanum cleistogamum	0.2	0.1
Tinospora smilacina		0.1
Tribulus occidentalis	0.1	0.1
Triodia epactia	0.3	5
Triodia lanigera	0.2	0.1

PHOTOS

Site Name:	DGJ12
Site Type:	QUADRAT
Dimensions:	50m x 50m
Survey Date:	03/05/2024
GPS Location:	GDA94 Zone 50 658625.31E 7714331.89N
Orientation:	90, 180
Landform Type:	Drainage Line
Slope Class:	Very Gently Inclined (1°)
Aspect:	N
Soil Type:	Sand
Soil Colour:	Orange
Soil Condition:	Dry
Rock Outcrop:	No bedrock exposed
CF Abundance:	20-50%
CF Sizes:	2-6mm, 6-20mm, 20-60mm, 60-200mm
CF Types:	Colluvium
Vegetation Condition:	Northern Vegetation Condition - VG - Very Good
Disturbance:	Animal - Cattle
Fire:	>10yrs
Habitat:	Melaleuca argentea low isolated clumps of trees over isolated sedges

SITE POINTS

Label	Easting	Northing	Comments
Corner 1	658625	7714332	
Corner 2	658626	7714282	
Corner 3	658676	7714282	
Corner 4	658676	7714332	

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Acacia colei	2.4	0.1
Acacia pyrifolia var. *morrisonii*	1.3	0.1
Afrohybanthus aurantiacus	0.2	0.1
Arivela viscosa	0.1	0.1
Cajanus cinereus	1.7	0.1
Calandrinia tepperiana	0.1	0.1
Corynotheca pungens	0.2	0.1
Cucumis variabilis		0.1
Cynanchum floribundum	0.1	0.1
Cyperus ixiocarpus	0.3	0.1
Cyperus leptocarpus	0.1	0.1
Cyperus vaginatus	0.7	0.2
Dentella asperata	0.1	0.1

Taxon Name	Avg. Height	Cover Alive
Eriachne benthamii	0.8	0.1
Eulalia aurea	0.7	0.1
Euphorbia trigonosperma	0.2	0.1
Goodenia lamprosperma	0.3	0.1
Melaleuca argentea	6	3.5
Melaleuca glomerata	1.2	0.1
Melaleuca linophylla	2	0.2
Nellica maderaspatensis	0.5	0.1
Ptilotus fusiformis	0.3	0.1
Stemodia grossa	0.5	0.1
Triodia epactia	0.3	0.1

Site Name:	DGJ13
Site Type:	QUADRAT
Dimensions:	50m x 50m
Survey Date:	03/05/2024
GPS Location:	GDA94 Zone 50 658813.0519E 7714196.832N
Orientation:	90, 180
Landform Type:	Drainage Line
Slope Class:	Very Gently Inclined (1°)
Aspect:	N
Soil Type:	Sand
Soil Colour:	Orange
Soil Condition:	Dry
Rock Outcrop:	No bedrock exposed
CF Abundance:	<2%
CF Sizes:	2-6mm, 6-20mm
CF Types:	Ironstone, Quartz
Vegetation Condition:	Northern Vegetation Condition - VG - Very Good
Disturbance:	Weeds, Animal - Cattle
Fire:	>10yrs
Habitat:	Eucalyptus camaldulensis low isolated clumps of trees over Melaleuca glomerate tall, isolated clumps of shrubs over Triodia epactia open hummock grassland

SITE POINTS

Label	Easting	Northing	Comments
Corner 1	658813	7714197	
Corner 2	658815	7714147	
Corner 3	658866	7714147	
Corner 4	658864	7714197	

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Abutilon sp. Pritzelianum (S. van Leeuwen 5095) (P3)		
Acacia colei	2.4	0.1
Acacia coriacea subsp. *pendens*	3.5	0.2
Acacia trachycarpa	3.4	0.4
Acacia tumida var. *pilbarensis*	3	0.1
**Aerva javanica*	0.8	0.2
Afrohybanthus aurantiacus	0.4	0.1
Arivela viscosa	0.2	0.1
Bonamia alatisemina	0.1	0.1
Bulbostylis barbata	0.1	0.1
Cassytha filiformis		0.1
**Cenchrus ciliaris*	0.2	0.2

Taxon Name	Avg. Height	Cover Alive
**Cenchrus setiger*	0.3	0.1
Corchorus incanus subsp. *incanus*	0.9	0.1
Corynotheca pungens		
Crotalaria cunninghamii	0.8	0.1
Cyperus vaginatus	0.5	0.1
Dentella asperata	0.1	0.1
**Eragrostis minor*	0.1	0.1
Eucalyptus camaldulensis subsp. *refulgens*	9	0.9
Eucalyptus victrix	7	0.2
Euphorbia australis var. *subtomentosa*	0.1	0.1
Euphorbia trigonosperma	0.1	0.1
Evolvulus alsinoides var. *villosicalyx*	0.1	0.1
Ficus aculeata var. *indecora*	1.6	0.1
Goodenia lamprosperma	0.2	0.1
Indigofera colutea	0.1	0.1
Ipomoea muelleri	0.1	0.1
Ipomoea polymorpha	0.1	0.1
Melaleuca argentea	6	1.7
Melaleuca glomerata	3	3.2
Melaleuca linophylla	2	0.3
Panicum australiense var. *australiense*	0.1	0.1
Paspalidium rarum	0.2	0.1
Pluchea ferdinandi-muelleri	0.4	0.1
Pluchea tetranthera	0.4	0.1
Rhynchosia minima		0.1
Sida rohlenae subsp. *rohlenae*	0.1	0.1
Sida sp. Rabbit Flat (B.J. Carter 626)	0.3	0.1
Solanum cleistogamum	0.2	0.1
Tephrosia sp. B Kimberley Flora (C.A. Gardner 7300)	1.1	0.1
Tinospora smilacina		0.1
Triodia epactia	0.4	25
Triumfetta propinqua	1.3	0.1
Vigna lanceolata var. *lanceolata*	0.1	0.1

PHOTOS

Site Name:	WE019
Site Type:	QUADRAT
Dimensions:	50m x 50m
Survey Date:	08/05/2024
GPS Location:	GDA94 Zone 50 638252.91E 7695165.12N
Orientation:	270, 0
Landform Type:	Drainage Line
Slope Class:	Gently Inclined (3°)
Soil Type:	Sand
Soil Colour:	Orange
Soil Condition:	Dry
Rock Outcrop:	No bedrock exposed
CF Abundance:	<2%
CF Sizes:	2-6mm, 6-20mm
CF Types:	Colluvium
Vegetation Condition:	Northern Vegetation Condition - VG - Very Good
Disturbance:	Weeds, Animal - Cattle
Fire:	>10yrs
Habitat:	Eucalyptus victrix and Atalaya hemiglauca low isolated clumps of trees with Acacia trachycarpa tall isolated clumps of shrubs over Triumfetta mid isolateed clumps of shrubs over Indigofera monophylla low isolated clumps of shrubs over Aristida holathera low isolated clumps of tussock grasses

SITE POINTS

Label	Easting	Northing	Comments
Corner 1	638253	7695165	
Corner 2	638253	7695215	
Corner 3	638202	7695215	
Corner 4	638203	7695164	

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Abutilon sp. Pritzelianum (S. van Leeuwen 5095) (P3)	0.9	0.1
Acacia pyrifolia var. *morrisonii*	2.3	0.1
Acacia pyrifolia var. *morrisonii*	1	0.1
Acacia trachycarpa	5	2
**Aerva javanica*	0.4	0.1
Afrohybanthus aurantiacus	0.5	0.1
Aristida holathera var. *holathera*	0.4	1
Arivela viscosa	0.5	0.1
Atalaya hemiglauca	4	0.6
Boerhavia coccinea	0.1	0.1
Bonamia alatisemina	0.1	0.1

Taxon Name	Avg. Height	Cover Alive
Bulbostylis barbata	0.1	0.1
Cajanus cinereus	1.3	0.2
**Cenchrus ciliaris*	0.2	0.1
Corchorus incanus subsp. *incanus*	1	0.6
Crotalaria cunninghamii	0.8	0.1
Cucumis variabilis		0.1
Eragrostis eriopoda	0.2	0.1
Eucalyptus camaldulensis subsp. *refulgens*		
Eucalyptus victrix	8	1.5
Euphorbia myrtoides	0.3	0.1
Euphorbia tannensis subsp. *eremophila*	0.5	0.1
Euploca glandulifera	0.4	0.1
Hypertelis cerviana	0.1	0.1
Indigofera monophylla	1.3	2
Paspalidium clementii	0.1	0.1
Paspalidium rarum	0.1	0.1
Petalostylis labicheoides	1.8	0.1
Pluchea tetranthera	0.7	0.1
Portulaca oleracea	0.1	0.1
Senna venusta	1.2	0.1
Sida rohlenae subsp. *rohlenae*	0.4	0.1
Tephrosia sp. B Kimberley Flora (C.A. Gardner 7300)	1.3	0.1
Tribulus occidentalis	0.1	0.1
Triodia epactia	0.3	0.1
Triodia lanigera	0.4	0.2
Triodia melvillei	0.4	0.3
Triumfetta propinqua	1.9	1
Waltheria indica	0.3	0.1

