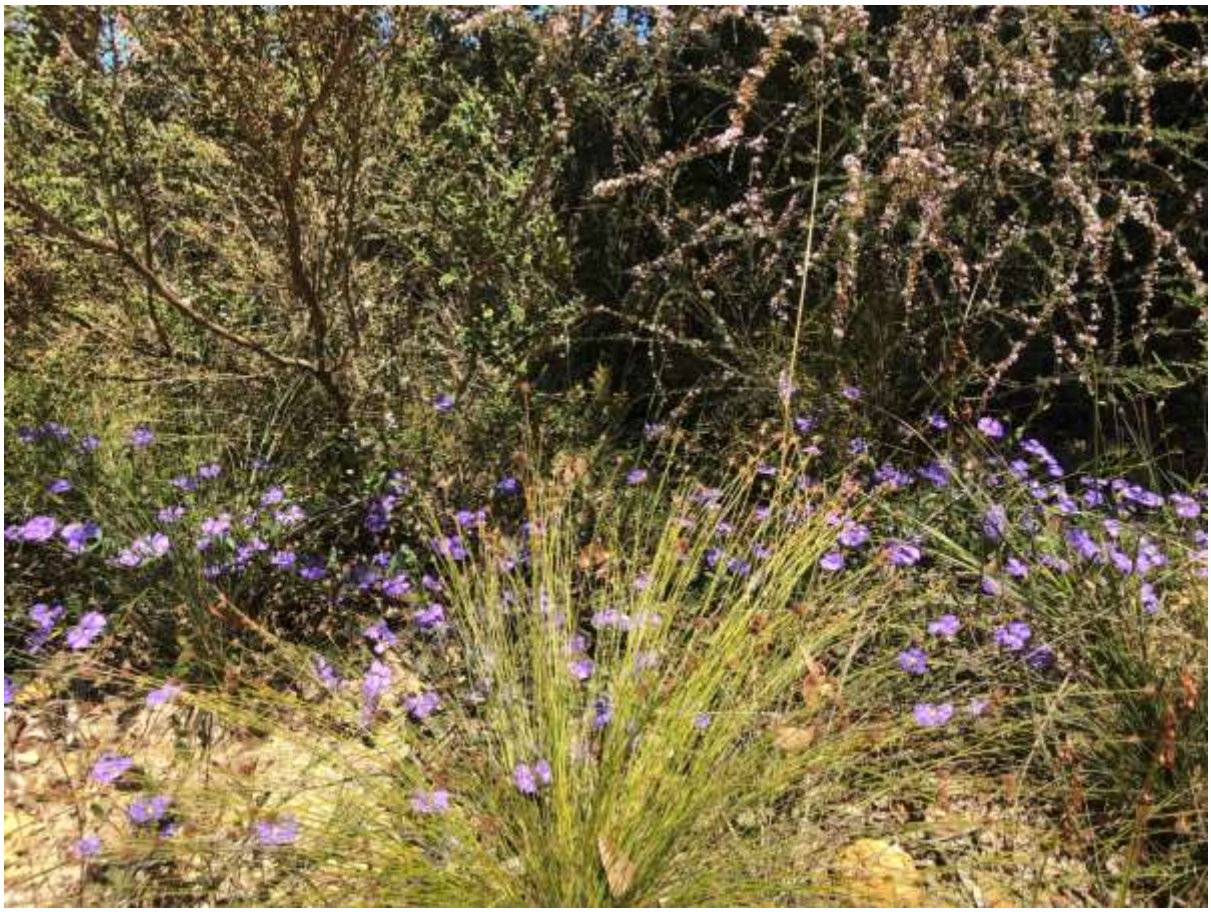
Newman Rd, Narrikup

Plantagenet Shire proposed road widening

Vegetation survey



December 2022

Wendy Bradshaw

Contents

Disclaimer

Every effort has been made to ensure the accuracy of the information provided, however the author does not accept responsibility for any omissions or errors or in how this information is used subsequently by others.

Executive summary

The Shire of Plantagenet proposes to excise a portion on the west side of the stretch of Newman Rd between Spencer Rd and Hannan Way from unnamed crown reserve for the purpose of road widening by three to four metres. A vegetation survey was conducted in the proposed clearing area.

The vegetation in the survey area is *Hakea ferruginea* Closed Heath with Emergent Sheoak and Jarrah and Jarrah Mallee over *Hakea ferruginea* Tall Open Scrub with Emergent Sheoak, neither of which are classified as Threatened or Priority Ecological Communities. No rare, endangered, threatened or priority flora species were recorded.

At the time of the survey, the vegetation was considered to be in healthy and pristine condition, with important habitat values. If the road widening proceeds, it is recommended that that all machinery should be cleaned prior to use on the site, to limit the introduction of weeds and plant pathogens.

1 Introduction

The Shire of Plantagenet proposes to widen an approximately 355 m long stretch of Newman Rd, Narrkiup between Spencer Rd and Hannan Way, approximately 3-4 m westwards. The road widening requires excision from unallocated crown land (Land ID Pin 3091247), managed by Department of Planning, Lands and Heritage.

This report includes methods, limitations, results, discussion, conclusions and recommendations. Results include an overview and summary of vegetation diversity values recorded. Also included is a list of threatened and priority flora in the Albany to Denmark area of the South Coast Region (Department of Biodiversity, Conservation and Attractions and Parks and Wildlife Service, 2022) (Appendix 1), the vegetation survey recording sheet template used in this survey (Appendix 2); condition and structural classification systems used (Appendix 3); genera and species names of all species recorded (Appendix 4); detailed descriptions of vegetation units (Appendix 5); vegetation association descriptions from site data,(Appendix 6) and floristics summary (two-way table) (Appendix 7).

1.1 Size and location

The proposed area to be cleared for the road widening is approximately 1420 m^2 or 0.142 ha. The road is within the Plantagenet Shire, located approximately 200 m north of the Narrikup town site (Figure 1), 32 km north west of Albany and 17 km south east of Mount Barker (Figure 1).

Figure 1: Aerial photo showing the location of Newman Rd in relation to the Narrikup townsite.

1.2 Geology

The context area is underlain by the Albany-Fraser Oregon composed of Proterozoic age (1200 to 1800 million years ago) gneissic and granitic rocks. Slumping of the south coast after Antarctica began to separate from Australia about 100 million years ago, caused the sea to cover the low-lying parts of the area, when the Stirling Range and Porongurup Range were islands. Silt and spongolite (Pallinup Siltstone) was deposited under the sea and swampy sediments (Werrilup Formation) were deposited in low lying areas in the Eocene (RAP & SCRIPT, 1996). Uplift and warping associated with the down-warps of the southern edge raised the land and caused faulting and shearing of the basement rocks, the rejuvenation of drainage lines and the formation of new surfaces along the ancient river systems (Mulcahy, 1960). Lateritisation occurred in the Tertiary (about 30 million years ago) (RAP & SCRIPT, 1996, p. 10).

The land surface of the context area is now a plain composed of sand and laterite that slopes gently south to the coast from the base of the Stirling Range, formed from the weathering of sediments and wind-blown sands over time. The lower parts of the plain are “broad, flat valleys containing lakes, sand dunes and erosional remnants of lateritised continental sandstone, Eocene spongolite and fossil wood”, drained at the southern edge by the headwaters of the Kalgan and Hay River (Muhling *et al.* 1985, p. 2).

1.3 Climate

The climate is Mediterranean, with generally cool and wet winters and warm, dry summers. The closest weather station with long-term climate records is Mount Barker (BOM, 2022). Mean annual rainfall is 726 mls. The wettest months are May to October. Monthly temperature and rainfall statistics for Mount Barker are shown in Table 1.

Table 1: Long term monthly rainfall and temperature statistics for Mount Barker (BOM As at 17 November, 2022)

Statistics	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual	Years	
Temperature															
Mean maximum temperature (°C)	26.3	26.2	24.3	21.3	17.9	15.4	14.4	15.1	16.8	18.9	21.9	24.2	20.2	103	1905 2022
Mean minimum temperature (°C)	12.8	13.1	12.4	10.7	8.8	7.2	6.1	6.2	7.0	8.1	9.9	11.4	9.5	103	1905 2022
Rainfall															
Mean rainfall (mm)	23.4	24.0	36.9	54.1	81.8	92.5	102.4	90.1	79.0	67.8	42.4	29.4	726.0	129	1886 2022
Decile 5 (median) rainfall (mm)	15.3	16.2	28.8	44.8	73.9	86.6	98.2	85.1	76.6	62.6	35.0	24.9	720.9	114	1886 2022
Mean number of days of rain ≥ 1 mm	3.9	3.8	5.3	7.3	10.5	11.9	13.3	12.3	10.8	9.6	6.7	4.8	100.2	110	1907 2022

2 Method

Prior to undertaking field work, a desktop study was carried out. Previous reports and publications relevant to the area were reviewed. A search of the Department of Biodiversity, Conservation and Attractions (DBCA) and Parks and Wildlife Service database to identify any potential rare, endangered, threatened or priority flora species and priority or threatened ecological communities that may occur in the area was undertaken. Contact was also made with Sarah Barrett, the Threatened Flora Officer with DBCA Albany District to give her the opportunity to provide feedback on any particular species she wanted me to watch out for.

An area approximately 10 m wide by 370 m long on the west side of Newman Rd was targeted for the survey (Figure 5). Survey sites were selected to represent variation of vegetation structure, landscape position and hydrology. Due to the long narrow nature of the overall survey area, variation in vegetation within the target area was initially identified by driving along Newman Rd with the aim of ensuring variations in vegetation structure and diversity were represented at survey sites.

Each sample (relevé) consisted of an unmarked 10m x 10m area. The relevé survey method used has been shown to be an effective rapid survey method rather than marked quadrats where every species is recorded. Although marked quadrats contain more data, they are a lot more time consuming and compromise the coverage of the targeted survey area. The relevé method was used for the Ravensthorpe Range (Craig et al. 2008), the Albany Regional Vegetation Survey (Sandiford & Barrett, 2010), Proteaceous Rich Vegetation Survey in the Forest to Stirlings section of the Gondwana Link (Sandiford, 2012), and for the Ranges Link Surveys (Bradshaw, 2013, 2014, 2015).

Site data records (Appendix 6) include vegetation association, stratum composition, percent cover and species dominance for each relevé area. Relevé area for trees, mallees and shrubs >2m in height strata are taken over an unmarked 20x20 m area and the remaining strata are recorded from an unmarked 10x10 m plot. Photographs and GPS locations were taken from the south west corner of each relevé. Rules governing inclusion of species in site data are that they are required to either project at least 5% canopy cover or be represented by at least three individuals in the relevé area to be included. If not, they are listed at the bottom as 'other species' and are included in the overall summary of species (Appendix 4) but not used in site data.

Vegetation structure was determined using Keighery (1994), adapted from Muir (1979) and Aplin (1979). Condition was determined using Keighery (1994) modified from Trudgen (1991) (Appendix 3).

Site attributes including visual assessment of soil colour and type to a depth of 10cm, geology, percentage surface rock, land form, hydrology and drainage status were recorded, as per relevé template (Appendix 2).

Samples of species that could not be identified in the field were collected, given a unique identifying name, and pressed for identification. Where possible, all species that could not be identified in the field were identified through cross referencing between Department of Biodiversity, Conservation and Attractions website *Florabase*, relevant plant identification keys/reference books, and the at

Albany Herbarium and with the DBCA Threatened Flora Officer where potential threatened/priority species were identified.

Following all field work, all relevés were reviewed. Results of all relevés were clustered by common dominant upper, mid and lower storey dominants, landform and soil units. Site data was entered into a two-way table (Appendix 7) to show the transition of species presence/absence between survey sites, linked to soil types and landscape positions. Vegetation is described to the level of associations (level V as defined in the National Vegetation Inventory System (NVIS) Information Hierarchy (ESCAVI, 2003).

2.1 Limitations

Soil and hydrology data was assessed briefly and subjectively and thus any conclusions regarding these attributes need to be treated with caution.

The Albany Herbarium also does not have a complete collection of flora from the area and some specimens in the herbarium are likely to be incorrectly named (pers. comm. E. Sandiford). Plants that were not able to be identified to species level were identified to genus level where possible. The genus of *Lepidosperma* is currently being revised with a large number of new species being named (Barrett & Wilson, 2020). Specimens identified as belonging to the genus *Lepidosperma* were named sp. aff. followed by the species name that appears closest to current Albany herbarium specimen identification.

