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Detailed flora and vegetation survey for the Airstrip at the Mardie Salt Project

Prepared for BCI Minerals Ltd

February 2025

Final

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Version history

Author/s	Reviewer/s	Version	Version number	Date submitted	Submitted to
N. Rogers & C. Williams	G. Wells	Draft for client comments	0.1	31-Jan-25	K. Frehill
N. Rogers	G. Wells	Final, client comments addressed	1.0	05-Feb-25	K. Frehill

Phoenix Environmental Sciences Pty Ltd

2/3 King Edward Road OSBORNE PARK WA 6017

P: 08 6323 5410

E: admin@phoenixenv.com.au

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EXECUTIVE SUMMARY

BCI Minerals Ltd (BCI) is seeking to develop the Airstrip at the Mardie Salt Project (the Project), located 115 km south-west of Karratha, Western Australia. In August 2024, Phoenix Environmental Sciences Pty Ltd was commissioned by BCI to undertake a single season, detailed flora, and vegetation survey for the Project. The study area is located in the Shire of Roebourne, and the Eremaean Botanical Province as defined by the EPA.

The scope for this Project included a desktop study to gather contextual information on the study area, a detailed season survey to collect comprehensive data on flora species and vegetation types in the study area, including quadrat sampling, targeted searches for significant flora within suitable habitat, defining population sizes, and boundaries, demarcating vegetation type boundaries, assessment, and mapping of vegetation condition, assessment of presence, and extent of any TECs and PECs. The survey was conducted between 25 – 26 September 2024.

A total of 60 flora taxa representing 15 families and 42 genera identified to species level were recorded in the study area during the field surveys. Species richness ranged from 9 in MSA002 to 26 species in MSA003. The assemblage included 57 native species and 3 introduced species, including 38 perennial species, 16 annual or short-lived species, and 6 species occurring as both. The most prominent families recorded were Fabaceae (17 taxa), Poaceae (13 taxa), and Asteraceae (7 taxa).

No Threatened or Priority flora were recorded during the field survey. The likelihood of occurrence assessment for the total 48 significant species identified in the desktop review determined that all were unlikely to occur.

Three introduced flora species were found during the survey, of which one, **Neltuma glandulosa* x *velutina* is considered a Declared Pest and a WoNS (Weed of National Significance).

Three vegetation types were identified within the study area, none were considered significant.

Vegetation condition varied within the study area, encompassing all condition ratings from Completely Degraded to Excellent. The majority of the study area (43.2%) in Good condition, followed by in (35.5%) Poor condition.

The survey found no conservation significant floral or vegetation values within the study area and therefore any clearing to the vegetation within the study area is unlikely to create any substantial threat to the vegetation types.

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ACRONYMS AND ABBREVIATIONS

BoM	Bureau of Meteorology
CD	Conservation Dependent
DBCA	Department of Biodiversity, Conservation and Attractions
DCCEEW	Department of Climate Change, Energy, the Environment and Water
DPIRD	Department of Primary Industries and Regional Development
EPA	Environmental Protection Authority
EPBC	Environment Protection and Biodiversity Conservation Act 1999
EP	Environmental Protection Act 1986
ESA	Environmentally Sensitive Areas
GIS	Geographic Information System
IBRA	Interim Biogeographic Regionalisation of Australia
IBSA	Index of Biodiversity Surveys for Assessment
NES	National Environmental Significance
NVIS	National Vegetation Information System
PEC	Priority Ecological Communities
TEC	Threatened Ecological Communities
WA	Western Australia
WoNS	Weed of National Significance

1 INTRODUCTION

BCI Minerals Ltd (BCI) is seeking to develop the Airstrip at the Mardie Salt Project (the Project), located 115 km south-west of Karratha, Western Australia (WA; Figure 1-1).

In August 2024, Phoenix Environmental Sciences Pty Ltd (Phoenix) was commissioned by BCI to undertake a single season, detailed flora, and vegetation survey for the Project.

The study area is located in the Shire of Roebourne, and the Eremaean Botanical Province as defined by the EPA (2016b).

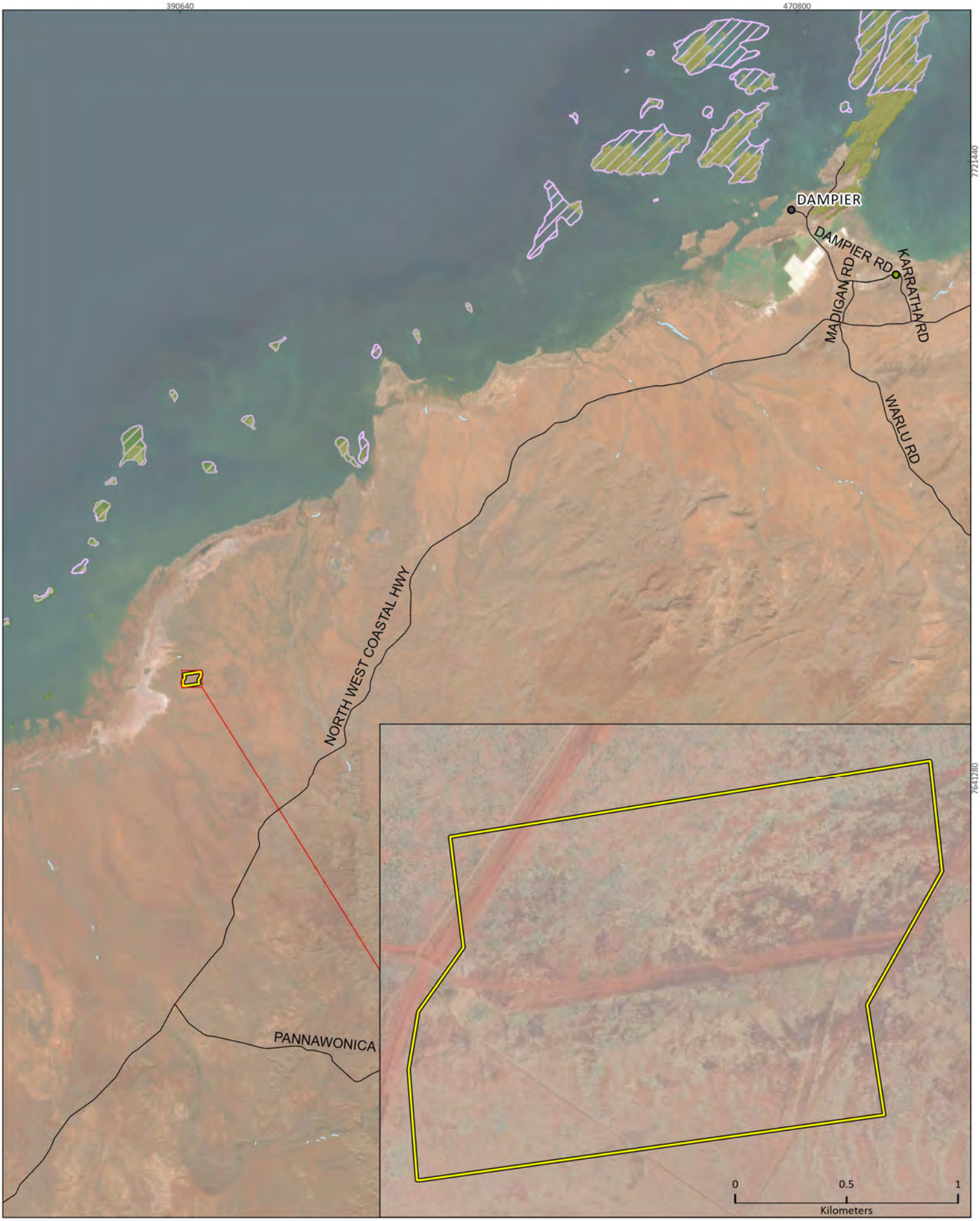
1.1 SCOPE OF WORK

The following scope of work was proposed for the flora and vegetation survey:

- desktop study – to gather contextual information on the study area
- detailed single season survey – to collect comprehensive data on flora species and vegetation types in the study area, that includes:
    - o quadrat sampling to collect comprehensive information on vegetation types present
    - o traverses for significant flora, in suitable habitat, and where possible define significant flora boundaries and population size
    - o demarcating vegetation type boundaries
    - o assessment and mapping of vegetation condition
    - o assessment of the presence and extent of any Threatened or Priority Ecological communities.
- targeted survey – for significant flora and vegetation that entails:
    - o searches of suitable habitat inside the study area
    - o determination of population size and extent within study area.

1.2 STUDY AREA

The study area is a single polygon study area and encompasses approximately 326.8 ha (Figure 1-1).



BCI Minerals
Mardie Salt Project

Project No	1688
Date	22/01/2025
Drawn by	JL
Map author	CW

0 10 20
Kilometers

1:635,200 (at A4) GDA 1994 MGA Zone 50

- Study area
- Lakes
- DBCA managed land
- Environmentally Sensitive Area (ESA)
- Roads

Figure 1-1

Project location and study area

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2 LEGISLATIVE CONTEXT

The protection of flora in WA is principally governed by 3 acts:

- Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act)
- State *Biodiversity Conservation Act 2016* (BC Act)
- State *Environmental Protection Act 1986* (EP Act).

2.1 COMMONWEALTH

The EPBC Act is administered by the Federal Department of Climate Change, Energy, the Environment, and Water. The EPBC Act provides for the listing of Threatened flora and Threatened Ecological Communities (TECs) as matters of National Environmental Significance (NES). Under the EPBC Act, actions that have, or are likely to have, a significant impact on a matter of NES, require approval from the Australian Government Minister for the Environment through a formal referral process. Key threats and habitat critical to the survival of EPBC Act Threatened species are usually defined in the conservation advice and/or recovery plan for the species.

Conservation categories applicable to Threatened flora species under the EPBC Act are as follows:

- Extinct (EX) [1]– there is no reasonable doubt that the last individual has died
- Extinct in the Wild (EW) – taxa known to survive only in captivity
- Critically Endangered (CR) – taxa facing an extremely high risk of extinction in the wild in the immediate future
- Endangered (EN) – taxa facing a very high risk of extinction in the wild in the near future
- Vulnerable – taxa facing a high risk of extinction in the wild in the medium term
- Conservation Dependent (CD)[1] – taxa whose survival depends upon ongoing conservation measures; without these measures, a conservation dependent taxon would be classified as Vulnerable, Endangered, or Critically Endangered.

Ecological communities are defined as 'naturally occurring biological assemblages that occur in a particular type of habitat' (English & Blyth 1997). There are 3 categories of TECs under the EPBC Act: Critically Endangered, Endangered, and Vulnerable.

2.2 STATE

2.2.1 Threatened and Priority species

In WA, the BC Act provides for the listing of Threatened flora species (Western Australian Government 2022) in the following categories:

- Critically Endangered – species facing an extremely high risk of extinction in the wild in the immediate future[2]
- Endangered – species facing a very high risk of extinction in the wild in the near future[2]
- Vulnerable – species facing a high risk of extinction in the wild in the medium term future[2].

[1] Species listed as Extinct and Conservation Dependent are not matters of NES and therefore do not trigger the EPBC Act.

[2] As determined in accordance with criteria set out in the ministerial guidelines.

The Department of Biodiversity, Conservation, and Attractions (DBCA) administers the BC Act and also maintains a non-statutory list of Priority flora. Priority species are still considered to be of conservation significance – that is they may be Threatened – but cannot be considered for listing under the BC Act until there is adequate understanding of threat levels imposed on them. Species on the Priority flora list are assigned to one of 4 Priority (P) categories, P1 (highest) – P4 (lowest), based on level of knowledge/concern.

2.2.2 Critical habitat

Under the BC Act, habitat is eligible for listing as critical habitat if it is critical to the survival of a Threatened species or a TEC and its listing is otherwise in accordance with the ministerial guidelines.

2.2.3 Threatened and Priority Ecological Communities

The BC Act provides for the listing of TECs in the following categories:

- Critically Endangered – facing an extremely high risk of becoming eligible for listing as a collapsed ecological community in the immediate future[2]
- Endangered – facing a very high risk of becoming eligible for listing as a collapsed ecological community in the near future[2]
- Vulnerable – facing a high risk of becoming eligible for listing as a collapsed ecological community in the medium term future[2].

An ecological community may be listed as a collapsed ecological community under the BC Act if there is no reasonable doubt that the last occurrence of the ecological community has collapsed or the ecological community has been so extensively modified throughout its range that no occurrence of it is likely to recover its species composition and/or structure.

The DBCA also maintains a non-statutory list of Priority Ecological Communities (PECs), which may become TECs in the future; however, do not currently meet survey criteria or that are not adequately defined. PECs are assigned to one of 5 categories depending on their priority for survey or definition, with Priority 1 of highest concern and Priority 5 of lowest concern.

2.2.4 Other significant flora and vegetation

Under the Environmental Protection Authority (EPA) environmental factor guideline (EPA 2016a), flora and vegetation may be considered significant for a range of reasons other than listing as Threatened or Priority. Specifically:

- flora may be significant for
    - local endemism or association with a restricted habitat type (e.g. surface water or groundwater dependent ecosystems)
    - new species or anomalous features that indicate a potential new species
    - representing the range of a species (particularly at the extremes of range, recently discovered range extensions, or isolated outliers of the main range)
    - being unusual species, including restricted subspecies, varieties, or naturally occurring hybrids
    - having relictual status, being representative of taxonomic groups that no longer occur widely in the broader landscape.
- Vegetation may be significant for:
    - having restricted distribution
    - subject to a degree of historical impact from threatening processes

- having a role as a refuge
- providing an important function required to maintain ecological integrity of a significant ecosystem.

Provided in the guide for assessment of applications to clear native vegetation (DER 2014) is a scale for assessing the bioregional conservation status of ecological vegetation classes (Table 2-1).

Table 2-1 Bioregional conservation status of ecological vegetation classes

Conservation status	Description
Presumed extinct	Probably no longer present in the bioregion
Endangered*	Less than 10% of pre-European extent remains
Vulnerable*	10-30% of pre-European extent exists
Depleted*	More than 30% and up to 50% pre-European extent exists
Least concern	More than 50% of pre-European extent exists and subject to little or no degradation over a majority of this area

*or a combination of depletion, loss of quality, current threats, and rarity gives a comparable status.

2.2.5 Environmentally Sensitive Areas

Under section 51B of the EP Act the Minister for Environment may declare by notice either a specified area of the State or a class of areas to be Environmentally Sensitive Areas (ESAs). ESAs are declared in the *Environmental Protection (Environmentally Sensitive Areas) Notice 2005* (Government of Western Australia 2005). ESAs are areas where the vegetation has high conservation value and include:

- the area covered by vegetation within 50 m of Threatened flora, to the extent to which the vegetation is continuous with the vegetation in which the Threatened flora is located
- the area covered by a TEC
- a defined wetland (Ramsar wetlands, conservation category wetlands and nationally important wetlands) and the area within 50 m of the wetland
- Bush Forever sites.

2.2.6 Introduced flora

Introduced flora (weeds) pose threats to biodiversity and natural values by successfully out-competing native species for available nutrients, water, space, and sunlight; reducing the natural structural and biological diversity by smothering native plants or preventing them from growing back after clearing, fire, or other disturbance; replacing the native plants that animals use for shelter, food and nesting; and altering fire regimes, often making fires hotter and more destructive (AWC 2007).

Management of some weed species is required under Commonwealth or State frameworks. Key classifications for significant introduced flora that are relevant to this report are:

- Declared Pest – the Biosecurity and Agriculture Management Act 2007 Section 22 makes provision for a plant taxon to be listed as a Declared Pest organism in parts of, or the entire State. Under the Biosecurity and Agriculture Management Regulations 2013 Declared Pests are assigned to one of 3 control categories that dictate the level of management required (DPIRD 2019).
- Weed of National Significance (WoNS) – high impact, established introduced flora causing major economic, environmental, social and/or cultural impacts in a number of states/territories, and which have strong potential for further spread (Australian Weeds Committee 2012). Management is required in accordance with Department of Primary Industries and Regional Development (DPIRD) guidelines for particular WoNS.

Throughout this report, introduced flora species are indicated with an asterisk (*).

3 EXISTING ENVIRONMENT

3.1 INTERIM BIOGEOGRAPHIC REGIONALISATION OF AUSTRALIA

The Interim Biogeographic Regionalisation of Australia (IBRA) classifies Australia's landscapes into large 'bioregions' and 'subregions' based on climate, geology, landform, native vegetation and species information (DoEE 2016). The study area is located in the Roebourne subregion (PIL4) of the Pilbara bioregion (Figure 3-1) which is characterised as Quaternary alluvial plains with a grass savanna of mixed bunch and hummock grasses, and dwarf shrub steppe of *Acacia translucens* over *Triodia pungens*. Samphire, *Sporobolus*, and Mangal occur on marine alluvial flats. Climate is arid tropical with summer rain (Environment Australia 2000).