PHOTOS

Site Name:	WE021
Site Type:	QUADRAT
Dimensions:	50m x 50m
Survey Date:	08/05/2024
GPS Location:	GDA94 Zone 50 638194.7916E 7692611.84N
Orientation:	90, 180
Landform Type:	Drainage Line
Slope Class:	Gently Inclined (3°)
Soil Type:	Sand
Soil Colour:	Orange
Soil Condition:	Dry
Rock Outcrop:	No bedrock exposed
CF Abundance:	<2%
CF Sizes:	2-6mm, 6-20mm, 20-60mm
CF Types:	Colluvium
Vegetation Condition:	Northern Vegetation Condition - G - Good
Disturbance:	Animal - Cattle- high density of cattle frequent here, obvious trampling and overgrazing, (other) - Off-road vehicle tracks through vegetation
Fire:	>10yrs
Habitat:	Eucalyptus camaldulensis mid isolated trees over Acacia trachycarpa tall isolated clumps of shrubs over Triumfetta hands (COL) mid isolated clumps of shrubs over Triodia low isolated clumps of hummock grasses

SITE POINTS

Label	Easting	Northing	Comments
Corner 1	638195	7692612	
Corner 2	638194	7692562	
Corner 3	638245	7692562	
Corner 4	638245	7692612	

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Acacia trachycarpa	4.5	3
**Aerva javanica*	0.5	0.4
Afrohybanthus aurantiacus	0.4	0.1
Amaranthus undulatus	0.1	0.1
Aristida holathera var. *holathera*	0.5	0.1
Arivela viscosa	0.5	0.2
Boerhavia coccinea	0.1	0.1
Boerhavia coccinea	0.1	0.1
Bonamia alatisemina	0.1	0.1
Bulbostylis barbata	0.1	0.1
Cajanus cinereus	0.3	0.1

Taxon Name	Avg. Height	Cover Alive
Capparis spinosa subsp. *nummularia*	1.5	0.1
**Cenchrus ciliaris*	0.2	0.1
Corchorus incanus subsp. *incanus*	1.6	0.2
Corynotheca pungens	0.6	0.8
Crotalaria cunninghamii	0.7	0.1
Cynanchum floribundum		0.1
Eucalyptus camaldulensis subsp. *refulgens*	13	0.3
Euphorbia australis var. *subtomentosa*	0.1	0.1
Euphorbia myrtoides	0.4	0.1
Euploca glandulifera	0.6	0.1
Grevillea wickhamii subsp. *macrodonta*		
Hypertelis cerviana	0.1	0.1
Indigofera colutea	0.1	0.1
?*Olearia fluvialis*	0.2	0.1
Paspalidium clementii	0.2	0.1
Paspalidium reflexum	0.4	0.1
Portulaca oleracea	0.1	0.1
Sida rohlenae subsp. *rohlenae*	0.4	0.1
Tephrosia sp. B Kimberley Flora (C.A. Gardner 7300)	1.2	0.1
Tinospora smilacina		0.1
Tribulus occidentalis	0.1	0.1
Triodia melvillei	0.5	3
Triumfetta propinqua	1.9	2.5
?*Waltheria indica*	0.1	0.1

PHOTOS

Site Name:	WFMP01
Site Type:	QUADRAT
Dimensions:	50m x 50m
Survey Date:	01/05/2024
GPS Location:	GDA94 Zone 50 658495.11E 7704481.07N
Orientation:	270, 0
Landform Type:	Drainage Line
Slope Class:	Very Gently Inclined (1°)
Aspect:	NW
Soil Type:	Sand
Soil Colour:	Red
Soil Condition:	Dry
Rock Outcrop:	Calcrete, <2% bedrock exposed
CF Abundance:	2-10%
CF Sizes:	2-6mm, 6-20mm, 20-60mm, 60-200mm
CF Types:	Colluvium
Vegetation Condition:	Northern Vegetation Condition - E - Excellent
Fire:	>10yrs
Habitat:	Eucalyptus camaldulensis, Eucalyptus victrix and Melaleuca argentia low woodland over Melaleuca glomerata tall open shrubland over Triodia epactia low open hummock grassland

SITE POINTS

Label	Easting	Northing	Comments
Corner 1	658495	7704481	
Corner 2	658447	7704484	
Corner 3	658451	7704536	
Corner 4	658502	7704534	

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Acacia orthocarpa	2.5	2
Acacia pyrifolia var. *morrisonii*	1.5	0.2
Acacia pyrifolia var. *morrisonii*	0.4	0.1
Acacia sericophylla	3	3
Acacia trachycarpa	2.5	0.5
Acacia trachycarpa x tumida var. pilbarensis	3	0.3
Acacia tumida var. *pilbarensis*	2	0.5
Afrohybanthus aurantiacus	0.3	0.2
Arivela viscosa	0.1	0.1
Bonamia alatisemina	0.1	0.1
Cajanus cinereus	1.5	0.2
Cassytha capillaris		0.1

Taxon Name	Avg. Height	Cover Alive
Crotalaria cunninghamii	1.2	0.3
Cucumis variabilis		0.1
Cynanchum floribundum		0.1
Eriachne tenuiculmis	0.3	0.7
Eucalyptus camaldulensis subsp. *refulgens*	8	10
Eucalyptus victrix	6	4
Euphorbia australis var. *subtomentosa*	0.1	0.1
Grevillea wickhamii	3	1
Melaleuca argentea	3.5	10
Melaleuca glomerata	2.2	5
Melaleuca linophylla		
Paspalidium reflexum	0.3	0.1
Petalostylis labicheoides		0.2
Pluchea tetranthera	0.2	0.1
Rhynchosia minima	0.2	0.1
Solanum phlomoides	0.8	0.1
Triodia epactia	0.8	20

PHOTOS

Site Name:	WMP02
Site Type:	QUADRAT
Dimensions:	50m x 50m
Survey Date:	01/05/2024
GPS Location:	GDA94 Zone 50 658417.2921E 7704455.456N
Orientation:	270, 0
Landform Type:	Drainage Line
Slope Class:	Very Gently Inclined (1°)
Aspect:	NW
Soil Type:	Sand
Soil Colour:	Red
Soil Condition:	Dry
Rock Outcrop:	No bedrock exposed
CF Abundance:	10-20%
CF Sizes:	2-6mm, 6-20mm, 20-60mm, 60-200mm
CF Types:	Colluvium
Vegetation Condition:	Northern Vegetation Condition - E - Excellent
Fire:	>10yrs
Habitat:	Melaleuca argentea low woodland over Melaleuca linophylla tall isolated clumps of shrubs

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Acacia sericophylla	2.5	0.3
Arivela viscosa	0.3	0.2
Bonamia alatisemina	0.1	0.1
Cajanus cinereus	1.5	0.1
Calandrinia tepperiana	0.1	0.1
Cucumis variabilis		0.1
Cynanchum floribundum		0.1
Cyperus ixiocarpus	0.4	0.1
Euphorbia australis var. *subtomentosa*	0.1	0.1
Euphorbia trigonosperma	0.3	0.1
Goodenia lamprosperma	0.3	0.1
Ipomoea muelleri		0.1
Melaleuca argentea	4.5	15
Melaleuca linophylla	2.5	2
Microstachys chamaelea	0.5	0.1
Nellica maderaspatensis	0.3	0.1
Paspalidium reflexum	0.3	0.1
Ptilotus fusiformis	0.3	0.1
Rhynchosia minima		0.1
Trigastrotheca molluginea	0.1	0.1
Triodia epactia	0.3	0.1

PHOTOS

Site Name:	WMP03
Site Type:	QUADRAT
Dimensions:	50m x 50m
Survey Date:	02/05/2024
GPS Location:	GDA94 Zone 50 652347.34E 7735874.15N
Landform Type:	Other, Drainage line, flow line (other)
Slope Class:	Very Gently Inclined (1°)
Aspect:	SE
Soil Type:	Sand
Soil Colour:	Red
Soil Condition:	Dry
Rock Outcrop:	None (other), No bedrock exposed
CF Abundance:	0%
Vegetation Condition:	Northern Vegetation Condition - E - Excellent
Disturbance:	Animal - Cattle
Fire:	>10
Habitat:	Euc camaldulensis over Mel argentea, Aca tumida and Aca trachycarpa.

