

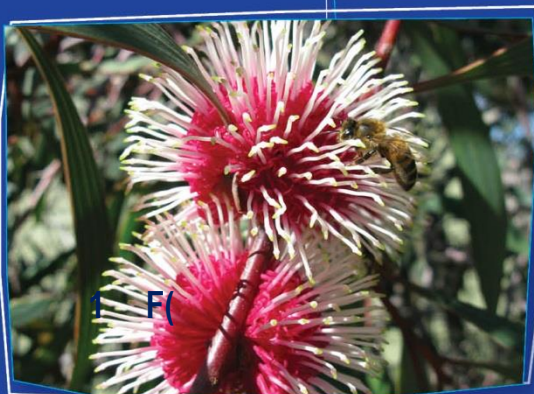
Vegetation, Flora, Fauna and Environmental Considerations, and Targeted Flora Report

Shire of Esperance Strategic Purpose Permit 2021/22
Site D – Coomalbidgup Road



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1 Executive Summary

This 'Vegetation, Flora, Fauna and Environmental Considerations and Targeted Flora Report' has been undertaken in accordance with the 'Environmental Protection Authority (EPA) Technical Guidance, Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment in Western Australia (2016)' as part of the application to the Department of Water and Environmental Regulations (DWER) to clear 3.436 ha of native vegetation for the purpose of gravel resheeting.

2 Introduction

The Shire of Esperance endeavors to maintain a high level of road safety, being proactive in identifying high risk road designs and progressively upgrading them. The Shire of Esperance manages the largest road network of any local government in Western Australia, encompassing a total of 4 593 km of road. The Shire of Esperance is submitting 'Site D – Coomalbidgup Road' project as Site D under the '2022 Strategic Purpose Permit' (Figure 1), for the purpose of gravel resheeting.

The proposed works are located ~60 km north west of Esperance, within the Shire of Esperance managed road reserve of Coomalbidgup Rd. Specifically, it is located from 0 to 9.9 km south of Griffith Rd, at straight line kilometre (SLK) 0.00 to 9.96 (Main Roads, 2021). A point within the proposed clearing permit area is -33.569790 S, 122.373358 E or 6285367.32 m N, 441840.42 mE (UTM Zone 51 H, GDA94).

Coomalbidgup road is classified as a Rural Access A road giving access to properties north of Cascade road. Traffic composition of up to 13% heavy vehicles during peak periods. Road design standard to be used is STD00023 (Appendix 8.2). In order to minimise clearing required it is believed that the desired improvement can be achieved by increasing the minimum cleared width through this section to 18m. To complete these works, native vegetation up to 1 m from the current road footprint on both sides of the road is required to be cleared, increasing the active road footprint to 18 m. To mitigate impact of clearing vegetation, where feasible clearing will not occur to the full permitted width, conserving vegetation.



Figure 1. Location of 'Site D – Coomalbidgup Road' project

3 Environmental Background

3.1 Scope

The removal of native vegetation to carry out gravel resheeting has the potential to affect a multiple environmental factors.

Possible impacts include;

- Threatened Flora (TF) and Priority Flora (PF).
- Threatened fauna, specifically, potential feeding, nesting and roosting habitat of endangered Carnaby's Black Cockatoo, *Calyptorhynchus latirostris*.
- Threatened Ecological communities (TEC) and Priority Ecological Communities (PEC), specifically the Environmental Protection and Biodiversity Conservation (EPBC) Act 1999 listed 'Proteaceae Dominated Kwongan Shrublands of the Southeast Coastal Floristic Province of Western Australia' (Kwongan) TEC.

Assessing these impacts involves two approaches; desktop study and field survey. The desktop study gathered background information on the target area. The field survey allows for detailed understanding of vegetation communities, targeted flora surveys for possible TF or PF, environmental condition, presence of PEC and TEC, and overall potential impact of clearing.

3.2 Catchment

'Site D – Coomalbidgup Road' is present within the Lort River catchment area. It is located approximately 40km from the coast where Stokes Inlet discharges to the ocean.

3.3 Climate

The Esperance climate is described as Mediterranean, characterised by cool wet winters and dry warm summers (BoM 2020). The area receives an average annual rainfall of 620 mm.

3.4 Geology

Three geological unit was identified within 'Site D – Coomalbidgup Road', by Schoknecht et al. (2004). It is described as:

- "Tertiary sediments with colluvium and alluvium deposits. Patches of granitic rock and Aeoli";
- "Tertiary marine sediments with aeolian carbonate rich deposits in places"; and
- "Tertiary marine sediments of the Pallinup formation".

3.5 Soils

Within 'Site D – Coomalbidgup Road', there has been three soil types recorded (Schnoknecht et al. 2004). These include:

- Young 1 Subsystem (Grey, shallow sandy duplex soils with associated deep, grey sandy duplex soils and other minor soils).
- Esperance 1 Subsystem (Grey, deep sandy duplex (gravelly) soils with associated pale deep sands and minor grey shallow sandy duplex soils).
- Scaddan 1 Subsystem (Alkaline grey shallow sandy duplex soils with associated pale deep sands and minor deep sandy duplexes, ironstone gravel soils).

3.6 Topography

The topography within 'Site D – Coomalbidgup Road' is mapped at a fine scale (Schnoknecht et al. 2004). The project transverses three topographic areas. These include:

- Level to gently undulating sandplain with sand sheets, internally drained to swamps externally via incipient saline drainage lines.
- Incised river valley with gently to moderately inclined slopes and narrow alluvial plain, some breakaway on upper slopes.
- Level to gently undulating plain with areas of gilgai microrelief. Drainage is generally poorly developed and usually internal.

3.7 Vegetation

'Site D – Coomalbidgup Road' is located on the boundary of two Interim Biogeographic Regionalisation for Australia (IBRA; Thackway & Cresswell 1995) regions; the Esperance Plains region (Esp2) of the Recherche sub-region and the Eastern Mallee (Mal01) region of the Mallee region.

The Esperance Plains region is described as "Proteaceae Scrub and Mallee heaths on sandplain overlying Eocene sediments, rich in endemics. Herbfields and heaths (rich in endemics) on abrupt granite and quartzite ranges that rise from the plain. Eucalyptus woodlands occur in gullies and alluvial foot-slopes".

The Eastern Mallee is described as "the south-eastern of Yilgarn Craton is gently undulating, with partially occluded drainage. Mainly Mallee over Myrtaceous-Proteaceous heaths on duplex (sand over clay) soils. Melaleuca shrublands characterize alluvia, and Halosarcia low shrublands occur on saline alluvium. A mosaic of mixed Eucalypt woodlands and Mallee occur on calcareous earth plans, and sandplains overlying the Eocene Limestone strata in the East. Semi-arid (dry) and warm mediterranean".

Beard (1973) mapped two vegetation associations (VA) within the ‘Site D – Coomalbidgup Road’ area. The majority of the site is within VA Esperance_47 defined as “Shrublands; tallerack mallee-heath” and there is a small area of VA Esperance_5048 defined as “Shrublands; banksia and lambertia scrub” (Table 1).

Table 1. Vegetation associations mapped by Beard (1973) within the ‘Site D – Coomalbidgup Road’, and statistics on pre-European remaining areas.

Nt. Acronyms used include Interim Biogeographic Regionalisation of Australia (IBRA), Eastern Mallee bioregion (Mal01), Esperance Plains bioregion (Esp2), local government area (LGA) and International Union of Conservation Nature (IUCN).

Vegetation Association		
Name	Esperance_47	Esperance_5048
Description	Shrublands; tallerack mallee-heath	Shrublands; banksia and lambertia scrub
Pre-European extent in IBRA subregion (%)	Esp2 subregion= 47.69% *Not located within Mal01 subregion	Mal01 subregion = 8.21% Esp2 subregion = 3.71%
Pre-European extent in LGA (%)	13.48%	3.72%
Current extent conserved in IUCN area (%)	17.68%	1.19%

3.8 Land use

The area directly included in the clearing permit application ‘Site D – Coomalbidgup Road’ is currently intact roadside vegetation. 4.2km at the north of the site is a 200m wide vegetated road reserve, 5.4km at the south of the site is a 100m wide vegetated road reserve managed by the Shire of Esperance. The current road footprint occupies between 16 and 20m. The surrounding land use is used for cropping and agricultural purposes. The area is within rural zoning.

4 Methodology

4.1 Desktop study

A desktop study was completed prior to any site visit. Geographical Information System (GIS) review existing

- Existing site digital orthophotos, as sourced from LandGate (Stokes Inlet, February 2018 and Lort, January 2015).
- Western Australian Local Government Association’s (WALGA) ‘Local Government Mapping (LGMap 2021)’ program was used to assess spatial information of geology, topography, soil profiles, native and planted vegetation, water bodies and Interim Biogeographical Regionalisation for Australia (IBRA; Thackway & Cresswell 1995) classification system
- Data provided by Department of Biodiversity, Conservation and Attractions (DBCA) and Western Australian Herbarium in July/August 2021 was used to assess threatened flora (TF),

priority flora (PF), and threatened (TEC) and priority (PEC) ecological communities within 20 km radius of the site. Specifically, spatial data included;

- WAHerb extract (DBCA 2021f).
- Threatened and Priority Reporting (TPFL; DBCA 2021d).
- Esperance District Threatened Flora (DBCA 2021a).
- TEC and PEC 'Likely to Occur' buffer and boundary areas (DBCA 2021e).
- Department of Agriculture, Water and the Environment Protected Matters Search Tool
- Index of Biodiversity Surveys for Assessment (IBSA).
- To assess fauna, the following databases were searched with a 20km buffer from the center of the site (-33.569790 S, 122.373358 E);
 - Department of Biodiversity, Conservation and Attractions (DBCA) and Western Australian Museum (WAM) NatureMap data portal
 - DBCA Threatened and Priority Fauna database
 - BirdLife Australia's Atlas and Birddata datasets
 - Department of Agriculture, Water and the Environment Protected Matters Search Tool
 - Atlas of Living Australia database
 - Index of Biodiversity Surveys for Assessment (IBSA).