3 Results and Discussion

A total of six relevé sites were surveyed (Figure 4). A total of 77 species from 27 genera were recorded overall, of which 74 species met relevé rules to be included in the data which in turn was used to describe two vegetation units. The average number of species recorded per relevé was 39. Overall, the Proteaceae and Myrtaceae families contained the greatest number of species (11 each), followed by the Fabaceae (nine species) and Cyperaceae (seven species). All remaining families were represented by five or less species.

3.2 Vegetation units and associations

As shown in the vegetation map (Figure 5), two vegetation units were developed from the floristics table (Appendix 7). Based on vegetation patterns shown on aerial photography, the approximate area of Unit 1 inside the mapped area was 520 m^2 and for Unit 2 was 3722 m^2. Vegetation units are described in detail in Appendix 5 and vegetation associations described from relevé site data in Appendix 6.

Following is a summary of the two vegetation units identified, listed by landform and soil type.

1. **Wet flat on sandy clay loam**
   Hakea ferruginea Closed Heath with Emergent Sheoak and Jarrah (Relevés 1, 6)

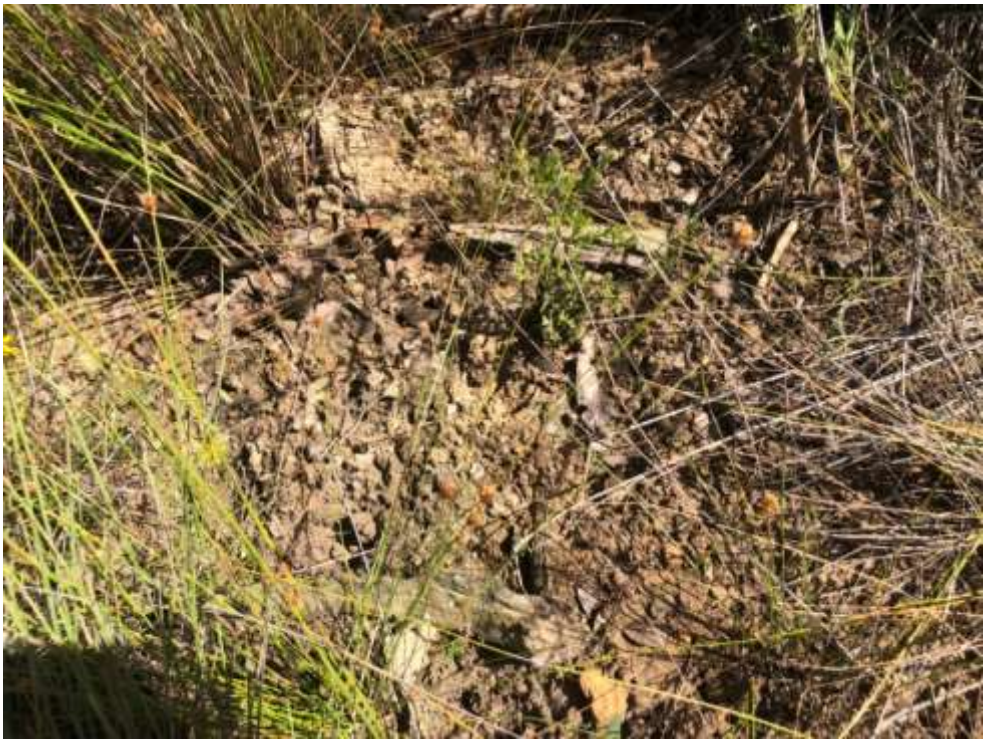
2. **Wel drainded flat on sandy soil**
   Jarrah Mallee over *Hakea ferruginea* Tall Open Scrub with Emergent Sheoak (Sites 2-5)

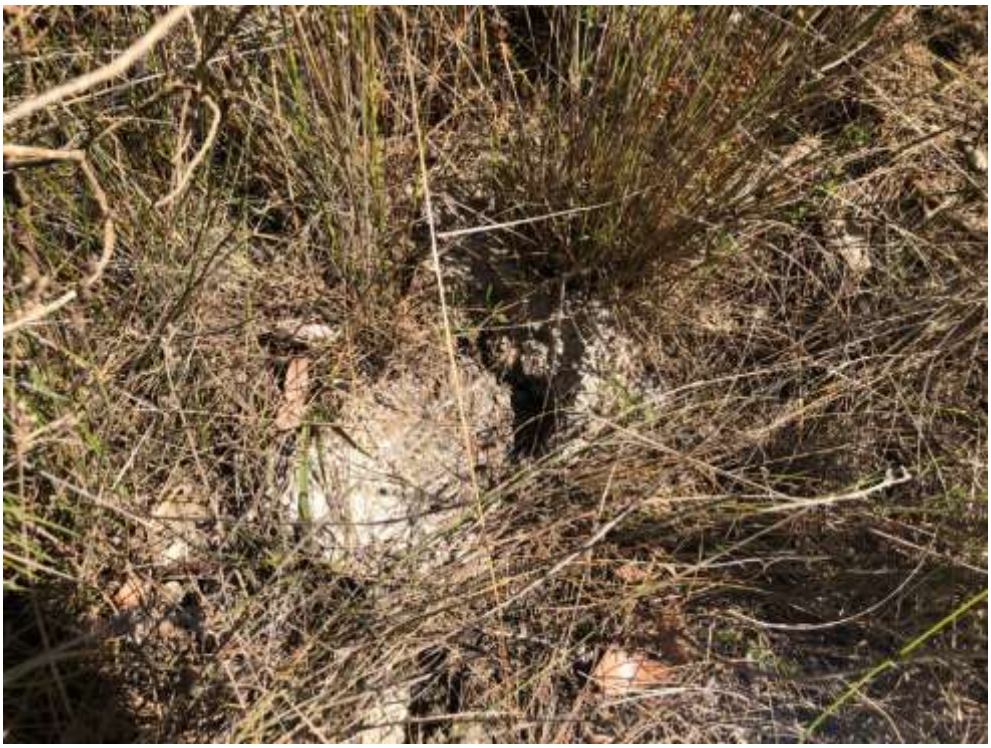
3.1 Conservation species

No rare, endangered, threatened or priority flora species or priority or threatened ecological communities were recorded.

3.3 Species diversity and condition status

The vegetation was all described as pristine as it was intact with no evidence of disease and no weeds recorded. The intact structural and compositional diversity at the survey sites is indicative of the high value habitat value of this bushland. Prevalent diggings of what appear to be both echidna (*Tachyglossus* sp.*)* and quenda (*Isoodon obesulus)* were observed within the first few steps taken into the bush (Figures 2 and 3).





Figures 2 & 3: Examples of diggings observed in intact bushland indicating presence of small native mammals

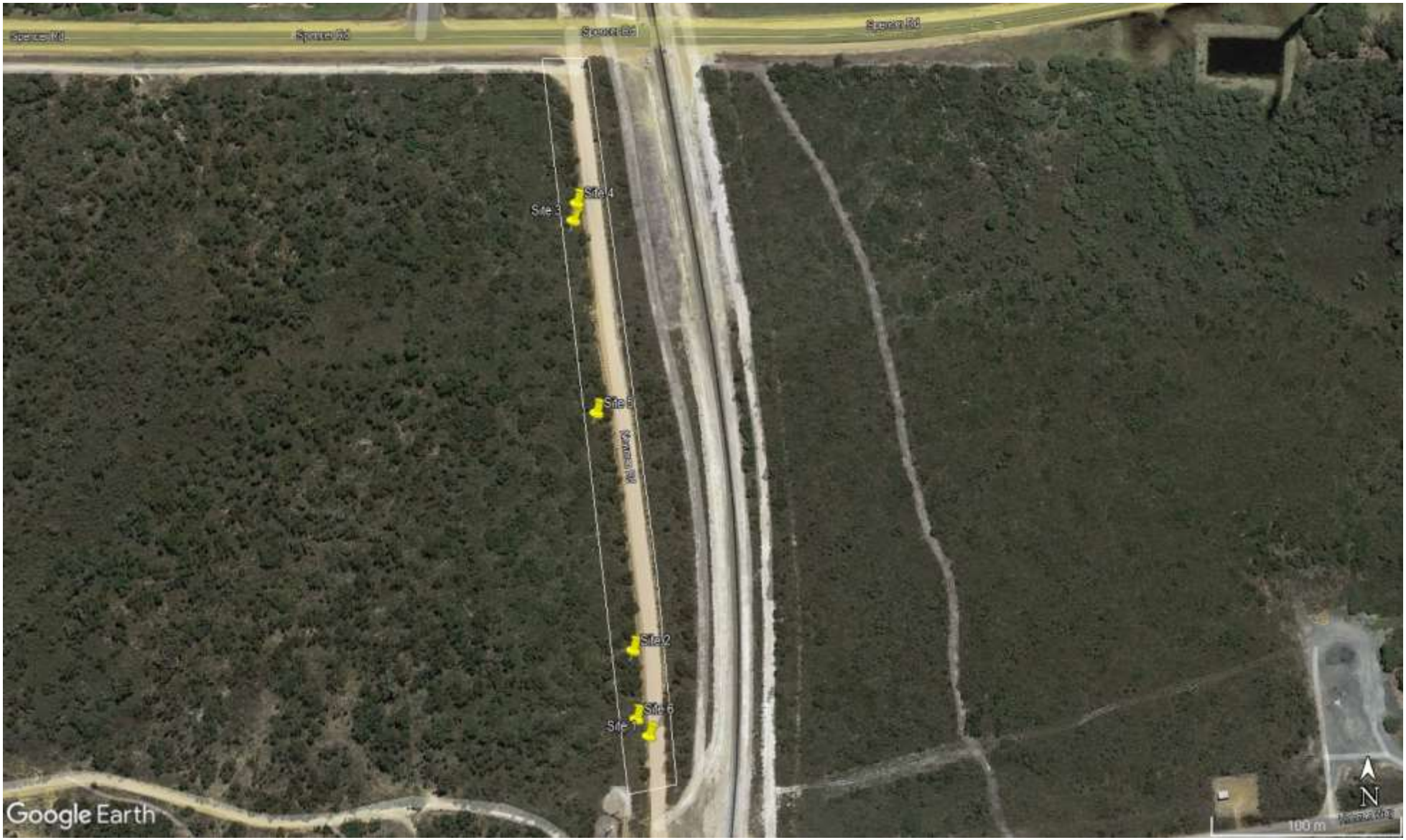


Figure 4: Location of waypoints representing relevés (survey sites)