SITE POINTS

Label	Easting	Northing	Comments
Corner 1	652347	7735874	
Corner 2	652400	7735884	
Corner 3	652396	7735834	
Corner 4	652347	7735821	

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Acacia trachycarpa	3	1
Acacia tumida var. *pilbarensis*	3.5	2
Afrohybanthus aurantiacus	0.2	0.2
Aristida holathera var. *holathera*	0.3	0.1
Arivela uncifera	0.6	0.2
Arivela viscosa	0.1	0.1
Bonamia alatisemina	0.1	0.1
Bonamia media	0.1	0.1
Cajanus cinereus	1.3	0.2
Carissa lanceolata	0.4	0.2
Cassytha capillaris		0.8
**Cenchrus ciliaris*	0.2	0.7
Corchorus incanus subsp. *incanus*	0.6	0.3
Crotalaria cunninghamii	0.4	0.3
Cucumis variabilis		0.1
Cynanchum floribundum		0.1
Cyperus blakeanus	0.5	0.2

Taxon Name	Avg. Height	Cover Alive
Cyperus ixiocarpus	0.5	0.3
Cyperus vaginatus	0.5	0.2
Eragrostis eriopoda	0.3	0.1
Eriachne aristidea	0.3	0.1
Eriachne ?*benthamii*	0.6	0.3
Eucalyptus camaldulensis subsp. *refulgens*		
Euphorbia australis var. *subtomentosa*	0.2	0.2
Euphorbia australis var. *subtomentosa*	0.1	0.1
Euphorbia trigonosperma	0.3	0.2
Goodenia lamprosperma	0.2	0.1
Indigofera linnaei	0.1	0.2
Ipomoea polymorpha	0.1	0.1
Melaleuca argentea	5	15
Melaleuca glomerata	2.2	4
Nellica maderaspatensis	0.2	0.1
Panicum australiense var. *australiense*	0.1	0.1
Paspalidium reflexum	0.4	0.2
**Passiflora foetida* var. *hispida*	0.1	0.1
Petalostylis labicheoides	0.9	0.1
Ptilotus calostachyus	0.3	0.1
Ptilotus fusiformis	0.3	0.2
Sida sp. Rabbit Flat (B.J. Carter 626)	0.2	0.1
Tephrosia simplicifolia	0.5	0.2
Tinospora smilacina		0.1
Trianthema pilosum	0.1	0.1
?*Tricoryne* sp.	0.5	0.2
Triodia epactia	0.8	0.4
Triodia lanigera	0.8	1
Triumfetta propinqua	1	0.3
Wahlenbergia tumidifructa	0.2	0.2

PHOTOS

Site Name:	WMP04
Site Type:	QUADRAT
Dimensions:	50m x 50m
Survey Date:	02/05/2024
GPS Location:	GDA94 Zone 50 652510.75E 7735948.08N
Landform Type:	Other, Drainage line, flow line (other)
Slope Class:	Level (0°)
Aspect:	NW
Soil Type:	Sand
Soil Colour:	Red
Soil Condition:	Dry
Rock Outcrop:	No bedrock exposed
CF Abundance:	<2%
CF Sizes:	2-6mm
CF Types:	Colluvium
Vegetation Condition:	Northern Vegetation Condition - VG - Very Good
Disturbance:	Animal - Cattle
Fire:	>10
Habitat:	Mel argentea over Crot cunning, Aca trachy and Trio epactia.

SITE POINTS

Label	Easting	Northing	Comments
Corner 1	652511	7735948	
Corner 2	652562	7735948	
Corner 3	652551	7735899	
Corner 4	652501	7735902	

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Acacia pyrifolia var. *morrisonii*	0.4	0.1
Acacia trachycarpa	2	2
Acacia tumida var. *pilbarensis*	0.3	0.1
Afrohybanthus aurantiacus	0.3	0.2
Aristida holathera var. *holathera*	0.3	0.3
Arivela viscosa	0.2	0.1
Bonamia media	0.1	0.1
Cajanus cinereus	1	0.8
**Cenchrus ciliaris*	0.4	0.1
Corchorus incanus subsp. *incanus*	0.5	0.3
Crotalaria cunninghamii	1	0.8
Cynanchum floribundum		0.1
Cyperus vaginatus	0.4	0.1
Dentella asperata	0.1	0.1

Taxon Name	Avg. Height	Cover Alive
Eriachne aristidea	0.4	0.2
Eriachne ?benthamii	0.3	0.2
Euphorbia australis var. *subtomentosa*	0.1	0.2
Euphorbia trigonosperma	0.3	0.2
Goodenia lamprosperma	0.2	0.1
Melaleuca argentea	3	20
Microstachys chamaelea	0.4	0.1
Nellica maderaspatensis	0.2	0.1
Paspalidium reflexum	0.3	0.1
Ptilotus fusiformis	0.3	0.2
?*Tricoryne* sp.	0.4	0.1
Triodia epactia	0.7	0.3
Wahlenbergia tumidifructa	0.2	0.1
Waltheria indica	0.1	0.1

PHOTOS

Site Name:	WMP05
Site Type:	QUADRAT
Dimensions:	50m x 50m
Survey Date:	02/05/2024
GPS Location:	GDA94 Zone 50 653200.9E 7732081.37N
Landform Type:	Other, Drainage line, flow line (other)
Slope Class:	Level (0°)
Aspect:	NW
Soil Type:	Sand
Soil Colour:	Red
Soil Condition:	Dry
Rock Outcrop:	No bedrock exposed
CF Abundance:	2-10%
CF Sizes:	2-6mm, 6-20mm, 20-60mm, 60-200mm
CF Types:	Colluvium
Vegetation Condition:	Northern Vegetation Condition - VG - Very Good
Disturbance:	Animal - Cattle
Fire:	>10
Habitat:	Euc camaldulensis, Mel argentea over Eriachne benthamii

SITE POINTS

Label	Easting	Northing	Comments
Corner 1	653201	7732081	
Corner 2	653252	7732081	
Corner 3	653237	7732033	
Corner 4	653188	7732033	

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Acacia pyrifolia var. *morrisonii*	0.6	0.1
Acacia trachycarpa	2	0.5
Acacia tumida var. *pilbarensis*	4	1.5
Afrohybanthus aurantiacus	0.3	0.2
Arivela viscosa	0.4	0.3
Bonamia alatisemina		0.1
Bonamia media		0.1
Cajanus cinereus	0.5	0.2
Calandrinia tepperiana	0.1	0.1
Cassytha capillaris		0.3
**Cenchrus ciliaris*	0.3	0.2
Corchorus incanus subsp. *incanus*	0.6	0.4
Cucumis variabilis		0.1
Cynanchum floribundum		0.2

Taxon Name	Avg. Height	Cover Alive
Cyperus blakeanus	0.4	0.1
Cyperus vaginatus	0.5	1
Dentella asperata	0.1	0.3
Drosera finlaysoniana	0.1	0.1
Ehretia saligna	2.5	0.3
Eriachne ?benthamii	1.1	6
Eucalyptus camaldulensis subsp. *refulgens*	7	1
Eulalia aurea	0.6	0.2
Euphorbia australis var. *subtomentosa*	0.1	0.3
Euphorbia trigonosperma	0.4	0.2
Goodenia lamprosperma	0.4	0.6
Hibiscus sturtii var. *campylochlamys*	0.2	0.1
Ipomoea polymorpha		0.1
Melaleuca argentea	7	30
Nellica maderaspatensis	0.5	0.1
Paspalidium clementii	0.1	0.1
Paspalidium reflexum	0.3	0.1
**Passiflora foetida* var. *hispida*		0.1
**Passiflora foetida* var. *hispida*	0.1	0.1
Pluchea rubelliflora	0.4	0.2
Ptilotus fusiformis	0.3	0.1
Rhynchosia minima		0.1
Senna notabilis	0.2	0.1
Sesbania cannabina	0.2	0.2
Sida clementii	0.8	
Sida rohlenae subsp. *rohlenae*	0.2	0.1
Sida sp. Rabbit Flat (B.J. Carter 626)	0.2	0.1
Solanum phlomoides	0.4	0.1
Stemodia grossa	0.1	0.1
Tinospora smilacina		0.2
Triodia epactia	1.5	0.5
Vigna lanceolata var. *lanceolata*		0.1
Wahlenbergia tumidifructa	0.2	0.1
Waltheria indica	0.4	0.2

PHOTOS

Site Name:	WMP06
Site Type:	QUADRAT
Dimensions:	50m x 50m
Survey Date:	03/05/2024
GPS Location:	GDA94 Zone 50 658419.07E 7720478.18N
Landform Type:	Other, Drainage line, flow line (other)
Slope Class:	Very Gently Inclined (1°)
Aspect:	NW
Soil Type:	Sand
Soil Colour:	Red
Soil Condition:	Dry
Rock Outcrop:	No bedrock exposed
CF Abundance:	10-20%
CF Sizes:	2-6mm, 6-20mm, 20-60mm, 60-200mm, 200-600mm, 600-2000mm
CF Types:	Colluvium
Vegetation Condition:	Northern Vegetation Condition - VG - Very Good
Disturbance:	Weeds, Animal - Cattle
Fire:	>10
Habitat:	Euc camaldulensis, Mel argentea, Aca tumida over Mel glomerata over Triodia epactia.