4.2 Field investigation: possible ecological impacts

The site was surveyed on 21, 23 and 24 September 2021, by Julie Waters and Katherine Walkerden the Shire of Esperance's Environmental Coordinator and Environmental Officer. An assessment of possible ecological impacts included historical clearing, artificial water way constructions, impact of fire regimes, regeneration from disturbance, waterlogging, senescence, weeds, erosion, sedimentation, invasive fauna, *Phytophthora cinnamomi* Dieback, and illegal dumping of rubbish.

Vegetation community was also assessed during the field survey. Broad vegetation types defined by structure and composition were recorded and described. Additionally, possible environmentally sensitive areas, such as wetlands or granite, were noted. Overall, an assessment of environmental impacts to Department of Water and Environmental Regulation's (DWER) biodiversity values were inspected and valued.

Condition of vegetation was assessed on 8/11/2021 using Keighery (1994) categories, as 'Excellent', 'Very Good', 'Good', 'Degraded' or 'Completely Degraded'. This illustrates how healthy vegetation is, determined by number of dead or dying plants, weed cover and other forms of degradation.

Only a very basic fauna survey was conducted as per EPA (2020) guidelines. Observations of fauna presence, such as call sounds, footprints and scats were also noted, and the area assessed for suitability of endangered Carnaby's Black Cockatoo (*Calyptorhynchus latirostris*) feeding, roosting and nesting habitat. Additionally, species that corresponded with suitable habitat within 'Site D – Coomalbidgup Road' identified in the desktop 20 km radius search were assessed, including Common Greenshank and Hooded Plover.

4.3 Field investigation: Assessing Threatened and Priority Ecological Communities

The vegetation community of 'Site D – Coomalbidgup Road' was assessed for the presence a TEC or PEC (DBCA 2018, 2021X), specifically the Environmental Protection and Biodiversity Conservation Act 1999 listed 'Proteaceae Dominated Kwongkan Shrublands of the Southeast Coastal Floristic Province of Western Australia (Kwongkan)' TEC. The presence of Kwongkan was identified using diagnostic characteristics defined in the 'Approved Conservation Advice for Kwongkan (Commonwealth of Australia, 2014)' as;

- 2a) Characterised by Proteaceae species having 30% or greater cover of Proteaceae species across all layers where these shrubs occur (crowns measured as if they are opaque).
And/or
2b) Two or more diagnostic Proteaceae species are present that are likely to form a significant vegetative component when regenerated.

PEC's do not have published approved conservation advice. Comparison of the vegetation community occurred using 'Priority Ecological Communities for Western Australia Version 32 (DBCA 2021b)' definitions.

4.4 Field Investigation: Targeted flora survey

The targeted flora survey was undertaken following the Environmental Protection Authority's (EPA) 'Technical Guidance, Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment in Western Australia (2016)'. The entirety of the proposed impact area was surveyed on foot in mid-spring, over 3 days between 21/09/2021 and 24/09/2021 by Julie Waters and Katherine Walkerden, Shire of Esperance's Environmental Coordinator and Environmental Officer. Due to the timing, the majority of species were flowering, decreasing the likelihood of missing species. The road was used as a continuous transect. Vegetation up to 4 meters from the edge of the existing road's back-slope was assessed to accurately cover the 18 m width proposed clearing permit area. Suitable associated habitat for TF or PF identified in the desktop study were particularly focused on, and extensively searched. A follow up survey was conducted on 8/11/2021 to specifically map vegetation communities and condition.

Due to the high diversity and complexity of Esperance's flora, all species were recorded to compile an incidental species list (Appendix 8.1). All species unknown in the field were collected and identified exsitu, using keys, WA Herbarium's Florabase (DBCA 2021c), manuals and Esperance District Herbarium, to ensure no TF or PF were missed. Material was collected under Julie Waters' and Katherine Walkerden's Regulation 61, Biodiversity Conservation Regulations 2018 Licences for Flora Taking, FT61000787 and FT61000788. Plants were identified by Julie Waters, Katherine Walkerden and Mary Hoggart. Any species that were unable to be identified were submitted to the WA Herbarium for identification.

Those PF or TF species identified in the desktop survey as possible to occur, surveyors familiarized themselves with them by visiting known populations first or taking scans of pressed specimens from the local Esperance District Herbarium and/or photos into the field. Any flora thought to be TF or PF was formally collected, counted and mapped using a Panasonic FS-G1 Toughpad with the program ROAM or a GPS Garmin GPS64. Specimens were then lodged with the WA Herbarium for formal verification. When PF were confirmed, TPFL forms were completed and submitted to the DBCA's District Conservation Officer, and Species and Communities Branch.

5 Results and Discussion

5.1 Ecological Impact

5.1.1 Vegetation Communities

Nine vegetation communities were identified within the 'Site D – Coomalbidgup Road', as defined by structure and composition (Table 2). The incidental flora list identified a total of 265 native species across all vegetation communities and an additional 18 non-native plants. It is believed that the Beard (1973) vegetation associations identified in Section 3.7 are an appropriate match for all nine vegetation

types observed.

Table 2. Vegetation communities identified within proposed 'Site D – Coomalbidgup Road' project area.

Type	Description	Figure	Closest Matching Beard Vegetation Association	Area to be cleared (ha)
A	<i>Nutysia floribunda</i> , <i>Lambertia inermis</i> and <i>Acacia cyclops</i> over mixed shrubland	5	VA 5048, Shrublands; banksia and lambertia scrub-heath in the Esperence Plains Region	0.360
B	<i>Melaleuca cuticularis</i> woodland and low samphire wetland	6	VA 41, Shrublands; teatree scrub	0.018
C	Scattered <i>Eucalyptus pleurocarpa</i> over <i>Banksia armata</i> dominated mixed low shrubland	7	VA 5048, Shrublands; banksia and lambertia scrub-heath in the Esperence Plains Region	0.152
D	Yate (<i>Eucalyptus occidentalis</i>) swamp with <i>Melaleuca</i> understory with surrounding <i>Calothamnus quadrifidus</i>	8	VA 931, Medium woodland; yate	0.173
E	Scattered <i>Melaleuca cuticularis</i> and <i>M. brevifolia</i> salt lake fringe dominated by Samphires	9	VA 41, Shrublands; teatree scrub	0.010
F	Closed mixed Mallee over <i>Melaleuca</i> with <i>Banksia media</i>	10	VA 516, Shrublands; mallee scrub, black marlock	0.828
G	Closed mixed Mallee over <i>Melaleuca</i>	11	VA 519, Shrublands; mallee scrub, <i>Eucalyptus eremophila</i>	0.875
H	<i>Eucalyptus platypus</i> closed woodland	12	VA 929, Low forest; moort (<i>Eucalyptus platypus</i>)	0.117
I	Tallerack and Mallee over mixed shrubland	13	VA 47, Shrublands; tallerack mallee-heath	0.902



Figure 2. Vegetation types A – I, within the 'Site D – Coomalbidgup Road' area, from SLK 0.00 km to 4.46 km along Coomalbidgup Road.



Figure 3. Vegetation types A – I, within the ‘Site D – Coomalbidgup Road’ area, from SLK 4.46 km to 8.99 km along Coomalbidgup Road.

