

# ASSESSMENT OF FLORA AND VEGETATION VALUES

**ALCOA OF AUSTRALIA SPION SURVEY AREA, WA**

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Prepared By



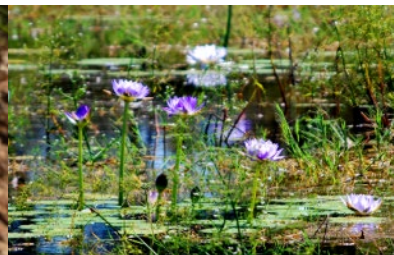
**Mattiske** Consulting Pty Ltd

Prepared For

**Alcoa of Australia Limited**

**August 2023**

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## LIST OF ABBREVIATIONS

- BAM Act:** *Biosecurity and Agriculture Management Act 2007 (WA)*
- BC Act:** *Biodiversity Conservation Act 2016 (WA)*
- BOM:** Bureau of Meteorology
- DCCEEW:** Department of Climate Change, Energy, the Environment and Water
- DBCA:** Department of Biodiversity, Conservation and Attractions
- EP Act:** *Environmental Protection Act 1986 (WA)*
- EPA:** Environmental Protection Authority
- EPBC Act:** *Environment Protection and Biodiversity Conservation Act 1999 (Commonwealth)*
- MCPL:** Mattiske Consulting Pty Ltd
- IBRA:** Interim Biogeographical Regionalisation for Australia
- PEC:** Priority ecological community
- TEC:** Threatened ecological community
- WAH:** Western Australian Herbarium (PERTH)

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## EXECUTIVE SUMMARY

Mattiske Consulting Pty Ltd was commissioned by Alcoa of Australia Ltd (Alcoa) to initially conduct a desktop and field assessment to evaluate the flora and vegetation values of the Spion survey area approximately 110 km south east of Perth, WA. The Spion survey area consists of nine blocks totalling 486 hectares, located east of the existing Willowdale bauxite mining operation and within tenements ML 1S4, E 70/6051, E 70/6279 and E 70/6456. The survey areas have been assessed by Mattiske Consulting Pty Ltd at a regional mapping scale as part of the Regional Forest Agreement (RFA) project by Mattiske and Havel (1998).

Various databases were used to identify the possible occurrence of flora (including introduced, threatened and priority taxa) and threatened and priority ecological communities within the Spion survey area. The field studies were undertaken over several months in line with previous assessments in the northern Jarrah forest.

The Spion survey area occurs within the Northern Jarrah Forest subregion of the Southwest Botanical Province. The geology of the region comprises lateritic duricrust, with drainage lines and occasional granite hills. The Northern Jarrah Forest subregion is characterised by Jarrah (*Eucalyptus marginata*) forest on ironstone gravels and Marri-Wandoo (*Corymbia calophylla* - *Eucalyptus wandoo*) woodlands on loamy soils, with sclerophyll understoreys. The vegetation of the region has been extensively studied, and has been described in a series of vegetation complexes of the Darling System by Heddl *et al.* (1980) and Mattiske and Havel (1998).

### Potential Flora Values

A total of 462 vascular plant taxa, representative of 186 genera and 72 families, have the potential to occur within the Spion survey area. The most commonly represented families were Fabaceae (56 taxa), Proteaceae (39 taxa) and Myrtaceae (38 taxa). The most commonly represented genera in the Spion survey areas were *Acacia* (21 taxa), *Lomandra* (15 taxa) and *Hibbertia* (14 taxa).

A total of 33 introduced taxa (inclusive of five Mixed- part alien/ part naturalised) have the potential to occur in the Spion survey area. Only one of the potential weeds *\*Rubus ulmifolius* as listed under the *\*Rubus fruticosus* aggregate, is a Weed of National Significance (DCCEEW, 2023b). *\*R. ulmifolius* is also a declared pest/organism under the *Biosecurity and Agriculture Management Act 2007* (WA) (DPIRD 2023).

### Recorded Flora Values

A total of 177 taxa from 40 families and 87 genera was recorded in the Spion survey areas and as such partly reflects the smaller survey area.

Of the 177 taxa, 1 was an introduced species. The introduced species all occur more widely in the Jarrah forest and are not listed as WONS weeds at the National scale or as Declared pests at the State level.

No Threatened flora species, pursuant to section 179 of the *EPBC Act* and as listed by DCCEEW (2023a) or pursuant to Part 2, Division 1 and Subdivision 2 of the *BC Act* and as listed by DBCA (2022a) were recorded during recent assessments of the Spion survey area.

One Priority three flora species (*Grevillea prominens*) as listed by DBCA (2022a) was recorded in the Spion survey area. This species occurred in the north-eastern section of the survey area.

### Potential Vegetation Values

No Threatened Ecological Communities or Priority Ecological Communities (TECs and PECs) occur in the Spion survey area.

The Spion survey area occurs within the Regional Forest Agreement (RFA) area of the southwest forests and as such was considered during the RFA process.

### **Recorded Vegetation Values**

Hedde *et al.* (1980) defined and described the dominant pre-European vegetation of the Darling System in a series of vegetation complexes as part of the System 6 studies. Matiske and Havel (1998) updated this initial more restricted mapping coverage to the wider south-west forest region as (Regional Forest Agreement vegetation complexes). Havel, J.J. (2000) summarized in greater detail the relationships between the landforms, soils and climatic conditions. Matiske and Havel (1998) defined and described five vegetation complexes in the survey areas. None of these are restricted to the Spion survey area.

A total of 15 site-vegetation types and 1 cleared area were defined and mapped in the Spion survey area. The site-vegetation types were subdivided into four main groupings associated with site conditions which reflected landforms, soils and soil moisture levels. The site-vegetation types on the extreme sites such as on the valley systems, granite outcrop areas and the creeklines differ markedly from the forest and woodland areas on the slopes and ridges.

The majority of the vegetation was ranked as very good despite historical harvesting activities, recent intense fires (which resulted in dominance of *Bossiaea aquifolium* in understorey), dieback and some established tracks and one restricted cleared area. The presence of the dieback disease is particularly evident in the condition of the vegetation on the lower slopes that support D and SW site-vegetation types.

### **Groundwater Dependent Ecosystems**

The potential groundwater dependent ecosystems were determined on the basis of the site-vegetation types. In view of the extensive flora and vegetation studies in the northern Jarrah Forest these vegetation complexes support species and site-vegetation types that prefer and occur on seasonally moister and wetter soils on the lower slopes of the Yarragil (Yg1 and Yg2) valley systems. This approach was considered to represent a precautionary approach in the absence of detailed groundwater level data at the time of selecting the potential groundwater dependent ecosystems at this juncture.

### **Old Growth Forest Areas**

There are no patches of old growth forests occurring in the Spion survey areas as supplied by the Department of Biodiversity, Conservation and Attractions.

## 1. INTRODUCTION

Mattiske Consulting Pty Ltd was commissioned by Alcoa of Australia Ltd (Alcoa) to initially conduct a desktop assessment to evaluate the potential flora and vegetation values of the Spion survey area. The purpose of the assessment was to provide information pertaining to mining approvals. This desktop assessment was then followed by detailed mapping of the areas within the Spion survey areas.

### 1.1. Location and Scope of Project

The Spion survey area occurs within the Northern Jarrah Forest subregion of the Southwest Botanical Province (Beard 1990), approximately 110 km south east of Perth, WA (Figure 1). The Spion survey area is located in the Dwellingup State Forest and consists of nine blocks located approximately 20 km ESE of the Waroona townsite and 10 km E of the existing Willowdale bauxite mining operation. The survey area lies within tenements ML 1SA, E 70/6051, E 70 6279 and E 70/6456 (Figure 2).

Parts of this region have previously been surveyed by E. M. Mattiske and Associates (1993 to 1994) and Mattiske Consulting Pty Ltd (1996 to 2022) at a regional mapping scale as part of the Regional Forest Agreement (RFA) project by Mattiske and Havel (1998). These studies built on the earlier work of Havel (1975a and 1975b) in the northern Jarrah forest.

This report describes the potential and recorded flora and vegetation values of the Spion survey areas and places them within a local and regional context.

### 1.2. Environmental Legislation and Guidelines

The following key Commonwealth (federal) legislation relevant to this survey is the:

- *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

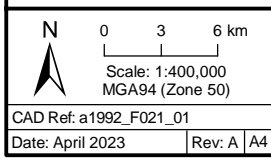
The following key Western Australian (state) legislation relevant to this survey includes the:

- *Wildlife Conservation (Rare Flora) Notice 2022*
- *Biodiversity Conservation Act 2016* (BC Act);
- *Biosecurity and Agriculture Management Act 2007* (BAM Act) and *Regulations 2013*;
- *Environmental Protection Act 1986* (EP Act); and
- *Environmental Protection (Clearing of Native Vegetation) Regulations 2004*

Furthermore, key Western Australian guidelines relevant to this survey are the:

- *Environmental Factor Guideline: Flora and Vegetation* (Environmental Protection Authority [EPA] 2016a); and
- *Technical Guidance – Flora and vegetation surveys for environmental impact assessment* (EPA 2016b); and.
- *Commonwealth of Australia (2013) - Survey Guidelines for Australia's Threatened Orchids. Guidelines for detecting Orchids listed as "Threatened" under the Environment Protection and Biodiversity Conservation Act 1999.*

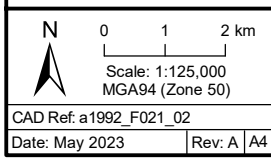
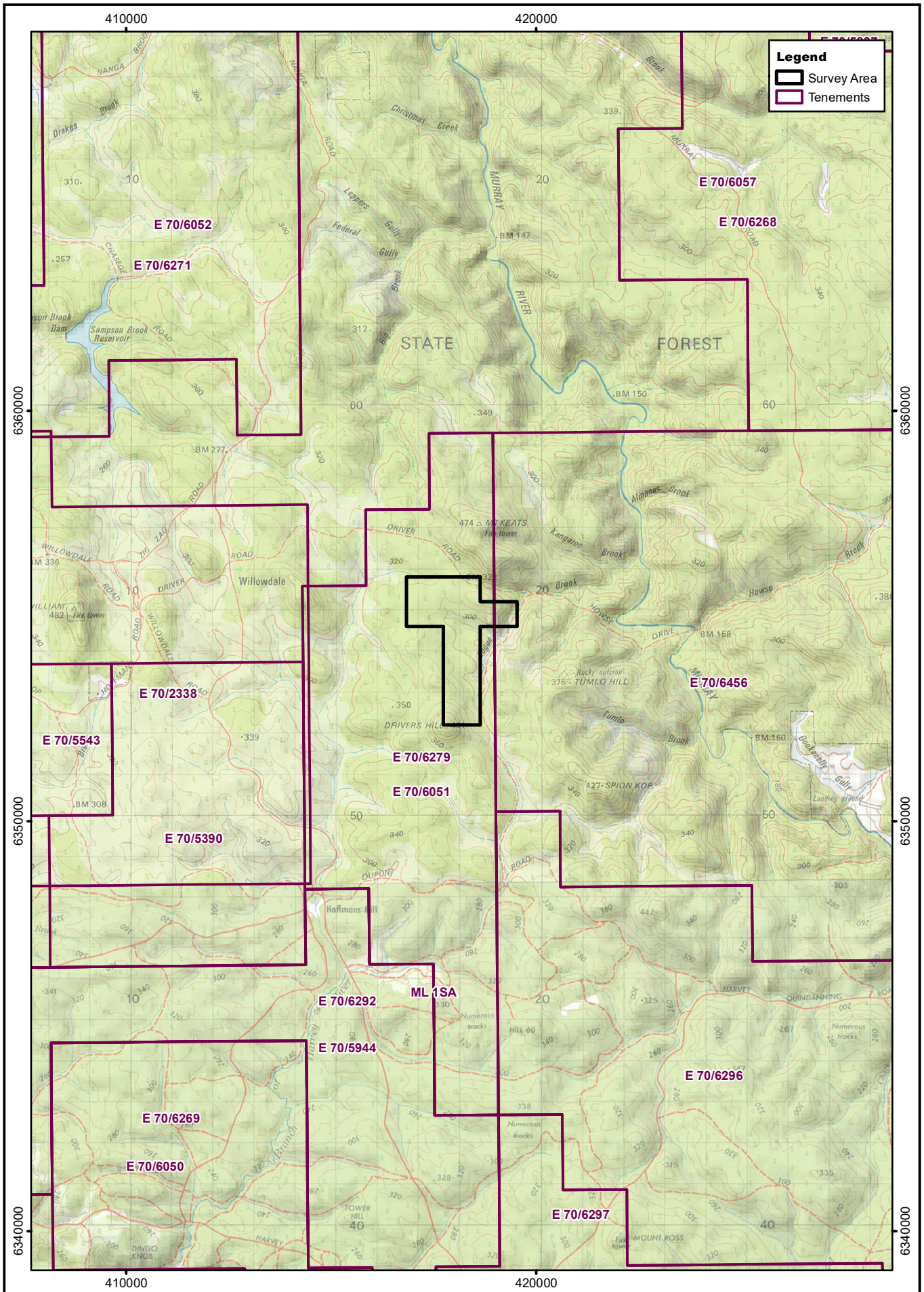
Definitions of flora and vegetation terminology commonly used throughout this report are provided in Appendix A1-A5.



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**Spion Survey Area**  
**Location**

Figure:  
**1**



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**Spion Survey Area  
Tenements**

Figure:  
**2**

## 2. OBJECTIVES

The objective of this assessment was to undertake the desktop component of a detailed flora and vegetation survey of the Spion survey area, including:

- Undertake a desktop assessment of the flora and vegetation of the Spion survey area, with an emphasis on threatened and priority flora, and threatened and priority ecological communities;
- Undertake a detailed assessment of the flora and vegetation of the Spion survey area, with an emphasis on threatened and priority flora, and threatened and priority ecological communities;
- Review previous literature and current databases associated with the Spion survey areas;
- Review the conservation status of the vascular plant species recorded by reference to current literature and current listings by the Department of Biodiversity, Conservation and Attractions (DBCA 2022a) and plant collections held at the Western Australian Herbarium ([WAH] 1998 - ), and plants listed by the Department of Climate Change, Energy and the Environment and Water [DCCEEW] (2023a) under the EPBC Act; and
- Prepare a report summarising the findings.

## 3. METHODS

### 3.1. Desktop Assessment

The NatureMap (01-0423 NM) and *EPBC Act* Protected Matters Search Tool (DCCEEW 2023a) databases were used to identify the possible occurrence of flora (including threatened and priority taxa) and threatened and priority ecological communities within the Spion survey areas. The vascular plant species recorded through this database search are summarized in Appendices B and C.

The TPFL database of threatened and priority flora and ecological communities and the Western Australian Herbarium (WAH) database were arranged by CAD Resources, where a 25 km buffer was applied (Carine, WA). In addition, any flora recorded by Mattiske Consulting Pty Ltd (2015-2022) within or adjacent to the survey area were included.

The following co-ordinate was used in the desktop assessment; -32°55'52.29"S, 116° 7'22.44"E (WGS1984), where search parameters were set to a 10 km radius for NatureMap and a 5 km buffer for the PMST.

Historical documentation and vegetation mapping of the Northern Jarrah Forest subregion that provide resource material for the floristics and vegetation of the Spion area was reviewed, including Mattiske Consulting Pty Ltd (2015-2022) reports on their flora and vegetation surveys in the nearby Larego survey areas. Nomenclature of flora species was checked against and is consistent with Florabase (WAH 1998- ).

### 3.2. Field studies

Field studies were undertaken at 331 sites on the 120m grid systems within the approximate 486 ha of the Spion survey area in the summer and autumn months of 2023.

To maintain consistency with previous mapping of the area, enabling spatial and temporal comparisons, flora and vegetation were assessed using site-type classification based on Heddlé *et al.* (1980). Sites were pre-designated using a 120 x 120 m grid system overlaid on the survey area. A total of 331 sites within the 486 ha area were assessed with recordings on the trees (20m radius) and understorey (5m radius). Additional targeted work was undertaken on the areas between the recording sites and also on specific areas such as the outcrop and sandier valley systems and creeklines.

This data was then used in combination with aerial imagery and field observations to map the vegetation of the survey area. Furthermore, searches for threatened, priority or Declared (plant) pests species were undertaken whilst walking between survey sites.

The following information was recorded at each vegetation assessment site:

GPS location	Easting, Northing and datum;
Soil types	gravels, sandy-gravels, sandy-loam-gravels, sandy-loams, loams, clay-loams, clays and peat;
Topography	ridge, upper slope, mid-slope, lower slope, valley floor and swamp;
Outcropping	type – granite, laterite, dolerite, and quantity – few, moderate, numerous;
Logging history	light, moderate or heavy, together with number of stumps within a 20 m radius;
Fire history	years since last fire; and
Dieback occurrence	<i>Phytophthora</i> spp. demarcation – field blazing, coloured flagging on trees, vegetation deaths, either old or recent.

At each site species were ranked according to the scale developed by Havel (1975a, 1975b). Tree and understorey species were assessed separately using the following method.

#### ***Tree species***

Tree species (*Allocasuarina fraseriana*, *Banksia grandis*, *B. littoralis*, *B. seminuda*, *Corymbia calophylla*, *Eucalyptus marginata*, *E. megacarpa*, *E. patens*, *E. rudis*, *E. wandoo*, *Melaleuca preissiana*, *M. raphiophylla*, *Nuytsia floribunda*, *Persoonia elliptica*, *P. longifolia* and *Xylomelum occidentale*) were assessed within a 20 m radius from the observation point using the following scale:

- 0 absent;
- 1 one or two trees;
- 2 three to five trees;
- 3 more than five trees, but contributing less than one third of the total stand;
- 4 between one third and one half of the total stand; or
- 5 more than one half of the total stand.

#### ***Understorey species***

Understorey species were assessed within a 5 m radius from the observation point using the following scale:

- 0 absent;
- 1 very rarely seen, only after a careful search;
- 2 present, observable, but in small numbers only;
- 3 common locally, but not uniform over the whole area;
- 4 common over the whole area; or
- 5 completely dominating the understorey.

The physiological stress was determined for each species within a 20 m radius from the observation point and ranked according to the following scale.

- 0 healthy, no evidence of stress;
- 1 odd plant showing signs of stress, not dead;
- 2 one or two dead plants, near death;
- 3 scattered stressed plants, (2-4) dead plants around survey site;
- 4 susceptible plants dying or dead (> 4 plants); or
- 5 "graveyard" death

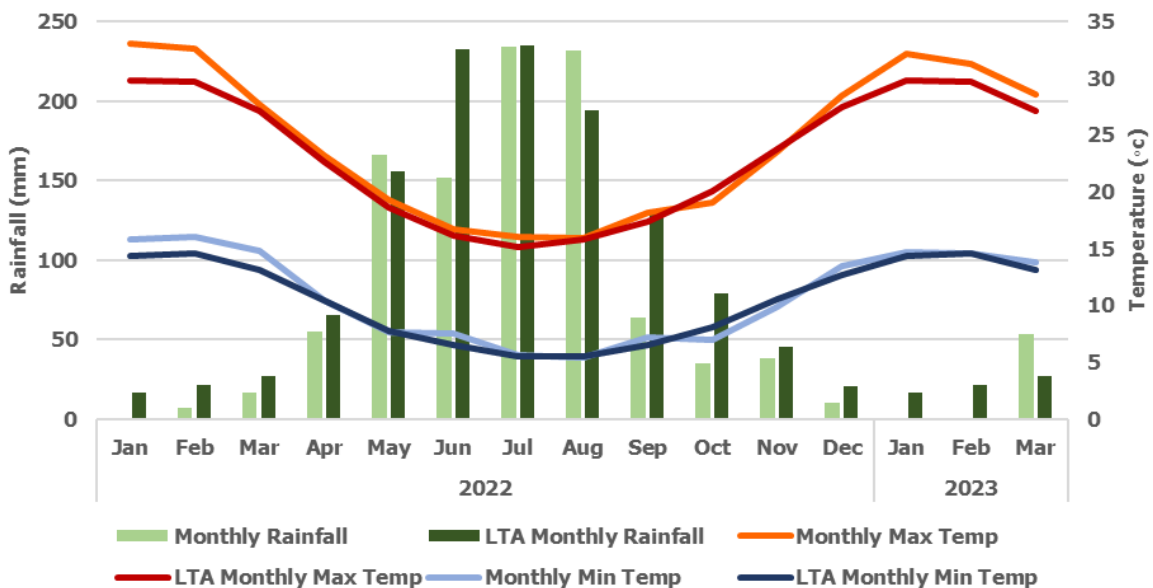
All plant specimens collected during the field survey were dried and processed in accordance with the requirements of the Western Australian Herbarium (WAH). All plant specimens were identified through comparisons with pressed specimens housed at the WAH. Where appropriate, plant taxonomists with specialist skills were consulted. Nomenclature of the species recorded is in accordance with the WAH (1998-).

#### 4. DESKTOP FINDINGS

The climate, geology, soils and landforms all influence the vegetation of the area and are described in this section. Potential flora, including threatened, priority and introduced species are described, along with possible vegetation communities, and placed within a local and regional context.

##### 4.1. Climate

The survey area lies at the southern end of the Northern Jarrah Forest subregion. Beard (1990) described the climate of this area as being warm Mediterranean, with rainfall of 600 – 1200 mm per annum and 5 - 6 dry months per year. The closest weather station is the Dwellingup weather station (Stn. No. 9538), located north of the Willowdale mine and Spion survey areas. Annual average rainfall at Dwellingup (1934 -2023) is 1224.5 mm (Bureau of Meteorology [BOM] 2023). Rainfall in 2022 was highest in August 2022 than the longer-term mean; although the summer months were again drier (Figure 3).

