Attachment 1: Warwick Open Space Vegetation Assessment

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Natural Area
CONSULTING MANAGEMENT SERVICES

City of Joondalup
Warwick Open Space Vegetation Assessment
June 2022

Acknowledgement of Country

Ngala kaaditj Noongar moort keyen kaadak nidja boodja.
Natural Area acknowledges the Traditional Owners of the lands on which we operate, and recognises their continuing connection to lands, waters and communities.

Disclaimer

System Certifications

Environmental management system registered to ISO 14001:2015
Quality management system registered to ISO 9001:2015
Occupational health and safety management system registered to AS/NZS 4801:2001

Document Title	COJ R Warwick Vegetation Assessment
Location	Client Folders NAC V2/City of Joondalup/Warwick Reveg Monitoring/FORM-HSEQ-071 NAC Report.docx

Draft/Version No.	Date	Changes	Prepared by	Approved by	Status
D1	June 2022	New document	SNH/SH	MW/LP	Released for Client comment
V1	24 June 2022	Additional information	SH	BC	Superseded
V2	30 June 2022	Minor amendments	SH	BC	Final

Contents

1.0 Introduction

Natural Area Consulting Management Services (Natural Area) was commissioned by the City of Joondalup in January 2021 to undertake a vegetation assessment pre and post construction works associated with the replacement of a power pole within a portion of Warwick Open Space. The City of Joondalup obtained a Clearing Permit (CPS 9378/1) for a project footprint area of 0.1138 ha, shown in Figure 1. The City's Tree Service team undertook clearing works on 1 April 2022, taking every effort to avoid, minimise and reduce impacts and extent of clearing. The power pole was replaced by Western Power and their sub-contractors on 4 April 2022. Remedial works were undertaken in June 2022 within the site including weed control (3 June), planting and watering activities (15 June).

1.1 Location

The vegetation assessment site is located on Lot 502 on Deposited Plan 62965, Warwick (Figure 1). The assessment area is located immediately south of the Greenwood Tennis Club courts and is approximately 12km north of the Perth CBD. The site occurs within a Bush Forever site and an Environmentally Sensitive Area (ESA) (Department of Water and Environmental Regulation, 2022).

1.2 Scope

Activities undertaken by Natural Area included:

- site assessments pre and post construction works
- recording of flora composition and structure (native and non-native species)
- recording vegetation density (% cover)
- recording vegetation type and condition present
- reporting outcomes of the assessment activities
- recording remediation works undertaken including weed control, planting and watering.

2.0 Site Characteristics

The characteristics of a site have a strong bearing on the flora, vegetation, fauna, and ecological communities present. Key characteristics of the site are outlined in this section.

2.1 Regional Context

The site is located within the Perth portion of the Swan Coastal Plain (SWA2) IBRA subregion (DPIRD, 2022). This region is characterised as a coastal plain of low elevation. Soils are typically composed of sands formed in situ weathering or colluvial or alluvial action, as well as coastal limestone. Vegetation types are predominantly woodlands, including Marri woodlands on colluvial and alluvial soils, Tuart woodlands on limestone and Banksia and Jarrah-Banksia woodlands on marine dunes (Mitchell, Williams & Desmond, 2002).

2.2 Climate

The climate experienced in the area is Mediterranean, with dry, hot summers and cool, wet winters. According to the Bureau of Meteorology (2022); Perth Airport WA, site number 009021, the region has an average:

- Rainfall of 760.9mm/pa, with rain falling predominantly between May and August
- Maximum temperature ranging from 18^{o}C in winter to 32^{o}C in summer, with a maximum recorded temperature of 46.7^{o}C
- Minimum temperatures ranging from 8^{o}C in winter to 15^{o}C in summer, with a minimum recorded temperature of -1.3^{o}C
- Predominant wind directions include morning easterlies and westerly sea breezes during the summer months, with an average wind speed of 16.5km/h and gusts of more than 100km/h.

2.3 Topography and Soils

Using the NRInfo Portal one soil type was identified on site, being the EnvGeol S7 Phase, which is described as sand - pale and olive yellow, medium to coarse-grained, sub-angular to sub-rounded quartz, trace of feldspar, moderately sorted, of residual origin. The site sits between elevations of 30 to 32 m Australian Height Datum (AHD) (DPIRD, 2022a).

