



NEOEN

YATHROO WIND FARM

Detailed and Targeted Flora
and Vegetation Assessment

FINAL

July 2025



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and Vegetation Assessment

FINAL

Prepared by
Umwelt (Australia) Pty Limited
on behalf of
Neoen Pty Ltd

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1.0 Introduction

1.1 Project Overview

Neoen Australia Pty Ltd (Neoen) is proposing the development of the Yathroo Wind Farm (the Project) located approximately 120 kilometres (km) north of Perth in the Shire of Dandaragan. The Project is expected to comprise of up to 65 Wind Turbine Generators (WTG), a Battery Energy Storage System (BESS) and associated ancillary infrastructure.

Umwelt were commissioned by Neoen in 2024 to undertake a flora and vegetation assessment to support approvals for the Yathroo Wind Farm. This report encompasses the results of the desktop assessment, the winter Reconnaissance survey and the Spring Detailed and Targeted flora and vegetation surveys, with the fauna survey results for these phases presented in a separate report.

1.1.1 Project Location

The Project is located within the Shire of Dandaragan, approximately 120 km north of Perth. The Project is situated across several freehold properties around Brand Highway and Dandaragan Road, between Dandaragan, Cataby and Regan's Ford. The Project will tie into existing 132 / 330 kV double circuit transmission infrastructure, which is scheduled to be upgraded to dual circuit 330 kV. This will provide network access and intersects the western portion of the Project.

The Project is located within the Intensive Land Use Zone, as defined by the Department of Primary Industries and Regional Development (DPIRD, 2016). Namming Nature Reserve and Moore River National Park are located west and south of the Project.

1.1.2 Study Area Definitions

The Project Area (YTO-PRJ-PA-008), as provided by Neoen on 1 November 2024, is 17,212.7 ha in size. For the purpose of the flora and vegetation assessment, a 'Survey Area' was produced by removing several portions of remnant vegetation that were presumed to be in 'Good' or better condition[^] and that can be avoided by the Project. The Survey Area is approximately 15,834.9 ha in size and encompasses properties surveyed across the Reconnaissance, Detailed and Targeted surveys of the flora and vegetation assessment. Finally, a Detailed and Targeted Survey Area, hereafter referred to as the "D&T Survey Area", was developed to encompass intact remnant vegetation that may be impacted by the Project. The D&T Survey Area largely encompasses the road verge vegetation of Brand Highway and Walyer Walyer Road.

For the purpose of the desktop assessment, including interrogation of databases and searches for relevant literature, a Desktop Study Area was defined. The Desktop Study Area encompasses a 20 km buffer of the original Project Area (20240501 New Project Area) provided by Neoen on 1 May 2024.

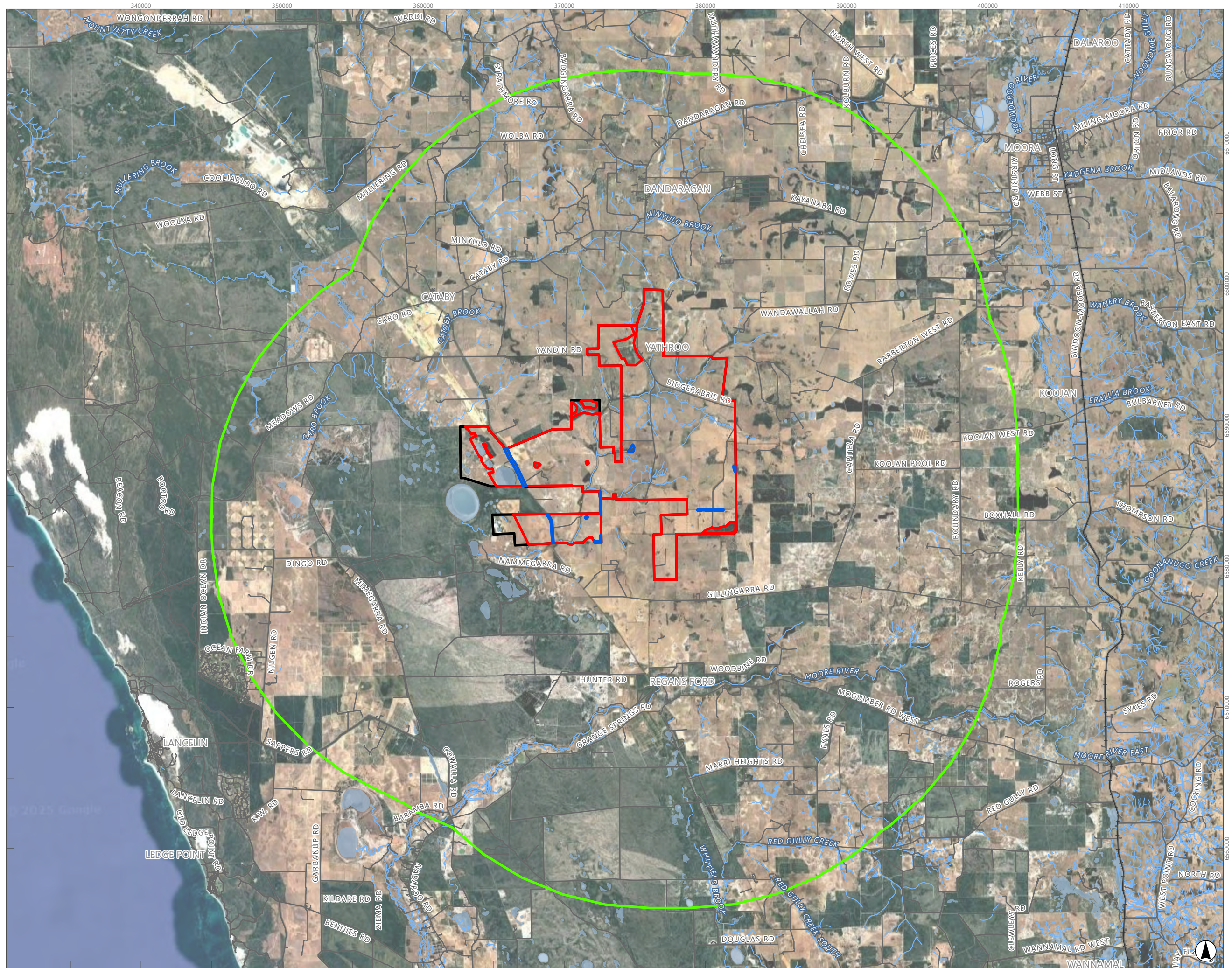
Table 1.1 provides a summary of the study areas associated with the Yathroo Wind Farm Project. These boundaries are presented in **Figure 1.1**.

Table 1.1 Study Areas of the Project

Name	Description	Area Extent
Project Area	YTO-PRJ-PA-008, provided by Neoen on 1 November 2024.	17,212.7 ha
Survey Area	The Project Area, with nominated areas of intact native vegetation removed where they can be avoided. Encompasses the D&T Survey Area, as well as the areas within which Reconnaissance Survey was conducted.	15,834.9 ha
D&T Survey Area	A subset of the Survey Area within which Detailed and Targeted survey was undertaken.	130.5 ha
Desktop Study Area	A 20 km buffer on the Project Area provided on 1 May 2024 (20240501 New Project Area).	20 km buffer

[^]Vegetation condition as per the scale for the Southwest and Interzone Botanical Provinces in the Environmental Protection Authority (EPA) Technical Guidance (2016b)

FIGURE 1.1
Project Location



- Legend**
- Project Area
 - Survey Area
 - D&T Survey Area
 - Desktop Study Area
 - Railway
 - Road
 - Watercourse
 - Waterbody



Scale: 1:250,000 at A3
GDA2020 MGA Zone 50

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1.2 Aims and Objectives

The primary aim of the flora and vegetation assessment was to define the ecological values of the Survey Area and its surrounding environment.

The specific objectives include to:

- Identify, map and describe Vegetation Types (VTs) that occur within the Survey Area.
- Map the condition of the vegetation in accordance with EPA Technical Guidance, using the Southwest and Interzone Botanical Provinces scale (EPA, 2016b).
- Assess the likelihood of the following occurring within the Survey Area:
 - o **Significant flora:** flora taxa that belong to one of the following categories as defined by EPA (2016a, 2016b) (note that conservation codes used by Department of Biodiversity, Conservation and Attractions (DBCA) for significant flora taxa in WA are presented in DBCA (2023a)):
 - taxa identified as a Threatened (T) or Priority (P) species (formally listed significant taxa – includes taxa listed under both State (*Biodiversity Conservation Act 2016* (WA) (BC Act)) and Commonwealth (*Environment Protection Biodiversity Conservation Act 1999* (EPBC Act)) legislation, and classified as Priority by DBCA)
 - locally endemic taxa or taxa associated with a restricted habitat type (e.g. surface water or groundwater dependent ecosystems (GDEs))
 - new species or taxa having anomalous features that indicate a potential new species
 - representative of the range of a species (particularly at the extremes of range, recently discovered range extensions, or isolated outliers of the main range)
 - unusual species, including restricted subspecies, varieties or naturally occurring hybrids
 - having a relictual status, being representative of taxonomic groups that no longer occur widely in the broader landscape.
 - o **Significant vegetation:** vegetation communities that belong to one of the following categories as defined by EPA (2016a, 2016b) (note that definitions, categories and criteria used by DBCA for significant vegetation in WA are presented in DBCA (2023d)):
 - being identified as a Threatened Ecological Community (TEC) or Priority Ecological Community (PEC) (formally listed significant vegetation – includes vegetation listed under State or Commonwealth legislation, or classified as a PEC by DBCA)
 - having a restricted distribution
 - having a degree of historical impact from threatening processes
 - playing a role as a refuge
 - providing an important function required to maintain ecological integrity of a significant ecosystem.

- Where deemed necessary, conduct Targeted survey for significant flora and vegetation, as defined above.
- Provide recommendations for appropriate mitigations to support approvals for the Project.

Note that this assessment does not attempt to record a full census of vascular flora taxa that occur in the Survey Area (i.e. those areas outside the D&T Survey Area).

1.3 Level of Assessment

The flora and vegetation survey of the Survey Area involved Reconnaissance, Detailed and Targeted survey as defined in Section 4.1, Section 4.2 and Section 4.3 respectively, of the *Technical Guidance for Flora and Vegetation Surveys for Environmental Impact Assessment* (EPA, 2016b).

Detailed and Targeted survey in all areas of remnant vegetation in the Survey Area (i.e. within the D&T Survey Area) is considered the appropriate level of survey, based on the location of the Project within the Swan Coastal Plain (SCP) and Dandaragan Plateau and the presence of intact vegetation in 'Good' or better condition (as per the rating scale for the South-West and Interzone Botanical Provinces presented by EPA (2016b)). The SCP and Dandaragan Plateau is known to support a high diversity of flora and vegetation relative to other areas of the State, including significant flora taxa and vegetation (EPA, 2016b).

Reconnaissance survey within all other parts of the Survey Area is considered appropriate, given the high level of disturbance in this area and the relative lack of native vegetation in 'Good' or better condition. These areas are less likely to support significant flora or vegetation.

The survey and reporting works comply with the following documents:

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

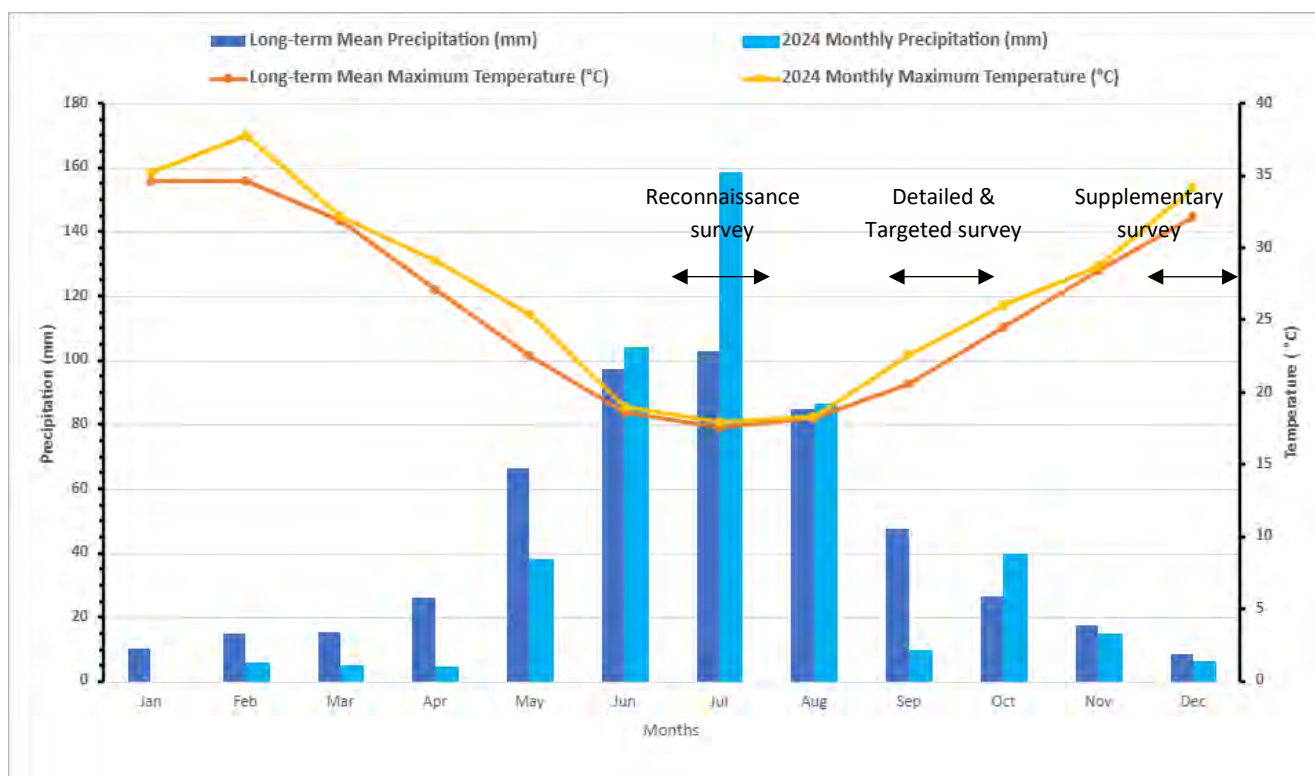
2.0 Background

2.1 Climate

The majority of the Project Area is located within the Swan Coastal Plain Interim Biogeographic Regionalisation for Australia (IBRA) bioregion, with the north-western corner of the Project Area intersecting the Geraldton Sandplains IBRA bioregion. More specifically, the Project Area is located across three IBRA subregions – Perth SWA02, Dandaragan Plateau SWA01 and Lesueur Sandplain GE02 ((DCCEEW, 2023d, 2023f)). The SCP IBRA Bioregion (including the Perth and Dandaragan Plateau IBRA Subregions), and the southern portion of the Geraldton Sandplain IBRA Bioregion, generally correspond with the Drummond Botanical Subdistrict as defined by Beard (2015). The Drummond Botanical Subdistrict experiences a warm Mediterranean climate with predominantly winter rainfall (600–1,000 millimetres (mm) annually) and five to six dry months per year (Beard, 2015).

Graph 2.1 presents the monthly precipitation totals and monthly maximum temperature statistics for 2024, as well as long-term average monthly precipitation and maximum temperature data recorded at Bureau of Meteorology (BoM) Badgingarra station (station number 9037) (BoM, 2024), located approximately 46 km northwest of the Project Area.

Throughout 2024, the maximum temperatures were slightly higher than the average maximum temperature for each month (**Graph 2.1**). Although the total rainfall of 2024 was below the long-term average (473.6 mm for 2024, long-term average of 517.7 mm), the total rainfall in the months *before* the Detailed and Targeted surveys (January–August 2024) was above slightly average (417.7 mm, the long-term average for this period being 403.0 mm). Thus, the Spring months (September–December) were drier than average.



Graph 2.1 Climate Statistics for Badgingarra Research Station (9037)

(BoM, 2024)

2.2 Geology, Landform and Soils

As previously mentioned, the Project Area is located within the Perth, Dandaragan Plateau and Lesueur Sandplain subregions. The Perth subregion (SWA02) is composed of colluvial and aeolian sands, alluvial river flats and coastal limestone (Mitchell et al., 2002). The Dandaragan Plateau subregion (SWA01) is composed of cretaceous marine sediments, mantled by sands and laterites (Desmond, 2001). The Lesueur Sandplain subregion is comprised of coastal Aeolian and limestones, Jurassic siltstones and sandstones (often highly laterised) and alluvials associated with drainage systems (Desmond & Chant, 2002).

Soil landscape mapping of WA has been compiled from the results of various surveys across WA by the Department of Agriculture (now DPIRD (2025)). The Project Area is located across 32 separate soil-landscape units, as summarised in **Table 2.1** and presented in **Figure 2.1**. The most commonly occurring soil-landscape units are the Dandaragan 3 Subsystem (27.0%), the Dandaragan 2 yellow Phase (16.1%), and the Rows 3 pale Phase (10.2%).

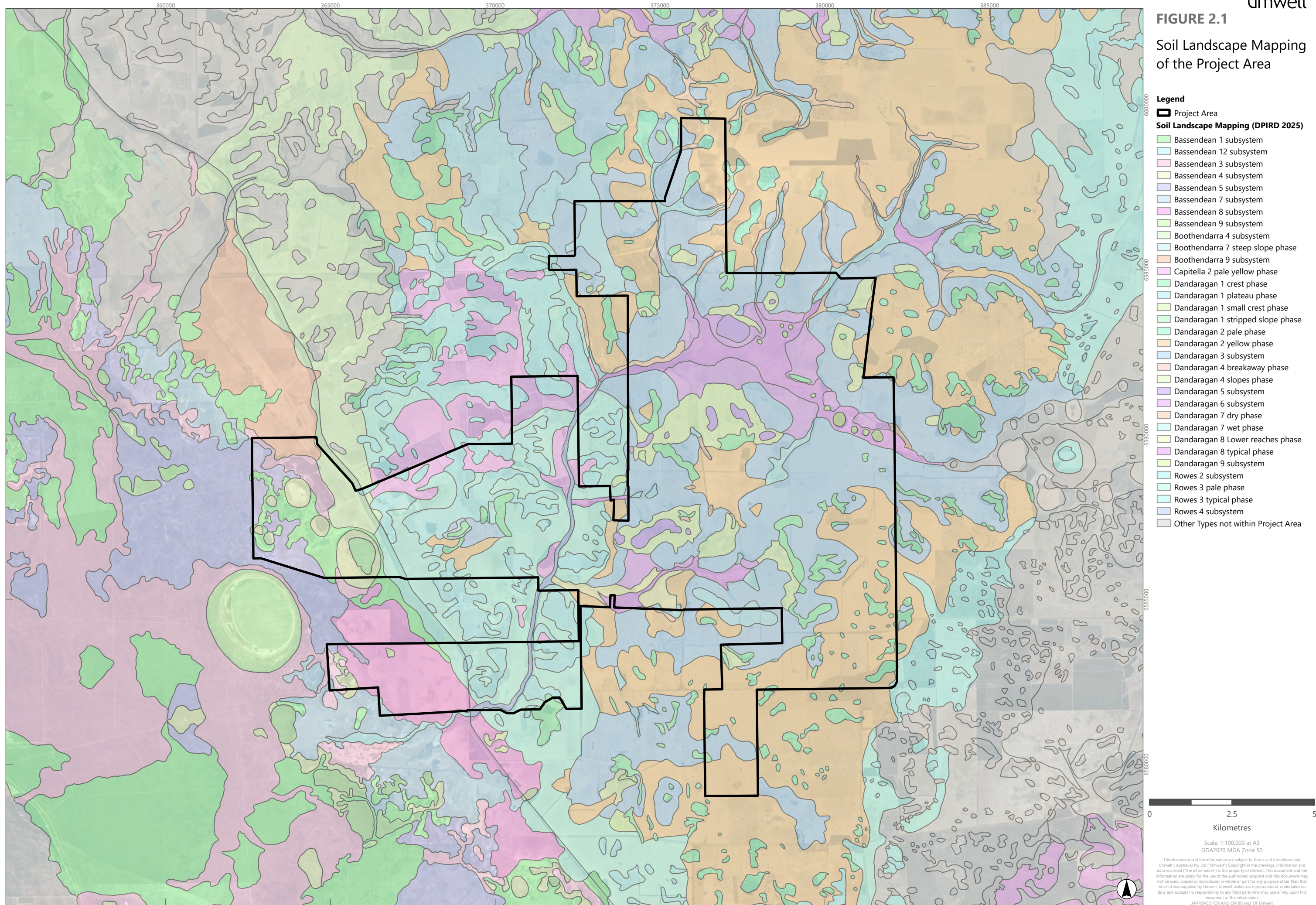
Table 2.1 Soil Landscape Mapping of the Project Area

Soil System	Soil Unit	Description [^]	Mapped Extent in Project Area (ha)
Bassendean	Bassendean 1 subsystem	Undulating to flat sandplain and minor swamps; pale to yellow deep sands.	328.5 (1.9%)
	Bassendean 3 subsystem	Low dunefields; deep, pale grey or white sands.	189.5 (1.1%)
	Bassendean 4 subsystem	Plain, often poorly drained; semi-wet soil, pale shallow sands over pan, sandy duplexes, wet soil.	250.2 (1.5%)
	Bassendean 5 subsystem	Complex pattern of dunes or low sandy rises, poorly drained plains, (Complex of Bs1, Bs4 and Bs6; Bs4 or Bs6 dominant); saline depressions and swamps.	304.6 (1.8%)
	Bassendean 7 subsystem	Plain, occasionally seasonally wet, and numerous sandy rises. Complex of Bs1, Bs4 and Bs6. Bs1 dominant.	15.6 (0.1%)
	Bassendean 8 subsystem	Gently undulating sandplain; yellow deep sand.	598.0 (3.5%)
	Bassendean 9 subsystem	Permanent or semi-permanent swamps.	60.7 (0.4%)
	Bassendean 12 subsystem	Drainage line and adjacent very gently inclined footslopes; mainly sandy duplexes, brown deep sand and brown sandy earth.	1.1 (0.006%)
Capitella	Capitella 2 pale yellow phase	Very gently to gently inclined hillslopes, and minor valleys, associated with Cp1b and Rw2a; pale and yellow deep sands.	471.9 (2.7%)
Dandaragan	Dandaragan 1 crest phase	Hillcrests and very gently to gently inclined hillslopes; red to pale sandy gravels, shallow red to pale sands over duricrust, some red to yellow deep sands.	679.7 (3.9%)
	Dandaragan 1 small crest phase	Small hillcrests associated with rejuvenation; loamy gravel, loamy earths, duplex sandy gravel.	22.5 (0.1%)
	Dandaragan 1 stripped slope phase	Gently to moderately inclined small breakaway slopes; red sandy and loamy gravels.	1.1 (0.006%)
	Dandaragan 1 plateau phase	Plateau remnant, plain some hillcrests; shallow red to brown sands over gravel and duricrust, red sandy gravels.	233.4 (1.4%)
	Dandaragan 2 yellow phase	Very gently to gently inclined hillslopes, some hillcrests and plateau remnants; yellow and brown deep sands, some sandy earths.	2774.4 (16.1%)
	Dandaragan 2 pale phase	Hillcrests and very gently to gently inclined upper hillslopes; pale and yellow deep sands, gravelly pale deep sand.	39.9 (0.2%)
	Dandaragan 3 subsystem	Colluvial slopes, very gently to gently inclined hillslopes; red to brown and yellow deep sands, some sandy gravels and sandy earths.	4643.1 (27.0%)
	Dandaragan 4 slopes phase	Very gently to gently inclined upper hillslopes, partially stripped; loamy and sandy duplexes, loamy earths, red deep sand, loamy gravel.	1017.3 (5.9%)

Soil System	Soil Unit	Description [^]	Mapped Extent in Project Area (ha)
	Dandaragan 4 breakaway phase	Gently to moderately inclined upper hillslopes, minor breakaway slopes; loamy duplexes, loamy gravel, red deep sand.	3.3 (0.02%)
	Dandaragan 5 subsystem	Stripped slopes, very gently inclined hillslopes and hillcrests on chalk outcrops; shallow calcareous loams.	188.1 (1.1%)
	Dandaragan 6 subsystem	Fans, very gently inclined footslopes and hillslopes; sandy duplexes, loamy earths, red deep sand, some sandy gravels.	783 (4.5%)
	Dandaragan 7 dry phase	Very gently inclined footslopes and open depressions; pale and yellow deep sands, sandy duplexes.	124.9 (0.7%)
	Dandaragan 7 wet phase	Narrow open depressions; wet soil, sandy and loamy duplexes, deep sands.	222 (1.3%)
	Dandaragan 8 typical phase	Alluvial plain and sand filled open depressions; wet soil, sandy and loamy duplexes (often over pan or bog iron), pale deep sand, shallow loams on pans.	695.5 (4.0%)
	Dandaragan 8 Lower reaches phase	Alluvial plain, apparently regional groundwater connected; Sandy duplexes, often wet soil.	162.1 (0.9%)
	Dandaragan 9 subsystem	Playas; shallow sands and loams over pans, often wet soil.	38.1 (0.2%)
Rowes	Rowes 2 subsystem	Plateau residuals, hillcrests and very gently to gently inclined hillslopes; sandy gravels, gravelly pale deep sand, some duricrust.	1168.5 (6.8%)
	Rowes 3 typical phase	Colluvial slopes, very gently to gently inclined hillslopes and sand filled minor valleys; yellow deep sand, some sandy earths.	4.9 (0.3%)
	Rowes 3 pale phase	Colluvial slopes, very gently to gently inclined hillslopes and sand filled minor valleys; yellow and pale deep sands.	1749.8 (10.2%)
	Rowes 4 subsystem	Narrow drainage line; deep sand, sandy duplexes, some wet soil.	111.3 (0.6%)
Boothendarra	Boothendarra 4 subsystem	Gently to very gently inclined hillslopes and footslopes; sandy duplexes, deep sands and sandy gravels.	229 (1.3%)
	Boothendarra 7 steep slope phase	Steeply inclined breakaway slopes; loamy gravel, loamy duplexes (over pallid zone clays), rock outcrops.	16.4 (0.1%)
	Boothendarra 9 subsystem	Floodplain, discharge of Cataby creek on coastal plain; sandy duplexes, some wet soil.	84.2 (0.5%)
Total			17,212.7

[^]Source: DPIRD (2025).

FIGURE 2.1
Soil Landscape Mapping
of the Project Area



2.3 Regional Vegetation

As previously mentioned, the Project Area is located within the Perth and Dandaragan IBRA subregions (SWA01, SWA02), as well as the southern edge of the Lesueur Sandplain subregion (GES02) (DCCEEW, 2023c, 2023e). The Perth subregion (SWA02) is a low lying coastal plain, mainly covered with woodlands. It is dominated by Banksia or Tuart on sandy soils, *Casuarina obesa* on outwash plains, and paperbark in swampy areas. In the east, the plain rises to duricrusted Mesozoic sediments dominated by Jarrah (*Eucalyptus marginata*) woodland. The outwash plains, once dominated by *Casuarina obesa-Corymbia calophylla* (Marri) woodlands and Melaleuca shrublands, are extensive only in the south (Mitchell et al., 2002). The Dandaragan Plateau subregion (SWA01) is characterised by Banksia woodland, Jarrah – Marri woodland, Marri woodland and by scrub heaths on laterite pavement and on gravelly sandplains (Desmond, 2001). Lastly, the Lesueur Sandplain subregion (GES02) comprises shrub-heaths rich in endemics on a mosaic of lateritic mesas, sandplains, coastal sands and limestones. Heath occurs on lateritised sandplains along the subregion’s north-eastern margins (Desmond & Chant, 2002).

The vegetation of WA as it was presumed to have existed prior to European settlement has been mapped at a scale of 1:250,000 as vegetation system associations (VSAs), with the Pre-European Vegetation spatial database created (DPIRD, 2019). The Government of Western Australia (GoWA) has released vegetation statistics for VSAs that include pre-European extent, current extent, current extent remaining and current extent protected for conservation (DBCA, 2019). This information has not been updated since 2018, even with the availability of the updated Native Vegetation Extent (DPIRD, 2023) and DBCA Legislated Lands and Waters (DBCA, 2024a) spatial data. Umwelt has intersected IBRA regions, Pre-European Vegetation Mapping (DPIRD, 2019), Native Vegetation Extent (DPIRD, 2023) and DBCA Legislated Lands and Waters (DBCA, 2024a) shapefiles to re-create the same information as DBCA (DBCA, 2019), resulting in less than $\pm 0.5\%$ difference between both GoWA’s current extent remaining and extent protected for conservation percentages (DBCA, 2019) and the re-created percentages. Therefore, the DBCA (2019) data has been presented in **Table 2.2**. The threshold level of retention for pre-European extent of each VSA within a local area and bioregion is considered to be 30% or more (DER, 2014).