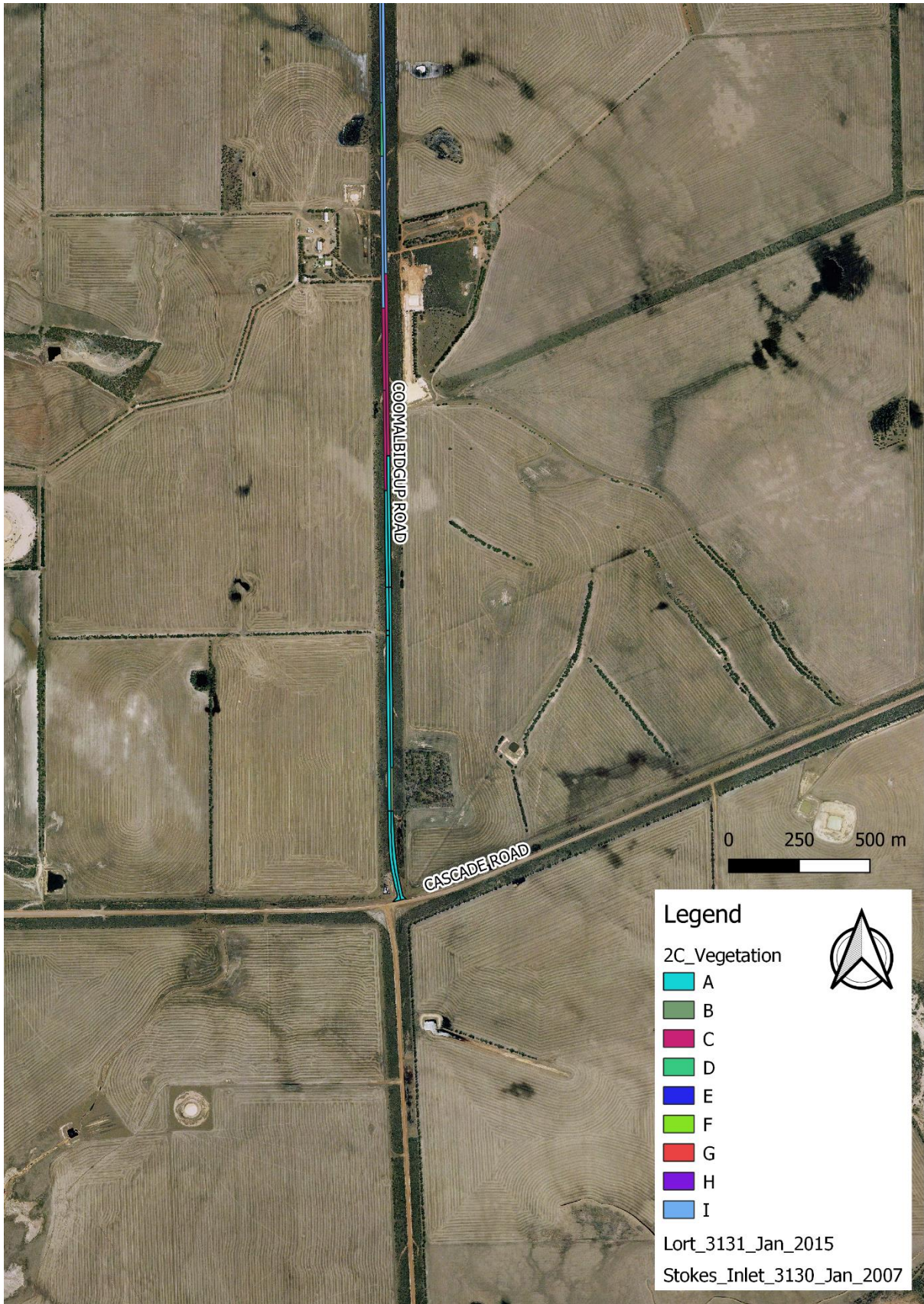


Figure 4. Vegetation types A – I, within the 'Site D – Coomalbidgup Road' area, from SLK 7.22 km to 9.94 km along Coomalbidgup Road.



Figure 5. Vegetation type A identified in 'Site D – Coomalbidgup Road' project, described as *Nutysia floribunda*, *Lambertia inermis* and *Acacia cyclops* shrubland over mixed shrubland.



Figure 6. Vegetation type B identified in 'Site D – Coomalbidgup Road' project, described as *Melaleuca cuticularis* woodland and low samphire wetland.



Figure 7. Vegetation type C identified in 'Site D – Coomalbidgup Road' project, described as Scattered *Eucalyptus pleurocarpa* over *Banksia armata* dominated mixed low shrubland.



Figure 8. Vegetation type D identified in 'Site D – Coomalbidgup Road' project, described as Yate (*Eucalyptus occidentalis*) swamp with *Melaleuca* understory with surrounding *Calothamnus quadrifidus*



Figure 9. Vegetation type E identified in 'Site D – Coomalbidgup Road' project, described as Scattered *Melaleuca cuticularis* and *M. brevifolia* salt lake fringe dominated by Samphires



Figure 10. Vegetation type F identified in 'Site D – Coomalbidgup Road' project, described as Closed mixed Mallee over Melaleuca with *Banksia media*.



Figure 11. Vegetation type G identified in 'Site D – Coomalbidgup Road' project, described as Closed mixed Mallee over Melaleuca.



Figure 12. Vegetation type H identified in 'Site D – Coomalbidgup Road' project, described as *Eucalyptus platypus* closed woodland.



Figure 13. Vegetation type I identified in 'Site D – Coomalbidgup Road' project, described as Tallerack and Mallee over mixed shrubland.

5.2 Vegetation Condition

The southern section of the site was highly variable in its vegetation condition ranging from excellent to degraded (Figure 16), the site contained historical gravel pits which were never rehabilitated and had a high weed burden. The narrowness of the road reserve in the southern half of the project likely allowed for easier invasion of weeds from neighbouring pastures. The northern section was almost exclusively in excellent condition with only minor weed invasion, there was however one historical gravel pit that had never been rehabilitated. Prior fire events were not visible and no historic fires were listed for the area. There was no significant rubbish dumping but the carcasses of several foxes had been dumped on the roadside.

Overall, 18 invasive species were identified within the project area (Appendix 8.1). Of these, the most extensive of these weeds were the grasses with *Secale cereale*, *Lolium* sp., and *Ehrharta calycina* being major problems in the southern sections of the road reserve. A major concern was the invasive eastern states wattle species (mostly *Acacia pycnantha*) that were planted around a property driveway and were now self-seeding and extending into roadside vegetation. Ideally, regular wash downs during the course of works to remove weed seeds or follow up herbicide control of invasive species needs to occur. However, this will be extremely expensive to employ contractors and mobilise equipment, which may not be feasible with given budgets.

Quantifying vegetation condition, there is:

- 0.002 ha of vegetation within a 3.436 ha footprint (0.05%) is in Degraded condition,
- 0.109 ha of vegetation within a 3.436 ha footprint (3.17%) is in Good condition,
- 0.216 ha of vegetation within a 3.436 ha footprint (6.29%) is in Very Good condition,
- 3.115 ha of vegetation within a 3.436 ha footprint (90.66%) is in Excellent condition,



Figure 14. Vegetation condition across 'Site D – Coomalbidgup Road' project from 0.00 km SLK to 4.38 km SLK, ranging from good to excellent condition.



Figure 15. Vegetation condition across 'Site D – Coomalbidgup Road' project from 4.38 km SLK to, 8.94 km SLK ranging from very good to excellent condition.



Figure 16. Vegetation condition across 'Site D – Coomalbidgup Road' project from 7.85 km SLK to 9.94 km SLK, ranging from degraded to excellent condition.

5.3 *Phytophthora* Dieback

Dieback Information Delivery and Management System (DIDMS; GAIA Resources, SCNRM & State NRM 2021) data shows no positive or negative *Phytophthora cinnamomi* or other *Phytophthora* sp. Dieback sample results in the immediate area. Vegetation types A, C, D and I contain species susceptible to Dieback. There were no visible signs of dieback observed during the flora survey.

Based on Dieback Management Plans prepared for Shire of Esperance road construction and management projects. Proposed works will be conducted using appropriate hygiene measures to limit spreading of the disease, including clearing in dry conditions and clean down of vehicles and machinery before entering the site. However, there is always a possibility that proposed works could introduce *P. cinnamomi* dieback to Coomalbidgup road.

5.4 Threatened and Priority Ecological Communities

The desktop study identified the Environmental Protection and Biodiversity Conservation (EPBC) Act 1999 listed threatened ecological community (TEC) 'Proteaceae Dominated Kwongkan Shrublands of the Southeast Coastal Floristic Province of Western Australia (Kwongkan)' as occurring within 'Site D – Coomalbidgup Road' project area. No other TEC's were identified by the desktop study as being within 'Site D – Coomalbidgup Road' or within a 20 km buffer of the site'.

Vegetation Type C 'Scattered *Eucalyptus pleurocarpa* over *Banksia armata* dominated mixed low shrubland' is considered to be the TEC 'Proteaceae Dominated Kwongkan Shrublands of the Southeast Coastal Floristic Province of Western Australia (Kwongkan)'. Vegetation types A and I did not meet the 30% proteaceous cover thresholds to be considered Kwongkan TEC.

The vegetation community described as 'Swamp Yate (*Eucalyptus occidentalis*) woodlands in seasonally inundated clay basins (South Coast)' is listed as a Priority 3 PEC (DBCA 2021b). Within the 'Site D – Coomalbidgup Road' project area, vegetation type D described as 'Yate (*Eucalyptus occidentalis*) swamp with *Melaleuca* understory with surrounding *Calothamnus quadrifidus*' met this criteria. 5.03% (0.173 ha) is considered likely to be this PEC.

Table 3. Vegetation to be cleared by TEC & PEC broken down by vegetation condition

TEC/PEC	TEC Total	TEC Excellent Condition	TEC Very Good Condition
Kwongkan TEC	0.157 ha	0.138 ha	0.019
Yate Swamp PEC	0.173 ha	0.140 ha	0.033