SITE POINTS

Label	Easting	Northing	Comments
Corner 1	658419	7720478	
Corner 2	658469	7720471	
Corner 3	658455	7720423	
Corner 4	658405	7720438	

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Acacia pyrifolia var. *morrisonii*	0.6	0.1
Acacia trachycarpa	0.6	0.2
Acacia tumida var. *pilbarensis*	4	3.5
**Aerva javanica*	0.6	2
Afrohybanthus aurantiacus	0.3	0.3
Aristida holathera var. *holathera*	0.2	0.1
Aristida hygrometrica	0.4	0.2
Arivela uncifera	0.3	0.2
Arivela viscosa	0.1	0.1
Boerhavia coccinea	0.1	0.3
Bonamia alatisemina	0.1	0.2
Bulbostylis barbata	0.1	0.1
Calandrinia tepperiana	0.1	0.1
Cassytha capillaris		0.6

Taxon Name	Avg. Height	Cover Alive
**Cenchrus ciliaris*	0.3	2
Corchorus incanus subsp. *incanus*	0.6	0.5
Crotalaria cunninghamii	1.2	0.5
Cucumis variabilis		0.1
Cynanchum floribundum		0.2
Dentella asperata	0.1	0.1
Eragrostis cumingii	0.1	0.1
**Eragrostis minor*	0.1	0.2
Eucalyptus camaldulensis subsp. *refulgens*		
Euphorbia australis var. *subtomentosa*	0.1	0.1
Euphorbia myrtoides	0.1	0.1
Euphorbia trigonosperma	0.2	0.1
Evolvulus alsinoides var. *decumbens*	0.1	0.1
Evolvulus alsinoides var. *villosicalyx*	0.2	0.1
Goodenia lamprosperma	0.3	0.2
Hypertelis cerviana	0.1	0.1
Indigofera linnaei	0.1	0.1
Ipomoea muelleri		0.2
Ipomoea polymorpha	0.1	0.2
Melaleuca argentea	3.5	1
Melaleuca glomerata	3	12
**Opuntia* sp.	0.5	0.1
Panicum australiense var. *australiense*	0.1	0.1
Paspalidium clementii	0.1	0.1
Perotis rara	0.1	0.1
Portulaca oleracea	0.1	0.1
Ptilotus fusiformis	0.2	0.1
Rhynchosia minima		0.1
Senna notabilis	0.1	0.1
Trianthema pilosum	0.1	0.1
Tribulus hirsutus	0.1	0.1
Tribulus occidentalis	0.1	0.1
Trichodesma zeylanicum	0.1	0.1
?*Tricoryne* sp.	0.4	0.2
Trigastrotheca molluginea	0.1	0.1
Triodia epactia	0.5	6
Triodia lanigera	0.5	2
Triumfetta propinqua	0.6	0.5
Waltheria indica	0.4	0.2

PHOTOS

Site Name:	WMP07
Site Type:	QUADRAT
Dimensions:	50m x 50m
Survey Date:	03/05/2024
GPS Location:	GDA94 Zone 50 658219.09E 7720628.4N
Landform Type:	Other, Drainage line, flow line (other)
Slope Class:	Very Gently Inclined (1°)
Soil Type:	Sand
Soil Colour:	Red
Soil Condition:	Dry
Rock Outcrop:	No bedrock exposed
CF Abundance:	2-10%
CF Sizes:	2-6mm, 6-20mm, 20-60mm
CF Types:	Colluvium
Vegetation Condition:	Northern Vegetation Condition - E - Excellent
Disturbance:	Animal - Cattle
Fire:	>10
Habitat:	Euc camaldulensis over Mel argentea on red sand.

SITE POINTS

Label	Easting	Northing	Comments
Corner 1	658219	7720628	
Corner 2	658270	7720626	
Corner 3	658266	7720576	
Corner 4	658217	7720574	

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Acacia pyrifolia var. *morrisonii*	1.3	0.4
Acacia pyrifolia var. *morrisonii*	1.5	0.2
Acacia trachycarpa	0.4	0.1
Acacia tumida var. *pilbarensis*	0.3	0.1
Afrohybanthus aurantiacus	0.2	0.1
Aristida holathera var. *holathera*	0.2	0.1
Aristida holathera var. *holathera*	0.2	0.1
Cajanus cinereus	1.3	0.2
Crotalaria cunninghamii	0.6	0.2
Cucumis variabilis		0.1
Cynanchum floribundum		0.1
Cyperus ixiocarpus	0.3	0.1
Ehretia saligna	2	0.4
Eriachne ?*benthamii*	0.5	0.2
Eucalyptus camaldulensis subsp. *refulgens*	7	28
Euphorbia trigonosperma	0.2	0.1

Taxon Name	Avg. Height	Cover Alive
Melaleuca argentea	6.5	35
Melaleuca glomerata	0.5	0.2
Nellica maderaspatensis	0.2	0.1
Triodia epactia	0.3	0.1

PHOTOS

Site Name:	WMP13
Site Type:	QUADRAT
Dimensions:	50m x 50m
Survey Date:	08/05/2024
GPS Location:	GDA94 Zone 50 637955.5707E 7693949.749N
Landform Type:	Other, Flow line (other)
Slope Class:	Very Gently Inclined (1°)
Aspect:	S
Soil Type:	Sandy Clay Loam
Soil Colour:	Brown
Rock Outcrop:	No bedrock exposed
CF Abundance:	0%
Vegetation Condition:	Northern Vegetation Condition - E - Excellent
Disturbance:	Animal - Cattle
Fire:	>10
Habitat:	Euc camaldulensis and Mel argentea over Atalaya hemiglauca

SITE POINTS

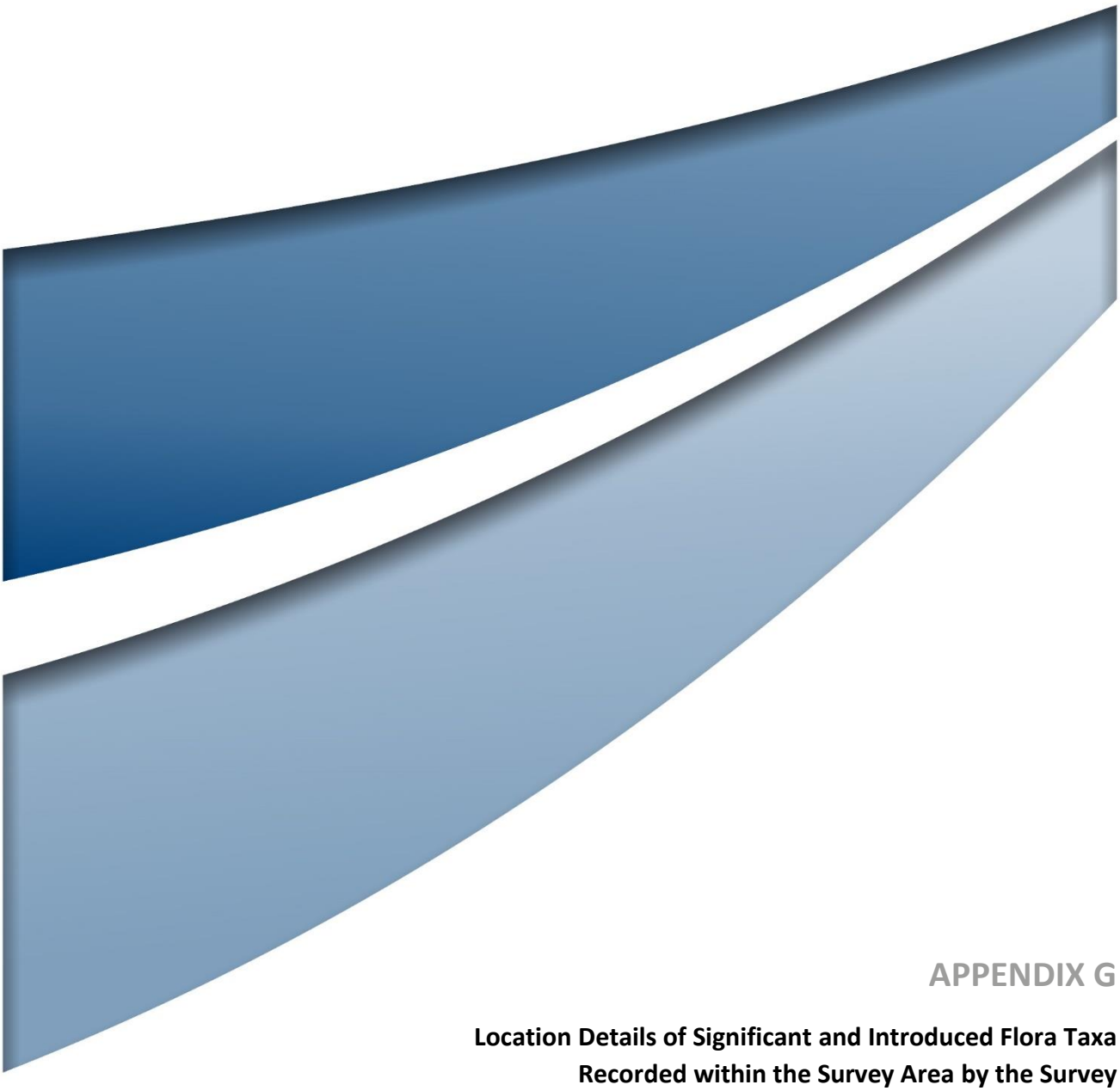
Label	Easting	Northing	Comments
Corner 1	637956	7693950	