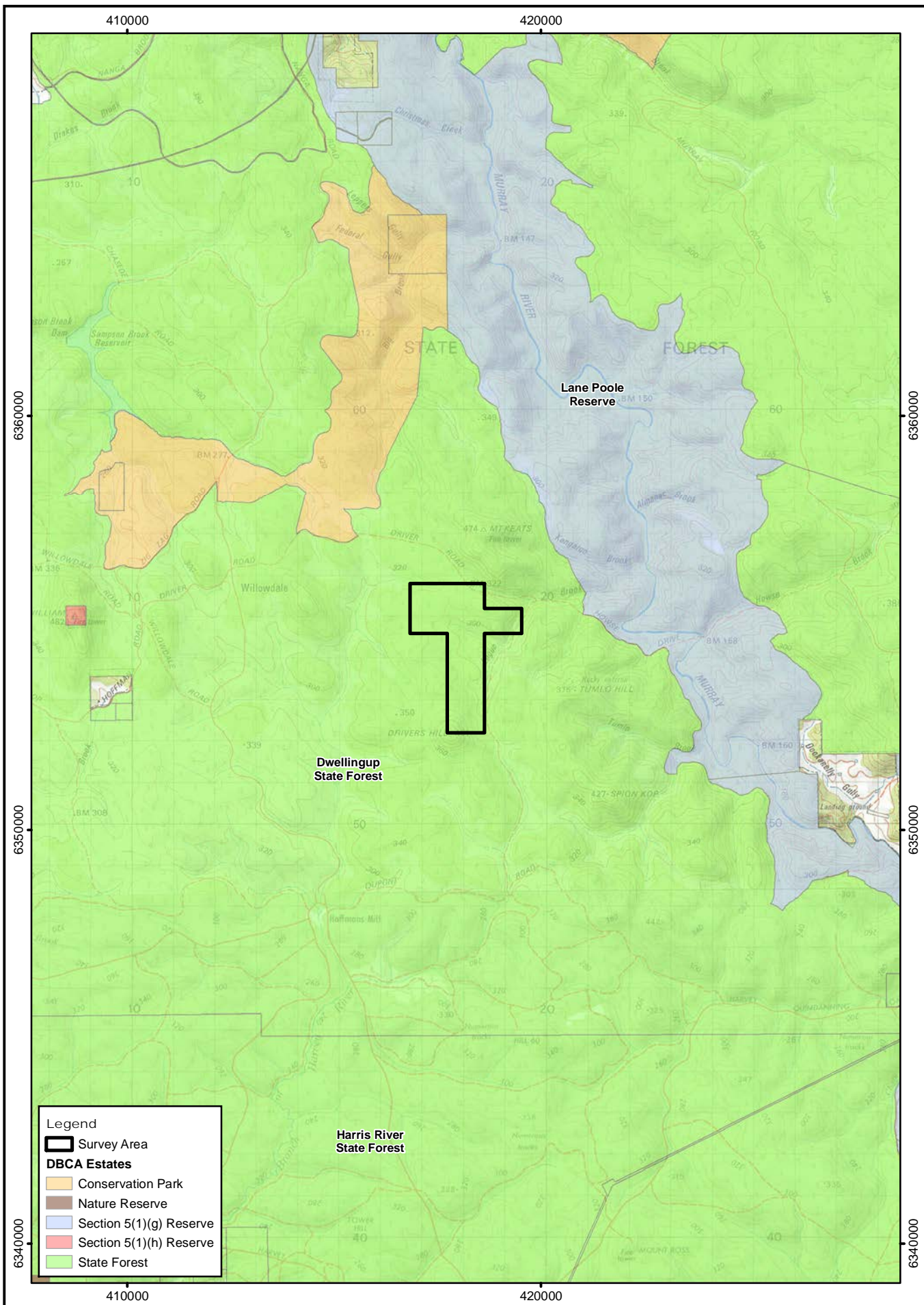


**Figure 3: Climatic data for the Spion survey area**

Long- term rainfall and temperature data from the Dwellingup weather stations respectively (ID 009538 respectively, years 1934-2023) (BOM 2023).

##### 4.2. DBCA Estates

The Spion survey area is situated in the Dwellingup State Forest (Figure 4).



410000 420000

6360000

6360000

6350000

6350000

6340000

6340000

410000 420000

**Legend**

- Survey Area
- DBCA Estates**
- Conservation Park
- Nature Reserve
- Section 5(1)(g) Reserve
- Section 5(1)(h) Reserve
- State Forest

N  
 0 1 2 km  
 Scale: 1:125,000  
 MGA94 (Zone 50)

CAD Ref: a1992\_F021\_03  
 Date: April 2023

Rev: A | A4

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**Spion Survey Area  
 DBCA Estates**

Figure:  
**4**

### 4.3. Geology, Soils and Topography

The Spion survey area are situated within Beard's (1990) Northern Jarrah Forest subregion of the Southwest Province. The Northern Jarrah Forest subregion encompasses the area to the east of the Darling Scarp, overlying Archaean granite and metamorphic rocks of the Yilgarn Craton at an average elevation of 300 m (Beard 1990). The area is capped by extensive lateritic duricrust, dissected by drainage lines and broken by occasional granite hills. In the eastern section, the laterite becomes deeply dissected until it compresses isolated remnants. The duricrusted plateau of the Yilgarn Craton is characterised by lateritic gravels, consisting of 5m or more of ironstone gravels in a yellow sandy matrix, and related lateritic podzolic soils with ironstone gravels in a sandy surface horizon. These overlay mottled yellow-brown clay subsoils and hard setting loamy soils, which become evident in the east (Beard 1990).

Furthermore, Western Australia is divided into twelve Systems, separated by natural and demographic boundaries (Department of Conservation and Environment 1980). The survey area lies within the Darling System (as known as System 6), which is further divided into provinces, with the survey area lying in The Darling Plateau province (Department of Conservation and Environment 1980).

The underlying geological units of the Darling Plateau province have been defined by Churchward and McArthur (1980), with four main landform and soil units occurring within the survey areas, these are:

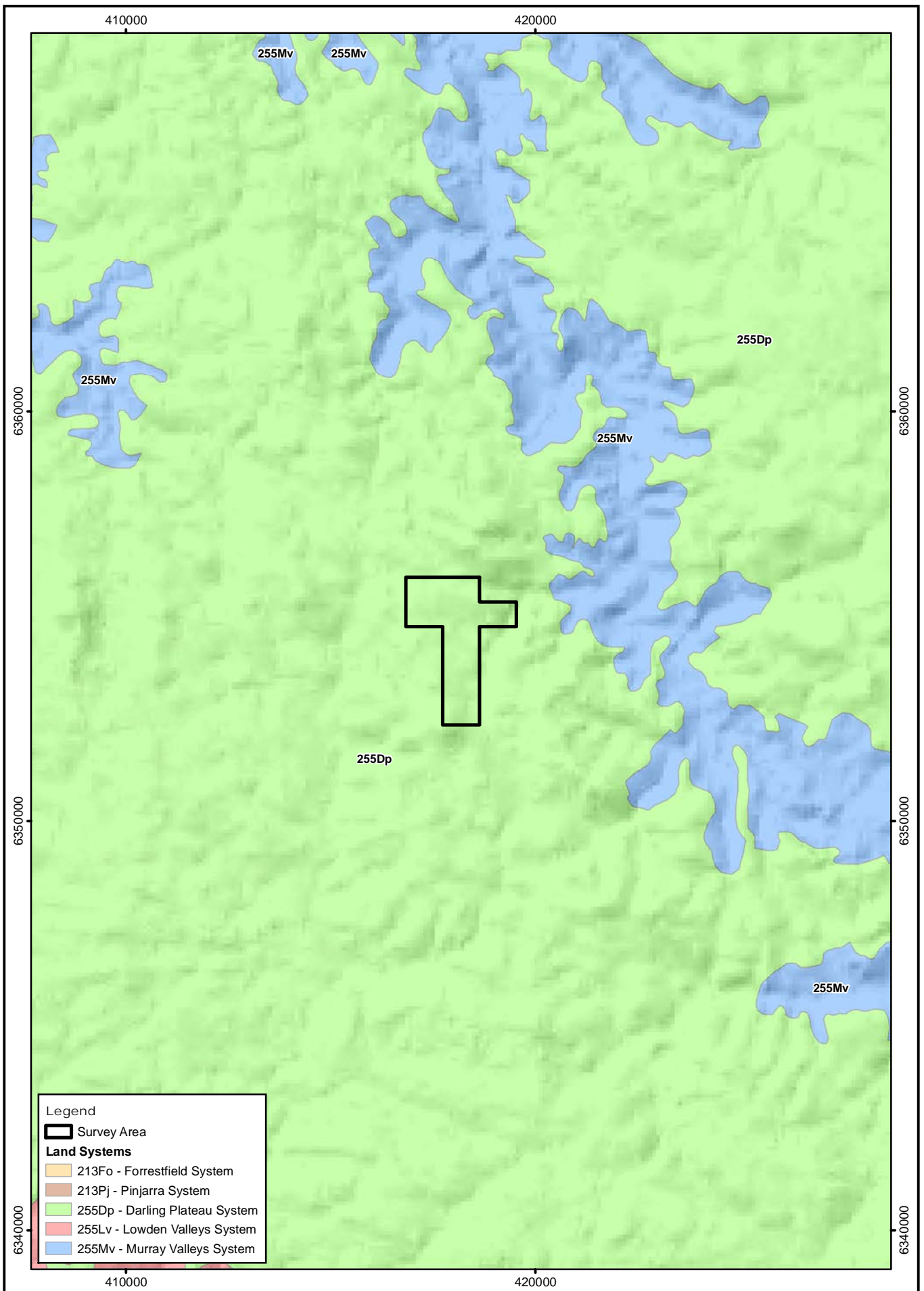
- Dwellingup:** Gently undulating landscape with duricrust on ridges; sands and gravels in shallow depressions.
- Yarragil:** Valleys of the western part of the plateau; sandy gravels on the slopes; orange earth in swampy floors.
- Cooke:** Hills rising above general plateau level; mainly mantled by laterite with some rock outcrop.
- Murray:** Deeply incised valleys with red and yellow earths on slopes; narrow alluvial terraces

The Department of Primary Industries and Regional Development's (DPIRD) Land Systems present within the Spion survey area (Figure 5, Table 1) includes the Darling Plateau System (255Dp);

1. **Darling Plateau System (255Dp):** Lateritic plateau. Duplex sandy gravels, loamy gravels and wet soils. Jarrah-marri-wandoo forest and woodland.

**Table 1: Extent of Land Systems intersecting the Spion survey area**

Land System	Mapping Unit	Total Extent (ha)	Area of Intersection with the Spion survey area	Proportion of Current Extent (%)
Darling Plateau System	255Dp	820265.7327	486.00	0.059



**Legend**

- Survey Area
- Land Systems**
- 213Fo - Forrestfield System
- 213Pj - Pinjarra System
- 255Dp - Darling Plateau System
- 255Lv - Lowden Valleys System
- 255Mv - Murray Valleys System

N  
  
 0 1 2 km  
 Scale: 1:125,000  
 MGA94 (Zone 50)

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**Spion Survey Area  
 Land Systems**

#### 4.4. Regional Vegetation

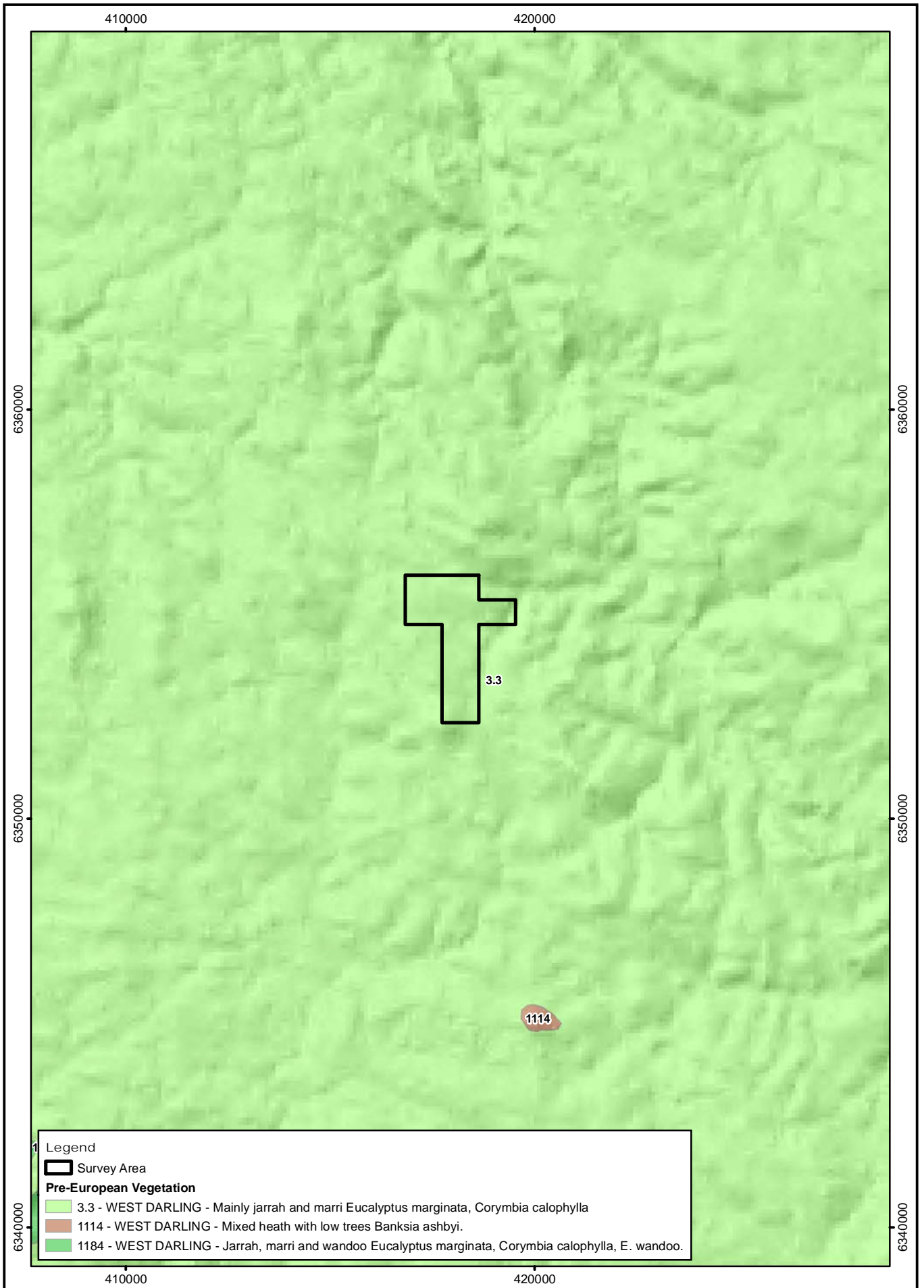
The survey area is situated within Beard's (1990) Northern Jarrah Forest subregion of the Southwest Province. The Northern Jarrah Forest subregion is characterised by Jarrah (*Eucalyptus marginata*) forest on ironstone gravels and Marri-Wandoo (*Corymbia calophylla* - *Eucalyptus wandoo*) woodlands on loamy soils, with sclerophyll understoreys. Dell and Havel (1989) broadly classified the Jarrah Forest as an open forest in its northern extent and as a tall forest in its southern extent. In lower rainfall areas towards the east trees decrease in size, forming woodlands or low forests. This dry sclerophyllous forest typically comprises a dominant *Eucalyptus marginata* and *Corymbia calophylla* overstorey, a mid-storey of *Allocasuarina fraseriana* (Sheoak), *Banksia grandis* (Bull Banksia), *Persoonia longifolia* (Snottygobble), *Persoonia elliptica* (Spreading Snottygobble), and a groundcover of woody shrubs with grass trees *Xanthorrhoea preissii*, *Kingia australis* and the cycad *Macrozamia riedlei* (Dell and Havel 1989).

The Pre-European vegetation systems present within the Spion survey area (Figure 6, Table 2) include:

1. **West Darling System - Vegetation Association 3.3:** Mainly jarrah and marri *Eucalyptus marginata*, *Corymbia calophylla*

**Table 2: Extent of Pre-European vegetation associations intersecting the Spion survey area**

System	Vegetation Association	State-wide Pre-European Extent (ha)	Area of Intersection with the Spion survey area (ha)	Proportion of Current Extent (%)
West Darling	3.3	485225.883	486.00	0.10



1 Legend

Survey Area

**Pre-European Vegetation**

3.3 - WEST DARLING - Mainly jarrah and marri Eucalyptus marginata, Corymbia calophylla

1114 - WEST DARLING - Mixed heath with low trees Banksia ashbyi.

1184 - WEST DARLING - Jarrah, marri and wandoo Eucalyptus marginata, Corymbia calophylla, E. wandoo.

N

0 1 2 km

Scale: 1:125,000  
MGA94 (Zone 50)

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Spion Survey Area

**Pre-European Vegetation**

Figure:

**6**

Hedde *et al.* (1980) defined and described the dominant pre-European vegetation of the Darling System in a series of vegetation complexes as part of the System 6 studies. Mattiske and Havel (1998) updated this initial more restricted mapping coverage to the wider south-west forest region as (Regional Forest Agreement vegetation complexes). Havel, J.J. (2000) summarized in greater detail the relationships between the landforms, soils and climatic conditions. Mattiske and Havel (1998) defined and described five vegetation complexes in the Spion survey area (Figure 7, Table 3). These include:

**Cooke (Ce):** Mosaic of open forest of *Eucalyptus marginata* subsp. *marginata* - *Corymbia calophylla* (subhumid zone) and open forest of *Eucalyptus marginata* subsp. *thalassica* - *Corymbia calophylla* (semiarid and arid zones) and on deeper soils adjacent to outcrops, closed heath of Myrtaceae - Proteaceae species and lithic complex on granite rocks and associated soils in all climate zones, with some *Eucalyptus laeliae* (semiarid), and *Allocasuarina huegeliana* and *Eucalyptus wandoo* (mainly semiarid to periarid zones).

**Dwellingup 1 (D1):** Open forest of *Eucalyptus marginata* subsp. *marginata* - *Corymbia calophylla* on lateritic uplands in mainly humid and subhumid zones.

**Yarragil 1 (Yg1):** Open forest of *Eucalyptus marginata* subsp. *marginata* - *Corymbia calophylla* on slopes with mixtures of *Eucalyptus patens* and *Eucalyptus megacarpa* on the valley floors in humid and subhumid zones.

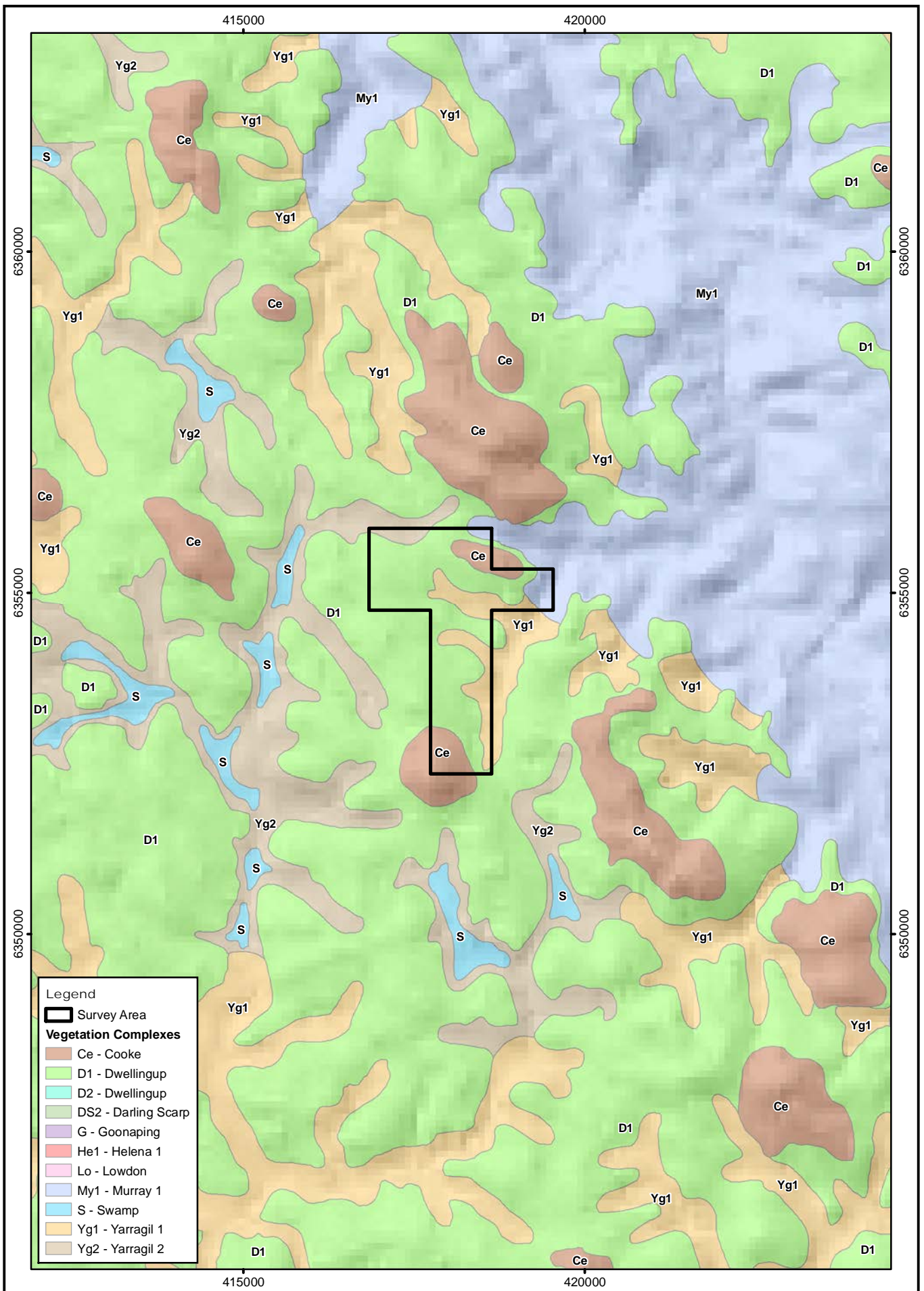
**Yarragil 2 (Yg2):** Open forest of *Eucalyptus marginata* subsp. *thalassica* – *Corymbia calophylla* on slopes, woodland of *Eucalyptus patens* – *Eucalyptus rudis* with *Hakea prostrata* and *Melaleuca viminea* on valley floors in subhumid and semiarid zones.

**Murray 1 (My1):** Open Forest of *Eucalyptus marginata* subsp. *marginata* – *Corymbia calophylla* - *Eucalyptus patens* on valley slopes to woodland of *Eucalyptus rudis*- *Melaleuca raphiophylla* on the valley floors in humid and subhumid zones.

**Table 3: Extent of Vegetation Complexes intersecting the Spion survey area**

Vegetation Complex	Vegetation Class	Total Extent (ha)	Area of Intersection with the Spion survey area (ha)	Proportion of Regional Extent (%)
Cooke	Ce	51872.10	56.786	0.11
Dwellingup 1	D1	297624.85	299.865	0.10
Yarragil 1	Yg1	113828.12	89.273	0.08
Yarragil 2	Yg2	71234.37	15.052	0.02
Murray 1	My1	97562.81	25.026	0.03

More recently, the vegetation of Western Australia has been assigned to bioregions and subregions under the Interim Biogeographical Regionalisation for Australia (IBRA), with the survey area falling within the Northern Jarrah Forest subregion (JF1) of the Jarrah Forest (JAF) Region (DCCEE 2023b). The vegetation of the Northern Jarrah Forest subregion consists of Jarrah – Marri forest, with Bullich and Blackbutt in the valleys to the west, grading to Wandoo and Marri woodlands to the east. Heath vegetation is the common understorey of forests and woodlands and occurs on granite rocks. The majority of the diversity between communities in this subregion occurs on lower slopes and near granite soils (Williams and Mitchell 2001).



N  
 0 0.5 1 km  
 Scale: 1:75,000  
 MGA94 (Zone 50)

CAD Ref: a1992\_F021\_06  
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**Spion Survey Area  
 Vegetation Complexes**

Figure:  
7

#### 4.5. Potential Flora

A total of 462 vascular plant taxa, representative of 186 genera and 72 families, have the potential to occur within the Spion survey area (Appendix B). The most commonly represented families were Fabaceae (56 taxa), Proteaceae (39 taxa) and Myrtaceae (38 taxa). The most commonly represented genera in the Spion survey areas were *Acacia* (21 taxa), *Lomandra* (15 taxa) and *Hibbertia* (14 taxa).