3.2 LAND SYSTEMS AND SURFACE GEOLOGY

DPIRD undertakes land system mapping for WA using a nesting soil-landscape mapping hierarchy (Schoknecht & Payne 2011). Whilst the primary purpose of the mapping is to inform pastoral and agricultural land capability, it is also useful for informing biological assessments. Under this hierarchy, land systems are defined as areas with recurring patterns of landforms, soils, vegetation and drainage (Payne & Leighton 2004).

The study area intersects the Horseflat System land system (Table 3-1; Figure 3-2).

Table 3-1 Land systems and extent in study area

Land system	Description	Area (ha)	% of study area
Horseflat System	Gilgaied clay plains supporting Roebourne Plains grass grasslands and minor grassy snakewood shrublands.	326.8	100

According to the Surface Geology of Australia 1:1,000,000 scale, WA database (Stewart et al. 2008), the study area intersects the colluvium 38491 (Qrc) geological formation (Table 3-2; Figure 3-3).

Table 3-2 Surface geology of the study area, extent by deposit type

Surface geology	Abbreviation	Description	Area (ha)	% of study area
colluvium 38491	Qrc	Colluvium, sheetwash, talus; gravel piedmonts and aprons over and around bedrock; clay-silt-sand with sheet and nodular kankar; alluvial and aeolian sand-silt-gravel in depressions and broad valleys in Canning Basin; local calcrete, reworked laterite.	326.8	100

BCI Minerals
Mardie Salt Project

Project No	1688
Date	5/02/2025
Drawn by	JL
Map author	CW

0 10 20
Kilometers

1:794,000 (at A4) GDA 1994 MGA Zone 50

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Study area
Desktop study area

Bioregion, subregion

Carnarvon, Cape Range
Pilbara, Chichester
Pilbara, Hamersley
Pilbara, Roebourne

Figure 3-1

Study area in relation to IBRA bioregions and subregions

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Mardie Salt Project

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Date	22/01/2025
Drawn by	JL
Map author	CW

0 0.45 0.9
Kilometers

1:32,500 (at A4) GDA 1994 MGA Zone 50

Study area

Land system

- Horseflat System
- Littoral System
- Onslow System
- Yamerina System

Figure 3-2

Land systems in the study area

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Mardie Salt Project

Project No	1688
Date	22/01/2025
Drawn by	JL
Map author	CW

0 0.5 1
Kilometers

1:32,500 (at A4) GDA 1994 MGA Zone 50

Study area

Surface geology

- alluvium 38485
- colluvium 38491
- estuarine and delta deposits 38489

Figure 3-3

Surface geology in the study area

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3.3 CLIMATE AND WEATHER

The climate of the Roebourne subregion is described as 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 subregion is subject to severe tropical cyclone activity, predominantly during the summer months. On rare occasions, tropical cyclones could also occur in November and May. The most severe tropical cyclones occurred in late March and April, when sea surface temperature reach their highest levels, though they are most frequent between January and March (RPS 2017). The nearest Bureau of Meteorology (BoM) weather station with comprehensive data collection and recent historic climate data is Mardie (no. 005008, Latitude: 21.19°S Longitude 115.98°E), located approximately 3 km to the north-east of the study area.

The long term averages for Mardie records the highest mean maximum monthly temperature in January (37.9°C), and the lowest in July (27.8°C). The lowest mean minimum monthly temperature occurs in July (12.0°C), and the highest in February (25.4°C) (Figure 3-4). Daily mean minimum and maximum temperatures at Mardie in the year preceding the survey relatively consistent with the long term average trendline. However, in the 8 months preceding the survey, beginning in February, both minimum, and maximum temperatures were consistently higher than the long term averages. The most marked deviation between the short term data and long term averages was in September, during the month of the survey, whereby the daily mean minimum temperature (19.6°C) rapidly increased and was 5°C higher than the long term average (14.6°C) (Figure 3-4).

Records from Mardie show that the lowest amount of rainfall was observed in October and December of 2023, as well as in January of 2024. All 3 months recorded 0.0 mm of rainfall. The highest amount of rainfall was observed in June 2024, where a total of 56.2 mm was recorded, compared to 19.3 mm higher than the long term average. When compared to the long term averages, the 3 months preceding the survey, rainfall was slightly below the long term average. The 2023-2024 annual rainfall (91.4 mm) was also markedly less than the long term average (274.9 mm) (Figure 3-4).

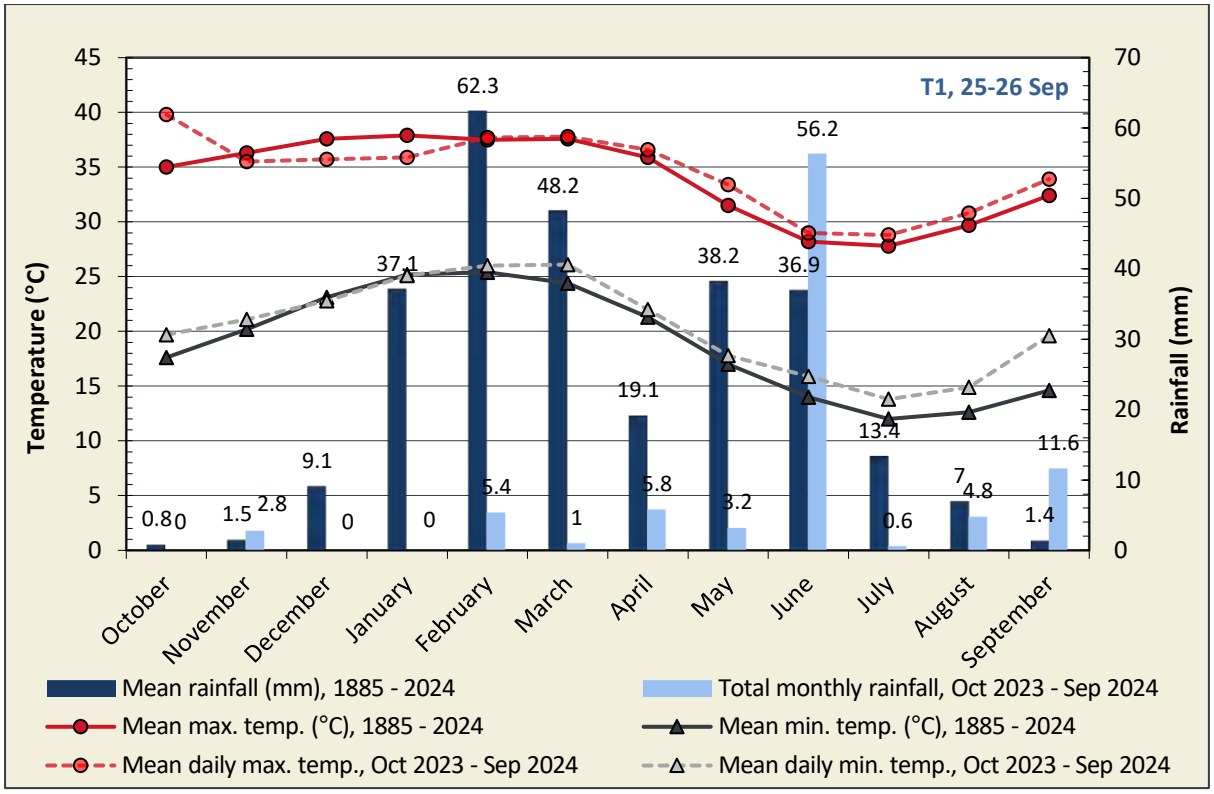


Figure 3-4 **Annual climate and weather data for Mardie (no. 005008) and mean monthly data for the 12 months preceding the May 2023 field trips (BoM 2024)**

3.4 LAND USE

The dominant land uses within the Roebourne subregion include grazing of native pastures, Aboriginal lands, and reserves, conservation, mining leases and urban (Kendrick & Stanley 2001). The Project area extends across terrestrial, coastal, and marine ecosystems. The study area and surroundings are within the Mardie Station, which is primarily used for cattle farming. The coastal and marine areas of the Project area are not used for any other purpose apart from recreation (fishing and boating) on rare occasions (Preston 2019).

3.5 CONSERVATION RESERVES AND ESAS

Within the 40 km buffer there is one Nature Reserve, the Great Sandy Island Nature Reserve, located approximately 16 km to the north-west of the study area (Figure 1-1). The Great Sandy Island Nature Reserve is a series of islands that run parallel to the coastline in between Dampier and Onslow. There are no conservation reserves intersecting the study area.

4 METHODS

The single season detailed survey was conducted with reference to the relevant survey guidelines and guidance, including:

- *EPA Environmental Factor Guideline: Flora and vegetation* (EPA 2016a)
- *EPA Technical Guidance: Flora and vegetation surveys for Environmental Impact Assessment* (EPA 2016b).

4.1 DESKTOP REVIEW

Searches of several biological database searches were undertaken to identify and prepare lists of significant flora and vegetation that may occur within the study area (Table 4-1). A literature search was conducted for accessible reports for biological surveys conducted within 40 km of the study area to build on the lists developed from the database searches (Table 4-2**).**

Table 4-1 Database searches conducted for the desktop review

Database	Target group/s	Search coordinates and extent
Protected Matters Search Tool (DAWE 2024)	EPBC Act Threatened flora and ecological communities	Approximate centre point of study area (-21.21, °S, 115.96°E) with 40 km buffer.
DBCA Threatened and Priority Flora Database (DBCA 2024c)	Threatened and Priority flora	Study area plus a 70 km buffer.
DBCA Threatened and Priority Ecological Communities Database (DBCA 2024b)	TECs and PECs	Study area plus a 70 km buffer.
Dandjoo Biodiversity Data Repository (DBCA 2024a)	Flora records and Threatened and Priority flora	Study area plus a 40 km buffer.
Atlas of Living Australia (ALA 2024)	Flora records and Threatened and Priority flora	Study area plus a 40 km buffer.
Index of Biodiversity Surveys for Assessment (IBSA) database (DWER 2024)	Flora and vegetation survey records and data	Study area plus a 40 km buffer.
Phoenix Biological Database (Phoenix 2024)	Threatened and Priority flora	Study area plus a 70 km buffer.

Table 4-2 Survey reports included in the desktop review

Report author	Survey description	Project
Phoenix (2018)	Flora and vegetation and terrestrial fauna values survey.	Mardie Salt Project
Phoenix (2019a)	Detailed flora and vegetation survey.	Mardie Salt Project
Phoenix (2020)	Detailed flora and vegetation survey.	Mardie Salt Project
Phoenix (2021)	Detailed flora and vegetation survey.	Mardie Salt Project
(Phoenix 2025)	Detailed flora and vegetation survey.	Eramurra Solar Salt Project

4.2 FIELD SURVEY

4.2.1 Survey timing

The field survey was conducted between 25 September and 26 September 2024.

4.2.2 Field methods

At the request of BCI, a detailed flora, and vegetation survey was conducted over a single survey phase. The survey was conducted in spring 2024 in the supplementary survey period for the Eremaean Botanical Province (EPA 2016b).

Survey methods included:

- quadrat, sampling
- searches for significant flora
- mapping of vegetation type and condition boundaries
- assessment for presence of any TECs or PECs.

Prior to the commencement of the field survey, data including satellite imagery, survey boundary, and pre-selected vegetation quadrats, transects, and relevés were loaded onto electronic field devices. The field survey involved assessing and mapping vegetation boundaries, conducting quadrat sampling, and collecting opportunistic flora specimens. GPS locations of vegetation and condition boundaries, survey sites, and flora specimen data were recorded digitally.

4.2.2.1 Quadrats, relevés, and transects

Pre-selected quadrat locations were ground-truthed in the field prior to sampling. Sites were located in intact mature vegetation in areas of best condition, positioned to avoid the boundary or transition zone between vegetation units and major environmental gradients (e.g. changes in soil type or aspect).

In total, 9 quadrats (50 m x 50 m) were sampled across the study area (Figure 4-1; Appendix 1).

Quadrat sampling dimensions were 10 m x 10 m in accordance with EPA guidance for the Pilbara bioregion. The following information was recorded for each quadrat (Appendix 2):

- location – the geographic coordinates of all 4 corners of the quadrat
- description of vegetation – a broad description utilising the structural formation and height classes based on National Vegetation Information System (NVIS) (ESCAVI 2003) and in accordance with EPA (2016b) (Appendix 3)
- habitat – a brief description of landform and habitat
- geology – a broad description of surface soil type and rock type
- disturbance history – a description of any observed disturbance including an estimate of time since last fire, weed invasions, soil disturbance, human activity, and fauna activity
- vegetation condition – using the condition scale in EPA (2016b) for the Eremaean Botanical Province
- height and percentage foliage cover (PFC) – a visual estimate of cover of total vegetation cover, cover of shrubs and trees >2 m tall, cover of shrubs <2 m tall, total grass cover, and total herb cover
- photograph – a colour photograph of the vegetation within each quadrat in a south-easterly direction from the north-west corner of the quadrat
- flora species list – comprehensive list of all flora species recorded within the quadrat.

To ensure accurate taxonomic identification of flora species present within the study area, collections were made of each specimen at least once and each collection pressed and documented for identification using the WA Herbarium resources. All plant specimens collected during the field surveys were identified using appropriate reference material or through comparisons with pressed specimens housed at the WA Herbarium, where necessary. Nomenclature of the species recorded was in accordance with DBCA's WA Flora-Fauna Census Names Database.

4.2.2.2 Significant flora searches

Targeted searches were undertaken for significant flora, including Threatened, and Priority species, as well as any other significant species identified as potentially occurring in the desktop study (e.g. new taxa). Targeted searches focussed on habitats considered likely to support significant flora, in addition to previously recorded locations of significant plants or populations within the study area.

Remnant vegetation was searched using traverses (both informal and systematic) by foot and appropriately spaced according to visibility and density of vegetation.

If a flora species was considered to potentially be a significant species (i.e. similar floristic characteristics and occurring within suitable habitat) the following information was collected:

- GPS coordinates, including delineation of population boundary where applicable
- description of the habitat and floristic community in which the potential significant species was located
- population size estimate (i.e. estimated number of individual plants) where applicable
- specimen collection for taxonomic identification and lodgement at the WA Herbarium
- photograph of live plant in situ and description of important details, such as flower colour, height of individual, or average height of population.

Searches for Declared Pests and Weeds of National Significance were also conducted during targeted searches.

Following the field survey, the likelihood of occurrence for each significant flora species identified in the desktop study was assessed and assigned to one of 3 ratings:

- recorded – species recorded within the study area by either a previous survey or the current survey
- possible – study area is within known range of species; potential habitat is present within the study area, plant may not have been detectible during the survey (e.g. survey was conducted outside of flowering period, annual plant survey was conducted outside likely period of occurrence, small herbaceous plant located within dense vegetation), or the entire area of habitat not thoroughly searched enough
- unlikely – study area outside known range of species and/or no suitable habitat present in study area and/or suitable/potential habitat present but study area considered adequately searched for the species.

4.2.2.3 Vegetation type mapping

Multivariate comparative (cluster) analysis was performed on a species by site matrix (to measure the similarity amongst sites, and a dendrogram was produced to illustrate the similarities between the vegetation units identified).

