Lot 2001 Pederick Rd TEC Clarification Survey

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DOCUMENT TRACKING

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Template 2.8.1

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Abbreviations

Abbreviation	Description
BC Act	Biodiversity Conservation Act 2016
BoM	Bureau of Meteorology
CLUSTER	Hierarchical Clustering
DAFWA	Department of Agriculture and Food Western Australia
DAWE	Department of Agriculture, Water and the Environment
DBCA	Department of Biodiversity, Conservation and Attractions
DPaW	Department of Parks and Wildlife
DPIRD	Department of Primary Industries and Regional Development
ELA	Eco Logical Australia
EPA	Environmental Protection Authority
EPBC Act	Environment Protection and Biodiversity Conservation Act 1999
FCT	Floristic Community Type
ha	hectares
IBRA	Interim Biogeographic Regionalisation for Australia
km	kilometres
MDS	Multi-Dimensional Scaling

Abbreviation	Description
mm	millimetres
NIA	Neerabup Industrial Area
PEC	Priority Ecological Community
SCP	Swan Coastal Plain
SIMPER	Similarity Percentages
TEC	Threatened Ecological Community
TSSC	Threatened Species Scientific Committee
WA	Western Australia
WAH	Western Australian Herbarium

Executive Summary

Eco Logical Australia (ELA) was engaged by DevelopmentWA to undertake a flora and vegetation survey to clarify the extent of the Banksia Woodlands of the Swan Coastal Plain Threatened Ecological Community (TEC) at Lot 2001 Pederick Road, Neerabup within the Neerabup Industrial Area. Lot 2001 Pederick Road comprises of two blocks, one previously cleared 9.9 hectare block north of Pederick Road and a 12.25 hectare block of remnant vegetation south of Pederick Road. The southern block is the target of this survey and will be referred to as 'the survey area'. The survey area, located in Neerabup, approximately 35 kilometres north of Perth, Western Australia, forms part of the Meridian Business Park within the Neerabup Industrial Area.

A prior survey undertaken by ELA in 2019 (ELA 2021a) determined the presence of the Banksia Woodlands of the Swan Coastal Plain Threatened Ecological Community. Three quadrats representing a single vegetation community 'EmBaf' were installed in the survey area in 2019 which multivariate analysis inferred to represent the Floristic Community Types 20a and 28 as defined by Gibson et al. (1994).

Each of these Floristic Community Types is recognised as being part of the 'Banksia Woodlands of the Swan Coastal Plain' TEC (listed as Endangered under the *Environment Protection and Biodiversity Conservation Act 1999*; EPBC Act). Under the State *Biodiversity Conservation Act 2016*, Floristic Community Type 20a (SCP20a) is listed as an Endangered Threatened Ecological Community (TEC, EN). Floristic Community Type 28 (SCP28) is not listed at a state level.

This survey aimed to clarify, where possible, the extent of each component of the Banksia Woodlands TEC. Prior to the field survey, the data from the ELA (2021a) survey and Gibson et al. (1994) were reviewed and analysed for characteristic species that would assist in separating the two components (FCT 20a and FCT 28) of the Banksia Woodlands in the field.

The three quadrats utilised in the 2019 survey were rescored and three additional quadrats were placed in representative locations within the survey area with the aim of three replicates of each FCT.

A total of 86 taxa (80 native and six introduced taxa) from 68 genera and 30 families were recorded across the survey area. Families with the highest number of species included Fabaceae and Orchidaceae, with 12 and nine species respectively. No priority or threatened flora were recorded within the quadrats and no introduced taxa were listed as Declared Pests under the State *Biosecurity and Agriculture Management Act 2007* or as Weeds of National Significance.

Results of the multivariate analysis infer that quadrats ELA01 and ELA05 are closely affiliated with FCT 20a, and quadrats ELA02, ELA03, ELA04 and ELA06 are closely affiliated with FCT 28 (Table 6). This is different to the ELA (2021a) results where quadrats ELA01 and ELA02 were affiliated with FCT20a and ELA03 was affiliated with FCT28.

Key indicator species for separating the two FCT's in the survey area were found to be *Eremaea pauciflora* and *Allocasuarina humilis* to indicate FCT 20a, while *Xanthorrhoea preissii* with a cover of greater than 10% and higher general weed presence indicated FCT 28.

A total of 11.84 ha (96.63% of the survey area) was recorded as representative of the Banksia Woodlands of the Swan Coastal Plain TEC. FCT 20a was determined to cover 2.77 ha (22.65% of the survey area), FCT 28 was determined to cover 9.06 ha (73.99% of the survey area). The remainder of the survey area was occupied by cleared vehicle tracks and/or firebreaks.

The majority of the survey area was recorded as being in Excellent Condition (92.9%), with the remainder recorded as Good condition (3.75%) and Completely Degraded condition (3.35%). The Completely Degraded area consisted of vehicle tracks and/or firebreaks intersecting and surrounding the survey area. The minor adjustment from ELA (2021a) is due to minor corrections to prior mapping noted during the field survey.

1. Introduction

1.1. Project Overview

Eco Logical Australia (ELA) understands that DevelopmentWA is planning resource extraction and industrial land development at Lot 2001 Pederick Road in Neerabup ('the project'). Lot 2001 Pederick Road comprises two blocks, one previously cleared 9.9 hectare (ha) block north of Pederick Road and a 12.25 ha block of remnant vegetation south of Pederick Road. The southern block is the target of this survey and will be referred to as 'the survey area' (Figure 1). The survey area, located in Neerabup, approximately 35 kilometres (km) north of Perth, Western Australia, forms part of the Meridian Business Park within the Neerabup Industrial Area (NIA).

Numerous ecological works have been conducted pertaining to this area since 2006, including:

- RPS (2006) - Flora and Vegetation Report, Lots 4, 40, 41 & 1002, Neerabup Industrial Estate.
- ATA Environmental (2007) - Flora, Vegetation and Vertebrate Fauna Assessment. Neerabup Industrial Area (NIA), Neerabup.
- ELA (2012) - Ground Truthing of Environmental Values for Lot 4 Flynn Drive, Neerabup.
- ELA (2013a) - Targeted Flora and Fauna Assessment, Lot 4 Flynn Drive Neerabup.
- ELA (2013b) - Flora and Fauna Technical Studies, Lot 1002 Pederick Road, Neerabup.
- ELA (2016) - Lot 2001 Pederick Road Neerabup – Desktop Assessment.
- ELA (2021a) - Neerabup Lot 2001 Pederick Rd Flora, Vegetation and Black Cockatoo Survey.
- ELA (2021b) - Targeted Survey for Caladenia huegelii at Lot 2001 Pederick Rd, Neerabup.

A Level 2 flora and vegetation survey was undertaken at the site in 2012 (ELA 2013). In 2019, a detailed flora and vegetation survey was undertaken to address information gaps and ensure all data met the current EPA requirements (ELA 2021a). The 2019 survey (ELA 2021a) recorded a single vegetation community 'EmBaf' based on three quadrats across the 12.25 ha survey area. Multivariate analysis of the three quadrats inferred that two quadrats were closely affiliated with Floristic Community Type (FCT) 20a and the third was closely affiliated with FCT 28. While both FCT's are a component of the Banksia Woodlands of the Swan Coastal Plain TEC (listed as Endangered under the *Environment Protection and Biodiversity Conservation Act 1999*; EPBC Act), at a State level, only FCT 20a is considered a TEC (EN).

This survey aimed to clarify the distribution and extent of the *SCP20a Banksia attenuata woodland over species rich dense shrublands* Threatened Ecological Community (SCP20a TEC; listed as Endangered under the *Biodiversity Conservation Act 2016*) for DevelopmentWA.

Figure 1: Survey Area

Survey Area

Lot 2001 Pederick Rd, Neerabup

0 215 430 860

Metres

Datum/Projection:
GDA 1994 MGA Zone 50

Project: 17694-DB Date: 12/01/2022

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2. Environmental Setting

2.1. Climate

The survey area is located in the Swan Coastal Plain bioregion (Swan Coastal Plain; SWA02) as defined by the Interim Biogeographic Regionalisation for Australia (IBRA; DAWE 2020b). This subregion is described as having a Mediterranean type climate, with total annual rainfall ranging between 600 and 1000 mm (Williams *et al*. 2002). The nearby weather station at Wanneroo (Station No. 9105, open since 1905) receives and annual mean rainfall of 789.1 mm with most rainfall occurring during the winter months of June, July and August (161.6 mm, 161.8 mm and 122.6 mm respectively; BoM 2021). In the three months preceding the field survey (June-August) a total of 455 mm of rainfall was received, slightly above the average rainfall of 446 mm for the same period (BoM 2021).

2.2. Regional Context

Environmental values for the region relevant to the survey area are presented in **Table 1**.

Table 1: Environmental values of the region

Existing environmental attributes	Survey area
Interim Biogeographical Regionalisation for Australia (IBRA) Bioregion (DAWE 2020b)	Swan Coastal Plain (SWA)
IBRA Subregion	Perth (SWA02) – commonly characterised by Tuart and heath on limestone soils and Banksia-Jarrah-Marri woodland on sandy soils. The subregional area is 1,333,901 ha (Mitchell et al. 2002).
Geology, landform and soils	Situated on the Spearwood Dune System (Spearwood 6) with soils derived from Tamala Limestone, characterised as yellow sands of quartz, coated with iron oxide (Government of Western Australia 2000). The Spearwood Sand Phase occurs within the survey area, characterised by undulating dunes with rocky crests on Aeolian sand over limestone.

2.3. Broad-scale Vegetation Mapping

Vegetation type and extent have been mapped at a regional scale by Beard (1990) who categorised vegetation into broad vegetation associations. Based on this mapping at a scale of 1:1,000,000, the Department of Primary Industries and Regional Development (DPIRD; previously Department of Agriculture and Food Western Australia (DAFWA)) has compiled a list of vegetation extent and types across WA (Shepherd et al. 2002).

One vegetation association occurs within the survey area, 'Spearwood 6 – Medium woodland, tuart and jarrah' (**Table 2**). This vegetation association has less than 30% of its total pre-European extent remaining within the Swan Coastal Plain subregion (Government of Western Australia 2019).

Table 2: Beard (1990) / Shepherd et al. (2002) vegetation associations of the survey area

Vegetation association	Description	Pre-European extent (ha) within the Swan Coastal Plain (SWA02) subregion	Current extent (ha) within the Swan Coastal Plain (SWA02) subregion	Remaining (%)
Spearwood 6	Medium woodland, tuart and jarrah	56,343.01	13,362.25	23.72

3. Methods

3.1. Desktop review

Statistical analysis of the previous vegetation survey data (ELA 2021a) within the survey area was undertaken to investigate potential differences in species composition that might be recognisable in the field to assist in delineation between FCT 20a and FCT 28 within the survey area. A comparison of species composition between ELA (2021a) quadrats and the Gibson et al. (1994) detailed descriptions of FCT 20a and FCT 28 was also undertaken to identify potentially distinguishing species.

Due to the current works occurring as a continuation of previous ELA (2021a) assessment, focused specifically on further clarification of the TEC known to be present, database searches such as EPBC Act Protected Matters Search, DBCA and Western Australian Museum's NatureMap and a likelihood of occurrence assessment for significant flora were not undertaken. The details of these can be found in the previous ELA (2021a) report.

3.2. Field survey

3.2.1. Survey team and timing

The field survey was conducted on 10th September 2021 by ELA Botanist Daniel Brassington. The survey was undertaken under scientific collection licence FB62000196 and permit to take DRF collection licence TFL 15-1920. September falls within the spring season (September to November) recommended for detailed level surveys in the EPA *Technical Guidance: Flora and Vegetation Surveys for Environmental Impact Assessment* (EPA 2016).

3.2.2. Flora and vegetation survey

The survey was conducted in accordance with the EPA *Technical Guidance: Flora and Vegetation Surveys for Environmental Impact Assessment* (EPA 2016). A total of six quadrats were established across the survey area to meet the requirement of three quadrats established per vegetation unit, as outlined in the EPA guidance statement (EPA 2016; Figure 2). The three quadrats established in 2019 (ELA 2021a) were re-surveyed and an additional three quadrats were established in vegetation considered representative of FCT 20a and 28 with the aim of establishing three quadrats in each community type.

Dominant vegetation communities were described, with respect to dominant species, structure and overall condition. The survey involved the use of 10 x 10 m quadrats as recommended for the Swan Coastal Plain bioregion (EPA 2016). Opportunistic sampling of species not recorded within the quadrats was undertaken to supplement the existing list of species recorded from within the survey area.

Photos were taken from the north-west corner of each quadrat. The following data was recorded within each quadrat:

- Site details (site name, site number, observers, date and location);
- Environmental information including landform, soil type and colour, bare ground and leaf litter cover, rock outcropping and time since last fire event; and
- Biological information including vegetation structure, vegetation condition in accordance with Keighery (1994), degree of disturbance, species present and species percentage cover.

Any flora representative or potentially representative of threatened or priority (conservation significant) species, or unfamiliar species were collected as voucher specimens for later identification. All collections were assigned a unique collecting number. For conservation significant flora species identified in the field, the following was recorded:

- A colour photograph;
- GPS location;
- Population size estimate;
- Location of population boundaries;
- Associated habitat/landscape element;
- Time and date observed;
- Observer details; and
- A voucher specimen suitable for use as a reference specimen (if appropriate to do so for conservation significant flora).

3.3. Data analysis

The preceding works undertaken by ELA (2021a) conducted a Banksia Woodlands TEC Assessment, confirming the presence of the TEC within the survey area. Due to this, no Banksia Woodlands TEC Assessment was re-conducted with this report.

3.3.1. Vegetation communities

Plymouth Routines in Multivariate Ecological Research v6 (PRIMER) statistical analysis software was used to analyse species-by-site data and discriminate survey sites based on their species composition (Clarke and Gorley 2006). A presence/absence transformation was applied to the dataset to align with Gibson *et al.* (1994). Introduced species (weeds), specimens not identified to species level and singletons (species recorded at a single quadrat and not forming a dominant structural component) were excluded from the data set prior to analysis. Computation of similarity matrices was based on the Bray-Curtis similarity measure. Data were analysed using a series of multivariate analysis routines including Hierarchical Clustering (CLUSTER) and Similarity Percentages (SIMPER). Results were used to inform and support interpretation of aerial photography and delineation of individual plant communities. Previously assigned vegetation mapping codes and descriptions (ELA 2013a, 2013b) were retained during the current assessment to provide consistency between survey periods.