#### 4.6. Potential Threatened and Priority Flora

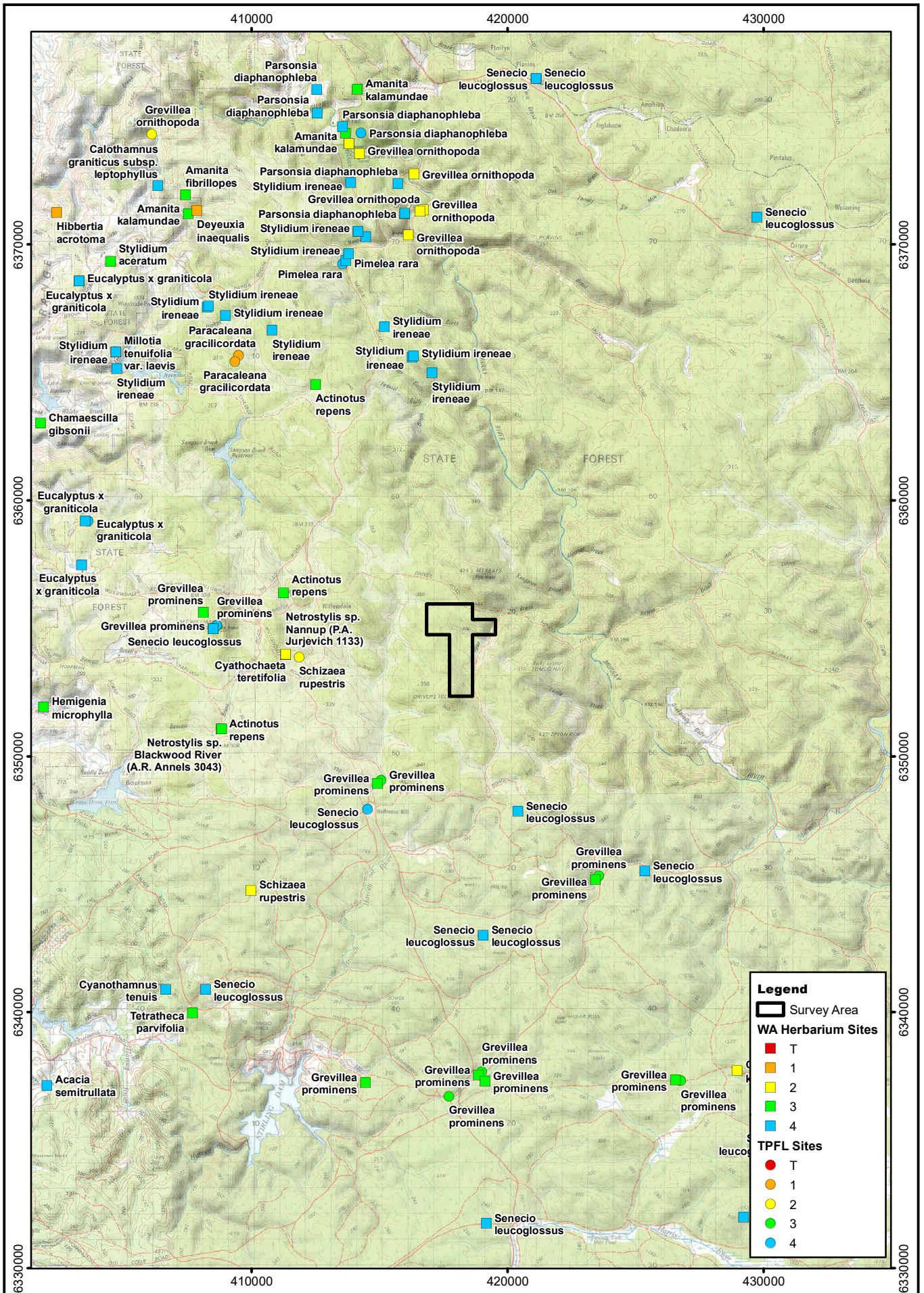
Two threatened flora species, pursuant to section 179 of the *EPBC Act* and as listed by DCCEEW (2023a) pursuant to Part 2, Division 1 and Subdivision 2 of the *BC Act* and as listed by DBCA (2022a) have the potential to occur in the Spion survey area (Figure 8). Both of these threatened taxa have a low potential of occurring as neither have been recorded by DBCA or previously by MCPL within the vicinity of the survey area (Appendices B and C).

A total of ten priority flora species as listed by DBCA (2022a), including one Priority 1, two Priority 2, five Priority 3 and two Priority 4 have the potential to occur within the Spion survey area (Appendices B and C, Figure 8). All potential threatened and priority flora are listed in Appendix C, along with their State and Federal Conservation Codes (see Appendix A for definitions), a description and an assessment of the likelihood of their occurrence in the Larego survey areas.

The likelihood that these species would occur within the survey area was determined using the following criteria:

- Known records within a 10 km radius of the centre of the survey area (as described above) and including information obtained from the paid search results. More recent, proximal and numerous records were ranked higher.
- Potential presence of suitable habitat and landforms for the species within the survey area (e.g. soil type, bedrock type, topography, drainage lines, vegetation).

The likelihood was ranked Low, Moderate or High, Appendix C. Records that have been documented either within or in close proximity of the Spion survey area were ranked as Moderate or High



**Legend**

Survey Area

WA Herbarium Sites

- T
- 1
- 2
- 3
- 4

TPFL Sites

- T
- 1
- 2
- 3
- 4

N

0 1.5 3 km

Scale: 1:200,000  
MGA94 (Zone 50)

CAD Ref: a1992\_F021\_07  
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Spion Survey Area

**Threatened and Priority Flora**

Figure:

**8**

#### 4.7. Potential Introduced (Weed) Species and Declared Pest (Plant) Organisms

A total of 29 introduced taxa (inclusive of part native (Mixed)) may potentially exist in the Spion survey area, based on NatureMap (DBCA 2007- ) and records from Mattiske Consulting Pty Ltd (2015-2022) Larego surveys. Only one of the potential weeds *\*Rubus ulmifolius*, as listed under the *\*Rubus fruticosus* aggregate, is a Weed of National Significance (DCCEEW, 2023b). It is also a declared pest/organism under the *Biosecurity and Agriculture Management Act 2007* (WA) (DPIRD 2023). In addition, *\*R. ulmifolius* is listed with a C3 Management Control and a Exempt Keeping category (refer to Appendix A3).

**Table 4: Ecological Impact and Invasiveness rankings for Introduced (Weed) Species potentially occurring within the Spion survey area**

**Note:** <sup>1</sup>Department of Parks and Wildlife (DPAW 2014), <sup>2</sup>West Australian Organism List (DPIRD 2023), <sup>3</sup>Weeds of National Significance (DCCEEW 2023b)

Species Name	DPAW <sup>1</sup>		WAOL <sup>2</sup>	Declared pest <sup>3</sup>
	Ecological Impact	Invasiveness Ranking		
<i>*Acacia pycnantha</i>	Low	Slow	Permitted - s11	-
<i>*Aira caryophyllea</i>	Unknown	Rapid	Permitted - s11	-
<i>*Briza maxima</i>	Unknown	Rapid	Permitted - s11	-
<i>*Callistemon citrinus</i>	-	-	Permitted - s11	-
<i>*Centaurium erythraea</i>	Unknown	Rapid	Permitted - s11	-
<i>*Cotula coronopifolia</i>	Unknown	Rapid	Permitted - s11	-
<i>*Erigeron sumatrensis</i>	Unknown	Rapid	Permitted - s11	-
<i>*Eucalyptus accedens</i>	-	-	Permitted - s11	-
<i>*Eucalyptus microcorys</i>	Unknown	Unknown	Permitted - s11	-
<i>*Eucalyptus saligna</i>	Unknown	Unknown	Permitted - s11	-
<i>*Galium murale</i>	Low	Unknown	Permitted - s11	-
<i>*Hypochaeris glabra</i>	Moderate	Rapid	Permitted - s11	-
<i>*Lilium candidum</i>	-	-	Permitted - s11	-
<i>*Lonicera japonica</i>	Unknown	Slow	Permitted - s11	-
<i>^Melia azedarach</i>	-	-	Permitted - s11	-
<i>*Orobancha minor</i>	Unknown	Rapid	Permitted - s11	-
<i>*Oxalis sp.</i>	-	-	Permitted - s11	-
<i>*Phytolacca octandra</i>	Unknown	Moderate	Permitted - s11	-
<i>*Pinus pinaster</i>	Moderate	Rapid	Permitted - s11	-
<i>*Pinus sp.2</i>	-	-	Permitted - s11	-
<i>*Quercus palustris</i>	-	-	Permitted - s11	-
<i>*Rubus ulmifolius</i>	High	Moderate	Declared Pest - s22(2)	Y
<i>*Senecio vulgaris</i>	Low	Moderate	Permitted - s11	-
<i>*Sonchus oleraceus</i>	Moderate	Rapid	Permitted - s11	-
<i>*Syncarpia glomulifera</i>	-	-	Permitted - s11	-
<i>*Ursinia anthemoides</i>	Unknown	Rapid	Permitted - s11	-
<i>*Vellereophyton dealbatum</i>	Moderate	Rapid	Permitted - s11	-
<i>*Vinca major</i>	High	Slow	Permitted - s11	-
<i>*Wahlenbergia capensis</i>	Unknown	Rapid	Permitted - s11	-

---

#### **4.8. Old Growth Forests**

There are a few patches of old growth forests occurring outside the Spion survey area (Figure 9); however based on data supplied by the Department of Biodiversity, Conservation and Attractions no areas have been highlighted within the Spion survey area.

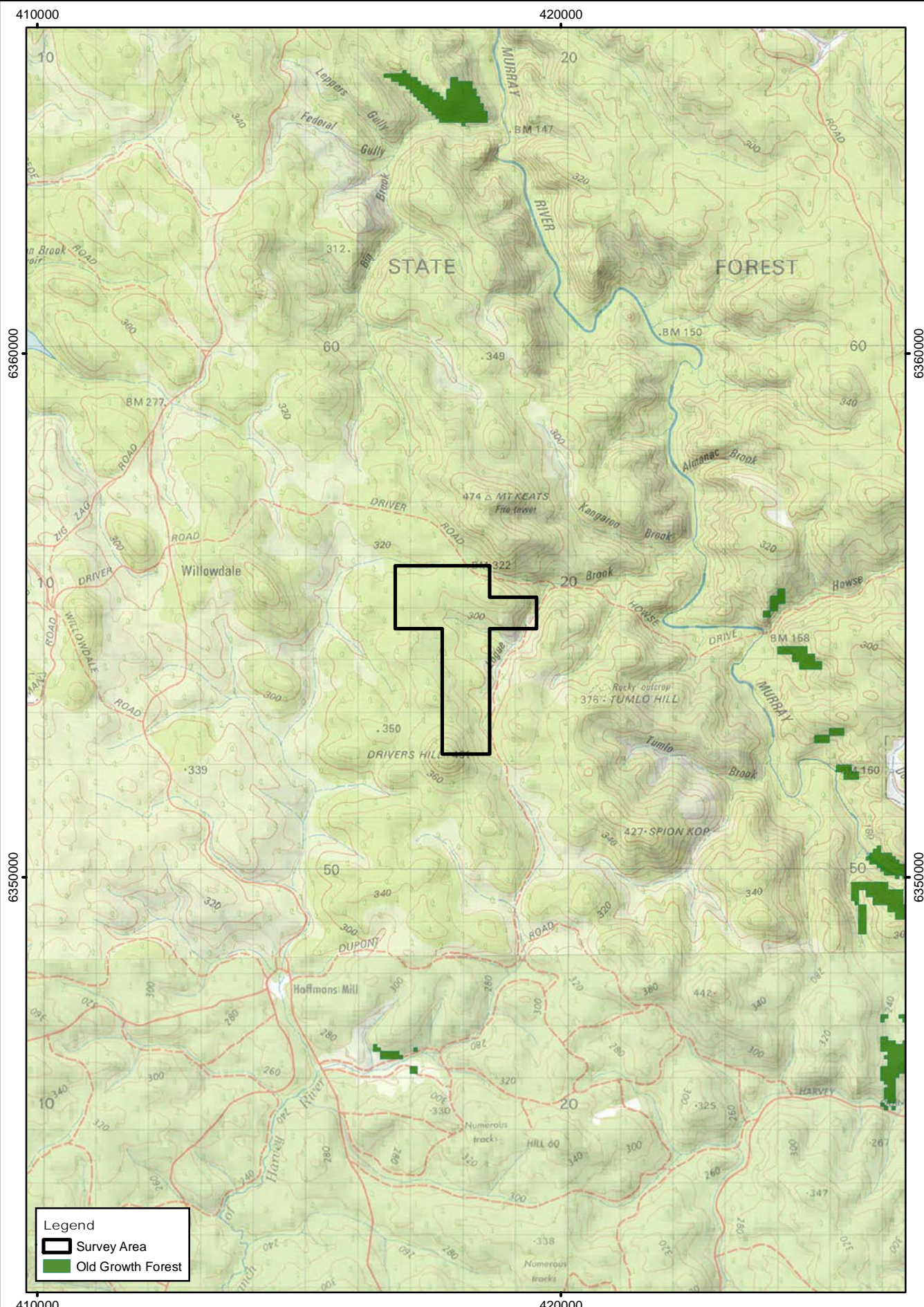
#### **4.9. Groundwater Dependant Ecosystems**

The potential groundwater dependent ecosystems were determined on the basis of the extent of the vegetation complexes such as the Murray 1, Yarragil 1 and Yarragil 2 that occur within the Larego survey areas. In view of the extensive flora and vegetation studies in the northern Jarrah Forest these vegetation complexes support species and site-vegetation types that prefer and occur on seasonally moister and wetter soils. This approach was considered to represent a precautionary approach in the absence of detailed groundwater level data at the time of selecting the potential groundwater dependent ecosystems at this juncture.

Key indicator plant species that are generally accepted as indicators of moister soils and, hence, potential groundwater dependent ecosystems include – *Banksia littoralis*, *Acacia divergens*, *Thomasia paniculata*, *Astartea scoparia*, *Eucalyptus rudis*, *Hypocalymma angustifolium*, *Hypocalymma cordifolium*, and *Taxandria linearifolia*.

#### **4.10. Dieback**

The extent of dieback from datasets supplied by the Department Biodiversity, Conservation and Attractions highlights the extent within the Spion survey area and adjacent forest areas, Figure 10.



**Legend**

- Survey Area
- Old Growth Forest

N  
 0 0.75 1.5 km  
 Scale: 1:100,000  
 MGA94 (Zone 50)

CAD Ref: a1992\_F021\_08  
 Date: April 2023

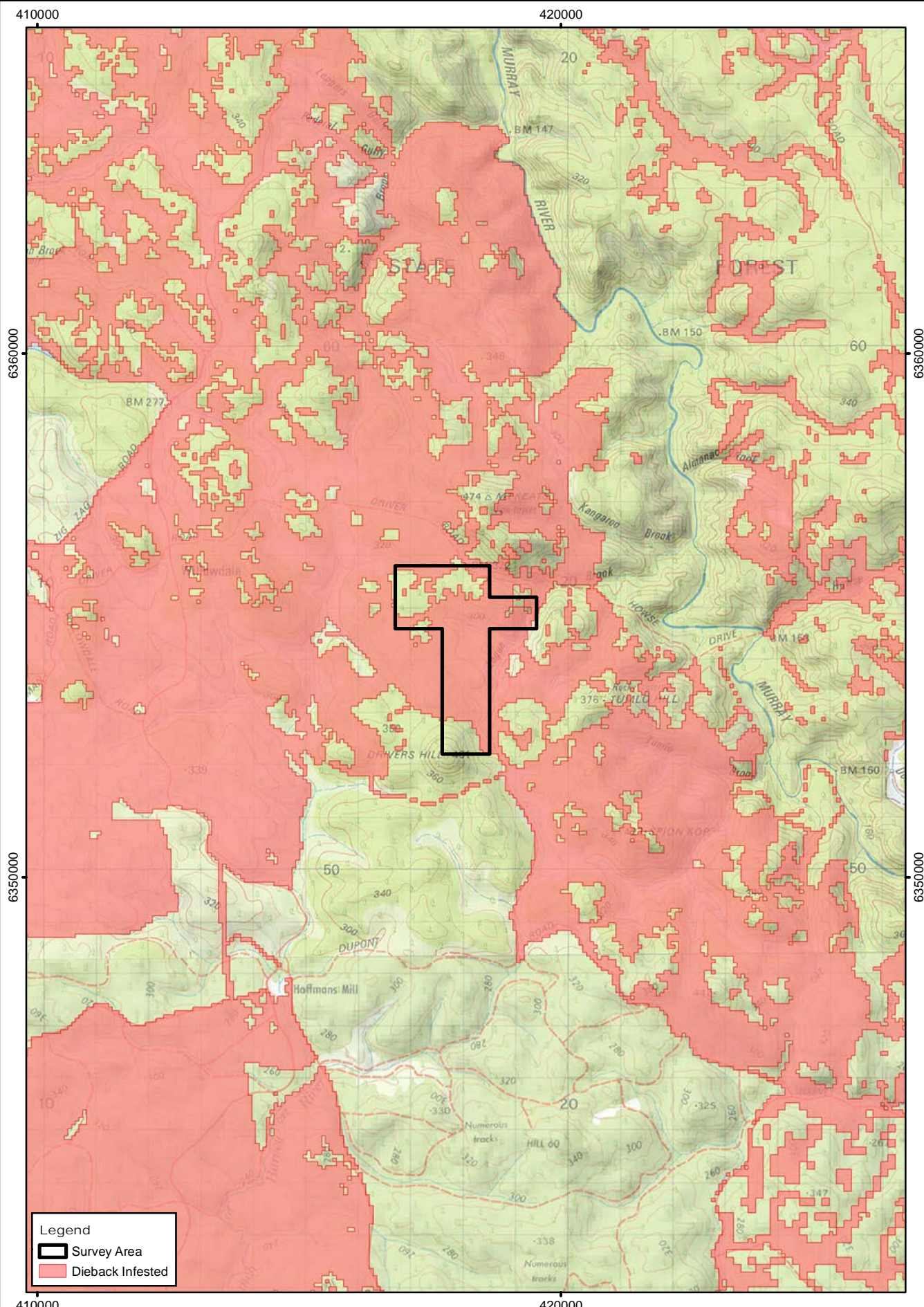
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**Spion Survey Area  
 Old Growth Forest**

Figure:  
9



**Legend**

-  Survey Area
-  Dieback Infested

N  
0 0.75 1.5 km  
Scale: 1:100,000  
MGA94 (Zone 50)

CAD Ref: a1992\_F021\_10  
Date: April 2023

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**Spion Survey Area**  
**Dieback**

Figure:  
**10**

#### **4.11. Previous Surveys**

Over the past forty years, Mattiske Consulting has previously mapped the vegetation associated with Willowdale (including previous Larego areas; Mattiske Consulting Pty Ltd (2015, 2019, 2020, 2022). These areas are in close vicinity to the Spion survey area.

#### **4.12. Potential Threatened and Priority Ecological Communities**

No Threatened Ecological Communities or Priority Ecological Communities (TECs and PECs) occur in the Spion survey areas (DBCA 2022b, 2023; DCCEEW, 2023a).

#### **4.13. Wetlands of International Importance (Ramsar)**

No wetlands of international importance listed at Commonwealth level pursuant to sections 181 and 182 of the *EPBC Act* and listed by the DCCEEW (2023a) occur within the Spion survey areas. The closest wetlands of international importance is the Peel- Yalgorup System.

## 5. FIELD STUDIES FINDINGS

The following text summarizes the key findings from recent studies in 2023 within the Larego survey areas; which includes recording sites for vegetation mapping and opportunistic and targeted assessments.

### 5.1. Survey Effort

The survey efforts has been undertaken over a decade from multiple studies within the Willowdale and Larego areas. The major effort in 2023 which when combined with the depth of previous studies in adjacent areas for both Alcoa and also other clients leads to the conclusion that the work exceeds the current EPA Guidance Statement (2016a and 2016b) expectations for flora and vegetation studies.

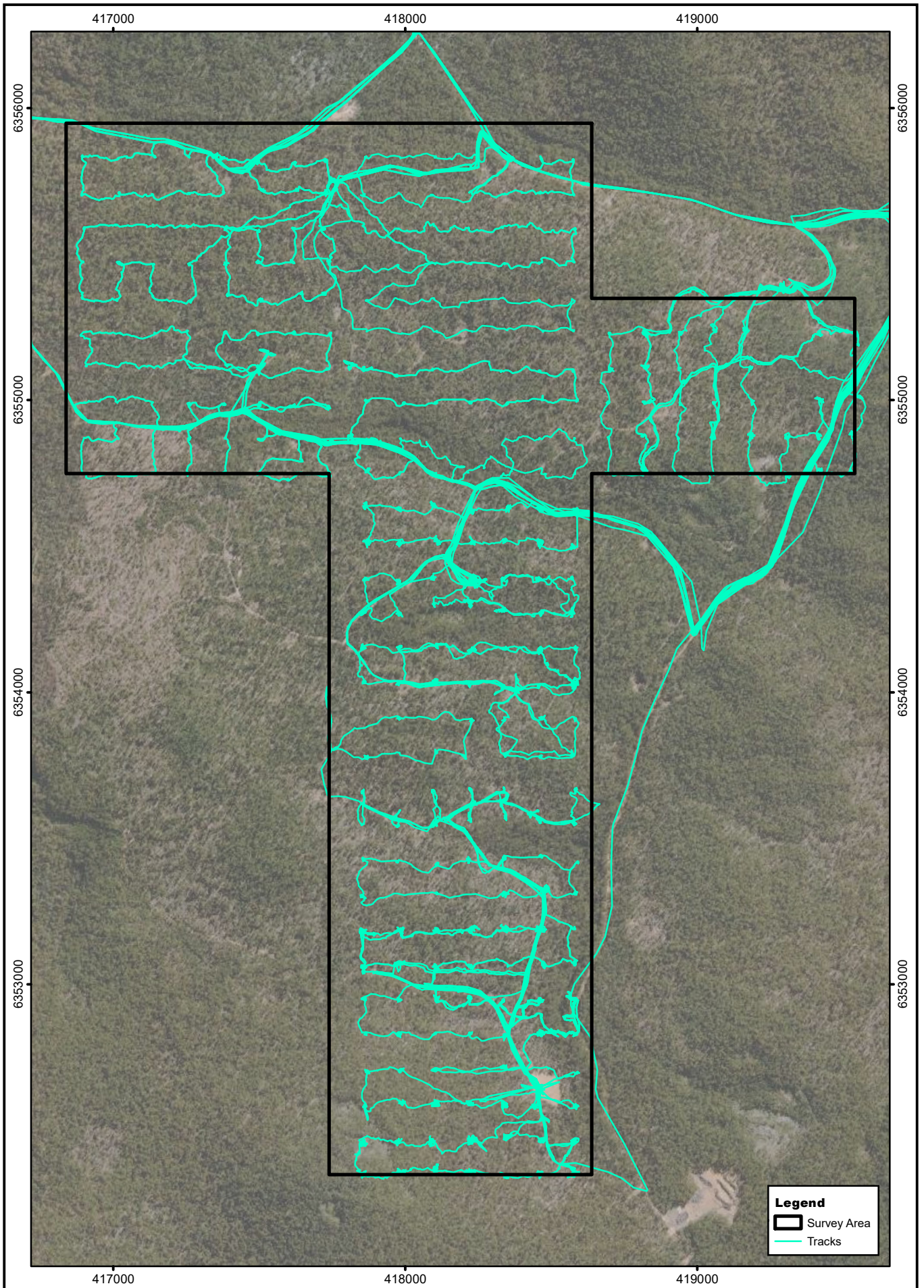
The survey effort to date has included (See Figure 11):

- . More than 40 kilometres of foot transects which includes the mapping efforts and targeted searches;
- . 331 recording sites in 2023 on a grid system which varied slightly from 120m x 120m with some sites closer than this average and some slightly wider. This pattern of recording is consistent with previous ecological studies in the northern Jarrah forest for both Alcoa and other clients in nearby areas;
- . targeted searches of additional extreme sites that are variable within the broader Yarragil and Swamp vegetation complexes as well as the variable communities on the valley slopes and ridges in the Larego survey areas. The coverage of the flora on the granite and swamp areas relied on the recording sites and targeted searching;
- . detailed and consistent data collection on position in the landscape, soils, flora, vegetation and vegetation condition.
- . consistent interpretation in line with previous site-vegetation studies where there is a greater reliance on key indicator species and a series of site parameters rather than the accepted clustering and groupings. Such an approach differs from the EPA guidance statement, but if the latter was followed the dominance of some tree and understorey species in the analyses would lead to a less comprehensive delineation of biodiversity values and also be inconsistent with the approach adopted on all other Alcoa leases where detailed flora and vegetation studies have been undertaken in the past by the Mattiske team and site personnel. In summary, the survey effort easily exceeds the expectations of the EPA Guidance Statement (2016a, 2016b).