Software package PATN (Belbin 2003) was employed to conduct association (Bray and Curtis), classification (flexible UPGMA technique of agglomerative hierarchical fusion), and ordination (semi-strong hybrid) analyses parameters. Both species presence and dominance were factored within the site-species matrix through transformation of each species' percent foliage cover values into

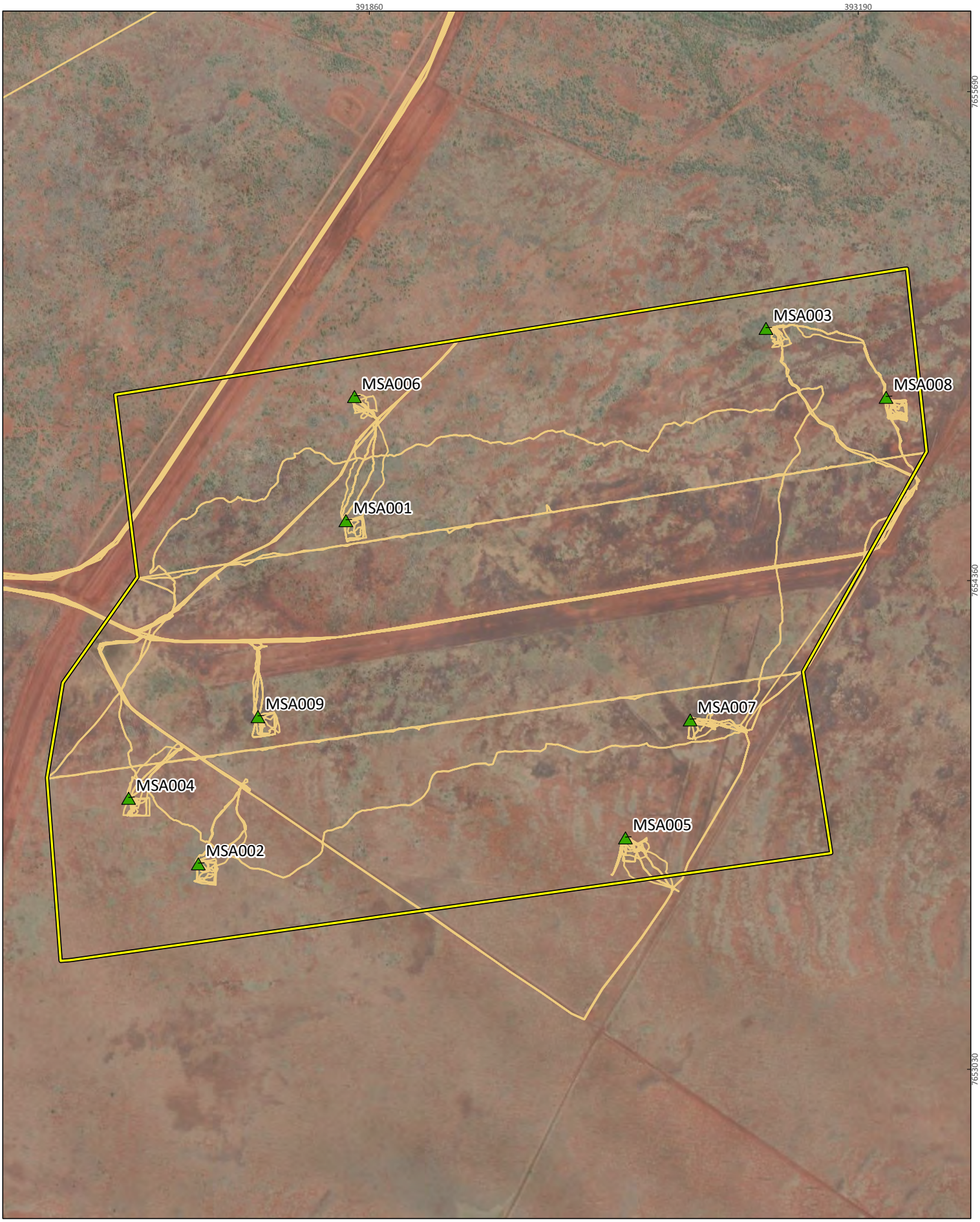
appropriately balanced cover class codes. Annual species were excluded from analysis to ensure the output produced survey site groupings based on perennial/structural species. Singleton species (only occurring in a single site) were excluded for clarity, as they are non-contributary to site similarity/dissimilarity in analysis.

Final analysis required inclusion of perennial weed species due to the overt dominance of **Neltuma glandulosa* x *velutina* across the study area. The inclusion of perennial weed species was equally utilised in a previous survey for the Mardie Salt Project (Phoenix 2021).

Vegetation type and condition boundaries were developed and digitised using Geographic Information System software. Local scale vegetation types were described at NVIS Level V – Association.

4.2.2.4 TEC/PEC assessment

Presence of TECs or PECs was assessed in the field using the appropriate assessment method for the community.



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Mardie Salt Project

Project No	1688
Date	5/02/2025
Drawn by	JL, GW
Map author	CW

0 250 500
Meters

1:13,300(at A4) GDA 1994 MGA Zone 50

Study area
Sites
Survey tracks

Figure 4-1

Survey site locations and survey effort

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4.2.3 Survey personnel

The personnel involved in the survey are listed in below (Table 4-3). All survey work was carried out under relevant licences issued by DBCA under the BC Act.

Table 4-3 Survey personnel

Name	Permit	Qualifications	Role/s
Dr. Grant Wells	N/A	BSc, PhD (Botany)	Principal botanist, Project manager, report review
Tim Morald	FB62000693 TFL 093-2122	BSc (Applied Science)	Field team leader, taxonomic identification
Calvin Williams	FB62000525 TFL 2324-0015	BSc (Environmental Science)	Field work, reporting, data management, taxonomy
Dr. David Leach	N/A	BAppSci (Hons), PhD (Plant Biology)	Senior botanist, data analysis, vegetation mapping
Natasha Rogers	N/A	BSc. (Botany)	Botanist, reporting
Jade Larkman	N/A	BSc (Environmental Management)	Zoologist, map production
Dr. Andrew Perkins	N/A	BSc (Hons), PhD (Botany)	Senior botanical taxonomist; taxonomic identification

5 RESULTS

5.1 DESKTOP REVIEW

5.1.1 Flora assemblage

The combination of the Dandjoo database search and additional significant flora species identified within the desktop extent found records of 501 flora taxa, comprising of 460 native species and 41 introduced species. The taxa represent 222 genera and 78 families. The most prominent families were Fabaceae (82 taxa), Poaceae (62 taxa), Malvaceae (34 taxa), Amaranthaceae (32 taxa) and Chenopodiaceae (31 taxa), which is relatively consistent with the previous reports assessed (Table 5-1).

Table 5-1 Floristic assemblages for survey reports used in desktop review

Survey report	Study area (ha)	Families	Genera	Taxa	3 most prominent families
Phoenix (2018)	48.87	9	16	20	1. Fabaceae 2. Poaceae 3. Proteaceae 3. Boraginaceae
Phoenix (2019a)	28,136.1	41	115	250	1. Fabaceae 2. Chenopodiaceae 3. Poaceae
Phoenix (2020)	29,020.4	44	122	253	1. Fabaceae] 2. Poaceae 3. Chenopodiaceae
Phoenix (2021)	4,435.9	41	120	224	1. Poaceae 2. Fabaceae 3. Malvaceae
Phoenix (2025)	26,448.9	53	164	360	1. Fabaceae 2. Poaceae 3. Chenopodiaceae

5.1.2 Significant flora

A total of 48 significant flora were identified in the desktop review with 36 Priority flora taxa, comprising 7 Priority 1 taxa, 6 Priority 2 taxa, 21 Priority 3 taxa and 2 Priority 4 taxa (Table 5-2). One of the Priority 1 species, *Minuria tridens* is also protected under the EPBC Act. Twelve specimens identified in the Phoenix (2025) report were considered to potentially be new species. None of the significant flora identified within the desktop review were recorded within the study area.

None of the significant flora identified within the desktop review intersect the study area, with the only 2 species occurring within 10 km of the study area; *Owenia acidula* (P3; 1.9 km NNE of study area) and *Tecticornia halocnemoides* 'large ovate seed aggregate' (sp. nov.; 1.4 km W of study area) (Figure 5-1).

Table 5-2 Significant flora identified in the desktop review

Species	Status	Proximity to study area	Habitat
Minuria tridens	VU (EPBC Act) P1 (DBCA list)	11.9 km NNW of study area	Shrub to 60 cm. Flowering in September. Dunes, roadsides, or adjacent to saline mudflats. Sandy soils. *Neltuma glandulosa* x *velutina* shrubland over *Aerva javanica*, *Amaranthus undulatus, and Swainsona* sp. shrubland over *Tecticornia* sp. chenopod shrubland over *Triodia* sp. hummock grassland and *Cenchrus* sp. tussock grassland (WA Herbarium 1998).
Bonamia brevifolia	P1 (DBCA list)	Indeterminate[3]	Prostrate herb to 0.4 m wide. Flowering in December. Plains; black, cracking clays (WA Herbarium 1998).
Goodenia pallida	P1 (DBCA list)	35.1 km ENE of study area	Flowering in August. Red soils. *Acacia* sp. woodland over annual grasslands (WA Herbarium 1998).
Helichrysum oligochaetum	P1 (DBCA list)	Indeterminate[3]	Herb to 30 cm. Flowering from August to November. On floodplains, alluvial plains, creeklines, and flats. Clay or clay loam soils, with ironstone. *Eucalyptus* sp. and *Acacia* sp. woodland (WA Herbarium 1998).
Tephrosia rosea var. Port Hedland (A.S. George 1114)	P1 (DBCA list)	Indeterminate[3]	Shrub to 1.7 m. Sandplains, dunes, slopes, and near creeklines, or road verges. Deep sand or sandy loam soils. *Acacia* sp. and *Aerva javanica* shrubland over *Triodia* sp. hummock grassland and *Eragrostis* sp. and *Cenchrus ciliaris* sp. tussock grassland (WA Herbarium 1998).
Triodia mallota	P1 (DBCA list)	69.2 km SSE of study area	Hummock grass to 1 m. Flowering in February to March. Lower slopes of mesas and hills; shale, chert soils; *Eucalyptus* woodlands and *Acacia* shrublands (WA Herbarium 1998).
Triodia sp. Pannawonica shale (P.J. Davidson PJD 2026)	P1 (DBCA list)	64.2 km SE of study area	Hummock grass to 40 cm (or 1 m including inflorescence). Flowering in February. Gentle drainage line. *Eucalyptus* woodlands and *Triodia* sp. hummock grasslands (WA Herbarium 1998).
Calandrinia sp. Cape Range (F. Obbens FO 10/18)	P2 (DBCA list)	68.4 km NW of study area	Perennial herb to 35 cm. Flowering in November. Drainage lines and moderate slopes with skeletal red brown sandy clay loam soils with limestone component. Open shrubs of *Ficus platypoda, Gossypium robinsonii*, and *Acacia* sp. over *Triodia* sp. hummock grasslands (WA Herbarium 1998).

[3] The desktop source of the species does not provide spatial data and records are not displayed on any figures.

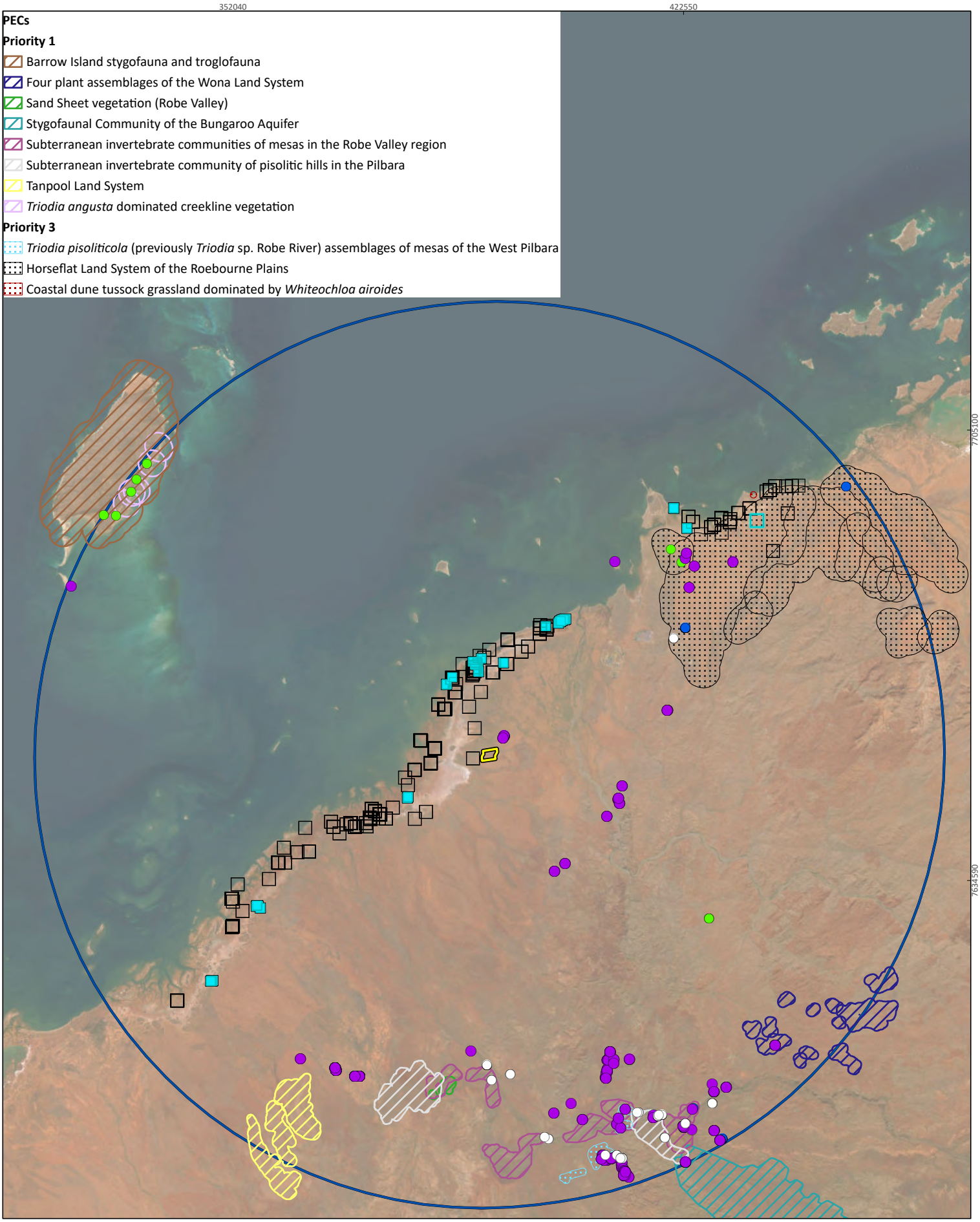
Species	Status	Proximity to study area	Habitat
Cucumis sp. Barrow Island (D.W. Goodall 1264)	P2 (DBCA list)	41.1 km NE of study area	Herbaceous vine to 3 m tall. Flat plains or plateaus. On limestone and sandy soils. *Triodia* sp. hummock grassland and *Cenchrus ciliaris* tussock grassland (WA Herbarium 1998).
Gomphrena pusilla	P2 (DBCA list)	Indeterminate[3]	Herb to 20 cm. Flowering from March to April or June. On dunes. Sandy soils with limestone or sandstone. *Crotalaria cunninghamii*, *Tephrosia rosea* var. *rosea*., and *Indigofera* sp. shrubland over *Enneopogon* sp. tussock grassland (WA Herbarium 1998).
Hemigenia sp. Nillup (R.D. Royce 98)	P2 (DBCA list)	Indeterminate[3]	Perennial shrub to 50 cm high. Flowering in November to January. Grey/brown clay loam/sand. Inundated areas. *Eucalyptus marginata* woodlands over *Xanthorrhoea preissii* shrublands over sedgelands (WA Herbarium 1998).
Isotropis canescens	P2 (DBCA list)	Indeterminate[3]	Prostrate herb. Flowering in August. On flat to undulating or gently sloping sandplains. Sand or sandy clay soils. *Eucalyptus* sp. woodland over *Triodia* sp. hummock grassland (WA Herbarium 1998).
Trianthema sp. Python Pool (G.R. Guerin & M.E. Trudgen GG 1023)	P2 (DBCA list)	41.7 km SE of study area	Annual prostrate herb to 10 cm. Flowering from March to September. On, floodplains, stony flats, valley floors, or undulating hills. Loam or clay loam soils. *Triodia* sp. hummock grassland over *Trianthema* sp. and *Ptilotus murrayi* forbland (WA Herbarium 1998).
Abutilon sp. Onslow (F. Smith s.n. 10/9/61)	P3 (DBCA list)	52.9 km SSW of study area	Prostrate to semi-prostrate shrub. Flowering in August or October. Flat to undulating sandplains, red brown sand, or loam. *Acacia* sp. mixed shrubland over *Triodia* sp. open hummock grassland (WA Herbarium 1998).
Carpobrotus sp. Thevenard Island (M. White 050)	P3 (DBCA list)	Indeterminate[3]	Prostrate, succulent herb to 0.2 m high. Flowering in August. Coastal dune slopes. On mostly white sandy soils, with limestone. *Melaleuca* sp. and *Acacia* sp. shrubland over *Frankenia pauciflora*, *Atriplex* sp. and *Rhagodia* sp. shrubland (WA Herbarium 1998).
Corchorus congener	P3 (DBCA list)	34.6 km NE of study area	Shrub to 1 m. Flowering from April to June, or August to November. Dunes or sandplains. On limestone and sandy soils. *Acacia* sp. shrubland over *Triodia* sp. hummock grassland (WA Herbarium 1998).
Corynotheca flexuosissima	P3 (DBCA list)	69.4 km WNW of study area	Perennial, herb, or shrub to 60 cm. Flowering May to October and January. Red or white sand, limestone on costal sand dunes. Within *Triodia* sp. hummock grassland (WA Herbarium 1998).