3.3.1.1. Floristic Community Type (FCT) Analysis

Floristic Community Type (FCT) refers to the vegetation types derived by Gibson et al. (1994) through the floristic survey of the Swan Coastal Plain (SCP). Species within the Gibson *et al*. (1994) data set were updated to align with current names as specified by FloraBase (DBCA and WAH 2019). Using current records, a number of species in the Gibson *et al*. (1994) data set were shown to be significant range extensions from the Swan Coastal Plain, where appropriate such cases were removed. In addition, excluded and misapplied names were removed from the data set and infra-specific names were reduced. The merged dataset was analysed using a combination of pre-treatments such as the inclusion and/or removal of introduced species and singletons. The removal of both singletons and introduced species from the merged dataset, an accepted pre-treatment for such analysis, produced the best results (e.g. stronger correlations; Clarke and Gorley 2006). Inclusion of such data (i.e. weeds and singletons) merely served to confound the dataset by introducing stochastic and 'site' artefact data. Transformed

data were analysed using a combination of multivariate analysis routines including Bray-Curtis Similarity Matrices, Cluster Analysis (Flexible Beta single site insertion) and Multi-Dimensional Scaling (MDS).

To identify potential TECs and PECs in the survey area, ELA quadrats and vegetation communities were compared to FCT's defined by Gibson *et al*. (1994). To identify the presence of FCT's, appropriate multivariate analyses comparing current data to that of Gibson *et al*. (1994) species by quadrat data, and inferences based on dominant species and geomorphology were used. Given the nature of the data (e.g. spatial and temporal differences), results and subsequent extrapolations, assigned FCT's within the survey area were inferred and not absolute, i.e. a vegetation code assigned to an FCT was inferred to comprise, to varying degrees, floristic aspects of that FCT as defined by Gibson *et al*. (1994). These FCT's were subsequently compared with vegetation communities delineated by ELA (2013a, 2013b, 2012) and ATA Environmental (2007).

3.4. Flora identification and nomenclature

Flora specimen identification was undertaken by ELA Botanist Daniel Brassington, with additional specimens confirmed by the Western Australian Herbarium (WAH). Species identification utilised taxonomic literature and keys and where required specimens were confirmed using the WAH collection. Suitable material that meets WAH specimen lodgement requirements, such as new incidences of Threatened or Priority flora, range extensions and good floristic material where current collections lack, will submitted along with Threatened and Priority Report forms to DBCA, as required by conditions of collection licences issued under the BC Act. Nomenclature used for the flora species within this report follows the WA Plant Census as available on FloraBase (DBCA and WAH 2019).

3.5. Limitations

The EPA *Technical Guide – Flora and Vegetation Surveys for Environmental Impact Assessment* (EPA 2016) recommends including discussion of the constraints and limitations of the survey methods used. Constraints and limitations for the detailed and targeted flora and vegetation for the survey area are summarised in Table 3 below. No constraints were identified.

Table 3: Survey limitations

Constraint	Limitations
Sources of information	**Not a constraint:** The Swan Coastal Plain has been well surveyed, with increasing survey work occurring due to the ongoing urban development of the Perth metropolitan area. Several flora and fauna surveys have been undertaken in the survey area which have been utilised for the purposes of this survey. Gibson *et al* 1994 was a primary source for determination of methods, analysis and results for assessing FCT's. Broad-scale vegetation mapping at a scale of 1:1,000,000 was available. Land system mapping at a scale of 1:2,000,000 and soil and landform mapping was also available. The information which was available was sufficient and as such sources of information were not considered a major limitation.
Scope of work	**Not a constraint:** The survey requirement for a Detailed and Targeted flora and vegetation survey in accordance with the EPA *Technical Guidance: Flora and Vegetation Surveys for Environmental Impact Assessment* (EPA 2016) was adequately met.
Completeness of survey	**Not a constraint:** The area was surveyed to the satisfaction of the scope and a Detailed level flora and vegetation survey as per relevant guidelines.

Constraint	Limitations
Intensity of survey	**Not a constraint:** Survey effort was considered adequate to meet objectives of the scope. The number of quadrats established was sufficient to determine the vegetation communities present and to identify any vegetation of conservation significance.
Timing, weather, season, cycle	**Not a constraint:** The survey area is located in the Swan Coastal Plain bioregion of Western Australia. Recommended survey timing for this region is in spring (September – November; EPA 2016). The field survey was undertaken in September. Many flora species were flowering at the time of the field survey or had sufficient material (fruit) available to identify the dominant and target species. The timing was appropriate for conducting this level of survey.
Disturbances	**Not a constraint:** Disturbances within the survey area included the presence of weeds, unauthorised access (walk trails and bike tracks) and edge effects. These disturbances did not negatively impact the ability to meet objectives outlined in the scope of works.
Resources	**Not a constraint:** The personnel conducting this field survey were both suitably qualified to identify specimens, having previously undertaken flora and vegetation assessments on the Swan Coastal Plain and within Lot 2001.
Accessibility	**Not a constraint:** All relevant areas of the survey area were easily accessed and able to be surveyed.

Figure 2: Survey Effort

Survey Area

Quadrat Location

GPS Track Log

0 35 70 140

Metres

Datum/Projection:
GDA 1994 MGA Zone 50

Project: 17694-DB Date: 10/01/2022

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4. Results

4.1. Desktop Review

The presence of the Banksia Woodlands of the Swan Coastal Plain TEC within the survey area was confirmed and detailed in ELA (2021a). In that document, Floristic Community Type (FCT) 20a and 28 were confirmed via multivariate analysis against the Gibson et al. (1994) datasets.

A review of the 2019 quadrat data and statistical analysis (ELA 2021a) was undertaken to determine potential species composition that may be recognisable in the field to assist in delineation between FCT 20a and FCT 28 within the survey area and are summarised in Table 4 below.

Review of the statistical analysis in ELA 2021a determined several characteristic species of the three recorded quadrats. Species present in ELA01, *Calytrix flavescens* and *Conostylis setigera* were determined to be characteristic of FCT20a, while species present in ELA03, *Tricoryne elatior*, *Corynotheca micrantha*, *Hemiandra pungens* and *Lobelia tenuiflora* were determined to be characteristic of FCT 28 within the survey area.

A comparison of Gibson et al. (1994) species lists for FCT 20a and FCT 28 against the three quadrats determined several key species could indicate a separation of the two FCT's. The species *Eremaea pauciflora* and *Lyginia barbata* indicated FCT 20a and the species *Xanthorrhoea preissii* (in cover >10%) and the presence of *Sowerbaea laxiflora* and *Conostylis aculeata* indicated FCT 28. The full analysis table is shown in Appendix B.

A comparison of typical and common species recorded in Gibson et al. (1994) was also undertaken and is shown in Appendix C. FCT 20a recorded a greater species richness with numerous species not listed for FCT 28 and only a single weed species, while FCT 28 was characterised by increased weed abundance and the mid storey species *Xanthorrhoea preissii* and *Acacia pulchella*.

Table 4: Summary of characteristic species differentiating FCT20a and FCT28 in the survey area

FCT 20a	Abundance	FCT 28	Abundance
Generally higher species richness and low to nil weed cover		Lower species richness and increased weed presence	
Eremaea pauciflora	≥ 1%	*Xanthorrhoea preissii*	≥ 10%
Lyginia barbata	≥ 1%	*Sowerbaea laxiflora*	Present
Schoenus curvifolius	Present	*Conostylis aculeata*	Present
Stylidium piliferum	Present	*Ursinia anthemoides*	Present
Xanthosia huegelii	Present	*Tricoryne elatior*	Present
Calytrix flavescens	Present	*Corynotheca micrantha*	Present
Conostylis setigera	Present	*Hemiandra pungens*	Present
		Lobelia tenuiflora	Present
		Acacia pulchella	Present

4.2. Flora overview

A total of 86 taxa (80 native and six introduced taxa) from 68 genera and 30 families were recorded across the survey area. Families with the highest number of species included Fabaceae and Orchidaceae, with 12 and nine species respectively. *Conostylis, Lepidosperma, Pterostylis* and *Stylidium* were the best represented genera with three species recorded each. The most common species (those that recorded an average of greater than 2% Foliar Cover across all sites) included *Allocasuarina fraseriana, Banksia attenuata, Desmocladus flexuosus, Eucalyptus marginata, Hibbertia hypericoides, Stirlingia latiflora and Xanthorrhoea preissii*. A flora species list is provided in Appendix D.

Three quadrats were resurveyed from the ELA (2021a) survey, with an additional three quadrats established in representative locations across the survey area. All six quadrat locations are shown in Figure 2. Five of the six quadrats were broadly comprised of a mixed Jarrah – Banksia - Allocasuarina woodland on grey sandy soils with differences mostly evident in the understory composition. Quadrat ELA06 was lacking the Allocasuarina component of the overstory and had the lowest species richness. Individual quadrat data is presented in Appendix F and a summary of each is presented below in Table 5.

Table 5: Quadrat Vegetation Summaries

Quadrat	Location (UTM) of North West Corner	Vegetation Description
ELA01	50J 385875 mE 6494665 mS	*Eucalyptus marginata, Allocasuarina fraseriana* and *Banksia attenuata* low woodland over *Xanthorrhoea preissii*, *Stirlingia latiflora* and *Jacksonia sternbergiana* sparse mid shrubland, over *Hibbertia hypericoides*, *Eremaea pauciflora* and *Hypocalymma robustum* open low shrubland with *Desmocladus flexuosus*, *Lyginia barbata* and *Mesomelaena pseudostygia* sparse low sedgeland.
ELA02	50J 385610 mE 6494676 mS	*Eucalyptus marginata, Allocasuarina fraseriana* and *Banksia attenuata* woodland over *Xanthorrhoea preissii* and *Stirlingia latiflora* sparse mid shrubland, over *Hibbertia hypericoides* and *Eremaea pauciflora* open low shrubland with *Desmocladus flexuosus* and *Mesomelaena pseudostygia* sparse low sedgeland.
ELA03	50J 385404 mE 6494648 mS	*Eucalyptus marginata, Allocasuarina fraseriana* and *Banksia attenuata* woodland over *Xanthorrhoea preissii, Hardenbergia comptoniana* and *Stirlingia latiflora* open mid shrubland, over *Hibbertia hypericoides*, *Hypocalymma robustum* and *Kennedia prostrata* sparse low shrubland with *Patersonia occidentalis*, *Desmocladus flexuosus* and *Lepidosperma apricola* sparse low sedgeland.
ELA04	50J 385443 mE 6494713 mS	*Eucalyptus marginata, Allocasuarina fraseriana* and *Banksia attenuata* low woodland over *Xanthorrhoea preissii*, *Stirlingia latiflora* and *Jacksonia sternbergiana* sparse mid shrubland, over *Hibbertia hypericoides*, *Bossiaea eriocarpa* and *Petrophile linearis* sparse low shrubland with *Desmocladus flexuosus*, *Mesomelaena pseudostygia* and *Opercularia vaginata* sparse low sedgeland.
ELA05	50J 385739 mE 6494604 mS	*Eucalyptus marginata, Allocasuarina fraseriana, Banksia attenuata* and *B. menziesii* open low woodland over *Allocasuarina humilis*, *Stirlingia latiflora* and *Jacksonia sternbergiana* sparse mid shrubland, over *Hibbertia hypericoides*, *Eremaea pauciflora* and *Xanthorrhoea preissii* open low shrubland with *Desmocladus flexuosus*, *Mesomelaena pseudostygia* and *Patersonia occidentalis* sparse low sedgeland.
ELA06	50J 385969 mE 6494628 mS	*Eucalyptus marginata* and *Banksia attenuata low* woodland over *Xanthorrhoea preissii, Jacksonia sternbergiana* and *Stirlingia latiflora* open mid shrubland, over *Desmocladus flexuosus*, *Hibbertia hypericoides* and *Briza maxima* sparse low shrub/sedge/grassland.

4.3. Floristic Community Types

A total of 11.84 ha (96.63% of the survey area) was recorded as representative of the Banksia Woodlands of the Swan Coastal Plain TEC. Two FCT's as originally described by Gibson et al. (1994) were identified within the survey area (FCT 20a and FCT 28) with the extent of each displayed in Figure 3. Both these FCT's are recognised as being part of the 'Banksia Woodlands of the Swan Coastal Plain' ecological community, which is listed as EN under the EPBC Act (TSSC 2016) and as Priority 3 by DBCA. Under the BC Act, the SCP20a TEC is listed as EN and is endorsed by the WA Minister for the Environment, while the SCP28 is not listed at a State level.

To identify each quadrat's relationship to the Banksia Woodlands of the Swan Coastal Plain TEC in the survey area, ELA quadrat data was compared to FCT's defined by Gibson *et al*. (1994; see Section 3.3.1.1). Quadrat data is presented in Appendix F.

Results of the multivariate analysis infer that quadrats ELA01 and ELA05 are closely affiliated with FCT 20a and quadrats ELA02, ELA03, ELA04 and ELA06 are closely affiliated with FCT 28 (Table 6). This is different to the ELA (2021a) results where quadrats ELA01 and ELA02 were affiliated with FCT 20a and ELA03 was affiliated with FCT 28. This difference is discussed in Section 5.

Table 6: Relationship between ELA Quadrats and FCT's defined by Gibson et al. (1994)

Quadrat number	Inferred FCT	Closest affiliated sites (Gibson et al. 1994)
ELA01	20a	GOLF-1, LAND-1, KOON-1, KOON-2
ELA02	28	TRIG-4, KING-2, KING-1, WARI-2, SHENTI-1, TRIG-3, WARI-1
ELA03	28	TRIG-4, KING-1, KING-2, WARI-2, SHENTI-1, TRIG-3, WARI-1
ELA04	28	KING-2
ELA05	20a	GOLF-1, LAND-1, KOON-1, KOON-2
ELA06	28	TRIG-4, KING-1, KING-2, WARI-2, SHENTI-1, TRIG-3, WARI-1

FCT 20a was determined to cover 2.77 ha (22.65% of the survey area) and FCT 28 was determined to cover 9.06 ha (73.99% of the survey area). The remainder of the survey area (0.42 ha or 3.36% of the survey area) was occupied by cleared vehicle tracks and/or fence line firebreaks.