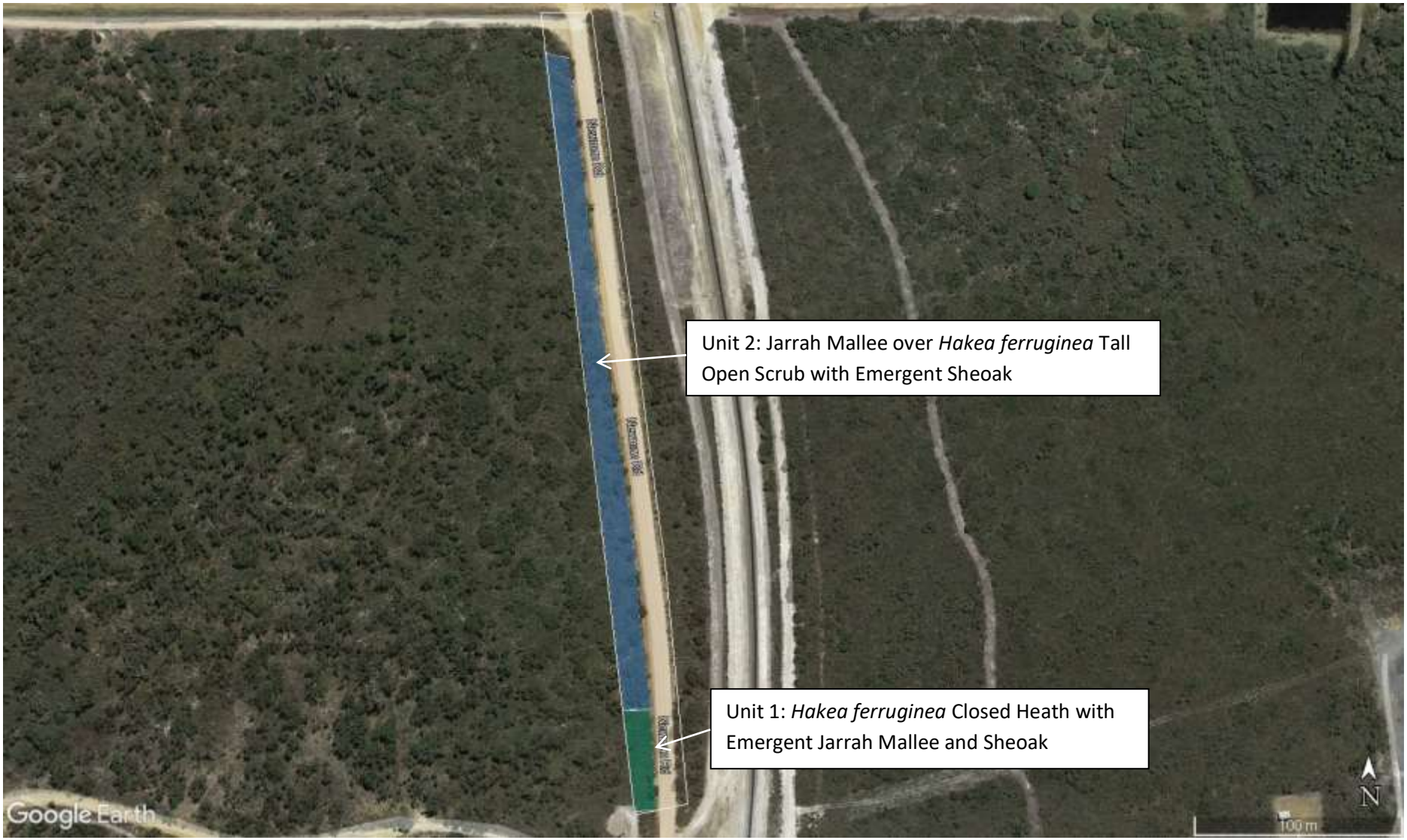


Figure 5: Vegetation map showing the location of Vegetation Unit 1: *Hakea ferruginea* Closed Heath with Emergent Jarrah Mallee and Sheoak and Unit 2: Jarrah Mallee over *Hakea ferruginea* Tall Open Scrub with Emergent Sheoak

4 Conclusion & Recommendations

The vegetation of the proposed road widening to the west of Newman Rd between Spencer Road and Hannan Way is *Hakea ferruginea* Closed Heath with Emergent Jarrah Mallee and Sheoak and Jarrah Mallee over *Hakea ferruinea* Tall Open Shrubland with Emergent Sheoak. Neither of these vegetation types are Threatened or Priority Ecological Communities.

Following are the 10 clearing principles for native vegetation under Schedule 5 of the Environmental Protection Act (1986) as listed in Department of Environment and Regulation (DER) (2014, p. 3) that native vegetation should not be cleared if:

1. it comprises a high level of biological diversity;
2. it comprises the whole or a part of, or is necessary for the maintenance of, a significant habitat for fauna indigenous to Western Australia;
3. it includes, or is necessary for the continued existence of, rare flora;
4. it comprises the whole or a part of, or is necessary for the maintenance of a threatened ecological community;
5. it is significant as a remnant of native vegetation in an area that has been extensively cleared;
6. it is growing in, or in association with, an environment associated with a watercourse or wetland;
7. the clearing of the land is likely to cause appreciable land degradation;
8. the clearing of the vegetation is likely to have an impact on the environmental values of any adjacent or nearby conservation area;
9. the clearing of the vegetation is likely to cause deterioration in the quality of surface or underground water;
10. clearing of the vegetation is likely to cause, or exacerbate, the incidence or intensity of flooding.

While the survey area is highly biodiverse and has important habitat values, none of the above principles appear to be limiting to the proposed road widening as that the survey area does not occur in any of the biodiversity hotspots identified in Western Australia (see DER 2014, p. 6). Also the percent of area cleared in the Shire of Plantagenet in 2002 was 47.8% and the vegetation associations recorded are above the 30% minimum remnant vegetation required where species loss appears to accelerate exponentially at an ecosystem level (Shepherd et al, 2002).

No rare, endangered, threatened or priority flora species or threatened ecological communities were recorded.

At the time of the survey, the vegetation was all recorded to be in pristine and healthy condition with the only disturbance observed indicative of small native marsupials including echidna and quenda. No weeds were recorded. If the clearing for road widening proceeds, it is recommended that all machinery should be cleaned prior to use on the site, to limit the introduction of weeds and plant pathogens.

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Appendix 1: South Coast Region Threatened and Priority Flora List

The following list of Threatened and Priority Flora is taken from the Government of Western Australia Department of Biodiversity, Conservation and Attractions and Parks and Wildlife Service *Threatened and priority flora list* (6 October, 2022) database available at: https://www.dpaw.wa.gov.au/plants-and-animals/threatened-species-and-communities/threatened-plants

SOUTH COAST REGION THREATENED AND PRIORITY FLORA LIST 6 OCTOBER 2022

Taxon	WA Status	WA Rank	EPBC	Distribution	Flowering Period
Acacia ataxiphylla subsp. ataxiphylla	3			Albany, Cranbrook, Jingalup, Kojonup, Chillerup, Bokal	Dec
Acacia prismifolia	T	CR	EX	Albany, Stirling Range N.P.	Sep
Agrostocrinum scabrum subsp. littorale	2			Mutton Bird Is., Mt Manypeaks, Cape Leeuwin	Oct-Nov
Amanita drummondii	3			Jandakot, Yunderup, Perup, Mount Roe N.P., Denmark, Albany	
Amanita fibrillopes	3			Swan Coastal Plain, Jarrah Forest and Warren bioregions	
Andersonia setifolia	3			Manypeaks, Napier, Albany, Two Peoples Bay, Ongerup	Jul-Aug
Andersonia sp. Jamesii (J. Liddelow 84)	4			Narrikup, Sheepwash, Albany, Porongurup, Millbrook N.R.,	Jun,Jul
Asplenium decurrens	4			Albany-Walpole, Chatham Is.	Oct
Astroloma sp. Grass Patch (A.J.G. Wilson 110)	2			Grass Patch, Cascade, Albany	May-Sep
Banksia brownii	T	CR	EN	Albany-Stirling Range	Jan-Jul
Banksia goodii	T	VU	VU	Albany, Narricup, Redmond, Mt Lindesay NP.	Nov-Dec
Banksia verticillata	T	CR	VU	Albany-Walpole	Jan-Apr
Boronia crassipes	3			Albany, Millbrook	Aug-Dec
Boronia virgata	4			Walpole, Denmark, Mt Frankland	Jan-Mar,Sep-
Caladenia harringtoniae	T	VU	VU	Nannup-Albany, Lake Muir	Sep-Nov
Calectasia cyanea	T	CR	CR	Albany	Aug-Dec
Centrolepis milleri	3			Albany, Eneabba	Aug-Nov
Conospermum quadripetalum	2			Scott River, Albany, Torndirrup	Nov
Conostylis misera	T	VU	EN	Stirling Range, Porogurups district, Mt Barker	Oct-Nov

Drakaea micrantha	T	EN	VU	Perth-Augusta-Albany, Denmark, Margaret River	Sep-Oct
Drosera fimbriata	4			NE of Manypeaks, Lake William, Albany, Leeuwin Naturaliste NP	Oct
Drosera lasiantha	2			Porongerup Range, Denmark	
Drosera paleacea	1			Albany	Dec
Eucalyptus x missilis	4			Cheyne Beach, West Cape Howe National Park, Cape le Grand, Torndirrup, Two Peoples Bay, Esperance, Hood Point (FRNP)	Jan-Apr
Euphrasia scabra	2			Stirling Range, Lake Muir, Yorn Creek, Mt Lindesay, All other Southern States	
Gahnia sclerioides	4			Yelverton, William Bay N.P., Denmark, Walpole Nornalup N.P., West Cape Howe N.P., Tuart NP, Nullaki, Margaret River	-
Gonocarpus orchardii	3			Donnybrook, Margaret River, Walpole, Albany	Nov - March
Gonocarpus pusillus	4			Albany, Walpole-Nornalup, Mt Frankland, Augusta, Scott River, Yelverton, Scotsdale	Nov-Dec
Goodenia sp. South Coast (A.R. Annels ARA 1846)	3			Albany, Nanarup, Porongurup NP, Kentdale, Mt Lindsay	Jul-Jan
Gyrostemon thesioides	2			West Cape Howe, Two Peoples Bay, Torndirrup NP	
Haegiela tatei	4			Grass Patch, Lake Lockhart, Lake King, Badja Station, Peak Charles N.P., Lake Grace, Lake Magenta N.R., Lake Lockhart, Lake Cronin, Jaurdi Stn.	-
Isopogon buxifolius var. buxifolius	2			Denmark, West Cape Howe N.P., Youngs Siding, Torbay	Jul-Dec
Isopogon buxifolius var. obovatus	3			Cape Riche, Stirling Range N.P., Porongurup	Jan-Dec
Isopogon uncinatus	T	CR	EN	Albany	
Juncus meianthus	3			West Cape Howe, Porongurup NP, Nornalup, Albany, Margaret River,	Nov,Jan

				Mungalup, Gidgegannup	
Lachnagrostis billardierei subsp. billardierei	3			Albany, Torndirrup NP., SA, VIC, NSW, QLD, TAS	
Lambertia orbifolia subsp. orbifolia	T	CR	EN	Narrikup	Jan-Jul
Lepidus pseudotasmanicum	4			Yanchep, Wongan Hills, Denmark, Albany, Porongurup R, Jerramungup, Munglinup, Stirling Range, Lake Clifton	
Leucopogon alternifolius	3			Cape Howe, Albany, Marbellup, Mt Frankland NP, Walpole-Nornalup NP	Sep-Nov
Leucopogon bracteolaris	2			Stirling Range N.P., Albany	Jan-May
Lysinema lasianthum	4			Porongurup Range, Albany, Collis Block, Millbrook, Nornalup, Cheyne Beach, West Cape Howe	July-Sep,Jan
Microtis globula	T	VU	VU	Walpole-Albany	Dec-Jan
Microtis pulchella	4			Northcliffe, Walpole, Albany, Donnelly River	Nov-Dec
Microtis quadrata	4			Pinjarra, Jandakot, Albany, Lake Barker, Denamrk , Baufort Inlet	Dec-Jan
Netrostylis sp. Blackwood River (A.R. Annels 3043) PN	3			Denmark, Witchcliffe, Green Range,Manjimup, Mullalyup	
Pilostyles collina	4			Fitzgerald peaks, Albany, Bluff Knoll	Jab-Mar
Pimelea eyrei	2			Fitzgerald River NP, East Mt Barron	Jul-Nov
Pimelea rosea subsp. annelsii	3			Mount Barker, Narrikup, Hay River, Denmark	Sep-Nov
Pleurophascum occidentale	4			Two Peoples Bay, N of Albany, Cape Le Grand NP, Hay River, Walpole, Mt Lindesay, Gull Rock, Mt Frankland NP, Granite Hill NR	-
Poa billardierei	3			Warren Beach, Albany, Fitzgerald River N.P., Cape Le Grand N.P.	
Prasophyllum paulinae	1			Albany	Sep-Nov

Psammomoya ephedroides	3			Toolonga N.R., Kalbarri, Woolgorong, Mount Gibson, Coolgardie, Albany	
Pterostylis heberlei	2			Albany, Denmark	Sep-Oct
Rytidosperma racemosum var. racemosum	2			Denmark, Peak Charles N.P.	
Sphaerolobium calcicola	3			Yalgorup, Yanchep, Safety Bay, Myalup, Denmark	Jun/Sep-Nov
Spyridium spadiceum	4			Porongurup Range, Albany, Gull Rock N.P., Mt Mason N.R., Vancouver Peninsula	Oct-Feb
Stylidium articulatum	2			Albany, Mermaid Point	Dec
Stylidium falcatum	2			Albany, Mt Clarence, Mt Melville, Mt Adelaide, Gull Rock N.P.	Oct-Nov
Stylidium lepidum	3			Wagin, Albany, Kojonup, Mt Barker, Beaufort River, Stirling Plains, Kent River, Collie, Lake Muir, Tone River	Sep-Nov
Synaphea preissii	3			Torndirrup NP, Albany, Mt Barker, Stirling Range NP, Gnowangerup, Narrikup, Rocky Gully	Aug-Sep
Thelymitra variegata	2			Baldivis, Capel, Albany, Hyden, Mt Lindesay	Aug-Sep
Thomasia multiflora	1			Albany, Warriup Hill	Oct
Thomasia purpurea x solanacea	1			Albany	Nov-Dec
Thomasia quercifolia	4			Albany, Torndirrup NP, Walpole Nornalup N.P., Denmark, William Bay N.P.	
Thomasia solanacea	4			Albany, Two Peoples Bay, Cape Riche, Stirling Range, Bald Is. N.R., Waychinnicup N.P., Bremer Bay, Mt Manypeaks N.R., Denmark	Jun
Thysanotus isantherus	4			Mt Melville, Mt Clarence, Torndirrup N.P., Albany, Mt Lindesay N.P., Shannon River, Kent River, Gull Rock, Cowaremup, Red Hill	Nov
Tribonanthes purpurea	T	VU	VU	Pingaring, Hillman T/S, Mt Dale, Albany	Aug