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Abutilon otocarpum	0.1	0.1
Abutilon sp. Pritzelianum (S. van Leeuwen 5095) (P3)	0.6	0.1
Acacia colei	2	0.1
Acacia pyrifolia var. *morrisonii*	0.9	0.2
Acacia sericophylla	2.5	1
Acacia trachycarpa	2.2	0.8
Achyranthes aspera	0.1	0.1
**Aerva javanica*	0.4	0.2
Afrohybanthus aurantiacus	0.6	0.1
Arivela viscosa	0.2	0.1
Atalaya hemiglauca	3.5	15
Cajanus cinereus	1.7	0.2
Carissa lanceolata	1.8	0.2
**Cenchrus ciliaris*	0.1	0.1
Corchorus ?tectus	0.2	0.1
Cucumis variabilis		0.1
Cynanchum floribundum		0.1
Cyperus ixiocarpus	0.4	0.1
Cyperus vaginatus	0.6	1
Ehretia saligna	1	0.2
Erythrina vespertilio	0.1	0.1

Taxon Name	Avg. Height	Cover Alive
Eucalyptus camaldulensis subsp. *refulgens*	17	38
Eucalyptus victrix	13	10
Eulalia aurea	0.8	0.4
Euphorbia myrtoides	0.1	0.1
Melaleuca argentea	12	3
Melaleuca glomerata	0.5	0.1
Nellica maderaspatensis	0.5	0.1
Sida rohlenae subsp. *rohlenae*	0.5	0.3
Solanum ?phlomoides	0.1	0.1
Tinospora smilacina		0.1
**Vachellia farnesiana* var. *farnesiana*	0.9	0.1
Vigna lanceolata var. *lanceolata*		0.1

PHOTOS



APPENDIX G

Location Details of Significant and Introduced Flora Taxa Recorded within the Survey Area by the Survey

GOVERNMENT AGENCY REFERENCE ONLY
NOT FOR PUBLIC DISSEMINATION
CONTAINS LOCATIONS OF SIGNIFICANT FLORA TAXA

All locations are in GDA2020 Zone 50

*denotes weed taxa

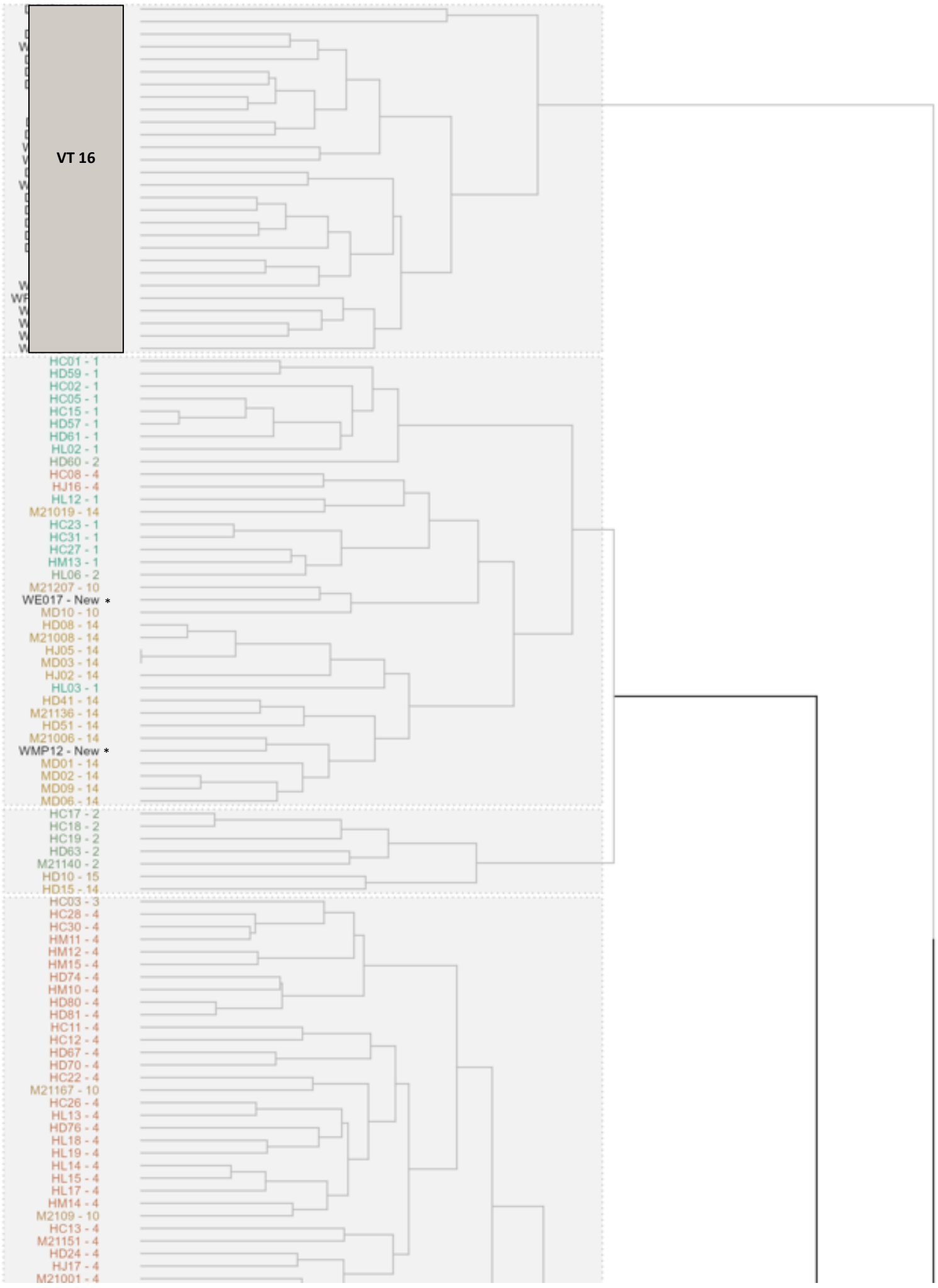
Taxon	Status (WA)	Abundance	Easting	Northing
***Abutilon* sp. Pritzelianum (S. van Leeuwen 5095)**	P3	1	658813	7714197
****Aerva javanica***	-	70	658813	7714197
****Aerva javanica***	-	50	658419	7720478
****Aerva javanica***	-	200	659826	7713901
****Aerva javanica***	-	30	658418	7709281
****Aerva javanica***	-	15	653360	7733302
****Aerva javanica***	-	12	655397	7728174
****Calotropis procera***	-	1	658567	7709228
****Cenchrus ciliaris***	-		653201	7732081
****Cenchrus ciliaris***	-	2	653178	7733254
****Cenchrus ciliaris***	-		655397	7728174
****Cenchrus ciliaris***	-	50	653360	7733302
****Cenchrus ciliaris***	-	40	658418	7709281
****Cenchrus ciliaris***	-	50	658813	7714197
****Cenchrus ciliaris***	-		659826	7713901
****Cenchrus ciliaris***	-		658419	7720478
****Cenchrus setiger***	-	5	658813	7714197
****Cenchrus setiger***	-		655397	7728174
****Citrullus amarus***	-	5	653360	7733302
****Citrullus amarus***	-		660003	7713988
****Eragrostis minor***	-	40	658419	7720478
****Eragrostis minor***	-		659826	7713901
****Eragrostis minor***	-		658813	7714197
****Eragrostis minor***	-		658418	7709281
****Opuntia* sp.**	-	1	659875	7713923
****Opuntia* sp.**	-	20	659851	7713832
****Opuntia* sp.**	-	1	658419	7720478
****Passiflora foetida* var. *hispida***	-		653201	7732081
****Passiflora foetida* var. *hispida***	-		653201	7732081