4.4. Vegetation Condition

Vegetation condition within the survey area was classed based on the condition scale adapted from Keighery (1994) described in the EPA *Technical Guidance: Flora and Vegetation Surveys for Environmental Impact Assessment* (EPA 2016). Majority of the survey area was considered to be in Excellent condition (11.38 ha; 92.9% of the survey area), with a thin band on the margins of the remnant bushland considered to be in Good condition (0.46 ha; 3.75% of the survey area). The margins of the survey area were cleared as road verges and firebreaks, with some vehicle tracks dissecting the survey area all considered as Completely Degraded (0.41 ha; 3.35%). Disturbances within the survey area included clearing of tracks, cutting timber for firewood, edge effects and fire. Vegetation condition within the survey area is presented in Table 7 and Figure 4 below.

Table 7: Vegetation Condition within the survey area

Vegetation Condition	Area (ha)	Portion of survey area (%)
Excellent	11.38	92.9%
Good	0.46	3.75%
Completely Degraded	0.41	3.35%
Total	**12.25**	**100**

Figure 3: Banksia Woodlands Floristic Community Types within the survey area

Survey Area

Vegetation Communities

- FCT 20a
- FCT 28
- Track

0 35 70 140

Metres

Datum/Projection:
GDA 1994 MGA Zone 50

Project: 17694-DB Date: 24/03/2022

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Figure 4: Vegetation Condition within the survey area

Survey Area

Vegetation Condition

- Completely Degraded
- Excellent
- Good

0 35 70 140

Metres

Datum/Projection:
GDA 1994 MGA Zone 50

Project: 17694-DB Date: 10/01/2022

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5. Discussion

5.1. Determination of FCT in the field

Species selection prior to the survey to determine characteristic differences in the two FCT's present in the survey area was made considerably difficult with the lack of replication of sites. A single quadrat for FCT28 and two for FCT20a were available for analysis, resulting in a limited number of characteristic species. More useful in the field was the comparison of Gibson et al. (1994) species lists against the three quadrats.

Most species determined during the desktop review were inconspicuous in the field and did not make for viable targets for determination of community. The presence of *Eremaea pauciflora* and higher cover of *Xanthorrhoea preissii* became the two primary determinators of FCT 20a and FCT 28 respectively. Presence of *Allocasuarina humilis* in the mid storey in the field also strongly indicated the presence of FCT 20a and became the primary driver for the placement of quadrat ELA05. The other primary feature used in the field for determining FCT was a visual determination of apparent species richness versus weed presence, where apparent understorey richness with a lack of weed species indicated FCT 20a.

5.2. Analysis of Quadrat Data

Re-survey of the 2019 quadrat ELA02 in 2021 recorded a change in the vegetation classification from FCT 20a in 2019 to FCT 28 in 2021. This is likely due to seasonal variability between survey periods, where the quadrat was recorded in November (late spring) in 2019 and September (early spring) in 2021. Slight changes in species presence, abundance and richness between early and late spring, combined with changes in vegetation over the two-year period and the slight spatial shift (estimated less than 1 m) of the quadrat boundaries resulted in sufficient variability to shift the placement within the cluster analysis to FCT 28, demonstrating the high level of similarity between the two FCT's. The slight spatial shift originated from GPS accuracy (generally taken as +/- 5m), where a combination of site photography and recorded waypoints from the 2019 survey was utilised to place the re-scored quadrats as close to the original placement as possible.

Despite an increase in recorded species richness (48 species in 2021 versus 39 in 2019), it was likely the presence of species *Acacia pulchella*, *Conostylis aculeata* and *Trachymene pilosa* and lack of *Xanthosia huegelii* in 2021 that shifted the placement of ELA02 within the FCT analysis, as the additional species are typical of FCT 28 (Gibson et al. 1994).

Due to the varying analysis results between the two analysis events some question existed on the determination of boundary placement between FCT 20a and FCT 28. On the recommendation of the DBCA's TEC specialists the boundary was determined by the results of the most recent analysis and is shown in Figure 3. Selection of the FCT 20a boundary as was based on a combination of quadrat positioning, field notations and incidental photography followed by mapping refinement utilising visual representation of homogeneity of vegetative reflectance in aerial photography.

5.3. Vegetation Condition

The majority of the survey area was recorded as being in Excellent condition (92.9%), with the remainder recorded as Good condition (3.75%) and Completely Degraded condition (3.35%). The Completely Degraded area consisted of vehicle tracks and/or firebreaks intersecting and surrounding the survey area. The increase in good condition area and decrease in excellent condition area as compared to ELA 2021a is due to minor corrections to prior mapping noted during the field survey and does not reflect a shift in condition of the vegetation present within the survey area.

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Appendix A Framework for conservation significant flora and fauna ranking

CATEGORIES OF THREATENED SPECIES UNDER THE ENVIRONMENT PROTECTION AND BIODIVERSITY CONSERVATION ACT 1999 (EPBC ACT)

Threatened fauna and flora may be listed in any one of the following categories as defined in Section 179 of the EPBC Act. Species listed as 'conservation dependent' and 'extinct' are not Matters of National Environmental Significance and therefore do not trigger the EPBC Act.

Category	Definition
Extinct (EX)	There is no reasonable doubt that the last member of the species has died.
Extinct in the Wild (EW)	Taxa known to survive only in captivity or as a naturalised population well outside its past range; or taxa has not been recorded in its known and/or expected habitat at appropriate seasons, anywhere in its past range, despite exhaustive surveys over a time frame appropriate to its life cycle and form.
Critically Endangered (CE)	Taxa considered to be facing an extremely high risk of extinction in the wild.
Endangered (EN)	Taxa considered to be facing a very high risk of extinction in the wild.
Vulnerable (VU)	Taxa considered to be facing a high risk of extinction in the wild.
Near Threatened (NT)	Taxa has been evaluated against the criteria but does not qualify for Critically Endangered, Endangered or Vulnerable now, but is close to qualifying for or is likely to qualify for a threatened category in the near future.
Least Concern (LC)	Taxa has been evaluated against the criteria and does not qualify for Critically Endangered, Endangered, Vulnerable or Near Threatened. Widespread and abundant taxa are included in this category.
Data Deficient (DD)	There is inadequate information to make a direct, or indirect, assessment of taxa's risk extinction based on its distribution and/or population status.
Not Evaluated (NE)	Taxa has not yet been evaluated against the criteria.
Migratory (M)	Not an IUCN category. Species are defined as migratory if they are listed in an international agreement approved by the Commonwealth Environment Minister, including: • the Bonn Convention (Convention on the Conservation of Migratory Species of Wild Animal) for which Australia is a range state; • the agreement between the Government of Australian and the Government of the People's Republic of China for the Protection of Migratory Birds and their environment (CAMBA); • the agreement between the Government of Japan and the Government of Australia for the Protection of Migratory Birds and Birds in Danger of Extinction and their Environment (JAMBA); or • the agreement between Australia and the Republic of Korea to develop a bilateral migratory bird agreement similar to the JAMBA and CAMBA in respect to migratory bird conservation and provides a basis for collaboration on the protection of migratory shorebirds and their habitat (ROKAMBA).

CONSERVATION CODES FOR WESTERN AUSTRALIA FLORA AND FAUNA

The Wildlife Conservation (Specially Protected Fauna) Notice 2018 and the Wildlife Conservation (Rare Flora) Notice 2018 have been transitioned under regulations 170, 171 and 172 of the Biodiversity Conservation Regulations 2018 to be the lists of Threatened, Extinct and Specially Protected species under Part 2 of the *Biodiversity Conservation Act 2016*.

Specially protected fauna or flora are species which have been adequately searched for and are deemed to be, in the wild, threatened, extinct or in need of special protection, and have been gazetted as such.

Threatened species (T)
Listed by order of the Minister as Threatened in the category of critically endangered, endangered or vulnerable under section 19(1), or is a rediscovered species to be regarded as threatened species under section 26(2) of the *Biodiversity Conservation Act 2016* (BC Act).

Threatened fauna is that subset of 'Specially Protected Fauna' listed under schedules 1 to 3 of the Wildlife Conservation (Specially Protected Fauna) Notice 2018 for Threatened Fauna.

Threatened flora is that subset of 'Rare Flora' listed under schedules 1 to 3 of the Wildlife Conservation (Rare Flora) Notice 2018 for Threatened Flora.

The assessment of the conservation status of these species is based on their national extent and ranked according to their level of threat using IUCN Red List categories and criteria as detailed below.

Category	Code	Description
Critically Endangered species	CR	Threatened species considered to be "facing an extremely high risk of extinction in the wild in the immediate future, as determined in accordance with criteria set out in the ministerial guidelines". Listed as critically endangered under section 19(1)(a) of the BC Act in accordance with the criteria set out in section 20 and the ministerial guidelines. Published under schedule 1 of the Wildlife Conservation (Specially Protected Fauna) Notice 2018 for critically endangered fauna or the Wildlife Conservation (Rare Flora) Notice 2018 for critically endangered flora.
Endangered species	EN	Threatened species considered to be "facing a very high risk of extinction in the wild in the near future, as determined in accordance with criteria set out in the ministerial guidelines". Listed as endangered under section 19(1)(b) of the BC Act in accordance with the criteria set out in section 21 and the ministerial guidelines. Published under schedule 2 of the Wildlife Conservation (Specially Protected Fauna) Notice 2018 for endangered fauna or the Wildlife Conservation (Rare Flora) Notice 2018 for endangered flora.
Vulnerable species	VU	Threatened species considered to be "facing a high risk of extinction in the wild in the medium-term future, as determined in accordance with criteria set out in the ministerial guidelines". Listed as vulnerable under section 19(1)(c) of the BC Act in accordance with the criteria set out in section 22 and the ministerial guidelines. Published under schedule 3 of the Wildlife Conservation (Specially Protected Fauna) Notice 2018 for vulnerable fauna or the Wildlife Conservation (Rare Flora) Notice 2018 for vulnerable flora.

Extinct species

Listed by order of the Minister as extinct under section 23(1) of the BC Act as extinct or extinct in the wild, as follows:

Category	Code	Description
Extinct species	EX	Species which have been adequately searched for and there is no reasonable doubt that the last individual has died. Published as Specially Protected under the Wildlife Conservation Act 1950, in Schedule 4 of the Wildlife Conservation (Specially Protected Fauna) Notice for Presumed Extinct Fauna and Wildlife Conservation (Rare Flora) Notice for Presumed Extinct Flora.
Extinct in the wild species	EW	Species that "is known only to survive in cultivation, in captivity or as a naturalised population well outside its past range; and it has not been recorded in its known habitat or expected habitat, at appropriate seasons, anywhere in its past range, despite surveys over a time frame appropriate to its life cycle and form", and listing is otherwise in accordance with the ministerial guidelines (section 25 of the BC Act). Currently there are no threatened fauna or threatened flora species listed as extinct in the wild. If listing of a species as extinct in the wild occurs, then a schedule will be added to the applicable notice.

Specially protected species

Listed by order of the Minister as specially protected under section 13(1) of the BC Act. Meeting one or more of the following categories: species of special conservation interest; migratory species; cetaceans; species subject to international agreement; or species otherwise in need of special protection.

Species that are listed as threatened species (critically endangered, endangered or vulnerable) or extinct species under the BC Act cannot also be listed as Specially Protected species.

Categories are detailed below.

Category	Code	Description
Migratory species	MI	Fauna that periodically or occasionally visit Australia or an external Territory or the exclusive economic zone; or the species is subject of an international agreement that relates to the protection of migratory species and that binds the Commonwealth; and listing is otherwise in accordance with the ministerial guidelines (section 15 of the BC Act). Includes birds that are subject to an agreement between the government of Australia and the governments of Japan (JAMBA), China (CAMBA) and The Republic of Korea (ROKAMBA), and fauna subject to the Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention), an environmental treaty under the United Nations Environment Program. Migratory species listed under the BC Act are a subset of the migratory animals that are known to visit Western Australia, protected under the international agreements or treaties, excluding species that are listed as Threatened species. Published as migratory birds protected under an international agreement under schedule 5 of the Wildlife Conservation (Specially Protected Fauna) Notice 2018.

Category	Code	Description
Species of special conservation interest (conservation dependent fauna)	CD	Fauna of special conservation need being species dependent on ongoing conservation intervention to prevent it becoming eligible for listing as threatened, and listing is otherwise in accordance with the ministerial guidelines (section 14 of the BC Act). Published as conservation dependent fauna under schedule 6 of the Wildlife Conservation (Specially Protected Fauna) Notice 2018.
Other specially protected species	OS	Fauna otherwise in need of special protection to ensure their conservation, and listing is otherwise in accordance with the ministerial guidelines (section 18 of the BC Act). Published as other specially protected fauna under schedule 7 of the Wildlife Conservation (Specially Protected Fauna) Notice 2018.

Priority species (P)

Possibly threatened species that do not meet survey criteria, or are otherwise data deficient, are added to the Priority Fauna or Priority Flora Lists under Priorities 1, 2 or 3. These three categories are ranked in order of priority for survey and evaluation of conservation status so that consideration can be given to their declaration as threatened fauna or flora.

Species that are adequately known, are rare but not threatened, or meet criteria for near threatened, or that have been recently removed from the threatened species or other specially protected fauna lists for other than taxonomic reasons, are placed in Priority 4. These species require regular monitoring.

Assessment of Priority codes is based on the Western Australian distribution of the species, unless the distribution in WA is part of a contiguous population extending into adjacent States, as defined by the known spread of locations.