Tricostularia drummondii	3			Perth to Arthur River, 3 pops with mining tenements, 4 pops in conservation areas	Spring

Appendix 2: Relevé recording sheet

		SITE_ID:
Date:	**Wp:**	**mE**
Recorder:	**VegCode:**	**mN**
Location and Site Notes:		

Condition: *Pristine Excellent Very Good Good Degraded --- RESIDUAL MODIFIED TRANFORMED*

Aspect: *N NE E SE S SW W NW*	**Slope:** *Flat Gentle Mod Steep*
Geology: *Gnei Gran Lat Lime Silt*	**Rock:** *0 <2 2-10 10-20 20-50 >50*
Soil Colour: *Brown Grey Dark Brown Dark Grey Light Grey Light Brown Orange/Brown White Yellow Yellow/Grey*	**Soil Type:** *C CL CLS CS L LS S SCL SL SP ZCL ZL ZS P GL GS*
Hydrology: *Good drain Poor drain Perm wet Seasonal wet*	**Landform:** *Breakaway Cliff Consolidated Dune Drainage Depression Dune Gully Hill Crest Riparian Bank Rock Outcrop Slope Lower Slope Middle Slope Upper Swale Swamp Tidal Flat Tor Valley Flat Berm Flat Plain Ridge*

Growth form	Ht	Cvr	NVIS/dominant	Others
T_1	>30			
T_2	10-30			
T_3	<10			
M_1	>8			
M_2	<8			
S_1	>2			
S_2	1-2			
S_3	0.5-1			
S_4	<0.5			
V	NA			
H	NA			
G	NA			

Cover Codes: **D** >70% **M** 30-70% **S** 10-30% **V** 2-10% **E** <5% Emergent

Other Species:

Appendix 3

3.1 Growth Form Layer definitions, 1b Condition Scale and 1c Structural Classification

1a. Growth Form Layers (Perth Biodiversity Project Natural Area Initial Assessment Templates)

Adapted from Keighery 1994, McDonald et al. 1990 and Executive Steering Committee for Australian Vegetation Information 2003)

Tree: woody plant with a single trunk and canopy, the canopy is less than or equal to ⅔ of the height of the trunk, no lignotuber apparent

Mallee: woody plant with many woody stems, canopy well above the base, lignotuber usually apparent, commonly of the genus *Eucalyptus*

Shrub: woody plant with one or many woody stems, foliage all or part of the total height of the plant, includes grass trees (*Xanthorrhoea spp*.) and cycads (*Macrozamia spp*.)

Herb: non-woody plant with stems, generally under 0.5 m tall and not a grass, sedge or rush

Grass: non-woody plant that comes from the plant family Poaceae; all have inconspicuous individual flowers that are pollinated by wind; leaf sheath always split, ligule present, leaf usually flat, stem cross-section circular, evenly spaced internodes

Sedge: non-woody, tufted or spreading plant that comes from the plant family Cyperaceae; most have inconspicuous flowers that are pollinated by wind; leaf sheath never split, usually no ligule, leaf not always flat, extended internode below inflorescence

Rush: same as sedge but comes from the plant families Juncaceae, Restionaceae, Typhaceae or Xyridaceae; leaf sheath may be split in Restionaceae

Climbers: plants that climb or scramble over other plants for support

3.2 Classification System Used to Describe Vegetation Structure (Keighery 1994), as adapted from Muir (1977) and Aplin (1979)

Growth Form/ Height Class	Canopy Cover			
	100% to 70 %	**70% to 30 %**	**30% to 10 %**	**10% to 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
Mallee over 8 m (Tree Mallee)	Closed Tree Mallee	Tree Mallee	Open Tree Mallee	Very Open Tree Mallee
Mallee under 8 m (Shrub Mallee)	Closed Shrub Mallee	Shrub Mallee	Open Shrub Mallee	Very Open Shrub
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	Very 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

3.3 Condition Scale (Keighery, 1994)

Pristine Pristine or nearly so, no obvious signs of disturbance
Excellent Vegetation structure intact; disturbance affecting individual species; weeds are non-aggressive species
Very good 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; grazing*
Good Vegetation structure significantly altered by very 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 some very aggressive weeds at high density; partial clearing; dieback; grazing.*
Degraded 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; partial clearing; dieback; grazing*
Completely Degraded The structure of the vegetation is no longer intact and the area is completely or almost completely without native species. *These areas are often described as 'parkland cleared' with the flora comprising weed or crop species with isolated native trees or shrubs.*

Appendix 4 – Species names

Apiaceae
Xanthosia singuliflora
Asparagaceae
Lomandra nutans
Casuarinaceae
Allocasuarina humilis
Allocasuarina fraseriana
Colchicaceae
Burchardia congesta
Cyperaceae
Cyathochaeta avenacea
Machaerina juncea
Mesomelaena tetragona
Morelotia octandra
Netrostylis sp. Jarrah Forest
Lepidosperma sp. aff. *squamatum*
Tricostularia davisii
Dasypogonaceae
Dasypogon bromeliifolilus
Dilleniaceae
Hibbertia gracilipes
Droseraceae
Drosera fimbriata
Drosera menziesii
Drosera verrucata
Ericaceae
Andersonia caerulea
Leucopogon gibbosus
Leucopogon glabellus
Styphellia concinna
Lysinema ciliatum
Fabaceae
Acacia myrtifolia
Acacia varia var. *parviflora*
Bossiaea rufa
Daviesia flexuosa
Daviesia preissii
Hovea trisperma
Gompholobium polymorphum
Gompholobium venustum
Sphaerolobium vimineum
Goodeniaceae
Dampiera leptoclada
Scaevola striata
Haemodoraceae
Conostylis aculeata
Hemerocallidaceae
Agrostocrinum hirsutum
Iridaceae
Patersonia umbrosa
Myrtaceae
Agonis theifomis
Astartea glomerulosa
Beaufortia anisandra
Darwinia diosmoides
Eucalyptus marginata
Kunzea recurva
Melaleuca thymoides
Pericalymma ellipticum
Taxandria linerifolia
Verticordia habrantha
Taxandria parviceps
Orchidaceae
Prasophyllum gracile
Thelymitra crinita
Pittosporaceae
Billardiera variifolia
Poaceae
Austrostipa variabilis
Rytidosperma caespitosum
Polygalaceae
Comesperma confertum
Proteaceae
Banksia arctotidis
Banksia sphaerocarpa var. *sphaerocarpa*
Grevillea fasciculata
Hakea ceratophylla
Hakea corymbosa
Hakea ferruginea
Hakea ruscifolia
Isopogon formosus
Isopogon sphaerocephalus
Synaphea favosa
Synaphea polymopha
Restionaceae
Desmocladus fasciculatus
Hypolaena exsculca
Loxocarya cinerea
Platychorda applanata

Rhamnaceae
Cryptandra nutans
Rutaceae
Boronia spathulata
Santalaceae
Choretrum lateriflorum
Stylidiaceae
Stylidium accuminatum subsp. *meridionale*
Stylidium hirsutum
Stylidium menziesii
Thymelaeaceae
Pimelea angustifolia
Pimelea sulphurea
Xanthorrhoeaceae
Xanthorrhoea platyphylla

Appendix 5: Vegetation descriptions

Vegetation unit 1: *Hakea ferruginea* Closed Heath with Emergent Sheoak and Jarrah Mallee **No. of relevés: 2 Sites 1 and 6**

Description

Hakea ferruginea Closed Heath with Emergent Sheoak and Jarrah Mallee was recorded on flat wet ground on sandy clay loam. The only upper storey species recorded were emergent strata of *Allocasuarina fraseriana* and Jarrah (*Eucalyptus marginata) mallee. Hakea ferruginea* was dominant in the closed heath stratum. Subdominant but commonly recorded at both sites was *Taxandria parviceps,* Dominant species recorded in the open low heath stratum were *Agonis theiformis* and *Allocasuarina humilis.* Common species recorded included *Pericalymma ellipticum, Astartea glomerulosa, Comesperma confertum, Lysinema cilliatum, Hovea trisperma, Hibbertia gracilipes* and *Synaphea polymorpha.* The most commonly dominant herbs recorded were variable and include *Lomandra nutans, Dampiera leptoclada* and *Scaevola striata* in a very open herbland stratum. *Stylidium hirsutum* was subdominant but also common. *Austrostipa variabilis* was most commonly dominant in the very open grassland stratum, with *Rytidopserma caespitosum* common but not dominant. Dominant sedges in the closed sedgeland stratum are *Triscostularia davisii* and *Mesomylaena tetragona*. Other sedges and rushes commonly found in this unit include *Machaerina juncea, Loxocarya cinerea* and *Hypolaena exscula.*

All sites in this unit were recorded in pristine condition with no signs of disease or weeds recorded.

No conservation species recorded.

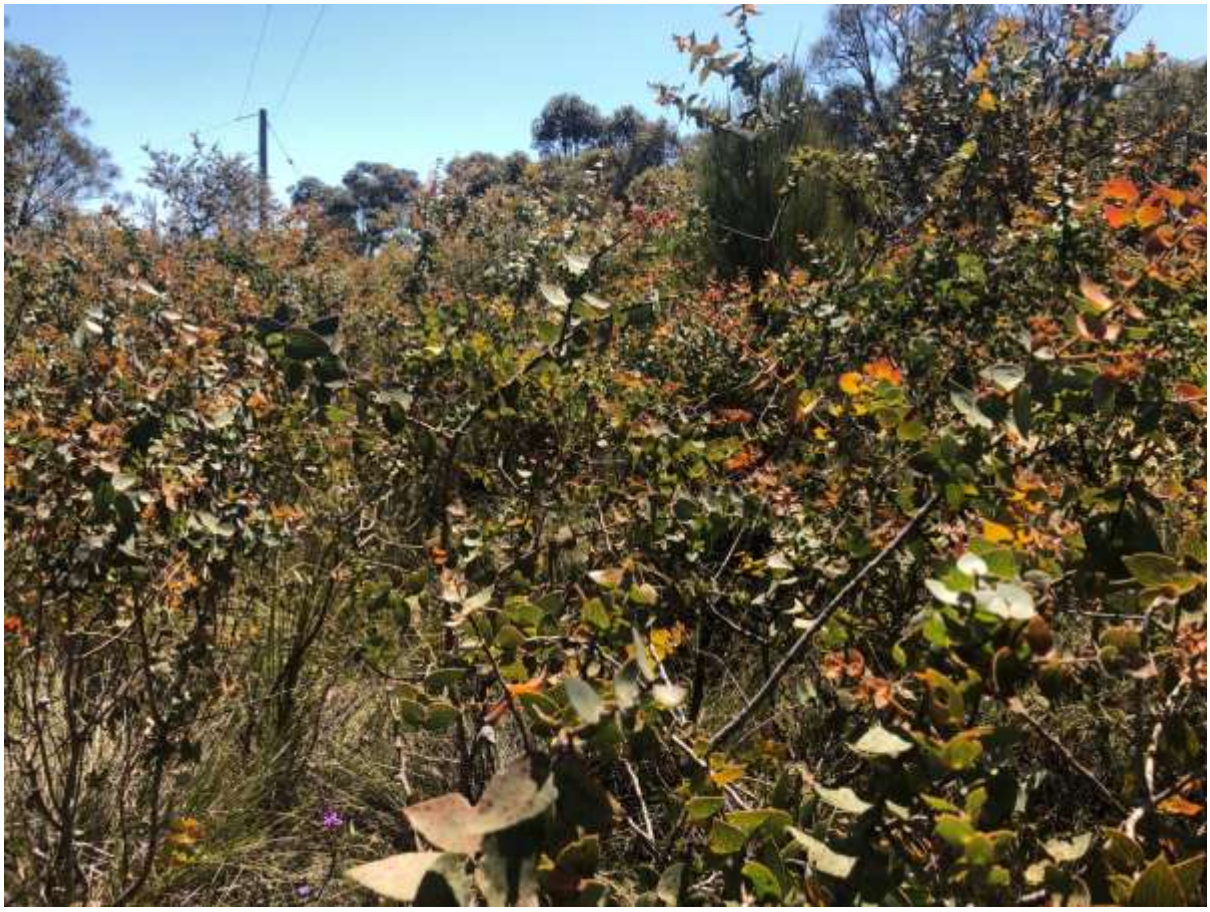
Comments

Key distinguishing features:

- Occurs on clay flat prone to waterlogging.
- Trees (sheoak) and mallees occur as an emergent stratum only
- *Hakea ferruginea* occurs as dominant shrub in the dense 1-2 m stratum
- Dominant sedges are *Triscostularia davisii* and *Mesomylaena tetragona* and the slightly wetter habitat is distinguished by the presence of bare twigrush (*Machaerina juncea)* that was only recorded in this unit.