The Project Area occurs across seven VSAs, with Dandaragan_999 occurring across 74.9% of the Project Area (**Table 2.2, Figure 2.2**). This VSA has only 9.4% of its pre-European extent remaining within the Dandaragan Plateau IBRA subregion, with only 1.2% currently protected for conservation.

Table 2.2 Vegetation System Associations of the Project Area

IBRA Subregion	VSA	Description	Proportion of VSA Mapped in Project Area (ha)	Current Extent (ha)	Pre-European Extent Remaining (%)	Current Extent Protected for Conservation (%)
Swan Coastal Plain	BASSEDEAN_1030	Low woodland; <i>Banksia attenuata</i> & <i>Banksia menziesii</i>	1,912.7 (11.1%)	79,560.9	69.7	13.9
	BASSEDEAN_1031	Mosaic: Shrublands; hakea scrub-heath / Shrublands; dryandra heath	1,892.6 (11.0%)	394.9	8.6	0
	BASSEDEAN_125	Bare areas; salt lakes	257.3 (1.5%)	355.3	23.1	5.0
Dandaragan Plateau	DANDARAGAN_1030	Low woodland; <i>Banksia attenuata</i> & <i>Banksia menziesii</i>	130.6 (0.8%)	570.5	41.2	0
	DANDARAGAN_1035	Mosaic: Medium open woodland; marri / Shrublands; dryandra heath	19.0 (0.1%)	339.8	10.1	0
	DANDARAGAN_999	Medium woodland; marri	12,890.9 (74.9%)	8477.4	9.4	1.2
Leseur Sandplains	LESUEUR_1031	Mosaic: Shrublands; hakea scrub-heath / Shrublands; dryandra heath	109.7 (0.6%)	73457.3	32.7	37.8

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

FIGURE 2.2

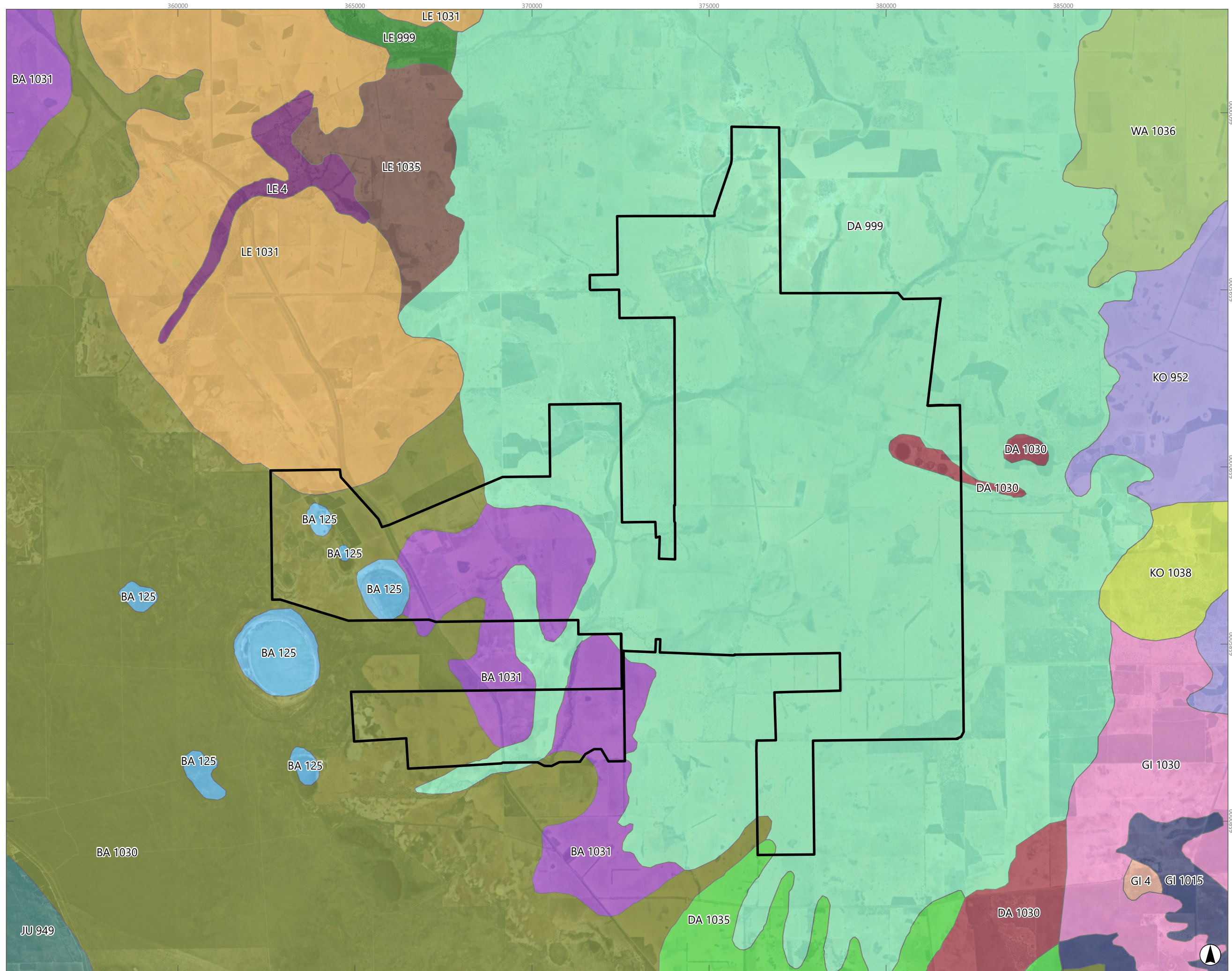
Vegetation System Associations of the Project Area

Legend

Project Area

Pre-European Vegetation (DPIRD 2019)

- BA 1030 : BASSENDEAN_1030
- BA 1031 : BASSENDEAN_1031
- BA 125 : BASSENDEAN_125
- DA 1030 : DANDARAGAN_1030
- DA 1035 : DANDARAGAN_1035
- DA 999 : DANDARAGAN_999
- GI 1015 : GINGIN_1015
- GI 1030 : GINGIN_1030
- GI 4 : GINGIN_4
- JU 949 : JURIE_949
- KO 1038 : KOOJAN_1038
- KO 952 : KOOJAN_952
- LE 1031 : LE SUEUR_1031
- LE 1035 : LE SUEUR_1035
- LE 4 : LE SUEUR_4
- LE 999 : LE SUEUR_999
- WA 1036 : WARRO_1036



2.4 Hydrology Values

The Project Area lies across three groundwater catchment areas within the Moore-Hill Rivers Basin. The Nambung River catchment intersects the Project Area by a small portion in the north, while Moore River catchment intersects the Project Area by a small portion in the south. The majority of the Project Area falls within the Minyulo-Caren Caren catchment.

The Nambung River catchment is situated from the Dandaragan plateau and ends a few kilometres inland from Cervantes. With no opening to the Indian Ocean, the catchment drains internally into the limestone dominated geology. Flowing westward for approximately 22 km, its three tributary sub-catchments (Bibby Creek, Mount Jetty Creek and the upper catchment in the east) comprise a total area of 3,000 km² (DWER, 2025). The Minyulo-Caren Caren catchment includes the large saline/brackish lake, Lake Guraga, and a second saline lake, Namming Lake, located 3 km south of Lake Guraga. Water recharge occurs through direct precipitation, ongoing waterflow from the Caren Caren Brook system (originating 25 km north-east of Lake Guraga) and connecting streams, also passing through Crackers Swamp (DBCA, 2008). Moore River catchment flows southward from Perenjori, Carnamah and Dalwallinu Shires through to Coorow, Dandaragan and Moora Shires, meeting the Gingin Brook where the catchment flows out to the Indian Ocean via Guilderton (Moore River Catchment Council, 2020).

The Project Area intersects the Caren Caren Brook, which flows in a north-south direction through the approximate centre of the Project Area. It is a non-perennial drainage line and is considered a minor river (Landgate, 2024).

Guraga Lake, which is listed on the Directory of Important Wetlands (DBCA-045) (DBCA, 2018), is located approximately 1.4 km west of the Project Area. There are no Ramsar sites located within the Desktop Study Area (DBCA, 2017a).

3.0 Methods

3.1 Personnel and Licensing Information

Table 3.1 lists the personnel involved in fieldwork, plant identifications and report preparation. The Project Manager and Field Team Leaders have considerable previous experience conducting ecological assessments. Other personnel have previous experience in assisting with flora and vegetation surveys in the region. All plant material was collected under the relevant Flora Taking (Biological Assessment) Licence (under Regulation 62 of the Biodiversity Conservation Regulations 2018) and Authorisation to Take or Disturb Threatened Species (pursuant to Section 40 of the BC Act) as outlined in **Table 3.1**. Personnel managing plant identifications have had extensive previous experience (>15 years) in plant identifications of the SCP and Geraldton Sandplain regions, and checked plant identifications undertaken by less experienced personnel for accuracy.

Table 3.1 Personnel and Licensing Information

Personnel	Experience	Flora Collecting Permit	Role
Thomas De Silva BSc Environmental Biology and Marine Science (Hons)	14 years	NA	Project Management
David Coultas BSc (Environmental Biology) (Hons)	>15 years	FB62000051-2 TFL 131-2122	Technical Director Field Team Leader Plant Identifications Reporting
Kyler Rowson BSc (Marine Biology and Biological Sciences)	3.5 years	FB62000399 TFL 2223-0139	Technical Manager Field Team Leader Reporting
Melissa White BSc (Botany)	1.5 years	FB62000612 TFL 2425-0078	Field Team Member
Tom Jones BSc (Botany and Zoology)	1.5 years	FB62000537 TFL 2425-0079	Field Team Member
Monika Hrubanova BSc (Hons) (Botany), MGr (MSc equivalent) (Botany)	4 years	FB62000375-2 TFL 2425-0077	Field Team Leader
Bethea Loudon BSc (Biology)	>15 years	NA	Plant Identifications
Marlee Starceovich Bsc (Environmental Science) (Hons)	9 years	NA	Floristic Classification Analyses

3.2 Desktop Assessment

Prior to commencement of the field survey, a review of all publicly available flora and vegetation data relevant to the Desktop Study Area was undertaken. This included obtaining and reviewing copies of reports of previous biological surveys carried out within the vicinity of the Survey Area (where available) (including interrogation of the Index of Biodiversity Surveys for Assessments (IBSA) database), and interrogation of relevant databases and other sources as listed in **Table 3.2** for the Desktop Study Area.

Where TECs or PECs were identified by the desktop assessment, appropriate DBCA or Department of Climate Change, Energy, the Environment and Water (DCCEEW) nomination/listing descriptions and recovery plans of the TEC or PEC were also reviewed prior to field survey, as well as the ‘Methods for survey and identification of Western Australian threatened ecological communities’ report by DBCA (2024d).

Table 3.2 Searches Undertaken for the Desktop Assessment of the Desktop Study Area

Source	Search Attributes	Purpose
DBCA NatureMap (DBCA, 2024e)	Desktop Study Area. Search undertaken 17 June 2024, reference 18-0624NM	Obtain records of DBCA-listed significant flora taxa within the Desktop Study Area
DBCA Significant Flora Databases (WA Herbarium specimen database and TPFL database) (DBCA, 2024c)	Desktop Study Area boundary. Search undertaken 19 April 2024, reference 15-0424FL	Obtain records of DBCA-listed significant flora taxa within the Desktop Study Area
DBCA Threatened and Priority Ecological Communities Database (DBCA, 2024b)	Desktop Study Area boundary. Search undertaken 19 April 2024, reference 12-0424EC	Obtain records of DBCA-listed TECs and PECs within the Desktop Study Area
DBCA TEC and PEC lists (DBCA, 2023b, 2023c)	Manual review of current DBCA TECs and PECs listed for the midwest DBCA region	Identify whether there are any DBCA-listed TECs or PECs that could occur within the Survey Area
DBCA TEC and PEC records spatial data (DBCA-038) (DBCA, 2024f)	Review of mapped DBCA TECs and PECs within or in proximity to the Desktop Study Area	Identify whether there are any DBCA-classified TECs or PECs that could occur within the Desktop Study Area
DCCEEW Species Profile and Threats (SPRAT) Database (interrogated using the Protected Matters Search Tool) (DCCEEW, 2024)	Database interrogated using Desktop Study Area boundary. No additional buffer applied. Search undertaken 20 April 2024	Identify Matters of National Environmental Significance (MNES), including Threatened flora and TECs listed under the EPBC Act, that occur or have the potential to occur within the Desktop Study Area
IBSA database (DWER, 2024)	Approximate Desktop Study Area boundary (exact boundary cannot be used)	Obtain copies of reports and associated spatial data (where available) to identify records of significant flora and vegetation and introduced flora in the vicinity of the Survey Area
Previous flora and vegetation surveys conducted for the Project or within or in the vicinity of the Study Area (various sources)	Approximate Desktop Study Area boundary	Identify records of significant flora taxa and vegetation and introduced flora in the vicinity of the Survey Area
2018 Statewide Vegetation Statistics incorporating the CAR Reserve Analysis (report 3b) (DBCA, 2019) and Pre-European Vegetation spatial data (DPIRD, 2019)	Project Area boundary	Identify extent of Vegetation System Associations (VSAs) within the Project Area

3.3 Aerial Photograph Interpretation and Survey Design

The design of the 2024 survey complies with the requirements of EPA Technical Guidance (EPA, 2016b) and is consistent with the methods used for other similar flora and vegetation assessments conducted within the vicinity of the Survey Area (**Section 5.1.1**).

Initial interpretation of ortho-rectified aerial photography at a scale of 1:5,000 was conducted to determine preliminary vegetation patterns present within the Survey Area, including any areas of restricted or unusual landforms and types. This review considered the size of vegetated areas and visible vegetation patterns in the Survey Area. Quadrat and relevé locations were proposed based on this review to ensure that a minimum of three quadrats sampled each major discernible vegetation pattern; for smaller patterns, fewer quadrats and relevés were allocated based on the size of the pattern polygon, while for widespread vegetation patterns, quadrats and relevés were allocated across their geographic range.

Data from quadrats established within the D&T Survey Area in 2024 were utilised for the floristic analysis (see **Section 3.6**) and for building a taxon inventory for the Survey Area (see **Section 5.2.1**).

3.4 Field Survey Methods

3.4.1 Survey Timing and Access

The Reconnaissance, Detailed and Targeted flora and vegetation survey was undertaken over four site visits (**Table 3.3**). The Survey Area was accessed and traversed by vehicle and foot. Appropriate landholder permission was obtained prior to undertaking the survey.

The timing of the Detailed and Targeted survey was selected to coincide with what is considered to be the most appropriate time to undertake a Primary survey in the South West province; as per EPA Technical Guidance (2016b), this is spring (September to November), as most flora taxa in this region flower at this time. This includes the majority of significant flora taxa that potentially occur in the Survey Area (**Section 5.1.2**).

Table 3.3 Survey Timing of the Flora and Vegetation Surveys

Trip Number and Survey Type	Date and Duration	Personnel
Trip 1 – Reconnaissance	3 days 2–4 July 2024	David Coultas Kyler Rowson
Trip 2 – Detailed and Targeted	4 days 24–27 September 2024	Kyler Rowson Melissa White
Trip 3 - Detailed	4 days 1–4 October 2024	Monika Hrubanova Tom Jones
Trip 4 – Reconnaissance	1 day 11 December 2024	Kyler Rowson

3.4.2 Detailed Field Survey

Data was collected in the Survey Area by establishing quadrats, relevés and vegetation mapping notes, where appropriate. A comparison and summary of what was recorded at each data point is presented in **Table 3.4**.

3.4.2.1 Quadrats

The quadrat size utilised for the survey is the indicative size for flora and vegetation surveys in the SCP IBRA Bioregion, as per Table 1 of the EPA Technical Guidance (2016b). All quadrats measured 10 m × 10 m, encompassing a total area of 100 m². Quadrat boundaries were demarcated using handheld Global Positioning System (GPS) units and surveying tape measures. Quadrat locations were selected to ensure that at least three quadrats sampled each vegetation pattern initially identified from aerial photograph interpretation, where possible (as per **Section 3.3**). Vegetation boundaries or transition zones were avoided. Additional quadrats were established in areas that were not identified by the initial aerial photograph interpretation but were observed in the field to differ from pre-identified areas, or areas of unusual habitat.

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

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

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

A total of 17 flora and vegetation survey quadrats were established in the D&T Survey Area.

3.4.2.2 Relevés

Flora and vegetation survey quadrats are not considered to be the most appropriate sampling method in all instances. Where areas of vegetation in relatively degraded condition are encountered, or if areas of vegetation are too small or narrow to allow for the establishment of quadrats (e.g. narrow road verges), the establishment and survey of relevés rather than quadrats is considered more appropriate. Relevés were also established in vegetation patterns that had already been adequately surveyed by at least three quadrats.

Relevés surveyed an area within a radius of approximately 20 m around a central point. Most of the data recorded for quadrats was also recorded for relevés (**Table 3.4**); however, only dominant taxa of each stratum level were recorded, as well as any significant flora taxa or taxa not previously observed elsewhere.

A total of eight relevés were recorded within the Survey Area.

3.4.2.3 Vegetation Mapping Notes

Notes on vegetation pattern boundaries and distribution were also taken while traversing the Survey Area. These notes included a GPS location at the point where the notes were taken, and a brief description of the vegetation, including dominant and characteristic taxa, vegetation condition, and landform information (**Table 3.4**). The notes were used to aid in mapping polygons of vegetation patterns that were not surveyed by quadrats or relevés. Not all vegetation pattern polygons received quadrats or relevés; however, polygons could be relatively confidently allocated to a final VT using a combination of field mapping notes and aerial photograph interpretation. Changes in vegetation condition, and additional flora taxa (significant, opportunistic and introduced taxa) were also recorded opportunistically in the Survey Area during traverses between quadrats and relevés.

A total of 282 vegetation mapping notes were recorded within the Survey Area.

Table 3.4 Information Recorded at Each Data Recording Point

Information	Quadrat	Relevé	Vegetation Mapping Note
Personnel	X	X	X
Unique site name	X	X	X
Survey date	X	X	X
GPS coordinates at centre point of note (recorded using handheld global positioning system (GPS) devices) (Geocentric Datum of Australia (GDA2020) Zone 50)		X	X
GPS coordinates at each corner of site (recorded using handheld global positioning system (GPS) devices) (Geocentric Datum of Australia (GDA2020) Zone 50)	X		
Bearings / Orientation of site	X		
Size of sample site (10 m x 10 m)	X		
Fire history	X	X	
Notes on disturbance	X	X	X
Site photograph	X	X	
Topography	X	X	X
Soil colour and type (including the presence of any rock outcropping and surface stones)	X	X	
Vegetation condition (as per EPA Technical Guidance (2016b)) for the South West and Interzone Botanical Provinces)	X	X	X
Dominant taxa within each vegetation stratum		X	X
Complete list of taxa within the site	X		
Average heights/foilage cover of dominant taxa		X	
Average heights/foilage cover of all taxa within site	X		

All traverses made during the 2024 field survey are mapped as track logs in **Figure 3.1**, along with quadrat, relevé and vegetation mapping note locations.

3.4.3 Targeted Field Survey

The majority of significant flora taxa identified by the desktop assessment were considered to be theoretically identifiable during the Detailed and Targeted field surveys (**Section 5.1.2**). In addition, all significant vegetation communities identified by the desktop assessment were considered to be identifiable irrespective of time of survey (**Section 5.1.3**). Therefore, all such taxa and vegetation were targeted during the survey.

Information relating to identifying characteristics, flowering period and habitat of these taxa, and relating to dominant taxa, soil and landform characteristics for significant vegetation, was provided to all field team members prior to undertaking the 2024 survey. In addition, known locations of significant flora taxa were visited prior to survey, where possible, to familiarise personnel with these taxa.

Systematic targeted survey was undertaken within the entirety of the D&T Survey Area, with the exception of the swamp vegetation located south of Stockyard Road. Targeted searching was generally conducted in a grid pattern, at 20 m spacing.

The following information was recorded during traverses of the Survey Area when significant flora taxa or vegetation were encountered opportunistically:

- location (including GPS coordinates and datum, recorded using handheld GPS units), taxon and count of any significant flora encountered at location within a radius of approximately 5 m from GPS coordinates,
- location (including GPS coordinates and datum, recorded using handheld GPS units), community name and extent of any significant vegetation encountered within a radius of approximately 5 m from GPS coordinates,
- comments on habitat, including landform and soils, dominant or characteristic taxa, vegetation condition, description of disturbances, and any apparent correlation between vegetation and landform features, as necessary.

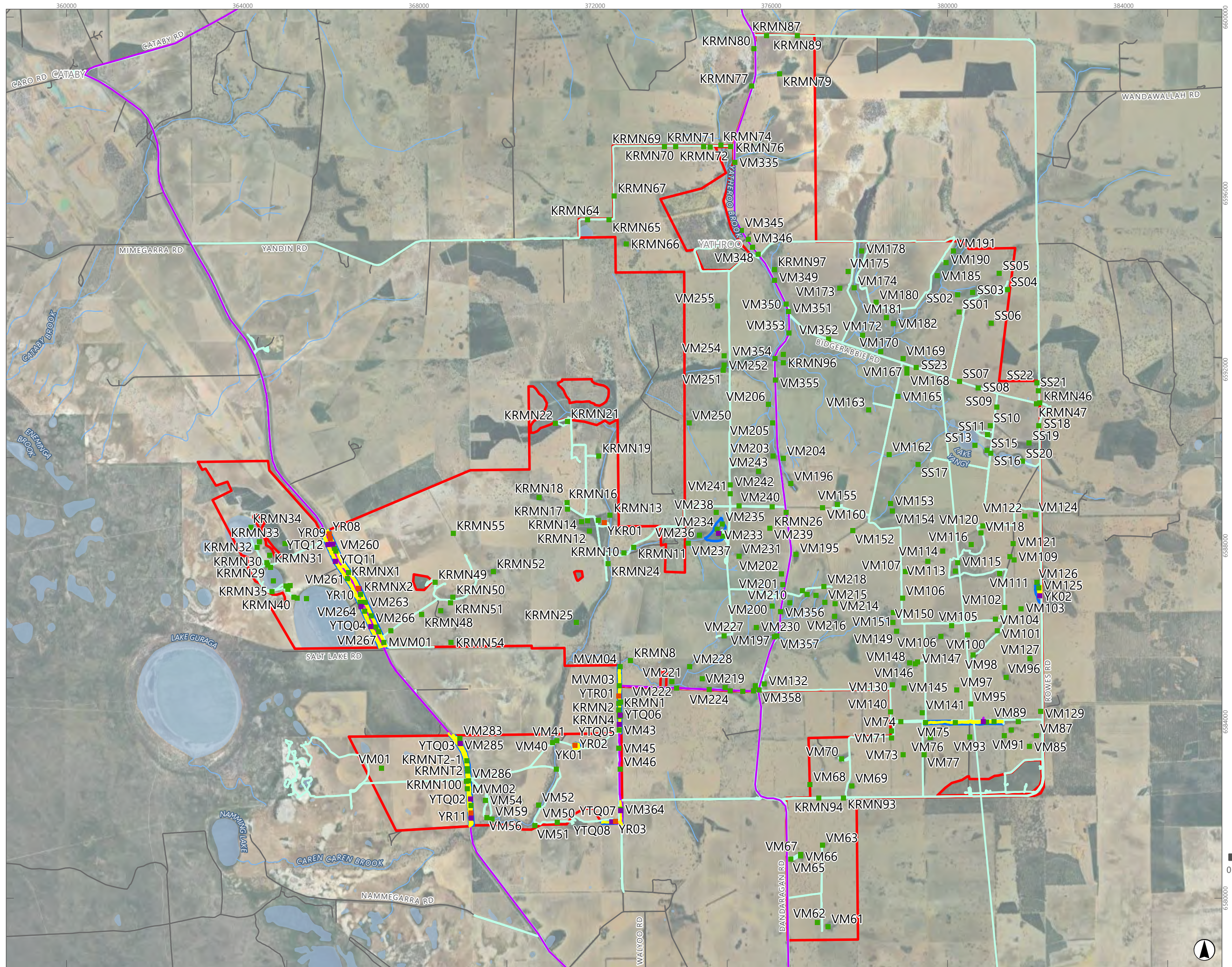
If new locations of significant flora taxa were identified, a representative collection of material was made (see **Section 3.5**).

Significant flora and vegetation searching was also undertaken opportunistically while traversing the broader Survey Area. Information recorded at such locations was the same as that recorded during targeted searching.

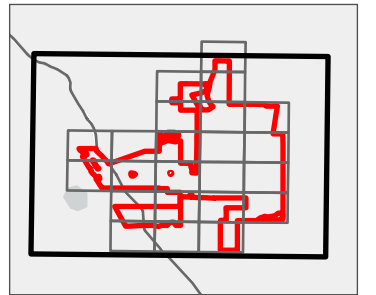
All traverses made during the 2024 Targeted survey are mapped as track logs in **Figure 3.1**.