Category	Code	Definition
Priority 1	P1	*Poorly-known species* Species that are known from one or a few locations (generally five or less) which are potentially at risk. All occurrences are either: very small; or on lands not managed for conservation, e.g. agricultural or pastoral lands, urban areas, road and rail reserves, gravel reserves and active mineral leases; or otherwise under threat of habitat destruction or degradation. Species may be included if they are comparatively well known from one or more locations but do not meet adequacy of survey requirements and appear to be under immediate threat from known threatening processes. Such species are in urgent need of further survey.
Priority 2	P2	*Poorly-known species* Species that are known from one or a few locations (generally five or less), some of which are on lands managed primarily for nature conservation, e.g. national parks, conservation parks, nature reserves and other lands with secure tenure being managed for conservation. Species may be included if they are comparatively well known from one or more locations but do not meet adequacy of survey requirements and appear to be under threat from known threatening processes. Such species are in urgent need of further survey.

Category	Code	Definition
Priority 3	P3	*Poorly-known species* Species that are known from several locations, and the species does not appear to be under imminent threat, or from few but widespread locations with either large population size or significant remaining areas of apparently suitable habitat, much of it not under imminent threat. Species may be included if they are comparatively well known from several locations but do not meet adequacy of survey requirements and known threatening processes exist that could affect them. Such species are in need of further survey.
Priority 4	P4	*Rare, Near Threatened and other species in need of monitoring* (a) Rare. Species that are considered to have been adequately surveyed, or for which sufficient knowledge is available, and that are considered not currently threatened or in need of special protection but could be if present circumstances change. These species are usually represented on conservation lands. (b) Near Threatened. Species that are considered to have been adequately surveyed and that are close to qualifying for vulnerable but are not listed as Conservation Dependent. (c) Species that have been removed from the list of threatened species during the past five years for reasons other than taxonomy.

Appendix B Analysis of ELA 2021a Species Data for FCT separation

Classification	Species	ELA01 Cover (%)	ELA02 Cover (%)	ELA03 Cover (%)	FCT20a	FCT28
FCT20a characteristic species	*Eremaea pauciflora*		2		Common	
	Lyginia barbata	1	1	0.1	Typical	
	Schoenus curvifolius	0.1			Common	
	Stylidium piliferum		0.1		Typical	
	Xanthosia huegelii		0.1		Common	
FCT28 characteristic species	*Sowerbaea laxiflora*			0.1	Typical	Common
	Xanthorrhoea preissii	1	4	20		Typical
	Conostylis aculeata			0.1		Common
	**Ursinia anthemoides*		0.1	0.1		Common
Species consistent over both FCT20a & FCT28	*Banksia attenuata*	3	4	1	Typical	Typical
	Burchardia congesta	0.1	0.1	0.1	Typical	Typical
	Conostephium pendulum	0.1	0.5	0.1	Typical	Common
	Conostylis setigera	0.1			Common	Common
	Desmocladus flexuosus	3	3	2	Common	Typical
	**Gladiolus caryophyllaceus*	0.1		0.1	Common	Common
	Gompholobium tomentosum	0.1			Common	Common
	Hibbertia hypericoides	15	20	9	Typical	Typical
	Mesomelaena pseudostygia	1	2	1	Typical	Typical
	Petrophile linearis	1	0.5	0.1	Typical	Common
Species not listed in FCT 20a or 28	*Allocasuarina fraseriana*	8	6	4		
	Eucalyptus marginata	20	15	30		
	Hovea trisperma	0.1	0.1	0.1		
	Hypocalymma robustum	1	1	1		
Species distinct to either ELA1&2 or ELA3	*Lomandra sp.*	0.1	0.1			
	Calytrix flavescens	1	1			
	Billardiera heterophylla			0.1		
	Conostephium preissii			0.5		
	Conostylis juncea			0.1		

Classification	Species	ELA01 Cover (%)	ELA02 Cover (%)	ELA03 Cover (%)	FCT20a	FCT28
	Corynotheca micrantha			0.1		
	Lobelia tenuior			0.1		
	Tricoryne elatior			0.1		
Species at odds with the analysis	**Aira cupaniana*	0.1				Common
	**Briza maxima*	0.1	0.1	0.1		Common
	**Hypochaeris glabra*		0.1			Typical
	Hemiandra pungens			0.1	Common	
	Haemodorum laxum			0.1	Typical	
FCT20a species but not indicative of a change	*Bossiaea eriocarpa*	0.1	0.1	0.1	Typical	
	Daviesia triflora	0.1	0.5	0.1	Common	
	Patersonia occidentalis	0.5	0.1	2	Typical	
	Stirlingia latifolia	13	1	2	Typical	
	Tetraria octandra	0.1	0.1	0.1	Common	
Species not indicative of a change	*Acacia pulchella var. pulchella*					Common
	Acacia sessilis		0.5			
	Acacia willdenowiana		0.1			
	Alexgeorgea nitens				Typical	
	Allocasuarina humilis				Common	
	Amphipogon turbinatus				Common	
	Arnocrinum preissii	0.1				
	Centrolepis drummondiana					Common
	Conostylis aurea				Common	
	Cyathochaeta clandestina				Common	
	Dampiera linearis				Common	
	Daucus glochidiatus					Common
	Daviesia nudiflora				Common	
	Desmocladus fasciculatus (ex. Loxocarya fasciculata)				Typical	
	Dianella revoluta		0.1			
	Drosera erythrorhiza				Typical	Typical
	Drosera menziesii subsp. penicillaris				Typical	

Classification	Species	ELA01 Cover (%)	ELA02 Cover (%)	ELA03 Cover (%)	FCT20a	FCT28
	**Ehrharta longiflora*		0.1	0.1		
	Gompholobium confertum	0.5				
	Gonocarpus pithyoides	0.1				
	Hardenbergia comptoniana		0.1	0.1		
	Grevillea vestita	12				
	Hibbertia huegelii				Typical	
	Hibbertia subvaginata	0.1				
	Hypolaena exsulca				Common	
	Jacksonia floribunda complex	2			Common	
	Kennedia prostrata		0.1			
	Lagenophora huegelii					Common
	Lepidosperma angustatum					Common
	Lepidosperma apricola		0.1	0.1		
	Lepidosperma pubisquameum		0.1			
	Lepidosperma sp. (coastal terete)				Common	
	Lomandra caespitosa				Common	
	Lomandra hermaphrodita				Typical	Common
	Lomandra sericea	0.1				
	Lomandra suaveolens		0.1	0.1		
	Lyginia imberbis	0.5				
	Monotaxis grandiflora				Common	
	Notodanthonia occidentalis (ex.Danthonia occidentalis)				Common	Common
	Petrophile macrostachya				Common	
	Philotheca spicata (ex.Eriostemon spicatus)				Common	
	Pimelea calcicola		0.1			
	Stylidium brunonianum				Common	Common
	Stylidium calcaratum				Common	
	Stylidium repens	0.1				
	Styphelia pallida (ex.Astroloma pallidum)				Common	
	Synaphea spinulosa				Common	

Classification	Species	ELA01 Cover (%)	ELA02 Cover (%)	ELA03 Cover (%)	FCT20a	FCT28
	Thysanotus manglesianus/patersonii complex					Common
	Thysanotus triandrus				Common	
	Trachymene pilosa					Typical
	**Vulpia myuros*		0.1			

Appendix C Comparison of Gibson et al (1994) FCT 20a and 28

	FCT 20a		FCT 28	
	Typical Species	**Other Common Species**	**Typical Species**	**Other Common Species**
Upper Storey	*Banksia attenuata*		*Banksia attenuata*	
	Bossiaea eriocarpa	***Allocasuarina humilis***	*Hibbertia hypericoides*	***Acacia pulchella* var. *pulchella***
	Conostephium pendulum	***Astroloma pallidum***	***Xanthorrhoea preissii***	*Conostephium pendulum*
	Hibbertia huegelii	***Daviesia nudiflora***		*Gompholobium tomentosum*
	Hibbertia hypericoides	***Daviesia triflora***		*Petrophile linearis*
	Petrophile linearis	***Eremaea pauciflora***		
Mid Storey	***Scaevola repens var. repens***	***Eriostemon spicatus***		
	Stirlingia latifolia	*Gompholobium tomentosum*		
		Hemiandra pungens		
		***Jacksonia densiflora / floribunda* complex**		
		Petrophile macrostachya		
		Synaphea spinulosa		
	Alexgeorgea nitens	***Amphipogon turbinatus***	**** Hypochaeris glabra***	****Aira caryophyllea***
	Burchardia umbellata	***Conostylis aurea***	*Burchardia umbellata*	****Briza maxima***
	Drosera erythrorhiza	***Conostylis setigera***	*Drosera erythrorhiza*	**Gladiolus caryophyllaceus*
	Drosera menziesii* subsp. *penicillaris	***Cyathochaeta clandestina***	*Loxocarya flexuosa*	***Centrolepis drummondiana***
	Haemodorum laxum	***Dampiera linearis***	*Mesomelaena pseudostygia*	***Conostylis aculeata***
	Lomandra hermaphrodita	*Danthonia occidentalis*	***Trachymene pilosa***	*Conostylis setigera*
Under storey	***Loxocarya fasciculata***	**Gladiolus caryophyllaceus*		*Danthonia occidentalis*
	Lyginia barbata	***Hypolaena exsulca***		***Daucus glochidiatus***
	Mesomelaena pseudostygia	***Lepidosperma sp.* (coastal terete)**		***Lagenifera huegelii***
	Patersonia occidentalis	***Lomandra caespitosa***		***Lepidosperma angustatum***
	Stylidium piliferum	*Loxocarya flexuosa*		*Lomandra hermaphrodita*
		Monotaxis grandiflora		***Sowerbaea laxiflora***
		Schoenus curvifolius		*Stylidium brunonianum*

	FCT 20a	FCT 28
	Stylidium brunonianum	***Thysanotus manglesianus/patersonii* complex**
	Stylidium calcaratum	****Ursinia anthemoides***
	Tetraria octandra	
	Thysanotus triandrus	
	Xanthosia huegelii	

* Indicates Introduced (weedy) species

Bold Type indicates those potentially characteristic of the FCT.

Appendix D Flora species list

Family	Species
Aizoaceae	*Carpobrotus virescens*
Amaranthaceae	*Ptilotus manglesii*
Anarthriaceae	*Lyginia barbata*
Apiaceae	*Xanthosia huegelii*
Araliaceae	*Trachymene pilosa*
Asparagaceae	*Lomandra caespitosa*
Asparagaceae	*Lomandra sonderi*
Asparagaceae	*Sowerbaea laxiflora*
Asteraceae	*Hypochaeris glabra**
Asteraceae	*Lagenophora huegelii*
Asteraceae	*Ursinia anthemoides**
Asteraceae	*Waitzia suaveolens*
Casuarinaceae	*Allocasuarina fraseriana*
Casuarinaceae	*Allocasuarina humilis*
Colchicaceae	*Burchardia congesta*
Cyperaceae	*Lepidosperma apricola*
Cyperaceae	*Lepidosperma pubisquameum*
Cyperaceae	*Lepidosperma scabrum*
Cyperaceae	*Mesomelaena pseudostygia*
Cyperaceae	*Schoenus curvifolius*
Cyperaceae	*Tetraria octandra*
Dasypogonaceae	*Calectasia narragara*
Dasypogonaceae	*Dasypogon bromeliifolius*
Dilleniaceae	*Hibbertia hypericoides*
Dilleniaceae	*Hibbertia striata*
Droseraceae	*Drosera erythrorhiza*
Droseraceae	*Drosera* sp.
Ericaceae	*Conostephium pendulum*
Ericaceae	*Conostephium preissii*
Fabaceae	*Acacia pulchella* var. *glaberrima*
Fabaceae	*Acacia willdenowiana*
Fabaceae	*Bossiaea eriocarpa*
Fabaceae	*Daviesia nudiflora*
Fabaceae	*Daviesia triflora*
Fabaceae	*Gompholobium confertum*
Fabaceae	*Gompholobium tomentosum*
Fabaceae	*Hardenbergia comptoniana*
Fabaceae	*Hovea trisperma*
Fabaceae	*Isotropis cuneifolia*
Fabaceae	*Jacksonia sternbergiana*
Fabaceae	*Kennedia prostrata*
Goodeniaceae	*Dampiera linearis*
Haemodoraceae	*Anigozanthos manglesii*
Haemodoraceae	*Conostylis aculeata*
Haemodoraceae	*Conostylis setigera*

Family	Species
Haemodoraceae	*Conostylis* sp.
Haemodoraceae	*Haemodorum laxum*
Haemodoraceae	*Phlebocarya ciliata*
Hemerocallidaceae	*Corynotheca micrantha*
Hemerocallidaceae	*Dianella revoluta*
Iridaceae	*Gladiolus caryophyllaceus**
Iridaceae	*Patersonia occidentalis*
Myrtaceae	*Calytrix flavescens*
Myrtaceae	*Eremaea pauciflora*
Myrtaceae	*Eucalyptus marginata*
Myrtaceae	*Hypocalymma robustum*
Myrtaceae	*Melaleuca trichophylla*
Orchidaceae	*Caladenia arenicola*
Orchidaceae	*Caladenia flava*
Orchidaceae	*Diuris magnifica*
Orchidaceae	*Elythranthera brunonis*
Orchidaceae	*Microtis media*
Orchidaceae	*Pterostylis platypetala*
Orchidaceae	*Pterostylis recurva*
Orchidaceae	*Pterostylis* sp.
Orchidaceae	*Thelymitra* sp.
Pittosporaceae	*Billardiera heterophylla*
Poaceae	*Briza maxima**
Poaceae	*Ehrharta longiflora**
Poaceae	*Vulpia myuros**
Proteaceae	*Banksia attenuata*
Proteaceae	*Banksia menziesii*
Proteaceae	*Persoonia saccata*
Proteaceae	*Petrophile linearis*
Proteaceae	*Petrophile macrostachya*
Proteaceae	*Stirlingia latifolia*
Restionaceae	*Desmocladus flexuosus*
Restionaceae	*Hypolaena exsulca*
Rubiaceae	*Opercularia vaginata*
Rutaceae	*Philotheca spicata*
Stylidiaceae	*Stylidium androsaceum*
Stylidiaceae	*Stylidium piliferum*
Stylidiaceae	*Stylidium repens*
Thymelaeaceae	*Pimelea sulphurea*
Violaceae	*Hybanthus calycinus*
Xanthorrhoeaceae	*Xanthorrhoea preissii*