A general assessment was made of the current survey against a range of factors that may have limited the outcomes and conclusions of this report (Table 4).

**Table 4: Potential flora and vegetation survey limitations for the Larego survey areas**

Potential Survey Limitation	Impact on Survey
Sources of information and availability of contextual information ( <i>i.e.</i> pre-existing background versus new material)	<b>Not a constraint:</b> Reference resources such as mapping by Beard (1979), Mattiske and Havel (1998), previous vegetation mapping completed for Alcoa by E.M Mattiske and Associates and Mattiske Consulting Pty Ltd teams together with online flora and vegetation information, has provided an appropriate level of information for the current survey.
Scope ( <i>i.e.</i> what life forms, <i>etc.</i> , were sampled)	<b>Not a constraint:</b> Vascular flora, which were the focus of the present survey was sampled on a close grid pattern within the survey area. In addition to the regular sampling sites, searches were undertaken to assess the likelihood of threatened and priority flora species.
Proportion of flora collected and identified (based on sampling, timing and intensity)	<b>Not a constraint:</b> The survey areas near Willowdale and Larego areas have been sampled over multiple years, with the more recent work on the detailed records on the grid system and targeted searches between sites. The recent survey effort in the majority of the areas was undertaken in early 6 months of 2023. The botanists undertaking the field surveys have had extensive experience working with the flora of the Jarrah forest. Any flora which could not be identified in the field was collected for subsequent identification. A few taxa were only recorded at genus level as flowering was not occurring.
Mapping reliability	<b>Not a constraint:</b> The vegetation was mainly assessed on a 120m x 120m grid pattern within the survey area. Over 40 kilometres were surveyed within the survey area. This together with 331 recording sites and the targeted and opportunistic survey sites (particularly near the granites and swamp areas) enabled intensive coverage of the values on the Spion survey area and therefore the associated mapping of key flora values and the site-vegetation types with a high level of confidence.
Timing, weather, season, cycle	<b>Minor constraint:</b> The EPA (2016a) recommends that flora and vegetation surveys in the South – West Botanical Province be conducted in Spring (September-November). The intensive work undertaken in sections of Larego has enabled coverage of different seasons. The detailed survey work commenced in early 2023 and continued to July 2023 on the Spion survey area. In view of extensive work in the areas adjacent to the survey areas this is considered to be only a minor constraint.
Disturbances (fire flood, accidental human intervention, <i>etc.</i> )	<b>Not a constraint:</b> With the exception of previous logging activities and occasional old forestry tracks, the vegetation of the survey area is largely undisturbed. In view of the >40 years of experience by Dr Mattiske in northern Jarrah forest vegetation mapping the latter is not considered to lead to any constraints.
Access problems ( <i>i.e.</i> ability to access survey area)	<b>Not a constraint:</b> Vehicle access through the Spion survey area was only restricted in small sections and all areas were accessible on foot.
Experience levels ( <i>e.g.</i> degree of expertise in plant identification to taxon level)	<b>Not a constraint:</b> All botanists had direct and recent experience working in the Jarrah Forest and working for Alcoa and a range of other clients, and thus were familiar with the local flora and vegetation values. Dr Mattiske has more than 40 years of ecological experience in flora and vegetation studies in the southwest forests at a detailed floristic level, as well as detailed and regional vegetation assessment level.



N  
 0 150 300 m  
 Scale: 1:17,500  
 MGA94 (Zone 50)


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**Spion Survey Area**  
**Survey Effort**

Figure:  
**11**

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 Date: August 2023 Rev: A | A4

## 5.2. Flora

The survey efforts were undertaken over several months and in view of the extensive work undertaken over multiple decades in the Willowdale and Larego areas was considered to exceed the EPA (2016a and 2016b) guidance statements expectations.

A total of 177 taxa from 40 families and 87 genera was recorded in the Spion survey areas and as such partly reflects the smaller survey area.

The range of flora collected on the Larego survey areas is summarized in Table 5 and Appendices B and D. As the survey efforts were undertaken over multiple years and also seasons the coverage of the flora was considered to exceed the EPA (2016a and 2016b) guidance statements expectations. The recordings on the grids was undertaken over multiple months the coverage of the flora in more diverse and spatially more complex areas such as the swamps, broad valley systems, slopes and ridges was considered to be comprehensive.

**Table 5: Summary of Flora Species on the Larego survey areas (see Appendices B and D)**

Source	Families	Genera	Native Taxa	Introduced Taxa
Larego Survey areas 2022	43	106	228	7
Spion Survey areas	40	87	177	1
Nature Map and Additional Potential and recorded Species (see Appendix B)	80	205	528	31

Of interest is the shift in landforms and soils across the survey areas and the latter is reflected in the change in the dominance of flora species that tolerate the lateritic uplands, gullies and outcrop areas. The summary of results from the plots and the recording sites as summarized by the site-vegetation types reflects this shift from species in the lateritic slopes and ridges and the broader valleys (see Appendix E).

## 5.3. Introduced Flora Species

Of the 177 species, 1 was an introduced species. The introduced species all occur more widely in the Jarrah forest and are not listed as WONS weeds at the National scale or as Declared pests at the State level.

## 5.4. Threatened and Priority Flora

No Threatened flora species, pursuant to section 179 of the *EPBC Act* and as listed by DCCEEW (2023a) or pursuant to Part 2, Division 1 and Subdivision 2 of the *BC Act* and as listed by DBCA (2022a) were recorded during recent assessments of the Spion survey area.

One Priority flora species as listed by DBCA (2022a) was recorded in the Spion survey areas (Appendix D), Table 6 and Figure 12.

**Table 6: Summary of Priority Flora recorded in the Spion survey area**

SPECIES	Federal Conservation Status	State Conservation Status	Site-vegetation Types	Population
<i>Grevillea prominens</i> (P3)	█	P3	G	3-5
<i>Grevillea prominens</i> (P3)	█	P3	T	3-5
<i>Grevillea prominens</i> (P3)	█	P3	AC	3-5
<i>Grevillea prominens</i> (P3)	█	P3	TS	3-5
<i>Grevillea prominens</i> (P3)	█	P3	ST	3-5
<i>Grevillea prominens</i> (P3)	█	P3	SW	3-5
<i>Grevillea prominens</i> (P3)	█	P3	TS	3-5
<i>Grevillea prominens</i> (P3)	█	P3	AC	3-5
<i>Grevillea prominens</i> (P3)	█	P3	S	1-3
<i>Grevillea prominens</i> (P3)	█	P3	S	3-5
<i>Grevillea prominens</i> (P3)	█	P3	W	5-10
<i>Grevillea prominens</i> (P3)	█	P3	T	3-5

*Grevillea prominens* (P3) is known from 9 records at the State Herbarium (DBCA 2007-) and has been recorded east of the western Larego survey area and south east of the eastern Larego survey area and was recorded in the Spion area on a range of soils ranging from lateritic gravelly soils to swamp loams to granite areas. This species has been recorded in the wider Jarrah forest (DBCA 2007-). *Grevillea prominens* was restricted to the north-eastern areas of the Spion area (Figure 12).

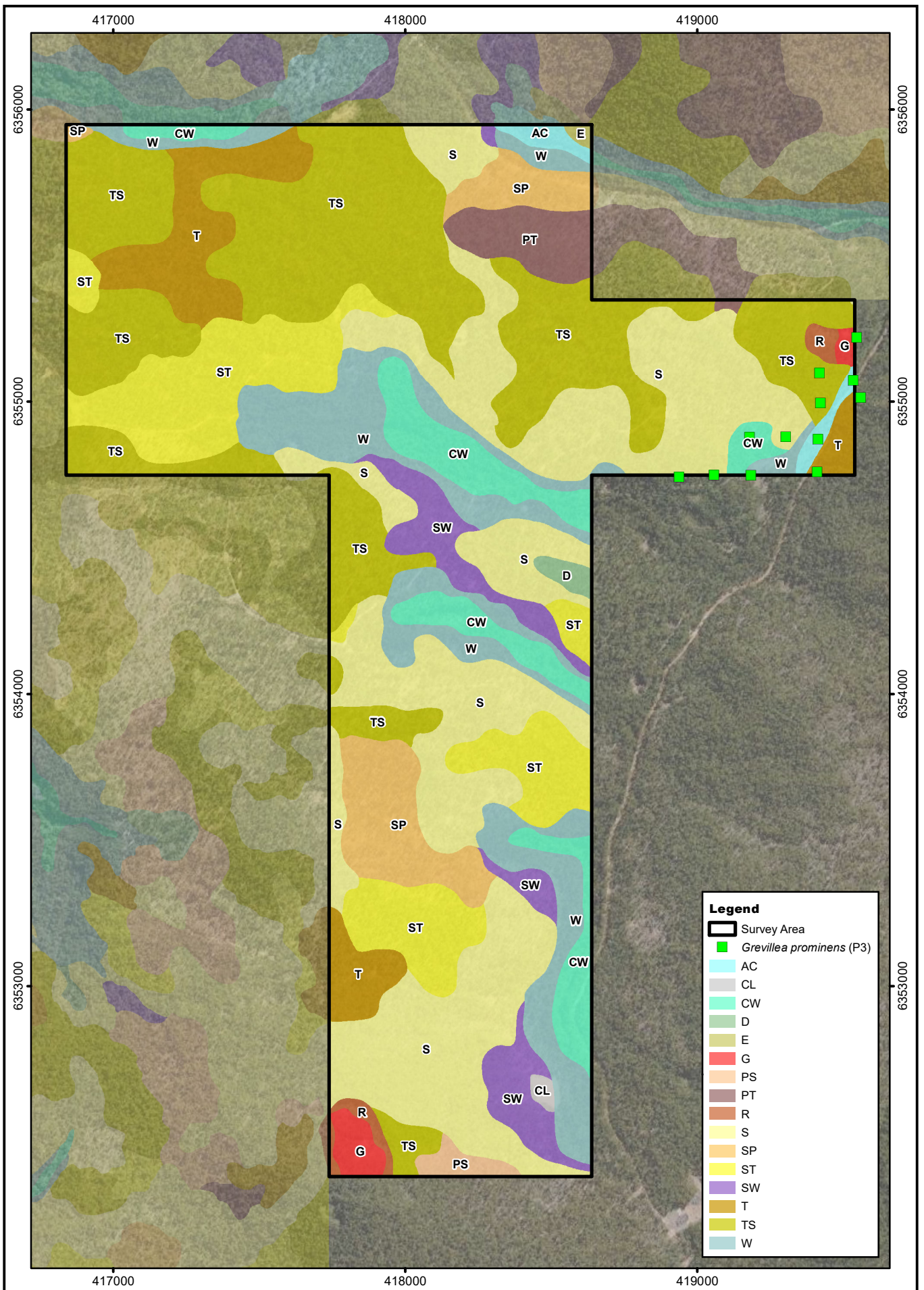
## 5.5. Site-vegetation Types

A total of 15 site-vegetation types and 1 cleared type were defined and mapped in the Spion survey area, Table 7 and Figure 12. The site-vegetation types were subdivided into four main groupings associated with site conditions which reflected landforms, soils and soil moisture levels, Table 7. The site-vegetation types on the extreme sites such as broad valley systems and swamps differ markedly from the forest and woodland areas on the slopes and ridges. The delineation of the site-vegetation types was based on the earlier work of Havel (1975a and 1975b) and as such rely on key site and species indicators. Whilst Mattiske has refined these initial site-vegetation types there is still a reliance on the original work of Havel (1975a and 1975b). The initial code is the dominant site-vegetation type code and the second code (where added) reflects some local influence of secondary key stone species. These site-vegetation types were developed in consultation with Dr David Goodall (formerly CSIRO at the time). In the 1970's Dr Havel and Dr Goodall undertook extensive analyses to delineate and differentiate the key species and site parameters that assist in the division of the continuum of the dominant trees of *Eucalyptus marginata* (Jarrah) and *Corymbia calophylla* (Marri). This approach has been used for some 45 years and as such to deviate from such an approach and rely on other approaches would negate the effort to date and the ability to align the findings with other areas in the northern Jarrah forest. So whilst such an approach might be perceived by assessors to deviate from the EPA guidance statements, to not adopt the site-vegetation approach would diminish the delineation of the biodiversity values in the Spion survey area. In addition the ranking of species and condition of species in the field has increased the intensity and coverage of the sites within the Larego survey areas.

The dominant site-vegetation types were S, ST and TS (63.76%) on the slopes and ridges and D, W and SW on the moister slopes (14.78%). The more extreme sites associated with swamps (types AC and CW) covered less than 6.82 of the areas and near the granite areas (G and R) covered 1.41%, Table 7, Figure 9. The site-vegetation types of D and SW reflect the moister soils that may influence the spread and intensification of *Phytophthora cinnamomi*.

**Table 7: Summary of Site-vegetation Types (SVT) on the Spion survey area**

SVT Code	Description	Area_Ha	% Total
<b>Swamps (AC) and Creeklines (CW)</b>			
AC	Open Woodland of <i>Eucalyptus rudis</i> – <i>Melaleuca preissiana</i> - <i>Eucalyptus patens</i> - <i>Banksia littoralis</i> with dense <i>Taxandria linearifolia</i> and <i>Astartea scoparia</i> in understorey on broad swamps and water-courses.	3.65	0.75
CW	Woodland to Open Forest of <i>Eucalyptus patens</i> – <i>Eucalyptus megacarpa</i> - <i>Corymbia calophylla</i> - <i>Banksia littoralis</i> with dense <i>Taxandria linearifolia</i> and <i>Astartea scoparia</i> in understorey on creek-lines and water-courses.	29.49	6.07
<b>Lower Slopes (D, E, W) and Moister Slopes (SW)</b>			
D	Open Forest of <i>Eucalyptus marginata</i> - <i>Corymbia calophylla</i> – <i>Hakea prostrata</i> on lower slopes with mixed low understorey species, including <i>Babingtonia camphorosmae</i> and <i>Acacia extensa</i> on clay loams to gravelly clay-loams.	1.68	0.35
E	Open woodland of <i>Eucalyptus marginata</i> and <i>Corymbia calophylla</i> over <i>Mesomelaena tetragona</i> , <i>Kingia australis</i> , <i>Leptospermum erubescens</i> and <i>Babingtonia camphorosmae</i> on sandy to sandy-loam soils on slopes.	0.55	0.11
W	Open Forest of <i>Eucalyptus megacarpa</i> - <i>Eucalyptus patens</i> – <i>Corymbia calophylla</i> on lower slopes with mixed low understorey species, including <i>Acacia extensa</i> and <i>Hypocalymma angustifolium</i> on seasonally moister sandy-loam gravelly soils.	50.97	10.49
SW	Open Forest of <i>Eucalyptus marginata</i> - <i>Corymbia calophylla</i> – <i>Banksia grandis</i> with scattered understorey, including <i>Adenanthos barbiger</i> , <i>Hypocalymma angustifolium</i> and <i>Styphelia tenuiflora</i> on seasonally moister sandy-gravelly soils.	19.16	3.94
<b>Slopes and Upper Ridges ( PS, PT, S, SP, ST, TP, TS, T)</b>			
PS	Open Forest of <i>Allocasuarina fraseriana</i> - <i>Eucalyptus marginata</i> - <i>Corymbia calophylla</i> - <i>Banksia grandis</i> with scattered understorey, including <i>Adenanthos barbiger</i> , <i>Leucopogon capitellatus</i> on gravels and sandy gravels.	2.67	0.55
PT	Open Forest of <i>Allocasuarina fraseriana</i> - <i>Eucalyptus marginata</i> - <i>Corymbia calophylla</i> - <i>Banksia grandis</i> with scattered understorey, including <i>Adenanthos barbiger</i> , <i>Leucopogon verticillatus</i> , <i>Pteridium esculentum</i> and <i>Bossiaea aquifolium</i> subsp. <i>aquifolium</i> on sandy-loam gravels.	9.99	2.06
S	Open Forest of <i>Eucalyptus marginata</i> - <i>Banksia grandis</i> – <i>Allocasuarina fraseriana</i> with scattered understorey, including <i>Adenanthos barbiger</i> , <i>Leucopogon capitellatus</i> and <i>Styphelia tenuiflora</i> on gravels and sandy-gravels.	129.78	26.70
SP	Open Forest of <i>Allocasuarina fraseriana</i> - <i>Eucalyptus marginata</i> - <i>Corymbia calophylla</i> - <i>Banksia grandis</i> with scattered understorey, including <i>Adenanthos barbiger</i> , <i>Grevillea wilsonii</i> and <i>Leucopogon capitellatus</i> on sandy-gravels to gravelly soils.	23.30	4.79
ST	Open Forest of <i>Eucalyptus marginata</i> - <i>Corymbia calophylla</i> with scattered understorey, including <i>Leucopogon capitellatus</i> , <i>Leucopogon verticillatus</i> , <i>Pteridium esculentum</i> , <i>Lasiopetalum floribundum</i> and <i>Styphelia tenuiflora</i> on sandy-gravelly soils.	54.89	11.29
TS	Open Forest of <i>Eucalyptus marginata</i> - <i>Corymbia calophylla</i> – <i>Banksia grandis</i> with scattered understorey, including <i>Leucopogon verticillatus</i> , <i>Pteridium esculentum</i> , <i>Clematis pubescens</i> and <i>Bossiaea aquifolium</i> subsp. <i>aquifolium</i> on sandy-loam gravelly to gravelly soils.	125.21	25.76
T	Open Forest of <i>Eucalyptus marginata</i> - <i>Corymbia calophylla</i> with scattered understorey, including <i>Leucopogon verticillatus</i> , <i>Pteridium esculentum</i> , <i>Clematis pubescens</i> and <i>Bossiaea aquifolium</i> subsp. <i>aquifolium</i> on sandy-loam gravelly soils.	27.02	5.56
<b>Granite and Outcrop Areas ( G, R)</b>			
G	Mosaic of Open Woodland of <i>Eucalyptus marginata</i> – <i>Corymbia calophylla</i> on the fringes of outcrops ranging to open heath communities of Proteaceae-Myrtaceae species and lithic complexes on the outcrop areas.	3.93	0.81
R	Open Woodland of <i>Eucalyptus marginata</i> - <i>Corymbia calophylla</i> on fringes of granite outcrops or shallow soils over mixed understorey species reflecting shallow soils over granite.	2.91	0.60
<b>Cleared Areas (CL)</b>			
CL	Already cleared areas	0.81	0.17



N  
 0 150 300 m  
 Scale: 1:17,500  
 MGA94 (Zone 50)  
 CAD Ref: a1992\_F021\_12  
 Date: August 2023  
 Rev: A | A4


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 28 Central Road, Kalamunda WA 6076 ~ Tel: 9257 1625 ~ Fax: 9257 1640  
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**Spion Survey Area**  
**Vegetation and Priority Flora**

Figure:  
**12**

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## 5.6. Vegetation Condition

The majority of the vegetation was ranked as very good despite historical harvesting activities, recent intense fires (which resulted in dominance of *Bossiaea aquifolium* in understorey), dieback and some established tracks and one restricted cleared area (Figure 13). The presence of the dieback disease is particularly evident in the condition of the vegetation on the lower slopes that support D and SW site-vegetation types.

## 5.7. Threatened and Priority Ecological Communities

No Threatened Ecological Communities (TECs) occur in the Spion survey area (DBCA 2023). The desktop assessment highlighted several potential TECs; however these are restricted to the Swan Coastal Plain and as such do not extend into the Jarrah forest area on the Darling Ranges.

No priority ecological communities (PECs), as listed at State level by DBCA (2022b) occurs within the Spion survey area.

The Spion survey area occurs within the Regional Forest Agreement (RFA) area of the southwest forests DCCEEW (2023a) and as such was considered during the RFA process.