FIGURE 3.1

Sample Sites and Track logs



- Legend**
- Survey Area
 - D&T Survey Area
 - Railway
 - Road
 - Watercourse
 - Waterbody
 - Quadrat track logs
 - Targeted Searching track logs
 - Reconnaissance track logs
- Site Type**
- Vegetation Mapping Note
 - Quadrat
 - Releve



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Kilometres

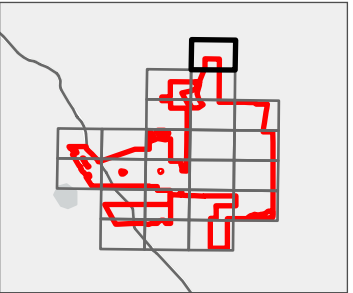
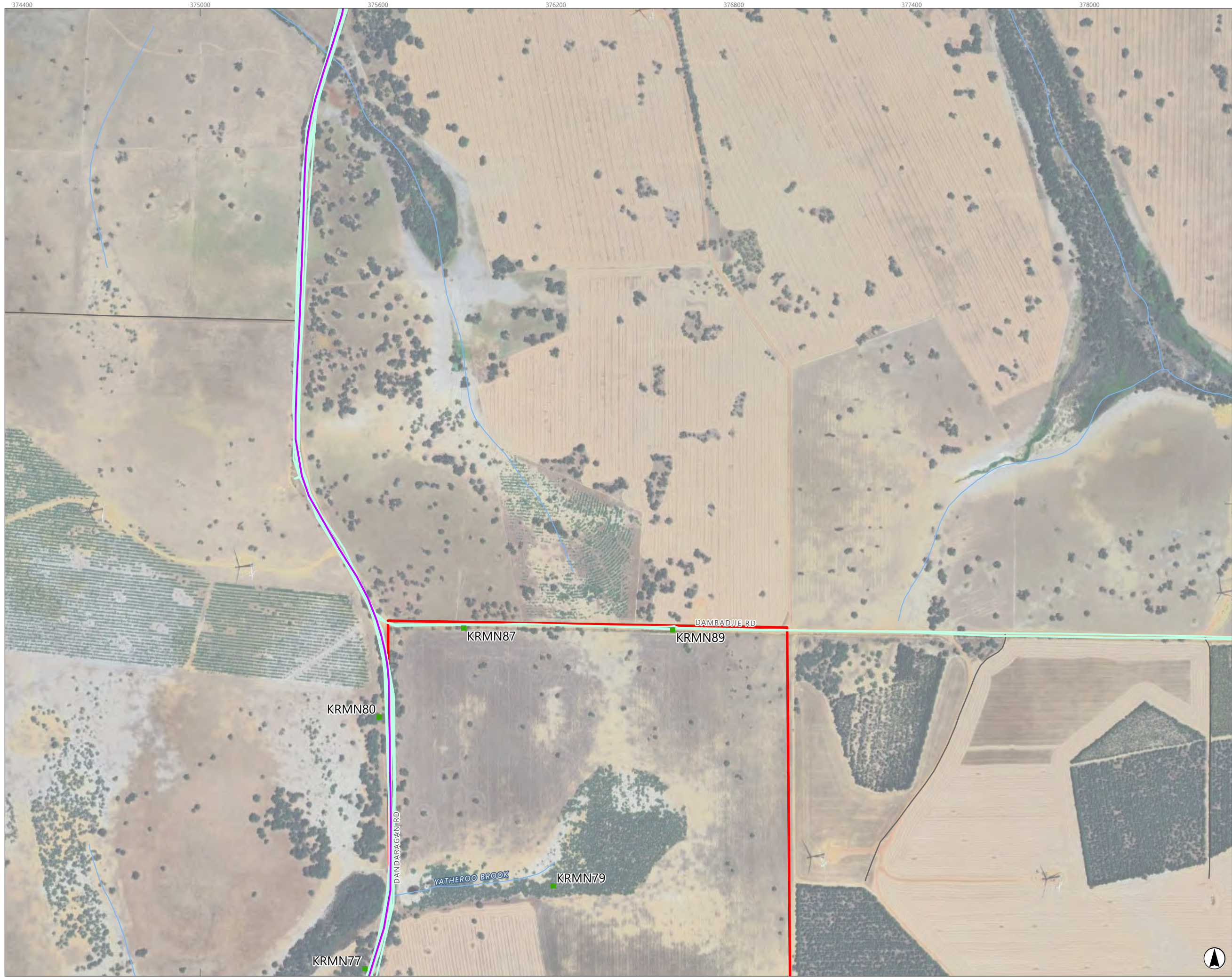
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GDA2020 MGA Zone 50

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FIGURE 3.1.1

Sample Sites and Track logs

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 - Waterbody
 - Quadrat track logs
 - Targeted Searching track logs
 - Reconnaissance track logs
- Site Type**
- Vegetation Mapping Note
 - Quadrat
 - Releve



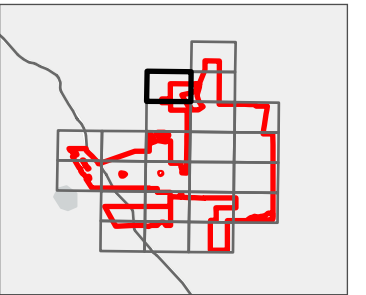
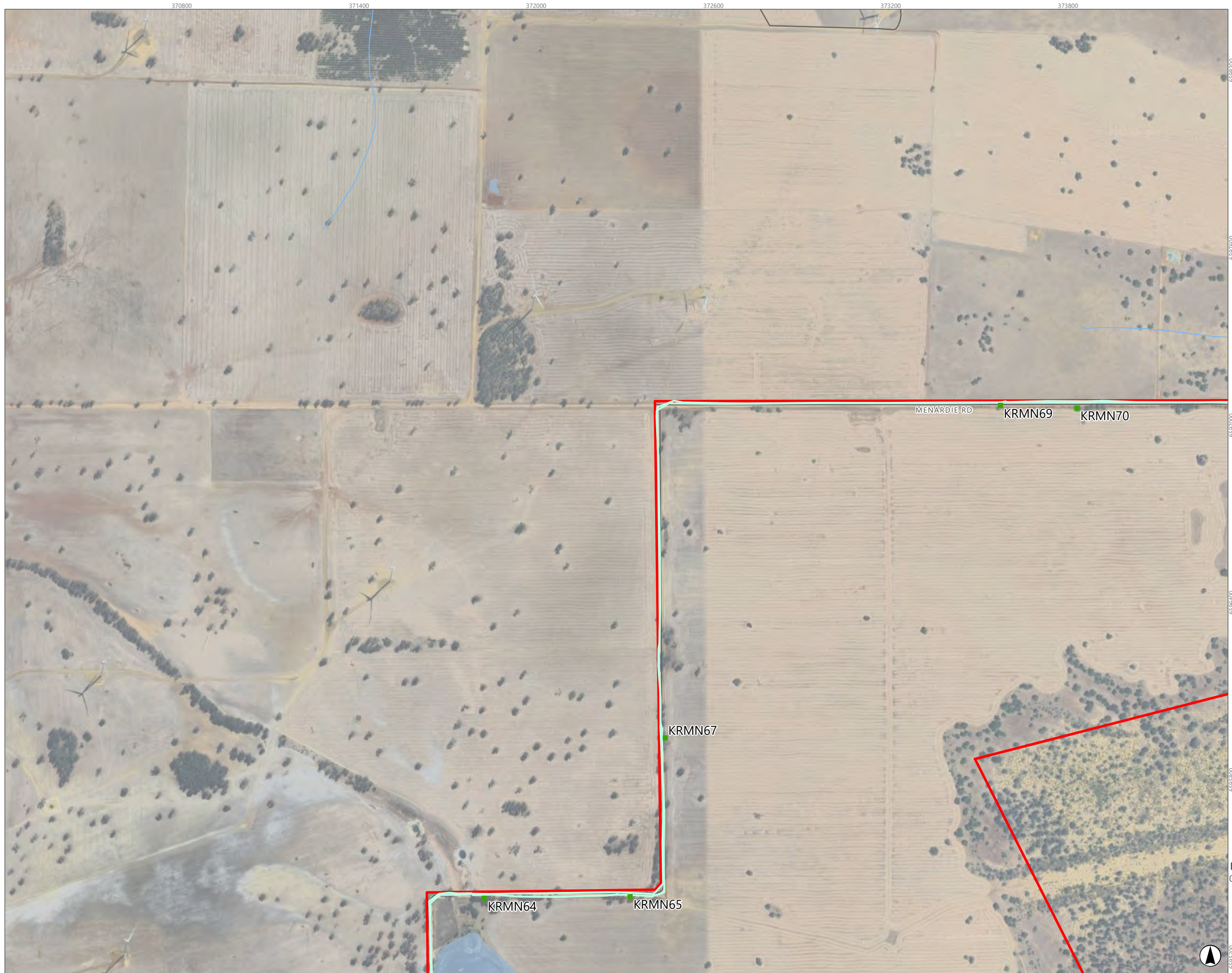
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GDA2020 MGA Zone 50

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FIGURE 3.1.2

Sample Sites and Track logs

- Legend**
- Survey Area
 - D&T Survey Area
 - Railway
 - Road
 - Watercourse
 - Waterbody
 - Quadrat track logs
 - Targeted Searching track logs
 - Reconnaissance track logs
- Site Type**
- Vegetation Mapping Note
 - Quadrat
 - Releve



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Scale: 1:12,000 at A3
GDA2020 MGA Zone 50

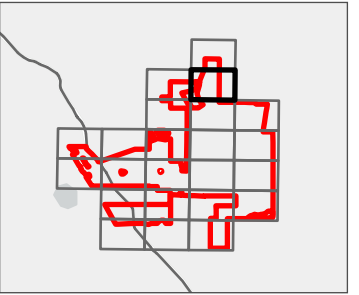
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FIGURE 3.1.3

Sample Sites and Track logs



- Legend**
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 - Railway
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 - Watercourse
 - Waterbody
 - Quadrat track logs
 - Targeted Searching track logs
 - Reconnaissance track logs
- Site Type**
- Vegetation Mapping Note
 - Quadrat
 - Releve



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Scale: 1:12,000 at A3
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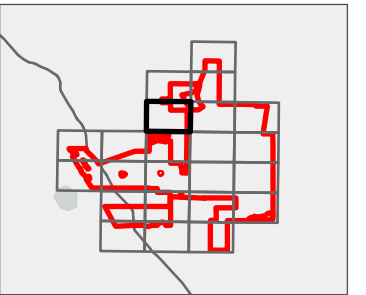
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FIGURE 3.1.4

Sample Sites and Track logs

- Legend**
- Survey Area
 - D&T Survey Area
 - Railway
 - Road
 - Watercourse
 - Waterbody
 - Quadrat track logs
 - Targeted Searching track logs
 - Reconnaissance track logs
- Site Type**
- Vegetation Mapping Note
 - Quadrat
 - Releve



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Scale: 1:12,000 at A3
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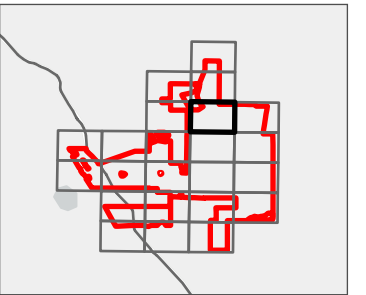
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FIGURE 3.1.5

Sample Sites and Track logs



- Legend**
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 - D&T Survey Area
 - Railway
 - Road
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 - Waterbody
 - Quadrat track logs
 - Targeted Searching track logs
 - Reconnaissance track logs
- Site Type**
- Vegetation Mapping Note
 - Quadrat
 - Releve



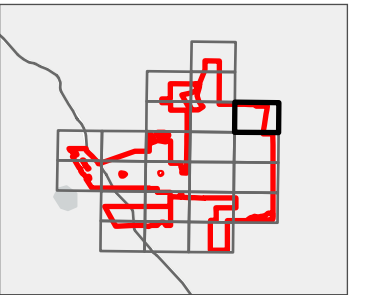
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FIGURE 3.1.6

Sample Sites and Track logs

- Legend**
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 - D&T Survey Area
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 - Road
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 - Waterbody
 - Quadrat track logs
 - Targeted Searching track logs
 - Reconnaissance track logs
- Site Type**
- Vegetation Mapping Note
 - Quadrat
 - Releve



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Kilometres

Scale: 1:12,000 at A3
GDA2020 MGA Zone 50

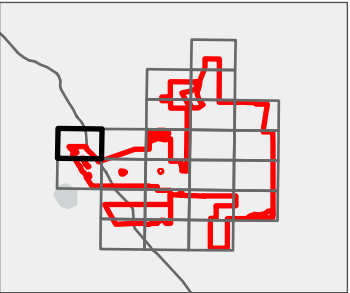
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FIGURE 3.1.7

Sample Sites and Track logs

- Legend**
- Survey Area
 - D&T Survey Area
 - Railway
 - Road
 - Watercourse
 - Waterbody
 - Quadrat track logs
 - Targeted Searching track logs
 - Reconnaissance track logs
- Site Type**
- Vegetation Mapping Note
 - Quadrat
 - Releve



Kilometres

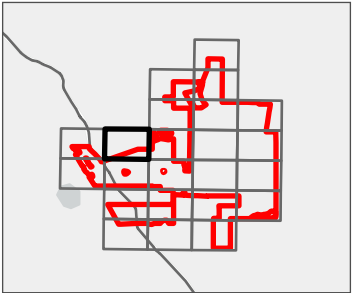
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FIGURE 3.1.8

Sample Sites and Track logs

- Legend**
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 - Waterbody
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 - Reconnaissance track logs
- Site Type**
- Vegetation Mapping Note
 - Quadrat
 - Releve



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Kilometres

Scale: 1:12,000 at A3
GDA2020 MGA Zone 50

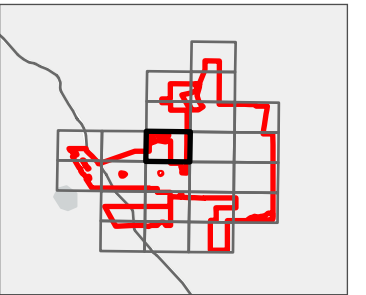
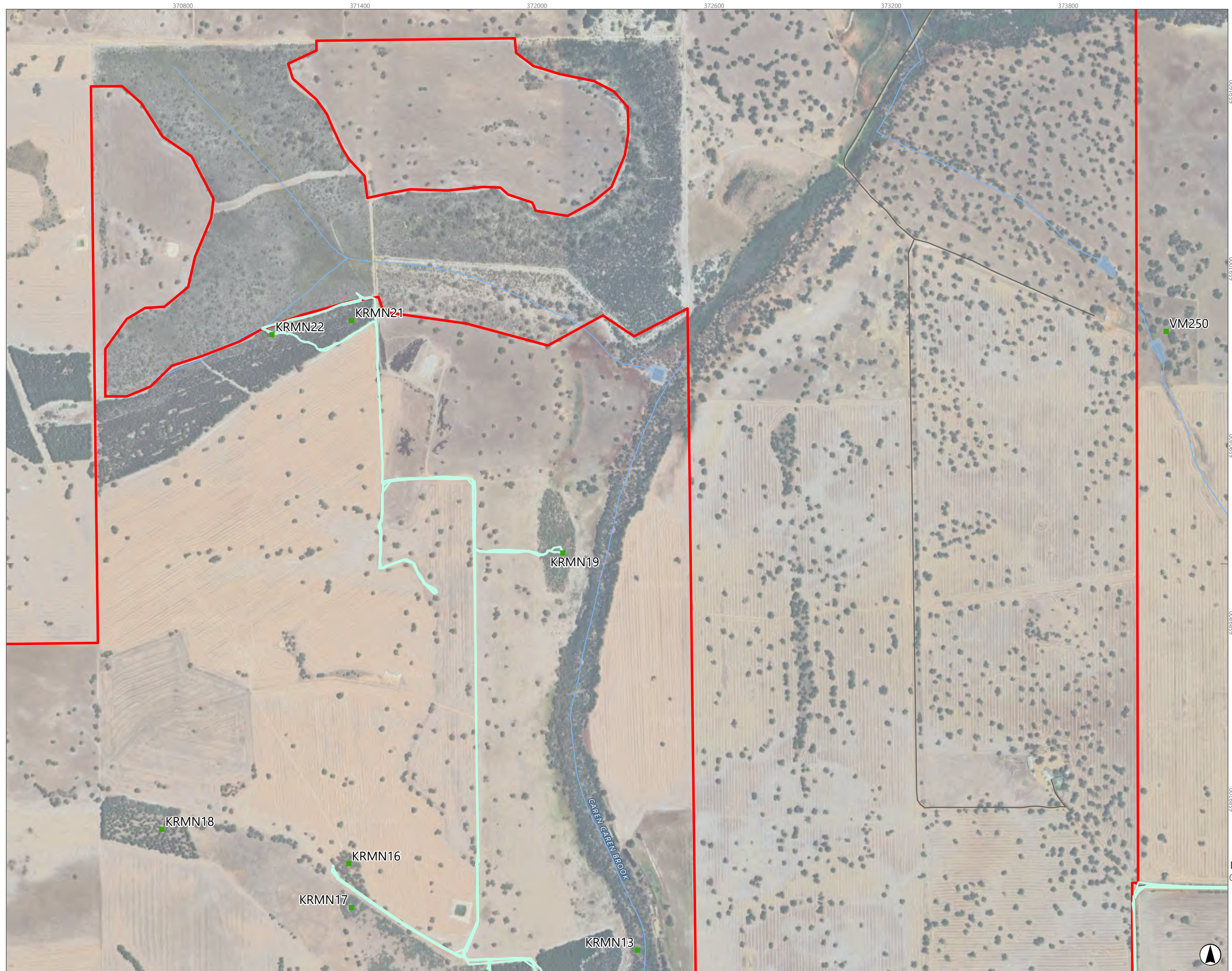
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FIGURE 3.1.9

Sample Sites and Track logs

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 - Releve



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Kilometres

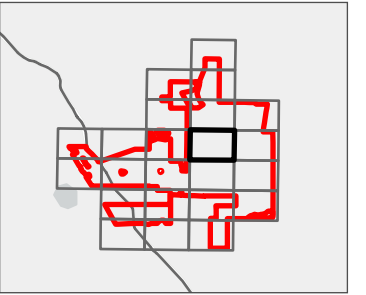
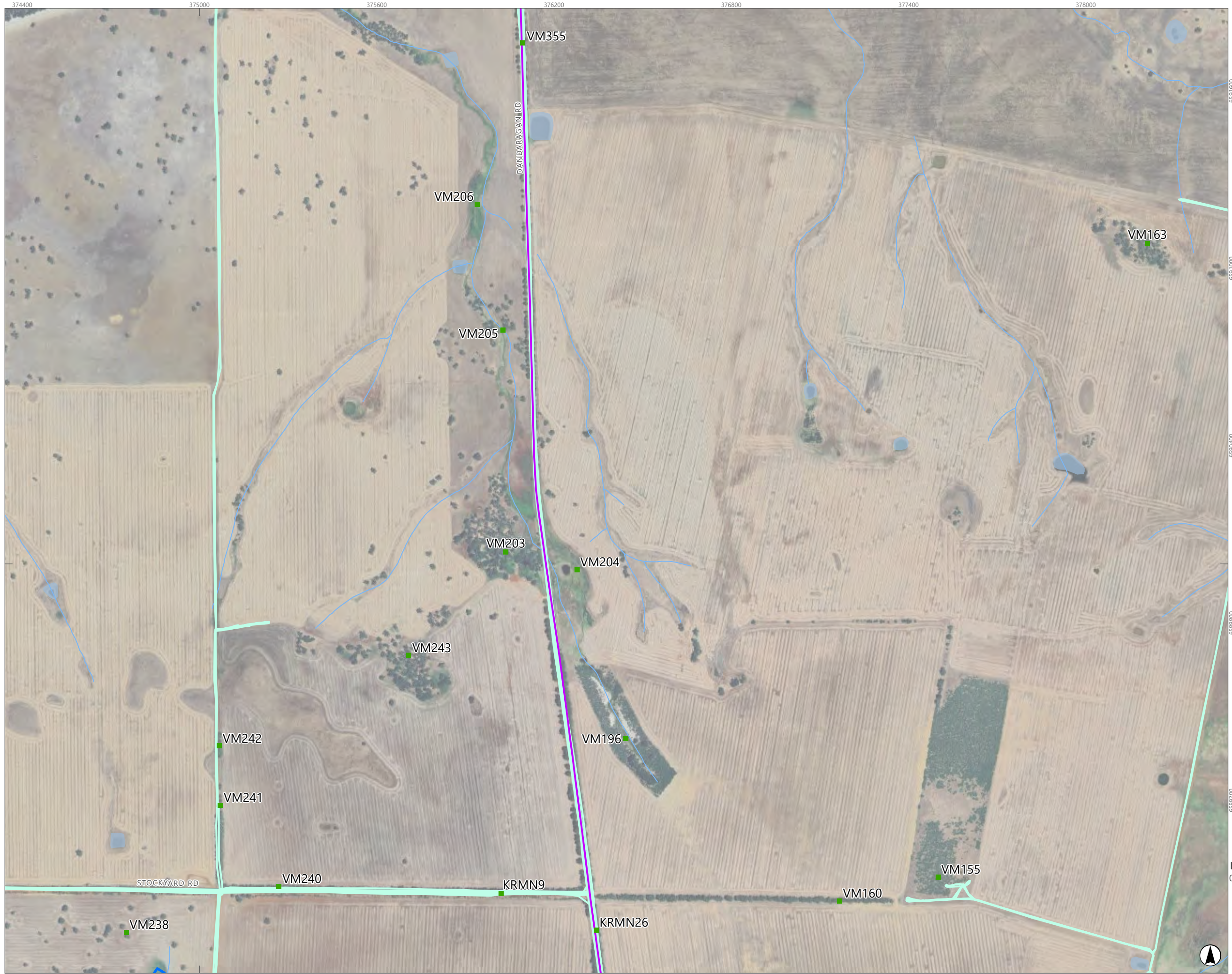
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GDA2020 MGA Zone 50

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FIGURE 3.1.10

Sample Sites and Track logs

- Legend**
- Survey Area
 - D&T Survey Area
 - Railway
 - Road
 - Watercourse
 - Waterbody
 - Quadrat track logs
 - Targeted Searching track logs
 - Reconnaissance track logs
- Site Type**
- Vegetation Mapping Note
 - Quadrat
 - Releve

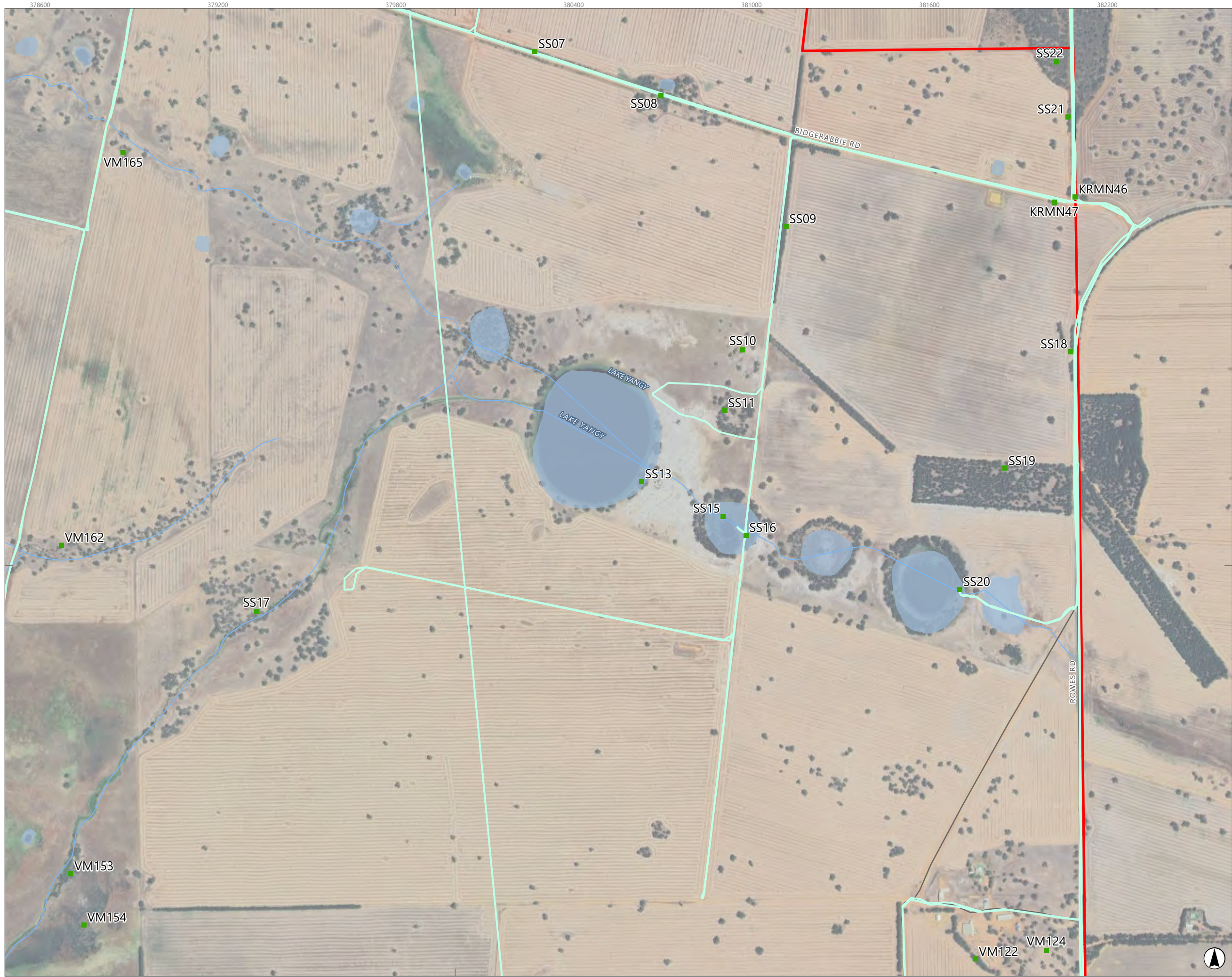


Kilometres
Scale: 1:12,000 at A3
GDA2020 MGA Zone 50

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FIGURE 3.1.11

Sample Sites and Track logs

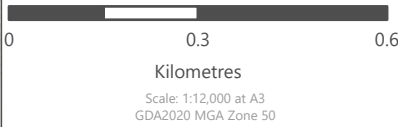
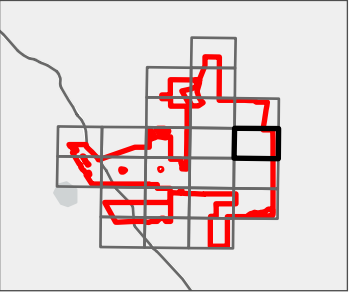


Legend

- Survey Area
- D&T Survey Area
- Railway
- Road
- Watercourse
- Waterbody
- Quadrat track logs
- Targeted Searching track logs
- Reconnaissance track logs

Site Type

- Vegetation Mapping Note
- Quadrat
- Releve



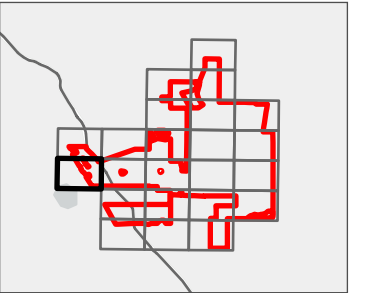
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FIGURE 3.1.12

Sample Sites and Track logs

- Legend**
- Survey Area
 - D&T Survey Area
 - Railway
 - Road
 - Watercourse
 - Waterbody
 - Quadrat track logs
 - Targeted Searching track logs
 - Reconnaissance track logs
- Site Type**
- Vegetation Mapping Note
 - Quadrat
 - Releve



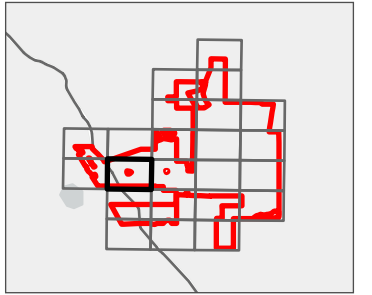
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Kilometres
Scale: 1:12,000 at A3
GDA2020 MGA Zone 50

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FIGURE 3.1.13

Sample Sites and Track logs

- Legend**
- Survey Area
 - D&T Survey Area
 - Railway
 - Road
 - Watercourse
 - Waterbody
 - Quadrat track logs
 - Targeted Searching track logs
 - Reconnaissance track logs
- Site Type**
- Vegetation Mapping Note
 - Quadrat
 - Releve



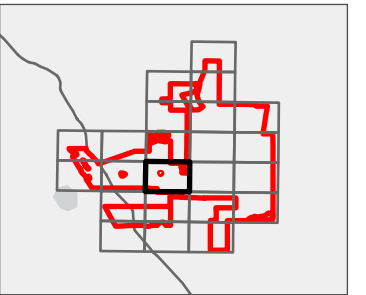
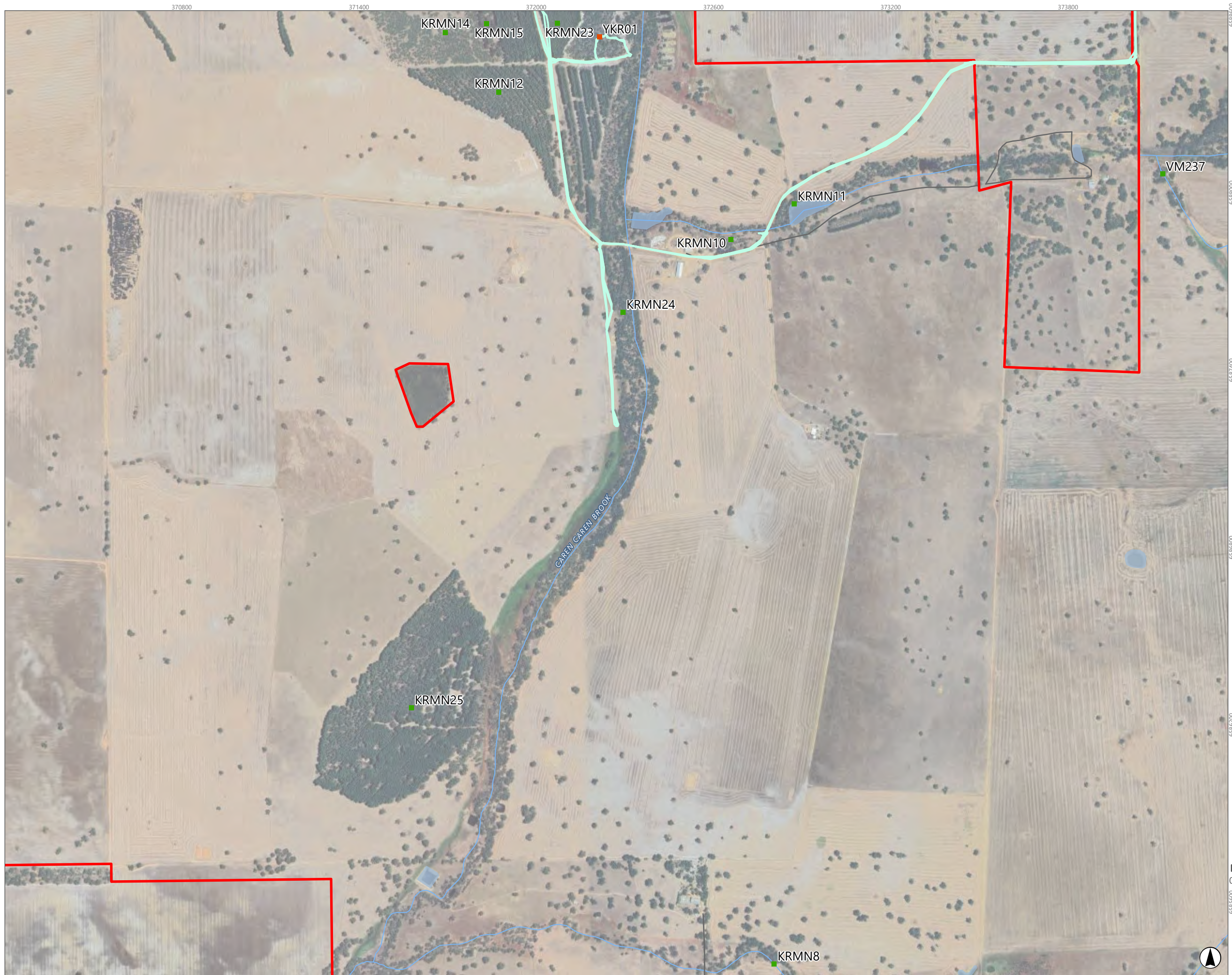
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Kilometres
Scale: 1:12,000 at A3
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FIGURE 3.1.14