Floristic Summary

Lifeform	%cover	Species
Trees <10-	e	*Allocasuarina fraseriana*
Mallees <8m	e	*Eucalyptus marginata*
Shrubs 1-2m	70-100	*Hakea ferruginea, Taxandria parviceps, Isopogon formosus, Taxandria linearifolia*
Shrubs <0.5-1m	10-70	*Allocasuarina humilis, Agonis theiformis, Xanthorrhoea platyphylla, Astartea glomerulosa, Lysinema cilliatum, Comesperma confertum, Sphaerolobium vimineum*
Shrubs <0.5 m	10-30	*Pericalymma ellipticum, Hovea trisperma, Hibbertia gracilipes, Synaphea polymorpha, Daviesia flexuosa, Synaphea favosa, Leucopogon glabellus, Grevillea fasciculata, Banksia arctotidis*
Sedges	70-100	*Mesomylaena tetragona, Tricostularia davisii, Hypolaena exsulca, Platychorda applanata, Machaerina juncea, Loxocarya cinerea, Desmocladus fasciculatus, Cyathochaeta avenacea, Lepidosperma* sp. aff. *squamatum*
Herbs	2-10	*Scaevola striata, Lomandra nutans, Dampiera leptoclada, Stylidium hirsutum, Conostylis aculeata, Drosera verrucata, Drosera menziesii, Xanthosia singuliflora*
Grasses	2-10	*Austrostipa variabilis, Rytidosperma caespitosum*



Unit 1

Vegetation unit 2: Jarrah Mallee over *Hakea ferruginea* Tall Open Scrub with Emergent Sheoak

No. of relevés: 4 Sites 2-5

Description

Jarrah Mallee over *Hakea ferruginea* Tall Open Scrub with Emergent Sheoak was recorded on flat ground on sand to loamy sand soils. *Hakea ferruginea* is dominant throughout in the tall open scrub stratum. Remaining understorey strata are highly diverse and variable in dominance and composition between sites. Dominant species recorded in the open heath to shrubland stratum include *Agonis theiformis* and *Allocasuarina humilis.* Dominant species in the open low heath to low shrubland stratum include *Melaleuca thymoides, Banksia sphaerocarpa* var. *sphaerocarpa, Hakea ceratophylla, Leucopogon gibbosus* and *Astartea glomerulosa.*

The very open grassland and herbland strata were dominated by *Austrostipa variabilis* and *Lomandra nutans* respectively. The most commonly dominant sedges in the closed sedgeland stratum are *Loxocarya cinerea* and *Triscostularia davisii.*

This unit occurs adjacent to Unit 1 on better drained soil. Many species are common to both units. Other key differences between this unit from Unit 1 are the mid-dense jarrah mallee over storey, the lack of the bare twig rush (*Machaerina juncea)* (that is an indicator of waterlogging) and the addition of *Netrostylis* sp. Jarrah Forest and *Morelotia octandra* to the sedge stratum.

All sites in this unit were recorded in pristine condition with no signs of disease or weeds recorded.

No conservation species were recorded.

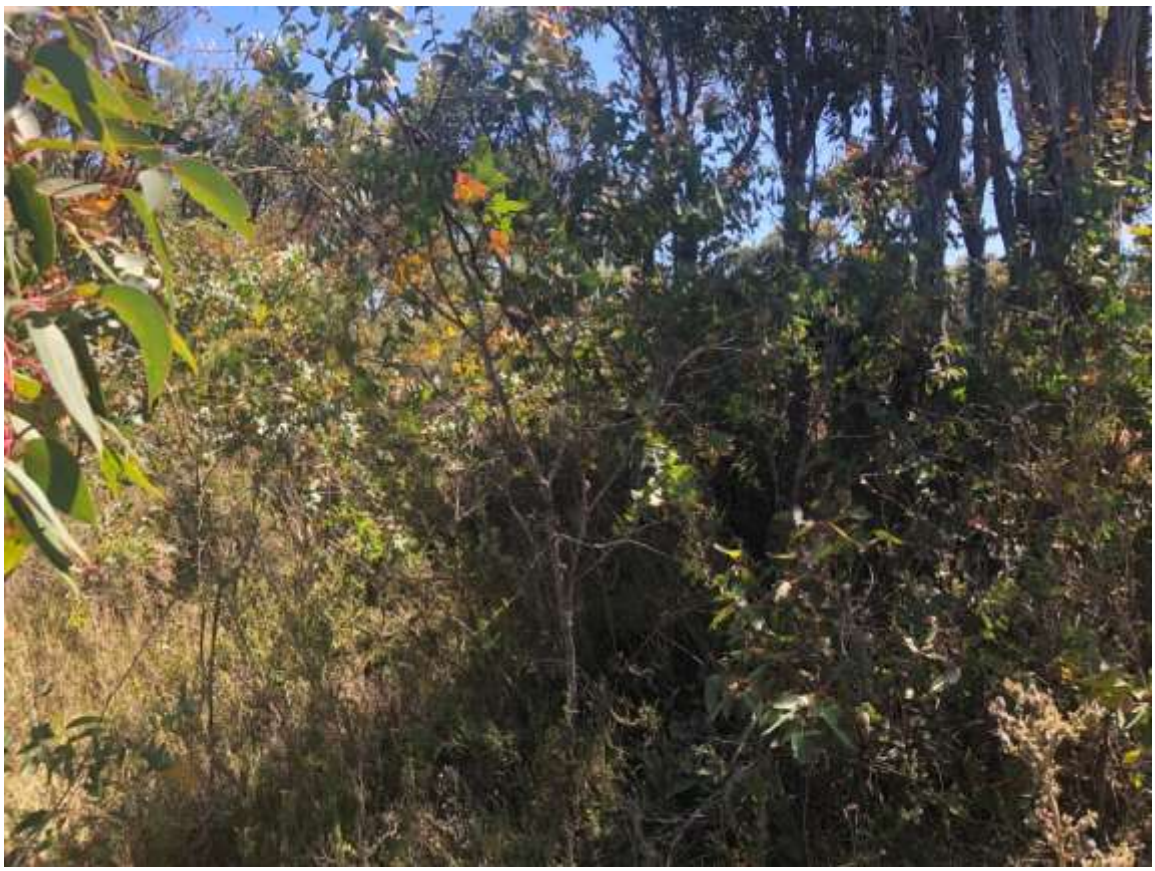
Key distinguishing features:

- Jarrah mallee stratum is present.
- Sheoak present as low woodland to emergent tree stratum.
- *Hakea ferruginea* occurs as dominant shrub in the >2 m stratum as a dense (closed heath) stratum
- Highly diverse and variable shrub strata

Floristic Summary

Lifeform	%cover	Species
Trees <10-	<5-30	*Allocasuarina fraseriana*
Mallees <8m	30-70	*Eucalyptus marginata*
Shrubs >2m	10-70	*Hakea ferruginea,*
Shrubs 1-2m	30-70	*Agonis theiformis, Taxandria parviceps, Isopogon formosus, Choretrum lateriflorum, Hakea ruscifolia*
Shrubs <0.5-1m	10-30	*Allocasuarina humilis, Hakea ceratophylla, Banksia sphaerocarpa* var. *sphaerocarpa, Daviesia flexuosa, Xanthorrhoea platyphylla, Astartea glomerulosa, Lysinema cilliatum, Comesperma confertum, Sphaerolobium*

		vimineum, Pimelea sulphurea, Pimelea anguistfolia, Hakea corymbosa, Cryptandra lateriflorum, Leucopogon glabellus, Styphelia concinna, Verticordia habrantha, Gompholobium venustum, Gompholobium polymorphum, Boronia spathulata, Isopogon sphaerocephalus
Shrubs <0.5 m	10-30	*Pericalymma ellipticum, Hovea trisperma, Hibbertia gracilipes, Synaphea polymorpha, Synaphea favosa, Leucopogon glabellus, Grevillea fasciculata, Banksia arctotidis, Leucopogon gibbosus, Andersonia caerulea, Melaleuca thymoides, Beaufortia anisandra, Darwinia diosmoides, Billardiera variifolia, Cryptandra nutans, Bossiaea rufa, Banksia gardneri, Burchardia congesta, Drosera fibriata, Acacia varia* var. *parviflora, Daviesia preissii*
Sedges	30-100	*Mesomylaena tetragona, Tricostularia davisii, Hypolaena exsulca, Platychorda applanata, Morelotia octandra, Loxocarya cinerea, Desmocladus fasciculatus, Cyathochaeta avenacea, Lepidosperma* sp. aff. *squamatum, Netrostylis* sp. Jarrah Forest
Herbs	2-30	*Scaevola striata, Lomandra nutans, Dampiera leptoclada, Stylidium hirsutum, Conostylis aculeata, Drosera menziesii, Xanthosia singuliflora, Dasypogon bromeliifolius, Thelymitra crinita, Agrostocrinum hirsutum, Stylidium repens, Stylidium acuminatum* subsp. *meridionale, Dampiera alata*
Grasses	<5-10	*Austrostipa variabilis, Rytidosperma caespitosum*



Unit 2

Appendix 6: Site data (from relevés)

SITE 1 DATE 16/11/2022 RECORDER W. Bradshaw

LATITUDE: S 34.76963 LONGITUDE: E 117.70365

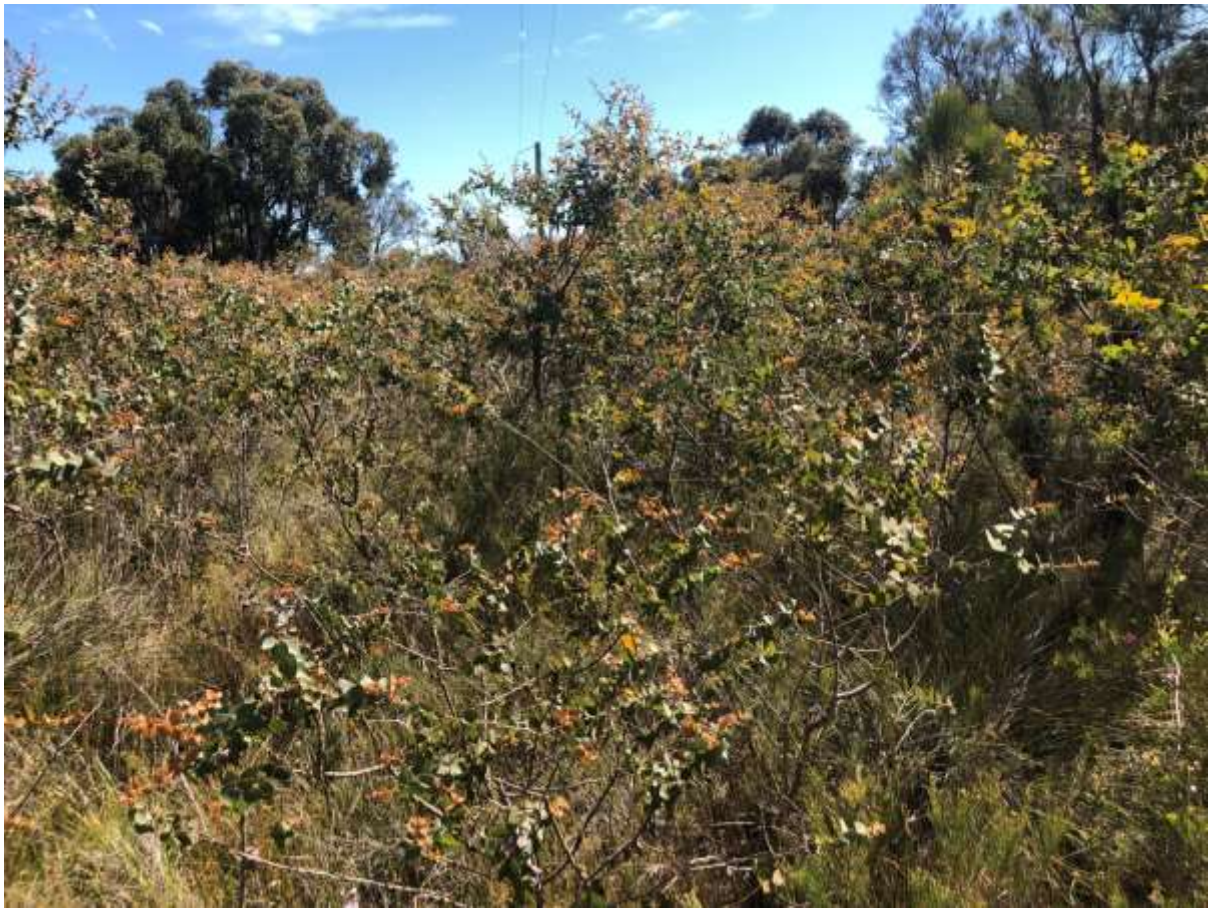
LOCATION West side of Newman Rd, Narrikup