* indicates introduced (weedy) flora

Appendix E Quadrat data

Quadrat	Date	Site type	Observer
ELA01	10/09/2021	10 m x 10 m	DB
Condition	**Disturbances**	**Fire history (years)**	**Vegetation community**
Excellent	Weeds, Pathogen	10-20 years	EmBaf / FCT20a
Soil type	**Soil colour**	**Landform unit**	**Aspect/slope °**
Sandy Loam	Pale grey brown	Slope	South-East
Rock type	**Outcropping %**	**Easting**	**Northing**
N/A	0	385875	6494665

Species	Cover (%)	Height (m)	Stratum (U=Upper, M=Middle, G=Ground)	Growth Form
Allocasuarina fraseriana	5	8	U	Tree, Low
Banksia attenuata	3	4	U	Tree, Low
Eucalyptus marginata	20	9	U	Tree, Low
Jacksonia sternbergiana	1	1	M	Shrub, mid

Species	Cover (%)	Height (m)	Stratum (U=Upper, M=Middle, G=Ground)	Growth Form
Stirlingia latiflora	8	1	M	Shrub, Mid
Xanthorrhoea preissii	1	1.2	M	Grass-tree, Mid
**Briza maxima*	0.01	0.3	G	Grasses, Low
**Gladiolus caryophyllaceus*	0.1	0.4	G	Herbs, Low
**Hypochaeris glabra*	0.1	0.01	G	Herbs, Low
Bossiaea eriocarpa	1.5	0.3	G	Shrub, Low
Burchardia congesta	0.1	0.5	G	Herbs, Mid
Caladenia flava	0.1	0.1	G	Herbs, Low
Calytrix flavescens	1	0.4	G	Shrub, Low
Carpobrotus virescens	0.1	0.05	G	Herbs, Low
Conostephium pendulum	0.3	0.3	G	Shrub, Low
Conostylis setigera	0.1	0.1	G	Herbs, Low
Dasypogon bromeliifolius	0.2	0.3	G	Herbs, Low
Desmocladus flexuosus	2	0.3	G	Sedge or Rush, Low
Drosera erythrorhiza	0.1	0.01	G	Herbs, Low
Elythranthera brunonis	0.1	0.4	G	Herbs, Low
Eremaea pauciflora	3	0.4	G	Shrub, Low
Gompholobium confertum	0.5	0.6	G	Shrub, Low
Gompholobium tomentosum	0.1	0.2	G	Shrub, Low
Haemodorum laxum	0.1	0.4	G	Herbs, Low
Hibbertia hypericoides	13	0.4	G	Shrub, Low
Hibbertia striata	0.25	0.2	G	Shrub, Low
Hovea trisperma	0.2	0.4	G	Shrub, Low
Hypocalymma robustum	3	0.4	G	Shrub, Low
Lepidosperma pubisquameum	0.3	0.3	G	Sedge or Rush, Low
Lomandra sonderi	0.1	0.3	G	Herbs, Low
Lyginia barbata	2	0.4	G	Sedge or Rush, Low
Mesomelaena pseudostygia	2	0.3	G	Sedge or Rush, Low
Patersonia occidentalis	1	0.4	G	Herbs, Low
Petrophile linearis	0.5	0.5	G	Shrub, Low
Philotheca spicata	0.1	0.3	G	Shrub, Low
Pterostylis platypetala	0.1	0.1	G	Herbs, Low
Pterostylis sp.	0.1	0.02	G	Herbs, Low
Schoenus curvifolius	0.1	0.2	G	Sedge or Rush, Low
Sowerbaea laxiflora	0.2	0.4	G	Herbs, Low
Stylidium androsaceum	0.1	0.1	G	Herbs, Low
Stylidium piliferum	0.1	0.1	G	Herbs, Low
Stylidium repens	0.1	0.1	G	Herbs, Low
Tetraria octandra	0.1	0.3	G	Sedge or Rush, Low
Trachymene pilosa	0.1	0.1	G	Herbs, Low
Waitzia suaveolens	0.1	0.1	G	Herbs, Low
Xanthosia huegelii	0.1	0.1	G	Herbs, Low

* Weed/ Introduced species

Quadrat	Date	Site type	Observer
ELA02	10/09/2021	10 m x 10 m	DB
Condition	**Disturbances**	**Fire history (years)**	**Vegetation community**
Excellent	Weeds, Pathogen	10-20 years	EmBaf / FCT28
Soil type	**Soil colour**	**Landform unit**	**Aspect/slope °**
Sandy Loam	Pale grey brown	Slope	South-East
Rock type	**Outcropping %**	**Easting**	**Northing**
N/A	0	385610	6494676

Species	Cover (%)	Height (m)	Stratum (U=Upper, M=Middle, G=Ground)	Growth form
Allocasuarina fraseriana	6	8	U	Tree, Low
Banksia attenuata	4	6	U	Tree, Low
Eucalyptus marginata	15	12	U	Tree, Mid
Hardenbergia comptoniana	0.1	1	M	Shrub, mid
Stirlingia latiflora	1	1	M	Shrub, mid
Xanthorrhoea preissii	4	2	M	Grass-tree, Mid
**Briza maxima*	0.3	0.1	G	Grasses, Low

Species	Cover (%)	Height (m)	Stratum (U=Upper, M=Middle, G=Ground)	Growth form
**Gladiolus caryophyllaceus*	0.1	0.4	G	Herbs, Low
**Hypochaeris glabra*	0.1	0.01	G	Herbs, Low
**Ursinia anthemoides*	0.1	0.1	G	Herbs, Low
Acacia pulchella var. *glaberrima*	0.5	0.6	G	Shrub, Low
Acacia willdenowiana	0.1	0.4	G	Shrub, Low
Bossiaea eriocarpa	1	0.2	G	Shrub, Low
Burchardia congesta	0.1	0.3	G	Herbs, Low
Caladenia flava	0.1	0.1	G	Herbs, Low
Calytrix flavescens	0.1	0.2	G	Shrub, Low
Conostephium pendulum	1	0.4	G	Shrub, Low
Conostylis aculeata	0.1	0.2	G	Herbs, Low
Conostylis setigera	0.1	0.1	G	Herbs, Low
Conostylis sp.	0.1	0.2	G	Herbs, Low
Daviesia triflora	0.5	0.4	G	Shrub, Low
Desmocladus flexuosus	1	0.3	G	Sedge or Rush, Low
Dianella revoluta	0.1	0.6	G	Sedge or Rush, Mid
Drosera erythrorhiza	0.2	0.01	G	Herbs, Low
Drosera sp.	0.1	0.1	G	Herbs, Low
Eremaea pauciflora	2	0.3	G	Shrub, Low
Gompholobium confertum	1	0.5	G	Shrub, Low
Gompholobium tomentosum	0.1	0.2	G	Shrub, Low
Haemodorum laxum	0.1	0.5	G	Herbs, Low
Hibbertia hypericoides	20	0.4	G	Shrub, Low
Hovea trisperma	0.2	0.4	G	Shrub, Low
Hypocalymma robustum	1	0.5	G	Shrub, Low
Lepidosperma apricola	0.1	0.3	G	Sedge or Rush, Low
Lepidosperma pubisquameum	0.1	0.3	G	Sedge or Rush, Low
Lomandra caespitosa	0.1	0.1	G	Sedge or Rush, Low
Lomandra sonderi	0.1	0.3	G	Sedge or Rush, Low
Lyginia barbata	0.5	0.4	G	Sedge or Rush, Low
Mesomelaena pseudostygia	2	0.3	G	Sedge or Rush, Low
Opercularia vaginata	0.1	0.2	G	Herbs, Low
Patersonia occidentalis	0.5	0.4	G	Herbs, Low
Philotheca spicata	0.1	0.3	G	Shrub, Low
Pimelea sulphurea	0.1	0.2	G	Herbs, Low
Pterostylis platypetala	0.1	0.1	G	Herbs, Low
Pterostylis sp.	0.1	0.1	G	Herbs, Low
Sowerbaea laxiflora	0.4	0.4	G	Herbs, Low
Stylidium piliferum	0.1	0.1	G	Herbs, Low
Tetraria octandra	0.5	0.3	G	Sedge or Rush, Low
Trachymene pilosa	0.1	0.1	G	Herbs, Low

* Weed/ Introduced species

Quadrat	Date	Site type	Observer
ELA03	10/09/2021	10 m x 10 m	DB
Condition	**Disturbances**	**Fire history (years)**	**Vegetation community**
Excellent	Weeds, Pathogen	10-20 years	EmBaf / FCT28
Soil type	**Soil colour**	**Landform unit**	**Aspect/slope °**
Sandy loam	Pale brown	Slope	South
Rock type	**Outcropping %**	**Easting**	**Northing**
N/A	0	385404	6494648

Species	Cover (%)	Height (m)	Stratum (U=Upper, M=Middle, G=Ground)	Sub-Stratum
Allocasuarina fraseriana	2	8	U	Tree, Low
Banksia attenuata	1	8	U	Tree, Low
Eucalyptus marginata	30	11	U	Tree, Mid
Hardenbergia comptoniana	1	3	M	Climber
Stirlingia latiflora	1.5	1	M	Shrub, mid
Xanthorrhoea preissii	20	2	M	Grass-tree, Mid
*Briza maxima	0.4	0.1	G	Grasses, Low

Species	Cover (%)	Height (m)	Stratum (U=Upper, M=Middle, G=Ground)	Sub-Stratum
*Gladiolus caryophyllaceus	0.2	0.4	G	Herbs, Low
*Hypochaeris glabra	0.3	0.01	G	Herbs, Low
*Ursinia anthemoides	0.3	0.2	G	Herbs, Low
Acacia willdenowiana	0.1	0.3	G	Shrub, Low
Billardiera heterophylla	0.5	0.5	G	Shrub, Low
Bossiaea eriocarpa	0.5	0.2	G	Shrub, Low
Burchardia congesta	0.1	0.4	G	Herbs, Low
Caladenia arenicola	0.1	0.4	G	Herbs, Low
Caladenia flava	0.1	0.1	G	Herbs, Low
Carpobrotus virescens	0.1	0.1	G	Herbs, Low
Conostephium pendulum	0.1	0.2	G	Shrub, Low
Conostephium preissii	0.1	0.4	G	Shrub, Low
Conostylis aculeata	0.1	0.3	G	Herbs, Low
Conostylis sp.	0.1	0.2	G	Herbs, Low
Corynotheca micrantha	0.1	0.4	G	Herbs, Low
Daviesia triflora	0.1	0.4	G	Shrub, Low
Desmocladus flexuosus	1	0.2	G	Sedge or Rush, Low
Diuris magnifica	0.1	0.4	G	Herbs, Low
Drosera erythrorhiza	0.1	0.01	G	Herbs, Low
Elythranthera brunonis	0.1	0.15	G	Herbs, Low
Haemodorum laxum	0.1	0.5	G	Sedge or Rush, Mid
Hibbertia hypericoides	9	0.6	G	Shrub, Low
Hovea trisperma	0.1	0.2	G	Shrub, Low
Hypocalymma robustum	3	0.5	G	Shrub, Low
Kennedia prostrata	1	0.2	G	Herbs, Low
Lagenophora huegelii	0.2	0.1	G	Herbs, Low
Lepidosperma apricola	1	0.3	G	Sedge or Rush, Low
Lepidosperma scabrum	0.1	0.4	G	Sedge or Rush, Low
Lomandra sonderi	0.1	0.3	G	Sedge or Rush, Low
Lyginia barbata	0.1	0.4	G	Sedge or Rush, Low
Mesomelaena pseudostygia	0.1	0.4	G	Sedge or Rush, Low
Patersonia occidentalis	2	0.6	G	Sedge or Rush, Mid
Pterostylis recurva	0.1	0.3	G	Herbs, Low
Sowerbaea laxiflora	0.5	0.4	G	Herbs, Low
Tetraria octandra	0.5	0.3	G	Sedge or Rush, Low
Thelymitra sp.	0.1	0.1	G	Herbs, Low
Trachymene pilosa	0.1	0.1	G	Herbs, Low
Xanthosia huegelii	0.1	0.1	G	Herbs, Low

* Weed/ Introduced species

Quadrat	Date	Site type	Observer
ELA04	10/09/2021	10 m x 10 m	DB
Condition	**Disturbances**	**Fire history (years)**	**Vegetation community**
Excellent	Weeds, Pathogen, Firewood cutters	10-20 years	EmBaf / FCT28
Soil type	**Soil colour**	**Landform unit**	**Aspect/slope °**
Sandy loam	Pale brown	Slope	West
Rock type	**Outcropping %**	**Easting**	**Northing**
N/A	0	385443	6494713

Species	Cover (%)	Height (m)	Stratum (U=Upper, M=Middle, G=Ground)	Sub-Stratum
Allocasuarina fraseriana	8	8	U	Tree, Low
Banksia attenuata	3	6	U	Tree, Low
Eucalyptus marginata	15	10	U	Tree, Low
Anigozanthos manglesii	0.2	1	M	Shrub, mid
Jacksonia sternbergiana	3	2.5	M	Shrub, mid
Stirlingia latifolia	2	1	M	Shrub, mid