Sample Sites and Track logs

- Legend**
- Survey Area
 - D&T Survey Area
 - Railway
 - Road
 - Watercourse
 - Waterbody
 - Quadrat track logs
 - Targeted Searching track logs
 - Reconnaissance track logs
- Site Type**
- Vegetation Mapping Note
 - Quadrat
 - Releve



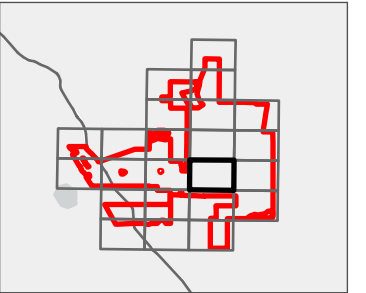
0 0.3 0.6
Kilometres
Scale: 1:12,000 at A3
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FIGURE 3.1.15

Sample Sites and Track logs

- Legend**
- Survey Area
 - D&T Survey Area
 - Railway
 - Road
 - Watercourse
 - Waterbody
 - Quadrat track logs
 - Targeted Searching track logs
 - Reconnaissance track logs
- Site Type**
- Vegetation Mapping Note
 - Quadrat
 - Releve



0 0.3 0.6
Kilometres

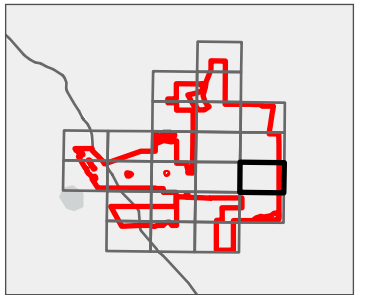
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FIGURE 3.1.16

Sample Sites and Track logs

- Legend**
- Survey Area
 - D&T Survey Area
 - Railway
 - Road
 - Watercourse
 - Waterbody
 - Quadrat track logs
 - Targeted Searching track logs
 - Reconnaissance track logs
- Site Type**
- Vegetation Mapping Note
 - Quadrat
 - Releve

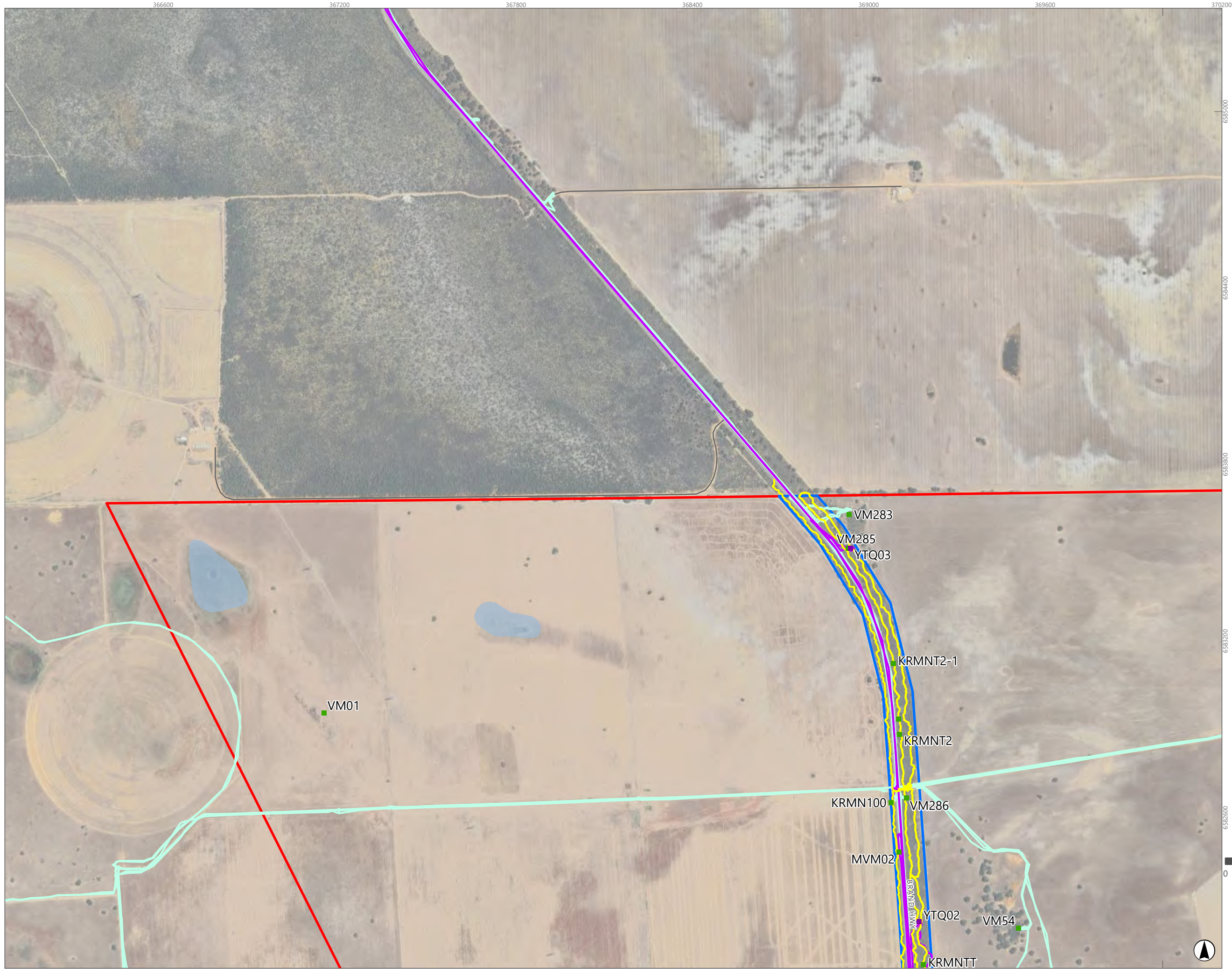


0 0.3 0.6
Kilometres
Scale: 1:12,000 at A3
GDA2020 MGA Zone 50

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FIGURE 3.1.17

Sample Sites and Track logs

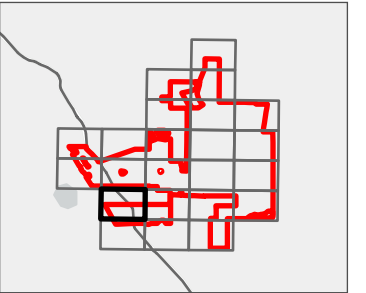


Legend

- Survey Area
- D&T Survey Area
- Railway
- Road
- Watercourse
- Waterbody
- Quadrat track logs
- Targeted Searching track logs
- Reconnaissance track logs

Site Type

- Vegetation Mapping Note
- Quadrat
- Releve



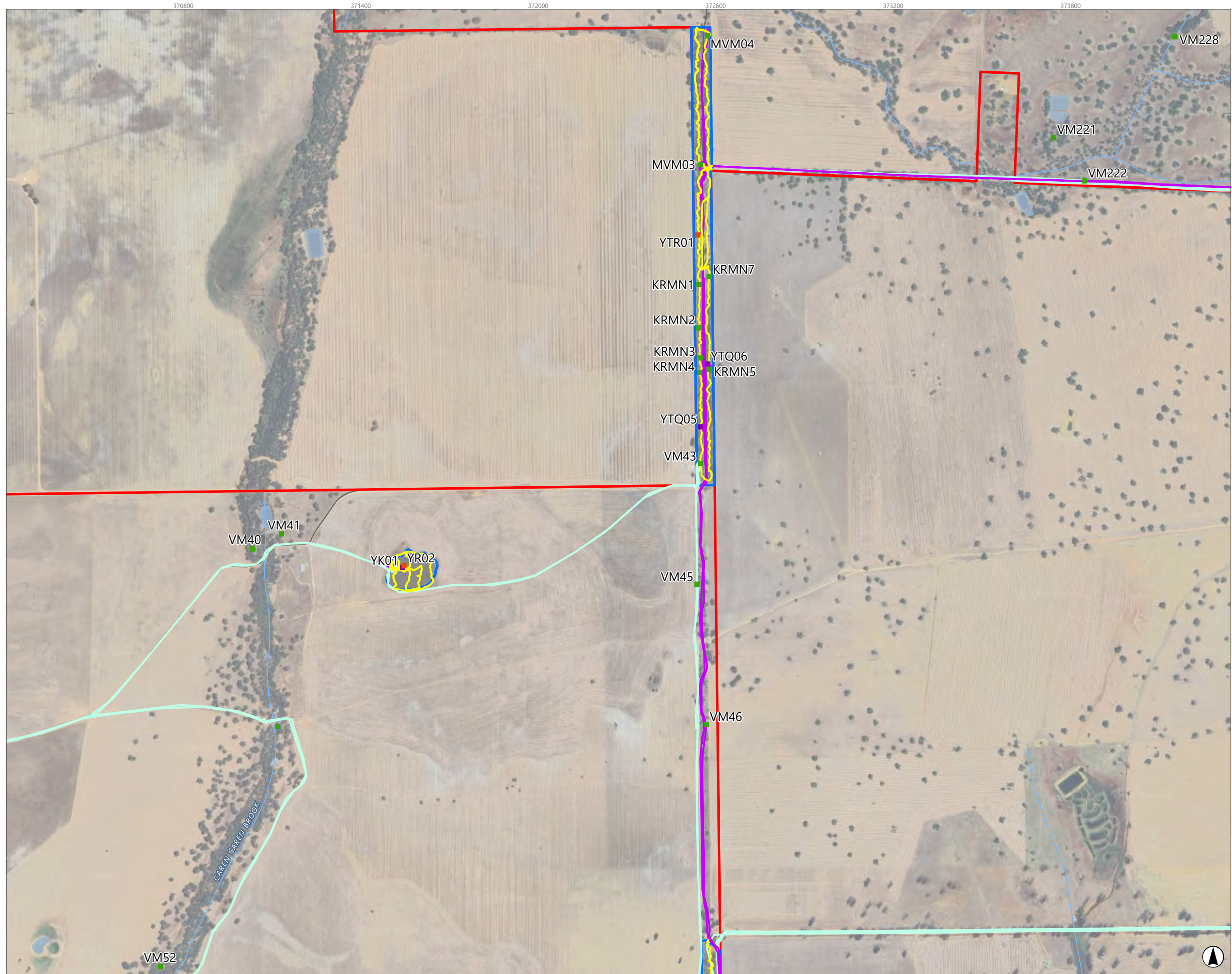
0 0.3 0.6
Kilometres

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GDA2020 MGA Zone 50

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FIGURE 3.1.18

Sample Sites and Track logs

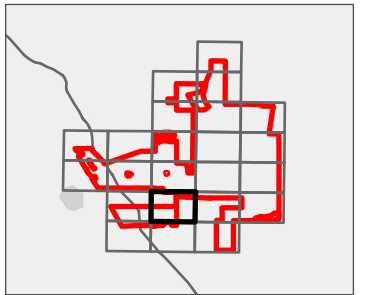


Legend

- Survey Area
- D&T Survey Area
- Railway
- Road
- Watercourse
- Waterbody
- Quadrat track logs
- Targeted Searching track logs
- Reconnaissance track logs

Site Type

- Vegetation Mapping Note
- Quadrat
- Releve



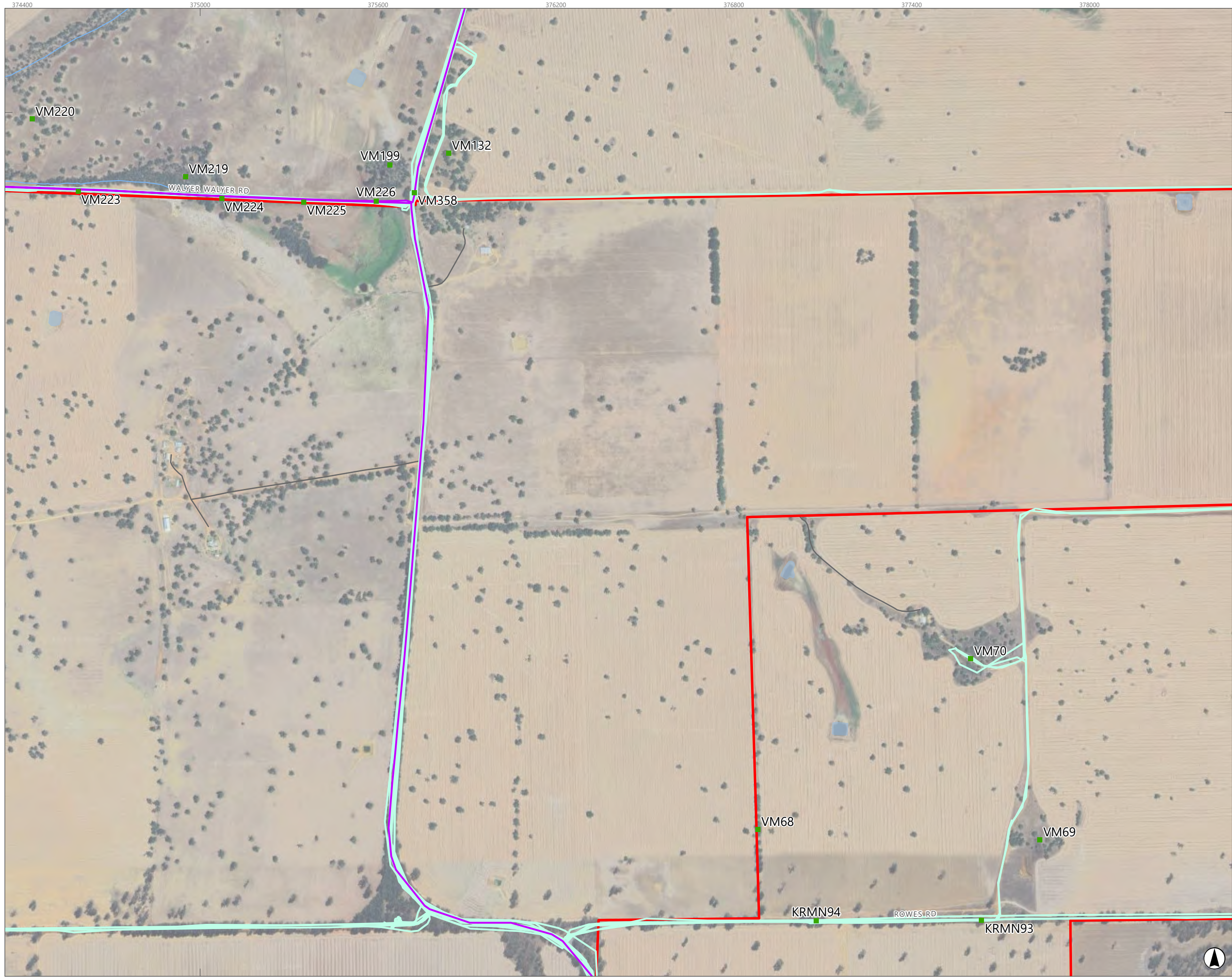
0 0.3 0.6
Kilometres

Scale: 1:12,000 at A3
GDA2020 MGA Zone 50

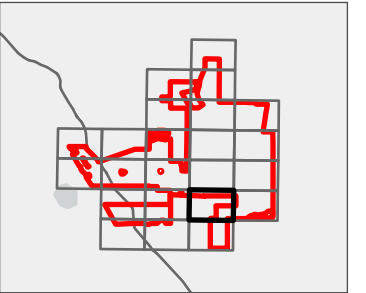
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FIGURE 3.1.19

Sample Sites and Track logs



- Legend**
- Survey Area
 - D&T Survey Area
 - Railway
 - Road
 - Watercourse
 - Waterbody
 - Quadrat track logs
 - Targeted Searching track logs
 - Reconnaissance track logs
- Site Type**
- Vegetation Mapping Note
 - Quadrat
 - Releve

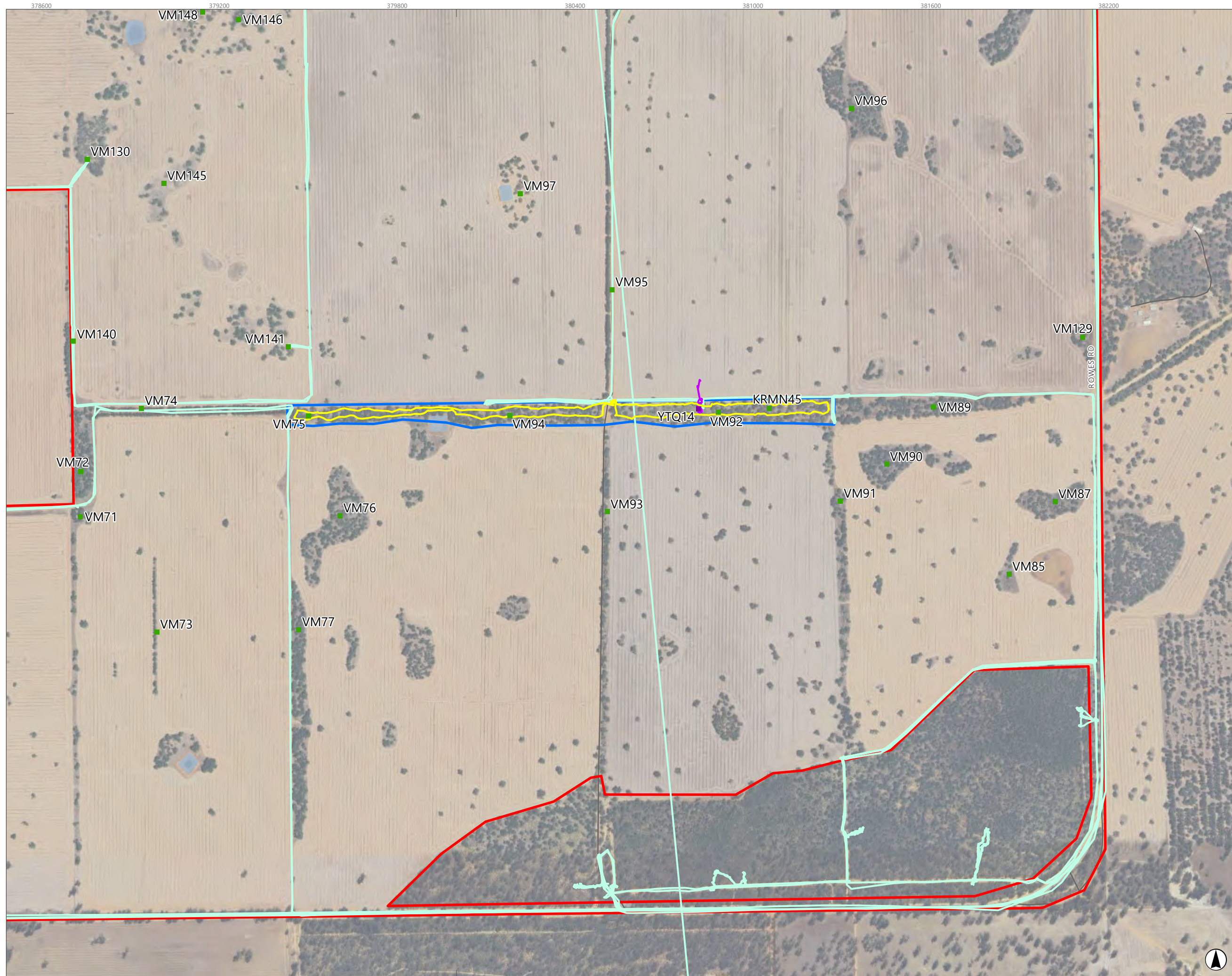


0 0.3 0.6
Kilometres
Scale: 1:12,000 at A3
GDA2020 MGA Zone 50

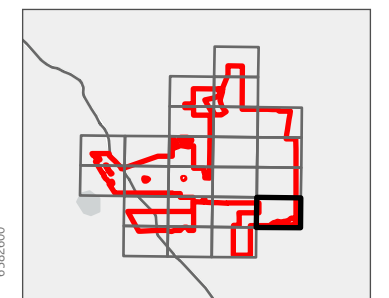
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FIGURE 3.1.20

Sample Sites and Track logs



- Legend**
- Survey Area
 - D&T Survey Area
 - Railway
 - Road
 - Watercourse
 - Waterbody
 - Quadrat track logs
 - Targeted Searching track logs
 - Reconnaissance track logs
- Site Type**
- Vegetation Mapping Note
 - Quadrat
 - Releve



0 0.3 0.6
Kilometres

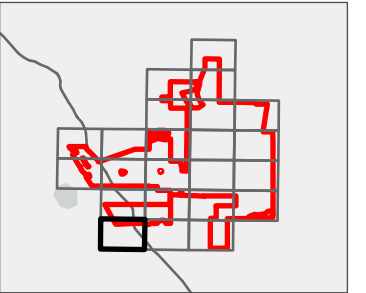
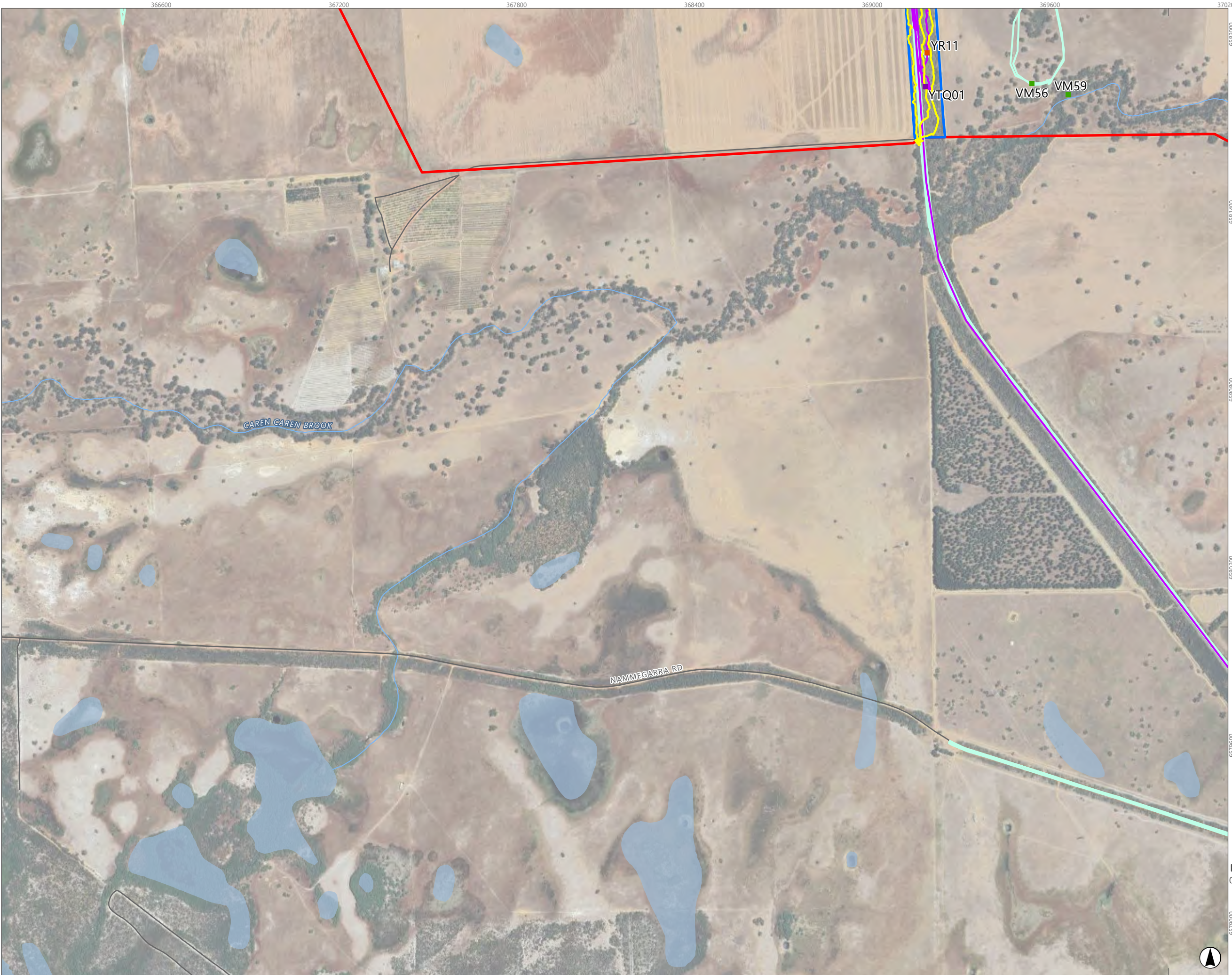
Scale: 1:12,000 at A3
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FIGURE 3.1.21

Sample Sites and Track logs

- Legend**
- Survey Area
 - D&T Survey Area
 - Railway
 - Road
 - Watercourse
 - Waterbody
 - Quadrat track logs
 - Targeted Searching track logs
 - Reconnaissance track logs
- Site Type**
- Vegetation Mapping Note
 - Quadrat
 - Releve



0 0.3 0.6
Kilometres

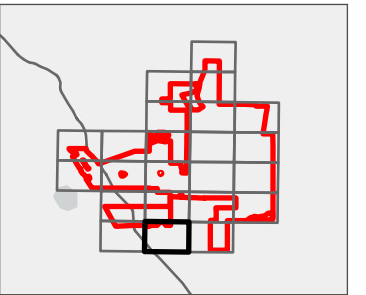
Scale: 1:12,000 at A3
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FIGURE 3.1.22

Sample Sites and Track logs

- Legend**
- Survey Area
 - D&T Survey Area
 - Railway
 - Road
 - Watercourse
 - Waterbody
 - Quadrat track logs
 - Targeted Searching track logs
 - Reconnaissance track logs
- Site Type**
- Vegetation Mapping Note
 - Quadrat
 - Releve



0 0.3 0.6

Kilometres

Scale: 1:12,000 at A3
GDA2020 MGA Zone 50

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FIGURE 3.1.23

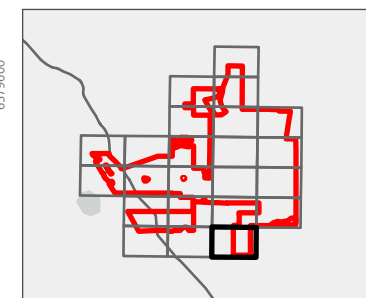
Sample Sites and Track logs

Legend

- Survey Area
- D&T Survey Area
- Railway
- Road
- Watercourse
- Waterbody
- Quadrat track logs
- Targeted Searching track logs
- Reconnaissance track logs

Site Type

- Vegetation Mapping Note
- Quadrat
- Releve



0 0.3 0.6

Kilometres

Scale: 1:12,000 at A3
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3.5 Plant Collection and Identification

Specimens of any unknown taxa encountered during the field survey were collected and pressed for later identification. Plant identifications were undertaken at the WA Herbarium and were overseen by a Principal Botanist with extensive previous experience (>15 years) in plant identifications for flora of the Dandaragan Plateau region (**Section 3.1**). The identification of all taxa (including significant taxa) used the most up to date information available (including taxonomic keys published in books, journals and online, comparison with herbarium specimens, and consultation with taxonomic experts). External experts of particular families or genera were consulted for any specimens considered to be difficult to identify or of taxonomic interest, including botanists at the WA Herbarium.

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

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

3.6 Survey Area Floristic Classification Analyses

Floristic agglomerative hierarchical clustering analysis of data from the 17 quadrats established in the Survey Area (**Section 3.4.2.1**) was performed to inform the groupings of quadrats.