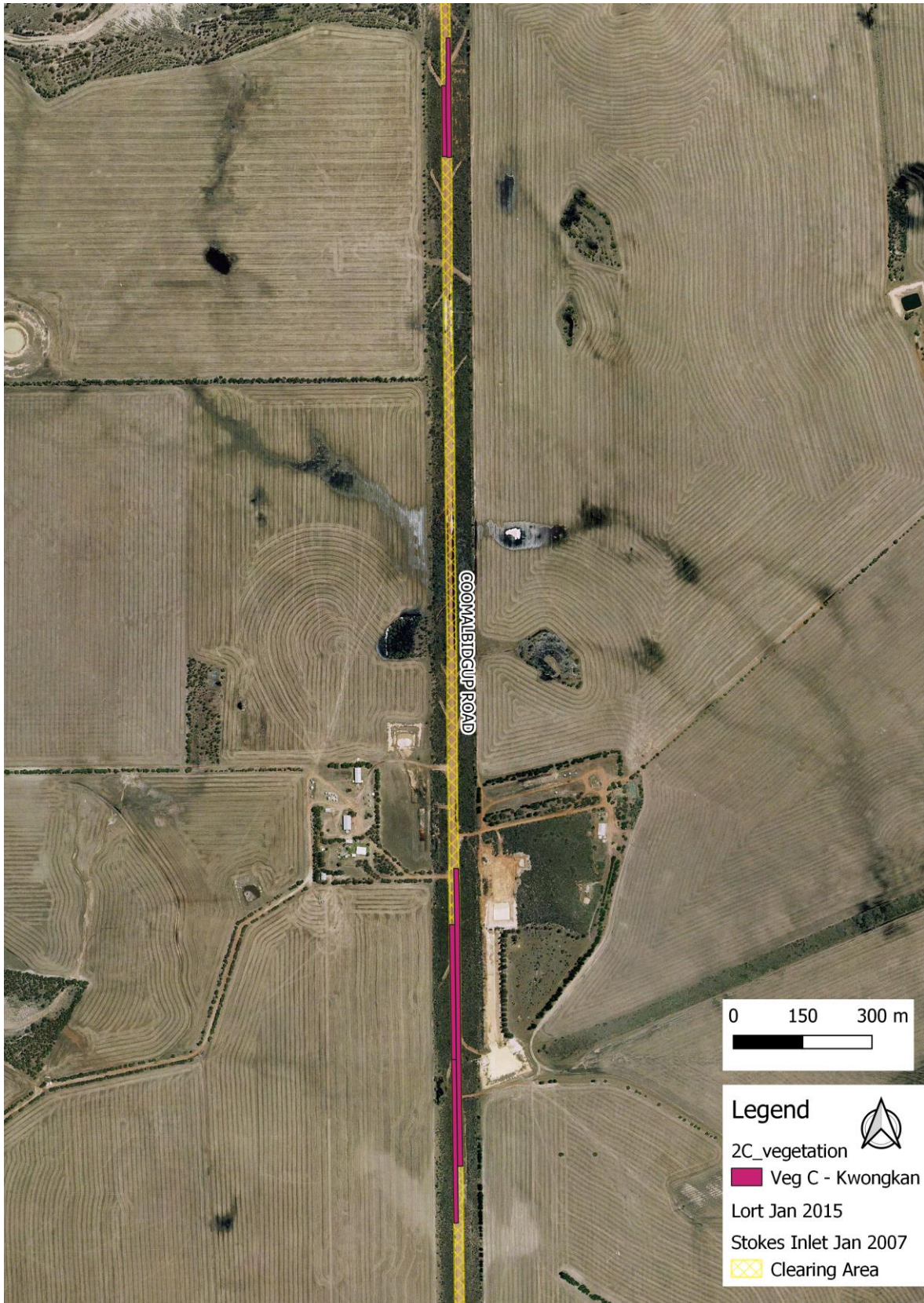


Figure 18. The vegetation community of 'Scattered *Eucalyptus pleurocarpa* over *Banksia armata* dominated mixed low shrubland' in excellent and very good condition met Threatened Ecological Community (TEC) 'Proteaceae Dominated Kwongkan Shrublands of the Southeast Coastal Floristic Province of Western Australia (Kwongkan' within 'Site D -Coomalbidgup Road' project.

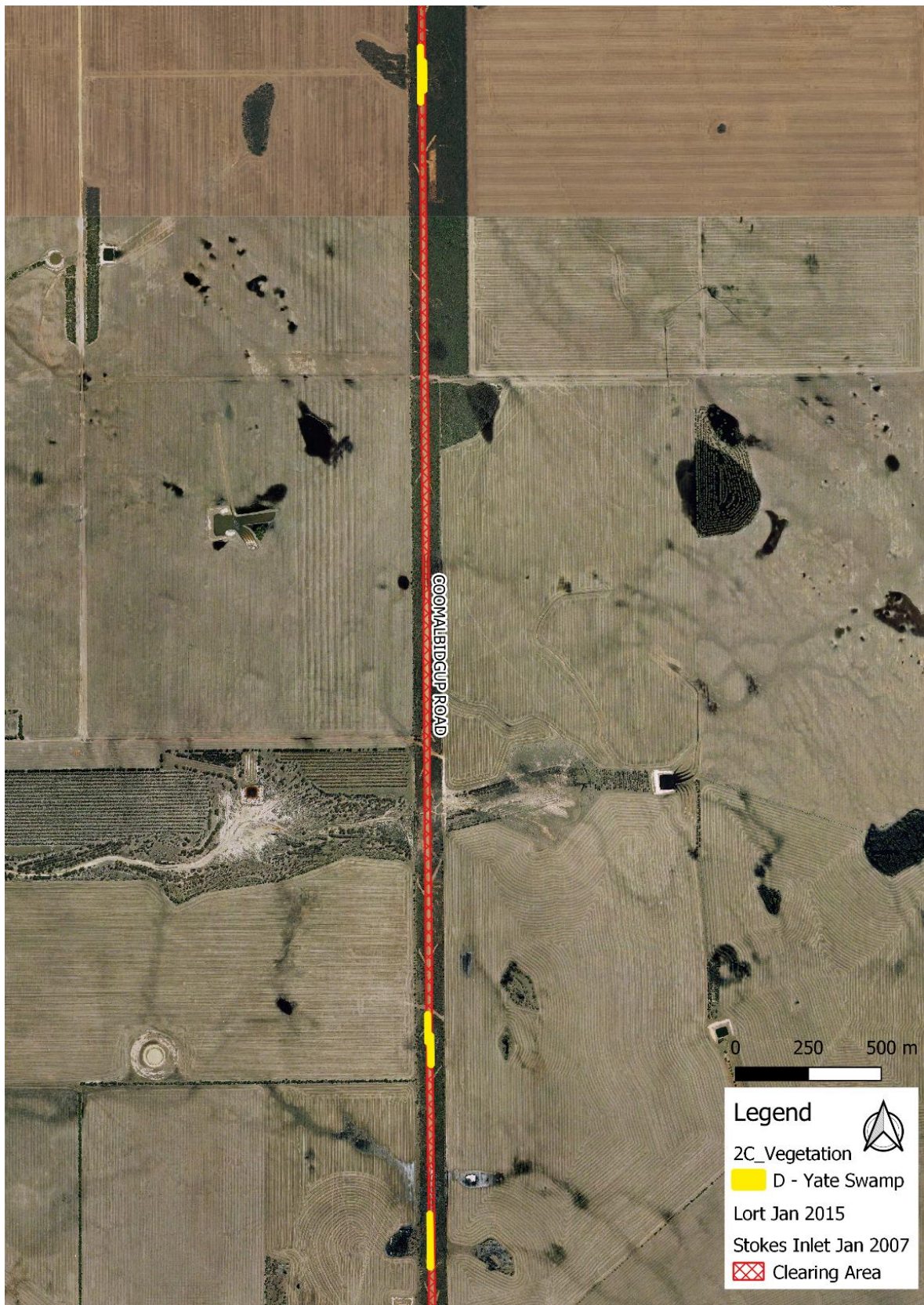


Figure 19. Vegetation communities of 'Yate (*Eucalyptus occidentalis*) swamp with *Melaleuca* understory with surrounding *Calothamnus quadrifidus*' in excellent condition met the definition of Priority 3 Ecological Community (PEC) 'Swamp Yate (*Eucalyptus occidentalis*) woodlands in seasonally inundated clay basins (South Coast)' within 'Site D - Coomalbidgup Road' project.

5.5 Threatened and Priority Flora

2 threatened flora (TF) and 35 priority flora (PF) were recorded within a 20 km radius of the proposed impact site (Table 3; DBCA 2021a, DBCA 2021d, DBCA 2021f). Of these, 28 PF species had suitable known associated habitat that corresponded with vegetation communities and soil type of 'Site D – Coomalbidgup Road' project. There were no known populations, of threatened or priority flora directly located within the clearing permit area.

Table 4. Threatened or priority flora identified by the desktop study to be present within a 20 km radius of 'Site D – Coomalbidgup Road' project area, using Threatened and Priority Flora Reporting (TPFL; DBCA 2021d), WA Herbarium (DBCA 2021f) and Esperance District Threatened Flora (DBCA 2021a). Nt. Acronyms used in the table include priority flora (P), threatened flora (TF), Biodiversity Conservation (BC) Act 2018, Environmental Protection and Biodiversity Conservation (EPBC) Act 1999, critically endangered (CN) and endangered (EN).

Species	Conservation Status	Associated Habitat	Likely to occur
<i>Acacia amyctica</i>	P2	Sandy loam or clay. Flats	Possible
<i>Acacia bartlei</i>	P3	Sandy loam or clay-loam in or near waterlogged depressions, often with Flat-topped Yate.	Possible
<i>Acacia diminuta</i>	P1	Sandy clay	Possible
<i>Astroloma sp. Grass Patch</i>	P2	White/grey sand. Edge of salt lakes.	Possible
<i>Bossiaea flexuosa</i>	P3	Deep sandy soil	Possible
<i>Brachyloma mogin</i>	P3	Grey clayey sand. Swamp flat.	Possible
<i>Caesia viscida</i>	P2	Aeolian sand. Low dunes.	Unlikely
<i>Caladenia longifimbriata</i>	P1	Seasonal creeks.	Unlikely
<i>Conostephium marchantiorum</i>	P3	White/grey sand. Plains, creek lines, edges of salt lakes.	Possible
<i>Conostylis lepidospermoides</i>	TF	Grey or yellow-brown sand over laterite in heath.	Possible
<i>Convolvulus sp. Cascades</i>	P1	Recently burnt. Water gaining sites. Gravelly, grey-brown sand.	Unlikely
<i>Darwinia sp. Mt Ragged</i>	P2	Brown loamy sand, quartzite, granite. Outcrops, steep ridges, rocky slopes.	Unlikely
<i>Daviesia pauciflora</i>	P3	White or grey sand over laterite or limestone. Flats.	Possible
<i>Eremophila lactea</i>	TF	White sandy clay loam. Open disturbed road verge.	Unlikely
<i>Eucalyptus dolichorhyncha</i>	P4	Sandy clay or clay flats.	Possible
<i>Eucalyptus foliosa</i>	P3	Grey/white sandy clay. Flat adjacent to salt lakes.	Possible
<i>Eucalyptus stoatei</i>	P4	Gravelly sand or clay, sandy loam. Flats, rises.	Possible
<i>Goodenia laevis Benth. subsp. laevis</i>	P3	Sandy loam or laterite.	Possible
<i>Hopkinsia adscendens</i>	P3	Dry or seasonally damp habitats along streams.	No