Species	Status	Proximity to study area	Habitat
Dolichocarpa sp. Hamersley Station (A.A. Mitchell PRP 1479)	P3 (DBCA list)	39.3 km NE of study area	Herb to 15 cm. Flat to gently sloping plains. On cracking clays with ironstone and silcrete. *Acacia* sp. woodland over *Astrebla* sp., *Aristida latifolia* and *Chrysopogon fallax* tussock grassland (WA Herbarium 1998).
Eremophila forrestii subsp. *viridis*	P3 (DBCA list)	41.9 km NE of study area	Shrub to 1 m. Flowering August. On plains between inland dunes. Red sandy soils. *Acacia* sp. shrubland over *Triodia* sp. hummock grassland (WA Herbarium 1998).
Euphorbia stevenii	P3 (DBCA list)	62.7 km SE of study area	Succulent perennial herb to 50 cm. Flowering in May to June. Clay, sandy soils on cracking clay plains. *Sida fibulifera* shrubland over *Aristida* sp. tussock grassland over mixed herbland (WA Herbarium 1998).
Goodenia obscurata	P3 (DBCA list)	45.4 km S of study area	Herb to 60 cm. On hill tops, slopes, or near drainage lines. Sandy loam or clay loam soils, with ironstone. *Acacia* sp., *Corymbia hamersleyana*, and *Eucalyptus* sp. woodland over *Triodia* sp. hummock grassland (WA Herbarium 1998).
Gymnanthera cunninghamii	P3 (DBCA list)	Indeterminate[3]	Shrub to 2.5 m. Flowering from January to December. In creek beds, drainage lines, mud, or tidal flats, and sandplains. Sand or clay loam soils, with limestone, ironstone, or calcrete. *Eucalyptus* sp., *Acacia* sp. and *Melaleuca* sp. woodland over *Triodia* sp. hummock grassland (WA Herbarium 1998).
Indigofera rivularis	P3 (DBCA list)	65.7 km SSE of study area	Shrubs to 1.8 m. Flowering from May to October. Often emergent around 3-5 years following a fire. Rocky drainage line to gorge at base of mesa with red brown sandy clay loam soils with ironstone rocks. *Eucalyptus* sp. woodland over *Acacia* sp. shrubland over *Cenchrus ciliaris, Themeda triandra*, and *Triodia* sp. grassland (WA Herbarium 1998).
Lepidobolus quadratus	P3 (DBCA list)	Indeterminate[3]	Sedge to 30 cm. Flowering from August to September. On hill tops or slopes. Sand or sandy clay soils, with laterite. *Banksia* sp. and *Eucalyptus* sp. over *Lambertia multiflora*, *Hibbertia* sp. and *Hakea* sp. shrubland (WA Herbarium 1998).
Owenia acidula	P3 (DBCA list)	1.9 km NNE of study area	Tree to 8 m. Adjacent to creeklines or on floodplains. Sandy clay, loam, or clay soils. *Acacia* sp. and *Vachellia farnesiana* shrubland over *Triodia epactia* hummock grassland (WA Herbarium 1998).

Species	Status	Proximity to study area	Habitat
Rostellularia adscendens var. *latifolia*	P3 (DBCA list)	42.7 km NE of study area	Herb or shrub to 30 cm. Flowering from April to May. Gullies and floodplains amongst boulder fields. Skeletal red clayey sand, with ironstone, and river rock pebbles, and cobbles. *Corymbia hamersleyana* and *Eucalyptus victrix* trees over *Acacia* sp. shrublands, over *Triodia epactia* hummock grassland (WA Herbarium 1998).
Solanum cataphractum	P3 (DBCA list)	Indeterminate[3]	Shrub to 1 m. Flowering from May to June. On flats and hill slopes or adjacent to boulders, within cracks. Sandy soils, on sandstone. *Eucalyptus* sp., *Acacia* sp. and *Grevillea* sp. woodland over *Triodia* sp. hummock grassland (WA Herbarium 1998).
Solanum sp. Red Hill (S. van Leeuwen et al. PBS 5415)	P3 (DBCA list)	51.5 km SSE of study area	Shrub to 80 cm. Flowering from March to November. Hill summit-slopes to bordering drainage lines in mesas. Skeletal soils of shale and ironstone, red brown sandy clayey loam. *Eucalyptus* sp. and *Corymbia* sp. trees over *Acacia* sp. *Hakea* sp. and *Grevillea* sp. shrubland over *Triodia* hummock grassland (WA Herbarium 1998).
Stackhousia clementii	P3 (DBCA list)	Indeterminate[3]	Herb to 50 cm. On flats or plains, drainage lines, and near lakes. Sand, sandy clay loam, clay loam and clay soils, on limestone, or calcrete. *Eucalyptus* sp., *Hakea lorea* and *Corymbia* sp. woodland over *Acacia* sp. *Tecticornia* sp. and *Eremophila* sp. shrubland over *Triodia* sp. hummock grassland and *Eragrostis* sp. and *Eulalia aurea* tussock grassland (WA Herbarium 1998).
Stackhousia umbellata	P3 (DBCA list)	Indeterminate[3]	Shrub to 1 m. Flowering from May to August. On hills, slopes, creek beds, and rocky outcrops. Sand or sandy clay soils, on limestone. *Acacia* sp., *Melaleuca* sp. and *Hibbertia spicata* subsp. *spicata* shrubland over *Triodia* sp. hummock grassland (WA Herbarium 1998).
Stylidium weeliwolli	P3 (DBCA list)	69.7 km SSE of study area	Herb to 25 cm. Flowering from August to September. Edge of watercourses on gritty sandy clay soils. *Eucalyptus* woodlands over *Melaleuca argentea, Acacia coriacea* subsp. *pendens* and *A. citrinoviridis* shrubland over *Themeda triandra* and *Eragrostis cumingii* grassland tussock grassland (WA Herbarium 1998).
Swainsona thompsoniana	P3 (DBCA list)	62.7 km SE of study area	Herb to 20 cm. Flowering from March to September. Cracking clay pans, floodplains, gilgai plains often growing in high altitudes on red heavy clay soils. *Eremophila maculata* shrubs over *Aristida latifolia* and *Eragrostis xerophila* tussock grassland over *Astrebla pectinata* and *Streptoglossa bubakii* mixed herbland (WA Herbarium 1998).

Species	Status	Proximity to study area	Habitat
Terminalia supranitifolia	P3 (DBCA list)	20.2 km ESE of study area	Tree to 7 m. Flowering May, July, or December. Slopes, hilltops, drainage lines, breakaways, and rocky outcrops, or plateaus. Sand, sandy loam, clay loam or loamy soils, on ironstone, granite, dolerite, or basalt. *Ficus virens*, *Brachychiton* sp. and *Acacia* sp. woodland over *Triodia* sp. hummock grassland over *Ipomoea costata* forbland (WA Herbarium 1998).
Triodia pisoliticola	P3 (DBCA list)	19.6 km ESE of study area	Hummock grass to 1 m. On top of mesas, hill slopes, and crests, and drainage lines. Sand, sandy loam or clay loam soils, on either pisolite, or ironstone. *Eucalyptus leucophloia* woodland over *Acacia* sp. shrubland over *Triodia* sp. hummock grassland (WA Herbarium 1998).
Livistona alfredii	P4 (DBCA list)	59.6 km SSE of study area	Tree-like monocot (palm) to 10 m. Flowering from July to September. Edges of permanent pools banks to riverbanks. Soils skeletal, red brown sandy loam often with a limestone component. *Eucalyptus* sp. and *Corymbia* sp. woodlands over *Acacia* sp. open shrubland over *Triodia* sp. hummock grassland (WA Herbarium 1998).
Rhynchosia bungarensis	P4 (DBCA list)	32.7 km ENE of study area	Creeper to 1.5 m. On or near drainage lines, rocky slopes, and hill tops. Sand, sandy clay, clay loam, sandy loam soils, on mostly ironstone, or volcanic rocks. *Eucalyptus* sp., *Corymbia hamersleyana* and *Brachychiton acuminatus* woodland over *Trichodesma zeylanicum* var. *zeylanicum*, *Terminalia* sp. and *Acacia* sp. shrubland over *Triodia* sp. hummock grassland, and *Cymbopogon* sp. and *Themeda* sp. tussock grassland (WA Herbarium 1998).
Bonamia aff. *media*	sp. nov.	54.2 km NE of study area	Taxonomic note: specimen collected has leaf bases attenuating to petiole rather than truncate to cordate (as is seen in *B. media*). Recorded growing on a rockshelf with isolated plants of *Indigofera linifolia, Eriachne mucronata* and **Cenchrus ciliaris* with diverse mixed herbs (Phoenix 2025).
Polygala aff. *galeocephala*	sp. nov.	58.6 km NE of study area	Taxonomic note: specimen collected is hairier than typical and different upright habit rather than prostrate, flowers larger. Recorded growing on a plain, with red sandy loam soils and ironstone gravel. Within a mixed grassland of *Eriachne caerulescens* and *Aristida contorta* with mixed herbs of *Goodenia pascua, Euphorbia careyi* and *Sida fibulifera* (Phoenix 2025).
Scaevola aff. *pulchella*	sp. nov.	58.3 km NE of study area	Taxonomic note: fruit material on specimen hairier than typical. Recorded growing on coastal dunes, in yellow sandy soils. Isolated tall *Acacia coriacea* shrublands over **Cenchrus ciliaris*, *Whitechloa airoides* and *Triodia epactia* grasslands (Phoenix 2025).

Species	Status	Proximity to study area	Habitat
Tecticornia halocnemoides 'large ovate seed aggregate'	sp. nov.	1.4 km W of study area	Taxonomic note: a known but undescribed taxon. Typically recorded growing on saline plains within samphire shrublands (Phoenix 2025).
Tecticornia sp. sterile 1	sp. nov.	58.9 km NE of study area	Taxonomic note: unresolved taxonomy due to a lack of fertile material. Recorded growing on hard packed saline clay soils on a plain with samphire shrublands (Phoenix 2025).
Tecticornia sp. sterile 2	sp. nov.	58.9 km NE of study area	Taxonomic note: unresolved taxonomy due to a lack of fertile material. Recorded growing on hard packed saline clay soils on a plain with samphire shrublands (Phoenix 2025).
Tecticornia sp. sterile 3	sp. nov.	48.8 km NE of study area	Taxonomic note: unresolved taxonomy due to a lack of fertile material. Recorded growing on hard packed saline clay soils on a plain with samphire shrublands (Phoenix 2025).
Tecticornia sp. sterile 4	sp. nov.	52.8 km NE of study area	Taxonomic note: unresolved taxonomy due to a lack of fertile material. Recorded growing on hard packed saline clay soils on a plain with samphire shrublands (Phoenix 2025).
Tecticornia sp. sterile 5	sp. nov.	52.9 km NE of study area	Taxonomic note: unresolved taxonomy due to a lack of fertile material. Recorded growing on hard packed saline clay to sandy soils on a plain with samphire shrublands (Phoenix 2025).
Tecticornia sp. sterile 6	sp. nov.	46.4 km NE of study area	Taxonomic note: unresolved taxonomy due to a lack of fertile material. Recorded growing on plain with orange sandy soils. Within a open shrubland of *Acacia ampliceps* and *Scaevola spinescens* over a closed grassland of *Triodia angusta, Sporobolus virginicus* and *Dactyloctenium radulans* with mixed herbs (Phoenix 2025).
Tecticornia sp. sterile 7	sp. nov.	61.9 km NE of study area	Taxonomic note: unresolved taxonomy due to a lack of fertile material. Recorded growing on an intertidal mudflat on saline brown clay soils. Within a *Tecticornia* sp. and *Surreya diandra* shrubland (Phoenix 2025).
Tecticornia sp. sterile 8	sp. nov.	61.9 km NE of study area	Taxonomic note: unresolved taxonomy due to a lack of fertile material. Recorded growing on an intertidal mudflat on saline brown clay soils. Within a *Tecticornia* sp. and *Surreya diandra* shrubland (Phoenix 2025).



BCI Minerals
Mardie Salt Project

Project No	1688
Date	5/02/2025
Drawn by	JL, GW
Map author	CW

0 10 20
Kilometers

1:765,000 (at A4) GDA 1994 MGA Zone 50

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Study area
Desktop study area

Conservation status

P1 (DBCA list); VU (EPBC Act)
P1 (DBCA list)
P2 (DBCA list)
P3 (DBCA list)
P4 (DBCA list)
Sp. nov.

Figure 5-1

Desktop records of significant flora and PECs

PHOENIX ENVIRONMENTAL SCIENCES

5.1.3 Introduced flora

The desktop review identified records of 41 introduced species within the desktop search extent, of which 3 are Declared Pests and WoNS (Table 5-3; Appendix 4).

Table 5-3 Desktop records of significant weeds

Species	Declared Pest	WoNS
**Neltuma pallida*	Y	Y
**Parkinsonia aculeata*	Y	Y
**Tamarix aphylla*	Y	Y

5.1.4 Vegetation associations

Regional scale pre-European vegetation mapping for WA (Beard *et al.* 2013; DPIRD 2018) identifies one vegetation association in the study area (Table 5-4; Figure 5-2) that is restricted to the Pilbara bioregion. The total area of the pre-European vegetation association is 109,686.98 ha. The current extent is 109,618.49 ha and therefore 99.94% of pre-European extent remains and the vegetation is therefore considered to be of least concern with regard to conservation status.

At the sub-regional scale, the pre-European extent is 107,810.14 ha and the current extent is 107,741.65 ha, resulting in the remaining extent being the same as it is at the statewide scale. There has been no significant depletion of this vegetation association at any scale and so the conservation status remains as being considered of least concern (Government of Western Australia 2019).

Table 5-4 Statewide extent of Pre-European vegetation associations present in the study area (DPIRD 2018)

Vegetation association	Pre-European extent (ha)	Current extent (ha)	Remaining (%)	Current extent in DBCA lands (%)	% of study area
601, Mosaic: Sedgeland; various sedges with very sparse snakewood / Hummock grasslands, shrub steppe; kanji over soft spinifex	109,686.98	109,618.49	99.94	0	100.00

BCI Minerals
Mardie Salt Project

Project No	1688
Date	5/02/2025
Drawn by	JL
Map author	CW

0 0.5 1
Kilometers

1:32,500 (at A4) GDA 1994 MGA Zone 50

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Study area

Pre-european vegetaion association

127,Bare areas; mud flats

601,Mosaic: Sedgeland; various sedges with very sparse snakewood / Hummock grasslands, shrub-steppe; kanji over soft spinifex

Figure 5-2

Vegetation associations in the study area

PHOENIX ENVIRONMENTAL SCIENCES

5.1.5 Significant vegetation

The DBCA Threatened and Priority Ecological Communities database search identified the presence of no TECs and 11 PECs within the desktop search extent. None of the communities intersect the study area. The closest PEC to the study area is the Horseflat Land System of the Roebourne Plains, which is approximately 34.7 km north-east of the study area (Figure 5-1; Table 5-5).

Of the 11 PEC identified in the desktop review, 4 are characterised by the presence of fauna species and not vegetation and therefore not applicable to this report:

- Subterranean invertebrate communities of mesas in the Robe Valley region (P1)
- Subterranean invertebrate community of pisolitic hills in the Pilbara (P1)
- Barrow Island Subterranean Fauna (P1)
- Stygofaunal Community of the Bungaroo Aquifer (P1).

One vegetation type (PgvExCt) previously recorded near the study area was considered to be representative of the Priority 3 PEC, Horseflat Land System of the Roebourne Plains. Several other vegetation types were considered to be locally significant due to being refuges for significant flora or undescribed species, or having a restricted distribution within the study area (AcAjTe, EvAcpCc, MaPgvTd, AjSlTe, TtSvTc, and low open *Tecticornia* spp. shrublands) (Phoenix 2019a, b). Mangal vegetation (AmMs) and 2 shrublands (ChAsCs and TtSvTc) were found to be locally significant in a later survey, as they had a restricted distribution within the study area (Phoenix 2021).