The floristic classification analysis was undertaken by a botanist with previous experience in undertaking and interpreting floristic analysis results and was reviewed by a senior botanist with extensive previous experience (nine years) in analyses of the Swan Coastal Plain and Geraldton Sandplain regions.

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

- **Introduced Taxa:** introduced taxa were removed as their distributions are generally defined by the presence of disturbance (e.g. clearing, animal movement etc.) rather than natural ecological drivers. Vegetation type must be determined independently of vegetation condition for the purposes of impact assessment; therefore, including weeds in the classification analyses introduces the risk of VTs allocated by the analysis being based on condition (presence/absence of introduced species) rather than native taxon presence/absence.
- **Hybrids:** hybrids are usually the result of random reproductive events that produce small numbers (often only one) of sterile offspring and are often not associated with particular habitat types

- Indeterminate taxa: taxa were removed from the analysis where identification was unclear due to poor material available in the field. However, if such a taxon was known to be unique within the dataset (i.e. although not identifiable to species level, there was enough material to indicate it representing a unique taxon), and the taxon had multiple records in the dataset, it was included in the analysis (e.g. *Drosera* sp.).
- Singletons: taxa that occur only once in the dataset were removed, as published studies indicate that they provide little information in the dataset; e.g. Markey & Dillon (2008).

All taxa removed from the classification analysis (excluding taxa belonging to the above mentioned categories) are presented in **Appendix A**. Also presented in **Appendix A** are taxa that were amalgamated in the classification analysis; this was done, for example, where different infra-taxa could not be consistently positively identified at all quadrats due to inadequate material. The dataset contained 147 species following the removal and/or amalgamation of the above noted taxa.

Prior to undertaking agglomerative hierarchical clustering, a principal component analysis (PCA) using R Statistical Software (R Core Team, 2024) was undertaken on a single-layer data matrix consisting of presence/absence species data. Three analyses were then undertaken to determine the optimal number of clusters, with the minimum number of these three metrics being considered to capture the majority of variation in the quadrat data:

- Determining the “elbow” of the curve of a PCA scree plot and retaining all components before this point,
- The point where the principal components contribute 5% of the standard deviation and the principal components cumulatively contribute 90% of the standard deviation,
- The point where the percent change in variation between consecutive principal components is less than 0.1%.

The same presence-absence data matrix was then used in the classification analysis, with the classification and ordination analysis of the data matrix undertaken using the ‘vegan’ (Oksanen et al., 2025) and ‘cluster’ (Maechler & Rousseeuw, 2024). The Bray-Curtis coefficient was used to generate an association matrix for the classification analysis. This association matrix consisted of pairwise coefficients of dissimilarities between quadrats based on floristic data. Agglomerative hierarchical clustering, using flexible Unweighted Pair Group Method with Arithmetic Mean (UPGMA) ($\beta = -0.1$), was used to generate a quadrat classification dendrogram using the ‘factoextra’ R package (Kassambara & Mundt, 2020).

A two-way table showing species presence in quadrats within clusters was also produced. Dissimilarity indices using the Bray-Curtis coefficient were generated for taxa as for quadrats, with the ‘dendextend’ R package (Galili, 2015) then used to split quadrats and taxa into clusters (as presented in the dendrogram). The ‘pheatmap’ package (Kolde, 2019) was subsequently used to produce the two way table.

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

3.7 Vegetation Type Definition, Mapping and Description

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

Following this process, floristic and structural data recorded at relevés was examined to determine whether vegetation sampled by such relevés, such as in the case where vegetation condition may not support classification analysis, was analogous to any of the VTs defined by floristic composition classification. Any such vegetation that was not considered to be analogous with any of the VTs defined by floristic classification was considered to represent a discrete VT.

VT descriptions have been adapted from the National Vegetation Information System (NVIS) Australian Vegetation Attribute Manual (NVIS Technical Working Group, 2017). The use of the NVIS system for VT descriptions is stipulated by EPA Technical Guidance (2016b), however it is worthy of note that the latest version (7.0) was published in 2017, subsequent to the release of the current EPA Technical Guidance. The NVIS model follows nationally-agreed guidelines to describe and represent VTs, so that comparable and consistent data are produced nation-wide. It should be noted that the NVIS system utilises vegetation descriptions derived from structural characteristics of the individual community units, while quadrat-derived VTs presented in this report are defined based on the results of a floristic classification analysis, excluding any structural data. Such VTs therefore may include multiple structural types. Considering the effect of disturbance factors such as fire on vegetation structure, this approach is designed to provide a map of VTs that reflect taxon composition and the influences of the physical and chemical environment, rather than disturbance history.

For each VT, indicator taxa were defined via Indicator Taxon Analysis (INDVAL). This was conducted using the 'labdsv' R package (Roberts, 2023) via the method of Dufrêne and Legendre (1997). This generates INDVAL values (a measure of taxon fidelity to a given VT) that range from 0 to 100; an INDVAL value of 100 indicates that a taxon is present in all quadrats within a particular VT and absent from all other quadrats included in the analysis. The INDVAL values were then tested for significance of the indicator taxa using a Monte Carlo permutation test. Indicator taxa were defined as taxa with a significance p value of either <0.05, <0.01 or <0.001. The same taxa exclusions (i.e. introduced taxa and hybrids) and amalgamations that were used for the Survey Area floristic classification analysis (as per **Appendix A**) were employed for the indicator species analysis. Note that only VTs sampled with more than one quadrat can be analysed for indicator species.

Locations of quadrats and/or relevés within each VT were used in conjunction with aerial photograph interpretation and vegetation mapping notes to develop VT mapping polygon boundaries. Mapping boundaries were then developed using aerial Light Detection and Ranging (LiDAR) imagery, provided by Neoen on 21 January 2025. Detections of vegetation were extracted from the LiDAR and converted into polygons using Geographic Information System (GIS) software. This data was then manually inspected at a maximum scale of 1:5,000 and alterations to polygons were made where the LiDAR mapping did not accurately reflect the actual vegetation boundaries (as per aerial imagery interpretation by an experienced botanist).

3.8 Vegetation Condition Mapping

Vegetation condition was described using the vegetation condition scale presented by EPA (2016b) for the South West and Interzone Botanical Provinces (**Table 3.5**). Notes on vegetation condition were taken during the survey at all data point locations. Vegetation condition category polygon boundaries were developed using this information in conjunction with introduced flora taxa location data and were digitised using GIS software as for VT polygon boundaries.

Table 3.5 Vegetation Condition Scale as Described in EPA (2016b) for South West and Interzone Botanical Provinces

Vegetation Condition	South West and Interzone Botanical Provinces
Pristine	Pristine or nearly so, no obvious signs of disturbance or damage caused by human activities since European settlement.
Excellent	Vegetation structure intact, disturbance affecting individual species and weeds are non-aggressive species. Damage to trees caused by fire, the presence of non-aggressive weeds and occasional vehicle tracks.
Very Good	Vegetation structure altered, obvious signs of disturbance. Disturbance to vegetation structure caused by repeated fires, the presence of some more aggressive weeds, dieback, logging and grazing.
Good	Vegetation structure significantly altered by very obvious signs of multiple disturbances. Retains basic vegetation structure or ability to regenerate it. Disturbance to vegetation structure caused by very frequent fires, the presence of very aggressive weeds, partial clearing, dieback and grazing.
Degraded	Basic vegetation structure severely impacted by disturbance. Scope for regeneration but not to a state approaching good condition without intensive management. Disturbance to vegetation structure caused by very frequent fires, the presence of very aggressive weeds at high density, partial clearing, dieback and grazing.
Completely Degraded	The structure of the vegetation is no longer intact and the area is completely or almost completely without native species. These areas are often described as 'parkland cleared' with the flora comprising weed or crop species with isolated native trees and shrubs.

3.9 Significant Flora

As per EPA (2016b), flora taxa may be significant for a range of reasons, as outlined in **Section 1.2**.

Significant flora taxa recorded within the Survey Area are discussed in **Section 5.2.3** with reference to the above categories. Point locations, individuals and populations of significant flora known from the Survey Area are also presented in this section. Note that a population in the context of this survey is defined as a discrete group of individuals of a taxon separated by more than 500 m from the nearest discrete group of individuals (DBCA, 2017b); however, this definition can only be tentatively applied if the intervening 500 m has not been surveyed.

Conservation codes for Western Australian flora are presented on the DBCA Threatened species and communities website (DBCA, 2023a).

3.10 Significant Vegetation

As per EPA (2016b), vegetation may be significant for a range of reasons as outlined in **Section 1.2**.

The vegetation of the Survey Area was manually compared to TEC/PEC descriptions by a Botanist, and reviewed by the Principal Botanist, as returned by desktop assessment, and otherwise as relevant to the region, to determine whether any vegetation may represent a TEC or PEC; specifically, comparisons of dominant taxa, soils, topography and geographical distribution of VTs were made to those of any TECs or PECs potentially occurring in the Survey Area.

Determination of BC Act listed TECs was undertaken by review of the survey and determination criteria as per DBCA (2023d). A similar process was followed for TECs listed under the EPBC Act, with comparisons made to the appropriate listing and conservation advice for any TECs potentially occurring in the Survey Area.

The remaining significant vegetation criteria other than “being identified as a TEC and PEC” were applied to VTs mapped in the Survey Area to determine whether a VT was significant in a local or regional context. However, in a regional context, limited information is available for comparison with VTs in the Survey Area. Significant vegetation is discussed further in **Section 5.2.9**.

Definitions, categories and criteria for TECs and PECs in WA are presented on the DBCA Threatened species and communities website (DBCA, 2023d).

3.11 Likelihood of Occurrence

A likelihood of occurrence (LoO) assessment for significant flora taxa and significant vegetation that were identified by the desktop assessment was undertaken post survey using the following categories:

- **Unlikely:** Species or community unlikely to occur in the Survey Area due to lack of suitable preferred habitat; or combination of survey undertaken during correct survey period for identification, adequate survey intensity and/or vegetation condition deemed insufficient for species or community to occur.
- **Potential:** Suitable habitat present in the Survey Area; no known locations in proximity to Survey Area (> 10 km); not recorded during the Survey, however survey intensity not sufficient to reduce likelihood of occurrence to Unlikely.
- **Possible:** Suitable habitat present in the Survey Area; known locations in close proximity to Survey Area (< 10 km); not recorded during the Survey, however survey intensity not sufficient to reduce likelihood of occurrence to Unlikely.
- **Known:** Species or community known to occur in the Survey Area, either through historical records or through the findings of this survey.

4.0 Adequacy and Limitations of Survey

4.1 Adequacy of Survey

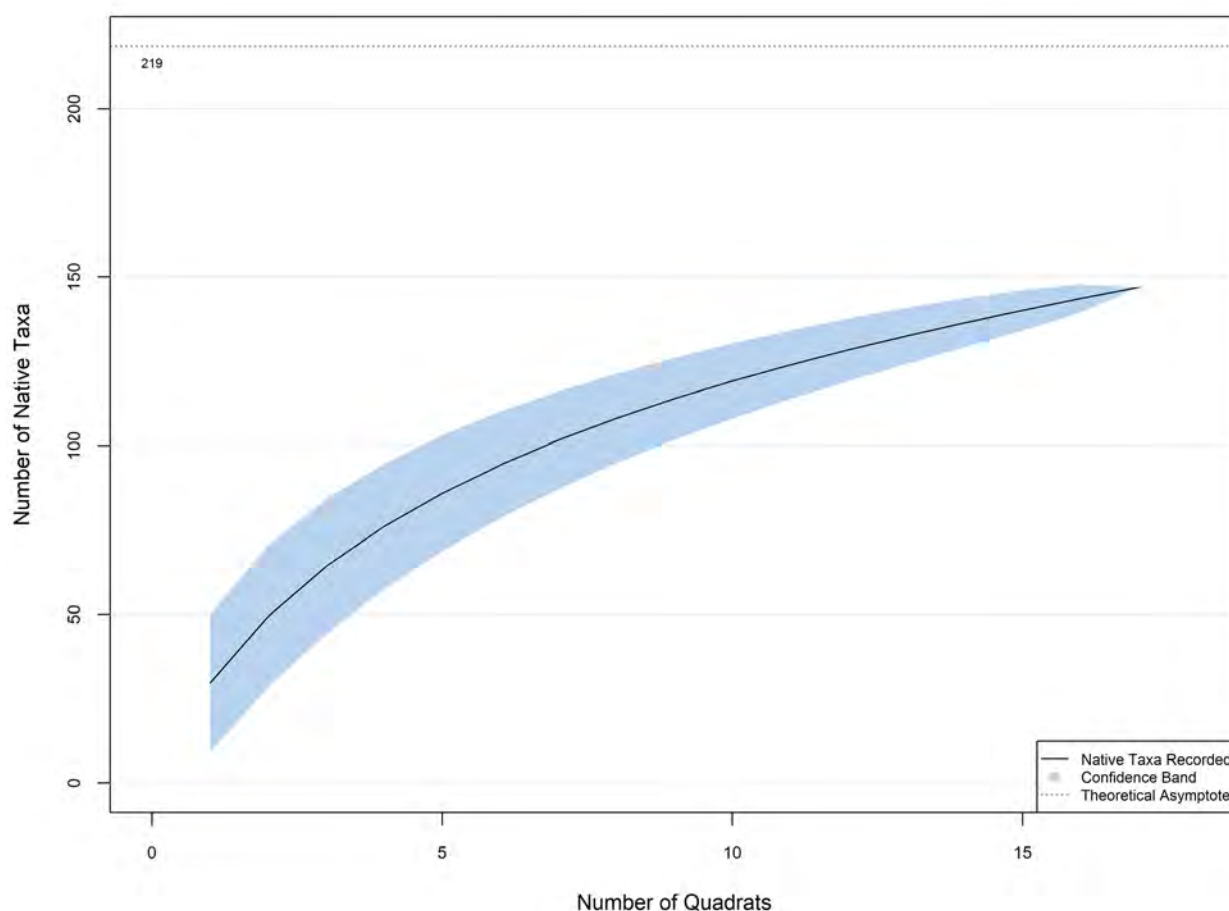
The D&T Survey Area covers 130.5 ha, within which 17 quadrats were established during the 2024 Detailed survey. Quadrats were established in all preliminary vegetation patterns discernible by initial aerial photograph interpretation (**Section 3.3** and **Section 3.4.2**), both to adequately sample variation in vegetation throughout the D&T Survey Area, and to ensure adequacy of sampling for vascular plants.

The number of quadrats established in the D&T Survey Area is considered to be acceptable given the relatively low diversity of topography and soil types noted in the D&T Survey Area, as well as its size (approximately 1 quadrat established per 7.6 ha).

To provide an indication of the adequacy of the Detailed survey, a taxon accumulation curve was produced with the 'vegan' R package (Oksanen et al., 2025) using R statistical Software (R Core Team, 2024). Taxon accumulation curves represent a theoretical model of the relationship between sampling intensity and taxon accumulation; when sampling intensity is increased, taxon accumulation is reduced, and the taxon accumulation curve becomes asymptotic.

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

Graph 4.1 presents the native taxon accumulation curve generated from quadrat data from the D&T Survey Area. Using the Chao-2 estimator, the recorded number of native taxa within quadrats (147 taxa) is equivalent to 67% of the estimated native taxon richness in the D&T Survey Area. It is important to note that this test of survey adequacy is conservative in that it does not consider taxa recorded opportunistically outside quadrats. Including this data, 248 native taxa were recorded in the D&T Survey Area, which is greater than the number estimated by the Chao -2 estimator (219).



Graph 4.1 D&T Survey Area Quadrat Data Native Taxon Accumulation Curve

Another adequacy of survey measure is that developed by Mueller-Dombois & Ellenberg, (1974), who suggest that a cut off point might be when a 10% increase in quadrats surveyed results in a $\leq 5\%$ increase in taxa recorded. This measure was also calculated using all native flora taxa recorded within each quadrat. The number of quadrats established by the field survey satisfies this adequacy measure, with the final native taxon increase value of 3.7% recorded following a 10% increase in quadrats.

4.2 Assessment of Limitations

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

Table 4.1 Potential Limitations of the Flora and Vegetation Survey

Limitation	Outcome	Comment
Effort and Extent	Not a limitation	A Reconnaissance, Detailed and Targeted survey was undertaken across the Survey Area over a combined 12 days. A Detailed and Targeted survey was undertaken across the D&T Survey Area. Seventeen quadrats and fifteen relevés were recorded within the broader Survey Area. Mapping of vegetation boundaries was undertaken within the broader Survey Area using a combination of aerial photography and information collected at relevés and vegetation observation points. No constraints prevented appropriate sampling techniques (quadrat and relevé establishment, foot traverses) being employed. All areas were easy to access using roads and tracks. Data reliability is therefore considered to be relatively high.
Competency/experience of the team carrying out the survey	Not a limitation	The field team leader for the Reconnaissance field survey has >18 years' experience conducting flora and vegetation surveys in the region and the field team leader of the Detailed and Targeted field survey has >3 years' experience in conducting flora and vegetation surveys in the region. Senior personnel provided guidance to less experienced botanists throughout the survey where necessary. Information relating to identifying characteristics of both significant flora taxa and vegetation identified by the desktop assessment as potentially occurring in the Survey Area was provided to all field team members prior to undertaking the field survey. The plant identifications were undertaken by Principal Botanists with >15 years' experience in plant identification for flora of the region.
Proportion of flora identified, recorded and/or collected	Not a limitation	All vascular groups that were present in the sample sites (quadrats, relevés and vegetation mapping notes) within the Survey Area were sampled. A high proportion of perennial vascular taxa were recorded based on the intensity and method of survey. The majority of annual vascular taxa that were sampled were identifiable, as the survey was conducted in Spring; it is considered likely that the majority of annual flora taxa that would be present in the Survey Area were recorded by the survey. Any unknown vascular taxa were collected and identified by a Principal Botanist.
Sources of information e.g. previously available information (whether historic or recent) as distinct from new data	Not a limitation	Good contextual information for the Survey Area was available prior to the survey. Sources of information used included government databases (DBCA, DCCEEW), flora and vegetation surveys previously conducted in the Desktop Study Area, as well as numerous general sources pertaining to the climate, geomorphology, flora and vegetation of the region.
Timing/weather/season/cycle	Not a limitation	The Detailed and Targeted field survey was conducted in September and early October 2024. This corresponds with the optimum time to undertake a Primary survey in the SCP bioregion (Spring), and the flowering period of most taxa in the region. The total rainfall received in the year of survey (2024) was below average overall (473.6 mm in comparison to long-term average of 517.7 mm); however, the total rainfall received from January–August 2024 (the months prior to the Detailed and Targeted survey) was higher than average (417.7 mm in comparison to average of 403.0 mm).

Limitation	Outcome	Comment
Disturbances (e.g. fire, flood, accidental human intervention etc.), which affected results of survey	Not a limitation	There was evidence of significant impacts to vegetation composition and structure in the majority of the Survey Area as a result of human activities, including clearing for agriculture and very high levels of introduced (weed) taxa. However, this is a reflection of the land use history in the region and is not specific to the Survey Area; consequently, this is not considered to be a limitation of the survey. These disturbances did not affect the results of the survey, with the vegetation able to be confidently described and mapped, and flora taxa mature enough to be easily identified or collected. No areas impacted by recent fire were observed.
Remoteness and/or access problems	Not a limitation	The Survey Area was accessed either via publicly accessible roads or farm tracks, and on foot. Appropriate landowner permissions were obtained prior to survey, and there were no access issues. This allowed high intensity of sampling across the Survey Area. Therefore, this is not a limitation of this assessment.

5.0 Results

5.1 Desktop Assessment

5.1.1 Local Flora and Vegetation Surveys

Four previous flora and vegetation surveys were identified within the Desktop Study Area as summarised in **Table 5.1**. Included in **Table 5.1** are the key flora and vegetation results recorded by these assessments, such as the presence of significant flora and vegetation, as well as Declared Pests and Weeds of National Significance (WoNS). Note that the nomenclature and conservation status of the taxa presented in **Table 5.1** have been updated where required, and taxa that are no longer listed as significant are not presented.

Table 5.1 Summary of Flora and Vegetation Surveys Previously Conducted Within the Desktop Study Area

Report and Author	Parameters	Survey Date	Key Findings – Flora	Key Findings – Vegetation
Yandin Wind Farm Flora, Vegetation and Avifauna Assessment (ecologia, 2017)	Southeast of Cataby Immediately adjacent to the north of the Project Area	18 September 2017	117 vascular plant taxa from 35 families were recorded. One Priority flora taxon was recorded: <i>Hypocalymma tetrapterum</i> (P3).	16 vegetation units described and mapped. The vegetation over 91.2% of the study area comprised <i>Corymbia calophylla</i> or <i>Eucalyptus todtiana</i> trees over pasture weeds in 'Completely Degraded' condition. Five patches of the 'Banksia Woodlands of the Swan Coastal Plain' TEC were identified within the study area. Each of these patches were considered to qualify as the TEC according to the 'Approved Conservation Advice (incorporating listing advice) for the Banksia Woodlands of the Swan Coastal Plain Ecological Community' (DoEE, 2016). Good–Excellent condition Banksia woodland made up 201.91 ha (1.3%) of the study area. Good condition Banksia woodland made up 10.10 ha (0.1%) of the study area.
Wind Prospect Pty Ltd, Yandin Wind Farm Supplementary Flora and Vegetation Survey (ecologia, 2018)	Southeast of Cataby Immediately adjacent to the north of the Project Area	16–17 October 2018	151 taxa representing 43 families and 96 genera were recorded. Four Priority flora taxa were recorded: <i>Eucalyptus macrocarpa</i> subsp. <i>elachantha</i> (P4), <i>Hypocalymma tetrapterum</i> (P3), <i>Persoonia filifolia</i> (P3), and <i>Stylidium aeonioides</i> (P4). No EPBC Act listed flora were recorded. 23 introduced plant taxa were recorded, none of which were Declared Pests or WoNS.	All vegetation types were considered typical of the broader area and were not considered to be representative of any known TEC or PEC. Much of the vegetation was mapped as 'Excellent' condition (25.5 ha, 84.5%), with no or minimal weed cover (<5%). Parkland and cleared areas were mapped as 'Completely Degraded' and comprised 4.8 ha (15.5%) of the study area.

Report and Author	Parameters	Survey Date	Key Findings – Flora	Key Findings – Vegetation
Brand Highway Passing Lanes Survey for Listed Threatened and Priority Flora Taxa (Woodman Environmental, 2018)	Multiple locations along Brand Highway, including northwest of Cataby – approximately 17 km northwest of the Project Area	6–10 November 2017	22 Priority flora taxa were recorded: <i>Anigozanthos humilis</i> subsp. <i>chrysanthus</i> (P4), <i>Arnocrinum gracillimum</i> (P2), <i>Beaufortia bicolor</i> (P3), <i>Catacolea enodis</i> (P2), <i>Comesperma rhadinocarpum</i> (P3), <i>Conostephium magnum</i> (P4), <i>Desmocladus biformis</i> (P3), <i>Desmocladus elongatus</i> (P4), <i>Desmocladus microcarpus</i> (P2), <i>Grevillea rudis</i> (P4), <i>Grevillea saccata</i> (P4), <i>Guichenotia alba</i> (P3), <i>Haemodorum loratum</i> (P4), <i>Hensmania stoniella</i> (P3), <i>Hypocalymma serrulatum</i> (P3), <i>Hypolaena robusta</i> (P4), <i>Jacksonia anthoclada</i> (P3), <i>Lyginia excelsa</i> (P1), <i>Persoonia filiformis</i> (P3), <i>Phlebocarya pilosissima</i> subsp. <i>pilosissima</i> (P3), <i>Schoenus griffinianus</i> (P4), <i>Tetratheca angulata</i> (P3). No Threatened flora taxa were recorded. 11 significant flora taxa known from the area could not be surveyed due to the timing of the survey not aligning with the flowering period of those taxa.	Vegetation was not assessed as part of the survey.
Targeted Flora and Vegetation Survey of Yandin Road Area (Terratree, 2019)	Immediately north of Project Area	29 October – 2 November 2019	2 Priority flora species recorded: <i>Banksia dallanneyi</i> subsp. <i>?pollostata</i> (P3) and <i>Anigozanthos humilis</i> subsp. <i>chrysanthus</i> (P4). No Threatened flora species were recorded. None of the weed species recorded were Declared Weeds or WoNS.	Community Type 2 was consistent with the description of the 'Banksia Woodlands of the Swan Coastal Plain' TEC as detailed in the Approved Conservation Advice (DoEE, 2016).

5.1.2 Significant Flora Taxa

The interrogation of the DBCA WA Herbarium (WAHerb) Specimen Database and TPFL Database (DBCA, 2024c) returned a total of 125 listed significant vascular flora taxa that have records in the Desktop Study Area (**Table 5.2**). A search of the DBCA NatureMap database (DBCA, 2024e) was also undertaken as part of the desktop assessment to check for any recently added records and to confirm the records returned from the DBCA WA Herbarium Specimen Database and TPFL Database search. An additional 12 taxa were returned by the NatureMap search (**Table 5.2**).

The search of the DCCEEW SPRAT Database (DCCEEW, 2024) for MNES listed under the EPBC Act identified an additional 34 flora taxa listed as Threatened species, or habitat for such species, that may occur in the Desktop Study Area (**Appendix B**). However, it is worthy of note that the SPRAT database search is based on Threatened flora taxa known from regional areas as opposed to actual records (as per the DBCA database searches) and includes provision of species and species habitat that are ‘likely to occur’ or ‘may occur’, as well as those that are ‘known to occur’ in such areas. Therefore, the interrogation of the SPRAT database returns flora taxa known from a wider area than the DBCA database searches.

Asterolasia nivea (T) was returned from the DCCEEW SPRAT search. This taxon was synonymised under *Asterolasia grandiflora*, which is listed as Priority 4, in 2017 (Wege, 2017). The examination of a range of specimens of both formerly distinct taxa provided evidence that the morphology of these taxa was much more variable than first thought. As such, the two taxa were amalgamated under the name *Asterolasia grandiflora* (P4). Therefore, *Asterolasia nivea* (T) is not presented in **Table 5.2**, and *Asterolasia grandiflora* (P4) has been included. However, it is to be noted that *Asterolasia nivea* (T) is still listed under the EPBC Act (DCCEEW, 2025). The records that were previously attributable to *Asterolasia nivea* (T) are now considered to represent an ecological variant of *Asterolasia grandiflora* (P4), rather than a distinct taxonomic entity. Consequently, the accepted range of this consolidated entity under this new treatment has resulted in a considerable expansion compared to the previously accepted range *Asterolasia nivea* (T), with *Asterolasia grandiflora* (P4) extending from near Mogumber in the north to Wandoo National Park in the south, and being relatively common within that range (WA Herbarium, 1998-). Therefore, this taxon may no longer meet the criteria to be listed under the EPBC Act.

As per **Section 5.1.1**, Woodman Environmental (2018) recorded 22 significant flora during their survey along Brand Highway. Of these 22 taxa, four were not returned from the above database searches, but have been included in **Table 5.2**.

In summary, a total of 177 flora taxa were returned by the database assessment (DBCA, 2024c, 2024e; DCCEEW, 2024). Of the 177 taxa, a total of 55 are listed as Threatened under the BC and/or EPBC Acts, including four orchids (**Table 5.2**).

Figure 5.1 presents the locations of the listed significant flora taxa returned from the DBCA database searches (DBCA, 2024c), within the Desktop Study Area. Eleven taxa returned from the DBCA database search have historical records within the Project Area – *Babingtonia delicata* (P1), *Banksia dallanneyi* subsp. *pollostata* (P3), *Calytrix ecalycata* subsp. *brevis* (P3), *Dampiera tephrea* (P3), *Grevillea drummondii* (P4), *Grevillea olivacea* (P4), *Haemodorum loratum* (P3), *Hypocalymma x proliferum* (P1), *Lepidobolus quadratus* (P3), *Stylidium milleri* (P2) and *Thysanotus glaucus* (P4) (**Figure 5.1**).