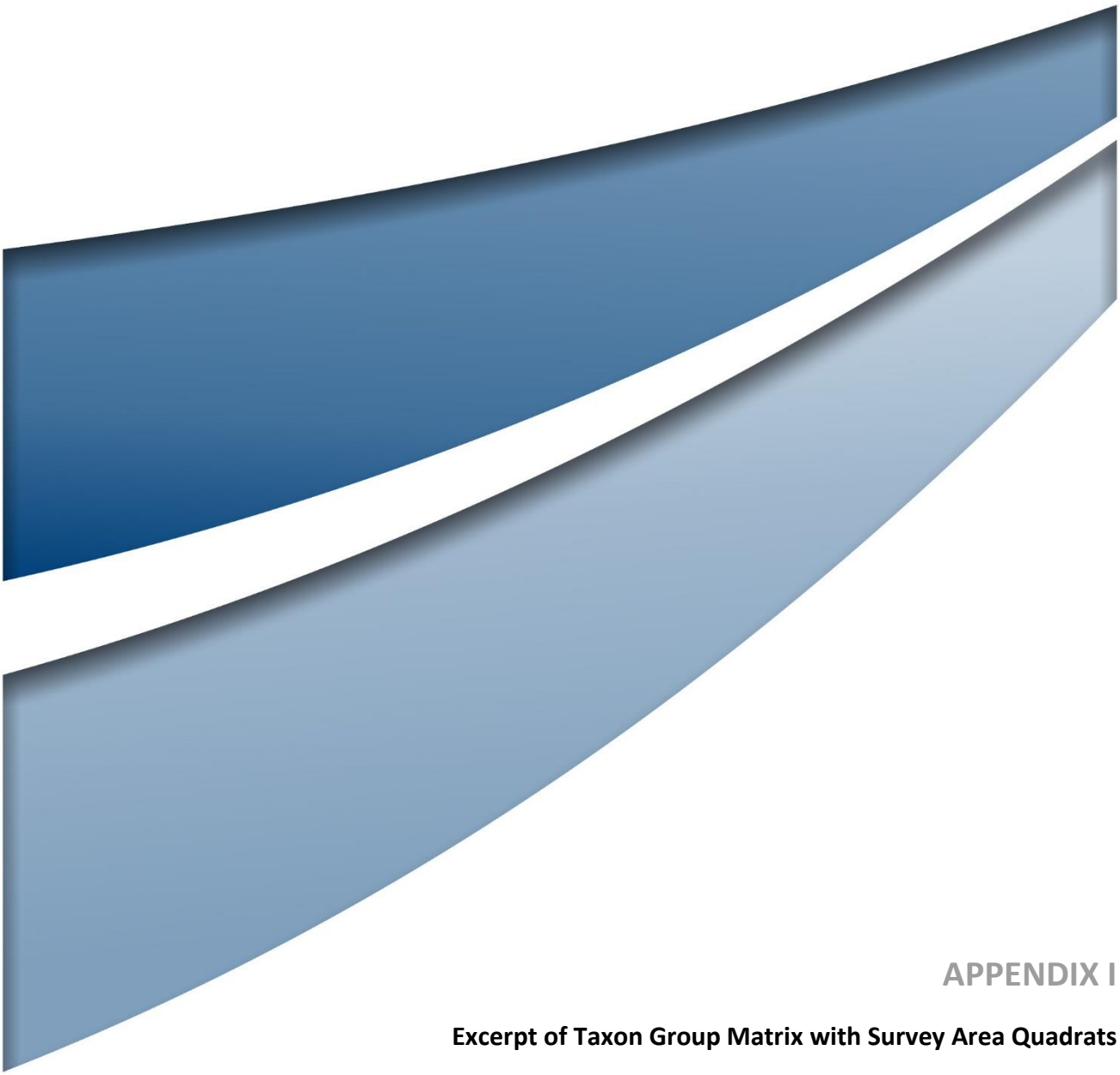
APPENDIX H

Excerpt of Classification Analysis Dendrogram with Survey Area Quadrats

New indicates quadrats from the current survey, quadrats from Umwelt (2024) are shown with their VTs assigned as part of that assessment.

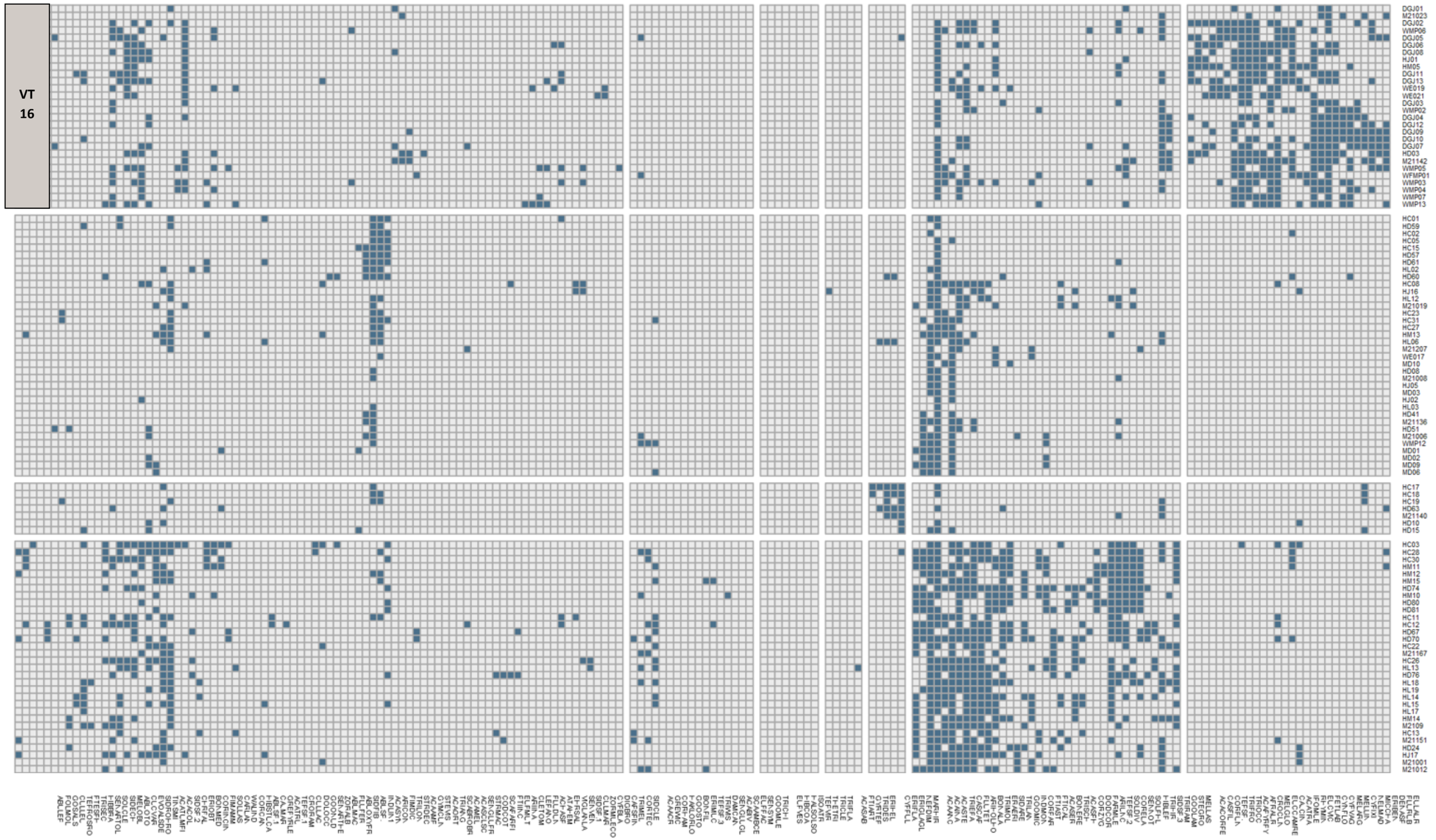
*Indicates additional quadrats assessed by Umwelt (2024) that have not been reported on