Table 5-5 TECs and PECs identified in the desktop review

Community name	Status	Proximity to study area	Description
Subterranean invertebrate communities of mesas in the Robe Valley region	P1 (DBCA)	49.1 km S of study area	A series of isolated mesas occur in the Robe Valley in the State's Pilbara region. The mesas are remnants of old valley infill deposits of the palaeo Robe River. The troglobitic faunal communities occur in an extremely specialised habitat and appear to require the particular structure and hydrogeology associated with mesas to provide a suitable humid habitat. Short range endemism is common in the fauna. The habitat is the humidified pisolitic strata. Threats: removal of substrate for mining, and associated hydrological changes.
Subterranean invertebrate community of pisolitic hills in the Pilbara	P1 (DBCA)	49.4 km S of study area	A series of isolated low undulating hills occur in the State's Pilbara region. The troglofauna are being identified as having very short range distributions. Threats: removal of substrate for mining, and associated hydrological changes.
Four plant assemblages of the Wona Land System	P1 (DBCA)	60.1 km SE of study area	Cracking clays of the Chichester and Mungaroona Range. This shrubless plain of stony gibber community occurs on the tablelands with very little vegetative cover during the dry season, however during the wet a suite of ephemerals/annuals and short-lived perennials emerge, many of which are poorly known and range-end taxa. Annual Sorghum grasslands on self-mulching clays with a moderate-dense overlay of rocks. This community appears very rare and restricted to the Pannawonica-Robe valley end of Chichester Range. Naturally species poor when dry. Mitchell grass plains (*Astrebela* spp.) on gilgai. Mitchell grass and Roebourne Plain grass (*Eragrostis xerophila*) plain on gilgai. *Astrebla pectinata, A. elymoides, E. xerophila, Aristida latifolia, Eriachne, and Sida fibulifera.* Typical type, heavily grazed. Threats: weed invasion, grazing, clearing for mining related activities and solar farms, altered fire regimes.
Barrow Island Subterranean Fauna	P1 (DBCA)	69.3 km NW of study area	Barrow Island stygofauna and troglofauna. Threats: clearing for mining; altered hydrology including potential contaminating activities.
Stygofaunal Community of the Bungaroo Aquifer	P1 (DBCA)	69.9 km SE of study area	A unique assemblage of aquatic subterranean fauna including eels, snails, and other stygofauna. Threats: hydrological changes (mining).

Community name	Status	Proximity to study area	Description
Triodia angusta Dominated Creekline Vegetation	P1 (DBCA)	70.0 km NW of study area	General cover of *Triodia angusta* with shrubs principally *Hakea subarea*, *Petalostylis labicheoides*, *Acacia bivenosa*, and *Gossypium robinsonii*. Threats: basic raw material extraction for island infrastructure.
Horseflat Land System of the Roebourne Plains	P3 (DBCA)	34.7 km NE of study area	The Horseflat land system (Roebourne Plains) land units forming extensive clay plains dominated by tussock grasslands on mostly alluvial, red clay loams gilgaied, and non-gilgaied for this community. The community is dominated by perennial tussock grasses include *Eragrostis xerophila* (Roebourne Plains grass), *Chrysopogon fallax* (ribbon grass) and other *Eragrostis* spp. and *Eriachne* spp. The community also supports a suite of annual grasses including *Dichanthium* spp. and *Sorghum* spp. The community extends from Peedamulla to Balla Balla surrounding the towns of Karratha and Roebourne. The land units of the Horseflat land system that align with this PEC are units 3 (excluding areas of snakewood and hummock grass; mosaic areas, and areas of heavily gilgaied soils), 4, 5, and 7 of the Horseflat land system as described in Van Vreeswyk *et al.* (2004). Threats: grazing, weed invasion, fragmentation, clearing for mining, infrastructure, and solar farms.
Sand Sheet vegetation (Robe Valley)	P3 (DBCA)	51.0 km S of study area	*Corymbia zygophylla* scattered low trees over *Acacia tumida* var. *pilbarensis*, *Grevillea eriostachya* high shrubland over *Triodia schinzii* hummock grassland. Other associated species include *Cleome uncifera*, *Heliotropium transforme*, *Indigofera boviperda* subsp. *boviperda*, and *Ptilotus arthrolasius*. Most northern example/expression of vegetation of Carnarvon Basin. Community is poorly represented type in the Pilbara region, and not represented in the reserve system. Community contains many plant species that are at their northern limits or exist as disjunct populations. Vulnerable to invasion by weeds. Threats: clearing for mining, basic raw material extraction, weed invasion especially buffel grass, grazing, and altered fire regimes.

Community name	Status	Proximity to study area	Description
Triodia pisoliticola assemblages of mesas of the West Pilbara	P3 (DBCA)	59.4 km S of study area	This community is typically restricted to mesas and Cordillo landforms where the plant assemblages are dominated by or contain *Triodia pisoliticola* (P3) and are indicative of inverted landscapes; that is, where *Triodia pisoliticola* occurs in combination with species that are considered 'out-of-context' from their normal habitat. The community is a combination of *Triodia pisoliticola* with *Acacia pruinocarpa, A. citrinoviridis* on slopes or peaks of mesas. These 2 *Acacias* are generally found associated with Pilbara creeklines, and their occurrence is probably indicative of the genesis of the mesa surfaces in wetlands, then erosion of the landscape and 'inversion of the landscape' such that the mesa slopes and peaks that were previously low in the landscape become high points. Threats: clearing for mining and associated infrastructure, and altered fire regimes.
Coastal dune native tussock grassland dominated by *Whiteochloa airoides*	P3 (DBCA)	59.8 km NE of study area	Tussock grassland of *Whiteochloa airoides* occurs on the landward side of foredunes, hind dunes, or remnant dunes with white or pinkish white medium sands with marine fragments. There may be occasional *Spinifex longifolius* tussock or *Triodia epactia* hummock grasses and scattered low shrubs of *Olearia dampierii* subsp. *dampierii*, *Scaevola spinescen*s, *S. cunninghamii, Trianthema turgidifolia* and *Corchorus* species (*C. walcottii, C. laniflorus*). Occurs on Barrow Island, Tent Island, and possibly some unaffected littoral areas in west Pilbara. Threats: weed invasion, especially buffel grass, grazing by cattle, altered fire regimes, erosion, and clearing for mining, and infrastructure.

5.2 FIELD SURVEY

5.2.1 Flora assemblage

A total of 60 flora taxa representing 15 families and 42 genera identified to species level were recorded in the study area during the field surveys (Appendix 5). Species richness ranged from 9 in MSA002 to 26 species in MSA003 (Appendix 2; Appendix 6). The assemblage included 57 native species and 3 introduced species, including 38 perennial species, 16 annual or short-lived species, and 6 species occurring as both. The most prominent families recorded were Fabaceae (17 taxa), Poaceae (13 taxa), and Asteraceae (7 taxa).

5.2.2 Significant flora

No Threatened or Priority flora were recorded during the field survey. There were also no significant range extensions or potential new species encountered during the survey.

The likelihood of occurrence assessment determined for all 48 significant species identified desktop review (section 5.1.2) none were unlikely to occur in the study area (Table 5-6).

Table 5-6 Likelihood of occurrence for significant flora identified in the desktop review

Species	Status	Likelihood of occurrence
Minuria tridens	VU (EPBC Act) P1 (DBCA list)	Unlikely. Lack of suitable habitat (sand dunes and islands adjacent tidal mudflats) in the study area.
Bonamia brevifolia	P1 (DBCA list)	Unlikely Lack of suitable habitat (black cracking clay) in study area
Goodenia pallida	P1 (DBCA list)	Unlikely Lack of suitable habitat in the study area (red soils with *Acacia* woodlands) and study area outside known distribution of this species.
Helichrysum oligochaetum	P1 (DBCA list)	Unlikely Lack of suitable habitat in the study area (floodplains or creek lines).
Tephrosia rosea var. Port Hedland (A.S. George 1114)	P1 (DBCA list)	Unlikely Lack of suitable habitat in the study area (Sandplains, dunes, creeklines, or road verges with deep sandy soils). and study area outside known distribution of this species.
Triodia mallota	P1 (DBCA list)	Unlikely Lack of suitable habitat within the study area (lower slopes of mesas and hills with chert soils), and study area outside known distribution of this species.
Triodia sp. Pannawonica shale (P.J. Davidson PJD 2026)	P1 (DBCA list)	Unlikely Lack of suitable habitat within the study area (drainage lines) and study area outside known distribution of this species.
Calandrinia sp. Cape Range (F. Obbens FO 10/18)	P2 (DBCA list)	Unlikely Restricted to the coasts of Barrow Island and the Exmouth peninsula and lack of suitable habitat within the study area (drainage lines and slopes with limestone soils).
Cucumis sp. Barrow Island (D.W. Goodall 1264)	P2 (DBCA list)	Unlikely Restricted to the coasts of Barrow Island and the Exmouth peninsula and lack of suitable habitat within the study area (flats with limestone soils).
Gomphrena pusilla	P2 (DBCA list)	Unlikely Lack of suitable habitat within the study area (coastal dunes with limestone soils) and study area outside known distribution of this species.
Hemigenia sp. Nillup (R.D. Royce 98)	P2 (DBCA list)	Unlikely Lack of suitable habitat within the study area (inundated areas), study area outside known distribution of this species and given the Florabase distribution of this species is >1,400 km away from the study area, it is possible that this record is an error.

Species	Status	Likelihood of occurrence
Isotropis canescens	P2 (DBCA list)	Unlikely Lack of suitable habitat within the study area (sandplains), study area outside known distribution of this species and given the Florabase distribution of this species is >1,200 km away from the study area, it is possible that this record is an error.
Trianthema sp. Python Pool (G.R. Guerin & M.E. Trudgen GG 1023)	P2 (DBCA list)	Unlikely Study area outside known distribution of this species and closest record is greater than 40 km away.
Abutilon sp. Onslow (F. Smith s.n. 10/9/61)	P3 (DBCA list)	Unlikely Lack of suitable habitat within the study area (sandplains).
Carpobrotus sp. Thevenard Island (M. White 050)	P3 (DBCA list)	Unlikely Lack of suitable habitat within the study area (coastal sandplains or dunes with white limestone sandy soils).
Corchorus congener	P3 (DBCA list)	Unlikely Lack of suitable habitat within the study area (coastal sandplains or dunes with limestone sandy soils).
Corynotheca flexuosissima	P3 (DBCA list)	Unlikely Lack of suitable habitat within the study area (coastal sandplains or dunes with white limestone sandy soils).
Dolichocarpa sp. Hamersley Station (A.A. Mitchell PRP 1479)	P3 (DBCA list)	Unlikely Lack of suitable habitat within the study area (cracking clay pans) and study area outside known distribution of this species.
Eremophila forrestii subsp. *viridis*	P3 (DBCA list)	Unlikely Lack of suitable habitat within the study area (plains between dunes).
Euphorbia stevenii	P3 (DBCA list)	Unlikely Lack of suitable habitat within the study area (cracking clay pans).
Goodenia obscurata	P3 (DBCA list)	Unlikely Lack of suitable habitat within the study area (hill tops, slopes, or drainage lines).
Gymnanthera cunninghamii	P3 (DBCA list)	Unlikely Lack of suitable habitat within the study area (creek beds, drainage lines, mudflats, and sandplains).
Indigofera rivularis	P3 (DBCA list)	Unlikely Lack of suitable habitat within the study area (drainage line to gorges) and study area outside known distribution of this species.

Species	Status	Likelihood of occurrence
Lepidobolus quadratus	P3 (DBCA list)	Unlikely Lack of suitable habitat within the study area (hill tops or slopes with laterite), study area outside known distribution of this species and given the Florabase distribution of this species is >900 km away from the study area, it is possible that this record is an error.
Owenia acidula	P3 (DBCA list)	Unlikely Lack of suitable habitat within the study area (adjacent to creeklines or on floodplains) and whilst it is known to occur within 2 km of the study area, it is up to 8 m tall and would be evident if it was in the study area.
Rostellularia adscendens var. *latifolia*	P3 (DBCA list)	Unlikely Lack of suitable habitat within the study area (gullies and floodplains) and study area outside known distribution of this species.
Solanum cataphractum	P3 (DBCA list)	Unlikely Lack of suitable habitat within the study area (flats and hill slopes or adjacent to boulders, within cracks), study area outside known distribution of this species and given the Florabase distribution of this species is >1,100 km away from the study area, it is possible that this record is an error.
Solanum sp. Red Hill (S. van Leeuwen et al. PBS 5415)	P3 (DBCA list)	Unlikely Lack of suitable habitat within the study area (Hill slopes and drainage lines associated with mesas) and study area outside known distribution of this species.
Stackhousia clementii	P3 (DBCA list)	Unlikely Lack of suitable habitat within the study area (plains, drainage lines, and lake margins with limestone or calcrete).
Stackhousia umbellata	P3 (DBCA list)	Unlikely Lack of suitable habitat within the study area (hillslopes, creek beds, and rocky outcrops), the study area outside known distribution of this species and seems to have a restricted distribution of the Exmouth peninsula.
Stylidium weeliwolli	P3 (DBCA list)	Unlikely Lack of suitable habitat within the study area (Edge of watercourses) and the study area outside known distribution of this species.
Swainsona thompsoniana	P3 (DBCA list)	Unlikely Lack of suitable habitat within the study area (cracking clay pans) and the study area outside known distribution of this species.

Species	Status	Likelihood of occurrence
Terminalia supranitifolia	P3 (DBCA list)	Unlikely Lack of suitable habitat within the study area (Slopes, hilltops, drainage lines, breakaways, and rocky outcrops, or plateaus).
Triodia pisoliticola	P3 (DBCA list)	Unlikely Lack of suitable habitat within the study area (mesas, hill slopes, and crests, and drainage lines).
Livistona alfredii	P4 (DBCA list)	Unlikely Lack of suitable habitat within the study area (edges of permanent pools banks to riverbanks) and the study area outside known distribution of this species.
Rhynchosia bungarensis	P4 (DBCA list)	Unlikely Lack of suitable habitat within the study area (drainage lines, rocky slopes, and hill tops).
Bonamia aff. *media*	sp. nov.	Unlikely Lack of suitable habitat within the study area (rockshelf).
Polygala aff. *galeocephala*	sp. nov.	Unlikely Nearest record in greater than 50 km away.
Scaevola aff. *pulchella*	sp. nov.	Unlikely Lack of suitable habitat within the study area (coastal dunes).
Tecticornia halocnemoides 'large ovate seed aggregate'	sp. nov.	Unlikely Lack of suitable habitat within the study area (saline plains within samphire shrublands).
Tecticornia sp. sterile 1	sp. nov.	Unlikely Lack of suitable habitat within the study area (saline plains within samphire shrublands).
Tecticornia sp. sterile 2	sp. nov.	Unlikely Lack of suitable habitat within the study area (saline plains within samphire shrublands).
Tecticornia sp. sterile 3	sp. nov.	Unlikely Lack of suitable habitat within the study area (saline plains within samphire shrublands).
Tecticornia sp. sterile 4	sp. nov.	Unlikely Lack of suitable habitat within the study area (saline plains within samphire shrublands).
Tecticornia sp. sterile 5	sp. nov.	Unlikely Lack of suitable habitat within the study area (saline plains within samphire shrublands).
Tecticornia sp. sterile 6	sp. nov.	Unlikely Lack of suitable habitat within the study area (plain with *Acacia* and *Scaevola* shrubland).
Tecticornia sp. sterile 7	sp. nov.	Unlikely Lack of suitable habitat within the study area (saline plains within samphire shrublands).

Species	Status	Likelihood of occurrence
Tecticornia sp. sterile 8	sp. nov.	Unlikely Lack of suitable habitat within the study area (saline plains within samphire shrublands).

5.2.3 Introduced flora

Three introduced flora species were recorded during the survey (Table 5-7). **Neltuma glandulosa* x *velutina* is the only Declared Pest and WoNS.

Table 5-7 Introduced flora recorded in the field survey

Family	Species	Declared Pest	WoNS
Fabaceae	**Neltuma glandulosa* x *velutina*	Y	Y
Poaceae	**Cenchrus ciliaris*		
Poaceae	**Cenchrus setiger*		

5.2.4 Unidentified flora

One specimen collected during the survey could not be identified to species level, *Acacia*?*inaequilatera*, as a result of insufficient taxonomic characters, as the specimen was sterile (lacking reproductive structures), and was therefore not useful for the purposes of identification.

5.2.5 Vegetation types

There were 3 vegetation types defined for the study area based on the cluster analysis (Figure 5-3). All were grasslands with isolated shrubs often with the Declared Pest and WoNS, **Neltuma glandulosa* x *velutina* prominent in the shrub layer (Table 5-8; Figure 5-4). The cleared areas within the study area were roads and tracks, which encompassed 28.5 ha (8.7%) of the study area.