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 MGA94 (Zone 50)  
 CAD Ref: a1992\_F021\_15  
 Date: August 2023


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## Spion Survey Area Vegetation Condition

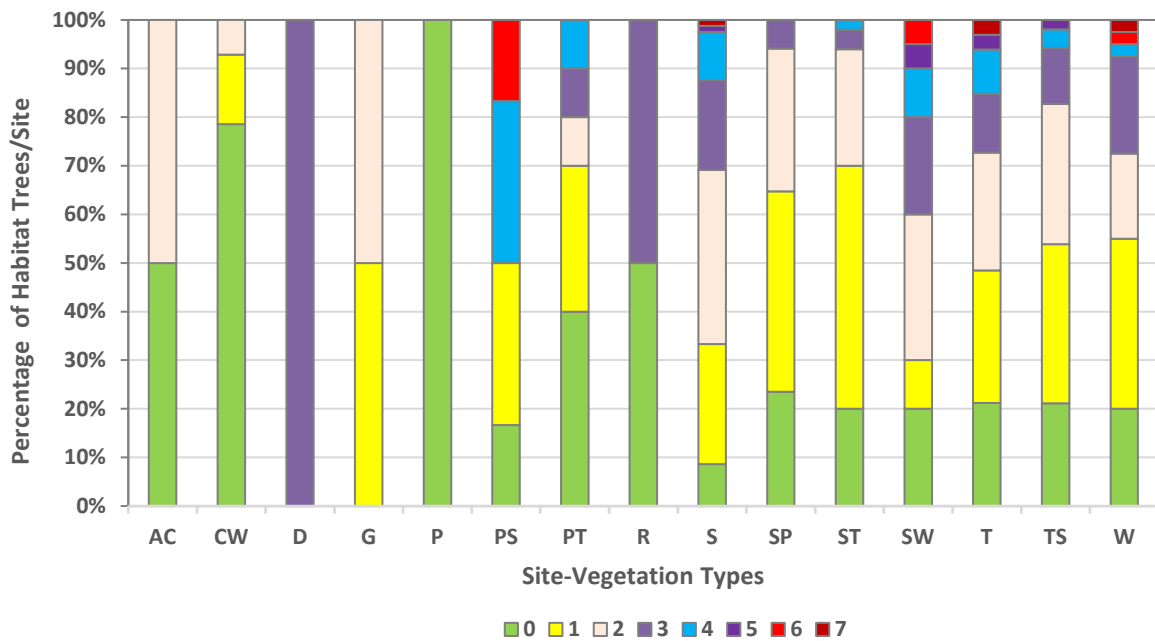
Figure: **13**

### 5.8. Old Growth Forests

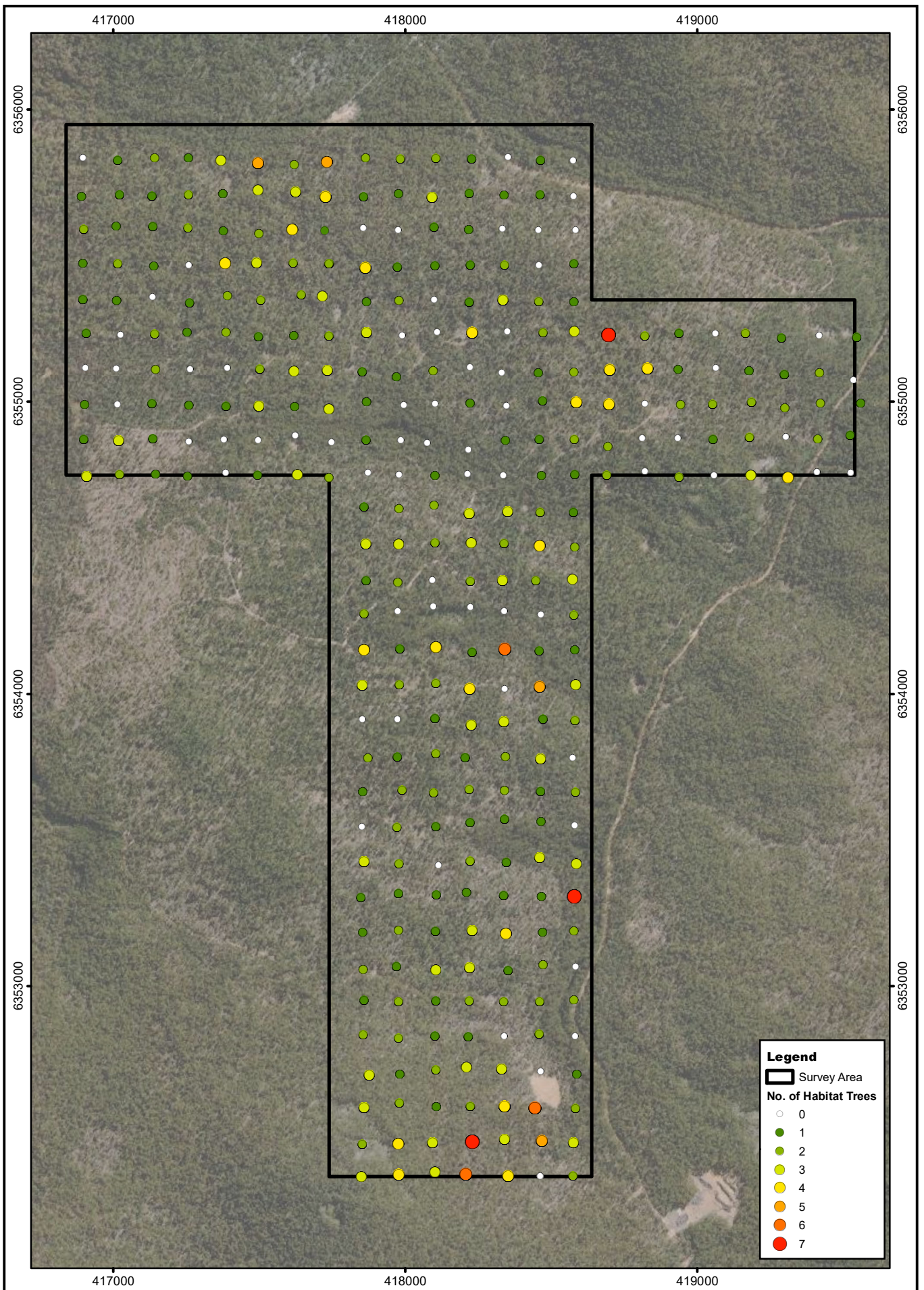
There are a few patches of old growth forests occurring outside the Spion survey area (Figure 9); however based on data supplied by the Department of Biodiversity, Conservation and Attractions no areas have been highlighted within the Spion survey area.

On the basis of the number of potential habitat trees and the number of stumps there are some areas of Spion survey area that have some potential to reflect lower logging rates (Figures 14 to 17).

In reviewing the data as collected within the Larego survey areas it is apparent that the swamp areas (A and AC) supported few larger trees and the site-vegetation types (ST, T, TS and PS) supported proportionally higher number of larger potential habitat trees (Diameter at Breast Height (DBH) > 50cm).



**Figure 14: Summary of Number of Potential Habitat Trees (>50cm DBH) in the respective Site-vegetation Types on the Spion survey area**



**Legend**

Survey Area

No. of Habitat Trees

- 0
- 1
- 2
- 3
- 4
- 5
- 6
- 7

N

0 150 300 m

Scale: 1:17,500  
MGA94 (Zone 50)

CAD Ref: a1992\_F021\_14  
Date: August 2023

Rev: A | A4

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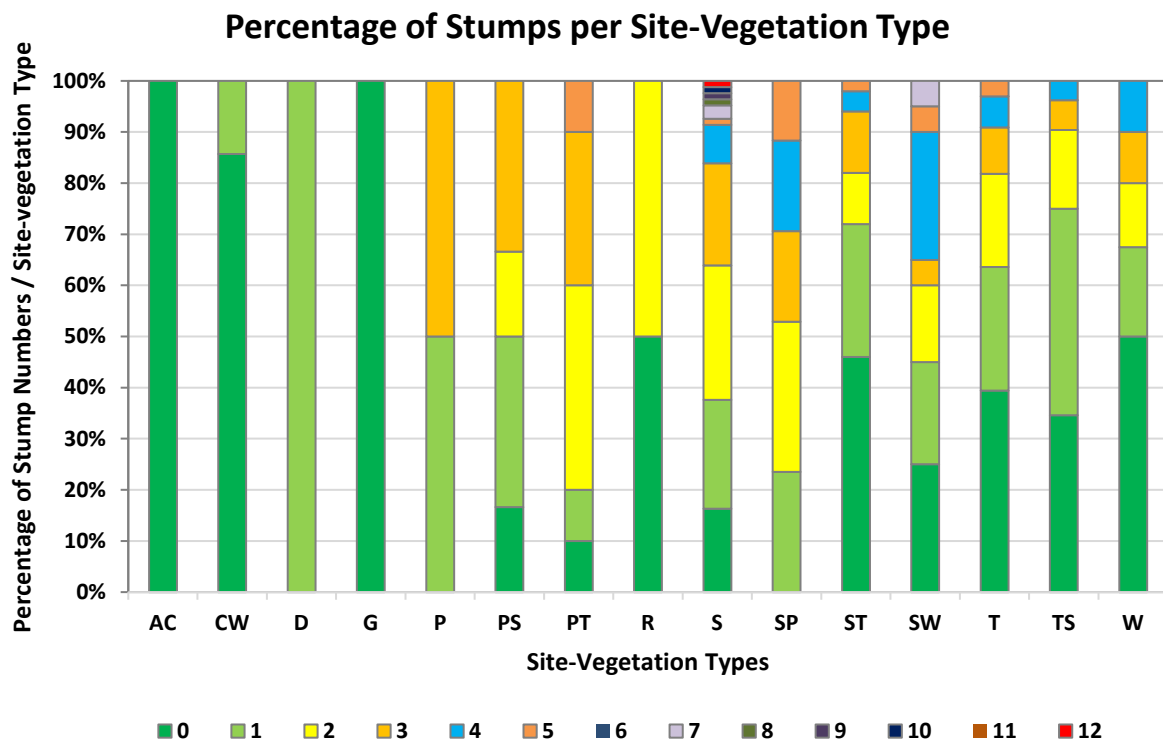
Author: E M Mattiske    MCPL Ref: ALC2305

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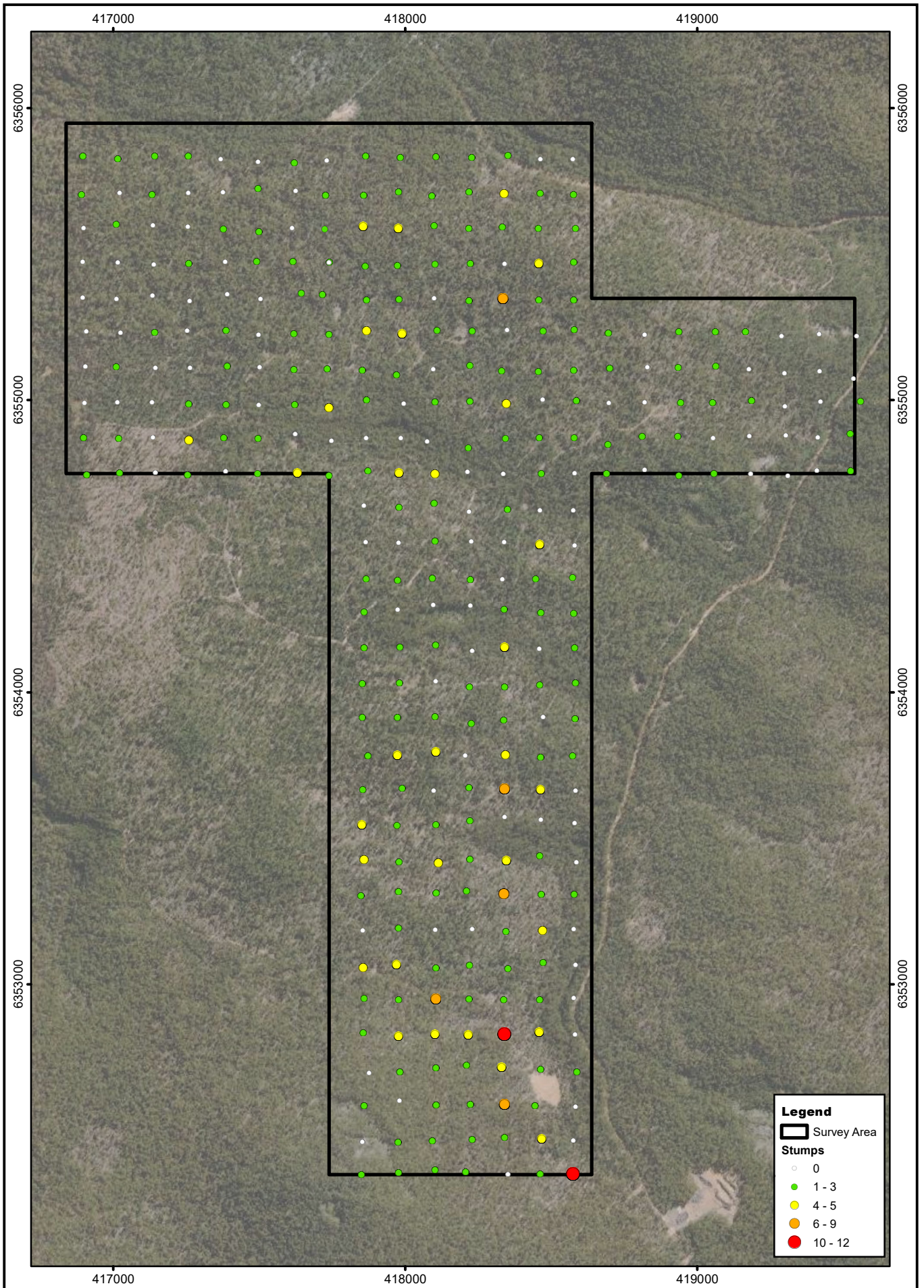
**Spion Survey Area**  
**Potential Habitat Trees**

Figure:  
**15**

2-



**Figure 16: Summary of the Percentage Number of Stumps in the respective Site-vegetation Types on the Spion survey area**



**Legend**

Survey Area

**Stumps**

- 0
- 1 - 3
- 4 - 5
- 6 - 9
- 10 - 12

N

0 150 300 m

Scale: 1:17,500  
MGA94 (Zone 50)

CAD Ref: a1992\_F021\_13  
Date: August 2023

Rev: A | A4

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**Spion Survey Area**  
**Number of Stumps**

Figure:  
**17**

## 6. DISCUSSION, CONCLUSIONS AND RECOMMENDATIONS

### 6.1. Flora

The survey efforts were undertaken over several months in the first six months of 2023, largely in late summer and autumn. The seasonal work in the Spion survey area and the previous Larego survey areas and nearby survey areas in recent years was considered to exceed the EPA (2016a and 2016b) guidance statements expectations.

A total of 177 taxa was recorded in the Spion survey area. This is within the range that would be expected in the smaller area of Willowdale. Of the 177 species, 1 was an introduced species. The introduced species (*Hypochaeris glabra*) occurs more widely in the Jarrah forest and are not listed as WONS weeds at the National scale or as Declared pests at the State level.

No listed threatened flora species were recorded in the Spion survey area.

Only one Priority three species (*Grevillea prominens* P3) was recorded in the north-eastern section of the Spion survey area.

### 6.2. Vegetation

The survey area is situated within Beard's (1990) Northern Jarrah Forest subregion of the Southwest Province. The Northern Jarrah Forest subregion is characterised by Jarrah (*Eucalyptus marginata*) forest on ironstone gravels and Marri-Wandoo (*Corymbia calophylla* - *Eucalyptus wandoo*) woodlands on loamy soils, with sclerophyll understoreys. Dell and Havel (1989) broadly classified the Jarrah Forest as an open forest in its northern extent and as a tall forest in its southern extent.

Hedde *et al.* (1980) defined and described the dominant pre-European vegetation of the Darling System in a series of vegetation complexes as part of the System 6 studies. Mattiske and Havel (1998) updated this initial more restricted mapping coverage to the wider south-west forest region as (Regional Forest Agreement vegetation complexes). Havel, J.J. (2000) summarized in greater detail the relationships between the landforms, soils and climatic conditions. Mattiske and Havel (1998) defined and described five vegetation complexes in the survey areas. None of these are restricted to the Spion survey area.

A total of 15 site-vegetation types and 1 cleared area were defined and mapped in the Spion survey area. The site-vegetation types were subdivided into four main groupings associated with site conditions which reflected landforms, soils and soil moisture levels, Table 7. The site-vegetation types on the extreme sites such as on the valley systems, granite outcrop areas and the creeklines differ markedly from the forest and woodland areas on the slopes and ridges. The delineation of the site-vegetation types was based on the earlier work of Havel (1975a and 1975b) and as such rely on key site and species indicators. Whilst Mattiske has refined these initial site-vegetation types there is still a reliance on the original work of Havel (1975a and 1975b). The initial code is the dominant site-vegetation type code and the second code (where added) reflects some local influence of secondary key stone species. These site-vegetation types were developed in consultation with Dr David Goodall (formerly CSIRO at the time). In the 1970's Dr Havel and Dr Goodall undertook extensive analyses to delineate and differentiate the key species and site parameters that assist in the division of the continuum of the dominant trees of *Eucalyptus marginata* (Jarrah) and *Corymbia calophylla* (Marri). This approach has been used for some 45 years and as such to deviate from such an approach and rely on other approaches would negate the effort to date and the ability to align the findings with other areas in the northern Jarrah forest. So whilst such an approach might be perceived by assessors to deviate from the EPA guidance statements, to not adopt the site-vegetation approach would diminish the delineation of the biodiversity values in the Spion survey area in the regional context. In addition the ranking of species and condition of species in the field has increased the intensity and coverage of the sites within the Spion survey area.

The dominant site-vegetation types were S, ST and TS (63.76%) on the slopes and ridges and D, W and SW on the moister slopes (14.78%). The more extreme sites associated with swamps (types AC and CW) covered less than 6.82% of the areas and near the granite areas (G and R) covered 1.41%, Table 7. The site-vegetation types of D and SW reflect the moister soils that may influence the spread and intensification of *Phytophthora cinnamomi*. As indicated in the Dieback data from DBCA it is evident that dieback has influenced the condition of the vegetation in the Spion survey area.

The site-vegetation types associated with these broader valleys (AC, CW, D, W and SW) and lower slopes have the potential to be groundwater dependent ecosystems.

The site-vegetation types of SW reflect the moister soils that may influence the spread and intensification of *Phytophthora cinnamomi*. As indicated in the Dieback data from DBCA it is evident that dieback and recent intense fires have influenced the condition of the vegetation in the Spion survey area.

### 6.3. Potential Groundwater Dependent Ecosystems

The potential groundwater dependent ecosystems were determined on the basis of the vegetation complexes and the site-vegetation types. In view of the extensive flora and vegetation studies in the northern Jarrah Forest these vegetation complexes and site-types support species that prefer and occur on seasonally moister and wetter soils on the swamps and lower slopes of the valley systems. This approach was considered to represent a precautionary approach in the absence of detailed groundwater level data at the time of selecting the potential groundwater dependent ecosystems at this juncture.

Key indicator plant species that are generally accepted as indicators of moister soils and, hence, potential groundwater dependent ecosystems include – *Banksia littoralis*, *Acacia divergens*, *Thomasia paniculata*, *Astartea scoparia*, *Eucalyptus rudis*, *Hypocalymma angustifolium*, *Hypocalymma cordifolium*, and *Taxandria linearifolia*.

### 6.4. Threatened and Priority Ecological Communities

No Threatened Ecological Communities (TECs) occur in the Spion survey area (DBCA 2023). The desktop assessment highlighted several potential TECs; however these are restricted to the Swan Coastal Plain and as such do not extend into the Jarrah forest area on the Darling Ranges.

One of the priority ecological communities (PECs), as listed at State level by DBCA (2022b) occurs north and east of the Larego survey areas on the granite areas near Jarrahdale and Boddington.

The Larego survey areas occurs within the Regional Forest Agreement (RFA) area of the southwest forests DCCEEW (2022b) and as such was considered during the RFA process.

### 6.5. Old Growth Forests

There are a few patches of old growth forests occurring outside the Spion survey area; however based on data supplied by the Department of Biodiversity, Conservation and Attractions no areas have been highlighted within the Spion survey areas. As indicated by the summary of potential habitat trees and stump numbers at the 20m radius sites there are some areas with denser potential habitat trees and variable logging rates.

## 7. ACKNOWLEDGEMENTS

The authors would like to thank Alcoa of Australia Ltd for their assistance with this project.

## 8. PERSONNEL

The following Mattiske Consulting Pty Ltd personnel were involved in this project:

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L Rowles	Experienced Botanist	Project Leader, Field Studies, Data Collation	FB62000020-5
A. Pereira	Experienced Botanist	Field Studies, Data Collation	FB62000145-5
D. Rubick	Botanist	Field Studies, Data Collation	FB62000328-3
A. Rowe	Botanist	Field Studies, Data Collation, assisting in draft report	FB62000329-3
B. Farrar	Botanist	Field Studies, Data Collation	FB62000559
S. Gianniti	Botanist	Field Studies, Data Collation	FB62000563
C. Athanassiou	Botanist	Field Studies, Data Collation	FB62000571
J. Wescombe	Botanist	Data collation, reporting	N/A
R. Jones	Botanist	Data collation and Assisting with Reporting	N/A

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## APPENDIX A1: THREATENED AND PRIORITY FLORA DEFINITIONS

Under section 179 of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), **threatened flora** are categorised as extinct, extinct in the wild, critically endangered, endangered, vulnerable and conservation dependent (Table A1.1).

**Table A1.1 Federal definition of threatened flora species**

**Note:** Adapted from section 179 of the EPBC Act.

CODE	CATEGORY	DEFINITION
<b>Ex</b>	<b>Extinct</b>	Species which at a particular time if, at that time, there is no reasonable doubt that the last member of the species has died.
<b>ExW</b>	<b>Extinct in the Wild</b>	Species which is known only to survive in cultivation, in captivity or as a naturalised population well outside its past range; or it has not been recorded in its known and/or expected habitat, at appropriate seasons, anywhere in its past range, despite exhaustive surveys over a time frame appropriate to its life cycle and form.
<b>CE</b>	<b>Critically Endangered</b>	Species which at a particular time if, at that time, it is facing an extremely high risk of extinction in the wild in the immediate future, as determined in accordance with the prescribed criteria.
<b>E</b>	<b>Endangered</b>	Species which is not critically endangered and it is facing a very high risk of extinction in the wild in the immediate or near future, as determined in accordance with the prescribed criteria.
<b>V</b>	<b>Vulnerable</b>	Species which is not critically endangered or endangered and is facing a high risk of extinction in the wild in the medium-term future, as determined in accordance with the prescribed criteria.
<b>CD</b>	<b>Conservation Dependent</b>	Species which at a particular time if, at that time, the species is the focus of a specific conservation program, the cessation of which would result in the species becoming vulnerable, endangered or critically endangered within a period of 5 years.

The *Biodiversity Conservation Act 2016* (BC Act) provides for (amongst other things) the protection of flora that is facing an extremely high risk of extinction in the wild in the immediate, near or medium-term future in Western Australia under Part 10 (Division 2).

**Threatened flora** are listed in the *Wildlife Conservation (Rare Flora) Notice 2018* (under Part 2, Division 1, Subdivision 2 of the BC Act; Department of Biodiversity, Conservation and Attractions (DBCA 2022a) and are categorised under Schedules 1-3. A flora species is defined as **threatened** if it is facing an extremely high risk of extinction in the wild in the immediate, near or medium-term future, pursuant to sections 20, 21 and 22 of the BC Act. Threatened species are categorised as critically endangered, endangered, and vulnerable (Table A1.2).