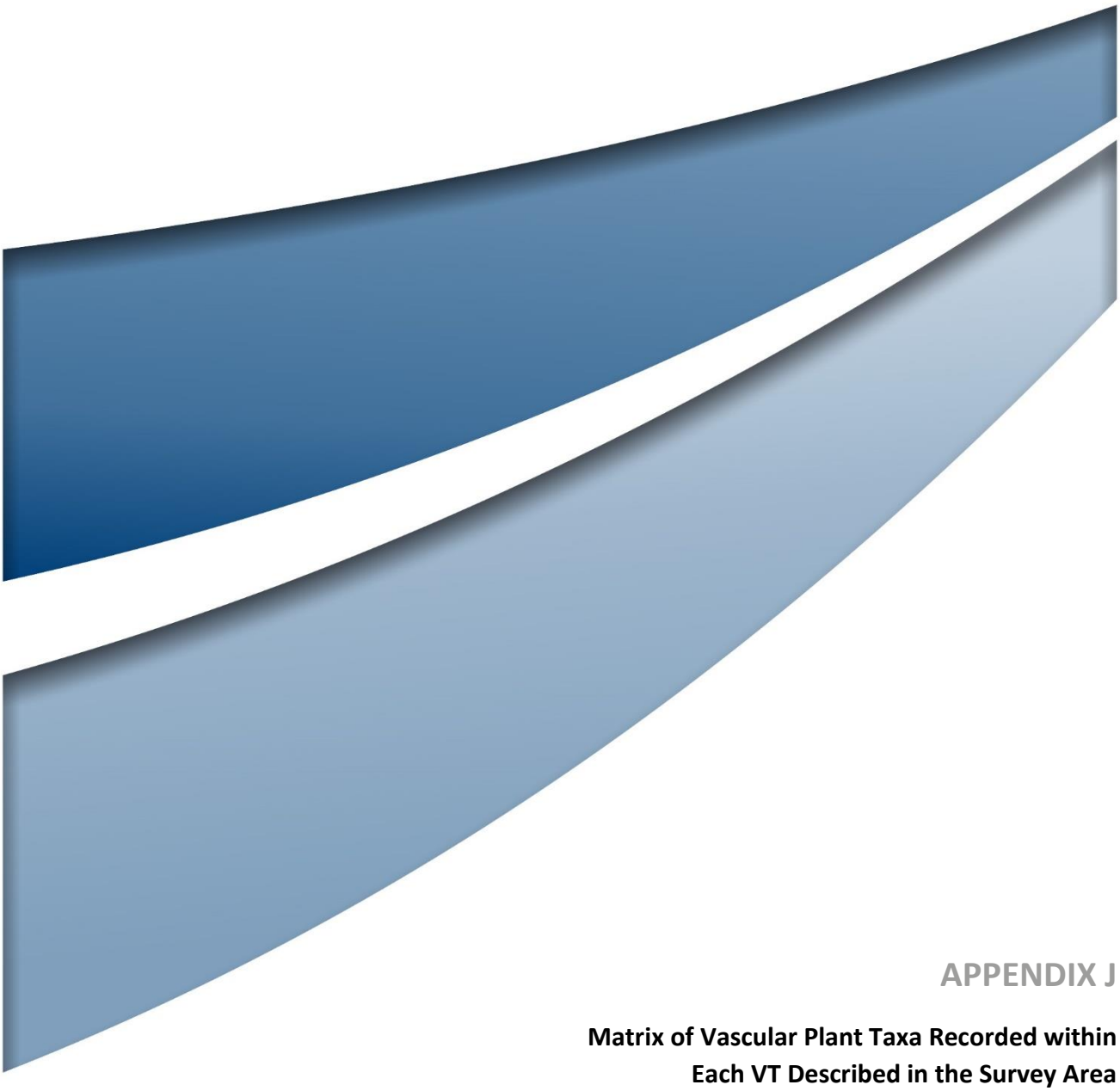




APPENDIX I

Excerpt of Taxon Group Matrix with Survey Area Quadrats


VT
16
DGJ01
M21023
DGJ02
WMP08
DGJ05
DGJ06
DGJ08
HJ01
HM05
DGJ11
DGJ13
WE019
WE021
DGJ03
WMP02
DGJ04
DGJ12
DGJ09
DGJ10
DGJ07
HD03
M21142
WMP05
WFMP01
WMP03
WMP04
WMP07
WMP13
HC01
HD59
HC02
HC05
HC15
HD57
HD61
HL02
HD60
HC08
HJ16
HL12
M21019
HC23
HC31
HC27
HM13
HL06
M212O7
WE017
MD10
HD08
M21008
HJ05
MD03
HJ02
HL03
HD41
M21136
HD51
M21006
WMP12
MD01
MD02
MD09
MD06
HC17
HC18
HC19
HD63
M21140
HD10
HD15
HC03
HC28
HC30
HM11
HM12
HM15
HD74
HM10
HD80
HD81
HC11
HC12
HD67
HD70
HC22
M21167
HC26
HL13
HD76
HL18
HL19
HL14
HL15
HL17
HM14
M2109
HC13
M21151
HD24
HJ17
M21001
M21012
Present
Absent



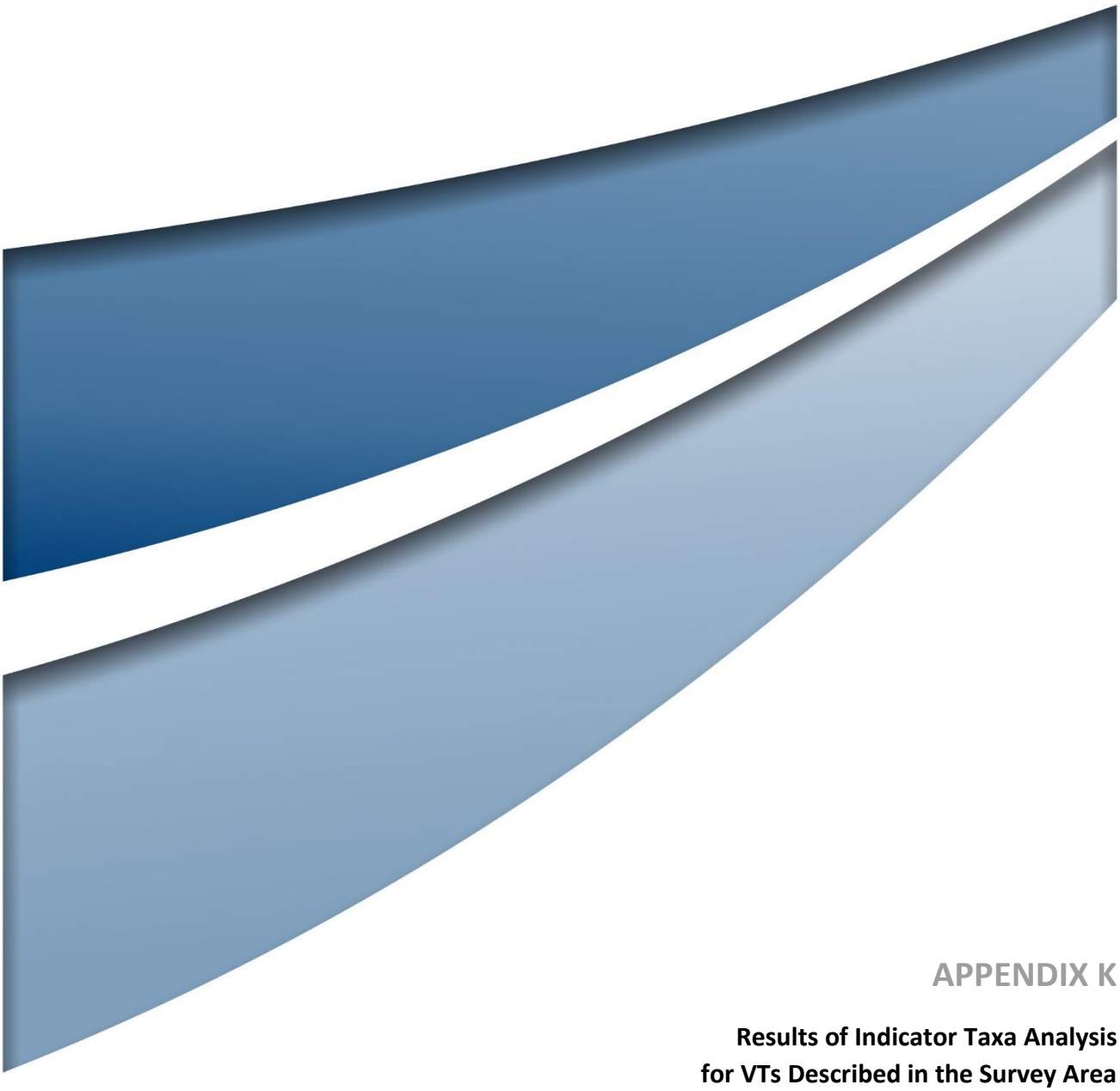
APPENDIX J

Matrix of Vascular Plant Taxa Recorded within Each VT Described in the Survey Area