VEGETATION TYPE *Hakea ferruginea* closed heath with emergent *Allocasuarina fraseriana* and Jarrah mallee

LANDFORM Flat SLOPE Flat GEOLOGY Laterite
ROCKS 0% SOIL TYPE Sandy clay loam SOIL COLOUR Grey-brown
HYDROLOGY Poor drainage CONDITION Pristine

VEG LAYER	**% COVER**	**SPECIES (Bold = dominant)**
Trees <10m	<5	***Alocasuarina fraseriana***
Mallees <8m	<5	***Eucalyptus marginata***
Shrubs 1-2m	70-100	***Hakea ferruginea*** *Isopogon formosus* *Taxandria parviceps* *Taxandria linearifolia*
Shrubs 0.5-1m	30-70	***Allocasuarina humilis*** *Sphaerolobium vimineum* *Lysinema ciliatum* *Astartea glomerulosa* *Comesperma confertum*
Shrubs <0.5m	10-30	***Hibbertia gracilipes*** *Daviesia flexuosa* *Pericalymma ellipticum* *Synaphea favosa* *Leucopogon glabellus* *Grevillea fasciculata* *Hovea trisperma* *Banskia arctotidis* *Synaphea polymorpha*
Sedges	70-100	***Tricostularia davisii*** *Lepidosperma* sp. aff. *squamatum* *Loxocarya cinerea* *Hypolaena exsculca* *Desmocladus fasciculatus* *Machaerina juncea* *Mesomylaena tetragona* *Cyathochaeta avenacea*
Herbs	2-10	***Lomandra nutans*** *Conostylis aculeata* *Dampiera leptoclada* *Drosera verrrucata* *Drosera menziesii* *Xanthosia singuliflora*

		Stylidium hirsutum
Grasses	e	***Austrostipa variabilis***
		Rytidosperma caespitosum



Site 1

SITE 2 DATE 16/11/2022 RECORDER W. Bradshaw

LATITUDE: S 34.76925 LONGITUDE: E 117.70356

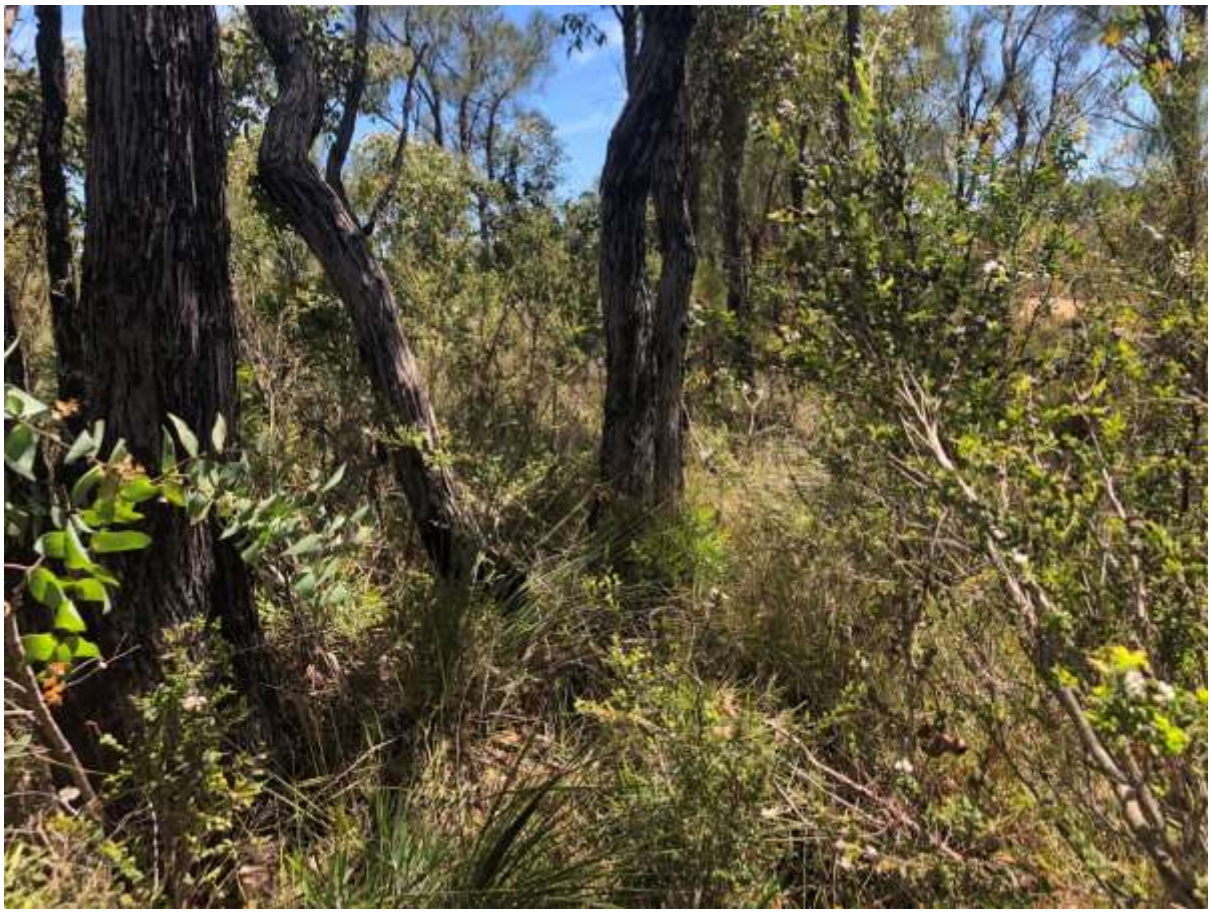
LOCATION West side of Newman Rd, Narrikup

VEGETATION TYPE *Allocasuarina fraseriana* low woodland/Jarrah mallee over *Hakea ferruginea* tall shrubland

LANDFORM Flat SLOPE Gentle GEOLOGY Laterite
ROCKS 0% SOIL TYPE Sand SOIL COLOUR Grey
HYDROLOGY Good drainage CONDITION Pristine

VEG LAYER	**% COVER**	**SPECIES (Bold = dominant)**
Trees <10 m	10-30	***Allocasuarina fraseriana***
Mallees <8m	30-70	***Eucalyptus marginata***
Shrubs >2m	10-30	***Hakea ferruginea***
Shrubs 1-2m	10-30	***Agonis theiformis*** *Allocasuarina humilis* *Choretrum lateriflorum*
Shrubs 0.5-1	10-30	***Hakea corymbosa*** *Xanthorrhoea platyphylla* *Leucopogon glabellus* *Comesperma conferta* *Isopogon formosus* *Boronia spathulata* *Beaufortia anisandra*
Shrubs <0.5m	10-30	***Hakea ceratophylla*** ***Hibbertia gracilipes*** *Lysinema ciliatum* *Comesperma confertum* *Hovea trisperma* *Sphaerolobium vimineum* *Andersonia caerulea* *Banksia arctotidis* *Darwinia diosmoides* *Billardiera variifolia* *Acacia varia* var *parviflora* *Periclaymma ellipticum* *Grevillea fasciculata*
Sedges	30-70	***Loxocarya cinerea*** ***Tricostularia davisii*** *Lepidosperma* sp. aff. *squamatum* *Hypolaena exsulca* *Desmocladus fasciculatus* *Cyathochaeta avenacea* *Platychorda applanata*
Herbs	2-10	***Lomandra nutans*** *Conostylis aculeata* *Thelymitra crinita*

		Dampiera leptoclada *Agrostocrinum hirsutum* *Stylidium repens* *Stylidium menziesii* *Stylidium hirsutum*
Grasses	<5	***Austrostipa variabilis*** *Rytidosperma caespitosum*



Site 2

SITE 3 DATE 16/11/2022 RECORDER W. Bradshaw

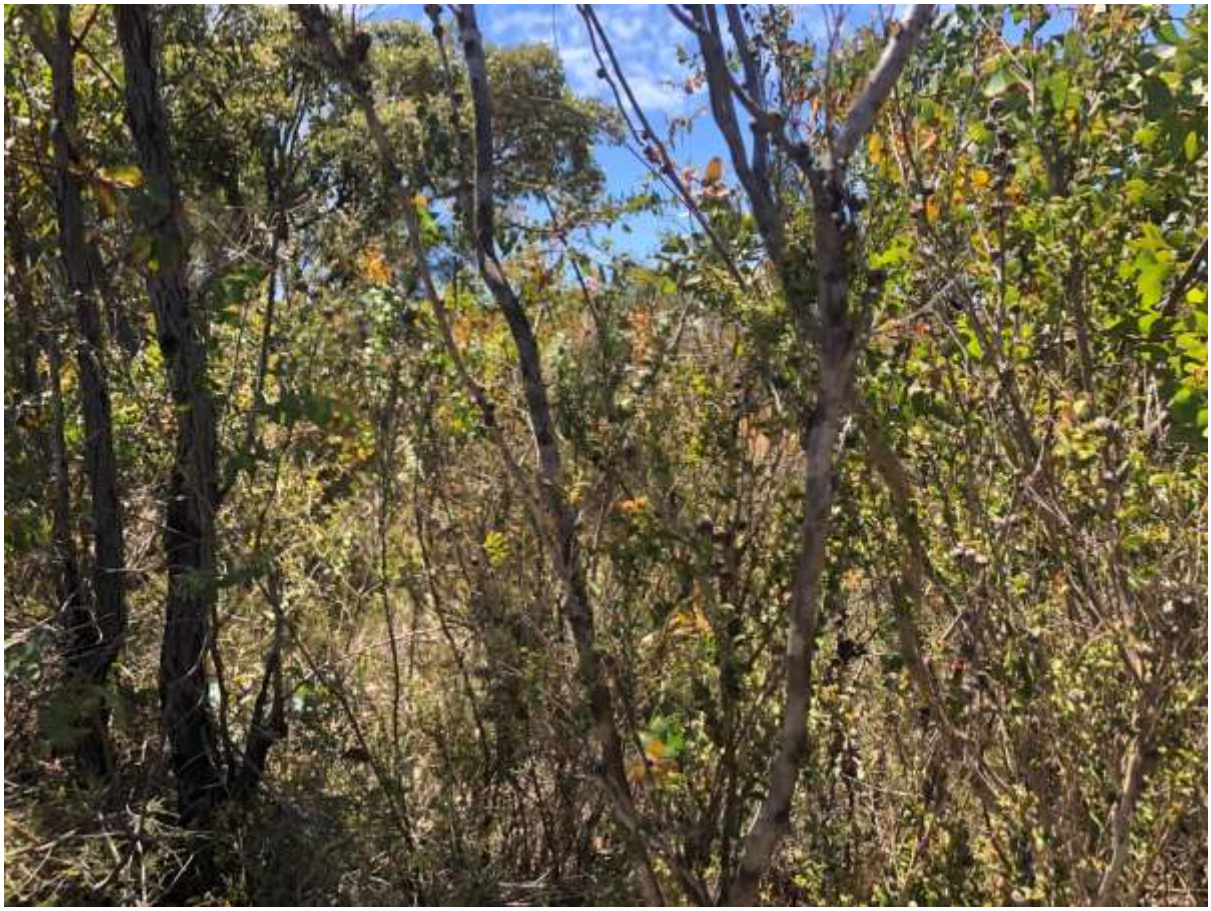
LATITUDE: S 34.76722 LONGITUDE: E 117.70322