**Table A1.2 State definition of threatened flora species**

**Note:** Adapted from DBCA (2022a).

CODE	CATEGORY	DEFINITION
CR	<b>Critically endangered</b>	Species considered to be facing an extremely high risk of becoming extinct in the wild (listed under Schedule 1 of the <i>Wildlife Conservation (Rare Flora) Notice 2018</i> ).
EN	<b>Endangered</b>	Species considered to be facing a very high risk of becoming extinct in the wild (listed under Schedule 2 of the <i>Wildlife Conservation (Rare Flora) Notice 2018</i> ).
VU	<b>Vulnerable</b>	Species considered to be facing a high risk of becoming extinct in the wild (listed under Schedule 3 of the <i>Wildlife Conservation (Rare Flora) Notice 2018</i> ).

**Priority flora** species are defined as “possibly threatened species that do not meet the survey criteria, or are otherwise data deficient” or species that are “adequately known, are rare but not threatened, meet criteria for near threatened or have recently been removed from the threatened species list” for other than taxonomic reasons” (DBCA 2022a). Priority species are not afforded the same level of protection under state or federal legislation as the listed Threatened species, however are considered significant under the Environmental Protection Authority’s *Environmental Factor Guideline: Flora and Vegetation* (Environmental Protection Authority 2016a). The Department of Biodiversity, Conservation and Attractions categorises priority flora into four categories: Priority 1; Priority 2, Priority 3 and Priority 4 (Table A1.3).

**Table A1.3: State definition of priority flora species**

**Note:** Adapted from DBCA (2022a).

CODE	CATEGORY	DEFINITION
<b>P1</b>	<b>Priority 1:</b> Poorly-known species	Known from one or a few locations (< 5) which are potentially at risk. All occurrences are either: very small; or on lands not managed for conservation; or are otherwise under threat of habitat destruction or degradation. In urgent need of further survey.
<b>P2</b>	<b>Priority 2:</b> Poorly-known species	Known from one or a few locations (< 5). Some occurrences are on lands managed primarily for nature conservation. In urgent need of further survey.
<b>P3</b>	<b>Priority 3:</b> Poorly-known species	Known from several locations and the species does not appear to be under imminent threat; or from few but widespread locations with either a large population size or significant remaining areas of apparently suitable habitat, much of it not under imminent threat. In need of further survey.
<b>P4</b>	<b>Priority 4:</b> Rare, Near Threatened, and other species in need of monitoring	<p><b>a) Rare</b> - Species that are considered to have been adequately surveyed, or for which sufficient knowledge is available, and that are considered not currently threatened or in need of special protection, but could be if present circumstances change. These species are usually represented on conservation lands.</p> <p><b>b) Near Threatened</b> - Species that are considered to have been adequately surveyed and that do not qualify for Conservation Dependent, but that are close to qualifying for Vulnerable.</p> <p><b>c) Other</b> - Species that have been removed from the list of threatened species during the past five years for reasons other than taxonomy.</p>

## APPENDIX A2: THREATENED AND PRIORITY ECOLOGICAL COMMUNITY DEFINITIONS

Under section 181 of the EPBC Act, **threatened ecological communities** are categorised as critically endangered, endangered and vulnerable (Table A2.1).

**Table A2.1** Federal definition of threatened ecological communities

**Note:** Adapted from section 181 and section 182 of the EPBC Act.

CATEGORY	DEFINITION
<b>Critically Endangered</b>	If, at that time, it is facing an extremely high risk of extinction in the wild in the immediate future.
<b>Endangered</b>	If, at that time, it is not critically endangered and is facing a very high risk of extinction in the wild in the near future.
<b>Vulnerable</b>	If, at that time, it is not critically endangered or endangered, and is facing a high risk of extinction in the wild in the medium-term future.

**Threatened ecological communities** (TECs) are listed in the *List of Threatened Ecological Communities endorsed by the Western Australian Minister for Environment (28 June 2018)* (under Part 2, Division 2, Subdivision 1 of the BC Act; DBCA 2018). An ecological community is defined as **threatened** if it is facing an extremely high risk of collapse in the immediate, near or medium-term future, pursuant to sections 28, 29 and 30 of the BC Act. Threatened ecological communities are categorised as critically endangered, endangered, and vulnerable (Table A2.2).

Currently there is no Western Australian legislation covering the conservation of state listed **threatened ecological communities** (TECs), however, a non-statutory process is in place, whereby the DBCA (and former equivalent departments) have been identifying and informally listing TECs since 1994. Some of these TECs are also endorsed by the Federal Minister as threatened, and some of these are listed under the EPBC Act and therefore afforded legislative protection at the Commonwealth level.

**Table A2.2 State definition of threatened ecological communities**

**Note:** Adapted from DBCA (2018).

CODE	CATEGORY	DEFINITION
CR	<b>Critically Endangered</b>	An ecological community will be listed as CR when it has been adequately surveyed and is found to be facing an extremely high risk of total destruction in the immediate future, meeting <b>any one or more of</b> the following criteria: <ol style="list-style-type: none"> <li>1. The estimated geographic range and distribution has been reduced by at least 90% and is either continuing to decline with total destruction imminent, or is unlikely to be substantially rehabilitated in the immediate future due to modification;</li> <li>2. The current distribution is limited i.e. highly restricted, having very few small or isolated occurrences, or covering a small area; or</li> <li>3. The ecological community is highly modified with potential of being rehabilitated in the immediate future.</li> </ol>
EN	<b>Endangered</b>	An ecological community will be listed as EN when it has been adequately surveyed and is not CR, but is facing a very high risk of total destruction in the near future. The ecological community must meet <b>any one or more of</b> the following criteria: <ol style="list-style-type: none"> <li>1. The estimated geographic range and distribution has been reduced by at least 70% and is either continuing to decline with total destruction imminent in the short term future, or is unlikely to be substantially rehabilitated in the short term future due to modification;</li> <li>2. The current distribution is limited i.e. highly restricted, having very few small or isolated occurrences, or covering a small area; or</li> <li>3. The ecological community is highly modified with potential of being rehabilitated in the short term future.</li> </ol>
VU	<b>Vulnerable</b>	An ecological community will be listed as VU when it has been adequately surveyed and is not Critically Endangered or Endangered but is facing high risk of total destruction in the medium to long term future. The ecological community must meet <b>any one or more of</b> the following criteria: <ol style="list-style-type: none"> <li>1. The ecological community exists largely as modified occurrences that are likely to be able to be substantially restored or rehabilitated;</li> <li>2. The ecological community may already be modified and would be vulnerable to threatening process, and restricted in range or distribution; or</li> <li>3. The ecological community may be widespread but has potential to move to a higher threat category due to existing or impending threatening processes.</li> </ol>

**Priority ecological communities** (PECs) are defined as possible threatened ecological communities that do not meet the stringent survey criteria for the assessment of threatened ecological communities, and are listed by the DBCA (2022b) in the *Priority Ecological Communities for Western Australia – Version 34 (21 December 2022)*. Similarly to priority flora, PECs are not afforded legislative protection, however are considered significant under the Environmental Protection Authority's (2016a) *Environmental Factor Guideline: Flora and Vegetation*. The Department of Biodiversity, Conservation and Attractions categorises priority ecological communities into five categories: Priority 1; Priority 2, Priority 3, Priority 4 and Priority 5 (Table A2.3).

**Table A2.3 State definition of priority ecological communities**

**Note:** Adapted from DBCA (2022b).

CODE	CATEGORY	DEFINITION
P1	<b>Priority 1</b> (Poorly known ecological communities)	Ecological communities that are known from very few, restricted occurrences (generally $\leq 5$ occurrences or a total area of $\leq 100$ ha). Most of these occurrences are not actively managed for conservation (e.g. located within agricultural or pastoral lands, urban areas, or active mineral leases) and for which immediate threats exist.
P2	<b>Priority 2</b> (Poorly known ecological communities)	Communities that are known from few small occurrences (generally $\leq 10$ occurrences or a total area of $\leq 200$ ha). At least some occurrences are not believed to be under immediate threat of destruction or degradation.
P3	<b>Priority 3</b> (Poorly known ecological communities)	<ol style="list-style-type: none"> <li>1. Communities that are known from several to many occurrences, a significant number or area of which are not under threat of habitat destruction or degradation;</li> <li>2. Communities known from a few widespread occurrences, which are either large or within significant remaining areas of habitat in which other occurrences may occur, much of it not under imminent threat; or</li> <li>3. Communities made up of large, and/or widespread occurrences, that may or not be represented in the reserve system, but are under threat of modification across much of their range from processes such as grazing and inappropriate fire regimes.</li> </ol>
P4	<b>Priority 4</b> (Ecological communities that are adequately known, rare but not threatened or meet criteria for Near Threatened, or that have been recently removed from the threatened list. These communities require regular monitoring)	<ol style="list-style-type: none"> <li>1. Rare – Communities known from few occurrences that are considered to have been adequately surveyed, sufficient knowledge is available, and are considered not to be currently threatened.</li> <li>2. Near Threatened – Communities considered to have been adequately surveyed and do not qualify for Conservation Dependent, but are close to qualifying for Vulnerable.</li> <li>3. Communities that have been removed from the list of threatened communities during the past five years.</li> </ol>
P5	<b>Priority 5</b> (Conservation Dependent ecological communities)	Ecological communities that are not threatened but are subject to a specific conservation program, the cessation of which would result in the community becoming threatened within five years.

## APPENDIX A3: CATEGORIES AND CONTROL MEASURES OF DECLARED PEST (PLANT) ORGANISMS IN WESTERN AUSTRALIA

Section 22 of Western Australia's *Biosecurity and Agriculture Management Act 2007* (BAM Act) makes provision for a plant taxon to be listed as a declared pest organism in respect to parts of, or the entire State. According to the BAM Act, a declared pest is defined as a prohibited organism (section 12), or an organism for which a declaration under section 22 (2) of the Act is in force.

Under the *Biosecurity and Agriculture Management Regulations 2013* (WA), declared pest plants are placed in one of three control categories, C1 (exclusion), C2 (eradication) or C3 (management), which determines the measures of control which apply to the declared pest (Table A4.1). The current listing of declared pest organisms and their control category is through the Western Australian Organism List (Department of Primary Industries and Regional Development 2023).

**Table A3.1 Categories and control measures of declared pest (plant) organisms**

**Note:** Adapted from *Biosecurity and Agriculture Management Regulations 2013*.

CONTROL CATEGORY	CONTROL MEASURES
<p style="text-align: center;"><b>C1 (Exclusion)</b></p> <p>'(a) Category 1 (C1) — Exclusion: if in the opinion of the Minister introduction of the declared pest into an area or part of an area for which it is declared should be prevented.'</p> <p>Pests will be assigned to this category if they are not established in Western Australia and control measures are to be taken, including border checks, in order to prevent them entering and establishing in the State.</p>	<p>In relation to a category 1 declared pest, the owner or occupier of land in an area for which an organism is a declared pest or a person who is conducting an activity on the land must take such of the control measures specified in subregulation (1) as are reasonable and necessary to destroy, prevent or eradicate the declared pest.</p>
<p style="text-align: center;"><b>C2 (Eradication)</b></p> <p>'(b) Category 2 (C2) — Eradication: if in the opinion of the Minister eradication of the declared pest from an area or part of an area for which it is declared is feasible.'</p> <p>Pests will be assigned to this category if they are present in Western Australia in low enough numbers or in sufficiently limited areas that their eradication is still a possibility.</p>	<p>In relation to a category 2 declared pest, the owner or occupier of land in an area for which an organism is a declared pest or a person who is conducting an activity on the land must take such of the control measures specified in subregulation (1) as are reasonable and necessary to destroy, prevent or eradicate the declared pest.</p>
<p style="text-align: center;"><b>C3 (Management)</b></p> <p>'(c) Category 3 (C3) — Management: if in the opinion of the Minister eradication of the declared pest from an area or part of an area for which it is declared is not feasible but that it is necessary to:</p> <p><b>(i)</b> alleviate the harmful impact of the declared pest in the area; or</p> <p><b>(ii)</b> reduce the number or distribution of the declared pest in the area; or</p> <p><b>(iii)</b> prevent or contain the spread of the declared pest in the area.'</p> <p>Pests will be assigned to this category if they are established in Western Australia but it is feasible, or desirable, to manage them in order to limit their damage. Control measures can prevent a C3 pest from increasing in population size or density or moving from an area in which it is established into an area which currently is free of that pest.</p>	<p>In relation to a category 3 declared pest, the owner or occupier of land in an area for which an organism is a declared pest or a person who is conducting an activity on the land must take such of the control measures specified in subregulation (1) as are reasonable and necessary to:</p> <p><b>(a)</b> alleviate the harmful impact of the declared pest in the area for which it is declared; or</p> <p><b>(b)</b> reduce the number or distribution of the declared pest in the area for which it is declared; or</p> <p><b>(c)</b> prevent or contain the spread of the declared pest in the area for which it is declared.</p>

## APPENDIX A4: OTHER DEFINITIONS

### Environmentally sensitive areas

Environmentally sensitive areas are declared by the State Minister under section 51B of the *Environmental Protection Act 1986* (EP Act) and are listed in the *Environmental Protection (Environmentally Sensitive Areas) Notice 2005*, gazetted 8 April 2005. Specific environmentally sensitive areas relevant to this report include: a defined wetland and the area within 50 metres of the wetland; the area covered by vegetation within 50 metres of rare flora; the area covered by a threatened ecological community; a Bush Forever site – further areas and information are described in the *Environmental Protection (Environmentally Sensitive Areas) Notice 2005*.

### Conservation significant flora

Under the *Environmental Factor Guideline: Flora and Vegetation* (Environmental Protection Authority 2016a), flora may be considered significant for a range of reasons, including, but not limited to the following:

- being identified as threatened or priority species;
- locally endemic or associated with a restricted habitat type (e.g. surface water or groundwater dependent ecosystems);
- new species or 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; or
- relictual status, being representative of taxonomic groups that no longer occur widely in the broader landscape.

### Conservation significant vegetation

Under the *Environmental Factor Guideline: Flora and Vegetation* (Environmental Protection Authority 2016a), vegetation may be considered significant for a range of reasons, including, but not limited to the following:

- being identified as threatened or priority ecological communities;
- restricted distribution;
- degree of historical impact from threatening processes;
- a role as a refuge; or
- providing an important function required to maintain ecological integrity of a significant ecosystem.

## APPENDIX A5: DEFINITION OF VEGETATION CONDITION SCALE FOR THE SOUTH WEST AND INTERZONE BOTANICAL PROVINCES

Vegetation condition ratings relate to vegetation structure, level of disturbance at each structural layer and the ability of the vegetation unit to regenerate (Table A5.1). Vegetation condition provides complementary information for assessing the significance of potential impacts.

**Table A5.1** Definition of vegetation condition categories

**Note:** Adapted from Keighery (1994).

CATEGORY	DEFINITION
1	Pristine or nearly so, no obvious sign of disturbance or damage caused by human activities since European settlement.
2	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.
3	Vegetation structure altered obvious signs of disturbance. For example, disturbance to vegetation structure caused by repeated fires, the presence of some more aggressive weeds, dieback, logging and grazing.
4	Vegetation structure significantly altered by obvious signs of multiple disturbances. Retains basic vegetation structure or ability to regenerate it. For example, disturbance to vegetation structure caused by very frequent fires, the presence of very aggressive weeds, partial clearing, dieback and grazing.
5	Basic vegetation structure severely impacted by disturbance. Scope for regeneration but not to a state approaching good condition without intensive management. For example, disturbance to vegetation structure caused by very frequent fires, the presence of very aggressive weeds at high density, partial clearing, dieback and grazing.
6	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 or shrubs.

**APPENDIX B: SUMMARY OF VASCULAR PLANT SPECIES WITH THE POTENTIAL TO OCCUR IN THE SPION SURVEY AREA**

Note: \* denotes alien species; PL denotes planted species; PL\* denotes both planted/alien; and Mixed (^) refers to part native and part naturalised. T, P1 to P4 reflect Threatened and Priority species (DBCA, 2019a). SCC = State Conservation Code; FCC= Federal Conservation Code; CE = Critically Endangered; E = Endangere V= Vulnerable. EPBC PMST (DCCEEW, 2013), NatureMap (DBCA, 2007-), Previous MCPL reports (MCPL, 2015, 2019, 2020, 2022), WAHerb and TPFL (DBCA, 38-0423FL, 2023).

FAMILY	* Species	SCC	FCC	EPBC PMST	NatureMap	MCPL 2015	MCPL 2019	MCPL 2020	MCPL 2022	WAHerb	TPFL
Amaranthaceae	<i>Ptilotus manglesii</i>					x					
Anarthriaceae	<i>Lyginia</i> sp.					x					
Apiaceae	<i>Actinotus glomeratus</i>				x						
	<i>Actinotus leucocephalus</i>				x						
	<i>Actinotus repens</i>	P3			x					x	
	<i>Pentapeltis peltigera</i>					x	x	x	x		
	<i>Pentapeltis silvatica</i>				x		x				
	<i>Platysace compressa</i>					x	x	x	x		
	<i>Platysace filiformis</i>				x	x	x		x		
	<i>Platysace tenuissima</i>					x	x		x		
	<i>Platysace</i> sp.								x		
	<i>Xanthosia atkinsoniana</i>				x	x		x	x		
	<i>Xanthosia candida</i>				x	x	x	x	x		
	<i>Xanthosia huegelii</i>				x	x	x		x		
	<i>Xanthosia singuliflora</i>				x				x		
	<i>Xanthosia ciliata</i>						x				
	<i>Xanthosia</i> sp.						x		x		
Apocynaceae	* <i>Vinca major</i>				x						
Araliaceae	<i>Hydrocotyle callicarpa</i>				x						
	<i>Trachymene pilosa</i>						x		x		
Asparagaceae	<i>Laxmannia squarrosa</i>					x		x			
	<i>Lomandra brittanii</i>					x			x		
	<i>Lomandra caespitosa</i>				x	x		x	x		
	<i>Lomandra hermaphrodita</i>				x	x		x	x		
	<i>Lomandra integra</i>				x						
	<i>Lomandra micrantha</i>					x			x		
	<i>Lomandra micrantha</i> subsp. <i>micrantha</i>				x	x			x		
	<i>Lomandra nigricans</i>				x	x		x	x		
	<i>Lomandra pauciflora</i>				x						
	<i>Lomandra preissii</i>				x			x	x		
	<i>Lomandra purpurea</i>					x		x	x		
	<i>Lomandra sericea</i>				x	x	x	x	x		
	<i>Lomandra sonderi</i>					x	x	x	x		
	<i>Lomandra spartea</i>					x	x	x	x		
	<i>Lomandra suaveolens</i>						x				
	<i>Lomandra</i> sp.					x	x	x	x		
	<i>Thysanotus dichotomus</i>				x	x	x		x		
	<i>Thysanotus fastigiatus</i>				x		x		x		
	<i>Thysanotus manglesianus</i>						x				
	<i>Thysanotus multiflorus</i>				x	x	x	x	x		



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Note: \* denotes alien species; PL denotes planted species; PL\* denotes both planted/alien; and Mixed (^) refers to part native and part naturalised. T, P1 to P4 reflect Threatened and Priority species (DBCA, 2019a). SCC = State Conservation Code; FCC= Federal Conservation Code; CE = Critically Endangered; E = Endangere V= Vulnerable. EPBC PMST (DCCEEW, 2013), NatureMap (DBCA, 2007-), Previous MCPL reports (MCPL, 2015, 2019, 2020, 2022), WAHerb and TPFL (DBCA, 38-0423FL, 2023).

FAMILY	* Species	SCC	FCC	EPBC PMST	NatureMap	MCPL 2015	MCPL 2019	MCPL 2020	MCPL 2022	WAHerb	TPFL
Centrolepidaceae	<i>Aphelia brizula</i>				x						
	<i>Centrolepis fascicularis</i>				x						
Colchicaceae	<i>Burchardia congesta</i>				x	x	x		x		
Crassulaceae	<i>Crassula exserta</i>				x						
	^ <i>Crassula</i> sp.				x						
Cupressaceae	<i>Callitris ?acuminata</i>					x					
Cyperaceae	<i>Cyathochaeta avenacea</i>				x	x	x		x		
	<i>Cyathochaeta teretifolia</i>	P3			x	x					
	<i>Gahnia decomposita</i>				x	x	x	x	x		
	<i>Gahnia trifida</i>				x	x					
	<i>Lepidosperma leptostachyum</i>				x						
	<i>Lepidosperma pubisquamum</i>				x	x			x		
	<i>Lepidosperma squamatum</i>				x	x	x	x	x		
	<i>Lepidosperma tenue</i>					x	x	x			
	<i>Lepidosperma tetraquetrum</i>				x	x	x	x	x		
	<i>Lepidosperma resinsum</i>					x					
	<i>Lepidosperma</i> sp.				x	x	x	x	x		
	<i>Machaerina vaginalis</i>				x						
	<i>Mesomelaena graciliceps</i>				x						
	<i>Morelotia octandra</i>				x	x	x	x			
	<i>Netrostylis</i> sp. Blackwood River (A.R. Annels 3043)	P3									x
	<i>Netrostylis</i> sp. Jarrah Forest (R. Davis 7391)					x	x	x	x	x	
<i>Netrostylis</i> sp. Nannup (P.A. Jurjevich 1133)	P1				x					x	
Cyperaceae sp.						x	x	x	x		
Dasyogonaceae	<i>Kingia australis</i>					x	x				
Dennstaedtiaceae	<i>Pteridium esculentum</i>					x	x	x	x		
	<i>Pteridium esculentum</i> subsp. <i>esculentum</i>				x						
Dilleniaceae	<i>Hibbertia acerosa</i>					x	x				
	<i>Hibbertia amplexicaulis</i>				x	x	x	x	x		
	<i>Hibbertia commutata</i>				x	x	x	x	x		
	<i>Hibbertia glomerata</i>				x						
	<i>Hibbertia glomerata</i> subsp. <i>glomerata</i>								x		
	<i>Hibbertia hypericoides</i>					x	x	x	x		
	<i>Hibbertia lasiopus</i>								x		
	<i>Hibbertia ovata</i>					x	x	x			
	<i>Hibbertia perfoliata</i>					x	x	x			
	<i>Hibbertia pilosa</i>				x						
	<i>Hibbertia serrata</i>				x	x					
<i>Hibbertia silvestris</i>				x	x	x	x				

**APPENDIX B: SUMMARY OF VASCULAR PLANT SPECIES WITH THE POTENTIAL TO OCCUR IN THE SPION SURVEY AREA**

Note: \* denotes alien species; PL denotes planted species; PL\* denotes both planted/alien; and Mixed (^) refers to part native and part naturalised. T, P1 to P4 reflect Threatened and Priority species (DBCA, 2019a). SCC = State Conservation Code; FCC= Federal Conservation Code; CE = Critically Endangered; E = Endangere V= Vulnerable. EPBC PMST (DCCEEW, 2013), NatureMap (DBCA, 2007-), Previous MCPL reports (MCPL, 2015, 2019, 2020, 2022), WAHerb and TPFL (DBCA, 38-0423FL, 2023).