Taxon	VT 16														
	DGJ02	DGJ03	DGJ06	DGJ07	DGJ08	DGJ09	DGJ10	DGJ11	DGJ12	DGJ13	WFMP01	WMP02	WMP05	WMP06	WMP07
Acacia ampliceps				X	X										
Acacia colei	X			X	X				X	X					
Acacia coriacea* subsp. *pendens	X						X	X		X					
Acacia orthocarpa											X				
Acacia pyrifolia* var. *pyrifolia	X														
Acacia pyrifolia* var. *morrisonii	X				X	X	X		X		X		X	X	X
Acacia sericophylla											X	X			
Acacia trachycarpa	X		X	X	X		X	X		X	X		X	X	X
Acacia trachycarpa x tumida var. pilbarensis					X						X				
Acacia tumida* var. *pilbarensis			X	X	X					X	X		X	X	X
****Aerva javanica***	X		X		X			X		X				X	
Afrohybanthus aurantiacus	X	X	X	X	X			X	X	X	X		X	X	X
Aristida holathera* var. *holathera	X		X	X			X	X						X	X
Aristida hygrometrica														X	
Arivela uncifera				X	X									X	
Arivela viscosa	X	X	X	X	X		X	X	X	X	X	X	X	X	
Boerhavia coccinea	X	X	X					X						X	
Bonamia alatisemina	X	X	X	X			X			X	X	X	X	X	
Bonamia media													X		
Bulbostylis barbata	X							X		X				X	
Cajanus cinereus	X	X	X	X	X				X		X	X	X		X
Calandrinia tepperiana									X			X	X	X	
Cassytha capillaris											X		X	X	
Cassytha filiformis	X		X		X					X					
****Cenchrus ciliaris***	X		X	X	X			X		X			X	X	
****Cenchrus setiger***					X					X					
Chloris pectinata								X							
****Citrullus amarus***			X				X								
Codonocarpus cotinifolius				X											
Corchorus incanus* subsp. *incanus	X	X	X		X			X		X			X	X	
Corchorus tridens								X							
Corynotheca pungens	X		X	X					X						
Crotalaria cunninghamii	X	X	X	X	X		X	X		X	X			X	X
Cucumis variabilis	X	X			X			X	X		X	X	X	X	X
Cynanchum floribundum		X	X	X	X	X	X	X	X		X	X	X	X	X
Cynanchum viminale	X														
Cyperus blakeanus													X		
Cyperus ixiocarpus						X	X		X			X			X
Cyperus leptocarpus									X						

Taxon	VT 16														
	DGJ02	DGJ03	DGJ06	DGJ07	DGJ08	DGJ09	DGJ10	DGJ11	DGJ12	DGJ13	WFMP01	WMP02	WMP05	WMP06	WMP07
Cyperus vaginatus		X		X	X	X	X	X	X	X			X		
Dactyloctenium radulans								X							
Dentella asperata	X			X		X	X		X	X			X	X	
Drosera finlaysoniana													X		
Dysphania rhadinostachya								X							
Dysphania sp.	X														
Ehretia saligna													X		X
Eragrostis cumingii								X						X	
Eragrostis eriopoda			X												
**Eragrostis minor*	X							X		X				X	
Eriachne aristidea			X	X											
Eriachne benthamii / Eriachne ?benthamii				X		X	X		X						X
Eriachne obtusa	X														
Eriachne tenuiculmis											X				
Eucalyptus camaldulensis subsp. *refulgens*			X		X			X		X	X		X		X
Eucalyptus victrix	X									X	X				
Eulalia aurea				X		X	X		X				X		
Euphorbia australis var. *subtomentosa*	X	X		X	X	X		X		X	X	X	X	X	
Euphorbia myrtoides			X											X	
Euphorbia tannensis subsp. *eremophila*	X														
Euphorbia trigonosperma	X	X		X	X	X	X	X	X	X		X	X	X	X
Evolvulus alsinoides var. *villosicalyx*								X		X				X	
Evolvulus alsinoides var. *decumbens*														X	
Ficus aculeata var. *indecora*										X					
Goodenia lamprosperma	X	X		X		X	X	X	X	X		X	X	X	
Goodenia microptera		X													
Grevillea wickhamii											X				
Hibiscus sturtii var. *campylochlamys*													X		
Hypertelis cerviana	X							X						X	
Indigofera colutea								X		X					
Indigofera linnaei														X	
Ipomoea muelleri			X					X		X		X		X	
Ipomoea polymorpha	X		X		X			X		X			X	X	
Melaleuca argentea	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Melaleuca glomerata	X		X		X		X	X	X	X	X			X	X
Melaleuca linophylla		X	X	X	X	X	X	X	X	X		X			
Microstachys chamaelea	X	X		X		X	X					X			
Nellica maderaspatensis				X		X	X		X			X	X		X
**Opuntia* sp.														X	

Taxon	VT 16														
	DGJ02	DGJ03	DGJ06	DGJ07	DGJ08	DGJ09	DGJ10	DGJ11	DGJ12	DGJ13	WFMP01	WMP02	WMP05	WMP06	WMP07
Panicum australiense* var. *australiense										X				X	
Paspalidium clementii	X							X					X	X	
Paspalidium rarum								X		X					
Paspalidium reflexum	X		X		X			X			X	X	X		
****Passiflora foetida* var. *hispida***													X		
Perotis rara	X							X						X	
Petalostylis labicheoides				X							X				
Pluchea ferdinandi-muelleri										X					
Pluchea rubelliflora				X		X	X						X		
Pluchea tetranthera										X	X				
Portulaca oleracea								X						X	
Pterocaulon sphacelatum				X											
Ptilotus fusiformis	X			X				X	X			X	X	X	
Rhynchosia minima			X		X		X	X		X	X	X	X	X	
Senna artemisioides* subsp. *oligophylla								X							
Senna notabilis	X	X						X					X	X	
Senna venusta			X												
Sesbania cannabina													X		
Sida clementii													X		
Sida rohlenae* subsp. *rohlenae			X		X			X		X			X		
***Sida* sp. Rabbit Flat (B.J. Carter 626)**			X					X		X			X		
Solanum cleistogamum							X	X		X					
Solanum phlomoides				X							X		X		
Stemodia grossa						X	X		X				X		
Stemodia viscosa						X									
***Tephrosia* sp. B Kimberley Flora (C.A. Gardner 7300)**	X		X	X	X	X				X					
Tinospora smilacina	X		X		X			X		X			X		
Trianthema pilosum	X													X	
Tribulopis angustifolia	X														
Tribulus hirsutus														X	
Tribulus occidentalis	X							X						X	
Trichodesma zeylanicum							X							X	
Trigastrotheca molluginea	X											X		X	
Triodia epactia	X	X	X	X	X		X	X	X	X	X	X	X	X	X
Triodia lanigera	X		X					X						X	
Triumfetta propinqua	X		X							X				X	
Vigna lanceolata* var. *lanceolata										X			X		
Wahlenbergia tumidifructa				X		X							X		
Waltheria indica													X	X	



APPENDIX K

Results of Indicator Taxa Analysis for VTs Described in the Survey Area

Taxa that are significant at $p < 0.05$. p values are indicated by:

* = $p < 0.05$

** = $p < 0.01$

*** = $p < 0.001$.

Taxon	Significance	VT
		16
Nellica maderaspatensis	***	30
Acacia pyrifolia* var. *morrisonii*, *Acacia pyrifolia* var. *pyrifolia	***	40
Corynotheca pungens	**	20
Cajanus cinereus	***	31
Acacia coriacea subsp. pendens	***	34
Microstachys chamaelea	***	29
Tribulus occidentalis	***	21
Dentella asperata	***	43
Melaleuca glomerata	***	64
Melaleuca argentea	***	82
Cyperus ixiocarpus	***	36
Rhynchosia minima	*	13
Melaleuca linophylla	***	46
Acacia trachycarpa	***	27
Crotalaria cunninghamii	***	48
Goodenia lamprosperma	***	18
Eulalia aurea	*	14
Triumfetta propinqua*, *Triumfetta ?propinqua	***	32
Cyperus vaginatus	***	61
Cynanchum floribundum	***	79
Eucalyptus camaldulensis subsp. refulgens	***	38
Acacia ampliceps	*	14
***Tephrosia* sp. B Kimberley Flora (C.A. Gardner 7300)**	***	32