Figure 5-3 Hierarchical clustering (UPGMA) of the flora quadrats of the study area

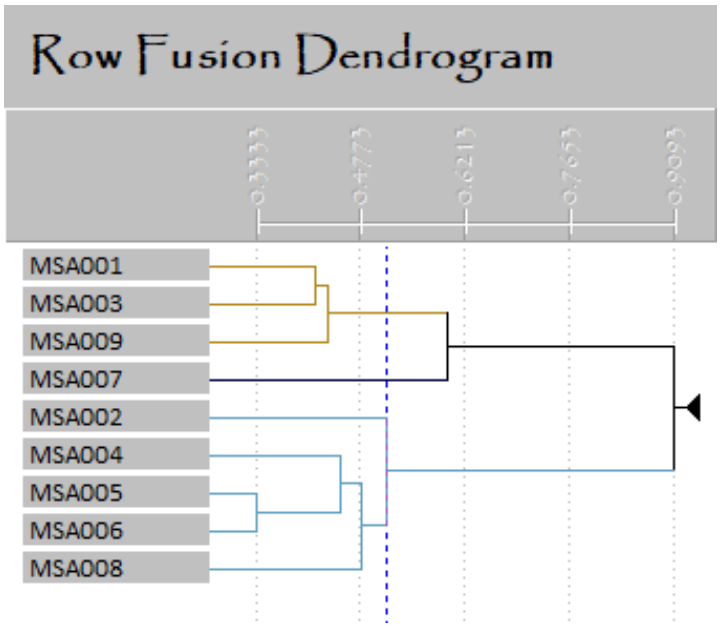
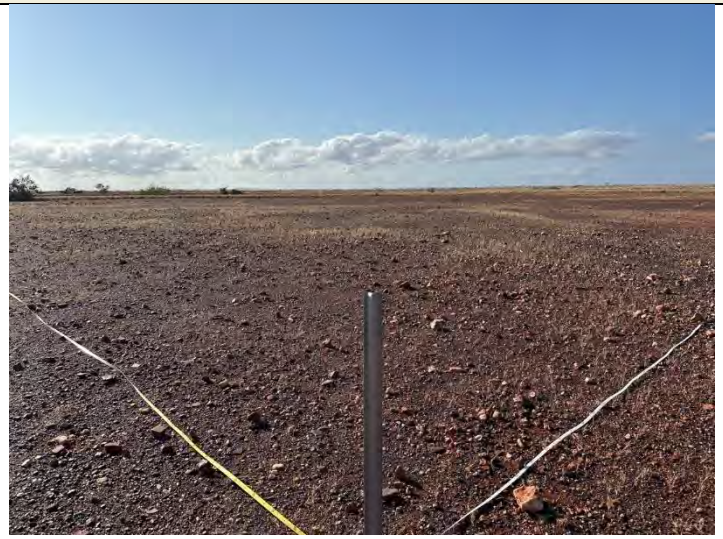
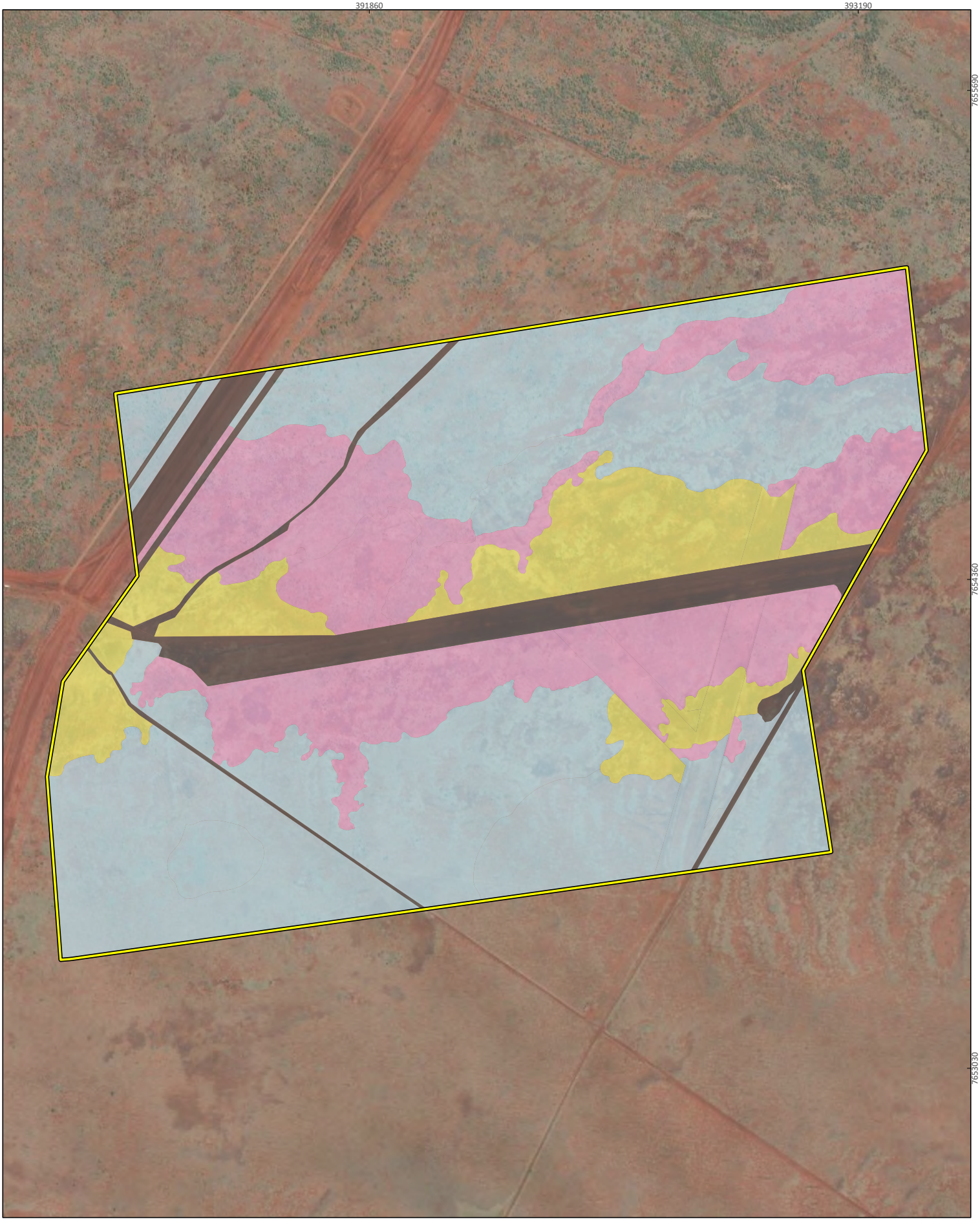


Table 5-8 Vegetation types, description, and extent in the study area

Vegetation type	Site/s	Vegetation description	Extent in study area (ha) and % of study area	Representative photograph
*NgExTa	MSA002 MSA004 MSA005 MSA006 MSA008	Tall isolated clumps of shrubs of **Neltuma glandulosa* x *velutina*, over low open tussock grassland to tussock grassland of *Eragrostis xerophila* and *Dichanthium sericeum* subsp. *humilius*, over variably present low sparse hummock grassland to hummock grassland of *Triodia angusta*.	164.4 ha 49.4%	

Vegetation type	Site/s	Vegetation description	Extent in study area (ha) and % of study area	Representative photograph
*NgTw	MSA001 MSA003 MSA009	Isolated tall shrubs of **Neltuma glandulosa* x *velutina, Acacia synchronicia*, and *Acacia inaequilatera,* over low hummock grassland of *Triodia wiseana,* with *Eriachne benthamii.*	93.5 ha 28.6%	

Vegetation type	Site/s	Vegetation description	Extent in study area (ha) and % of study area	Representative photograph
AiScEx	MSA007	Isolated tall shrubs of *Acacia inaequilatera* and *A. synchronicia* over, isolated low forbs of *Sclerolaena costata, Bonamia pilbarensis*, and *Evolvulus alsinoides* var. *villosicalyx,* over low sparse tussock grassland of *Eragrostis xerophila, Aristida contorta,* and *Eriachne benthamii.*	43.4 ha 13.3%	



BCI Minerals
Mardie Salt Project

Project No	1688
Date	5/02/2025
Drawn by	GW
Map author	CW

0 250 500
Meters

1:13,300(at A4) GDA 1994 MGA Zone 50

P:\Data\Projects\MardieSaltProject\1688-MSP-BCI-BOT\1688-MSP-BCI-BOT\GIS\Mapping\MapDocuments\Figures\1688_maps.aprx

Study area

Vegetation types

- *NgExTa
- *NgTw
- AiScEx
- Cleared

Figure 5-4

Vegetation types recorded in the field survey

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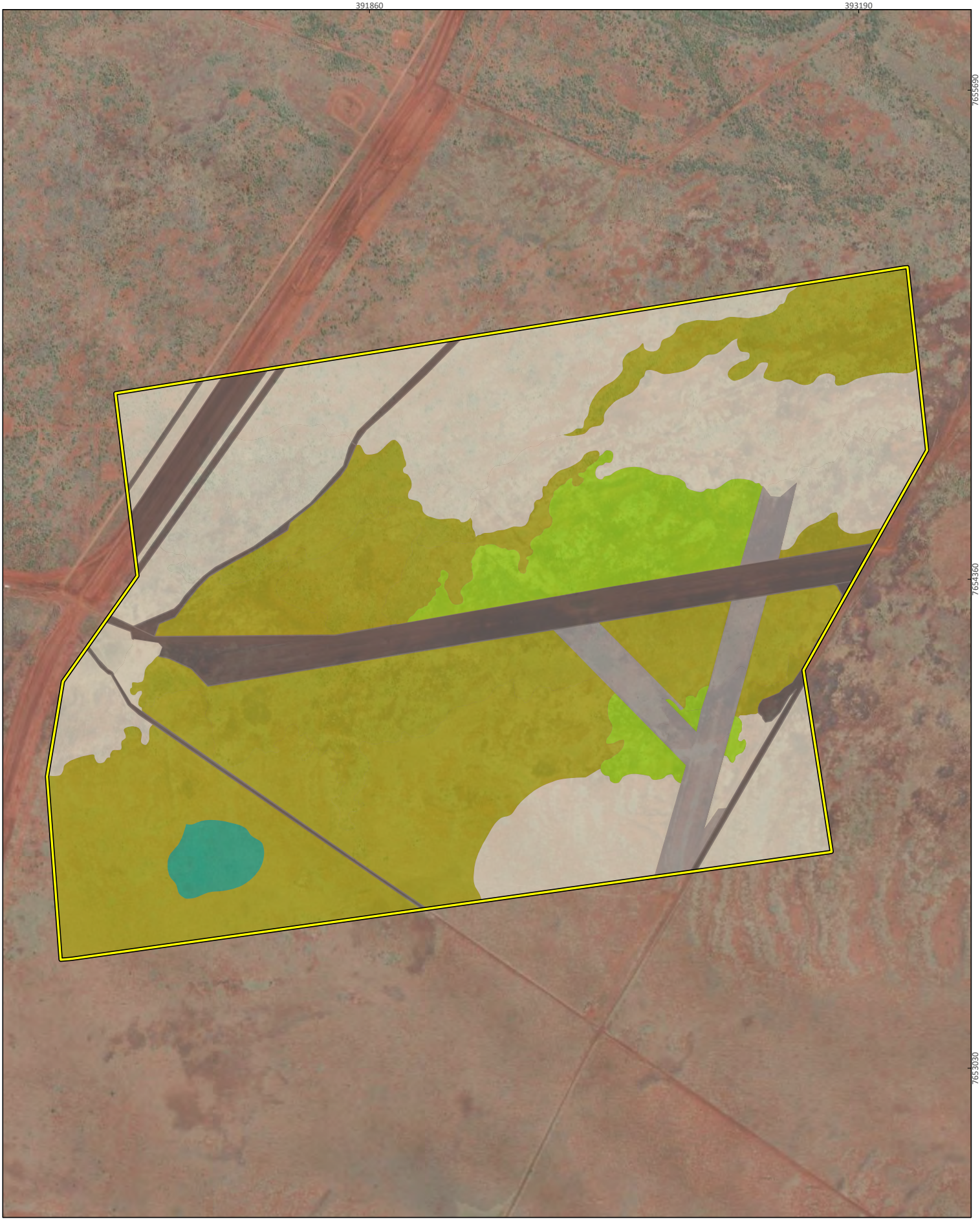
5.2.6 Vegetation condition

Vegetation in the study area was recorded to be in Completely Degraded to Excellent condition (Figure 5-5) with the majority (43.2%) in Good condition (Table 5-9). Vegetation in Excellent condition encompassed the smallest proportion of the study area, (1.3%) and was only characterised by one vegetation type, *NgExTa, in an area where the introduced species was not present.

Table 5-9 Vegetation condition – extent of each condition rating in study area

Condition rating	Area (ha)	% of study area	Vegetation types
Excellent	4.1	1.3	*NgExTa
Very Good	23.2	7.1	*NgTw, AiScEx
Good	141.3	43.2	*NgExTa, *NgTw, AiScEx
Poor	115.9	35.5	*NgExTa, *NgTw, AiScEx
Degraded	13.7	4.2	*NgExTa, *NgTw, AiScEx
Completely Degraded	28.5	8.7	Cleared
Total	**326.7**	**100**	



BCI Minerals
Mardie Salt Project

Project No	1688
Date	5/02/2025
Drawn by	GW
Map author	GW

0 250 500
Meters

1:13,300 (at A4) GDA 1994 MGA Zone 50

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Study area

Vegetation condition

- Excellent
- Very Good
- Good
- Poor
- Degraded
- Completely Degraded

Figure 5-5

Vegetation condition in the study area

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5.2.7 Significant vegetation

None of the vegetation types were identified as TEC, PEC, habitat for significant flora, role as a refuge, having a restricted distribution, or any additional criteria for measuring vegetation significance.

5.3 SURVEY LIMITATIONS

The limitations of the flora and vegetation survey have been considered in accordance with EPA (2016b) (Table 5-10).

Table 5-10 Consideration of potential survey limitations

Limitations	Comments
Availability of contextual information at a regional and local scale	Not a limitation: The Mardie Salt Project has been subject to many flora and vegetation surveys by Phoenix, given the interest in the area for salt mining. Additional to the surveys reviewed, several databases were compared to gain sufficient contextual information.
Competency/experience of the team carrying out the survey	Not a limitation: Tim Morald has a Bachelor of Applied Science (Goldfields Environmental Management) degree, with more than 25 years of experience working in botany. Calvin Williams has a Bachelor of Environmental Science degree, 2 years of experience working as a botanical consultant, with more than 5 years' experience working in the field with flora and vegetation.
Scope and completeness	Not a limitation: All sites were surveyed completely according to the scope within the amount of time allocated towards the survey.
Proportion of flora recorded and/or collected, any identification issues	Not a limitation: Flora was recorded completely within each quadrat and collections were made of each species where required, i.e. if specimens could not be identified to species level whilst out in the field.
Access within the study area	Not a limitation: There were no issues associated with lack of access within the study area.
Timing, rainfall, season	Moderate limitation: The survey was undertaken outside of the recommended optimal timing according to the EPA Technical Guidance, which suggests that the primary survey for the Northern Botanical Province should take place during the wet season (between January and March). This may have resulted in the lack of detection of certain species, and therefore affected the results of the survey (EPA 2016b). Minor limitation: In the months leading up to the survey, heavier than average rainfall during June may have impacted the presence of certain species, making them easier detect, or identify. Mean minimum and maximum temperatures were also slightly higher in the months leading up to the survey, which could also have had an effect on the presence or absence of flora.
Disturbance that may have affected the results of the survey	Not a limitation: There were no signs of major disturbances within the study area which would have impacted the results of the survey.

6 DISCUSSION

The current survey recorded 60 flora taxa, representing 12% of the species identified in the desktop review. When compared to the previous surveys, all reports except one identified more than triple the flora than the current survey. The small-scale of the current study area to the desktop extent (0.02% of the desktop extent) and the previous surveys, accounts for the marked difference in species diversity. Additionally, the lack of unique habitats or landforms and the relatively poor condition of the study area likely also contribute to the low species diversity.

The most prominent families recorded in the current survey were Fabaceae (17 taxa), Poaceae (13 taxa), and Asteraceae (7 taxa). The Fabaceae and Poaceae were also prominent in all previous surveys.

6.1 SIGNIFICANT FLORA

No significant flora were recorded within the study area.

The unidentified *Acacia*? *inaequilatera* species is unlikely to represent a significant flora as there were no significant *Acacia* species identified within the desktop review.

The likelihood of occurrence assessment deemed all 48 desktop significant species were unlikely to occur, the majority of these records were discounted due to a lack of suitable habitat within the study area or the study area was outside the known distribution for the species. However, 4 species were also identified to potentially be record errors; *Hemigenia* sp. Nillup (R.D. Royce 98) (P2), *Isotropis canescens* (P2), *Lepidobolus quadratus* (P3) and *Solanum cataphractum* (P3). Due to the nearest records on Florabase were between 900 km to 1,400 km from the study area and the records of these species within the desktop review also did not have spatial data and therefore could not be verified.