FAMILY	* Species	SCC	FCC	EPBC PMST	NatureMap	MCPL 2015	MCPL 2019	MCPL 2020	MCPL 2022	WAHerb	TPFL
Dilleniaceae (Cont.)	<i>Hibbertia subvaginata</i>							x	x		
	<i>Hibbertia</i> sp.					x	x		x		
Droseraceae	<i>Drosera erythrorhiza</i>					x	x				
	<i>Drosera leucoblasta</i>						x				
	<i>Drosera pallida</i>				x						
	<i>Drosera pulchella</i>				x						
	<i>Drosera squamosa</i>				x						
	<i>Drosera stolonifera</i>					x	x	x	x		
	<i>Drosera</i> sp.					x	x	x	x		
Elaeocarpaceae	<i>Tetratheca hirsuta</i>					x	x		x		
	<i>Tetratheca virgata</i>							x			
	<i>Tetratheca ?pilifera</i>						x				
	<i>Tetratheca</i> sp.						x				
Ericaceae	<i>Andersonia aristata</i>				x						
	<i>Andersonia latiflora</i>								x		
	<i>Andersonia</i> sp.					x	x				
	<i>Astroloma</i> sp.					x	x				
	<i>Leucopogon australis</i>				x				x		
	<i>Leucopogon capitellatus</i>				x	x	x	x	x		
	<i>Leucopogon glabellus</i>								x		
	<i>Leucopogon gracillimus</i>					x					
	<i>Leucopogon hirsutus</i>				x						
	<i>Leucopogon verticillatus</i>				x	x	x	x	x		
	<i>Leucopogon</i> sp.					x	x		x		
	<i>Styphelia concinna</i>						x				
	<i>Styphelia discolor</i>				x		x	x	x		
	<i>Styphelia nitens</i>					x	x	x	x		
	<i>Styphelia pallida</i>						x	x	x		
	<i>Styphelia propinqua</i>				x	x	x	x	x		
<i>Styphelia tenuiflora</i>				x	x	x	x	x			
<i>Styphelia</i> sp.					x			x			
Euphorbiaceae	<i>Amperea simulans</i>				x						
	<i>Monotaxis grandiflora</i>						x				
	<i>Monotaxis occidentalis</i>					x	x				
	<i>Ricinocarpus glaucus</i>				x						
	<i>Stachystemon vermicularis</i>				x				x		
	<i>Euphorbiaceae</i> sp.					x					
Fabaceae	<i>Acacia alata</i>						x		x		
	<i>Acacia alata</i> var. <i>alata</i>				x	x		x			
	<i>Acacia browniana</i>				x	x	x	x			
	<i>Acacia browniana</i> var. <i>browniana</i>				x						

**APPENDIX B: SUMMARY OF VASCULAR PLANT SPECIES WITH THE POTENTIAL TO OCCUR IN THE SPION SURVEY AREA**

Note: \* denotes alien species; PL denotes planted species; PL\* denotes both planted/alien; and Mixed (^) refers to part native and part naturalised. T, P1 to P4 reflect Threatened and Priority species (DBCA, 2019a). SCC = State Conservation Code; FCC= Federal Conservation Code; CE = Critically Endangered; E = Endangere V= Vulnerable. EPBC PMST (DCCEEW, 2013), NatureMap (DBCA, 2007-), Previous MCPL reports (MCPL, 2015, 2019, 2020, 2022), WAHerb and TPFL (DBCA, 38-0423FL, 2023).

FAMILY	* Species	SCC	FCC	EPBC PMST	NatureMap	MCPL 2015	MCPL 2019	MCPL 2020	MCPL 2022	WAHerb	TPFL
Fabaceae (C0nt.)	<i>Acacia browniana</i> var. <i>obscura</i>					x					
	^ <i>Acacia celastrifolia</i>					x	x				
	<i>Acacia divergens</i>				x	x	x	x	x		
	<i>Acacia drummondii</i> subsp. <i>candolleana</i>				x	x	x	x	x		
	<i>Acacia drummondii</i> subsp. <i>drummondii</i>					x	x	x	x		
	<i>Acacia extensa</i>				x	x	x	x	x		
	<i>Acacia lateriticola</i>					x	x	x	x		
	<i>Acacia nervosa</i>					x	x	x	x		
	<i>Acacia preissiana</i>						x				
	<i>Acacia pulchella</i>					x	x	x	x		
	* <i>Acacia pycnantha</i>						x				
	<i>Acacia saligna</i>									x	
	<i>Acacia urophylla</i>							x	x	x	
	<i>Acacia varia</i> var. <i>varia</i>					x	x				
	<i>Acacia willdenowiana</i>						x	x		x	
	<i>Acacia myrtifolia</i>							x			
	<i>Acacia</i> sp.						x				
	<i>Bossiaea aquifolium</i>						x		x	x	
	<i>Bossiaea aquifolium</i> subsp. <i>aquifolium</i>					x		x			
	<i>Bossiaea ornata</i>						x	x	x	x	
	<i>Callistachys lanceolata</i>						x				
	<i>Chorizema cordatum</i>					x	x		x		
	<i>Chorizema dicksonii</i>							x			
	<i>Daviesia cordata</i>							x			
	<i>Daviesia costata</i>					x					
	<i>Daviesia decurrens</i>						x	x			
	<i>Daviesia preissii</i>							x			
	<i>Daviesia</i> sp.							x			
	<i>Eutaxia exilis</i>					x					
	<i>Gastrolobium glabratum</i>					x					
	<i>Gastrolobium spinosum</i>									x	
	<i>Gastrolobium</i> sp.						x				
	<i>Gompholobium knightianum</i>						x	x		x	
	<i>Gompholobium marginatum</i>						x	x		x	
	<i>Gompholobium polymorphum</i>							x			
	<i>Gompholobium preissii</i>							x		x	
	<i>Gompholobium tomentosum</i>						x				
	<i>Gompholobium</i> sp.							x		x	
	<i>Hovea chorizemifolia</i>					x	x	x	x	x	
	<i>Hovea trisperma</i>					x	x	x			
	<i>Hovea</i> sp.									x	
	<i>Jacksonia furcellata</i>							x			
	<i>Kennedia coccinea</i>					x	x	x	x	x	
	<i>Kennedia prostrata</i>							x		x	
	<i>Labichea punctata</i>						x	x	x	x	
<i>Mirbelia dilatata</i>					x	x	x	x	x		

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FAMILY	* Species	SCC	FCC	EPBC PMST	NatureMap	MCPL 2015	MCPL 2019	MCPL 2020	MCPL 2022	WAHerb	TPFL
Fabaceae (cont.)	^ <i>Paraserianthes lophantha</i>				x		x	x	x		
	<i>Sphaerolobium medium</i>						x	x	x		
	<i>Sphaerolobium scabriusculum</i>				x						
	<i>Templetonia drummondii</i>					x					
	<i>Templetonia</i> sp.							x			
	Fabaceae sp.									x	
Fagaceae	* <i>Quercus palustris</i>				x						
Gentianaceae	* <i>Centaurium erythraea</i>								x		
Goodeniaceae	<i>Dampiera hederacea</i>				x		x				
	<i>Dampiera linearis</i>					x			x		
	^ <i>Lechenaultia biloba</i>				x	x	x	x	x		
	<i>Lechenaultia</i> sp.					x					
	<i>Scaevola calliptera</i>				x	x	x		x		
	<i>Scaevola</i> sp.						x				
	Goodeniaceae sp.									x	
Haemodoraceae	<i>Anigozanthos</i> sp.							x	x		
	<i>Conostylis serrulata</i>				x	x	x	x	x		
	<i>Conostylis setigera</i>					x	x	x	x		
	<i>Conostylis setigera</i> subsp. <i>setigera</i>				x						
	<i>Conostylis setosa</i>					x	x	x	x		
	<i>Conostylis pusilla</i>						x		x		
	<i>Conostylis</i> sp.						x	x			
	<i>Haemodorum laxum</i>									x	
	<i>Haemodorum</i> sp.					x	x		x		
	<i>Tribonanthes violacea</i>				x						
Haemodoraceae sp.						x					
Haloragaceae	<i>Glischrocaryon aureum</i>						x	x	x		
	<i>Gonocarpus benthamii</i>				x		x				
	<i>Gonocarpus diffusus</i>				x						
Hemerocallidaceae	<i>Agrostocrinum hirsutum</i>									x	
	<i>Agrostocrinum</i> sp.				x						
	<i>Chamaescilla corymbosa</i>					x	x	x	x		
	<i>Chamaescilla corymbosa</i> var. <i>corymbosa</i>				x						
	<i>Chamaescilla</i> sp.					x					
	<i>Dianella revoluta</i>					x		x			
	<i>Dianella revoluta</i> var. <i>divaricata</i>				x						
	<i>Johnsonia lupulina</i>				x	x			x		
	<i>Stypandra glauca</i>				x	x					
	<i>Tricoryne elatior</i>				x						
Hemerocallidaceae sp.					x						

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FAMILY	* Species	SCC	FCC	EPBC PMST	NatureMap	MCPL 2015	MCPL 2019	MCPL 2020	MCPL 2022	WAHerb	TPFL
Hypoxidaceae	<i>Pauridia gardneri</i>						x				
Iridaceae	<i>Patersonia babianoides</i>								x		
	<i>Patersonia juncea</i>						x				
	<i>Patersonia occidentalis</i>					x	x	x	x		
	<i>Patersonia pygmaea</i>					x	x		x		
	<i>Patersonia rudis</i>					x	x		x		
	<i>Patersonia</i> sp.						x	x	x		
	Iridaceae sp.									x	
Juncaginaceae	<i>Triglochin nana</i>				x						
Lamiaceae	<i>Hemiandra pungens</i>									x	
	<i>Hemigenia pritzelii</i>				x	x	x	x	x		
	Lamiaceae sp.							x			
Lauraceae	<i>Cassytha filiformis</i>							x			
	<i>Cassytha glabella</i>								x		
	<i>Cassytha glabella forma casuarinae</i>				x						
	<i>Cassytha pomiformis</i>				x						
	<i>Cassytha</i> sp.					x	x	x	x		
Liliaceae	* <i>Lilium candidum</i>				x						
Lindsaeaceae	<i>Lindsaea linearis</i>				x	x	x		x		
Loganiaceae	<i>Orianthera serpyllifolia</i> subsp. <i>angustifolia</i>				x						
Loranthaceae	<i>Nuytsia floribunda</i>					x					
Malvaceae	<i>Lasiopetalum floribundum</i>				x	x	x	x	x		
	<i>Lasiopetalum glabratum</i>					x	x	x	x		
	<i>Lasiopetalum</i> sp.						x				
	<i>Thomasia ?macrocalyx</i>						x				
	<i>Thomasia paniculata</i>				x	x	x	x	x		
	<i>Thomasia pauciflora</i>				x						
	<i>Thomasia</i> sp. Big Brook (M. Koch 2373)				x						
	<i>Thomasia</i> sp.					x		x			
Meliaceae	^ <i>Melia azedarach</i>				x						
Myrtaceae	<i>Astartea scoparia</i>				x	x	x	x	x		
	<i>Babingtonia camphorosmae</i>					x	x	x	x		
	* <i>Callistemon citrinus</i>				x						
	<i>Callistemon glaucus</i>							x			
	<i>Calothamnus</i> sp.								x		

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FAMILY	* Species	SCC	FCC	EPBC PMST	NatureMap	MCPL 2015	MCPL 2019	MCPL 2020	MCPL 2022	WAHerb	TPFL	
Myrtaceae (Cont.)	<i>Calytrix depressa</i>				x							
	<i>Calytrix leschenaultii</i>					x	x	x				
	<i>Calytrix</i> sp.					x	x	x	x			
	<i>Corymbia calophylla</i>				x	x	x	x	x			
	<i>Darwinia citriodora</i>					x						
	PL <i>Eucalyptus accedens</i>					x						
	<i>Eucalyptus drummondii</i>											
	<i>Eucalyptus marginata</i>					x	x	x	x			
	<i>Eucalyptus marginata</i> subsp. <i>marginata</i>				x							
	<i>Eucalyptus megacarpa</i>				x	x	x	x	x			
	* <i>Eucalyptus microcorys</i>					x	x					
	<i>Eucalyptus patens</i>					x	x	x	x			
	<i>Eucalyptus rudis</i>						x	x	x			
	* <i>Eucalyptus saligna</i>					x						
	<i>Eucalyptus</i> sp.						x					
	<i>Homalospermum firmum</i>					x	x					
	<i>Hypocalymma angustifolium</i>					x	x	x	x	x		
	<i>Hypocalymma cordifolium</i>					x	x	x	x	x		
	<i>Hypocalymma robustum</i>					x	x	x	x			
	<i>Hypocalymma</i> sp.					x	x					
	<i>Leptospermum erubescens</i>						x			x		
	<i>Melaleuca ?parviceps</i>						x					
	<i>Melaleuca preissiana</i>							x		x		
	<i>Melaleuca trichophylla</i>							x	x			
	<i>Melaleuca</i> sp.							x				
	<i>Pericalymma ellipticum</i>						x	x	x	x		
	* <i>Syncarpia glomulifera</i>					x						
	<i>Taxandria fragrans</i>					x						
	<i>Taxandria linearifolia</i>					x	x	x	x	x		
	<i>Verticordia huegelii</i> var. <i>huegelii</i>					x						
	<i>Verticordia plumosa</i> var. <i>plumosa</i>					x	x					
	Myrtaceae sp.						x	x		x		
	Ophioglossaceae	<i>Ophioglossum lusitanicum</i>				x						
	Orchidaceae	<i>Caladenia flava</i>					x					
		<i>Caladenia latifolia</i>								x		
<i>Caladenia macrostylis</i>					x							
<i>Caladenia reptans</i>									x			
<i>Caladenia</i> sp.						x			x			
<i>Cryptostylis ovata</i>					x	x		x	x			
<i>Diuris micrantha</i>		T	VU	x								
<i>Diuris</i> sp.									x			
<i>Drakaea livida</i>					x							
<i>Eriochilus dilatatus</i>					x							
<i>Leporella</i> sp.					x							

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FAMILY	* Species	SCC	FCC	EPBC PMST	NatureMap	MCPL 2015	MCPL 2019	MCPL 2020	MCPL 2022	WAHerb	TPFL
Orchidaceae (Cont.)	<i>Microtis media</i>						x				
	<i>Microtis</i> sp.					x					
	<i>Paracaleana hortiorum</i>				x						
	<i>Pterostylis pyramidalis</i>					x					
	<i>Pterostylis recurva</i>				x						
	<i>Pterostylis scabra</i>				x						
	<i>Pterostylis vittata</i>				x					x	
	<i>Pterostylis</i> sp.				x	x	x	x	x		
	<i>Pyrorchis nigricans</i>					x	x			x	
	<i>Thelymitra crinita</i>				x						
	Orchidaceae sp.					x	x	x	x		
Orobanchaceae	* <i>Orobanche minor</i>						x				
Oxalidaceae	* <i>Oxalis</i> sp.						x				
Phyllanthaceae	<i>Lysiandra calycina</i>				x	x	x	x	x		
Phytolaccaceae	* <i>Phytolacca octandra</i>						x				
Pinaceae	* <i>Pinus pinaster</i>					x		x			
	* <i>Pinus</i> sp.				x	x					
Pittosporaceae	<i>Billardiera floribunda</i>				x					x	
	<i>Billardiera fraseri</i>										
	<i>Billardiera fusiformis</i>					x	x	x	x		
	<i>Billardiera variifolia</i>				x		x				
	<i>Billardiera</i> sp.						x				
	<i>Marianthus bicolor</i>							x			
	<i>Marianthus drummondianus</i>						x	x			
Pittosporaceae sp.					x				x		
Plantaginaceae	<i>Gratiola pubescens</i>				x						
Poaceae	* <i>Aira caryophyllea</i>									x	
	* <i>Briza maxima</i>									x	
	<i>Amphipogon amphipogonoides</i>						x		x		
	<i>Amphipogon laguroides</i>				x		x				
	<i>Austrostipa</i> sp.					x					
	<i>Eriachne</i> sp.							x			
	<i>Neurachne alopecuroidea</i>					x	x	x	x		
	<i>Rytidosperma acerosum</i>									x	
	<i>Rytidosperma caespitosum</i>					x	x	x	x		
	<i>Rytidosperma</i> sp.					x				x	
	<i>Tetrarrhena laevis</i>				x	x	x	x	x		
Poaceae sp.					x	x	x	x			

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FAMILY	* Species	SCC	FCC	EPBC PMST	NatureMap	MCPL 2015	MCPL 2019	MCPL 2020	MCPL 2022	WAHerb	TPFL
Podocarpaceae	<i>Podocarpus drouynianus</i>					x					
Polygalaceae	<i>Comesperma calymega</i>							x		x	
	<i>Comesperma virgatum</i>					x	x			x	
	<i>Comesperma</i> sp.					x					
Proteaceae	<i>Adenanthos barbiger</i>								x		
	<i>Adenanthos obovatus</i>				x						
	<i>Banksia dallanneyi</i> subsp. <i>dallanneyi</i>						x				
	<i>Banksia dallanneyi</i> subsp. <i>dallanneyi</i> var. <i>dallanneyi</i>							x	x		
	<i>Banksia dallanneyi</i> subsp. <i>dallanneyi</i> var. <i>mellicula</i>				x						
	<i>Banksia dallanneyi</i> subsp. <i>sylvestris</i>				x			x	x		
	<i>Banksia grandis</i>				x	x	x	x	x		
	<i>Banksia littoralis</i>					x	x	x	x		
	<i>Banksia seminuda</i>				x	x	x	x	x		
	<i>Banksia sessilis</i>					x	x	x	x		
	<i>Banksia sphaerocarpa</i>					x	x	x	x		
	<i>Banksia squarrosa</i> subsp. <i>squarrosa</i>						x				
	<i>Banksia</i> sp.							x	x		
	<i>Conospermum capitatum</i> subsp. <i>glabratum</i>					x	x				
	<i>Conospermum flexuosum</i>					x					
	<i>Conospermum flexuosum</i> subsp. <i>laevigatum</i>					x				x	
	<i>Conospermum stoechadis</i>									x	
	<i>Conospermum</i> sp.						x				
	<i>Grevillea bipinnatifida</i>							x			
	<i>Grevillea diversifolia</i>							x		x	
	<i>Grevillea manglesii</i> subsp. <i>manglesii</i>							x			
	<i>Grevillea prominens</i>		P3			x				x	x
	<i>Grevillea pulchella</i>							x			
	<i>Grevillea quercifolia</i>						x				
	<i>Grevillea synapheae</i>					x					
	<i>Grevillea wilsonii</i>							x	x	x	
	<i>Hakea amplexicaulis</i>					x	x	x	x	x	
	<i>Hakea cyclocarpa</i>							x			
	<i>Hakea incrassata</i>									x	
	<i>Hakea lasianthoides</i>					x			x		
	<i>Hakea lissocarpha</i>						x	x	x	x	
	<i>Hakea prostrata</i>								x	x	
<i>Hakea ruscifolia</i>					x		x	x	x		
<i>Hakea varia</i>								x			
<i>Isopogon sphaerocephalus</i>						x					
<i>Persoonia elliptica</i>						x	x	x	x		
<i>Persoonia longifolia</i>						x	x	x	x		
<i>Synaphea petiolaris</i>						x	x				
<i>Xylomelum occidentale</i>						x					

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FAMILY	* Species	SCC	FCC	EPBC PMST	NatureMap	MCPL 2015	MCPL 2019	MCPL 2020	MCPL 2022	WAHerb	TPFL
Ranunculaceae	<i>Clematis pubescens</i>				x	x	x	x	x		
	<i>Ranunculus colonorum</i>				x						
Restionaceae	<i>Desmocladius fasciculatus</i>					x	x	x	x		
	<i>Desmocladius flexuosus</i>					x	x	x	x		
	<i>Hypolaena exsulca</i>				x	x	x	x	x		
	<i>Leptocarpus tenax</i>				x						
	<i>Lepyrodia curvescens</i>	P2					x				
	<i>Loxocarya cinerea</i>				x				x		
	<i>Loxocarya striata</i>					x					
	<i>Sporadanthus rivularis</i>				x	x					
	Restionaceae sp.					x			x		
Rhamnaceae	<i>Trymalium ledifolium</i>					x	x	x	x		
	<i>Trymalium ledifolium</i> var. <i>rosmarinifolium</i>				x						
	<i>Trymalium odoratissimum</i> subsp. <i>odoratissimum</i>				x	x	x	x	x		
Rosaceae	* <i>Rubus ulmifolius</i>						x				
Rubiaceae	* <i>Galium murale</i>				x						
	<i>Opercularia apiciflora</i>								x		
	<i>Opercularia echinocephala</i>				x	x	x	x			
	<i>Opercularia hispidula</i>				x				x		
	<i>Opercularia vaginata</i>						x				
	<i>Opercularia</i> sp.						x		x		
Rutaceae	<i>Asterolasia pallida</i>				x		x				
	<i>Boronia crenulata</i>				x		x				
	<i>Boronia crenulata</i> subsp. <i>crenulata</i>							x			
	<i>Boronia crenulata</i> subsp. <i>viminea</i>				x						
	<i>Boronia fastigiata</i>				x	x	x	x	x		
	<i>Boronia molloyae</i>				x	x	x	x			
	<i>Boronia</i> sp.					x					
	<i>Philotheca spicata</i>				x	x	x		x		
Santalaceae	<i>Leptomeria cunninghamii</i>								x		
Sapindaceae	<i>Dodonaea</i> sp.						x				
Schizaeaceae	<i>Schizaea rupestris</i>	P2			x					x	x
Solanaceae	<i>Anthocercis gracilis</i>	T	VU	x							
Stylidiaceae	<i>Levenhookia pusilla</i>				x	x			x		
	<i>Levenhookia stipitata</i>								x		
	<i>Stylidium amoenum</i>				x	x	x	x	x		

**APPENDIX B: SUMMARY OF VASCULAR PLANT SPECIES WITH THE POTENTIAL TO OCCUR IN THE SPION SURVEY AREA**

Note: \* denotes alien species; PL denotes planted species; PL\* denotes both planted/alien; and Mixed (^) refers to part native and part naturalised. T, P1 to P4 reflect Threatened and Priority species (DBCA, 2019a). SCC = State Conservation Code; FCC= Federal Conservation Code; CE = Critically Endangered; E = Endangered; V= Vulnerable. EPBC PMST (DCCEEW, 2013), NatureMap (DBCA, 2007-), Previous MCPL reports (MCPL, 2015, 2019, 2020, 2022), WAHerb and TPFL (DBCA, 38-0423FL, 2023).