LOCATION West side of Newman Rd, Narrikup

VEGETATION TYPE Jarrah mallee over *Hakea ferruginea* tall open scrub with emergent *Allocasuarina fraseriana*

LANDFORM Valley flat SLOPE Flat GEOLOGY Laterite
ROCKS 0% SOIL TYPE Sand SOIL COLOUR Grey
HYDROLOGY Good drainage CONDITION Pristine

VEG LAYER	**% COVER**	**SPECIES (Bold = dominant)**
Trees <10m	<5	***Allocasuarina fraseriana***
Mallees <8m	30-70	***Eucalyptus marginata***
Shrubs >2m	30-70	***Hakea ferruginea*** *Agonis theiformis*
Shrubs 1-2m	10-30	***Allocasuarina humilis*** *Pericalymma ellipticum* *Melaleuca thymoides*
Shrubs 0.5-1m	10-30	***Hakea ceratophylla*** *Leucopogon glabellus* *Lysinema ciliatum* *Daviesia preissii* *Xanthorrhoea platyphylla* *Styphelia concinna*
Shrubs <0.5m	10-30	***Astartea glomerulosa*** *Banksia arctotidis* *Verticordia habrantha* *Gompholobium venustum* *Gompholobium polymorphum*
Sedges	70-100	***Loxocarya cinerea*** *Desmocladus fasciculatus* *Lepidosperma* sp. aff. *squamatum* *Morelotia octandra* *Hypolaena exsulca* *Tricostularia davisii*
Herbs	<5	***Lomandra nutans*** *Dasypogon bromeliifolius* *Xanthosia singuliflora* *Dampiera leptoclada*
Grasses	2-10	***Austrostipa variabilis***



Site 3

SITE 4 DATE 22/11/2022 RECORDER W. Bradshaw

LATITUDE: S 34.76714 LONGITUDE: E 117.70324

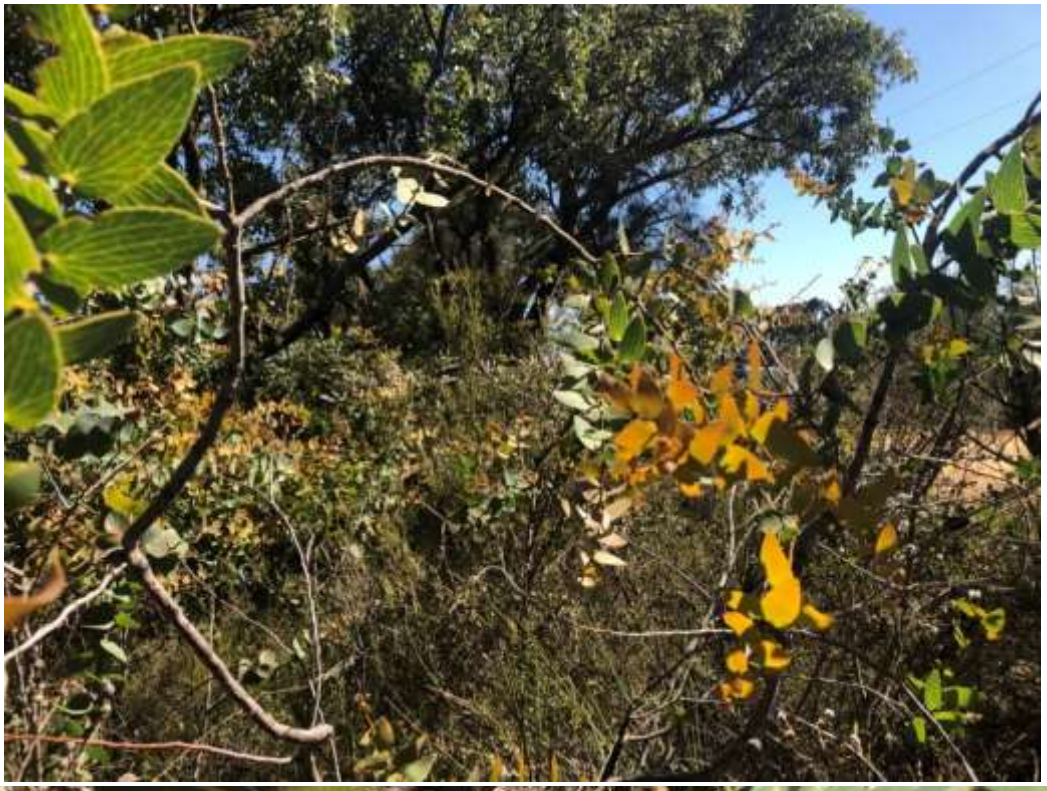
LOCATION West side of Newman Rd, Narrikup

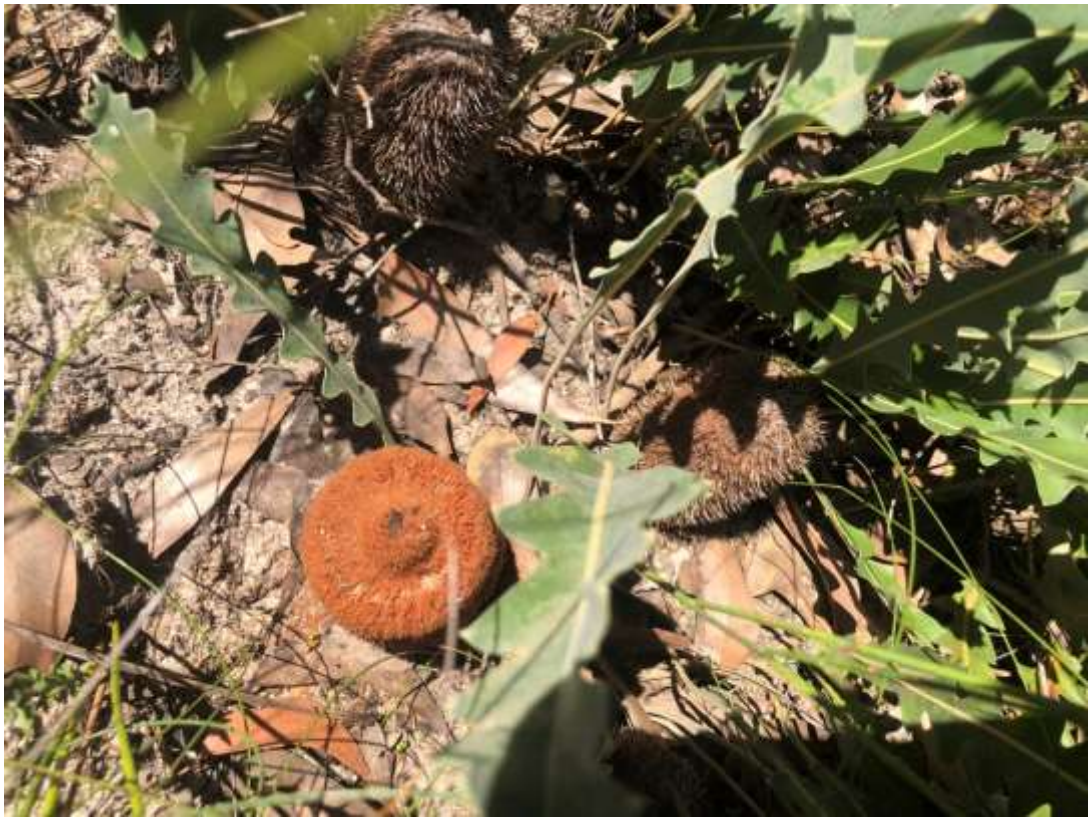
VEGETATION TYPE Jarrah mallee over *Hakea ferruginea* tall shrubland with emergent *Allocasuarina fraseriana*

LANDFORM Flat SLOPE Flat GEOLOGY Laterite
ROCKS 0% SOIL TYPE Sand SOIL COLOUR Light grey
HYDROLOGY Good drainage CONDITION Pristine

VEG LAYER	**% COVER**	**SPECIES (Bold = dominant)**
Trees <10m	<5	***Allocasuarina fraseriana***
Mallees <8m	30-70	***Eucalyptus marginata***
Shrubs >2m	30-70	***Hakea ferruginea***
Shrubs 1-2m	30-70	***Agonis theiformis***
Shrubs 0.5-1m	10-30	***Hakea ceratophylla*** *Banksia sphaerocarpa* var *sphaerocarpa* *Astartea glomerulosa* *Daviesia flexuosa* *Comesperma confertum* *Pimelea sulphurea* *Pimelea angustifolia* *Hakea corymbosa* *Cryptandra lateriflorum*
Shrubs <0.5m	10-30	***Leucopogon gibbosus*** *Hibbertia gracilipes* *Dampiera leptoclada* *Synaphea favosa* *Synaphea polymorpha* *Banksia arctotidis* *Andersonia caerulea* *Melaleuca thymoides* *Beaufortia anisandra*
Sedges	70-100	***Tricostularia davisii*** *Hypolaena exsulca* *Loxocarya cinerea* *Platychorda applanata* *Mesomylaena tetragona* *Netrostylis* sp. Jarrah Forest *Morelotia octandra* *Desmocladus fasciculatus* *Cyathochaeta avenacea*
Herbs	10-30	***Lomandra nutans*** *Dampiera leptoclada* *Conostylis aculeata* *Stylidium accuminatum* subsp. *meridionale*

		Dampiera alata *Scaevola striata*
Grasses	2-10	***Austrostipa variabilis*** ***Rytidosperma caespitosum***





Site 4 (Top and bottom) Banksia gardneri (bottom)

SITE 5 DATE 22/11/2022 RECORDER W. Bradshaw

LATITUDE: S 34.76812 LONGITUDE: E 117.70335

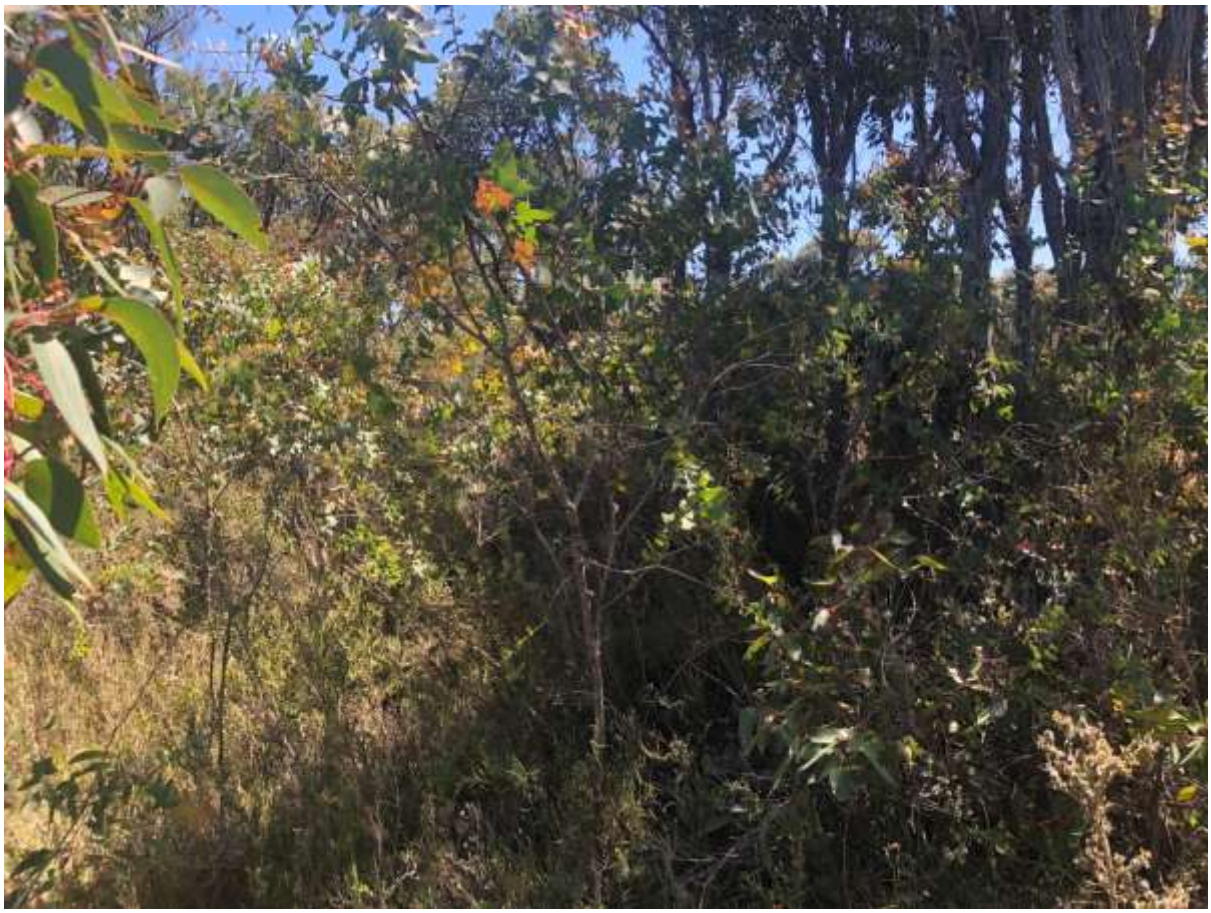
LOCATION West side of Newman Rd, Narrikup