2.4 Vegetation Complex

One vegetation complex exists within the site boundary, the Karrakatta Complex – Central and South. It is described by Heddle, Loneragan, and Havel (1980) as predominantly containing open-forests of Tuart-Jarrah-Marri as a result of the cool and moist conditions of the area. Species within these open-forests include *Banksia attenuata, Banksia menziesii, Banksia grandis, Allocasuarina fraseriana, Jacksonia sternbergiana, Jacksonia furcellata, Acacia cyclops, Acacia saligna, Calothamnus quadrifidus* and *Hibbertia* species (Heddle *et al.* 1980). The pre-European extent of this vegetation complex remaining is:

- 23.5% within the Swan Coastal Plain
- 12.6% within the City of Joondalup (Government of Western Australia, 2019).

3.0 Methodology

3.1 On-ground Flora Survey

The flora and vegetation survey was conducted in accordance with *Technical Guidance-Flora and Vegetation Surveys for Environmental Impact Assessment* (Environmental Protection Authority, 2016), and included a desktop review of literature and databases. Samples were collected, or photographs taken of unfamiliar species to enable later identification.

Natural Area's lead botanist Sharon Hynes undertook pre and post construction monitoring surveys on 30 January and 2 May, 2022, with key data recorded using Mappt software on a handheld tablet. Spring is the optimal time to undertake flora surveys within the Swan Coastal Plain region, however, some annual species that occur at other times of the year may not have been presenting at the time of the survey. Monitoring activities included:

- traversing the site to record species present (native and invasive)
- Taking photographs from each of the 10 photo monitoring points and recording GPS coordinates using GDA94 datum (Figure 1)
- recording percentage cover of natives within each stratum (overstorey, midstorey and understorey), and percentage cover of weeds
- recording vegetation type including dominant over, middle and understorey species (Table 1) (Government of Western Australia, 2000).

3.1.1 Weed and Pathogen Management

When undertaking pre and post construction monitoring surveys Natural Area implemented the City's Pathogen Hygiene Procedure. This was undertaken by staff and contractors to minimise the risk of introducing and spreading weeds and pathogens.

3.1.2 Vegetation Type

The vegetation type was determined using the structural classes described in *Bush Forever Volume 2* (Government of Western Australia, 2000), and records dominant over, middle and understorey species. A description of the various structural classes is provided in Table 1.

Table 1: Vegetation structural classes

Life Form/Height Class	Canopy Percentage Cover			
	100 – 70%	70 – 30%	30 – 10%	10 – 2 %
Trees over 30 m	Tall closed forest	Tall open forest	Tall woodland	Tall open woodland
Trees 10 – 30 m	Closed forest	Open forest	Woodland	Open woodland
Trees under 10 m	Low closed forest	Low open forest	Low woodland	Low open woodland
Tree Mallee	Closed tree mallee	Tree mallee	Open tree mallee	Very open tree mallee
Shrub Mallee	Closed shrub mallee	Shrub mallee	Open shrub mallee	Very open shrub mallee

Life Form/Height Class	Canopy Percentage Cover			
	100 – 70%	70 – 30%	30 – 10%	10 – 2 %
Shrubs over 2 m	Closed tall scrub	Tall open scrub	Tall shrubland	Tall open shrubland
Shrubs 1 – 2 m	Closed heath	Open heath	Shrubland	Open shrubland
Shrubs under 1 m	Closed low heath	Open low heath	Low shrubland	Low open shrubland
Grasses	Closed grassland	Grassland	Open grassland	Very open grassland
Herbs	Closed herbland	Herbland	Open herbland	Very open herbland
Sedges	Closed sedgeland	Sedgeland	Open sedgeland	Very open sedgeland