FAMILY	* Species	SCC	FCC	EPBC PMST	NatureMap	MCPL 2015	MCPL 2019	MCPL 2020	MCPL 2022	WAHerb	TPFL
Stylidiaceae (cont.)	<i>Stylidium brunonianum</i>						x				
	<i>Stylidium bulbiferum</i>								x		
	<i>Stylidium ciliatum</i>						x	x			
	<i>Stylidium crassifolium</i>				x						
	<i>Stylidium hispidum</i>				x				x		
	<i>Stylidium ireneae</i>	P4			x					x	
	<i>Stylidium lineatum</i>				x						
	<i>Stylidium piliferum</i>					x	x	x	x		
	<i>Stylidium repens</i>					x	x	x	x		
	<i>Stylidium rhynchocarpum</i>				x						
<i>Stylidium</i> sp.					x	x	x	x			
Thymelaeaceae	<i>Pimelea suaveolens</i>				x	x	x	x			
	<i>Pimelea sylvestris</i>				x						
	<i>Pimelea</i> sp.					x	x	x	x		
Violaceae	<i>Pigea debilissima</i>				x						
Xanthorrhoeaceae	<i>Xanthorrhoea gracilis</i>				x	x	x	x	x		
	<i>Xanthorrhoea preissii</i>				x	x	x	x	x		
	<i>Xanthorrhoea</i> sp.						x			x	
Xyridaceae	<i>Xyris atriviridis</i>				x						
	<i>Xyris</i> sp.				x						
Zamiaceae	<i>Macrozamia riedlei</i>				x	x	x	x	x		

**APPENDIX C: ASSESSMENT OF POTENTIAL THREATENED AND PRIORITY FLORA IN THE SPION SURVEY AREA**

**Note:** Refer to Appendix A for State (SCC; Department of Biodiversity, Conservation and Attractions 2022a) and Federal (FCC; EPBC Act) conservation code definitions. IBRA Distribution: AVW – Avon Wheatbelt; ESP – Esperance Plains; GES – Geraldton Sandplains; JAF – Jarrah Forest; MAL – Mallee; SWA – Swan Coastal Plain; WAR – Warren.

Species	Family	SCC	FCC	Description and Habitat	Likelihood of Occurrence												
<i>Anthocercis gracilis</i>	Solanaceae	T	Vulnerable	Habit: Erect, spindly shrub, to 0.6 (-1) m high. Flower colour: yellow-green Flowering period (indicated in green): <table border="1" style="display: inline-table; vertical-align: middle;"> <tr> <td>J</td><td>F</td><td>M</td><td>A</td><td>M</td><td>J</td><td>J</td><td>A</td><td>S</td><td>O</td><td>N</td><td>D</td> </tr> </table> Soils: Sandy or loamy soils. Granite outcrops. IBRA Distribution: AVW, JAF Florabase records: 29	J	F	M	A	M	J	J	A	S	O	N	D	Low Has not been recorded by DBCA or by MCPL previously within the survey area.
J	F	M	A	M	J	J	A	S	O	N	D						
<i>Diuris micrantha</i>	Orchidaceae	T	Vulnerable	Habit: Tuberos, perennial, herb, 0.3-0.6 m high. Flower colour: yellow & brown Flowering period (indicated in green): <table border="1" style="display: inline-table; vertical-align: middle;"> <tr> <td>J</td><td>F</td><td>M</td><td>A</td><td>M</td><td>J</td><td>J</td><td>A</td><td>S</td><td>O</td><td>N</td><td>D</td> </tr> </table> Soils: Brown loamy clay. Winter-wet swamps, in shallow water. IBRA Distribution: JAF, SWA Florabase records: 9	J	F	M	A	M	J	J	A	S	O	N	D	Low Has not been recorded by DBCA or by MCPL previously within the survey area.
J	F	M	A	M	J	J	A	S	O	N	D						
<i>Netrostylis</i> sp. Nannup (P.A. Jurjevich 1133)	Cyperaceae	P1	-	Habit: Perennial. Caespitose sedge 90 cm high. Flower colour: Flowering period (indicated in green): <table border="1" style="display: inline-table; vertical-align: middle;"> <tr> <td>J</td><td>F</td><td>M</td><td>A</td><td>M</td><td>J</td><td>J</td><td>A</td><td>S</td><td>O</td><td>N</td><td>D</td> </tr> </table> Soils: Creek, valley floors. IBRA Distribution: JAF Florabase records: 6	J	F	M	A	M	J	J	A	S	O	N	D	Moderate Locally abundant to the NW and within 10 km of survey area (WA Herb). Findings associated with clay loam and dark grey soils in lowland areas.
J	F	M	A	M	J	J	A	S	O	N	D						
<i>Lepyrodia curvescens</i>	Restionaceae	P2	-	Habit: Dioecious, shortly creeping, tufted rhizomatous, herb, 0.24-0.4 m high, rhizomes on surface or to 1 cm deep. Flower colour: Light brown Flowering period (indicated in green): <table border="1" style="display: inline-table; vertical-align: middle;"> <tr> <td>J</td><td>F</td><td>M</td><td>A</td><td>M</td><td>J</td><td>J</td><td>A</td><td>S</td><td>O</td><td>N</td><td>D</td> </tr> </table> Soils: Sand, laterite. Seasonally inundated swampland. IBRA Distribution: GES, JAF, SWA Florabase records: 21	J	F	M	A	M	J	J	A	S	O	N	D	Moderate Recorded previously by MCPL (2019) near creekline approximately 10 km W of Spion survey area.
J	F	M	A	M	J	J	A	S	O	N	D						

**APPENDIX C: ASSESSMENT OF POTENTIAL THREATENED AND PRIORITY FLORA IN THE SPION SURVEY AREA**

**Note:** Refer to Appendix A for State (SCC; Department of Biodiversity, Conservation and Attractions 2022a) and Federal (FCC; EPBC Act) conservation code definitions. IBRA Distribution: AVW – Avon Wheatbelt; ESP – Esperance Plains; GES – Geraldton Sandplains; JAF – Jarrah Forest; MAL – Mallee; SWA – Swan Coastal Plain; WAR – Warren.

Species	Family	SCC	FCC	Description and Habitat	Likelihood of Occurrence												
<i>Schizaea rupestris</i>	Schizaeaceae	P2	-	Habit: Rhizomatous, perennial, herb or grass-like or (fern), 0.1-0.2m high. Flower colour: - Flowering period (indicated in green): <table border="1" style="display: inline-table; vertical-align: middle;"> <tr> <td>J</td><td>F</td><td>M</td><td>A</td><td>M</td><td>J</td><td>J</td><td>A</td><td>S</td><td>O</td><td>N</td><td>D</td> </tr> </table> Soils: Sand. Gullies, creek banks, shaded moist rock faces. IBRA Distribution: ESP, JAF, WAR Florabase records: 13	J	F	M	A	M	J	J	A	S	O	N	D	Low One record contained in both the WAHerb and TPFL databases with finding to the W and associated with clay- loams soils in riverbank.
J	F	M	A	M	J	J	A	S	O	N	D						
<i>Actinotus repens</i>	Apiaceae	P3	-	Habit: Prostrate perennial to 5 cm high, c. 20cm wide. Flower colour: white Flowering period (indicated in green): <table border="1" style="display: inline-table; vertical-align: middle;"> <tr> <td>J</td><td>F</td><td>M</td><td>A</td><td>M</td><td>J</td><td>J</td><td>A</td><td>S</td><td>O</td><td>N</td><td>D</td> </tr> </table> Soils: Coarse black peaty sand over clay. Creeklines, edges of other water channels. IBRA Distribution: JAF, WAR Florabase records: 36	J	F	M	A	M	J	J	A	S	O	N	D	Moderate Three records contained with the WAHerb, with one finding associated with riparian vegetation.
J	F	M	A	M	J	J	A	S	O	N	D						
<i>Cyathochaeta teretifolia</i>	Cyperaceae	P3	-	Habit: Rhizomatous, clumped, robust perennial, grass-like or herb (sedge), to 2.0 m high, to 1.0 m wide. Flower colour: brown Flowering period (indicated in green): <table border="1" style="display: inline-table; vertical-align: middle;"> <tr> <td>J</td><td>F</td><td>M</td><td>A</td><td>M</td><td>J</td><td>J</td><td>A</td><td>S</td><td>O</td><td>N</td><td>D</td> </tr> </table> Soils: Grey sand, sandy clay. Swamps, creek edges. IBRA Distribution: JAF, SWA, WAR Florabase records: 39	J	F	M	A	M	J	J	A	S	O	N	D	Moderate Recorded previously by MCPL (2015) and W of current survey area.
J	F	M	A	M	J	J	A	S	O	N	D						
<i>Grevillea prominens</i>	Proteaceae	P3	-	Habit: Spreading shrub, 0.5-1.7m high, 0.3-1m wide. Flower colour: cream-white Flowering period (indicated in green): <table border="1" style="display: inline-table; vertical-align: middle;"> <tr> <td>J</td><td>F</td><td>M</td><td>A</td><td>M</td><td>J</td><td>J</td><td>A</td><td>S</td><td>O</td><td>N</td><td>D</td> </tr> </table> Soils: Gravelly loam, along creeklines. IBRA Distribution: JAF Florabase records: 9	J	F	M	A	M	J	J	A	S	O	N	D	Moderate Three TPFL records in close proximity of the survey area and associated with clay soils.
J	F	M	A	M	J	J	A	S	O	N	D						

**APPENDIX C: ASSESSMENT OF POTENTIAL THREATENED AND PRIORITY FLORA IN THE SPION SURVEY AREA**

**Note:** Refer to Appendix A for State (SCC; Department of Biodiversity, Conservation and Attractions 2022a) and Federal (FCC; EPBC Act) conservation code definitions. IBRA Distribution: AVW – Avon Wheatbelt; ESP – Esperance Plains; GES – Geraldton Sandplains; JAF – Jarrah Forest; MAL – Mallee; SWA – Swan Coastal Plain; WAR – Warren.

Species	Family	SCC	FCC	Description and Habitat	Likelihood of Occurrence
<i>Netrostylis</i> sp. Blackwood River (A.R. Annels 3043)	Cyperaceae	P3	-	Habit: Erect or spreading sedge to 1 m high. Flower colour: brown Flowering period (indicated in green): J F M A M J J A S O N D Soils: Shallow grey sandy soil, clay loam. Along edges of creeklines and inundated swamp. IBRA Distribution: ESP, JAF, SWA, WAR Florabase records: 16	Moderate WAHerb lists one record within 10 km of central survey point and found within creekline.
<i>Tetradthea pilifera</i>	Elaeocarpaceae	P3	-	Habit: Spreading shrub, 0.1-0.3 m high. Flower colour: purple Flowering period (indicated in green): J F M A M J J A S O N D Soils: Gravelly soils. IBRA Distribution: JAF, SWA Florabase records: 35	Low. MCPL (2019) recorded at one location and within 10 km SW of survey area on the slopes and ridges associated with the S site-vegetation type.
<i>Senecio leucoglossus</i>	Asteraceae	P4	-	Habit: Erect annual, herb, to 1.3 m high. Flower colour: white Flowering period (indicated in green): J F M A M J J A S O N D Soils: Gravelly lateritic or granitic soils. Granite outcrops, slopes. IBRA Distribution: JAF, SWA, WAR Florabase records: 45	High Previously recorded by MCPL over multiple years with numerous records contained in both the WAHerb and TPFL databases.
<i>Stylidium ireneae</i>	Stylidiaceae	P4	-	Habit: Lax perennial, herb, (0.06-) 0.1-0.28 m high. Flower colour: pink Flowering period (indicated in green): J F M A M J J A S O N D Soils: Sandy loam. Valleys near creek lines. IBRA Distribution: JAF, SWA, WAR Florabase records: 29	Low Has not been recorded by DBCA or by MCPL previously within the survey area.

**APPENDIX D: SUMMARY OF VASCULAR PLANT SPECIES RECORDED IN THE SPION SURVEY AREA**

\* - Denotes introduced species; P1 to P4 - Priority flora as defined by DBCA 2022a.

Family	Species
Apiaceae	<i>Pentapeltis peltigera</i> <i>Platysace compressa</i> <i>Platysace filiformis</i> <i>Platysace tenuissima</i> <i>Platysace</i> sp. <i>Xanthosia candida</i> <i>Xanthosia huegelii</i> <i>Xanthosia singuliflora</i> Apiaceae sp.
Asparagaceae	<i>Lomandra caespitosa</i> <i>Lomandra drummondii</i> <i>Lomandra hermaphrodita</i> <i>Lomandra nigricans</i> <i>Lomandra preissii</i> <i>Lomandra purpurea</i> <i>Lomandra sericea</i> <i>Lomandra sonderi</i> <i>Lomandra spartea</i> <i>Lomandra</i> sp. <i>Thysanotus dichotomus</i> <i>Thysanotus fastigiatus</i> <i>Thysanotus multiflorus</i> <i>Thysanotus sparteus</i> <i>Thysantos thyrsoides</i> <i>Thysanotus</i> sp.
Asteraceae	* <i>Hypochaeris glabra</i> <i>Lagenophora huegelii</i> <i>Pterochaeta paniculata</i> <i>Senecio diaschides</i> <i>Senecio hispidulus</i> <i>Senecio quadridentatus</i> <i>Senecio</i> sp. <i>Trichocline spathulata</i> Asteraceae sp.
Boryaceae	<i>Borya sphaerocephala</i>
Campanulaceae	<i>Wahlenbergia</i> sp.

**APPENDIX D: SUMMARY OF VASCULAR PLANT SPECIES RECORDED IN THE SPION SURVEY AREA**

\* - Denotes introduced species; P1 to P4 - Priority flora as defined by DBCA 2022a.

Family	Species
Casuarinaceae	<i>Allocasuarina fraseriana</i> <i>Allocasuarina huegeliana</i>
Celestraceae	<i>Stackhousia ?monogyna</i>
Colchicaceae	<i>Burchardia congesta</i>
Cyperaceae	<i>Gahnia decomposita</i> <i>Lepidosperma squamatum</i> <i>Lepidosperma tetraquetrum</i> <i>Lepidosperma</i> sp. <i>Mesomelaena tetragona</i> <i>Morelotia octandra</i> <i>Netrostylis</i> sp. Jarrah Forest (R. Davis 7391)
Dennstaedtiaceae	<i>Pteridium esculentum</i>
Dilleniaceae	<i>Hibbertia amplexicaulis</i> <i>Hibbertia commutata</i> <i>Hibbertia perfoliata</i> <i>Hibbertia silvestris</i> <i>Hibbertia</i> sp.
Droseraceae	<i>Drosera</i> sp.
Elaeocarpaceae	<i>Tetratheca hirsuta</i>
Ericaceae	<i>Leucopogon australis</i> <i>Leucopogon australis</i> <i>Leucopogon verticillatus</i> <i>Styphelia conostephioides</i> <i>Styphelia discolor</i> <i>Styphelia nitens</i> <i>Styphelia pallida</i> <i>Styphelia propinqua</i> <i>Styphelia tenuiflora</i> <i>Styphelia</i> sp.
Euphorbiaceae	<i>Amperea simulans</i> <i>Monotaxis occidentalis</i>

**APPENDIX D: SUMMARY OF VASCULAR PLANT SPECIES RECORDED IN THE SPION SURVEY AREA**

\* - Denotes introduced species; P1 to P4 - Priority flora as defined by DBCA 2022a.

Family	Species
Fabaceae	<i>Acacia alata</i> var. <i>alata</i> <i>Acacia applanata</i> <i>Acacia divergens</i> <i>Acacia drummondii</i> subsp. <i>candolleana</i> <i>Acacia extensa</i> <i>Acacia lateriticola</i> <i>Acacia pulchella</i> <i>Acacia urophylla</i> <i>Bossiaea aquifolium</i> <i>Bossiaea ornata</i> <i>Chorizema cordatum</i> <i>Gastrolobium spinosum</i> <i>Gompholobium marginatum</i> <i>Gompholobium preissii</i> <i>Hardenbergia comptoniana</i> <i>Hovea chorizemifolia</i> <i>Hovea trisperma</i> <i>Hypocalymma angustifolium</i> <i>Kennedia coccinea</i> <i>Kennedia prostrata</i> <i>Labichea punctata</i> <i>Mirbelia dilatata</i>
Goodeniaceae	<i>Lechenaultia biloba</i> <i>Scaevola calliptera</i> <i>Scaevola</i> sp.
Haemodoraceae	<i>Conostylis pusilla</i> <i>Conostylis serrulata</i> <i>Conostylis setigera</i>
Hemerocallidaceae	<i>Chamaescilla corymbosa</i> <i>Dianella revoluta</i>
Iridaceae	<i>Patersonia babianoides</i> <i>Patersonia occidentalis</i> <i>Patersonia pygmaea</i> <i>Patersonia rudis</i> <i>Patersonia</i> sp.

**APPENDIX D: SUMMARY OF VASCULAR PLANT SPECIES RECORDED IN THE SPION SURVEY AREA**

\* - Denotes introduced species; P1 to P4 - Priority flora as defined by DBCA 2022a.

Family	Species
Lamiaceae	<i>Hemigenia incana</i> <i>Hemigenia pritzelii</i>
Lauraceae	<i>Cassytha</i> sp.
Malvaceae	<i>Lasiopetalum floribundum</i> <i>Lasiopetalum glabratum</i> <i>Lasiopetalum</i> sp. <i>Thomasia paniculata</i> Malvaceae sp.?
Myrtaceae	<i>Astartea scoparia</i> <i>Calothamnus</i> sp. <i>Corymbia calophylla</i> <i>Eucalyptus marginata</i> <i>Eucalyptus megacarpa</i> <i>Eucalyptus patens</i> <i>Eucalyptus rudis</i> <i>Hypocalymma angustifolium</i> <i>Hypocalymma cordifolium</i> <i>Hypocalymma robustum</i> <i>Leptospermum erubescens</i> <i>Pericalymma ellipticum</i> <i>Taxandria linearifolia</i>
Orchidaceae	<i>Caladenia</i> sp. <i>Cryptostylis ovata</i> <i>Eriochilus</i> sp. <i>Pterostylis</i> sp. <i>Pterostylis</i> sp. 1 <i>Pterostylis</i> sp. 2 <i>Pyrorchis nigricans</i> Orchidaceae sp. Orchidaceae sp. 1 Orchidaceae sp. 2
Phyllanthaceae	<i>Lysiandra calycina</i>
Pittosporaceae	<i>Billardiera fusiformis</i> <i>Marianthus</i> sp. Pittosporaceae sp.

**APPENDIX D: SUMMARY OF VASCULAR PLANT SPECIES RECORDED IN THE SPION SURVEY AREA**

\* - Denotes introduced species; P1 to P4 - Priority flora as defined by DBCA 2022a.

Family	Species
Poaceae	<i>Amphipogon amphipogonoides</i> <i>Neurachne alopecuroidea</i> <i>Rytidosperma caespitosum</i> <i>Tetrarrhena laevis</i> Poaceae sp.
Polygalaceae	<i>Comesperma virgatum</i> <i>Comesperma</i> sp.
Proteaceae	<i>Adenanthos barbiger</i> <i>Banksia dallanneyi</i> subsp. <i>dallanneyi</i> <i>Banksia grandis</i> <i>Banksia littoralis</i> P3 <i>Grevillea prominens</i> <i>Grevillea wilsonii</i> <i>Hakea amplexicaulis</i> <i>Hakea lissocarpha</i> <i>Persoonia elliptica</i> <i>Persoonia longifolia</i>
Ranunculaceae	<i>Clematis pubescens</i>
Restionaceae	<i>Desmocladius fasciculatus</i> <i>Desmocladius flexuosus</i>
Rhamnaceae	<i>Trymalium ledifolium</i> <i>Trymalium odoratissimum</i>
Rubiaceae	<i>Opercularia apiciflora</i> <i>Opercularia echinocephala</i>
Rutaceae	<i>Boronia crenulata</i> <i>Boronia fastigiata</i> <i>Philothea spicata</i> Rutaceae sp.
Sapindaceae	<i>Dodonaea ?ceratocarpa</i>
Stylidiaceae	<i>Levenhookia pusilla</i> <i>Levenhookia stipitata</i> <i>Stylidium amoenum</i>

**APPENDIX D: SUMMARY OF VASCULAR PLANT SPECIES RECORDED IN THE SPION SURVEY AREA**

\* - Denotes introduced species; P1 to P4 - Priority flora as defined by DBCA 2022a.

Family	Species
Stylidiaceae	<i>Stylidium piliferum</i> <i>Stylidium</i> sp.
Thymelaeaceae	<i>Pimelea ciliata</i> <i>Pimelea suaveolens</i> <i>Pimelea suaveolens</i>
Xanthorrhoeaceae	<i>Xanthorrhoea gracilis</i> <i>Xanthorrhoea preissii</i>
Zamiaceae	<i>Macrozamia riedlei</i>





**APPENDIX E: SUMMARY OF VASCULAR PLANT SPECIES RECORDED IN THE RESPECTIVE  
SITE-VEGETATION TYPES IN THE SPION SURVEY AREA**

\* denotes introduced species, P1 to P4 denotes Priority species (DBCA A2007-);

Site-vegetation Type E is not included as this occurred on the fringes of previously mapped near the Spion survey area

Species	AC	CW	D	W	SW	P	PS	PT	SP	S	ST	TS	T	G	R
<i>Stylidium piliferum</i>				x	x			x	x	x	x		x		
<i>Tetradlea hirsuta</i>				x	x					x					
<i>Trichocline spathulata</i>				x	x		x	x	x	x	x	x	x		
<i>Xanthorrhoea gracilis</i>				x	x			x	x	x	x	x	x		
<i>Acacia extensa</i>				x							x				
<i>Amperea simulans</i>				x						x		x	x		
<i>Dodonaea ?ceratocarpa</i>				x											
<i>Gompholobium marginatum</i>				x											
<i>Hemigenia incana</i>				x										x	x
<i>Hemigenia pritzelii</i>				x						x			x		
<i>Hibbertia perfoliata</i>				x					x	x					x
* <i>Hypochaeris glabra</i>				x						x			x		
<i>Lepidosperma</i> sp.				x							x				
<i>Lepidosperma squamatum</i>				x											
<i>Leucopogon verticillatus</i>				x					x	x	x	x	x		
<i>Lomandra nigricans</i>				x						x	x				
<i>Lomandra purpurea</i>				x					x	x	x				
<i>Morelotia octandra</i>				x											
Orchidaceae sp. 1				x					x						
Orchidaceae sp. 2				x					x	x					
<i>Pittosporaceae</i> sp.				x						x					
<i>Senecio diaschides</i>				x						x	x	x	x		
<i>Stackhousia ?monogyna</i>				x					x	x	x		x		
<i>Stylidium</i> sp.				x						x			x		
<i>Styphelia conostephioides</i>				x											
<i>Styphelia nitens</i>				x							x				
<i>Styphelia pallida</i>				x			x			x		x	x		
<i>Thysanotus multiflorus</i>				x						x	x		x		
<i>Thysanotus</i> sp.				x								x			
<i>Wahlenbergia</i> sp.				x						x	x		x		
<i>Acacia drummondii</i> subsp. <i>candolleana</i>					x						x				
<i>Acacia pulchella</i>					x			x		x	x	x	x		
<i>Adenanthos barbiger</i>					x					x		x			
<i>Amphipogon amphipogonoides</i>					x						x				
<i>Chorizema cordatum</i>					x										
<i>Conostylis serrulata</i>					x				x	x	x		x		
<i>Cryptostylis ovata</i>					x					x					
<i>Desmocladus fasciculatus</i>					x										
<i>Hakea lissocarpa</i>					x										x
<i>Patersonia occidentalis</i>					x					x					
<i>Philothea spicata</i>					x					x					