6.2 INTRODUCED FLORA

The Declared Pest and WoNS, **Neltuma glandulosa* x *velutina* was recorded in 7 of the 9 quadrats, with a cover values reaching 5%. Due to the prevalence of this introduced species within the study area, it is one of the primary characteristics in the 2 most extensive vegetation types (*NgExTa and *NgTw). This introduced species is allocated to the category 3 (C3) management category (DPIRD 2021). This identifies organisms that should have some form of management applied that will alleviate the harmful impact of the organism, reduce the numbers, or distribution of the organism or prevent or contain the spread of the organism.

6.3 VEGETATION

The single vegetation association is not entirely analogous to any of the 3 vegetation types mapped within the study area. The 601 vegetation association is described as a sedgeland with very sparse *Acacia xiphophylla* and *A. inaequilatera* over spinifex hummock grasslands. Whilst the vegetation type*NgTw is most similar to the description, due to the presence of *Acacia inaequilatera* and spinifex, it cannot be described as a sedgeland. No sedges were recorded within the survey.

No vegetation types identified during the survey are considered significant. All vegetation types were considered abundant within and outside the study area.

Vegetation condition varied within the study area, as it encompassed all condition ratings from Completely Degraded to Excellent. The Completely Degraded areas included roads and tracks. The Excellent area, encompassing the smallest portion of the study area was within the *NgExTa vegetation type. Whilst the *NgExTa vegetation type is described as having **Neltuma glandulosa* x *velutina* within the shrub layer, this small patch (4.1 ha) was almost free of introduced species, including the Declared Pest & WoNS. The majority of the study area (78.7%) was in Poor to Good

condition. Poor rated areas consisted of 35.5% and Good areas consisted of 43.2% of the study area. Two disturbances were identified within the quadrats, weed infestation, and grazing.

6.4 CONCLUSION

The most notable result of the survey was the presence and abundance of the Declared Pest and WoNS, **Neltuma glandulosa* x *velutina.*

The survey found no conservation significant flora or vegetation values within the study area. The majority of the study area showed a degree of disturbance cause by anthropogenic activities and therefore considered lower quality. Furthermore, the 3 vegetation types were observed to be abundant outside the study area. These findings suggest that any clearing to the vegetation within the study area is unlikely to create any substantial threat to the vegetation types.

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Appendix 1 Survey site locations

Site Name	Sample Type	Latitude	Longitude
MSA001	Quadrat	-21.207542	115.957469
MSA002	Quadrat	-21.215954	115.953541
MSA003	Quadrat	-21.202885	115.968511
MSA004	Quadrat	-21.214331	115.951726
MSA005	Quadrat	-21.215385	115.964741
MSA006	Quadrat	-21.204493	115.957714
MSA007	Quadrat	-21.212496	115.966457
MSA008	Quadrat	-21.204598	115.971647
MSA009	Quadrat	-21.212345	115.95513

Appendix 2 Flora survey site descriptions

Site details			
Site	**MSA001**	**Position (WGS84)**	115.9574, -21.2076
Slope	negligible	**Topography**	plain
Soil colour	red-brown	**Soil texture**	clay loam
Rock cover (%)	0	**Rock type**	ferrous - ironstone,quartz

Observation details - visit 1 (26 Sep 2024)

Site description	Isolated tall **Neltuma glandulosa* x *velutina* and *Acacia inaequilatera* shrubs over isolated clumps of low *Bonamia pilbarensis, Sclerolaena costata* and *Pterocaulon sphacelatum* shrubs over mid *Triodia wiseana* hummock grassland.
Habitat	spinifex grassland
Disturbance	weed infestation

Vegetation condition	Good	**Fire age**	moderate (>5 years)
Total veg. cover (%)	50	**Tree cover (%)**	1
Shrub cover (%)	1	**Grass cover (%)**	40
Herb cover (%)	0		

Sample and effort summary				
Sample method	**Visit**	**Sample date**	**Dimensions**	**Observer**
Quadrat	1	26 Sep 2024	50m x 50m	Calvin Williams

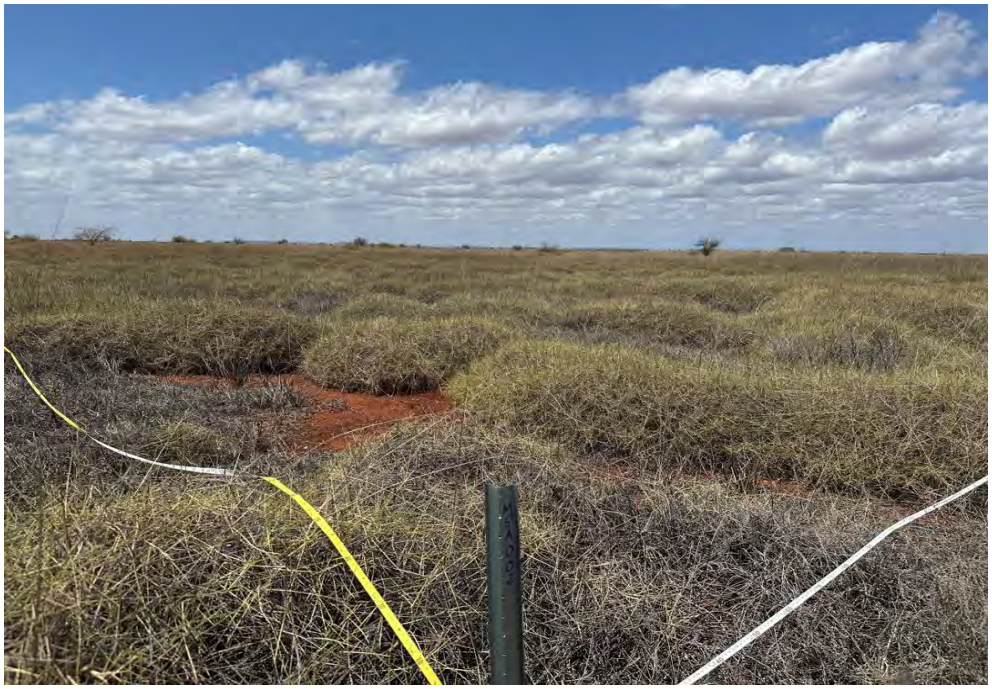
Species (15)	Status	Cover (%)	Height (m)
Triodia wiseana		40.0	0.6
**Neltuma glandulosa* x *velutina*	Weed, Declared Pest, WoNS	1.0	2.2
Acacia inaequilatera		0.5	2.5
Eriachne benthamii		0.5	0.3
Bonamia pilbarensis		0.3	0.3
Sclerolaena costata		0.2	0.4
Pterocaulon sphacelatum		0.1	0.5
Goodenia muelleriana		0.1	0.4
Streptoglossa bubakii		0.1	0.2
Rhynchosia minima		0.1	0.1
Acacia xiphophylla		0.0	1.9
Triumfetta clementii		0.0	0.3
Hibiscus sturtii var. *platychlamys*		0.0	0.2
Senna notabilis		0.0	0.1
Tephrosia sp. NW Eremaean (S. van Leeuwen et al. PBS 0356)		0.0	0.1

Site details			
Site	**MSA002**	**Position (WGS84)**	115.9536, -21.2160
Slope	negligible	**Topography**	plain
Soil colour	red-brown	**Soil texture**	clay loam
Rock cover (%)	0	**Rock type**	ferrous - ironstone,quartz

Observation details - visit 1 (26 Sep 2024)

Site description	Mid *Triodia angusta* hummock grassland over low open *Eragrostis xerophila* tussock grassland over isolated clumps of low *Rhynchosia minima, Sida fibulifera* and *Streptoglossa adscendens* shrubs.
Habitat	spinifex grassland
Disturbance	none evident

Vegetation condition	Excellent	**Fire age**	moderate (>5 years)
Total veg. cover (%)	70	**Tree cover (%)**	0
Shrub cover (%)	0	**Grass cover (%)**	70
Herb cover (%)	0		



Sample and effort summary				
Sample method	**Visit**	**Sample date**	**Dimensions**	**Observer**
Quadrat	1	26 Sep 2024	50m x 50m	Calvin Williams

Species (9)	Status	Cover (%)	Height (m)
Triodia angusta		60.0	0.7
Eragrostis xerophila		10.0	0.3
Ptilotus exaltatus		0.1	0.3
Dichanthium sericeum subsp. *humilius*		0.1	0.1
Euphorbia coghlanii		0.1	0.1
Euploca inexplicita		0.1	0.1
Rhynchosia minima		0.1	0.1
Sida fibulifera		0.1	0.1
Streptoglossa adscendens		0.1	0.1

Site details			
Site	**MSA003**	**Position (WGS84)**	115.9686, -21.2029
Slope	negligible	**Topography**	plain
Soil colour	red-brown	**Soil texture**	clay loam
Rock cover (%)	0	**Rock type**	ferrous - ironstone,quartz

Observation details - visit 1 (25 Sep 2024)

Site description	Isolated tall *Acacia inaequilatera, A. coriacea* subsp. *coriacea* and **Neltuma glandulosa* x *velutina* shrubs over isolated mid *Acacia bivenosa* and *Senna artemisioides* subsp. *oligophylla* shrubs over *Triodia wiseana* mid hummock grassland.
Habitat	spinifex grassland
Disturbance	grazing-low, weed infestation

Vegetation condition	Good	**Fire age**	moderate (>5 years)
Total veg. cover (%)	60	**Tree cover (%)**	0
Shrub cover (%)	10	**Grass cover (%)**	50
Herb cover (%)	0		

Sample and effort summary				
Sample method	**Visit**	**Sample date**	**Dimensions**	**Observer**
Quadrat	1	25 Sep 2024	50m x 50m	Calvin Williams

Species (26)	Status	Cover (%)	Height (m)
Triodia wiseana		40.0	0.8
Aristida contorta		3.0	0.4
Acacia inaequilatera		1.0	3.0
**Neltuma glandulosa* x *velutina*	Weed, Declared Pest, WoNS	1.0	2.5
Acacia synchronicia		1.0	0.7
Acacia coriacea subsp. *coriacea*		0.5	3.0
Acacia bivenosa		0.5	1.2
Senna artemisioides subsp. *oligophylla*		0.5	0.6
Corchorus walcottii		0.2	0.4
Rhodanthe floribunda		0.2	0.2
Sclerolaena costata		0.2	0.2
Trichodesma zeylanicum var. *zeylanicum*		0.1	1.2
Acacia ?inaequilatera		0.1	0.5
Alysicarpus muelleri		0.1	0.4
Solanum cleistogamum		0.1	0.4
Solanum lasiophyllum		0.1	0.4
**Cenchrus ciliaris*	Weed	0.1	0.3
**Cenchrus setiger*	Weed	0.1	0.3
Tephrosia sp. NW Eremaean (S. van Leeuwen et al. PBS 0356)		0.1	0.3
Angianthus acrohyalinus		0.1	0.2
Bonamia pilbarensis		0.1	0.2
Evolvulus alsinoides var. *villosicalyx*		0.1	0.2
Goodenia muelleriana		0.1	0.2
Pterocaulon sphacelatum		0.1	0.2
Euphorbia boophthona		0.1	0.1
Rhodanthe humboldtiana		0.1	0.1

Site details			
Site	**MSA004**	**Position (WGS84)**	115.9518, -21.2144
Slope	negligible	**Topography**	plain
Soil colour	red-brown	**Soil texture**	clay loam
Rock cover (%)	0	**Rock type**	ferrous - ironstone,quartz

Observation details - visit 1 (26 Sep 2024)

Site description	Isolated clumps of mid **Neltuma glandulosa* x *velutina* mid sparse shrubs over isolated clumps of low *Sida fibulifera, Streptoglossa adscendens* and *Trianthema triquetrum* shrubs over low *Eragrostis xerophila* tussock grassland.
Habitat	grassland
Disturbance	grazing-medium, weed infestation

Vegetation condition	Good	**Fire age**	moderate (>5 years)
Total veg. cover (%)	50	**Tree cover (%)**	0
Shrub cover (%)	0	**Grass cover (%)**	50
Herb cover (%)	0		

Sample and effort summary				
Sample method	**Visit**	**Sample date**	**Dimensions**	**Observer**
Quadrat	1	26 Sep 2024	50m x 50m	Calvin Williams

Species (14)	Status	Cover (%)	Height (m)
Eragrostis xerophila		50.0	0.4
Dichanthium sericeum subsp. *humilius*		0.2	0.2
**Neltuma glandulosa* x *velutina*	Weed, Declared Pest, WoNS	0.1	1.7
Angianthus acrohyalinus		0.1	0.2
Nellica maderaspatensis		0.1	0.2
Ptilotus exaltatus		0.1	0.2
Sclerolaena costata		0.1	0.2
Streptoglossa adscendens		0.1	0.2
Swainsona leeana		0.1	0.2
Euploca inexplicita		0.1	0.1
Indigofera colutea		0.1	0.1
Sida fibulifera		0.1	0.1
Sporobolus australasicus		0.1	0.1
Trianthema triquetrum		0.0	0.1

Site details			
Site	**MSA005**	**Position (WGS84)**	115.9647, -21.2154
Slope	negligible	**Topography**	plain
Soil colour	red-brown	**Soil texture**	clay loam
Rock cover (%)	0	**Rock type**	ferrous - ironstone,quartz

Observation details - visit 1 (26 Sep 2024)

Site description	Isolated mid **Neltuma glandulosa* x *velutina* shrubs over isolated mid *Triodia angusta* hummock grasses over low open *Eragrostis xerophila* and *Aristida contorta* tussock grassland.
Habitat	tussock grassland
Disturbance	grazing-medium, weed infestation

Vegetation condition	Poor	**Fire age**	moderate (>5 years)
Total veg. cover (%)	30	**Tree cover (%)**	0
Shrub cover (%)	1	**Grass cover (%)**	30
Herb cover (%)	0		

Sample and effort summary				
Sample method	**Visit**	**Sample date**	**Dimensions**	**Observer**
Quadrat	1	26 Sep 2024	50m x 50m	Calvin Williams

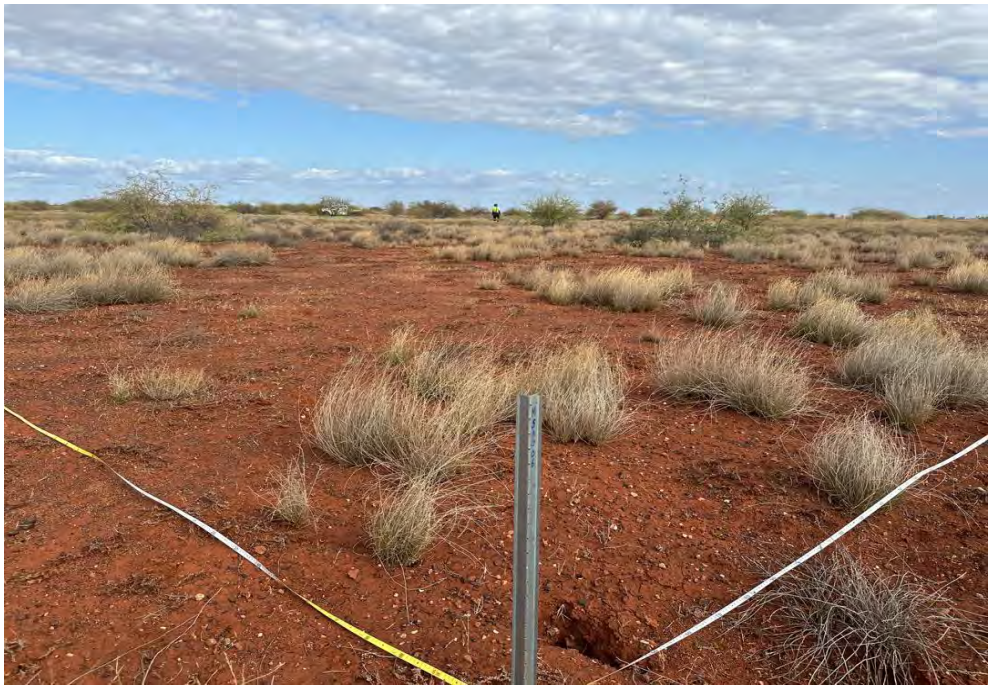
Species (18)	Status	Cover (%)	Height (m)
Eragrostis xerophila		15.0	0.5
Aristida contorta		10.0	0.2
Triodia angusta		3.0	1.2
**Neltuma glandulosa* x *velutina*	Weed, Declared Pest, WoNS	1.0	1.5
Sclerolaena costata		0.5	0.2
Sida fibulifera		0.2	0.2
Sclerolaena bicornis var. *bicornis*		0.1	0.3
Angianthus acrohyalinus		0.1	0.2
Rhodanthe humboldtiana		0.1	0.2
Dactyloctenium radulans		0.1	0.1
Euploca inexplicita		0.1	0.1
Iseilema vaginiflorum		0.1	0.1
Ptilotus exaltatus		0.1	0.1
Salsola australis		0.1	0.1
Sclerolaena densiflora		0.1	0.1
Sporobolus australasicus		0.1	0.1
Streptoglossa adscendens		0.1	0.1
Xerochloa imberbis		0.1	0.1