Source: Government of Western Australia, 2000

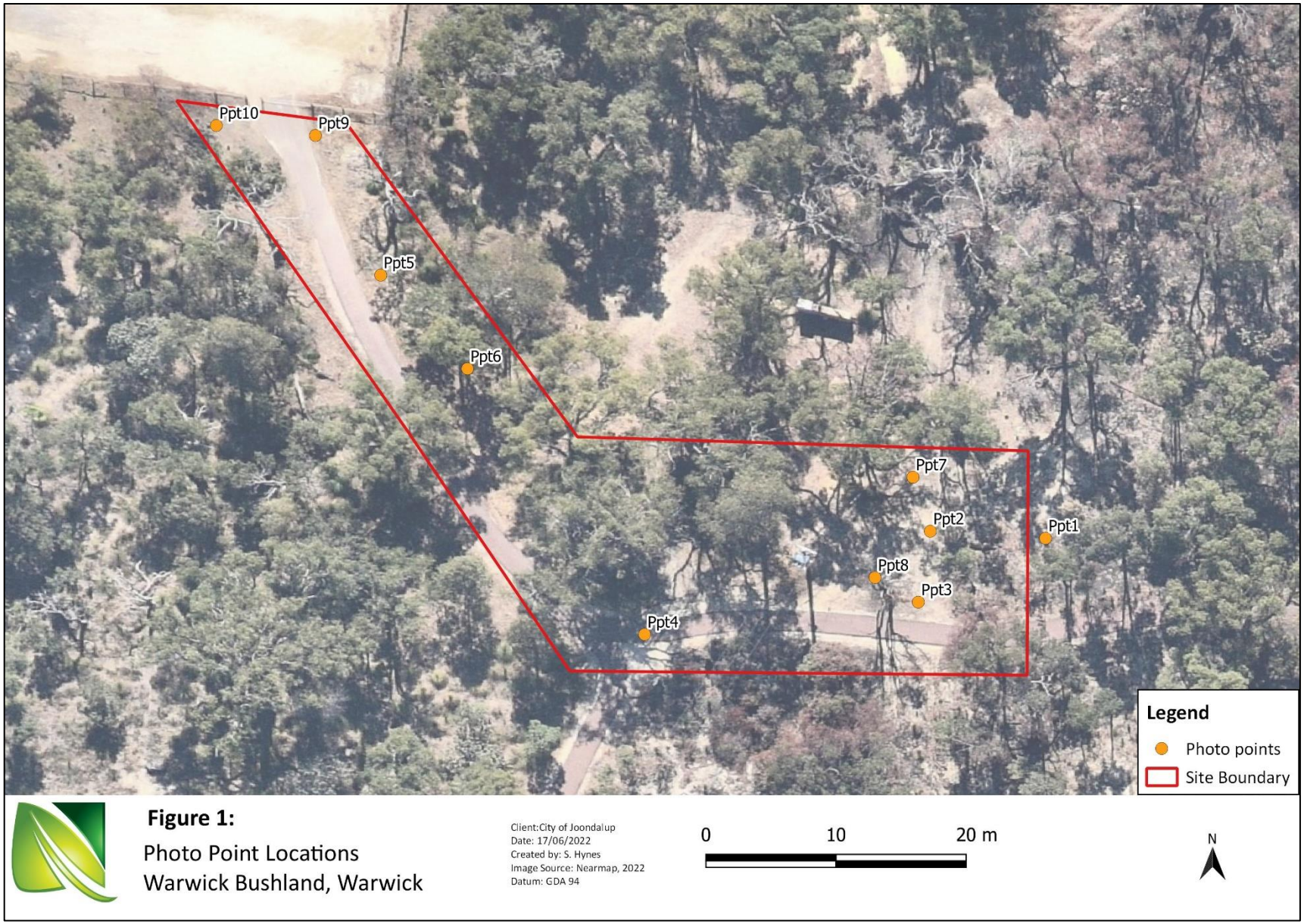


Figure 1:
Photo Point Locations
Warwick Bushland, Warwick

4.0 Flora Survey Results

4.1 Flora

During the January 2022 survey, a total of 34 flora species (taxa) were recorded from 17 families during the field survey, including 24 native species and nine introduced species (weeds). Additionally, one species identified, *Acacia cyclops*, was determined to not naturally occur within the site. Examples of native flora species are shown in Figure 3 and weed species in Figure 2. A complete flora species list is provided in Appendix 1. No Declared Pests and Weeds of National Significance (WoNS) were identified within the survey site (DPIRD, 2022b and 2022c). Photographs were taken in January 2022 and again in May 2022; a complete photo record is provided in Appendix 2 and photo point locations are outlined in Figure 1 above.

Vegetation cover of the site was determined to consist of the following:

- 60% native overstorey
- 40% native midstorey
- 10% native understorey
- 60% introduced species.

No change in flora species presence or survival was observed between January and May 2022. The clearing undertaken on 1 April 2022 and construction associated with the power supply upgrade works on 4 April 2022 was undertaken in an area containing exclusively introduced species. The death of one *Jacksonia furcellata* shrub was also identified in May 2022; this shrub was noted as being removed during the installation of the new power pole.