Table 5.2 Significant Flora Taxa Known from the Desktop Study Area

Taxon	Status# (WA)	Status# (EPBC)	Flowering Period*	Habitat*	Source^
<i>Acacia aristulata</i>	T	EN	September to December	Ridges and hills with chert, brown or red clayey sand.	DCCEEW
<i>Acacia cummingiana</i>	P3		May to June, August	Sandplains, lateritic breakaways with grey or yellow sand and lateritic gravel.	DBCA TPFL, DBCA WAHerb, NatureMap
<i>Acacia denticulosa</i>	T	VU	September to December	Rock outcrops of greenstone or granite, clay loam.	DBCA WAHerb, NatureMap
<i>Acacia epacantha</i>	P3		July to August	Breakaways, slopes, flats and along drainage lines with gravelly sand or clay loam over laterite.	DBCA WAHerb, NatureMap
<i>Acacia forrestiana</i>	T	VU	November to December	Gullies, hills, breakaways.	DBCA TPFL, DBCA WAHerb, DCCEEW, NatureMap
<i>Acacia plicata</i>	P3		August to October	Hillslopes and drainage lines with loamy and clayey soils, often over sandstone or siltstone.	DBCA WAHerb, NatureMap
<i>Acacia ridleyana</i>	P3		April, November to December	White or brown or yellow or grey sand or loam or gravel.	NatureMap
<i>Acacia splendens</i>	T	EN	May, August	Laterite breakaways, brown sandy loam, sometimes alluvial flats.	DBCA WAHerb, DCCEEW, NatureMap
<i>Allocasuarina grevilleoides</i>	P3		September to November	Slopes, outcrops and plains with rocky or gravelly brown sand or clay loam over laterite or granite.	DBCA WAHerb, NatureMap
<i>Allocasuarina ramosissima</i>	P3		May to September	Breakaways, slopes and plains with gravelly grey, brown or white sand or loam over laterite.	NatureMap
<i>Andersonia gracilis</i>	T	EN	August to November	Winter-wet areas, near swamps. White-grey sand, sandy clay and gravelly loam.	DBCA TPFL, DBCA WAHerb, DCCEEW, NatureMap
<i>Andersonia</i> sp. <i>Mysosma</i> (E.A. Griffin 2213)	P2		September to November	Habitat includes grey sand on hills, breakaways and slopes with laterite.	DBCA WAHerb, NatureMap
<i>Angianthus micropodioides</i>	P3		September to November	Saline flats, winter-wet depressions and adjacent dunes. Grey or brown clay loam or sand.	DBCA WAHerb, NatureMap
<i>Anigozanthos humilis</i> subsp. <i>Badgingarra</i> (S.D. Hopper 7114)	P2		September to December	Slopes, plains, flats and winter-wet areas with white or grey sand. Banksia woodland, low wet heath.	DBCA TPFL, DBCA WAHerb, NatureMap

Taxon	Status# (WA)	Status# (EPBC)	Flowering Period*	Habitat*	Source^
<i>Anigozanthos humilis</i> subsp. <i>chrysanthus</i>	P4		August to November	Slopes, plains and winter-wet areas with white, grey or yellow sand. Banksia woodland, low wet heath.	DBCA TPFL, DBCA WAHerb, NatureMap, Terratree (2019), Woodman (2018)
<i>Anigozanthos viridis</i> subsp. <i>terraspectans</i>	T	VU	August to September	Grey sand, clay loam. Winter-wet depressions.	DBCA TPFL, DBCA WAHerb, DCCEEW, NatureMap
<i>Arnocrinum gracillimum</i>	P2		October to November	Flats and plains with white, grey, yellow or lateritic sand over laterite.	Woodman (2018)
<i>Asterolasia drummondii</i>	P4		July to September	Lateritic hills, sandplains and breakaways with lateritic gravel and sand or loam.	DBCA TPFL, DBCA WAHerb, NatureMap
<i>Asterolasia grandiflora</i>	P4	VU	September to October	Slopes, gullies and breakaways of laterite, with brown loam.	DCCEEW (listed as <i>Asterolasia nivea</i>)
<i>Babingtonia delicata</i>	P1		November	Winter-wet closed depressions, wetlands and lakes with white, yellow or grey clayey sand.	DBCA TPFL, DBCA WAHerb, NatureMap
<i>Babingtonia urbana</i>	P3		December to March	Wetlands with clay, winter-wet flats.	DBCA WAHerb, NatureMap
<i>Banksia cataglypta</i>	T	VU	June to July	Hillslopes and breakaways with grey sand and laterite.	DCCEEW
<i>Banksia chamaephyton</i>	P4		October to December	Slopes, breakaways and flats with grey or white sand over laterite.	DBCA WAHerb, NatureMap
<i>Banksia dallanneyi</i> subsp. <i>pollosta</i>	P3		August to September	Grey/yellow sand. Flats, lateritic rises.	DBCA TPFL, DBCA WAHerb, NatureMap
<i>Banksia fuscobracteata</i>	T	CR	September to February	Laterite hills and rises, grey sand or brown loam.	DBCA TPFL, DBCA WAHerb, DCCEEW, NatureMap
<i>Banksia kippistiana</i> var. <i>paenepeccata</i>	P3		October to November	Hills and slopes with white-yellow or grey sand over laterite.	DBCA WAHerb, NatureMap
<i>Banksia mimica</i>	T	EN	September to January	Flats or gentle slopes with grey sand.	DBCA TPFL, DBCA WAHerb, DCCEEW, NatureMap
<i>Banksia nana</i>	P3		October	Hills with white/grey sand and/or gravel over laterite.	DBCA WAHerb, NatureMap
<i>Banksia prionophylla</i>	T	not fed listed!	July	Dry grey sand with laterite.	DBCA TPFL, DBCA WAHerb, NatureMap

Taxon	Status# (WA)	Status# (EPBC)	Flowering Period*	Habitat*	Source^
<i>Banksia pteridifolia</i> subsp. <i>vernalis</i>	P3		September to October	White/grey sand over laterite, usually on plains or lower slopes.	DBCA WAHerb, NatureMap
<i>Banksia serratuloides</i> subsp. <i>perissa</i>	T	CR	August to September	Hillsides, slopes and breakaways with white/grey sand or brown loam with laterite.	DCCEEW
<i>Banksia serratuloides</i> subsp. <i>serratuloides</i>	T	VU	August to October	Lateritic sandy clay flats, slopes and valleys.	DCCEEW
<i>Beaufortia bicolor</i>	P3		November to December	Sandplains with white sand over laterite.	NatureMap, Woodman (2018)
<i>Beaufortia eriocephala</i>	P3		June, September to December	Ridges, low rises and flats with brown, grey or white sand or sandy clay and lateritic gravel over laterite or sometimes granite.	DBCA TPFL, DBCA WAHerb, NatureMap
<i>Boronia ericifolia</i>	P2		April to September	Breakaways with greenstone, slopes with brown loam and laterite.	DBCA WAHerb, NatureMap
<i>Boronia scabra</i> subsp. <i>condensata</i>	P2		August	Upper slopes and lateritic breakaways with grey/brown sandy clay or loam with laterite.	DBCA WAHerb, NatureMap
<i>Caladenia multiplex</i>	P2		Mid-August to September. Latest record from 13 September.	Red to brown loam, slopes and creeklines, winter wet areas.	DBCA WAHerb, NatureMap
<i>Caladenia speciosa</i>	P4		Late August to October. Latest record from 25 October	Flats, swampy areas with black sand; clay pans. Also grey sand.	NatureMap
<i>Calectasia elegans</i>	T	not fed listed!	September to October	Plains with deep grey or pale yellow sand.	DBCA TPFL, DBCA WAHerb, NatureMap
<i>Calothamnus accedens</i>	P4		September to January	Slopes or rises with brown clay loam.	DBCA WAHerb, NatureMap
<i>Calothamnus brevifolius</i>	P4		Jan to Feb or April	White/grey or yellow sand.	DBCA WAHerb, NatureMap
<i>Calothamnus pachystachyus</i>	P4		September to November	Hills and breakaways with laterite, sandy slopes with laterite.	DBCA WAHerb, NatureMap

Taxon	Status# (WA)	Status# (EPBC)	Flowering Period*	Habitat*	Source^
<i>Calytrix ecalycata</i> subsp. <i>brevis</i>	P3		August to September	Sandplains and low rises with white/grey or yellow sand.	DBCA WAHerb, NatureMap
<i>Catacolea enodis</i>	P2		Unknown	Deep white sand over laterite. Flats.	Woodman (2018)
<i>Chamaescilla gibsonii</i>	P3		August to November	Brown or grey sandy clay. Winter-wet clay pans and flats.	NatureMap
<i>Chamelaucium lullfitzii</i>	T	EN	September to December	Hilltops, slopes and undulating plains with gravelly sand.	DCCEEW
<i>Chamelaucium</i> sp. <i>Cataby</i> (G.J. Keighery 11009)	T	VU	September to December	Lateritic breakaways.	DBCA TPFL, DBCA WAHerb, NatureMap
<i>Chordifex reseminans</i>	P2		March to May	Flats and winter-wet depressions with white-grey sand over laterite.	DBCA WAHerb, NatureMap
<i>Chorizema humile</i>	T	EN	August to September	Plains with granite, Rock outcrops of granite with red-brown soil.	DCCEEW
<i>Comesperma rhadinocarpum</i>	P3		October to November	Undulating plains, valley slopes and flats with grey, brown or yellow sandy loam or sand.	DBCA WAHerb, NatureMap, Woodman (2018)
<i>Conospermum densiflorum</i> subsp. <i>unicephalum</i>	T	EN	September to December	Plains with red-brown soil, laterite.	DCCEEW
<i>Conostephium magnum</i>	P4		July to September	Sand dunes and slopes with white-grey sand.	DBCA WAHerb, NatureMap, Woodman (2018)
<i>Cristonia biloba</i> subsp. <i>pubescens</i>	P2		June to July	Hillslopes and ridges with white sand or brown loam and gravel.	NatureMap
<i>Dampiera tephrea</i>	P3		August to October	Flats, riverbanks and slopes with sand or loam, often with limestone.	DBCA TPFL, DBCA WAHerb, NatureMap
<i>Darwinia acerosa</i>	T	EN	August to September	Granite outcrops with brown soils.	DBCA WAHerb, DCCEEW, NatureMap
<i>Darwinia carnea</i>	T	EN	October to November	Breakaways, brown loamy sand over laterite.	DBCA WAHerb, DCCEEW, NatureMap
<i>Daviesia dielsii</i>	T	EN	July	Sandy, often gravelly soils.	DCCEEW

Taxon	Status [#] (WA)	Status [#] (EPBC)	Flowering Period*	Habitat*	Source [^]
<i>Desmocladius biformis</i>	P3		September to October	Hills, slopes and undulating plains with white or brown sand or sandy clay over laterite.	DBCA WAHerb, NatureMap, Woodman (2018)
<i>Desmocladius elongatus</i>	P4		August to December	Slopes, plains and uplands with white or grey sand over laterite.	NatureMap, Woodman (2018)
<i>Desmocladius microcarpus</i>	P2		August to October	Slopes with grey or cream sand over laterite.	DBCA TPFL, DBCA WAHerb, NatureMap, Woodman (2018)
<i>Desmocladius nodatus</i>	P3		October to November	Moist sites in open woodland with shrubs.	DBCA WAHerb, NatureMap
<i>Dillwynia dillwynioides</i>	P3		August to January	Saline flats, winter wet depressions and wetlands. Grey, brown or black sandy loam, sometimes peaty.	DBCA TPFL, DBCA WAHerb, NatureMap
<i>Diplolaena andrewsii</i>	T	EN	August to November	Brown sandy loam over granite. Granite outcrops and slopes.	DCCEEW
<i>Dodoniae hackettiana</i>	P4		April to October	Limestone ridges, dunes, plains and low rises. Grey sand over limestone.	NatureMap
<i>Drakaea elastica</i>	T	EN	October to November	Winter-wet depressions. Grey sand.	DBCA TPFL, DBCA WAHerb, DCCEEW, NatureMap
<i>Drosera leioblastus</i>	P1		September to October	White siliceous sand with laterite.	DBCA WAHerb, NatureMap
<i>Drosera prophylla</i>	P3		June to July	Hilltops, lateritic breakaways and ridges and slopes with gravelly sand over laterite.	DBCA TPFL, DBCA WAHerb, NatureMap
<i>Eleocharis keigheryi</i>	T	VU	August to November	Clay, sandy loam. Emergent in freshwater: creeks, claypans.	DBCA TPFL, DBCA WAHerb, DCCEEW, NatureMap
<i>Eremaea</i> sp. Cairn Hill (B. Morgan 532)	P2		October to November	White to light brown sand, plains with laterite.	DBCA WAHerb, NatureMap
<i>Eremophila glabra</i> subsp. <i>chlorella</i>	T	EN	July to November	Winter-wet depressions, lake edges and flats with grey-white sandy clay or sand.	DBCA WAHerb, DCCEEW, NatureMap
<i>Eremophila scaberula</i>	T	EN	August to November	Plains with sandy clay, laterite.	DCCEEW
<i>Eucalyptus abdita</i>	P2		February	Laterite, sandy clay with gravel over laterite. Slopes, breakaways.	DBCA WAHerb, NatureMap

Taxon	Status [#] (WA)	Status [#] (EPBC)	Flowering Period*	Habitat*	Source [^]
<i>Eucalyptus absita</i>	T	EN	May	Flats with sandy loam or grey sand.	DCCEEW
<i>Eucalyptus annuliformis</i>	P1		July	Laterite hills.	DBCA TPFL, DBCA WAHerb, NatureMap
<i>Eucalyptus argutifolia</i>	T	VU	Year round	Limestone outcrops on hills and breakaways with brown-orange sand.	DCCEEW
<i>Eucalyptus crispata</i>	T	VU	March to June	Lateritic breakaways and slopes with brown-grey sand or loam with lateritic gravel.	DCCEEW
<i>Eucalyptus dolorosa</i>	T	EN	February	Lateritic slopes and breakaways with gravelly/rocky brown loam.	DBCA TPFL, DBCA WAHerb, DCCEEW, NatureMap
<i>Eucalyptus leprophloia</i>	T	EN	July to November	Breakaways and slopes with grey or white sand or sandy clay over laterite.	DCCEEW
<i>Eucalyptus macrocarpa</i> subsp. <i>elachantha</i>	P4		August to December	Hillslopes, ridges, sandplains with white or grey sand over laterite.	DBCA TPFL, DBCA WAHerb, ecologia (2018), NatureMap
<i>Eucalyptus pruiniramis</i>	T	EN	December to Feb	Skeletal soils over sandstone or laterite. Rocky hillslopes.	DCCEEW
<i>Eucalyptus recta</i>	T	EN	January	Pale yellow or white sand, low rises with laterite.	DCCEEW
<i>Eucalyptus x balanites</i>	T	EN	February, June to July	Plains with brown sandy loam.	DCCEEW
<i>Eucalyptus x carnabyi</i>	P4		October to November	Grey sand, sandy loam. Lateritic ridges.	DBCA TPFL, DBCA WAHerb, NatureMap
<i>Gastrolobium hamulosum</i>	T	EN	August to October	Flats, slopes, ridges with sandy, often gravelly soils or clay.	DCCEEW
<i>Gastrolobium nudum</i>	P2		October to December	Hilltops and ridges with clay and laterite.	DBCA WAHerb, NatureMap
<i>Glyceria drummondii</i>	T	EN	July to October	Seasonally flooded clay pans within clay plains, in hollows. Brown or red-brown clay.	DCCEEW
<i>Gompholobium gairdnerianum</i>	P3		September to November	Hills, slopes and ridges with white, brown or grey sandy clay or sand over laterite or occasionally sandstone.	DBCA WAHerb, NatureMap
<i>Goodenia arthrotricha</i>	T	EN	November to March	Granite slopes with brown loam clay.	DCCEEW
<i>Gratiola pedunculata</i>	P2		November to March	Grey black clay. Edges of swamps and winter wet areas.	NatureMap

Taxon	Status# (WA)	Status# (EPBC)	Flowering Period*	Habitat*	Source^
<i>Grevillea calliantha</i>	T	EN	April, August to October	Plains and lower slopes with sandy loam over laterite or occasionally ironstone.	DBCA TPFL, DBCA WAHerb, DCCEEW, NatureMap
<i>Grevillea christineae</i>	T	EN	July to September	Laterite hills and slopes.	DCCEEW
<i>Grevillea curviloba</i>	T	EN	August to October	Grey, white or brown sand or sandy loam. Flats, drainage lines and lower slopes.	DCCEEW
<i>Grevillea drummondii</i>	P4		June to September	Laterite hills with brown loam.	DBCA TPFL, DBCA WAHerb, NatureMap
<i>Grevillea florida</i>	P3		July to September	Sandplains and slopes with brown sand, sandy clay and lateritic gravel.	DBCA TPFL, DBCA WAHerb, NatureMap
<i>Grevillea gillingarra</i>	T	CR	September	Red lateritic loam, creek edges and steep slopes.	DBCA WAHerb, NatureMap
<i>Grevillea olivacea</i>	P4		June to September	White or grey sand. Coastal dunes, limestone rocks.	DCCEEW
<i>Grevillea pythara</i>	T	EN	August to October	Slopes. Brown or yellow sandy or gravelly loam.	DBCA WAHerb, NatureMap, Woodman (2018)
<i>Grevillea rudis</i>	P4		April to January	Hills and slopes with white, grey, yellow or red sand, often with gravel and laterite.	DBCA TPFL, DBCA WAHerb, NatureMap, Woodman (2018)
<i>Grevillea saccata</i>	P4		April, June to November	Hills and slopes with yellow or brown sand or loam, often with gravel and laterite.	DCCEEW
<i>Grevillea synapheae</i> subsp. A Flora of Australia (S.D. Hopper 6333)	P1		September	Laterite breakaways.	DBCA TPFL, DBCA WAHerb, NatureMap
<i>Grevillea synapheae</i> subsp. <i>minyulo</i>	P1		September to October	Slopes with yellow brown or grey gravelly sand. Laterite.	DBCA TPFL, DBCA WAHerb, NatureMap
<i>Grevillea thyrsoides</i> subsp. <i>thyrsoides</i>	P3		February, August to September	Hills and plains with grey, white or brown sand or clay loam, often with laterite.	DBCA WAHerb, NatureMap
<i>Guichenotia alba</i>	P3		July to August	Sandy and gravelly soils. Low lying flats, depressions.	DBCA WAHerb, NatureMap, Woodman (2018)
<i>Gyrostemon</i> sp. Mogumber (T.J. Hawkeswood 250)	P1		Unknown	Unknown.	DBCA WAHerb, NatureMap

Taxon	Status# (WA)	Status# (EPBC)	Flowering Period*	Habitat*	Source^
<i>Haemodorum loratum</i>	P3		November	Uplands and sandplains with grey, white or yellow sand and gravel.	DBCA TPFL, DBCA WAHerb, NatureMap, Woodman (2018)
<i>Hakea longiflora</i>	P3		June to July	High in landscape; hills, breakaways and plains with white, grey or yellow gravelly sand or sandy loam over laterite or occasionally sandstone.	DBCA WAHerb, NatureMap
<i>Hakea megalosperma</i>	T	VU	April to June	High in landscape; hills, breakaways, slopes and flats with white, grey or brown sand or sandy loam over laterite.	DBCA WAHerb, DCCEEW, NatureMap
<i>Haloragis platycarpa</i>	T	CR	October to December	Cracking clay, winter-wet, margins of wetlands or plains with brown loam.	DCCEEW
<i>Hemiandra gardneri</i>	T	EN	August to November	Plains with yellow or grey sand or clayey sand.	DCCEEW
<i>Hemigenia curvifolia</i>	P2		September to October	Plains with white or yellow sand.	DBCA WAHerb, NatureMap
<i>Hensmania stoniella</i>	P3		September to November	Flats and slopes with white, grey or lateritic sand, sometimes winter-wet.	DBCA WAHerb, NatureMap, Woodman (2018)
<i>Hypocalymma lateriticola</i>	P1		August to September	Laterite plains with grey or yellow sand.	DBCA WAHerb, NatureMap
<i>Hypocalymma quadrangulare</i>	P3		July to October	Slopes and plains with sand.	DBCA WAHerb, NatureMap
<i>Hypocalymma serrulatum</i>	P2		April to July, November, January	Drainage lines, edges of and slopes above winter-wet depressions with grey sand.	DBCA WAHerb, NatureMap, Woodman (2018)
<i>Hypocalymma tetrapterum</i>	P3		August	Grey sand, loam, lateritic gravel. Riverbanks, breakaways.	DBCA TPFL, DBCA WAHerb, ecologia (2017), ecologia (2018), NatureMap
<i>Hypocalymma x proliferum</i>	P1		August to September	Sandy plains over clay, riverbanks, slopes.	DBCA TPFL, DBCA WAHerb, NatureMap
<i>Hypolaena robusta</i>	P4		October to November	Flats, grey sand. Banksia to <i>Eucalyptus todtiana</i> woodland.	DBCA WAHerb, NatureMap, Woodman (2018)
<i>Isopogon autumnalis</i>	P3		February, April	Sandplains with white/grey sand.	DBCA TPFL, DBCA WAHerb, NatureMap

Taxon	Status# (WA)	Status# (EPBC)	Flowering Period*	Habitat*	Source^
<i>Isotropis cuneifolia</i> subsp. <i>glabra</i>	P3		August to October	Low rises and winter-wet depressions and flats with grey or brown sand or clay.	DBCA TPFL, DBCA WAHerb, NatureMap
<i>Jacksonia anthoclada</i>	P3		November	Slopes with brown, yellow or white sand over laterite.	Woodman (2018)
<i>Jacksonia carduacea</i>	P3		July, November to December	Plains and flats with white, grey or yellow sand, sometimes over laterite.	DBCA WAHerb, NatureMap
<i>Lasiopetalum rupicola</i>	P1		August to September	Hilltops with laterite and brown loam.	DBCA TPFL, DBCA WAHerb, NatureMap
<i>Lechenaultia galactites</i>	P3		June, September to October	Yellow or brown sand over laterite, plains.	DBCA WAHerb, NatureMap
<i>Lepidobolus quadratus</i>	P3		August to September	Dry kwongan, hillslopes and rises with grey-white sand and lateritic gravel.	DBCA WAHerb, NatureMap
<i>Lepidosperma rostratum</i>	T	EN	June to December	Peaty sand or clay. Winter-wet swamps.	DCCEEW
<i>Lepyrodia curvescens</i>	P2		September to November	Seasonally inundated swamplands, depressions and flats with white/grey sand or peaty sand.	DBCA WAHerb, NatureMap
<i>Leucopogon foliosus</i>	P3		September to November	Uplands and slopes with yellow/white sand with gravel, over laterite.	DBCA WAHerb, NatureMap
<i>Leucopogon squarrosus</i> subsp. <i>trigynus</i>	P2		June to September	Coastal habitats. Grey sand, low lying flats.	DCCEEW
<i>Lyginia excelsa</i>	P2		March to November	Undulating plains, flats and depressions with white/grey sand.	DBCA WAHerb, NatureMap
<i>Macarthuria keigheryi</i>	T	EN	September to October	Dunes, plains and low rises above winter-wet areas with white, brown or grey sand or clay loam. Banksia woodland, recently burnt areas.	DBCA WAHerb, NatureMap, Woodman (2018)
<i>Meionectes tenuifolia</i>	P3		October to December	Seasonally inundated areas, Edge of wetlands. Clay or clayey loam over laterite.	DBCA TPFL, DBCA WAHerb, DCCEEW, NatureMap
<i>Melaleuca sciotostyla</i>	T	EN	August to October	Hills and Breakaways, bases of ridges. Clay loam with laterite.	NatureMap
<i>Paracaleana dixonii</i>	T	EN	Late October to Late November	Flats, plains and slopes with grey sand, sometimes with laterite gravel.	DCCEEW

Taxon	Status [#] (WA)	Status [#] (EPBC)	Flowering Period*	Habitat*	Source [^]
<i>Persoonia filiformis</i>	P3		November to December	Plains and slopes with yellow or white sand over laterite.	DBCA TPFL, NatureMap
<i>Persoonia rudis</i>	P3		September to January	Flats and slopes with white, grey or yellow sand, often over laterite.	DBCA WAHerb, ecologia (2018), NatureMap, Woodman (2018)
<i>Petrophile bitermata</i>	P3		August to September	Lateritic hills, ridges.	DBCA TPFL, DBCA WAHerb, NatureMap
<i>Petrophile clavata</i>	P2		September	Hilltops, slopes and ridges with grey sand and laterite.	DBCA WAHerb, NatureMap
<i>Phlebocarya pilosissima</i> subsp. <i>pilosissima</i>	P3		August to October	Slopes with sand over laterite.	DBCA WAHerb, NatureMap
<i>Platysace ramosissima</i>	P3		October to November	Undulating plains and flats with yellow, brown or grey sand.	DBCA WAHerb, NatureMap, Woodman (2018)
<i>Podotheca pritzelii</i>	P3		September to October	Salt lakes and saline habitats.	DBCA WAHerb, NatureMap
<i>Ptychosema pusillum</i>	T	VU	September to October	Low plains, slopes and dunes with white or grey sand. Banksia woodland on margins of seasonal wetlands.	DBCA WAHerb, NatureMap
<i>Regelia megacephala</i>	P4		November to February	Quartz hills.	DBCA TPFL, DBCA WAHerb, DCCEEW, NatureMap
<i>Rhetinocarpha suffruticosa</i>	P1		December to January	Low rises with gravelly clay loam over laterite.	DBCA WAHerb, NatureMap
<i>Roycea pycnophylloides</i>	T	EN	September to October	Salt lakes and saline habitats.	DBCA WAHerb, NatureMap
<i>Rumex drummondii</i>	P4		August to November	Creeklines with black peaty sandy clay over limestone; winter wet depressions.	DCCEEW
<i>Schoenus griffinianus</i>	P4		September to October	Undulating sandplains, lower slopes, flats and depressions with grey sand.	DBCA WAHerb, NatureMap
<i>Schoenus pennisetis</i>	P3		August to September	Low lying areas, edge of wetlands. Grey/brown sand or sandy loam.	DBCA WAHerb, NatureMap, Woodman (2018)
<i>Spirogardnera rubescens</i>	T	EN	August to January	Slopes and plains, gravelly sandy loam.	DBCA WAHerb, NatureMap
<i>Stylidium aceratum</i>	P3		September to November	Claypans, winter-wet flats. Brown clay.	DCCEEW

Taxon	Status [#] (WA)	Status [#] (EPBC)	Flowering Period*	Habitat*	Source [^]
<i>Stylidium aeonioides</i>	P4		September to November	Hillsides and breakaways, low heath and open woodland with sandy clay loam over laterite.	DBCA WAHerb, NatureMap
<i>Stylidium carnosum</i> subsp. Narrow leaves (J.A. Wege 490)	P1		September to October	Hillslopes and plains with white-grey sand and lateritic gravel.	DBCA TPFL, DBCA WAHerb, ecologia (2018), NatureMap
<i>Stylidium hymenocraspedum</i>	P3		September to October	Sand over laterite. Hillslopes. Heath, Banksia and Eucalyptus low open woodland.	DBCA WAHerb, NatureMap
<i>Stylidium longitubum</i>	P4		July to November	Seasonal damplands, brown clay loam.	NatureMap
<i>Stylidium milleri</i>	P2		September to October	Grey sand over laterite, plains.	NatureMap
<i>Stylidium nonscandens</i>	P3		September to November	Sand over laterite. Hillslopes and crests. Banksia woodland, heath, mallee shrubland.	DBCA WAHerb, NatureMap
<i>Stylidium periscelanthum</i>	P3		September to October	Wet flats, low granitic hills with loamy clay, moist soils pockets.	DBCA WAHerb, NatureMap
<i>Stylidium</i> sp. Moora (J.A. Wege 713)	P2		September to November	Sand or clay loam hills and slopes over laterite or granite.	DBCA WAHerb, NatureMap
<i>Stylidium striatum</i>	P4		September to December	Brown or yellow sandy clay with laterite. Slopes and flats.	DBCA WAHerb, NatureMap
<i>Stylidium torticarpum</i>	P3		September to November	Adjacent to drainage lines, depressions, and beneath breakaways, heath or mallee shrubland on sandy clay or clay loam over laterite.	DBCA WAHerb, NatureMap
<i>Stylidium vinosum</i>	P1		September to November	White or yellow sand over laterite.	DBCA WAHerb, NatureMap
<i>Styphelia allittii</i>	P3		April to June	Slopes with brown soils over laterite, gullies and creeks.	DBCA WAHerb, NatureMap
<i>Styphelia obtecta</i>	T	EN	October to November	Plains with white, grey or yellow sand.	DBCA WAHerb, NatureMap
<i>Synaphea endothrix</i>	P3		July to October	Ridges and hills with brown, yellow or white gravelly sand over laterite.	NatureMap
<i>Synaphea panhesya</i>	P1		November	Laterite. Slopes.	DBCA TPFL, DBCA WAHerb, NatureMap
<i>Synaphea quartzitica</i>	T	EN	July to September	Chert slopes, rocky quartz gullies.	DCCEEW

Taxon	Status [#] (WA)	Status [#] (EPBC)	Flowering Period*	Habitat*	Source [^]
<i>Synaphea sparsiflora</i>	P2		August to September	Slopes / crests of hills and lateritic ridges with grey / brown sand.	DBCA TPFL, DBCA WAHerb, NatureMap
<i>Tetratheca angulata</i>	P3		September to December	Low hill crests, breakaways with massive laterite boulders with sandy to gravelly laterite soils.	Woodman (2018)
<i>Thelymitra apiculata</i>	P4		June to July	Hillslopes with grey sand, lateritic gravel and laterite.	DBCA TPFL, DBCA WAHerb, NatureMap
<i>Thelymitra dedmaniarum</i>	T	EN	November to January	Grey loam. Granite.	DCCEEW
<i>Thelymitra stellata</i>	T	EN	September to November	Ridges and tops of lateritic hills with grey or brown sand or loam and lateritic gravel.	DBCA TPFL, DCCEEW, NatureMap
<i>Thysanotus glaucus</i>	P4		October to March	White, grey or yellow sand, sandy gravel.	DBCA TPFL, DBCA WAHerb, NatureMap
<i>Trithuria australis</i>	P4		October to November	Clay. Swamps and winter-wet flats.	NatureMap
<i>Verticordia huegelii</i> var. <i>tridens</i>	P3		October to November	Flats, clay loam, over laterite.	DBCA TPFL, DBCA WAHerb, NatureMap
<i>Verticordia insignis</i> subsp. <i>eomagis</i>	P3		August to November	Sandplains and rocky rises with sandy soils over laterite.	DBCA TPFL, DBCA WAHerb, NatureMap
<i>Verticordia lindleyi</i> subsp. <i>lindleyi</i>	P4		May to January	Sand, sandy clay, winter wet depressions.	DBCA TPFL, DBCA WAHerb, NatureMap
<i>Verticordia paludosa</i>	P4		January, April, August	Grey sand, open depressions, winter-wet flats, drainage lines.	DBCA TPFL, DBCA WAHerb, NatureMap
<i>Verticordia rutilastra</i>	P3		September to November	Lateritic breakaways and slopes with white or brown gravelly sand or sandy loam.	DBCA WAHerb, NatureMap

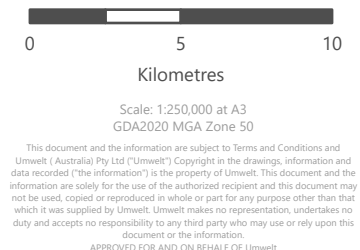
[^] Sources are: DBCA TPFL and DBCA WAHERB (DBCA, 2024c), DCCEEW (2024), *ecologia* (2018), *NatureMap* (DBCA, 2024e), *Terratree* (2019), *Woodman Environmental* (2018).