Species	Cover (%)	Height (m)	Stratum (U=Upper, M=Middle, G=Ground)	Sub-Stratum
Xanthorrhoea preissii	4	1.5	M	Grass-tree, Mid
*Briza maxima	0.1	0.1	G	Grasses, Low
*Gladiolus caryophyllaceus	0.1	0.4	G	Herbs, Low
*Hypochaeris glabra	0.1	0.01	G	Herbs, Low
*Ursinia anthemoides	0.1	0.1	G	Herbs, Low
Bossiaea eriocarpa	1	0.3	G	Shrub, Low
Burchardia congesta	0.1	0.4	G	Herbs, Low
Caladenia arenicola	0.1	0.4	G	Herbs, Low
Caladenia flava	0.1	0.1	G	Herbs, Low
Calectasia narragara	0.1	0.3	G	Herbs, Low
Conostephium pendulum	0.3	0.2	G	Shrub, Low
Conostylis aculeata	0.1	0.1	G	Herbs, Low
Conostylis setigera	0.2	0.1	G	Herbs, Low
Daviesia nudiflora	0.3	0.5	G	Shrub, Low
Daviesia triflora	0.1	0.5	G	Shrub, Low
Desmocladus flexuosus	5	0.2	G	Sedge or Rush, Low
Dianella revoluta	0.1	0.5	G	Herbs, Mid
Gompholobium tomentosum	0.1	0.1	G	Shrub, Low
Haemodorum laxum	0.1	1	G	Herbs, Mid
Hardenbergia comptoniana	0.2	0.5	G	Climber
Hibbertia hypericoides	9	0.4	G	Shrub, Low
Hibbertia striata	0.5	0.2	G	Shrub, Low
Hovea trisperma	0.1	0.2	G	Shrub, Low
Hypocalymma robustum	0.5	0.4	G	Shrub, Low
Isotropis cuneifolia	0.1	0.1	G	Herbs, Low
Lagenophora huegelii	0.1	0.1	G	Herbs, Low
Lepidosperma scabrum	0.1	0.4	G	Sedge or Rush, Low
Lomandra sonderi	0.1	0.3	G	Sedge or Rush, Low
Lyginia barbata	0.5	0.5	G	Sedge or Rush, Low
Mesomelaena pseudostygia	3	0.3	G	Sedge or Rush, Low
Opercularia vaginata	2	0.2	G	Herbs, Low
Patersonia occidentalis	1.3	0.4	G	Herbs, Low
Petrophile linearis	1	0.5	G	Shrub, Low
Petrophile macrostachya	0.5	0.4	G	Shrub, Low
Phlebocarya ciliata	0.5	0.4	G	Herbs, Low
Sowerbaea laxiflora	0.2	0.3	G	Herbs, Low
Stylidium androsaceum	0.1	0.1	G	Herbs, Low
Stylidium piliferum	0.1	0.3	G	Herbs, Low
Tetraria octandra	0.5	0.3	G	Sedge or Rush, Low
Thelymitra sp.	0.1	0.05	G	Herbs, Low
Trachymene pilosa	0.1	0.1	G	Herbs, Low

* Weed/ Introduced species

Quadrat	Date	Site type	Observer
ELA05	10/09/2021	10 m x 10 m	DB
Condition	**Disturbances**	**Fire history (years)**	**Vegetation community**
Excellent	Weeds, Pathogen, Firewood cutters	10-20 years	EmBaf / FCT20a
Soil type	**Soil colour**	**Landform unit**	**Aspect/slope °**
Sandy loam	Pale brown	Flat	N/A
Rock type	**Outcropping %**	**Easting**	**Northing**
N/A	0	385739	6494604

Species	Cover (%)	Height (m)	Stratum (U=Upper, M=Middle, G=Ground)	Sub-Stratum
Allocasuarina fraseriana	3	6	U	Tree, Low
Banksia attenuata	2	6	U	Tree, Low
Banksia menziesii	3	6	U	Tree, Low
Eucalyptus marginata	4	6	U	Tree, Low
Allocasuarina humilis	6	1.8	M	Shrub, mid
Haemodorum laxum	0.1	1	M	Herb, Tall

Species	Cover (%)	Height (m)	Stratum (U=Upper, M=Middle, G=Ground)	Sub-Stratum
Jacksonia sternbergiana	2	2.5	M	Shrub, Tall
Stirlingia latiflora	4	1	M	Shrub, mid
*Briza maxima	0.1	0.2	G	Grasses, Low
*Gladiolus caryophyllaceus	0.1	0.5	G	Herbs, Low
*Hypochaeris glabra	0.1	0.01	G	Herbs, Low
*Ursinia anthemoides	0.1	0.2	G	Herbs, Low
Acacia willdenowiana	0.1	0.2	G	Shrub, Low
Anigozanthos manglesii	0.1	0.4	G	Herbs, Low
Bossiaea eriocarpa	1	0.2	G	Shrub, Low
Burchardia congesta	0.1	0.4	G	Herbs, Low
Caladenia arenicola	0.1	0.4	G	Herbs, Low
Caladenia flava	0.1	0.1	G	Herbs, Low
Calectasia narragara	0.2	0.3	G	Herbs, Low
Calytrix flavescens	0.3	0.3	G	Shrub, Low
Conostephium pendulum	0.5	0.3	G	Shrub, Low
Conostylis aculeata	0.1	0.2	G	Herbs, Low
Conostylis setigera	0.1	0.1	G	Herbs, Low
Conostylis sp.	0.1	0.2	G	Herbs, Low
Dampiera linearis	0.2	0.2	G	Herbs, Low
Daviesia triflora	0.1	0.6	G	Shrub, Low
Desmocladus flexuosus	1	0.3	G	Sedge or Rush, Low
Drosera erythrorhiza	0.1	0.01	G	Herbs, Low
Elythranthera brunonis	0.1	0.3	G	Herbs, Low
Eremaea pauciflora	2	0.6	G	Shrub, Low
Gompholobium confertum	1	0.3	G	Shrub, Low
Gompholobium tomentosum	0.4	0.6	G	Shrub, Low
Hibbertia hypericoides	15	0.6	G	Shrub, Low
Hibbertia striata	0.1	0.3	G	Shrub, Low
Hovea trisperma	0.1	0.4	G	Shrub, Low
Hybanthus calycinus	0.1	0.3	G	Herbs, Low
Hypocalymma robustum	0.5	0.3	G	Shrub, Low
Hypolaena exsulca	0.3	0.4	G	Sedge or Rush, Low
Lagenophora huegelii	0.1	0.2	G	Herbs, Low
Lepidosperma apricola	0.3	0.5	G	Sedge or Rush, Low
Lomandra sonderi	0.1	0.3	G	Sedge or Rush, Low
Lyginia barbata	0.5	0.4	G	Sedge or Rush, Low
Mesomelaena pseudostygia	2	0.3	G	Sedge or Rush, Low
Patersonia occidentalis	1	0.4	G	Herbs, Low
Persoonia saccata	0.5	0.4	G	Shrub, Low
Petrophile linearis	0.1	0.4	G	Shrub, Low
Petrophile macrostachya	1	0.5	G	Shrub, Low
Philotheca spicata	0.1	0.4	G	Shrub, Low

Species	Cover (%)	Height (m)	Stratum (U=Upper, M=Middle, G=Ground)	Sub-Stratum
Phlebocarya ciliata	1	0.4	G	Herbs, Low
Schoenus curvifolius	0.1	0.1	G	Sedge or Rush, Low
Sowerbaea laxiflora	0.1	0.4	G	Herbs, Low
Stylidium androsaceum	0.1	0.1	G	Herbs, Low
Stylidium piliferum	0.1	0.2	G	Herbs, Low
Tetraria octandra	0.3	0.3	G	Sedge or Rush, Low
Trachymene pilosa	0.1	0.1	G	Herbs, Low
Waitzia suaveolens	0.1	0.1	G	Herbs, Low
Xanthorrhoea preissii	2	0.3	G	Herbs, Low

* Weed/ Introduced species

Quadrat	Date	Site type	Observer
ELA06	10/09/2021	10 m x 10 m	DB
Condition	**Disturbances**	**Fire history (years)**	**Vegetation community**
Excellent	Weeds, Pathogen	10-20 years	EmBaf / FCT28
Soil type	**Soil colour**	**Landform unit**	**Aspect/slope °**
Sandy loam	Light brown	Slope	East
Rock type	**Outcropping %**	**Easting**	**Northing**
N/A	0	385969	6494628

Species	Cover (%)	Height (m)	Stratum (U=Upper, M=Middle, G=Ground)	Sub-Stratum
Banksia attenuata	2	4	U	Tree, Low
Eucalyptus marginata	28	8	U	Tree, Low
Acacia pulchella var. glaberrima	0.3	1	M	Shrub, mid
Hardenbergia comptoniana	0.5	2.5	M	Climber
Jacksonia sternbergiana	1	2.5	M	Shrub, tall
Stirlingia latiflora	1	1	M	Shrub, mid
Xanthorrhoea preissii	18	2	M	Grass-tree, Mid

Species	Cover (%)	Height (m)	Stratum (U=Upper, M=Middle, G=Ground)	Sub-Stratum
*Briza maxima	3	0.15	G	Grasses, Low
*Ehrharta longiflora	0.1	0.6	G	Grasses, Mid
*Gladiolus caryophyllaceus	0.1	0.6	G	Herbs, Mid
*Hypochaeris glabra	0.1	0.01	G	Herbs, Low
*Ursinia anthemoides	0.5	0.3	G	Herbs, Low
*Vulpia myuros	0.2	0.1	G	Grasses, Low
Bossiaea eriocarpa	0.5	0.3	G	Shrub, Low
Burchardia congesta	0.1	0.5	G	Herbs, Mid
Caladenia flava	0.1	0.2	G	Herbs, Low
Carpobrotus virescens	0.3	0.1	G	Herbs, Low
Conostephium pendulum	0.2	0.4	G	Shrub, Low
Conostylis aculeata	0.1	0.2	G	Herbs, Low
Dampiera linearis	0.1	0.4	G	Shrub, Low
Dasypogon bromeliifolius	0.1	0.2	G	Herbs, Low
Desmocladus flexuosus	12	0.3	G	Sedge or Rush, Low
Drosera erythrorhiza	2	0.01	G	Herbs, Low
Elythranthera brunonis	0.1	0.2	G	Herbs, Low
Gompholobium confertum	0.5	0.6	G	Shrub, Low
Hibbertia hypericoides	3	0.5	G	Shrub, Low
Hypocalymma robustum	0.3	0.4	G	Shrub, Low
Kennedia prostrata	0.2	0.1	G	Herbs, Low
Lagenophora huegelii	0.1	0.1	G	Herbs, Low
Lepidosperma apricola	0.1	0.5	G	Sedge or Rush, Low
Melaleuca trichophylla	0.3	0.4	G	Shrub, Low
Mesomelaena pseudostygia	0.1	0.3	G	Sedge or Rush, Low
Microtis media	0.1	0.2	G	Herbs, Low
Opercularia vaginata	0.1	0.2	G	Herbs, Low
Petrophile linearis	0.1	0.4	G	Shrub, Low
Philotheca spicata	0.1	0.3	G	Shrub, Low
Ptilotus manglesii	0.1	0.1	G	Herbs, Low
Sowerbaea laxiflora	0.1	0.4	G	Herbs, Low
Tetraria octandra	0.2	0.2	G	Sedge or Rush, Low
Trachymene pilosa	0.1	0.1	G	Herbs, Low

* Weed/ Introduced species

Appendix F Species by Quadrat Matrix

Taxon	ELA01	ELA02	ELA03	ELA04	ELA05	ELA06
**Briza maxima*	0.01	0.3	0.4	0.1	0.1	3
**Ehrharta longiflora*	0	0	0	0	0	0.1
**Gladiolus caryophyllaceus*	0.1	0.1	0.2	0.1	0.1	0.1
**Hypochaeris glabra*	0.1	0.1	0.3	0.1	0.1	0.1
**Ursinia anthemoides*	0	0.1	0.3	0.1	0.1	0.5
**Vulpia myuros*	0	0	0	0	0	0.2
Acacia pulchella var. *glaberrima*	0	0.5	0	0	0	0.3
Acacia willdenowiana	0	0.1	0.1	0	0.1	0
Allocasuarina fraseriana	5	6	2	8	3	0
Allocasuarina humilis	0	0	0	0	6	0
Anigozanthos manglesii	0	0	0	0.2	0.1	0
Banksia attenuata	3	4	1	3	2	2
Banksia menziesii	0	0	0	0	3	0
Billardiera heterophylla	0	0	0.5	0	0	0
Bossiaea eriocarpa	1.5	1	0.5	1	1	0.5
Burchardia congesta	0.1	0.1	0.1	0.1	0.1	0.1
Caladenia arenicola	0	0	0.1	0.1	0.1	0
Caladenia flava	0.1	0.1	0.1	0.1	0.1	0.1
Calectasia narragara	0	0	0	0.1	0.2	0
Calytrix flavescens	1	0.1	0	0	0.3	0
Carpobrotus virescens	0.1	0	0.1	0	0	0.3
Conostephium pendulum	0.3	1	0.1	0.3	0.5	0.2
Conostephium preissii	0	0	0.1	0	0	0
Conostylis aculeata	0	0.1	0.1	0.1	0.1	0.1
Conostylis setigera	0.1	0.1	0	0.2	0.1	0
Conostylis sp.	0	0.1	0.1	0	0.1	0
Corynotheca micrantha	0	0	0.1	0	0	0
Dampiera linearis	0	0	0	0	0.2	0.1
Dasypogon bromeliifolius	0.2	0	0	0	0	0.1
Daviesia nudiflora	0	0	0	0.3	0	0
Daviesia triflora	0	0.5	0.1	0.1	0.1	0
Desmocladus flexuosus	2	1	1	5	1	12
Dianella revoluta	0	0.1	0	0.1	0	0
Diuris magnifica	0	0	0.1	0	0	0