Rose Pelargonium (**Pelargonium capitatum*)

Dry introduced grasses

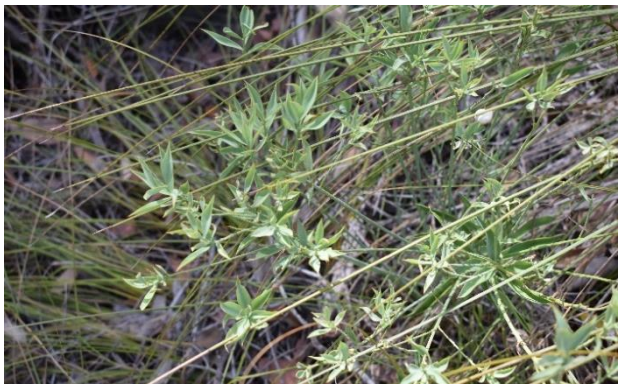
Figure 2: Examples of introduced flora species recorded

Eucalyptus marginata (Jarrah)

Xanthorrhoea preissii (Grass Tree)

Banksia attenuata (Slender Banksia)

Stirlingia latifolia (Blueboy)



Daviesia nudiflora

Jacksonia furcellata (Grey Stinkwood)

Figure 3: Examples of native flora species recorded

4.2 Vegetation Types

One vegetation type was recorded within the site, being Jarrah and *Banksia* woodland. This is described as a woodland of *Eucalyptus marginata* (Jarrah) and *Banksia attenuata* (Slender Banksia) over *Xanthorrhoea preissii* and mixed shrubland with an understorey of sparse mixed native sedges and herbs, and invasive grasses.

4.3 Vegetation Condition

Vegetation condition across the site was classified as Good. With the vegetation present comprised of the three strata layers typical of Jarrah and Banksia Woodland with portions of bare area and a high weed load of weedy grasses and herbs. The south-eastern portion of the site had been recently burnt prior to the January 2022 monitoring event, with regeneration of vegetation noted during the May 2022 surveys.

5.0 Implications of Results

No significant change was identified within the site between pre and post construction monitoring undertaken in January 2022 and May 2022. This included minimal changes to vegetation present and no impact to topsoil. Both native and introduced species presence and cover remained unchanged. The removal of a single deceased *Jacksonia furcellata* shrub and a single *Eucalyptus marginata* (Jarrah) tree had occurred since the initial January 2022 monitoring event; this occurred during installation of the new power pole. In addition, there had been a number of branches of larger trees (Banksia, Marri and Jarrah) that were pruned along the existing dual use pathway, to allow Western Power and their sub-contractors access to the site during the power pole installation works. Due to the small size of the *Jacksonia furcellata* shrub and the fact it was deceased, this is not considered environmentally significant. The pruning o the branches overhanging the existing pathway and removal of the single jarrah tree for access had minimal impacts on native vegetation present. Where limbs were removed suitable branches were retained for habitat creation on site, while some were removed by the City's Tree Service team.

The clearing and construction associated with the power supply upgrade works in April 2022 was undertaken in an area containing mostly introduced species, and therefore had no to minimal impact upon native species or revegetation.

5.1 Remedial Works Undertaken

Remedial works were undertaken by Natural Area within the site as per the requirements outlined in CPS 9378/1, a summary of remedial works is outlined in Table 2 below and shown in Figure 4.

Weed control works were undertaken within the site on 3 June 2022 prior to planting activities.

Revegetation of the site was conducted on 15 June 2022 for the 0.1138 ha (Figure 1), with the installation of 1,313 tubestock across 21 species. June is an optimal time to undertake revegetation works due to cooler weather and higher rainfall meaning greater success rates for plant survival and establishment. Tubestock used were of locally sourced provenance and plantings were installed at a density of 1.15 plants/m2. Plants were installed with stakes and plant guards. The composition of tubestock plantings was installed to achieve a composition of 26% overstorey, 56% middle storey shrubs and 17% herbaceous/grass species for the understorey. Watering of the tubestock plantings was undertaken at the time of installation.

Natural Area ensured all tools and equipment were clean prior to entering and leaving the area. No known dieback or weed-affected soil, mulch or other material was brought into the site; and restricted the movement of vehicles from the site

Table 2: Remedial works

Action	Date	Description
Weed control	3/06/2022	Rehabilitation area spot sprayed with Glyphosate in preparation for planting. Hygiene protocol was implemented to reduce the risk of spreading weed and pathogens to the site.

Action	Date	Description
Planting	15/06/2022	1,313 tube stock plants were installed in the area. Prior to entering the site, hygiene protocol was implemented to reduce the risk of spreading pathogens to the site. Plants were distributed randomly in across the site. Species composition and numbers are outlined in Table 3
Watering	15/06/2022	Watering of the tubestock was conducted immediately after planting to consolidate the soil around the root ball of the plant. Each plant received approximately 3L of water.