<i>Hydrocotyle papilionella</i> (was <i>H. sp. vigintimilia</i>)	P1	Low gypsum soils	Unlikely
<i>Hydrocotyle eichleri</i>	P3	Edge of salt lakes	Possible
<i>Hydrocotyle papilionella</i>	P2	Grows in damp loam soils surrounding the margins of inland salt lakes and in damp granitic sandy loams surrounding exposed granite outcrops.	Possible
<i>Kunzea salina</i>	P3	White sand dunes over clay at the edges of small playa lakes.	Possible
<i>Leucopogon remotus</i>	P1	Growing on sandy, loamy or limestone soils, at times associated with salt lakes.	Possible
<i>Leucopogon sp. Cascades</i>	P1	Mallee woodland, brown sandy loam	Possible
<i>Leucopogon sp. Lake Magenta</i>	P1	Undulating plains and slopes. Sand and loamy sand, sometimes over laterite.	Possible
<i>Melaleuca dempta</i>	P3	Grows in dense scrub in sandy soil in swampy areas and on the edges of clay pans	Possible
<i>Melaleuca viminea subsp. appressa</i>	P2	Shallow sand over clay. Near creeks or wet depressions.	Possible
<i>Opercularia rubioides</i>	P2	White/grey sand, gravelly sandy clay, sandy loam. Floodplains, stony hills, flat plains.	Possible
<i>Opercularia acolytantha</i>	P3	White/grey or yellow sandy loam/sand often over laterite. Plains and flats.	Possible
<i>Patersonia inaequalis</i>	P2	Sandy clay, lateritic or granitic sand.	Possible
<i>Persoonia flexifolia</i>	P1	Lateritic soils with granitic rock. River banks.	Unlikely
<i>Persoonia cymbifolia</i>	P3	Variety of habitats	Possible
<i>Pterostylis faceta</i>	P3	Often near granite	Possible
<i>Stachystemon vinosus</i>	P4	Fine loamy sand, stony soils. Sandplains, rock crevices on breakaways.	Possible
<i>Thomasia pygmaea</i>	P3	Stony sandy loam, clayey sand. Marine plains	Possible
<i>Thysanotus brachiatus</i>	P2	Grey sand. Sand Plain, Single Esperance specimen without accurate GPS details	Unlikely

No currently listed TF or PF species were identified within the clearing footprint. A specimen of the non-threatened *Acacia moirii* ssp. *dasycarpa* (KSW5021, Accession number 9306) was sent to the WA Herbarium as this collection was a range extension 60km to the east of the closest other verified population. This species was confirmed by Mike Hislop on 30/1/2021, with specimen retained.

5.5.1 *Acrotriche* sp. Cascade* (K.S. Walkerden 5221).

Two specimens of an *Acrotriche* which could not be identified were sent to the WA Herbarium for identification (KSW5221, KSW5321; Accession #9306 with specimen KSW5221 retained). The specimens were described by Mike Hislop as: “almost certainly a new species! Although still immature the fruit is highly distinctive and quite unlike any other taxa” on the 30/12/2021. Michael Hislop has advised that the species is likely to receive the phrase name of *Acrotriche* sp. Cascade (K.S. Walkerden 5221). Michael Hislop also advised that the species is likely to be listed as Priority 1 after an initial conservation assessment. The specimen was collected on the 24/09/2021, the plants specific location was not noted in the field when it was collected. The specimen was collected on the last day of the flora survey, so its location could only be narrowed down to a 3.4km section at the northern part of the site.

A targeted flora survey was conducted on 11/01/2021 by Shire Environmental Officer Katherine Walkerden and Casual Environmental Services Assistant Bradley Husbands. Coomalbidgup Rd SLK 0-3.4 was searched via foot, this area corresponding with the area surveyed on the day the original specimens were found, in addition the bushland surrounding the *Acrotriche* sp. Cascade specimens was also searched, the intersection of Griffiths road was also briefly searched. A total of 13 plants were found in 4 subpopulations (Figure 21), three specimens were fruiting. Five specimens were taken, three fruiting and two sterile and were sent to the W.A Herbarium to assist the description of the taxon. The new specimens have the following collectors number KSW0122, KSW0222, KSW0322, KSW0422, and KSW0522.

An additional survey was conducted by Shire of Esperance Environmental Officer, Katherine Walkerden and eight members of the Esperance Wildflower Society, searching further outside the proposed clearing area and into the road reserve outside of the original survey area with the known population expanded significantly with an additional 53 plants found and the known range of the species was extended 120 metres south and 870 metres north. The entire road reserve was not systematically surveyed and the population is likely larger than the current count and survey area.

Of the 66 plants observed in the road reserve, only two plants will be impacted upon by proposed works within ‘Site D – Coomalbidgup Road’. All specimens will be flagged out and the road construction supervisors will be briefed on the presence of the species with an avoidance approach implemented through proposed road works.

Acrotriche sp. Cascade is a spreading multi-stemmed shrub growing up to 60cm tall and 2 metres wide, flowering and beginning to fruit in mid-September. Both mature and immature fruit were present on the plant in mid-January suggesting a potentially long flowering period. The undersides of the leaves were a distinctive pale green, stipules were a distinctive bronze or pale brown and fruit were a distinctive oval/disk like shape with ribbing (Figure 20). The plant was easily distinguished from other Ericaceous species at the site.



Figure 20. Photo of *Acrotriche* sp. Cascade, taken by Katherine Walkerden on the 13/02/2021.



Figure 21. Map of new *Acrotriche* taxon '*Acrotriche* sp. Cascade' found within 'Site D – Coomalbidgup Road' with locations of each herbarium specimen collected on the 11/01/2021.

5.6 Fauna

Within a 20 km radius of the 'Site D – Coomalbidgup Road', 126 fauna have previously been recorded. Of these, three species are threatened fauna, priority fauna and fauna protected under international agreement have been recorded (Table 5) (Naturemap, 2021).

Table 5. Potential threatened, priority and protected under international agreement fauna recorded within a 20 km radius of the proposed 'Coomalbidgup Road'.

Nt. Acronyms used include priority (P), threatened (T), and protected under international agreement (IA) (Naturemap, 2021).

Scientific Name	Common Name	Conservation Status	Likelihood of occurring	Associated habitat
<i>Thinornis rubricollis</i>	Hooded Plover	P4	Low	Beaches with large amounts of beach-washed seaweed. They also occur on inland salt lakes.
<i>Calyptorhynchus latirostris</i>	Carnaby's Cockatoo	T	Possible	Inhabits native woodlands dominated by eucalypts such as Wandoo and Salmon Gum, as well as nearby heathlands.
<i>Tringa nebulari</i>	Common Greenshank	IA	Low	Found both on the coast and inland, in estuaries and mudflats, mangrove swamps and lagoons, and in billabongs, swamps, sewage farms and flooded crops.

Carnaby's Black Cockatoo, *Calyptorhynchus latirostris* is the only species to have suitable foraging habitat within the proposed clearing permit area. No Carnaby's were noted at the site at any of the site visits. No large trees with hollows were located within the site. It is worth noting that 11 km east of the site is a large pine plantation. 'Site D – Coomalbidgup Road' has a moderate amount of Proteaceae species, such as Banksias and Hakeas providing moderate amounts of potential forage, but due to the distance (11km) from the nearest potential roosting trees the site would likely only be used as a foraging habitat opportunistically by Carnaby's passing through the area.

During the field survey the no evidence of invasive cats or rabbits were seen throughout the area, though both of these species were almost certainly present in the general vicinity. There were also several fox carcasses that had been dumped on the roadside (Figure 22), likely after being dispatched by local farmers.



Figure 22. Fox carcasses dumped at ‘Site D – Coomalbidgup Road’

6 Conclusion; assessment of Department of Water and Environmental Regulations clearing principles

The ‘Site D – Coomalbidgup Road’ project may be at variance to some of the clearing principles that the Department of Water and Environmental Regulations (DWER) assess applications, as listed under Schedule 5 of the Environmental Protection Act 1986 (DWER 2019).

Table 6. Shire of Esperance Assessment against Clearing Principles of the proposed ‘Site D – Coomalbidgup Road’.

Assessment against Clearing Principles	Conclusion
Principle (a) Native vegetation should not be cleared if it comprises a high level of biological diversity.	Biodiversity at this site is high with 265 native species recorded over nine vegetation communities. This high biodiversity is likely to be attributed to being at the convergence of two Interim Biogeographic Regions.
Principle (b) Native vegetation should not be cleared if it comprises the whole or a part of, or is necessary for the maintenance of, a significant habitat for fauna indigenous to Western Australia.	The vegetation may contain opportunist foraging habitat for Carnaby’s Black Cockatoo due to the presence of some vegetation high in Proteaceous species. No other fauna species are likely to be impacted upon.