VEGETATION TYPE Jarrah mallee over *Hakea ferruginea* tall shrubland with emergent *Allocasuarina fraseriana*

LANDFORM Flat SLOPE Flat GEOLOGY Laterite
ROCKS 0% SOIL TYPE Loamy sand SOIL COLOUR Light grey/brown
HYDROLOGY Good drainage CONDITION Pristine

VEG LAYER	**% COVER**	**SPECIES (Bold = dominant)**
Trees <10m	<5	***Allocasuarina fraseriana***
Mallees <8m	30-70	***Eucalyptus marginata***
Shrubs >2m	30-70	***Hakea ferruginea***
Shrubs 1-2m	30-70	***Agonis theiformis*** *Daviesia flexuosa* *Allocasuarina humlis* *Cryptandra nutans* *Hakea ruscifolia* *Taxandria parviceps*
Shrubs 0.5-1	30-70	***Melaleuca thymoides*** *Sphaerolobium vimineum* *Xanthorrhoea platyphylla* *Isopogon sphaerocephalus* *Isopogon formosus* *Bossiaea rufa* *Grevillea fasciculata* *Beaufortia anisandra* *Andersonia caerulea* *Hakea ceratophylla*
Shrubs <0.5m	10-30	***Banksia sphaerocarpa* var. *sphaerocarpa*** *Banksia gardneri* *Leucopogon gibbosus* *Synaphea polymorpha* *Gompholobium venustum* *Hibbertia gracilipes*
Sedges	30-70	***Tricostularia davisii*** ***Netrosylis* sp. Jarrah Forest** *Morelotia octandra* *Platychorda applanata* *Loxocarya cinerea* *Mesomylaena tetragona* *Desmocladus fasciculatus* *Lepidosperma* sp. aff. *squamatum*
Herbs	2-10	***Lomandra nutans*** *Xanthosia singuliflora* *Drosera menziesii*

		Stylidium accuminatum var. *meridionale* *Burchardia congesta* *Stylidium repens* *Dampiera leptoclada* *Drosera fimbriata*
Grasses	2-10	***Austrostipa variabilis*** ***Rytidosperma caespitosum***



Site 5

SITE 6 DATE 22/11/2022 RECORDER W. Bradshaw

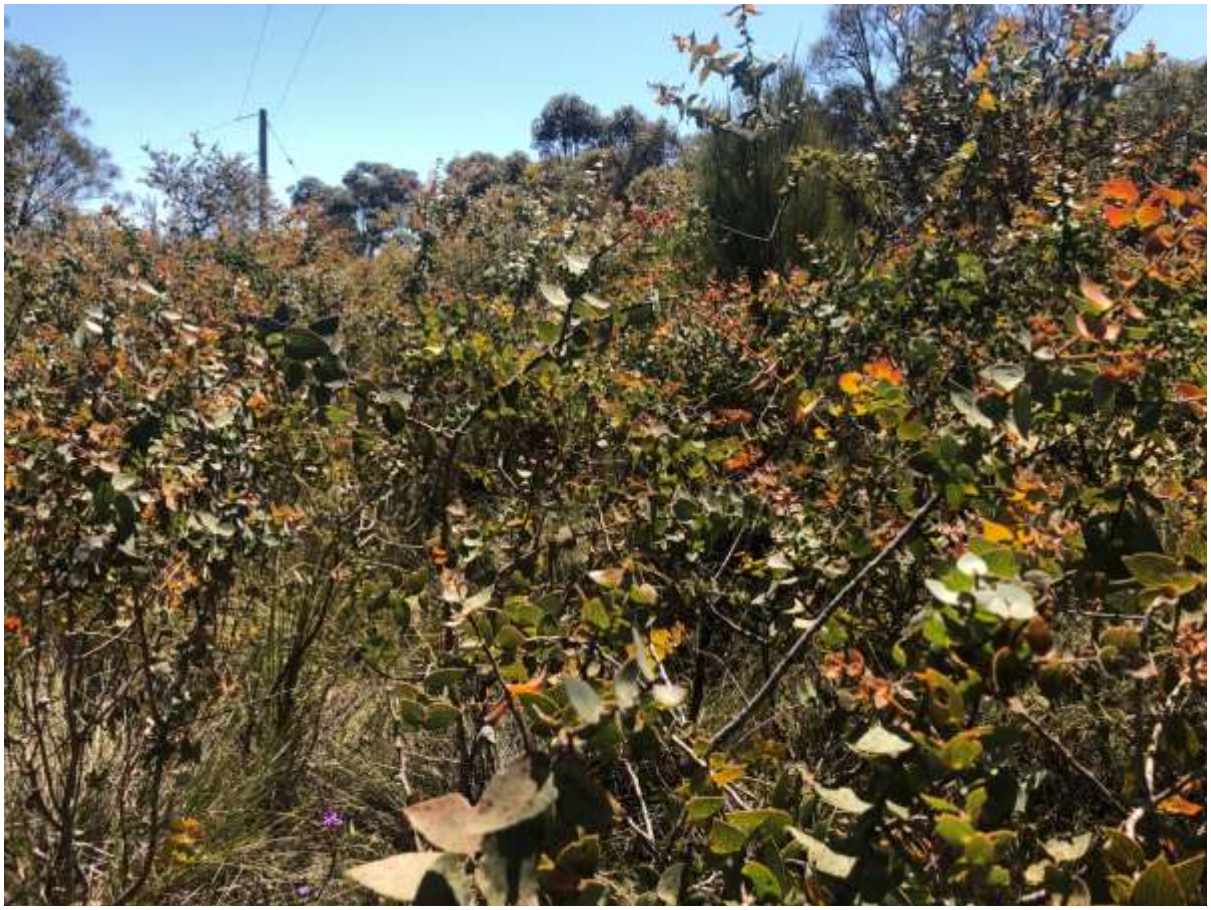
LATITUDE: S 34.76955 LONGITUDE: E 117.70358

LOCATION West side of Newman Rd, Narrikup

VEGETATION TYPE *Hakea ferruginea* closed heath with emergent *Allocasuarina fraseriana* and Jarrah mallee

LANDFORM Flat SLOPE Flat GEOLOGY Laterite
ROCKS 0% SOIL TYPE Sandy clay loam SOIL COLOUR Grey brown
HYDROLOGY Poor drainage CONDITION Pristine

VEG LAYER	**% COVER**	**SPECIES (Bold = dominant)**
Trees <10m	<5	***Allocasuarina fraseriana***
Mallees <8m	<5	***Eucalyptus marginata***
Shrubs 1>2m	70-100	***Hakea ferruginea*** *Taxandria parviceps*
Shrubs 0.5-1	10-30	***Agonis theiformis*** *Xanthorrhoea platyphylla* *Astartea glomerulosa* *Comesperma confertum* *Lysinema ciliatum*
Shrubs <0.5m	10-30	***Pericalymma ellipticum*** *Hovea trisperma* *Hibbertia gracilipes* *Synaphea polymorpha*
Sedges	70-100	***Mesomylaena tetragona*** ***Tricostularia davisii*** *Hypolaena exsulca* *Platychorda applanata* *Machaerina juncea* *Loxocarya cinerea*
Herbs	2-10	***Scaevola stiata*** ***Dampiera leptoclada*** *Lomandra nutans* *Stylidium hirsutum*
Grasses	<5	***Austrostipa variabilis***



Site 6

Appendix 7: Floristics summary two-way table of site and species data

(**bold = dominant, P=pristine, LS = loamy sand)**

Landform	Flat					
Site (Releve) No.	1	6	2	3	4	5
Vegetation associations	Hfer	Hfer	Afra	Emar	Emar	Emar
Condition	P	P	P	P	P	P
Soil type	SCL	SCL	S	S	S	LS
Machaerina juncea	1	1				
Stylidium hirsutum	1	1	1			
Hovea trisperma	1	1	1			
Lysinema ciliatum	1	1	1	1		
Pericalymma ellipticum	1	1	1	1		
Allocasuarina fraseriana	**1**	**1**	**1**	**1**	**1**	**1**
Eucalyptus marginata	**1**	**1**	**1**	**1**	**1**	**1**
Hakea ferruginea	**1**	**1**	**1**	**1**	**1**	**1**
Tricosularia davisii	**1**	**1**	**1**	1	**1**	**1**
Loxocarya cinerea	1	1	**1**	**1**	1	1
Dampiera leptoclada	1	**1**	1	1	1	1
Austrostipa variabilis	**1**	**1**	**1**	**1**	**1**	**1**
Hypolaena exsculca	1	1	1	1	1	
Synaphea polymorpha	1	1			1	1
Lomandra nutans	**1**	1	**1**	**1**	**1**	**1**
Allocasuarina humilis	**1**		1	**1**		1
Hibbertia gracilipes	**1**	1	**1**		1	1
Agonis theiformis		**1**	**1**	1	**1**	**1**
Astartea glomerulosa	1	1		**1**	1	
Taxandria parviceps	1	1				1
Isopogon formosus	1		1			1
Mesomylaena tetragona	1	**1**			1	1
Comesperma confertum	1	1	1		1	
Sphaerolobium vimineum	1		1			1
Leucopogon glabellus	1		1	1		
Grevillea fasciculata	1		1			1
Banksia arctotidis	1		1	1	1	
Lepidospermum sp. aff squamatum	1		1	1		1
Desmocladus fasciculatus	1		1		1	1
Cyathochaeta avenacea	1		1		1	
Conostylis aculeata	1		1		1	
Drosera menziesii	1					1
Rytidosperma caespitosum	1		1		**1**	**1**
Xanthosia singuliflora	1			1		1
Synaphea favosa	1				1	
Daviesia flexuosa	1				1	1
Platychorda applanata		1			1	1
Scaevola striata		**1**			1	
Xanthorrhoea platyphylla		1	**1**	1		1
Hakea ceratophylla			**1**	**1**	**1**	1
Hakea corymbosa			**1**		1	
Beaufortia anisandra			1		1	1

Landform	Flat					
Site (Releve) No.	1	6	2	3	4	5
Vegetation associations	Hfer	Hfer	Afra	Emar	Emar	Emar
Condition	P	P	P	P	P	P
Soil type	SCL	SCL	S	S	S	LS
Andersonia caerulea			1		1	1
Stylidium repens			1			1
Melaleuca thymoides				1	1	**1**
Morelotia octandra				1	1	1
Banksia sphaerocarpa var. sphaerocarpa				1		**1**
Gompholobium venustum				1		1
Cryptandra nutans					1	1
Netrostylis sp. Jarrah Forest					1	**1**
Stylidium acuminata subsp. meridionale					1	1
Leucopogon gibbosus					**1**	1
Drosera verrucata	1					
Taxandria linearifolia	1					
Choretrum lateriflorum			1			
Darwinia diosmoides			1			
Billardiera variifolia			1			
Acacia varia var. parviflora			1			
Thelymitra crinita			1			
Agrostocrinum hirsutum			1			
Stylidium menziesii			1			
Boronia spathulata			1			
Gompholobium polymorphum				1		
Daviesia preissii				1		
Verticordia habrantha				1		
Dasypogon bromeliifolius				1		
Styphelia concinna				1		
Daviesia preissii				1		
Verticordia habrantha				1		
Gompholobium polymorphum				1		
Dasypogon bromeliifolius				1		
Dampiera alata					1	
Pimelia angustifolia					1	
Pimelia sulphurea					1	
Hakea ruscifolia						1
Isopogon sphaerocephalus						1
Bossiaea rufa						1
Banksia gardneri						1
Burcharida congesta						1
Drosera fimbriata						1
Total no. native species/relevé	38	30	43	36	41	48