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

[#]As defined by DBCA (DBCA, 2023a).

Legend

-  Project Area
-  Desktop Study Area
-  Railway
-  Road
-  Watercourse
-  Waterbody



Legend

DBCA Significant Flora

- *Acacia cummingiana* (P3)-Accu
- *Acacia denticulosa* (T)-Acden
- *Acacia epacantha* (P3)-Acepa
- *Acacia forrestiana* (T)-Acforr
- *Acacia plicata* (P3)-Acpli
- *Acacia splendens* (T)-Acspl
- *Allocasuarina grevilleoides* (P3)-Algr
- *Andersonia gracilis* (T)-Angr
- *Andersonia* sp. Mysosma (E.A. Griffin 2213) (P2)-AnspM
- *Angianthus micropodioides* (P3)-Anmicr
- *Anigozanthos humilis* subsp. *chrysanthus* (P4)-Anhuc
- *Anigozanthos humilis* subsp. Badgingarra (S.D. Hopper 7114) (P2)-AnhuB
- *Anigozanthos viridis* subsp. *terraspectans* (T)-Anvit
- *Asterolasia drummondii* (P4)-Asd
- *Babingtonia delicata* (P1)-Bade
- *Babingtonia urbana* (P3)-Baur
- *Banksia chamaephyton* (P4)-Bach
- *Banksia dallanneyi* subsp. *pollostata* (P3)-Badap
- *Banksia fuscobractea* (T)-Bafu
- *Banksia kippistiana* var. *paenepeccata* (P3)-Bakip
- *Banksia mimica* (T)-Bami
- *Banksia nana* (P3)-Banan
- *Banksia prionophylla* (T)-Bpr
- *Banksia pteridifolia* subsp. *vernalis* (P3)-Baptv
- *Beaufortia eriocephala* (P3)-Beer
- *Boronia ericifolia* (P2)-Beri
- *Boronia scabra* subsp. *condensata* (P2)-Boscc
- *Caladenia multiplex* (P2)-Camul
- *Calectasia elegans* (T)-Caele
- *Calothamnus accedens* (P4)-Caac
- *Calothamnus brevifolius* (P4)-Cbre
- *Calothamnus pachystachyus* (P4)-Capac
- *Calytrix ecalycata* subsp. *brevis* (P3)-Cecb
- *Chamelaucium* sp. Cataby (G.J. Keighery 11009) (T)-CspCa
- *Chordifex reseminans* (P2)-Chre
- *Comesperma rhadinocarpum* (P3)-Corh
- *Conostephium magnum* (P4)-Comag
- *Dampiera tephrea* (P3)-Date
- *Darwinia acerosa* (T)-Daac
- *Darwinia carnea* (T)-Daca
- *Desmocladius biformis* (P3)-Debi
- *Desmocladius microcarpus* (P2)-Demi
- *Desmocladius nodatus* (P3)-Deno
- *Dillwynia dillwynioides* (P3)-Didi
- *Drakaea elastica* (T)-Drel
- *Drosera leioblastus* (P1)-Drlei
- *Drosera prophylla* (P3)-Drpr
- *Eleocharis keigheryi* (T)-Elke
- *Eremaea* sp. Cairn Hill (B. Morgan 532) (P2)-ErspCH
- *Eremophila glabra* subsp. *chlorella* (T)-Erglc
- *Eucalyptus abdita* (P2)-Euab
- *Eucalyptus annuliformis* (P1)-Euan
- *Eucalyptus dolorosa* (T)-Edo
- *Eucalyptus macrocarpa* subsp. *elachantha* (P4)-Eumae
- *Eucalyptus x carnabyi* (P4)-Euxca
- *Gastrolobium nudum* (P2)-Ganu
- *Gompholobium gairdnerianum* (P3)-Gga
- *Grevillea calliantha* (T)-Gca
- *Grevillea drummondii* (P4)-Gdr
- *Grevillea florida* (P3)-Grflo
- *Grevillea olivacea* (P4)-Grol
- *Grevillea rudis* (P4)-Grru
- *Grevillea saccata* (P4)-Grsa
- *Grevillea synapheae* subsp. *minyulo* (P1)-Gsym
- *Grevillea synapheae* subsp. A Flora of Australia (S.D. Hopper 6333) (P1)-GsyA
- *Grevillea thyrsoides* subsp. *thyrsoides* (P3)-Grtht
- *Guichenotia alba* (P3)-Gual
- *Gyrostemon* sp. Mogumber (T.J. Hawkeswood 250) (P1)-GsM
- *Haemodorum loratum* (P3)-Halor
- *Hakea longiflora* (P3)-Halo
- *Hakea megalosperma* (T)-Hame
- *Hemigenia curvifolia* (P2)-Hecu

- *Hensmania stoniella* (P3)-Hest
- *Hypocalymma lateriticola* (P1)-Hyla
- *Hypocalymma quadrangulare* (P3)-Hyqu
- *Hypocalymma serrulatum* (P2)-Hyse
- *Hypocalymma tetrapterum* (P3)-Hyte
- *Hypocalymma x proliferum* (P1)-Hyxpr
- *Hypolaena robusta* (P4)-Hyro
- *Isopogon autumnalis* (P3)-Isau
- *Isotropis cuneifolia* subsp. *glabra* (P3)-Iscug
- *Jacksonia carduacea* (P3)-Jaca
- *Lasiopetalum rupicola* (P1)-Lrup
- *Lechenaultia galactites* (P3)-Lega
- *Lepidobolus quadratus* (P3)-Lequ
- *Lepyrodia curvescens* (P2)-Lecu
- *Leucopogon foliosus* (P3)-Lefo
- *Leucopogon squarrosus* subsp. *trigynus* (P2)-Lesqt
- *Lyginia excelsa* (P2)-Lyex
- *Macarthuria keigheryi* (T)-Make
- *Paracaleana dixonii* (T)-Padix
- *Persoonia filiformis* (P3)-Pefi
- *Persoonia rudis* (P3)-Peru
- *Petrophile biternata* (P3)-Pebi
- *Petrophile clavata* (P2)-PecI
- *Phlebotocarya pilosissima* subsp. *pilosissima* (P3)-Phpip
- *Platysace ramosissima* (P3)-Plra
- *Podotheca pritzelii* (P3)-Popr
- *Ptychosema pusillum* (T)-Ptpu
- *Regelia megacephala* (P4)-Reme
- *Rhedinocarpha suffruticosa* (P1)-Rhsu
- *Rumex drummondii* (P4)-Rudr
- *Schoenus griffinianus* (P4)-Scgr
- *Schoenus pennisetis* (P3)-Scpe
- *Stylidium aceratum* (P3)-Stac
- *Stylidium aeonioides* (P4)-Stae
- *Stylidium carnosum* subsp. Narrow leaves (J.A. Wege 490) (P1)-StcaN
- *Stylidium milleri* (P2)-Stmi
- *Stylidium nonscandens* (P3)-Stno
- *Stylidium periscelanthum* (P3)-Sper
- *Stylidium striatum* (P4)-Ststr
- *Stylidium torticarpum* (P3)-Stto
- *Stylidium vinosum* (P1)-Stvi
- *Stylidium* sp. Moora (J.A. Wege 713) (P2)-SspM
- *Styphelia allittii* (P3)-Stal
- *Synaphea panhesya* (P1)-Sypa
- *Synaphea sparsiflora* (P2)-Sysp
- *Thelymitra apiculata* (P4)-Thap
- *Thelymitra stellata* (T)-Thst
- *Thysanotus glaucus* (P4)-Thgl
- *Verticordia huegelii* var. *tridens* (P3)-Vehut
- *Verticordia insignis* subsp. *eomagis* (P3)-Veine
- *Verticordia lindleyi* subsp. *lindleyi* (P4)-Velil
- *Verticordia paludosa* (P4)-Vepal
- *Verticordia rutilastra* (P3)-Veru



FIGURE 5.1

DBCA Significant Flora
Taxa Known from the
Desktop Study Area

5.1.3 Significant Vegetation

The interrogation of DBCA's TEC and PEC Database (DBCA, 2024b) returned two listed significant vegetation communities with records within the Desktop Study Area (**Table 5.3**). Of these two communities, one has historical records within the Project Area – The Banksia Woodlands of the Swan Coastal Plains TEC (Priority 3 WA PEC, Endangered Commonwealth TEC). Indicative locations of these communities are presented on **Figure 5.2**; these consist of DBCA-applied buffers surrounding known locations or likely to occur locations, ranging from 200-2,000 m (as per the metadata from the DBCA Threatened and Priority Ecological Communities Database interrogation (DBCA, 2024b)). As such, these may not represent verified extents of this community.

The searches of the DCCEEW SPRAT database with regard to MNES listed under the EPBC Act (DCCEEW, 2024) returned five Commonwealth-listed TECs that are likely to/may occur within the Desktop Study Area, as presented in **Table 5.3**. The full results of the DCCEEW database searches are presented in **Appendix B**.

A manual review of current DBCA TEC and PEC lists (DBCA, 2023c, 2023b) did not identify any additional significant vegetation communities that may occur within the Project Area.

In summary, a total of six significant vegetation communities have been identified as occurring or having the potential to occur within the Desktop Study Area, including one community with historical records within the Project Area (**Table 5.3**).

Table 5.3 Significant Vegetation Known from Within the Desktop Study Area

Status (EPBC)	Status (WA)	Description	Source^
Banksia Woodlands of the Swan Coastal Plain ecological community TEC – Endangered	Banksia Woodlands of the Swan Coastal Plain PEC – P3	Canopy is most commonly dominated or co-dominated by <i>Banksia attenuata</i> and/or <i>B. menziesii</i> . Other Banksia species that can dominate in the community are <i>B. prionotes</i> or <i>B. ilicifolia</i> . It typically occurs on well drained, low nutrient soils on sandplain landforms, particularly deep Bassendean and Spearwood sands and occasionally on Quindalup sands; it is also common on sandy colluvium and aeolian sands of the Ridge Hill Shelf, Whicher Scarp and Dandaragan Plateau and, in other less common scenarios. The description, area and condition thresholds that apply to the EPBC-listed TEC of the same name, also apply to this PEC.	DBCA, DCCEEW ('likely' to occur – in feature area), ecologia (2017), Terratree (2019)
	SCP23b: Swan Coastal Plain <i>Banksia attenuata</i> – <i>Banksia menziesii</i> woodlands PEC – P3	These woodlands occur in the Bassendean system, from Melaleuca Park to Gingin. Occurs in reasonably extensive Banksia woodlands north of Perth.	DBCA
Clay Pans of the Swan Coastal Plain TEC – Critically Endangered	-	The clay pan communities occur where clay substrate is low in the landscape and forms an impermeable layer close to the surface. These wetlands that rely on rainfall and local surface drainage to fill are considered unlikely to be connected to groundwater. The clay pans then dry out to form a relatively impervious substrate in summer. A suite of perennial plants that propagate by underground bulbs, tubers or corms (geophytes), and annual herbs flower sequentially as the clay pans dry out. The clay pans are the most diverse of the SCP wetlands and contain a number of local endemic flora.	DCCEEW ('likely' to occur – buffer area only)
Empodisma peatlands of southwestern Australia TEC – Endangered	-	The assemblage of plants, animals and other organisms associated with a type of freshwater, peat-based wetland that is found in the High Rainfall Province of the south-west of Western Australia. It is typically a sedgeland to shrubland vegetation complex on peaty substrates that almost always includes the perennial grass-like twig rush <i>Empodisma gracillimum</i> (tanglefoot). Empodisma peatlands provide habitat for a diverse range of hydrophilic species, including threatened, regionally endemic, and relictual flora and fauna species.	DCCEEW ('may' occur – buffer area only)

Status (EPBC)	Status (WA)	Description	Source [^]
Honeymyrtle shrubland on limestone ridges of the Swan Coastal Plain Bioregion TEC – Critically Endangered	<i>Melaleuca huegelii</i> – <i>M. systema</i> shrublands of limestone ridges (floristic community type 26a as originally described in Gibson et al. 1994) TEC	The community is known from shallow soils over limestone or massive limestone ridges of Tamala Limestone between Yanchep north of Perth, and south of Perth near Lake Clifton. The community generally comprises species-rich thickets, heaths and scrubs dominated by <i>Melaleuca huegelii</i> (chenille honeymyrtle), <i>Melaleuca systema</i> (coastal honeymyrtle) and <i>Banksia sessilis</i> (parrot bush), commonly over <i>Grevillea preissii</i> (spider net grevillea), <i>Spyridium globulosum</i> (basket bush), and <i>Acacia lasiocarpa</i> (pajang). A suite of herbs commonly occurs under the shrub layer.	DCCEEW ('may' occur – buffer area only)
Tuart (<i>Eucalyptus gomphocephala</i>) Woodlands and Forests of the Swan Coastal Plain ecological community TEC – Critically Endangered	Tuart (<i>Eucalyptus gomphocephala</i>) Woodlands of the Swan Coastal Plain PEC - P3	Mostly confined to Quindalup Dunes and Spearwood Dunes but can also occur on the Bassendean dunes and Pinjarra Plain. It can occur on the banks of rivers and wetlands. Tuart is the key upper canopy species although it may co-occur with trees of other species. Trees commonly co-occurring with Tuart include <i>Agonis flexuosa</i> , <i>Banksia grandis</i> , <i>Banksia attenuata</i> , <i>Eucalyptus marginata</i> ; and less commonly, <i>Corymbia calophylla</i> , <i>Banksia menziesii</i> and <i>Banksia prionotes</i> . An understorey of native plants is typically present, which may include grasses, herbs and shrubs. The description, area and condition thresholds that apply to the EPBC-listed TEC of the same name, also apply to this PEC.	DCCEEW ('likely' to occur – in project area)

[^]Sources are: DBCA (2024b), DCCEEW (2024), ecologia (2017), Terratree (2019).

FIGURE 5.2

DBCA Significant
Vegetation Records from
the Desktop Study Area

Legend

Project Area

Desktop Study Area

Railway

Road

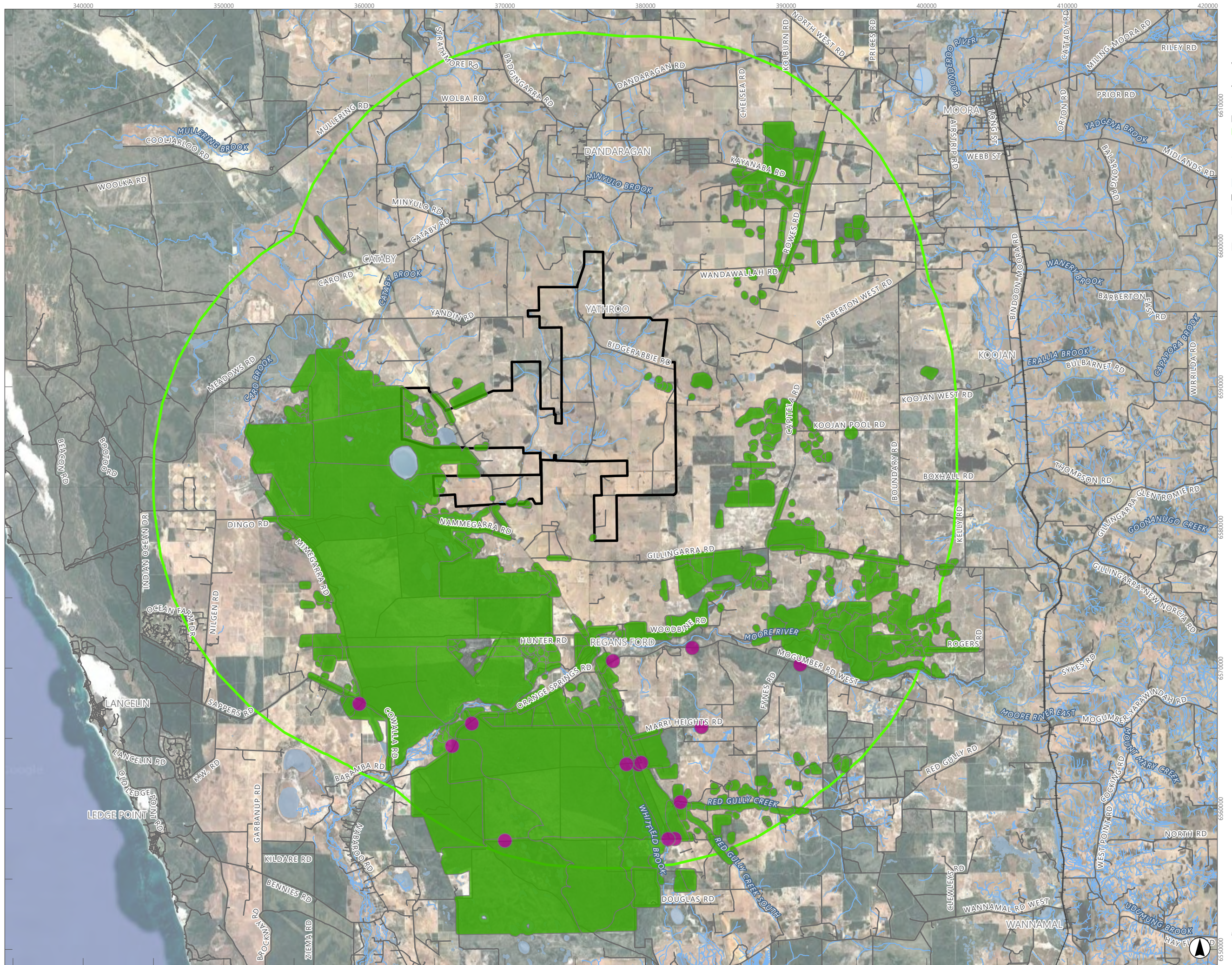
Watercourse

Waterbody

DBCA Ecological Community

Banksia Woodlands of the Swan Coastal
Plain ecological community (PEC – P3)
(TEC – Endangered)

Swan Coastal Plain *Banksia attenuata* -
Banksia menziesii woodlands (SCP 23b)
(PEC – P3) (TEC – Endangered)



5.2 Field Survey

5.2.1 Flora Census

A total of 248 discrete flora taxa, including 45 introduced taxa (18.1% of all taxa recorded), were recorded in the Survey Area by the 2024 survey. The 248 flora taxa represent a total of 53 families and 146 genera. The most well-represented families were Myrtaceae (36 taxa), Fabaceae (24 taxa), Proteaceae (23 taxa), Poaceae (17 taxa) and Asteraceae (16 taxa). A full list of vascular flora taxa recorded by the 2024 survey is presented in **Appendix C**.

Note that as discussed in **Section 1.3**, a Reconnaissance assessment was undertaken in areas outside the D&T Survey Area, and therefore the above numbers do not necessarily represent a full census of all vascular flora taxa that occur in the Survey Area.

Within quadrats established in the D&T Survey Area, average taxon richness per quadrat (including introduced and native non-endemic taxa (i.e. cultivated or cultivation escapees) was 39.9 (± 11.3), and average native endemic taxon richness per quadrat was 31.7 (± 11). Quadrat YTQ11 had the greatest number of taxa recorded in a single quadrat (57 taxa, 51 of which are native endemic and the remaining 6 as introduced species), while quadrat YK03 had the lowest (8 taxa, five of which are native endemic and 3 as introduced species). The raw quadrat and relevé data are presented in **Appendix D**.

Note that several collections could not be identified to species level due to poor material. Some are known to be distinct taxa relative to other taxa recorded by the survey, and therefore have been included in the totals presented above and in **Appendix C** (e.g. *Typha* sp.). Other collections may represent distinct taxa relative to other taxa recorded by the survey; however, it is more likely that they represent taxa already recorded elsewhere, with the quality of the material such that this distinction cannot be made (e.g. *Pterostylis* sp.). Such collections are not included in the totals above or presented in **Appendix C**.

5.2.2 Significant Flora Taxa

5.2.2.1 Overview

Table 5.5 presents a summary of data relating to significant flora taxa recorded by the 2024 survey in the Survey Area at quadrats/relevés or opportunistically. A total of five significant flora taxa were recorded, including one Threatened taxon listed under the BC and EPBC Acts (*Grevillea curviloba*). However, *Grevillea curviloba* (T), was found to be planted outside of its natural range, in an area of disturbed, revegetated bushland along Brand Highway, and as such, has been excluded from **Table 5.5** and is not discussed further in this report in a significant flora context. *Grevillea curviloba* (T) has a restricted distribution, with the northernmost records located along the entrance road to RAAF Gingin, and the southernmost records located in Ellenbrook. It has a very narrow east-west distribution, occurring in a line between Gingin and Ellenbrook (WA Herbarium, 1998-). This taxon is also a common cultivar and is often planted outside of its range throughout Perth and the southwest.

Note that for the purpose of **Table 5.5**, the number of individuals at locations where plant counts were not recorded (e.g. within quadrats) has been attributed a value of 1. **Table 5.5** also includes a summary of the VTs within which each significant flora taxon was recorded (VT descriptions provided in **Section 5.2.6**).

An overview of locations of significant flora taxa recorded in the Survey Area by the 2024 survey are presented in **Figure 5.3**. A detailed description and summary of information for each taxon recorded in the Survey Area is provided in **Section 5.2.2.2** to **Section 5.2.2.6**, and location coordinates are presented in **Appendix E**. The likelihood of occurrence of further occurrences of significant flora taxa within the Survey Area are discussed in **Section 5.2.4**.

Table 5.4 Summary of Significant Flora Taxa Recorded in the Survey Area

Taxon	Status (WA)	Number of Locations	Number of Individuals	VTs*
<i>Calytix ecalycata subsp. brevis</i>	P3	1	5	VT3
<i>Eucalyptus macrocarpa subsp. elachantha</i>	P4	4	14	VT1, VT3, PE
<i>Haemodorum loratum</i>	P3	13	29	VT1, VT2, VT3
<i>Poranthera moorokatta</i>	P2	2	24	VT3

*Refer to **Section 5.2.6** for VT descriptions.

FIGURE 5.3

Significant Flora Taxa
Recorded in the Survey
Area

Legend

Survey Area

Railway

Road

Watercourse

Waterbody

Taxon,WA Status

Calytrix ecalycata subsp. *brevis* (P3) (CAEC)

Eucalyptus macrocarpa subsp. *elachantha* (P4) (EUMA)

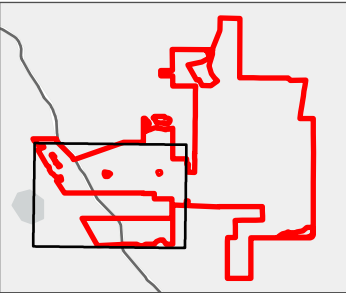
Grevillea curviloba (T) (GRCU)

Haemodorum ?loratum (P3) (HA?LO)

Haemodorum loratum (P3) (HALO)

Poranthera moorokatta (P2) (POMO)

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



0 0.5 1
Kilometres
Scale: 1:30,000 at A3
GDA2020 MGA Zone 50
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5.2.2.2 *Calytrix ecalycata* subsp. *brevis* (P3)

Calytrix ecalycata subsp. *brevis* (P3) is an upright shrub growing to 1 m high (**Photo 5.1**) occurring on sandplains and low rises with yellow sand (WA Herbarium, 1998-). This taxon is known to occur over a range of approximately 95 km in WA, from south-east of Cataby in the south to Coorow in the north (WA Herbarium, 1998-). This taxon is known from 12 WA Herbarium records representing 10 localities, two of which occur within DBCA-managed tenure, including Manaling Nature Reserve and Lesueur National Park (WA Herbarium, 1998-).



Photo 5.1 *Calytrix ecalycata* subsp. *brevis* (P3)

(Photo source - Umwelt)

5.2.2.3 *Eucalyptus macrocarpa* subsp. *elachantha* (P4)

Eucalyptus macrocarpa subsp. *elachantha* (P4) is a spreading mallee growing up to 4 m high (**Photo 5.2**) occurring on hillslopes, ridges and sandplains with white or grey sand, over laterite (WA Herbarium, 1998-). It is known to occur over a range of approximately 240 km in WA from south-east of Geraldton in the north to near Regans Ford in the south. This taxon is known from 59 WA Herbarium records representing 44 localities, four of which occur within DBCA-managed tenure, including Fynes Nature Reserve and South Eneabba Nature Reserve (WA Herbarium, 1998-).





Photo 5.2 *Eucalyptus macrocarpa* subsp. *elachantha* (P4)

(Photo source – Umwelt)

5.2.2.4 *Haemodorum loratum* (P3)

Haemodorum loratum (P3) is a bulbaceous perennial herb growing up to 1.2 m high (**Photo 5.3**), and occurs on grey or yellow sand, often with lateritic gravel, on flats and slopes (WA Herbarium, 1998-). It is known to occur over a range of approximately 300 km in WA from south-east of Dongara in the north to Forrestfield in the south. This taxon is known from 25 WA Herbarium records representing 16 localities, six of which occur within DBCA-managed tenure, including Coomallo Nature Reserve, Lesueur National Park and Moore River National Park (WA Herbarium, 1998-).