<p>Principle (c) Native vegetation should not be cleared if it includes, or is necessary for the continued existence of, rare flora.</p>	<p>No listed Threatened or priority species were recorded in the area. However a new taxon was discovered during the survey which will likely be initially listed as Priority 1 due to the extremely small population size (66 plants) and none within conservation estate. In addition it has highly distinctive morphology which suggests its actual distribution is extremely limited, as the plant is highly unlikely to go unnoticed during a flora survey. Whilst there will be a very limited impact on the current plants of this taxon (two plants impacted), any additional clearing in the road reserve could limit potential recruitment within the species.</p>
<p>Principle (d) Native vegetation should not be cleared if it comprises the whole or a part of, or is necessary for the maintenance of a threatened ecological community.</p>	<p>0.157 ha of Vegetation Type C 'Scattered <i>Eucalyptus pleurocarpa</i> over <i>Banksia armata</i> dominated mixed low shrubland' is considered to be the TEC 'Proteaceae Dominated Kwongkan Shrublands of the Southeast Coastal Floristic Province of Western Australia (Kwongkan)'. 0.173 ha of the PEC 'Swamp Yate (<i>Eucalyptus occidentalis</i>) woodlands in seasonally inundated clay basins (South Coast)' is also proposed to be cleared.</p>
<p>Principle (e) Native vegetation should not be cleared if it is significant as a remnant of native vegetation in an area that has been extensively cleared.</p>	<p>The immediate surroundings of the site were highly cleared agricultural land, with the intact vegetation within the site likely playing contributing to ecological linkages in the area. However the amount of vegetation being cleared and the fact that this is a 100-200m wide road reserve which will still exist as a wildlife corridor after road widening does not constitute being a significant impact. Vegetation Association 5048 is a poorly conserved and highly cleared vegetation association.</p>
<p>Principle (f) Native vegetation should not be cleared if it is growing in, or in association with, an environment associated with a watercourse or wetland.</p>	<p>Vegetation in this area was growing in association with four minor wetlands. Three of these are Yate swamps which do not appear to be large or permanent on aerial photography, and one area of <i>Melaleuca cuticularis</i> wetland. This wetland may be man-made after historic extraction activities lowered the soil profile in the road reserve.</p>
<p>Principle (g) Native vegetation should not be cleared if the clearing of the vegetation is likely to cause appreciable land degradation.</p>	<p>The clearing of 1-2m wide of vegetation within this area will not affect the road corridor providing function as windbreaks and erosion control for the agricultural areas surrounding it.</p>
<p>Principle (h) Native vegetation should not be cleared if the clearing of the vegetation is likely to have an impact on the environmental values of any adjacent or nearby conservation area.</p>	<p>The project is 7km west of Nature Reserve 36183. The relatively low amount of native vegetation cleared will have little effect on the ecological linkages to this reserve.</p>
<p>Principle (i) Native vegetation should not be cleared if the clearing of the vegetation is likely to cause deterioration in the quality of surface or underground water.</p>	<p>The project is unlikely to have any significant impacts due to low amount being cleared and being 3.5km east of the Lort River.</p>

Principle (j) Native vegetation should not be cleared if clearing the vegetation is likely to cause, or exacerbate, the incidence or intensity of flooding.

The project is unlikely to have any significant impacts due to low amount being cleared and due to being 3.5km east of the Lort River.

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8 Appendix

8.1 Incidental species list

Family	Genus	Species	Common Name	Weed	Herb Ref	Cons Stat
Aizoaceae	<i>Carpobrotus</i>	<i>modesta</i>	Inland Pigface			
Aizoaceae	<i>Mesembryanthemum</i>	<i>nodiflorum</i>	Slender Iceplant	x		
Apiaceae	<i>Platysace</i>	<i>effusa</i>				
Araliaceae	<i>Trachymene</i>	<i>pilosa</i>	Native Parsnip			
Asparagaceae	<i>Laxmannia</i>	<i>minor</i>				
Asparagaceae	<i>Laxmannia</i>	<i>omnifertilis</i>				
Asparagaceae	<i>Lomandra</i>	<i>micrantha ssp. teretifolia</i>				
Asparagaceae	<i>Lomandra</i>	<i>mucronata</i>				
Asparagaceae	<i>Thysanotus</i>	<i>patersonii</i>				
Asparagaceae	<i>Laxmannia</i>	<i>omnifertilis</i>				
Asphodelaceae	<i>Bulbine</i>	<i>semibarbata</i>	Leek Lily			
Asphodelaceae	<i>Trachyandra</i>	<i>divaricata</i>	Dune onion weed			
Asteraceae	<i>Argentipallium</i>	<i>niveum</i>				
Asteraceae	<i>Blennospora</i>	<i>drummondii</i>				
Asteraceae	<i>Cotula</i>	<i>cotuloides</i>				
Asteraceae	<i>Gnephosis</i>	<i>drummondii</i>				
Asteraceae	<i>Hypochaeris</i>	<i>radicata</i>	Flatweed	x		
Asteraceae	<i>Pseudognaphalium</i>	<i>luteoalbum</i>	Jersey Cudweed			
Asteraceae	<i>Pterochaeta</i>	<i>paniculata</i>				
Asteraceae	<i>Senecio</i>	<i>glossanthus</i>	Slender Goundsel			
Asteraceae	<i>Ursinia</i>	<i>anthemoides</i>	solar fire	x		
Asteraceae	<i>Vittadinia</i>	<i>gracilis</i>				
Asteraceae	<i>Vittadinia</i>	<i>dissecta var. hirta</i>				
Asteraceae	<i>Waitzia</i>	<i>suaveolens var. flava</i>				
Boraginaceae	<i>Halgania</i>	<i>cyanea</i>	Rough Halgania			
Brassicaceae	<i>Brassica</i>	<i>tournefortii</i>	Asian Mustard			
Campanulaceae	<i>Wahlenbergia</i>	<i>preissii</i>				
Caryophyllaceae	<i>Spergularia</i>	<i>marina</i>	Salt Sandspurry			
Casuarinaceae	<i>Allocasuarina</i>	<i>humilis</i>	Dwarf She-oak			
Casuarinaceae	<i>Allocasuarina</i>	<i>lehmanniana subsp. ecarinata</i>	Dune She-oak			
Casuarinaceae	<i>Allocasuarina</i>	<i>microstachya</i>				
Casuarinaceae	<i>Allocasuarina</i>	<i>thuyoides</i>				
Casuarinaceae	<i>Casuarina</i>	<i>obesa</i>		x		
Celastraceae	<i>Stackhousia</i>	<i>pubescens</i>	Downy Stackhousia			
Centrolepidaceae	<i>Centrolepis</i>	<i>strigosa</i>	Hairy Centrolepis			
Chenopodiaceae	<i>Enchylaena</i>	<i>tomentosa</i>	Barrier Saltbush			
Goodeniaceae	<i>Lechenaultia</i>	<i>formosa</i>	Red Lechenaultia			
Chenopodiaceae	<i>Tecticornia</i>	<i>indica ssp. bidens</i>				
Crassulaceae	<i>Crassula</i>	<i>exserta</i>				
Cupressaceae	<i>Callitris</i>	<i>roei</i>	Roe's Cypress Pine			
Cyperaceae	<i>Caustis</i>	<i>dioica</i>				

Cyperaceae	<i>Lepidosperma</i>	<i>rigidulum</i>				
Cyperaceae	<i>Lepidosperma</i>	<i>squamatum</i>				
Cyperaceae	<i>Mesomelaena</i>	<i>stygia</i>				
Cyperaceae	<i>Mesomelaena</i>	<i>tetragona</i>				
Cyperaceae	<i>Netrostylis</i>	<i>sp. Mt Madden</i>			KSW282 2 ACC940 5	
Cyperaceae	<i>Schoenus</i>	<i>breviculmis</i>				
Cyperaceae	<i>Schoenus</i>	<i>breviseta</i>				
Cyperaceae	<i>Schoenus</i>	<i>subfascicularis</i>				
Cyperaceae	<i>Tricostularia</i>	<i>compressa</i>			KSW292 2 ACC940 5	
Dasygogonaceae	<i>Calectasia</i>	<i>valida</i>	Robust Tinsel Lily			
Dilleniaceae	<i>Hibbertia</i>	<i>acerosa</i>	Needle Leaved Guinea Flower			
Dilleniaceae	<i>Hibbertia</i>	<i>gracilipes</i>				
Dilleniaceae	<i>Hibbertia</i>	<i>psilocarpa</i>				
Droseraceae	<i>Drosera</i>	<i>menziesii</i>	Pink Rainbow Drosera			
Droseraceae	<i>Drosera</i>	<i>sp. Branched styles</i>				
Ericaceae	<i>Acrotriche</i>	<i>sp. Cascade</i>			KSW522 1 ACC930 6	P1
Ericaceae	<i>Leucopogon</i>	<i>sp. Newdegate</i>				
Ericaceae	<i>Lysinema</i>	<i>ciliatum</i>				
Ericaceae	<i>Lysinema</i>	<i>pentapetalum</i>				
Ericaceae	<i>Styphelia</i>	<i>lissanthoides</i>				
Ericaceae	<i>Styphelia</i>	<i>sp. South Coast</i>				
Euphorbiaceae	<i>Beyeria</i>	<i>sulcata</i>				
Euphorbiaceae	<i>Monotaxis</i>	<i>paxii</i>				
Euphorbiaceae	<i>Stachystemon</i>	<i>virgatus</i>				
Fabaceae	<i>Acacia</i>	<i>acuminata</i>	Raspberry Jam Wattle			
Fabaceae	<i>Acacia</i>	<i>aemula</i>				
Fabaceae	<i>Acacia</i>	<i>assimilis ssp. atroviridis</i>				
Fabaceae	<i>Acacia</i>	<i>bidentata</i>				
Fabaceae	<i>Acacia</i>	<i>chrysocephala</i>				
Fabaceae	<i>Acacia</i>	<i>crispulata</i>				
Fabaceae	<i>Acacia</i>	<i>cupularis</i>				
Fabaceae	<i>Acacia</i>	<i>curvata</i>				
Fabaceae	<i>Acacia</i>	<i>cyclops</i>	Coastal Wattle			
Fabaceae	<i>Acacia</i>	<i>dermatophylla</i>				
Fabaceae	<i>Acacia</i>	<i>flavipila var. flavipila</i>				
Fabaceae	<i>Acacia</i>	<i>gonophylla</i>				
Fabaceae	<i>Acacia</i>	<i>iteaphylla</i>	Flinders Range Wattle	x		
Fabaceae	<i>Acacia</i>	<i>lasiocarpa var. bracteolata</i>				
Fabaceae	<i>Acacia</i>	<i>lasiocalyx</i>	Silver Wattle			
Fabaceae	<i>Acacia</i>	<i>maxwellii</i>				