Site details			
Site	**MSA006**	**Position (WGS84)**	115.9577, -21.2045
Slope	negligible	**Topography**	plain
Soil colour	red-brown	**Soil texture**	sandy clay
Rock cover (%)	0	**Rock type**	ferrous - ironstone,quartz

Observation details - visit 1 (26 Sep 2024)

Site description	Tall sparse **Neltuma glandulosa* x *velutina* shrubland over mid sparse *Triodia angusta* hummock grassland over low open *Eragrostis xerophila* and *Dichanthium sericeum* subsp. *humilis* tussock grassland.
Habitat	tussock grassland
Disturbance	grazing-medium, weed infestation

Vegetation condition	Poor	**Fire age**	moderate (>5 years)
Total veg. cover (%)	40	**Tree cover (%)**	0
Shrub cover (%)	5	**Grass cover (%)**	30
Herb cover (%)	0		



Sample and effort summary				
Sample method	**Visit**	**Sample date**	**Dimensions**	**Observer**
Quadrat	1	26 Sep 2024	50m x 50m	Calvin Williams

Species (14)	Status	Cover (%)	Height (m)
Eragrostis xerophila		10.0	0.4
**Neltuma glandulosa* x *velutina*	Weed, Declared Pest, WoNS	5.0	2.0
Triodia angusta		5.0	0.8
Salsola australis		1.0	0.7
Dichanthium sericeum subsp. *humilius*		0.5	0.1
Ptilotus exaltatus		0.1	0.3
Sclerolaena costata		0.1	0.2
Angianthus acrohyalinus		0.1	0.1
Euphorbia coghlanii		0.1	0.1
Indigofera colutea		0.1	0.1
Iseilema vaginiflorum		0.1	0.1
Rhodanthe humboldtiana		0.1	0.1
Sida fibulifera		0.1	0.1
Streptoglossa bubakii		0.1	0.1

Site details			
Site	**MSA007**	**Position (WGS84)**	115.9670, -21.2126
Slope	negligible	**Topography**	plain
Soil colour	red-brown	**Soil texture**	clay loam
Rock cover (%)	0	**Rock type**	ferrous - ironstone,quartz

Observation details - visit 1 (26 Sep 2024)

Site description	Isolated tall *Acacia inaequilatera* and *A. synchronicia* shrubs over low sparse *Eragrostis xerophila, Aristida contorta* and *Eriachne benthamii* tussock grassland over isolated clumps of low *Sclerolaena costata, Evolvulus alsinoides* var. *villosicalyx* and *Goodenia muelleriana* forbs.
Habitat	tussock grassland
Disturbance	grazing-high

Vegetation condition	Very Good	**Fire age**	moderate (>5 years)
Total veg. cover (%)	10	**Tree cover (%)**	0
Shrub cover (%)	1	**Grass cover (%)**	10
Herb cover (%)	1		

Sample and effort summary				
Sample method	**Visit**	**Sample date**	**Dimensions**	**Observer**
Quadrat	1	26 Sep 2024	50m x 50m	Calvin Williams

Species (23)	Status	Cover (%)	Height (m)
Eragrostis xerophila		5.0	0.5
Aristida contorta		3.0	0.3
Eriachne benthamii		2.0	0.6
Acacia inaequilatera		0.5	2.5
Acacia synchronicia		0.5	1.8
Sclerolaena costata		0.5	0.2
Sorghum timorense		0.1	0.6
Goodenia muelleriana		0.1	0.2
Alysicarpus muelleri		0.1	0.1
Angianthus acrohyalinus		0.1	0.1
Bonamia pilbarensis		0.1	0.1
Evolvulus alsinoides var. *villosicalyx*		0.1	0.1
Indigofera boviperda subsp. *boviperda*		0.1	0.1
Indigofera colutea		0.1	0.1
Neptunia xanthonema		0.1	0.1
Pterocaulon sphacelatum		0.1	0.1
Ptilotus aervoides		0.1	0.1
Rhodanthe floribunda		0.1	0.1
Rhodanthe humboldtiana		0.1	0.1
Rhynchosia minima		0.1	0.1
Senna notabilis		0.1	0.1
Stemodia grossa		0.1	0.1
Swainsona leeana		0.1	0.1

Site details			
Site	**MSA008**	**Position (WGS84)**	115.9716, -21.2046
Slope	negligible	**Topography**	plain
Soil colour	red-brown	**Soil texture**	clay
Rock cover (%)	0	**Rock type**	ferrous - ironstone,quartz

Observation details - visit 1 (25 Sep 2024)

Site description	Isolated mid **Neltuma glandulosa* x *velutina* shrubs over isolated low *Acacia xiphophylla* and *A. synchronicia* shrubs over low open *Eragrostis xerophila* and *Triodia wiseana* grassland.
Habitat	spinifex grassland
Disturbance	grazing-medium, weed infestation

Vegetation condition	Poor	**Fire age**	moderate (>5 years)
Total veg. cover (%)	40	**Tree cover (%)**	0
Shrub cover (%)	5	**Grass cover (%)**	25
Herb cover (%)	0		

Sample and effort summary				
Sample method	**Visit**	**Sample date**	**Dimensions**	**Observer**
Quadrat	1	25 Sep 2024	50m x 50m	Calvin Williams

Species (22)	Status	Cover (%)	Height (m)
Eragrostis xerophila		15.0	0.3
Triodia wiseana		3.0	0.5
**Neltuma glandulosa* x *velutina*	Weed, Declared Pest, WoNS	1.0	1.7
Acacia synchronicia		1.0	0.7
Acacia xiphophylla		0.5	1.0
Aristida contorta		0.3	0.2
Sclerolaena costata		0.2	0.2
Ptilotus exaltatus		0.2	0.1
**Cenchrus ciliaris*	Weed	0.1	0.3
Angianthus acrohyalinus		0.1	0.2
Eriachne benthamii		0.1	0.2
Erodium cygnorum		0.1	0.2
Rhodanthe floribunda		0.1	0.2
Rhodanthe humboldtiana		0.1	0.2
Salsola australis		0.1	0.2
Euphorbia boophthona		0.1	0.1
Euploca inexplicita		0.1	0.1
Indigofera linifolia		0.1	0.1
Rhynchosia minima		0.1	0.1
Sida fibulifera		0.1	0.1
Boerhavia repleta		0.0	0.2
Goodenia muelleriana		0.0	0.2

Site details			
Site	**MSA009**	**Position (WGS84)**	115.9551, -21.2124
Slope	negligible	**Topography**	plain
Soil colour	red-brown	**Soil texture**	clay loam
Rock cover (%)	0	**Rock type**	ferrous - ironstone,quartz

Observation details - visit 1 (26 Sep 2024)

Site description	Isolated tall *Acacia sclerosperma* subsp. *sclerosperma* and *Acacia synchronicia* shrubs over low sparse *Hibiscus sturtii* var. *platychlamys*, *Sclerolaena costata* and *Pterocaulon sphacelatum* shrubland over mid open *Triodia wiseana* hummock grassland.
Habitat	spinifex grassland
Disturbance	grazing-medium, weed infestation

Vegetation condition	Good	**Fire age**	moderate (>5 years)
Total veg. cover (%)	20	**Tree cover (%)**	1
Shrub cover (%)	3	**Grass cover (%)**	15
Herb cover (%)	0		

Sample and effort summary				
Sample method	**Visit**	**Sample date**	**Dimensions**	**Observer**
Quadrat	1	26 Sep 2024	50m x 50m	Calvin Williams

Species (16)	Status	Cover (%)	Height (m)
Triodia wiseana		10.0	0.6
Hibiscus sturtii var. *platychlamys*		8.0	0.2
Eragrostis xerophila		5.0	0.3
Acacia sclerosperma subsp. *sclerosperma*		2.0	3.0
Acacia synchronicia		1.0	4.0
**Neltuma glandulosa* x *velutina*	Weed, Declared Pest, WoNS	0.5	1.9
Eriachne benthamii		0.5	0.3
Sclerolaena costata		0.5	0.2
Goodenia muelleriana		0.3	0.3
Solanum cleistogamum		0.1	0.3
Bonamia pilbarensis		0.1	0.2
Pterocaulon sphacelatum		0.1	0.2
Angianthus acrohyalinus		0.1	0.1
Evolvulus alsinoides var. *villosicalyx*		0.1	0.1
Ptilotus aervoides		0.1	0.1
Triumfetta clementii		0.0	0.2

Appendix 3 NVIS hierarchy

Western Australia Current Practice			National Standard		
Hierarchy of terms	**Brief description in WA**	**Indicative scale**	**NVIS Level**	**Description**	**NVIS structural/floristic components required**
Vegetation formation	Structure and growth form–e.g. Forest, Woodland.	1:5 000 000	I	Class	Dominant growth form for the ecologically or structurally dominant stratum.
Vegetation sub-formation	Structural and dominant vegetation layer–Eucalypt Forest, Banksia Woodland	1:2 500 000 l	II	Structural Formation	Dominant growth form, cover, and height for the ecologically or structurally dominant stratum.
Vegetation association	Structural form and dominant species–e.g. Medium woodland; York gum (*Eucalyptus loxophleba*) & Wandoo	1:1 000 000 to 1:250 000	III	Broad Floristic Formation	Dominant growth form, cover, height, and dominant land cover genus for the uppermost or dominant stratum.
Vegetation complex	Structural and floristic description linked to geomorphology–e.g. Quindalup Complex.	1:250 000 to 1:100 000	IV	Sub-Formation	Dominant growth form, cover, height, and dominant genus and Family for the 3 traditional strata. (i.e. Upper, Mid, and Ground).
Vegetation type	Floristic definition by strata with structural detail. Often represented with a code and floristic description.	1:100 000 to 1:10 000	V	Association	Dominant growth form, height, cover, and up to 3 species for the 3 traditional strata. (i.e. Upper, Mid, and Ground).
Plant community	Basic unit of vegetation classification, site specific, and highly localised with detailed floristics for each stratum.	1:10 000	VI	Sub-Association	Dominant growth form, height, cover and up to 5 species for all layers/ strata.
Floristic Community Type	Floristic composition definition; e.g. Northern banksia woodlands over herb rich shrublands on the Swan Coastal Plain.	No absolute scale			

Appendix 4 Introduced flora identified in the desktop review

Family	Species	Status
Amaranthaceae	**Aerva javanica*	
Amaranthaceae	**Amaranthus viridis*	
Arecaceae	**Washingtonia filifera*	
Asphodelaceae	**Asphodelus fistulosus*	
Asteraceae	**Arctotheca calendula*	
Asteraceae	**Bidens bipinnata*	
Asteraceae	**Erigeron bonariensis*	
Asteraceae	**Flaveria trinervia*	
Asteraceae	**Sonchus oleraceus*	
Caryophyllaceae	**Polycarpon tetraphyllum*	
Casuarinaceae	**Casuarina equisetifolia*	
Convolvulaceae	**Ipomoea cairica*	
Cucurbitaceae	**Citrullus amarus*	
Cyperaceae	**Ficinia marginata*	
Fabaceae	**Neltuma pallida*	Declared Pest s12; WoNS
Fabaceae	**Parkinsonia aculeata*	Declared Pest s22(2); WoNS
Fabaceae	**Senna occidentalis*	
Fabaceae	**Stylosanthes hamata*	
Fabaceae	**Tamarindus indica*	
Fabaceae	**Vachellia farnesiana*	
Gentianaceae	**Centaurium erythraea*	
Malvaceae	**Brachychiton australis*	
Malvaceae	**Malvastrum americanum*	
Malvaceae	**Melochia pyramidata*	
Oxalidaceae	**Oxalis corniculata*	
Papaveraceae	**Papaver somniferum*	
Passifloraceae	**Passiflora foetida*	
Passifloraceae	**Passiflora foetida* var. *hispida*	
Poaceae	**Cenchrus ciliaris*	
Poaceae	**Cenchrus echinatus*	
Poaceae	**Cenchrus setaceus*	
Poaceae	**Cenchrus setiger*	
Poaceae	**Chloris virgata*	
Poaceae	**Cynodon dactylon*	
Poaceae	**Eragrostis minor*	
Poaceae	**Setaria verticillata*	
Solanaceae	**Datura leichhardtii*	
Solanaceae	**Datura leichhardtii* subsp. *leichhardtii*	
Solanaceae	**Solanum nigrum*	
Tamaricaceae	**Tamarix aphylla*	Declared Pest s22(2); WoNS
Zygophyllaceae	**Tribulus terrestris*	

Appendix 5 Flora species inventory

Family	Species	Status
Aizoaceae	*Trianthema triquetrum*	
Amaranthaceae	*Ptilotus aervoides*	
Amaranthaceae	*Ptilotus exaltatus*	
Asteraceae	*Angianthus acrohyalinus*	
Asteraceae	*Pterocaulon sphacelatum*	
Asteraceae	*Rhodanthe floribunda*	
Asteraceae	*Rhodanthe humboldtiana*	
Asteraceae	*Streptoglossa adscendens*	
Asteraceae	*Streptoglossa bubakii*	
Asteraceae	*Streptoglossa odora*	
Boraginaceae	*Euploca inexplicita*	
Boraginaceae	*Trichodesma zeylanicum* var. *zeylanicum*	
Chenopodiaceae	*Salsola australis*	
Chenopodiaceae	*Sclerolaena bicornis* var. *bicornis*	
Chenopodiaceae	*Sclerolaena costata*	
Chenopodiaceae	*Sclerolaena densiflora*	
Convolvulaceae	*Bonamia pilbarensis*	
Convolvulaceae	*Evolvulus alsinoides* var. *villosicalyx*	
Euphorbiaceae	*Euphorbia boophthona*	
Euphorbiaceae	*Euphorbia coghlanii*	
Fabaceae	*Acacia inaequilatera*	
Fabaceae	*Acacia bivenosa*	
Fabaceae	*Acacia coriacea* subsp. *coriacea*	
Fabaceae	*Acacia sclerosperma* subsp. *sclerosperma*	
Fabaceae	*Acacia synchronicia*	
Fabaceae	*Acacia xiphophylla*	
Fabaceae	*Alysicarpus muelleri*	
Fabaceae	*Indigofera boviperda* subsp. *boviperda*	
Fabaceae	*Indigofera colutea*	
Fabaceae	*Indigofera linifolia*	
Fabaceae	**Neltuma glandulosa* x *velutina*	Weed, Declared Pest, WoNS
Fabaceae	*Neptunia xanthonema*	
Fabaceae	*Rhynchosia minima*	
Fabaceae	*Senna artemisioides* subsp. *oligophylla*	
Fabaceae	*Senna notabilis*	
Fabaceae	*Swainsona leeana*	
Fabaceae	*Tephrosia* sp. NW Eremaean (S. van Leeuwen et al. PBS 0356)	
Geraniaceae	*Erodium cygnorum*	
Goodeniaceae	*Goodenia muelleriana*	
Malvaceae	*Corchorus walcottii*	
Malvaceae	*Hibiscus sturtii* var. *platychlamys*	

Family	Species	Status
Malvaceae	*Sida fibulifera*	
Malvaceae	*Triumfetta clementii*	
Nyctaginaceae	*Boerhavia repleta*	
Phyllanthaceae	*Nellica maderaspatensis*	
Poaceae	*Aristida contorta*	
Poaceae	**Cenchrus ciliaris*	Weed
Poaceae	**Cenchrus setiger*	Weed
Poaceae	*Dactyloctenium radulans*	
Poaceae	*Dichanthium sericeum* subsp. *humilius*	
Poaceae	*Eragrostis xerophila*	
Poaceae	*Eriachne benthamii*	
Poaceae	*Iseilema vaginiflorum*	
Poaceae	*Sorghum timorense*	
Poaceae	*Sporobolus australasicus*	
Poaceae	*Triodia angusta*	
Poaceae	*Triodia wiseana*	
Poaceae	*Xerochloa imberbis*	
Solanaceae	*Solanum cleistogamum*	
Solanaceae	*Solanum lasiophyllum*	

Appendix 6 Flora species by site matrix