Taxon	ELA01	ELA02	ELA03	ELA04	ELA05	ELA06
Drosera erythrorhiza	0.1	0.2	0.1	0	0.1	2
Drosera sp.	0	0.1	0	0	0	0
Elythranthera brunonis	0.1	0	0.1	0	0.1	0.1
Eremaea pauciflora	3	2	0	0	2	0
Eucalyptus marginata	20	15	30	15	4	28
Gompholobium confertum	0.5	1	0	0	1	0.5
Gompholobium tomentosum	0.1	0.1	0	0.1	0.4	0
Haemodorum laxum	0.1	0.1	0.1	0.1	0.1	0
Hardenbergia comptoniana	0	0.1	1	0.2	0	0.5
Hibbertia hypericoides	13	20	9	9	15	3
Hibbertia striata	0.25	0	0	0.5	0.1	0
Hovea trisperma	0.2	0.2	0.1	0.1	0.1	0
Hybanthus calycinus	0	0	0	0	0.1	0
Hypocalymma robustum	3	1	3	0.5	0.5	0.3
Hypolaena exsulca	0	0	0	0	0.3	0
Isotropis cuneifolia	0	0	0	0.1	0	0
Jacksonia sternbergiana	1	0	0	3	2	1
Kennedia prostrata	0	0	1	0	0	0.2
Lagenophora huegelii	0	0	0.2	0.1	0.1	0.1
Lepidosperma apricola	0	0.1	1	0	0.3	0.1
Lepidosperma pubisquameum	0.3	0.1	0	0	0	0
Lepidosperma scabrum	0	0	0.1	0.1	0	0
Lomandra caespitosa	0	0.1	0	0	0	0
Lomandra sonderi	0.1	0.1	0.1	0.1	0.1	0
Lyginia barbata	2	0.5	0.1	0.5	0.5	0
Melaleuca trichophylla	0	0	0	0	0	0.3
Mesomelaena pseudostygia	2	2	0.1	3	2	0.1
Microtis media	0	0	0	0	0	0.1
Opercularia vaginata	0	0.1	0	2	0	0.1
Patersonia occidentalis	1	0.5	2	1.3	1	0
Persoonia saccata	0	0	0	0	0.5	0
Petrophile linearis	0.5	0	0	1	0.1	0.1
Petrophile macrostachya	0	0	0	0.5	1	0
Philotheca spicata	0.1	0.1	0	0	0.1	0.1
Phlebocarya ciliata	0	0	0	0.5	1	0
Pimelea sulphurea	0	0.1	0	0	0	0

Taxon	ELA01	ELA02	ELA03	ELA04	ELA05	ELA06
Pterostylis platypetala	0.1	0.1	0	0	0	0
Pterostylis recurva	0	0	0.1	0	0	0
Pterostylis sp.	0.1	0.1	0	0	0	0
Ptilotus manglesii	0	0	0	0	0	0.1
Schoenus curvifolius	0.1	0	0	0	0.1	0
Sowerbaea laxiflora	0.2	0.4	0.5	0.2	0.1	0.1
Stirlingia latiflora	8	1	1.5	2	4	1
Stylidium androsaceum	0.1	0	0	0.1	0.1	0
Stylidium piliferum	0.1	0.1	0	0.1	0.1	0
Stylidium repens	0.1	0	0	0	0	0
Tetraria octandra	0.1	0.5	0.5	0.5	0.3	0.2
Thelymitra sp.	0	0	0.1	0.1	0	0
Trachymene pilosa	0.1	0.1	0.1	0.1	0.1	0.1
Waitzia suaveolens	0.1	0	0	0	0.1	0
Xanthorrhoea preissii	1	4	20	4	2	18
Xanthosia huegelii	0.1	0	0.1	0	0	0

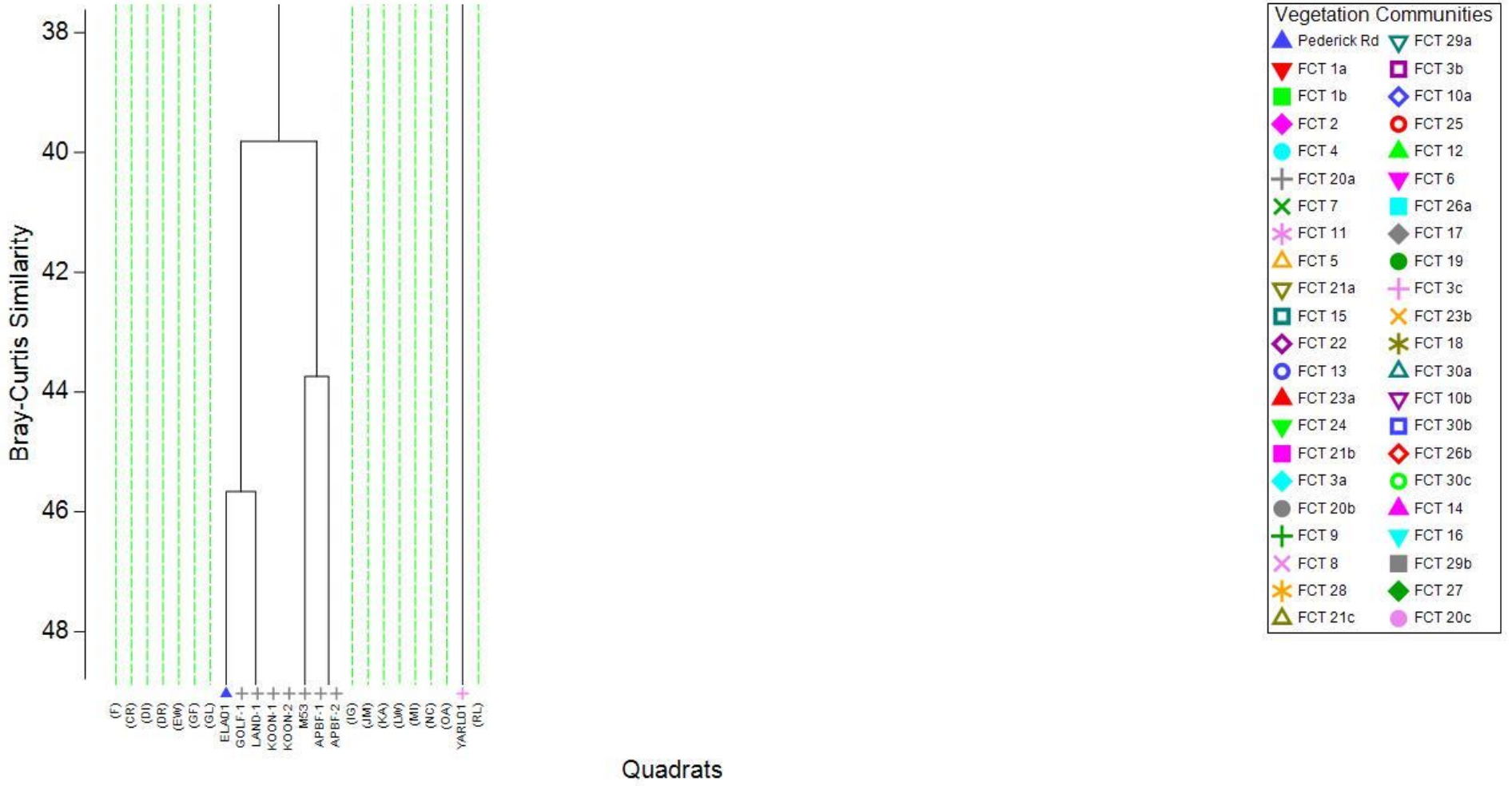
* Weed / introduced species

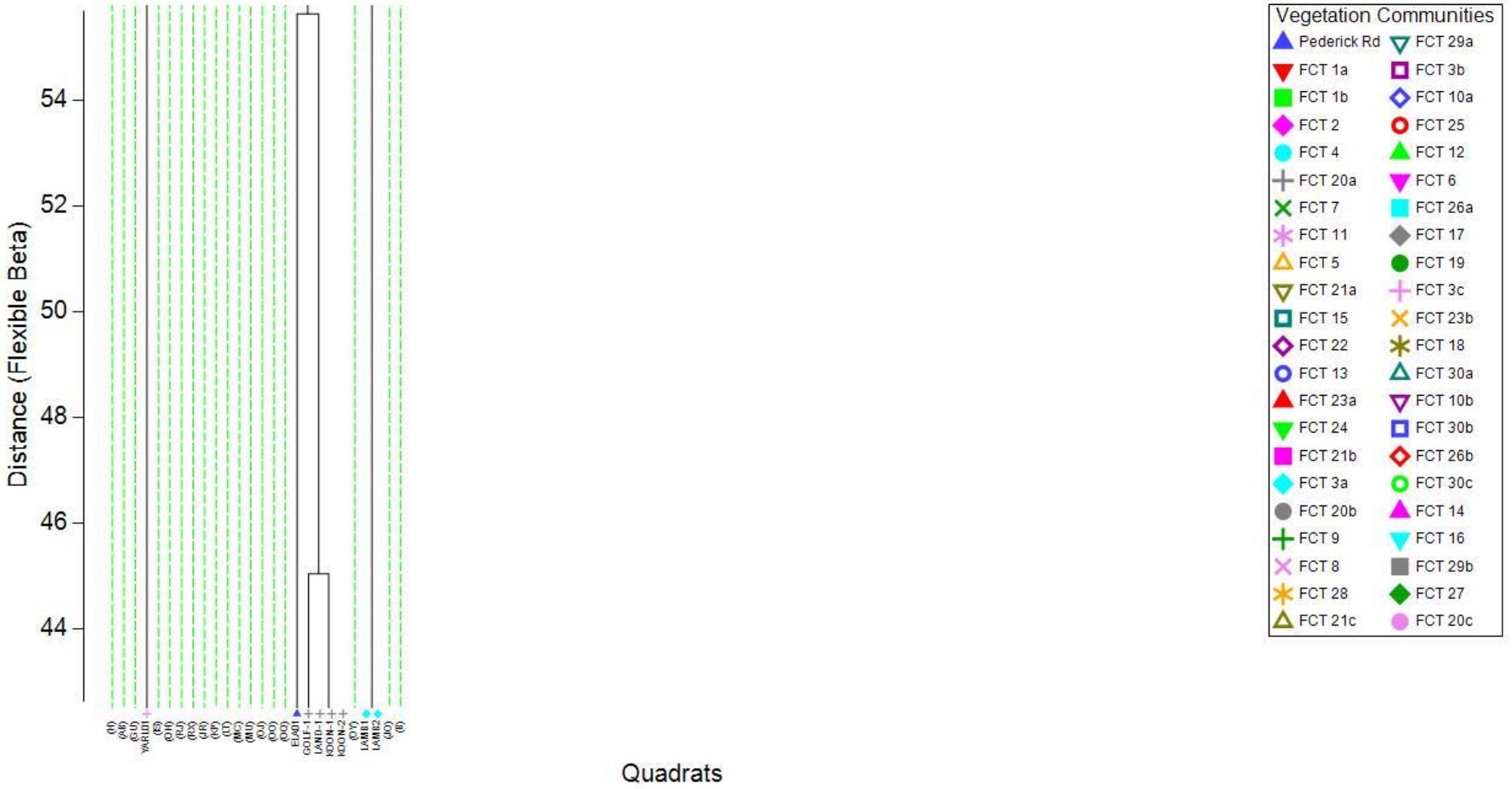
Appendix G FCT vs Quadrat similarity summary table

ELA Quadrat	Gibson site	FCT	%Bray-Curtis Similarity
ELA01	**GOLF-1**	**20a**	**42.31**
	KOON-1	**20a**	**51.85**
	KOON-2	**20a**	**41.12**
	LAND-1	**20a**	**47.37**
ELA02	KING-2	28	47.92
	KING-1	28	35.15
	NEER-3	28	47.19
	NEER-4	28	43.01
	YAN-3	28	43.96
	WARI-2	28	48.08
	SHENT-1	28	41.76
	TRIG-3	28	38.89
	WARI-1	28	35.29
	TRIG-4	28	37.65
ELA03	TRIG-4	28	39.02
	KING-1	28	38.09
	KING-2	28	45.16
	WARI-2	28	45.54
	SHENT-1	28	38.64
	TRIG-3	28	36.19
	WARI-1	28	32.76
ELA04	KING-2	28	51.54
ELA05	**GOLF-1**	**20a**	**46.96**
	LAND-1	**20a**	**46.4**
	KOON-1	**20a**	**57.14**
	KOON-2	**20a**	**45.76**
ELA06	TRIG-4	28	**30**
	KING-1	28	34.95
	KING-2	28	39.56
	WARI-1	28	31.58
	SHENT-1	28	41.86
	TRIG-3	28	36.89

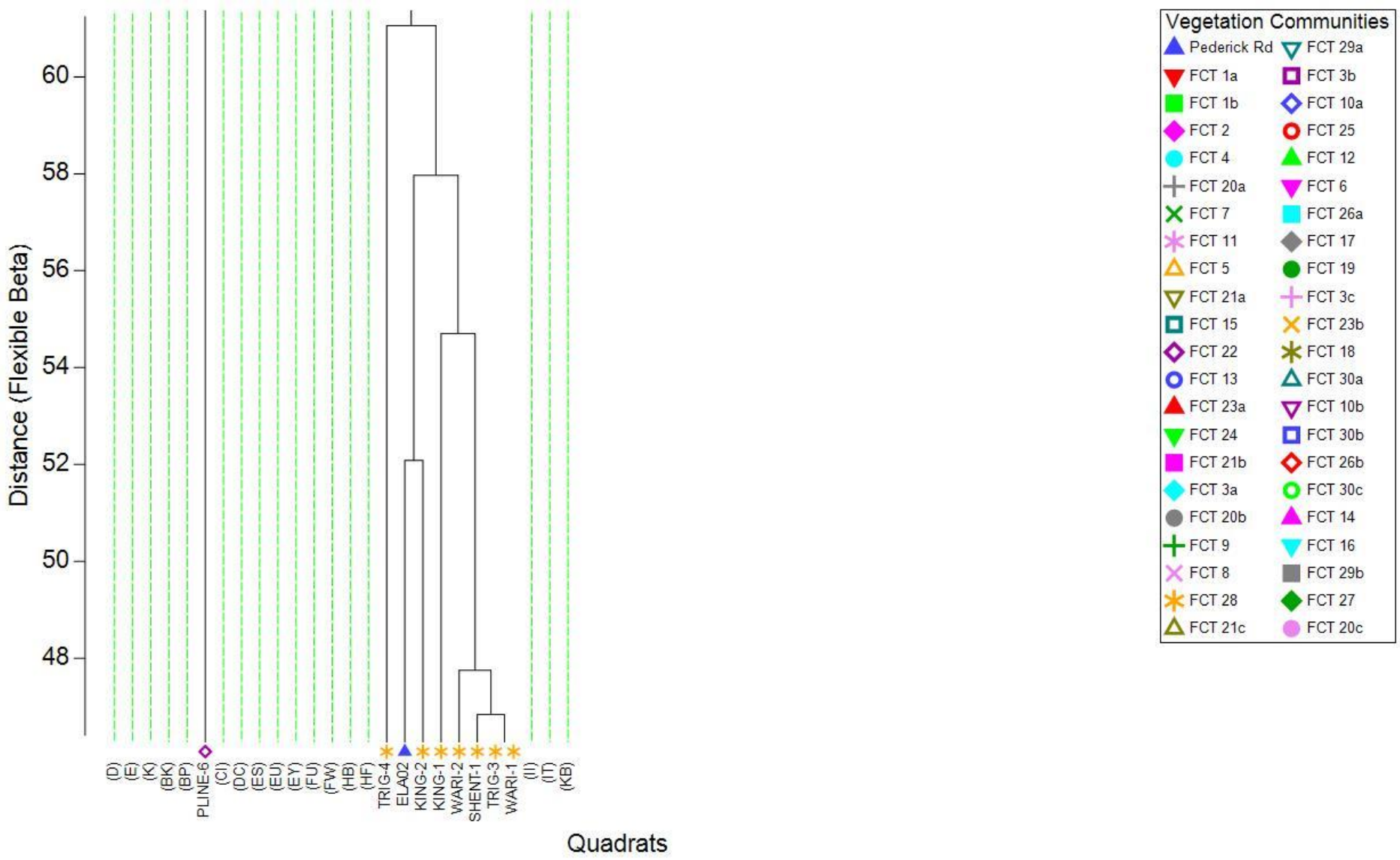
Appendix H Hierarchical Clustering Dendrogram Excerpts