Fabaceae	<i>Acacia</i>	<i>moirii ssp. dasycarpa</i>			KSW502 1 ACC930 6	
Fabaceae	<i>Acacia</i>	<i>mutabilis ssp. angustifolia</i>				
Fabaceae	<i>Acacia</i>	<i>mutabilis ssp. mutabilis</i>				
Fabaceae	<i>Acacia</i>	<i>myrtifolia</i>	Myrtle Wattle			
Fabaceae	<i>Acacia</i>	<i>praviflora</i>				
Fabaceae	<i>Acacia</i>	<i>pritzeliana</i>				
Fabaceae	<i>Acacia</i>	<i>pycnantha</i>	Golden Wattle	x		
Fabaceae	<i>Acacia</i>	<i>quinquenervia</i>				
Fabaceae	<i>Acacia</i>	<i>saligna</i>	Golden Wreath Wattle			
Fabaceae	<i>Acacia</i>	<i>sphacelata ssp. sphacelata</i>				
Fabaceae	<i>Aotus</i>	<i>sp. Esperance</i>				
Fabaceae	<i>Chorizema</i>	<i>aciculare</i>				
Fabaceae	<i>Daviesia</i>	<i>aphylla</i>				
Fabaceae	<i>Daviesia</i>	<i>incrassata ssp. incrassata</i>				
Fabaceae	<i>Daviesia</i>	<i>incrassata ssp. reversifolia</i>				
Fabaceae	<i>Daviesia</i>	<i>lancifolia</i>	Bitter Pea			
Fabaceae	<i>Daviesia</i>	<i>teretifolia</i>				
Fabaceae	<i>Dillwynia</i>	<i>sp. Mallee</i>				
Fabaceae	<i>Eutaxia</i>	<i>inuncta</i>				
Fabaceae	<i>Eutaxia</i>	<i>lutea</i>				
Fabaceae	<i>Eutaxia</i>	<i>parviflora</i>				
Fabaceae	<i>Gastrolobium</i>	<i>spinosum</i>	Prickly Poison			
Fabaceae	<i>Gompholobium</i>	<i>baxteri</i>	Baxter's Wedge Pea			
Fabaceae	<i>Gompholobium</i>	<i>knightianum</i>				
Fabaceae	<i>Gompholobium</i>	<i>marginatum</i>				
Fabaceae	<i>Gompholobium</i>	<i>scabrum</i>	Painted Lady			
Fabaceae	<i>Isotropis</i>	<i>cuneifolia</i>	Granny Bonnets			
Fabaceae	<i>Jacksonia</i>	<i>venosa</i>				
Fabaceae	<i>Kennedia</i>	<i>sp. South Coast</i>				
Fabaceae	<i>Pultenaea</i>	<i>purpurea</i>				
Fabaceae	<i>Pultenaea</i>	<i>indura</i>				
Fabaceae	<i>Senna</i>	<i>sp. Pallinup River</i>				
Fabaceae	<i>Templetonia</i>	<i>sulcata</i>				
Fabaceae	<i>Trifolium</i>	<i>glomeratum</i>	Cluster Clover	x		
Goodeniaceae	<i>Cooperhooia</i>	<i>stropholata</i>				
Goodeniaceae	<i>Dampiera</i>	<i>lavandulacea</i>				
Goodeniaceae	<i>Dampiera</i>	<i>sacculata</i>	Pouched Dampiera			
Goodeniaceae	<i>Goodenia</i>	<i>affinis</i>	Silver Goodenia			
Goodeniaceae	<i>Goodenia</i>	<i>concinna</i>	Elegant Goodenia			
Goodeniaceae	<i>Goodenia</i>	<i>incana</i>	Hoary Goodenia			
Goodeniaceae	<i>Goodenia</i>	<i>pterigosperma</i>				
Goodeniaceae	<i>Goodenia</i>	<i>scapigera</i>	White Goodenia			
Goodeniaceae	<i>Goodenia</i>	<i>trinervis</i>				
Goodeniaceae	<i>Scaevola</i>	<i>thesioides ssp. filifolia</i>				
Haemodoraceae	<i>Anigozanthos</i>	<i>rufus</i>	Red Kangaroo Paw			
Haemodoraceae	<i>Conostylis</i>	<i>breviscapa</i>				
Haemodoraceae	<i>Conostylis</i>	<i>seorsifolia</i>	Hairy Mat Conostylis			
Haemodoraceae	<i>Haemodorum</i>	<i>discolor</i>				
Haloragaceae	<i>Glischrocaryon</i>	<i>angustifolium</i>				

Haloragaceae	<i>Glischrocaryon</i>	<i>roei</i>				
Hemerocallidaceae	<i>Chamaescilla</i>	<i>corymbosa</i>	Blue stars			
Hemerocallidaceae	<i>Dianella</i>	<i>brevicaulis</i>	Flax Lily			
Hemerocallidaceae	<i>Stypandra</i>	<i>glauca</i>	Nodding Blue Lily			
Iridaceae	<i>Freesia</i>	<i>sp.</i>		x		x
Iridaceae	<i>Patersonia</i>	<i>lanata</i>	Woolly Patersonia			
Iridaceae	<i>Patersonia</i>	<i>occidentalis</i>				
Juncaginaceae	<i>Triglochin</i>	<i>minutissima</i>				
Lamiaceae	<i>Hemigenia</i>	<i>teretiuscula</i>				
Lamiaceae	<i>Microcorys</i>	<i>subcanescens</i>				
Lauraceae	<i>Cassytha</i>	<i>melantha</i>	Coarse Dodder Laurel			
Lauraceae	<i>Nuytsia</i>	<i>floribunda</i>	Moodja			
Loganiaceae	<i>Logania</i>	<i>stenophylla</i>				
Malvaceae	<i>Androcalva</i>	<i>crispa</i>				
Malvaceae	<i>Lasiopetalum</i>	<i>compactum</i>				
Malvaceae	<i>Lasiopetalum</i>	<i>rosmarinifolium</i>				
Malvaceae	<i>Lasiopetalum</i>	<i>sp. Mt Ragged</i>				
Malvaceae	<i>Thomasia</i>	<i>petalocalyx</i>	Paper Flower			
Myrtaceae	<i>Baeckea</i>	<i>latens</i>				
Myrtaceae	<i>Beaufortia</i>	<i>micrantha</i>	Little Bottlebrush			
Myrtaceae	<i>Beaufortia</i>	<i>schaueri</i>	Pink Bottlebrush			
Myrtaceae	<i>Calothamnus</i>	<i>gibbosus</i>	Corky Netbush			
Myrtaceae	<i>Calothamnus</i>	<i>gracilis</i>				
Myrtaceae	<i>Calothamnus</i>	<i>quadrifidus</i>	One-sided Bottlebrush			
Myrtaceae	<i>Calytrix</i>	<i>leschenaultii</i>				
Myrtaceae	<i>Calytrix</i>	<i>tetragona</i>				
Myrtaceae	<i>Conothamnus</i>	<i>aureus</i>				
Myrtaceae	<i>Corymbia</i>	<i>ficifolia</i>	Red-flowering Gum	x		
Myrtaceae	<i>Cyathostemon</i>	<i>ambiguus</i>				
Myrtaceae	<i>Darwinia</i>	<i>vestita</i>	Pom-Pom Darwinia			
Myrtaceae	<i>Eucalyptus</i>	<i>conglobata ssp conglobata</i>	Port Lincoln Mallee			
Myrtaceae	<i>Eucalyptus</i>	<i>cylindrocarpa</i>	Woodline Mallee			
Myrtaceae	<i>Eucalyptus</i>	<i>eremophila</i>	Tall Sand Mallee			
Myrtaceae	<i>Eucalyptus</i>	<i>falcata</i>	Silver Mallet			
Myrtaceae	<i>Eucalyptus</i>	<i>flocktoniae ssp flocktoniae</i>	Merrit			
Myrtaceae	<i>Eucalyptus</i>	<i>kessellii ssp. kessellii</i>	Jerdacuttup Mallee			
Myrtaceae	<i>Eucalyptus</i>	<i>leptocalyx</i>	Hopetoun Mallee			
Myrtaceae	<i>Eucalyptus</i>	<i>micranthera</i>	Alexander River Mallee			
Myrtaceae	<i>Eucalyptus</i>	<i>occidentalis</i>	Flat Topped yate			
Myrtaceae	<i>Eucalyptus</i>	<i>perangusta</i>	Fine-leaved Mallee			
Myrtaceae	<i>Eucalyptus</i>	<i>pleurocarpa</i>	Tallerack			
Myrtaceae	<i>Eucalyptus</i>	<i>tumida</i>				
Myrtaceae	<i>Eucalyptus</i>	<i>uncinata</i>	Hook-leaved Mallee			
Myrtaceae	<i>Eucalyptus</i>	<i>utilis</i>	Coastal Moort			
Myrtaceae	<i>Kunzea</i>	<i>affinis</i>				
Myrtaceae	<i>Leptospermum</i>	<i>nitens</i>				
Myrtaceae	<i>Leptospermum</i>	<i>spinescens</i>	Spiny Tea Tree			
Myrtaceae	<i>Melaleuca</i>	<i>brevifolia</i>	Mallee Honey Myrtle			
Myrtaceae	<i>Melaleuca</i>	<i>cucullata</i>				