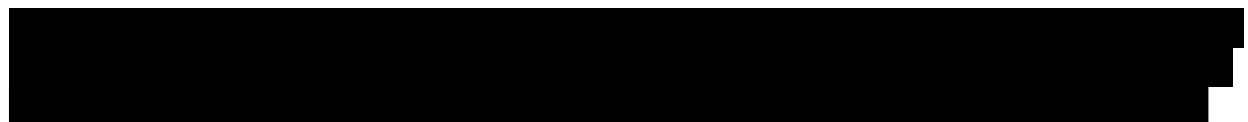




Photo 5.3 *Haemodorum loratum* (P3)

(Photo source - Umwelt)

5.2.2.5 *Poranthera moorokatta* (P2)

Poranthera moorokatta (P2) is a small annual herb growing to 4 cm high (**Photo 5.4**), occurring on sandy soils, mainly in Banksia woodlands (WA Herbarium, 1998-). This taxon is known to occur over a range of approximately 345 km in WA, from Tutunup in the south to Cataby in the north (WA Herbarium, 1998-). This taxon is known from 16 WA Herbarium records representing 15 localities, three of which occur within DBCA-managed tenure, including Lot 2091 (known as Ioppolo Road) and Millbrook State Forest (WA Herbarium, 1998-).

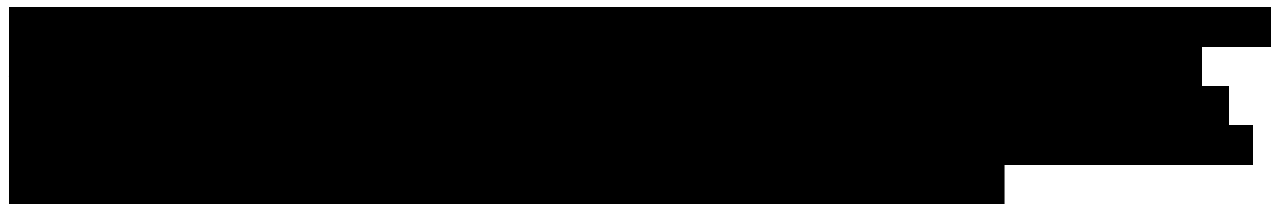




Photo 5.4 *Poranthera moorokatta* (P2)

(Photo source - Umwelt)

5.2.2.6 Other Flora Taxa of Interest

One collection of a *Hypocalymma* species was made during the 2024 survey, from Quadrat YTQ07, located within the road reserve of Walyoo Road. This entity was initially identified by Umwelt as *Hypocalymma lateriticola* (P1), however, the specimen was sterile. Without reproductive material, this taxon could not be identified with confidence. The specimen was sent to the WA Herbarium for further investigation and identification, and was reviewed by Michael Hislop. Hislop noted that the vegetative morphology of this specimen was not typical of any taxon known to be in the Cataby-Dandaragan area.

Therefore, this entity is considered to be potentially significant under the ‘new species or species with anomalous features that indicate a potential new species’ reason from EPA (2016a, 2016b) (**Section 1.2**). No further collections were made of this taxon, and further investigation is recommended to determine whether this taxon is an undescribed species. Collections of fertile material are required for formal identification of this entity.

This taxon was collected in VT 3, on yellow-grey sands on undulating plains.



Photo 5.5 *Hypocalymma* sp. Scanned Specimen

(Photo source – Umwelt)

5.2.3 Introduced Flora Taxa

A high percentage of introduced taxa were recorded in the areas assessed (18.1% of the total number of taxa recorded), which is representative of the high levels of human impact evident throughout the Survey Area. Note that nine taxa included in this list are taxa that are native to Australia, but planted outside their natural range, and thus are classified as introduced in this context. These taxa, with the exception of the nine Australian natives, planted outside of their natural distributions, are listed in **Table 5.5**, along with ecological impact and invasiveness ratings as per the *Ecological Impact and Invasiveness Ratings from the Department of Parks and Wildlife for the Midwest Region* (DBCA, 2014). One Declared Pest listed under the BAM Act (**Zantedeschia aethiopica*) was recorded in the Survey Area.

Of the 36 introduced flora taxa recorded in the Survey Area (excluding non-endemic Australian natives), seven have not been rated for ecological impact by DBCA (2014) (**Table 5.5**). As noted above, only **Zantedeschia aethiopica* is listed as a Declared Pest (under section 22(2) of the BAM Act). According to Hussey et al. (2007), while many of the remaining weeds are common and widespread in WA, they are not noted as being serious environmental weeds.

Eleven introduced flora taxa recorded in the Survey Area are rated as having ‘High’ ecological impact (**Table 5.5**). Taxa with this ecological impact rating are considered significant weeds capable of causing acute disruption of ecological processes, as well as dominating and/or significantly altering the vegetation structure, composition and function of ecosystems (DBCA, 2014). Of note is **Gladiolus caryophyllaceus*, which is considered a ‘serious invader of relatively undisturbed Banksia woodland’ (Brown & Brooks, 2002).

Twenty-six of the introduced flora taxa recorded in the Survey Area are rated as having ‘Rapid’ invasiveness in native vegetation (**Table 5.5**). This describes the rate of spread of a weed in native vegetation, encompassing factors of establishment (including the ability to outcompete and the requirement for disturbance to establish), reproduction factors (including time to seeding and seed/vegetative production) and long distance dispersal mechanisms (>100 m) (DBCA, 2014). Taxa with ‘Rapid’ invasiveness ratings are typically disturbance opportunists and are relatively common around disturbance areas, on road verges, and along drainage lines and other areas of periodic inundation.

Table 5.5 Introduced Flora Taxa Recorded in the Survey Area

Taxon	Common Name	Ecological Impact^	Invasiveness^
<i>Aira caryophyllea</i>	Silvery Hairgrass	High	Rapid
<i>Aira cupaniana</i>	Hairgrass, Silvery Hairgrass	High	Rapid
<i>Arctotheca calendula</i>	Capeweed	High	Rapid
<i>Avellinia festucoides</i>		Unrated	Unrated
<i>Briza maxima</i>	Blowfly Grass	Unknown	Rapid
<i>Briza minor</i>	Shivery Grass	Unknown	Rapid
<i>Bromus diandrus</i>	Great Brome	High	Rapid
<i>Corynephorus fasciculatus</i>		Unrated	Unrated
<i>Ehrharta calycina</i>	Perennial Veldtgrass	High	Rapid
<i>Ehrharta longiflora</i>	Annual Veldtgrass	Unknown	Rapid
<i>Eragrostis curvula</i>	African Love Grass	High	Rapid
<i>Erodium botrys</i>	Long Storksbill	Low	Rapid
<i>Ficinia marginata</i>		Unrated	Unrated
<i>Galium divaricatum</i>	Slender Goosegrass	Unknown	Rapid
<i>Gladiolus caryophyllaceus</i>	Pink Gladiolus	High	Rapid
<i>Hypochaeris glabra</i>	Flatweed, Smooth Catsear	Low	Rapid
<i>Juncus acutus</i> subsp. <i>acutus</i>	Sharp Rush	High	Rapid
<i>Lactuca serriola</i>	Prickly Lettuce	Low	Rapid
<i>Lolium rigidum</i>	Annual Ryegrass	Unknown	Rapid
<i>Lotus subbiflorus</i>	Hairy Birdsfoot Trefoil	Unknown	Moderate
<i>Lysimachia arvensis</i>	Scarlet Pimpernel	Low	Rapid
<i>Mentha</i> sp.	Mint	Unrated	Unrated
<i>Ornithopus compressus</i>	Yellow Serradella	Low	Rapid
<i>Parentucellia latifolia</i>	Red Bartsia	Medium	Rapid
<i>Pentameris airoides</i> subsp. <i>airoides</i>	False Hairgrass	Unknown	Rapid

Taxon	Common Name	Ecological Impact^	Invasiveness^
<i>Petrorhagia dubia</i>	Velvet Pink	Low	Rapid
<i>Pinus</i> sp.	Pine	Unrated	Unrated
<i>Polycarpon tetraphyllum</i>	Allseed, Fourleaf Allseed	Low	Moderate
<i>Romulea rosea</i>	Guildford Grass	High	Rapid
<i>Sonchus oleraceus</i>	Common Sowthistle	Unknown	Rapid
<i>Trifolium campestre</i> var. <i>campestre</i>	Hop Clover	High	Moderate
<i>Ursinia anthemoides</i> subsp. <i>anthemoides</i>	Ursinia	High	Rapid
<i>Vitis vinifera</i>	Grape	Unrated	Unrated
<i>Vulpia bromoides</i>	Squirrel's Tail Fescue	Unknown	Rapid
<i>Wahlenbergia capensis</i>	Cape Bluebell	Unknown	Rapid
<i>Zantedeschia aethiopica</i>	Arum Lily	Unrated	Unrated

^Source: DBCA (2014).

5.2.4 Likelihood of Occurrence of Further Significant Flora Taxa

As discussed in **Section 5.1.2**, a total of 177 significant flora taxa were identified as occurring (or potentially occurring) within the Desktop Study Area prior to the 2024 survey. Theoretically, these taxa were likely all identifiable during the 2024 survey, either because the survey periods coincided with the taxon's flowering period, or the taxon can be identified reliably when in fruit or when sterile. **Appendix F** presents the likelihood of each taxon occurring within both the D&T Survey Area (subject to Detailed and Targeted survey) and the wider Survey Area (subject to Reconnaissance survey only). The likelihood of occurrence assessments were undertaken following review of species' habitats and distributions. **Table 5.6** presents a summary of the likelihood of occurrence assessments for both the D&T Survey Area, and the Survey Area.

It should be noted that suitable habitat has predominantly been determined utilising details recorded from known locations of specimens lodged with the WA Herbarium (WA Herbarium, 1998-). However, for many taxa known within the general vicinity of the Survey Area, suitable habitat is difficult to define as the available information is often vague or very broad and difficult to interpret. Therefore, a precautionary approach has been adopted when assessing whether suitable habitat for the taxon is present in the Survey Area.

Table 5.6 Summary of the Likelihood of Occurrence Assessments

Category	Count of Significant Flora Taxa	
	D&T Survey Area	Survey Area
Unlikely	173	96
Potential	-	-
Possible	-	77
Known	5 (Including the planted taxon <i>Grevillea curviloba</i> (T))	5 (Including the planted taxon <i>Grevillea curviloba</i> (T))

5.2.5 Distribution Extensions and Distribution Gaps

Table 5.7 presents a list of flora taxa collected in the Survey Area, for which the collections represent extensions (greater than approximately 20 km) to the known distributions of such taxa, or otherwise fill gaps within their known distributions, according to Florabase (WA Herbarium, 1998-).

Collections of nine taxa made during the 2024 survey represent range extensions or fill gaps within their known distributions. Specimen material from these taxa will be lodged at the WA Herbarium by Umwelt as per the requirements of EPA Technical Guidance (EPA, 2016b), where such material is of sufficient quality.

Note that although collections of taxa that are ‘representative of the range of a species (particularly, at the extremes of range, recently discovered range extensions, or isolated outliers of the main range)’ can be considered significant taxa as per EPA definitions (EPA, 2016a, 2016b), none of the taxa listed in **Table 5.7** are considered to be significant taxa in this context, as they are all known from wide distributions (with the exception of the significant flora taxa discussed in **Section 5.2.3**).

Table 5.7 Summary of Flora Taxa Where Collections Represent Range Extensions or Fill Distribution Gaps

Taxon	Description
<i>Amyema miquelii</i>	Locality hole [^]
<i>Drosera eneabba</i>	Range extension to the south-east
<i>Centella asiatica</i>	Locality hole
<i>Hydrocotyle callicarpa</i>	Locality hole
<i>Machaerina preissii</i>	Range extension to the north
<i>*Polycarpon tetraphyllum</i>	Locality hole
<i>Poranthera moorokatta</i> (P2)	Locality hole
<i>Rhodanthe laevis</i>	Locality hole
<i>Styphelia erubescens</i>	Range extension to the north-east

[^]Locality hole: defined as a gap, or ‘hole’ within the known distribution of a taxon.

5.2.6 Vegetation of the Survey Area

PCA of the Survey Area quadrat dataset determined that three clusters may be appropriate to capture the majority of the variation in the dataset; the ‘elbow’ of the scree plots as presented in **Appendix G** indicates where the eigenvalues level off, and hence the principal components to the left of this point should be retained as significant. Also presented in **Appendix G** are the 2D cluster plots (clusters denoted by different colours and symbology), taxon group matrices (clusters denoted by vertical and horizontal spacings) and clustering dendrograms (clusters denoted by grey hashed boxes); these plots were generated using the number of clusters indicated by PCA as being appropriate for the dataset. All plots were initially examined at this level, to determine the plausibility of clusters with regard to taxon groups, as well as field observations.

The process described above determined that the three clusters were appropriate for this dataset. This was supported by review of the 2D cluster plots and taxon group matrices (**Appendix G**).

In addition, quadrat YK03 was determined to represent a discrete vegetation community. This quadrat was not included in the analysis, on the basis that all taxa recorded within the quadrat were singletons in the dataset. This VT is widespread throughout the Survey Area, however the condition of the vegetation was deemed too poor for additional sampling, thus preventing replication of quadrats within the VT.

Therefore, the 17 quadrats in the Survey Area are considered to be representative of four VTs, as described above. The review of relevé and vegetation mapping note data identified an additional four VTs (VTs 5–8) outside the D&T Survey Area in the wider Survey Area, where vegetation condition was considered too poor for sampling via quadrats.

Table 5.8 presents a description of each of the eight VTs mapped in the Survey Area, including location, area mapped, sampling regime, significant flora recorded, average taxon richness and a description of variation found within the VT. **Figure 5.4** presents the vegetation mapping. Raw quadrat and relevé data and parameters are presented in **Appendix D**. **Appendix H** presents a species-by-community matrix (for VTs determined by floristic analysis) and **Appendix I** presents the results of the indicator taxa analysis.

5.2.7 Other Areas Mapped

Seven Highly Modified Areas (HMAs) were identified during the 2024 survey (**Table 5.8**, **Figure 5.4**). These consist of areas where natural vegetation has been almost or entirely removed, cleared, or replaced with introduced or non-endemic taxa.

Isolated remnant trees (IT) were mapped across 185.4 ha of the Survey Area (1.2%), largely consisting of native remnant paddock and road verge trees and shrubs.

Areas where natural vegetation has been completely and apparently permanently removed, with either no or very scattered native taxa (trees) remaining, have been mapped as 'PD' (where discernible at 1:5,000 scale). This category mainly consists of paddocks, with infrastructure, tracks and firebreaks providing a minor proportion of this area. A total of 14,228.1 ha of PD was mapped, representing 89.9% of the Survey Area

A further 301.4 ha (1.9%) of the Survey Area comprises planted vegetation, where the natural vegetation has been cleared and replaced. These areas were mapped as PP (Pine plantations), PE (Planted *Eucalyptus* spp.) and TP (Tagasaste or Grape plantations),

Water bodies (WB) were also mapped in the Survey Area, consisting of artificial dams and natural or artificial lakes and pooling water. This category comprises 101.0 ha of the Survey Area.

Table 5.8 Vegetation Types of the Survey Area

VT	Description	Representative Photo
1	Description: Low isolated trees to open woodland of <i>Corymbia calophylla</i>, occasionally with <i>Eucalyptus todtiana</i>, occasionally with a tall shrubland of <i>Banksia hewardiana</i> over mid open shrubland of <i>Hakea trifurcata</i>, <i>Xanthorrhoea preissii</i>, <i>Allocasuarina humilis</i>, and <i>Calothamnus sanguineus</i> over low isolated shrubs of <i>Babingtonia grandiflora</i> and <i>Hibbertia hypericoides</i> subsp. <i>hypericoides</i> over low isolated tussock grasses of <i>Austrostipa elegantissima</i> and occasionally <i>Neurachne alopecuroidea</i> over low isolated sedges of <i>Morelotia octandra</i> occasionally over low open rushland of <i>Lepidosperma</i> cf. <i>pubisquameum</i> or <i>Lepidosperma apricola</i> and/or <i>Desmocladus asper</i> over low isolated clumps of forbs of <i>Opercularia vaginata</i>, occasionally with <i>Chamaescilla corymbosa</i>, <i>Trachymene pilosa</i> and <i>Podotheca gnaphalioides</i>; on undulating plains with grey/yellow/white sand-sandy loam or on slopes with red/brown clay loam and laterite pebbles. Location: Widespread across the Survey Area Area Mapped (Proportion of Survey Area): 254.6 ha (1.6%) Definition Method: floristic composition classification Sample Sites: YK01, YK02, YTQ05, YTQ06, YTQ09, YTQ14, YR02, YTR01, KRMN1, KRMN2, KRMN3, KRMN4, KRMN5, KRMN7, KRMN16, KRMN41, KRMN45, KRMN50, KRMN52, KRMN54, KRMN64, KRMN65, KRMN66, KRMN67, KRMN70, KRMN72, KRMN76, KRMN87, KRMNT2, KRMNT2-1, MVM03, VM43, VM54, VM61, VM65, VM66, VM67, VM70, VM71, VM72, VM75, VM76, VM77, VM85, VM87, VM89, VM90, VM92, VM94, VM96, VM98, VM100, VM101, VM104, VM111, VM112, VM115, VM125, VM126, VM129, VM132, VM173, VM223, VM264, VM283, VM285, VM335, VM358. Indicator Taxa: <i>Austrostipa elegantissima</i>, <i>Babingtonia grandiflora</i>, <i>Chamaescilla corymbosa</i>, <i>Corymbia calophylla</i>, <i>Opercularia vaginata</i> Significant Taxa: <i>Eucalyptus macrocarpa</i> subsp. <i>elachantha</i> (P4), <i>Haemodorum loratum</i> (P3) Average Taxon Richness per Quadrat: 40 ± 9 Variation: There is a lateritic variant with a tall shrubland layer of <i>Banksia hewardiana</i> (quadrat YK02)	 YTQ09 – Typical VT 1  YK02 – Laterite Variant

VT	Description	Representative Photo
2	Description: Occasional low woodland of <i>Banksia prionotes</i>, sometimes with <i>Eucalyptus todtiana</i>, over tall open shrubland to shrubland of <i>Acacia blakelyi</i> over mid sparse shrubland of <i>Allocasuarina humilis</i>, <i>Calothamnus quadrifidus</i> subsp. <i>quadrifidus</i> and <i>Xanthorrhoea preissii</i> over low sparse shrubland of <i>Dianella revoluta</i> and <i>Conostylis aculeata</i> subsp. <i>aculeata</i> over low isolated grasses of <i>Austrostipa macalpinei</i> over low clumps of sedges of <i>Mesomelaena pseudostygia</i> over low isolated forbs of <i>Calandrinia corrigioloides</i>, <i>Centrolepis drummondiana</i>, <i>Drosera erythrorhiza</i>, <i>Poranthera microphylla</i> and <i>Trachymene pilosa</i>; on sand plains with grey/yellow/brown sand. Location: the southern portion of the south section of Brand Highway, and one small patch approximately in the centre of the Survey Area. Area Mapped (Proportion of Survey Area): 16.5 ha (0.1%) Definition Method: floristic composition classification Sample Sites: YTQ01, YTQ02, YTQ10, YR10, YR11, VM286, MVM02, KRMN19, KRMNX1, KRMNTT, KRMN100 Indicator Taxa: <i>Acacia blakelyi</i>, <i>Calandrinia corrigioloides</i>, <i>Centrolepis drummondiana</i>, <i>Conostylis aculeata</i> subsp. <i>aculeata</i>, <i>Drosera erythrorhiza</i>, <i>Gompholobium tomentosum</i> Significant Taxa: <i>Haemodorum loratum</i> (P3) Average Taxon Richness per Quadrat: 38 ± 6 Variation: No notable variation observed.	 YTQ01

VT	Description	Representative Photo
3	Description: Occasional low open woodland of <i>Eucalyptus tottiana</i>, <i>Banksia attenuata</i> and <i>Banksia menziesii</i>, sometimes with <i>Banksia prionotes</i>, occasionally with a mid shrubland of <i>Leptospermopsis erubescens</i>, over mid sparse shrubland of <i>Xanthorrhoea preissii</i> and <i>Jacksonia floribunda</i> over low sparse shrubland of <i>Banksia dallanneyi</i> subsp. <i>dallanneyi</i> var. <i>dallanneyi</i>, <i>Hibbertia hypericoides</i> subsp. <i>hypericoides</i>, <i>Melaleuca ciliosa</i> and <i>Petrophile macrostachya</i> over low isolated clumps of grasses of <i>Austrostipa elegantissima</i> and <i>Austrostipa macalpinei</i> over low sparse sedgeland to isolated clumps of sedges of <i>Mesomelaena pseudostygia</i>, <i>Schoenus clandestinus</i> and <i>Schoenus nanus</i> over isolated clumps of rushes of <i>Lepidobolus preissianus</i> subsp. <i>preissianus</i> and <i>Caustis dioica</i> over low isolated clumps of forbs of <i>Burchardia congesta</i>, <i>Drosera erythrorhiza</i>, <i>Phyllangium divergens</i>, <i>Podothea gnaphalioides</i> and <i>Trachymene pilosa</i>, on sand plains with white/grey/yellow sand. Location: forms the majority of the north section of Brand Highway, and some remnant patches occur to the west of Brand Highway. Area Mapped (Proportion of Survey Area): 79.4 ha (0.5%) Definition Method: floristic composition classification Sample Sites: YTQ03, YTQ04, YTQ07, YTQ08, YTQ11, YTQ12, YTQ13A, YR03, YR08, YR09, KRMN29, KRMN31, KRMN35, KRMN40, VM260, VM261, VM263, VM266, VM267, VM364, MVM01. Indicator Taxa: <i>Banksia attenuata</i>, <i>Banksia menziesii</i>, <i>Caustis dioica</i>, <i>Conostylis teretifolia</i> subsp. <i>teretifolia</i>, <i>Haemodorum laxum</i>, <i>Mesomelaena pseudostygia</i>, <i>Phyllangium divergens</i>, <i>Schoenus clandestinus</i> Significant Taxa: <i>Calytrix ecalycata</i> subsp. <i>brevis</i> (P3), <i>Eucalyptus macrocarpa</i> subsp. <i>elachantha</i> (P4), <i>Haemodorum loratum</i> (P3), <i>Poranthera moorokatta</i> (P2) Average Taxon Richness per Quadrat: 45 ± 6 Variation: A variant of this VT exists without the presence of the <i>Banksia</i> overstorey.	 YTQ07 – Typical VT 3  YTQ04 – No Banksia Variant

VT	Description	Representative Photo
4	Description: Low open woodland of <i>Eucalyptus rudis</i> subsp. <i>rudis</i> over tall open shrubland of <i>Melaleuca raphiophylla</i> over mid closed rushland of <i>Lepidosperma longitudinale</i> and <i>Machaerina preissii</i>, on drainage lines and open depressions with brown loam. Location: Widespread through the Survey Area. Area Mapped (Proportion of Survey Area): 428.0 ha (2.7%) Definition Method: floristic composition classification Sample Sites: YK03, YKR01, SS01, SS11, SS13, SS16, SS20, KRMN10, KRMN11, KRMN13, KRMN24, KRMN33, KRMN34, KRMN95, KRMN96, KRMN97, VM40, VM51, VM52, VM59, VM130, VM146, VM147, VM148, VM149, VM150, VM153, VM162, VM163, VM170, VM173, VM178, VM180, VM181, VM182, VM197, VM199, VM200, VM202, VM203, VM211, VM212, VM219, VM221, VM224, VM230, VM231, VM232, VM233, VM234, VM236, VM237, VM243, VM251, VM252. Indicator Taxa: <i>Eucalyptus rudis</i> subsp. <i>rudis</i>, <i>Melaleuca raphiophylla</i>, <i>Lepidosperma longitudinale</i>, <i>Machaerina preissii</i>. Significant Taxa: NA Average Taxon Richness per Quadrat: 8 Variation: No notable variation observed.	 YK03

VT	Description	Representative Photo
5	Description: Low woodland of <i>Melaleuca preissiana</i> and/or <i>Melaleuca raphiophylla</i> occasionally over low isolated sedges of <i>Schoenus subfascularis</i> over low closed grassland of pasture weeds, on open depressions, sometimes with standing water, with brown loam. Location: north-eastern portion of Survey Area. Area Mapped (Proportion of Survey Area): 32.4 ha (0.2%) Definition Method: structural vegetation classification Sample Sites: VM190, VM191, KRMN36. Variation: No notable variation observed.	 VM190
6	Description: Low isolated trees to low open woodland of <i>Eucalyptus loxophleba</i> subsp. <i>loxophleba</i> over low closed grassland of pasture weeds, on plains or slopes with grey/brown loam. Location: north-eastern portion of Survey Area. Area Mapped (Proportion of Survey Area): 5.3 ha (0.03%) Definition Method: structural vegetation classification Sample Sites: VM141, SS05, SS22. Variation: No notable variation observed.	No Photo Available

VT	Description	Representative Photo
7	Description: Isolated low trees to low open woodland of <i>Eucalyptus tottiana</i> over low closed grassland of pasture weeds, on plains and slopes or grey/brown sand or loam. Location: sporadic across the northeastern section of the Survey Area, as well as the approximate centre of the Survey Area. Area Mapped (Proportion of Survey Area): 3.6 ha (0.02%) Definition Method: structural vegetation classification Sample Sites: KRMN48, SS04. Variation: No notable variation observed.	No Photo Available
8	Description: Isolated mid shrubland of <i>Xanthorrhoea ?drummondii</i> over low open shrubland of <i>Acacia pulchella</i> and <i>Hibbertia hypericoides</i> subsp. <i>hypericoides</i> over low open sedgeland of <i>Mesomelaena pseudostygia</i>, <i>Schoenus brevisetis</i>, <i>Schoenus clandestinus</i> and <i>Morelotia octandra</i>, over isolated low tussock grasses of <i>Amphipogon turbinatus</i>, on slopes of yellow-grey sand or red-brown clay loam with laterite. Location: two isolated locations within the southwest of the Survey Area. Area Mapped (Proportion of Survey Area): 1.5 ha (0.01%) Definition Method: structural vegetation classification Sample Sites: VM50. Variation: No notable variation observed.	 VM50

VT	Description	Representative Photo
Highly Modified Areas		
IT	Description: Isolated remnant trees and shrubs, sometimes low open woodlands, typically with <i>Corymbia calophylla</i>, <i>Eucalyptus rudis</i> subsp. <i>rudis</i>, <i>Eucalyptus tottiana</i>, <i>Jacksonia sternbergiana</i> and <i>Acacia saligna</i>. Location: Widespread across the Survey Area. Area Mapped (Proportion of Survey Area): 185.4 ha (1.2%) Sample Sites: KRMN39, KRMN46, KRMN47, KRMN49, KRMN69, KRMN72, KRMN89, KRMN93, VM140, VM165, VM168, VM225, VM226, VM238, VM350.	 VM62
PP	Description: Plantations of *<i>Pinus</i> sp. Location: Widespread across the Survey Area. Area Mapped (Proportion of Survey Area): 168.0 ha (1.1%) Sample Sites: VM113, VM195, VM239, KRMN18, KRMN12, KRMN21, KRMN22, KRMN23, KRMN25, KRMN27, SS19.	 VM195

VT	Description	Representative Photo
PE	Description: Planted trees of <i>Eucalyptus</i> spp., of either native or exotic origin. Location: Widespread across the Survey Area. Area Mapped (Proportion of Survey Area): 45.2 ha (0.3%) Sample Sites: KRMN09, KRMN15, KRMN26, KRMN47, KRMN55, SS09, VM68, VM74, VM95, VM107, VM118, VM121, VM152, VM169, VM214, VM218, VM240, VM241, VM242, VM346.	 KRMN09
TP	Description: Plantations of <i>*Chamaecytisus palmensis</i> or <i>*Vitis vinifera</i>. Location: Occasional, but widespread across the Survey Area. Area Mapped (Proportion of Survey Area): 88.2 ha (0.6%) Sample Sites: KRMN14, KRMN17, KRMN30, KRMN79, VM41, VM116, VM155, VM196.	No Photo Available

VT	Description	Representative Photo
JD	Description: Mid to tall sedgeland to open sedgeland of <i>*Juncus acutus</i> over low closed grasslands of pasture weeds, on drainage lines and sump areas. Location: Widespread across the Survey Area. Area Mapped (Proportion of Survey Area): 197.7 ha (1.2%) Sample Sites: KRMN28, KRMN32, KRMN42, KRMN49, VM154, VM185, VM210, VM213, VM215, VM216, VM235, SS03.	 VM01
PD	Description: Paddocks and infrastructure, cleared land. Location: Widespread across the Survey Area. Area Mapped (Proportion of Survey Area): 14,228.1 ha (89.9%) Sample Sites: NA	

VT	Description	Representative Photo
WB	Description: Water Bodies and Artificial Dams. Location: Widespread across the Survey Area. Area Mapped (Proportion of Survey Area): 101.0 ha (0.6%) Sample Sites: NA	