Table 3: Rehabilitation Species List

Item	Unit	Qty
Overstory		
Banksia attenuata	Ea.	86
Banksia ilicifolia	Ea.	86
Banksia menziesii	Ea.	86
Eucalyptus marginata	Ea.	86
Shrubs and Understory		
Acacia pulchella	Ea.	57
Allocasuarina humilis	Ea.	57
Daviesia divaricata	Ea.	57
Daviesia triflora	Ea.	57
Gastrolobium capitatum	Ea.	57
Gompholobium tomentosum	Ea.	57
Grevillea vestita	Ea.	57
Hakea lissocarpha	Ea.	57
Hakea prostrata	Ea.	57
Hibbertia subvaginata	Ea.	57
Hypocalymma robustum	Ea.	57
Jacksonia furcellata	Ea.	57
Stirlingia latifolia	Ea.	57
Herbaceous/Grass		
Anigozanthos manglesii	Ea.	57
Dianella revoluta	Ea.	57
Eryngium pinnatifidum	Ea.	57
Kennedia prostrata	Ea.	57
Total		**1,313**

Figure 4: Photographs of remedial works

5.2 Monitoring and Maintenance

Monitoring of revegetation success within the revegetation area to occur a minimum of once annually in autumn for a period of two consecutive years after the initial planting. Monitoring will involve:

- setting up three photo monitoring points after initial planting has occurred, with photos taken in the same direction to enable comparison of plant growth and establishment over time
- establishing two 5 x 5 m quadrat placed evenly across the site within the rehabilitated area to monitor species survival, vegetation health, native species coverage and composition, weed species present and their density
- a general assessment of the entire site, considering maintenance issues, identification of potential success inhibiting factors, fauna presences and other relevant information
- quarterly weed control events for 3 years
- watering to be conducted 5 times over summer months each year for a period of 3 years
- provision of a yearly report to the City to determine any required management actions or requirements for infill planting.

Monitoring should be carried out by personnel with botanical knowledge and experience, either by the City of Joondalup or through use of a consultant and/or contractor.

6.0 References

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Appendix 1: Species List

The complete flora list for the site is provided in the table below with flora listed by species, and vegetation type they occurred within indicated. *Denotes introduced species and # denotes species that are native to Western Australia but not to this local region.

Family	Species Name	Common Name
Fabaceae	*#Acacia cyclops*	Coastal Wattle
Poaceae	**Briza maxima*	Blowfly Grass
Poaceae	**Bromus diandrus*	Great Brome
Aizoaceae	**Carpobrotus edulis*	Hottentot Fig
Poaceae	**Ehrharta calycina*	Perennial Veldt Grass
Poaceae	**Eragrostis curvula*	African Lovegrass
Iridaceae	**Gladiolus caryophyllaceus*	Wild Gladiolus
Geraniaceae	**Pelargonium capitatum*	Rose Pelargonium
Iridaceae	**Romulea rosea*	Guildford Grass
Asteraceae	**Sonchus oleraceus*	Common Sowthistle
Fabaceae	*Acacia saligna*	Orange Wattle
Proteaceae	*Banksia attenuata*	Slender Banksia
Proteaceae	*Banksia grandis*	Bull Banksia
Proteaceae	*Banksia menziesii*	Firewood Banksia
Haemodoraceae	*Conostylis aculeata*	Prickly Conostylis
Myrtaceae	*Corymbia calophylla*	Marri
Hemerocallidaceae	*Corynotheca micrantha*	Hexagon Zigzag Lily
Goodeniaceae	*Dampiera linearis*	Common Dampiera
Dasypogonaceae	*Dasypogon bromeliifolius*	Pineapple Bush
Fabaceae	*Daviesia divaricata*	Marno
Fabaceae	*Daviesia nudiflora*	
Restionaceae	*Desmocladus flexuosus*	
Myrtaceae	*Eucalyptus marginata*	Jarrah
Fabaceae	*Hardenbergia comptoniana*	Native Wisteria
Dilleniaceae	*Hibbertia hypericoides*	Yellow Buttercups
Myrtaceae	*Hypocalymma robustum*	Swan River Myrtle
Fabaceae	*Jacksonia furcellata*	Grey Stinkwood

Family	Species Name	Common Name
Cyperaceae	*Mesomelaena pseudostygia*	
Cyperaceae	*Morelotia octandra*	
Proteaceae	*Stirlingia latifolia*	Blueboy
Asparagaceae	*Thysanotus sparteus*	
Hemerocallidaceae	*Tricoryne elatior*	Yellow Autumn Lily
Xanthorrhoeaceae	*Xanthorrhoea brunonis*	
Xanthorrhoeaceae	*Xanthorrhoea preissii*	Grass Tree

Appendix 2: Photo Monitoring Points

Point N°	January 2022	May 2022
1		
2		

Point N°	January 2022	May 2022
3		
4		

Point N°	January 2022	May 2022
5		
6		

Point N°	January 2022	May 2022
7		
8		

Point N°	January 2022	May 2022
9		
10