Myrtaceae	<i>Melaleuca</i>	<i>cuticularis</i>				
Myrtaceae	<i>Melaleuca</i>	<i>glaberrima</i>				
Myrtaceae	<i>Melaleuca</i>	<i>hamata</i>				
Myrtaceae	<i>Melaleuca</i>	<i>pentagona</i> var. <i>latifolia</i>				
Myrtaceae	<i>Melaleuca</i>	<i>pulchella</i>	Claw Honey Myrtle			
Myrtaceae	<i>Melaleuca</i>	<i>rigidifolia</i>				
Myrtaceae	<i>Melaleuca</i>	<i>torquata</i>				
Myrtaceae	<i>Melaleuca</i>	<i>tuberculata</i> var. <i>macrophylla</i>				
Myrtaceae	<i>Melaleuca</i>	<i>undulata</i>	Hidden Honey Myrtle			
Myrtaceae	<i>Micromyrtus</i>	<i>elobata</i>				
Myrtaceae	<i>Micromyrtus</i>	<i>imbricata</i>				
Myrtaceae	<i>Phymatocarpus</i>	<i>maxwellii</i>				
Myrtaceae	<i>Rinzia</i>	<i>icosandra</i>	Recherche Mainland Rinzia			
Myrtaceae	<i>Taxandria</i>	<i>spathulata</i>				
Myrtaceae	<i>Tetrapora</i>	<i>preissiana</i>				
Myrtaceae	<i>Verticordia</i>	<i>chrysantha</i>	Yellow Feather-flower			
Myrtaceae	<i>Verticordia</i>	<i>minutiflora</i>				
Myrtaceae	<i>Verticordia</i>	<i>roei</i> ssp. <i>roei</i>				
Olacaceae	<i>Olax</i>	<i>benthamiana</i>				
Onagraceae	<i>Oenothera</i>	<i>stricta</i>	Evening Primrose	x		
Orchidaceae	<i>Caladenia</i>	<i>atingens</i> ssp. <i>gracillima</i>	Jug Orchid			
Orchidaceae	<i>Caladenia</i>	<i>exstans</i>	Pointing Spider Orchid			
Orchidaceae	<i>Elythranthera</i>	<i>brunonis</i>	Purple Enamel Orchid			
Orchidaceae	<i>Microtis</i>	<i>media</i>	Common Mignonette Orchid			
Orchidaceae	<i>Pterostylis</i>	<i>recurva</i>	Jug Orchid			
Orchidaceae	<i>Thelymitra</i>	<i>graminea</i>	Shy Sun Orchid			
Orchidaceae	<i>Thelymitra</i>	<i>vulgaris</i>	Slender Sun Orchid			
Pinaceae	<i>Pinus</i>	<i>pinaster</i>	Maritime Pine	x		
Pinaceae	<i>Pinus</i>	<i>radiata</i>	Monterey Pine	x		
Pittosporaceae	<i>Billardiera</i>	<i>coriacea</i>				
Pittosporaceae	<i>Billardiera</i>	<i>fusiformis</i>	Australian Blue-bells			
Pittosporaceae	<i>Billardiera</i>	<i>lehmanniana</i>	Kurup			
Pittosporaceae	<i>Marianthus</i>	<i>bicolor</i>				
Poaceae	<i>Amphipogon</i>	<i>turbinatus</i>				
Poaceae	<i>Austrostipa</i>	<i>elegantissima</i>	Tall-feather Grass			
Poaceae	<i>Austrostipa</i>	<i>hemipogon</i>	Spear Grass			
Poaceae	<i>Austrostipa</i>	<i>juncifolia</i>				
Poaceae	<i>Briza</i>	<i>maxima</i>	Blowfly Grass	x		
Poaceae	<i>Ehrharta</i>	<i>calycina</i>	Perennial Veldt Grass	x		
Poaceae	<i>Ehrharta</i>	<i>sp.</i>	Veldt grass	x		
Poaceae	<i>Lolium</i>	<i>sp.</i>		x		
Poaceae	<i>Neurachne</i>	<i>alopecuroidea</i>	Foxtail Mulga Grass			
Poaceae	<i>Secale</i>	<i>cereale</i>	Rye	x		
Poaceae	<i>Triticum</i>	<i>sp.</i>	Wheat	x		
Polygalaceae	<i>Comesperma</i>	<i>scoparium</i>	Broom Milkwort			
Proteaceae	<i>Adenanthos</i>	<i>cuneatus</i>	Coastal Jugflower			
Proteaceae	<i>Banksia</i>	<i>armata</i>	Prickly Dryandra			
Proteaceae	<i>Banksia</i>	<i>media</i>				
Proteaceae	<i>Banksia</i>	<i>obovata</i>	Wedge Leaved Dryandra			
Proteaceae	<i>Banksia</i>	<i>pulchella</i>	Teasel Banksia			

Proteaceae	<i>Banksia</i>	<i>repens</i>			
Proteaceae	<i>Grevillea</i>	<i>concinna</i>	Elegant Grevillea		
Proteaceae	<i>Grevillea</i>	<i>huegeliana</i>	Smooth Grevillea		
Proteaceae	<i>Grevillea</i>	<i>nudiflora</i>			
Proteaceae	<i>Grevillea</i>	<i>oligantha</i>	Few-flowered Grevillea		
Proteaceae	<i>Grevillea</i>	<i>plurijuga</i> ssp. <i>superba</i>			
Proteaceae	<i>Hakea</i>	<i>corymbosa</i>	Cauliflower Hakea		
Proteaceae	<i>Hakea</i>	<i>ilicifolia</i>			
Proteaceae	<i>Hakea</i>	<i>laurina</i>	Pin-cushion Hakea		
Proteaceae	<i>Hakea</i>	<i>lissocarpa</i>	Honey Bush		
Proteaceae	<i>Hakea</i>	<i>marginata</i>			
Proteaceae	<i>Hakea</i>	<i>pandanicarpa</i> ssp. <i>pandanicarpa</i>	Cricket Ball Hakea		
Proteaceae	<i>Hakea</i>	<i>prostrata</i>	Harsh Hakea		
Proteaceae	<i>Hakea</i>	<i>trifurcata</i>	Two-leaved Hakea		
Proteaceae	<i>Isopogon</i>	<i>polycephalus</i>			
Proteaceae	<i>Isopogon</i>	sp. <i>Fitzgerald River</i>			
Proteaceae	<i>Lambertia</i>	<i>inermis</i> var. <i>drummondii</i>	Chittick		
Proteaceae	<i>Lambertia</i>	<i>inermis</i> var. <i>inermis</i>	Chittick		
Proteaceae	<i>Persoonia</i>	<i>teretifolia</i>			
Proteaceae	<i>Petrophile</i>	<i>fastigiata</i>			
Proteaceae	<i>Petrophile</i>	<i>squamata</i> ssp. <i>northern</i>			
Proteaceae	<i>Petrophile</i>	<i>teretifolia</i>			
Proteaceae	<i>Synaphea</i>	<i>divaricata</i>			
Proteaceae	<i>Synaphea</i>	<i>favosa</i>			
Proteaceae	<i>Synaphea</i>	<i>media</i>			
Proteaceae	<i>Synaphea</i>	<i>oligantha</i>			
Proteaceae	<i>Synaphea</i>	<i>petiolaris</i> ssp. <i>petiolaris</i>			
Pteridaceae	<i>Cheilanthes</i>	<i>austrotenuifolia</i>	Rock Fern		
Restionaceae	<i>Desmocladus</i>	<i>myriocladus</i>			
Restionaceae	<i>Hypolaena</i>	<i>fastigiata</i>	Tassel Rope-rush		
Restionaceae	<i>Hypolaena</i>	<i>humilis</i>			
Restionaceae	<i>Lepidobolus</i>	<i>chaetocephalus</i>	Bristle-headed Chaff Rush		
Restionaceae	<i>Lyginia</i>	<i>imberbis</i>			
Rhamnaceae	<i>Cryptandra</i>	<i>myriantha</i>			
Rhamnaceae	<i>Cryptandra</i>	<i>pungens</i>			
Rhamnaceae	<i>Spyridium</i>	<i>mucronatum</i>			
Rhamnaceae	<i>Spyridium</i>	<i>polycephalum</i>			
Rhamnaceae	<i>Spyridium</i>	sp. <i>Jerdacuttup</i>			
Rhamnaceae	<i>Stenanthemum</i>	<i>notiale</i> ssp. <i>notiale</i>			
Rubiaceae	<i>Opercularia</i>	<i>vaginata</i>	Dog Weed		
Rutaceae	<i>Boronia</i>	<i>crenulata</i>	Aniseed Boronia		
Rutaceae	<i>Boronia</i>	<i>inornata</i> ssp. <i>inornata</i>			
Rutaceae	<i>Cyanothamnus</i>	<i>baeckeaceus</i>			
Rutaceae	<i>Cyanothamnus</i>	<i>ramosus</i> ssp. <i>anethifolia</i>			
Rutaceae	<i>Microcybe</i>	<i>pauciflora</i> ssp. <i>pauciflora</i>			
Santalaceae	<i>Exocarpos</i>	<i>aphyllus</i>	Leafless Ballarat		
Santalaceae	<i>Leptomeria</i>	<i>pachyclada</i>			
Sapindaceae	<i>Dodonaea</i>	<i>caespitosa</i>			
Stylidiaceae	<i>Stylidium</i>	<i>turleyae</i>	Turley's Stylidium		
Thymelaeaceae	<i>Pimelea</i>	<i>angustifolia</i>	Narrow-leaved Pimelea		

Thymelaeaceae	<i>Pimelea</i>	<i>brachyphylla</i>				
Thymelaeaceae	<i>Pimelea</i>	<i>erecta</i>				
Thymelaeaceae	<i>Pimelea</i>	<i>imbricata var. piligera</i>				
Violaceae	<i>Hybanthus</i>	<i>epacroides</i>	Spiny Hybanthus			

8.2 Typical Rural Road Cross Section – Gravel Road STD00023