ELA 01 similarity with Gibson *et. al.* (1994) Floristic Community Types

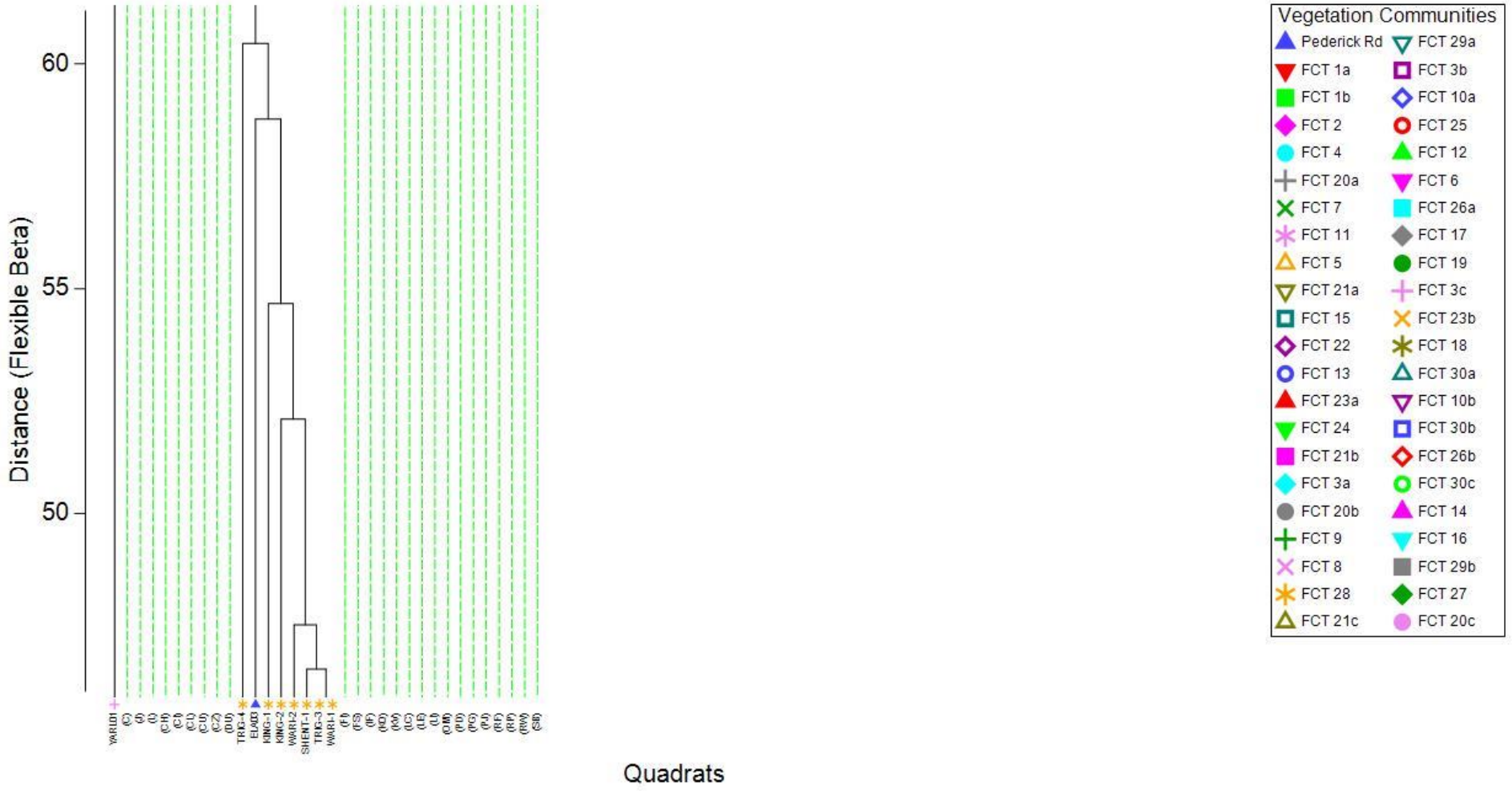



Distance (Flexible Beta)
54
52
50
48
46
44
Quadrats
Vegetation Communities
Pederick Rd
FCT 1a
FCT 1b
FCT 2
FCT 4
FCT 20a
FCT 7
FCT 11
FCT 5
FCT 21a
FCT 15
FCT 22
FCT 13
FCT 23a
FCT 24
FCT 21b
FCT 3a
FCT 20b
FCT 9
FCT 8
FCT 28
FCT 21c
FCT 29a
FCT 3b
FCT 10a
FCT 25
FCT 12
FCT 6
FCT 26a
FCT 17
FCT 19
FCT 3c
FCT 23b
FCT 18
FCT 30a
FCT 10b
FCT 30b
FCT 26b
FCT 30c
FCT 14
FCT 16
FCT 29b
FCT 27
FCT 20c

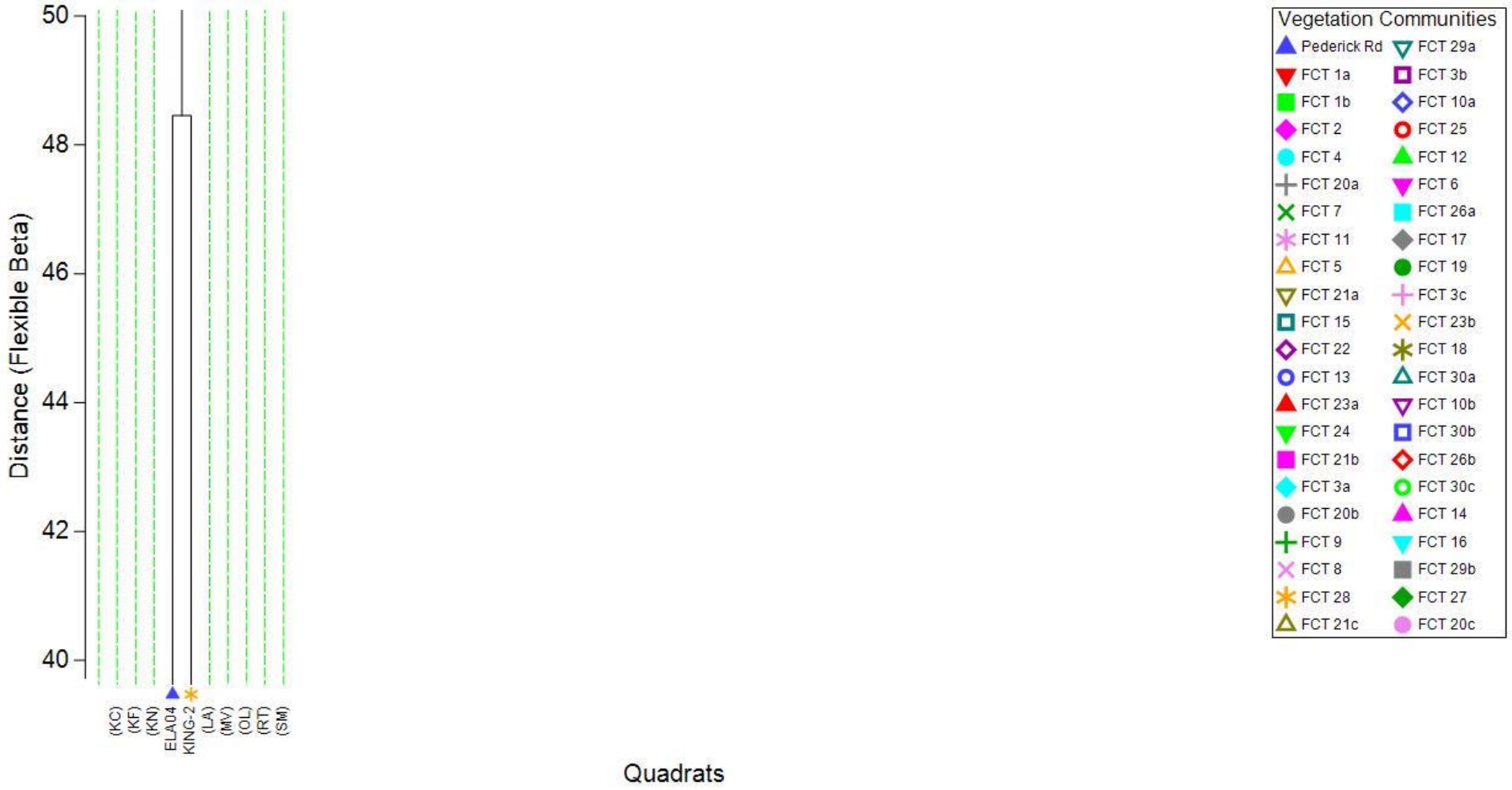
ELA 02 similarity with Gibson *et. al.* (1994) Floristic Community Types



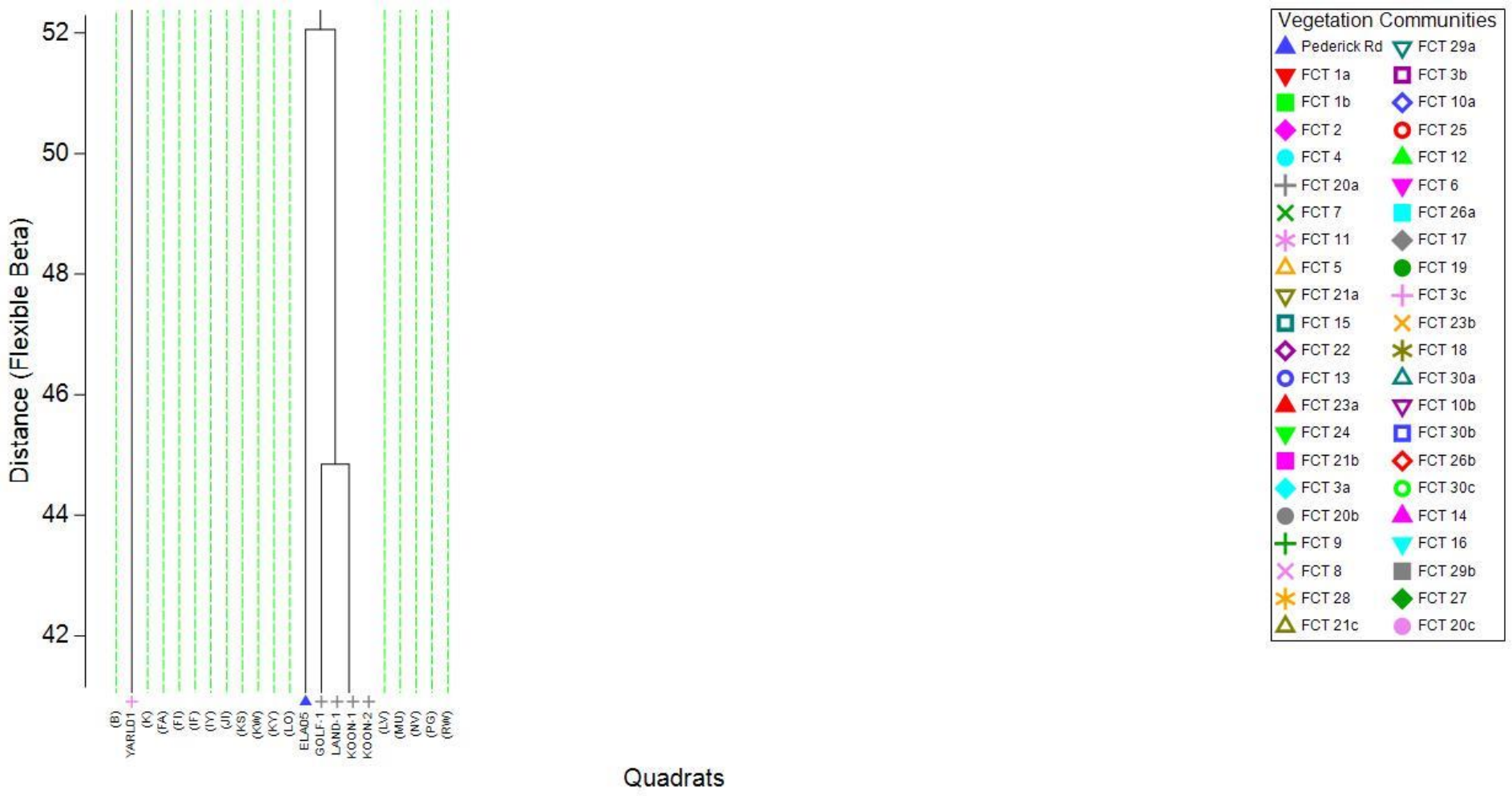
ELA 03 similarity with Gibson *et. al.* (1994) Floristic Community Types



ELA 04 similarity with Gibson *et. al.* (1994) Floristic Community Types



ELA 05 similarity with Gibson *et. al.* (1994) Floristic Community Types



ELA 06 similarity with Gibson *et. al.* (1994) Floristic Community Types

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