1.0 INTRODUCTION

1.1 Purpose of this report

The current report is intended to help clarify the assignment of Floristic Community type (FCT) designation to vegetation community (site) data. FCTs were defined by Gibson et al (1994) based on site data collected from vegetation on the Swan Coastal Plain. In particular, the potential that a Threatened Ecological Community (English and Blyth 1997) is represented by the data collected needs to be clarified.

1.2 Location of Sites

The sites were from an undisclosed location.

1.3 Brief background to floristic analysis of vegetation on the Swan Coastal Plain

Floristic analysis (ie., analysis of variation in vegetation based on the species present, rather than description of structural variation and dominance) as a significant component of the understanding of the variation present in the native vegetation of the Swan Coastal Plain dates to Gibson *et al* (1994 – all references to the SCP survey in the current report refer to this publication), the first publication to document the floristics of the vegetation of a large part of the Swan Coastal Plain. While the SCP survey is based on a very significant amount of work, it must be viewed as a "first pass" survey, limited, in the context of the great variety of vegetation present in the very large area surveyed, by the relatively limited number (509) of sites (quadrats) it is based on. To a limited degree, this limitation has subsequently been addressed in an "update" to the work of the SCP survey (which describes additional units). However, there is no detailed publication of the results of this update available and the additional data used are not readily available in an appropriate form (ie., one that would enable ready comparison of new data to the overall data set).

The units described by the SCP survey are a series of "floristic community types", a "unit" whose rank is defined by the use within a study. The SCP survey surveyed a very large survey area and defined a relatively small number of floristic community types. Consequently, the floristic community types they have described are of a very high order (see Trudgen 1999, volume 1, for further discussion of this point). This is an extremely important point to fully grasp in interpreting the analysis presented by the SCP survey and in understanding the meaning of analysis of other data sets when they are compared to the floristic community types of the SCP survey.

The important effects of the limited size data set used by the SCP survey and of the relatively small number of floristic community types defined by them, can be summarised by the following points:

1. the definition of all but two of the Threatened Ecological Communities for vegetation on the Swan Coastal Plain (English and Blyth 1997) has been based on the floristic community types of the SCP survey. It therefore follows that, with two exceptions, only vegetation units from one study that are different at a very high order of floristics are treated as rare by Government. No account is taken of other important differences, such as differences in structure and dominance;

2. for the definition of floristic community types to be robust, a sufficient sized database is needed to give adequate precision in their definition. About half of the floristics community types (or sub types) of the SCP survey are based on less than 10 sites. It is likely that with a larger data set there would be significant alteration in the classification of those floristic community types from the SCP survey based on small numbers of sites.

3. as noted above, many (if not most) of the floristic community types defined by the SCP survey are very broad. They contain very significant variation in floristics, structure and dominance. Some (or in more highly cleared parts of the Swan Coastal Plain much) of this variation may be rare by any reasonable definition, but it is currently "buried" within larger groups;

4. there is likely to be significant variation not sampled by the SCP survey. This includes some variation at a high level of floristic difference (see Trudgen 1999, volume 1, for an example of this) and undoubtedly quite significant (large!) amounts of variation at "medium" and "low" levels.

5. the document, and its use by Government, has focussed attention in the environmental impact assessment process on the high level of units described, deflecting attention from the layers of variation beneath these units that also have significant conservation value.

From these points it is obvious that there is a need for a major "upgrade" to the floristic analysis of the vegetation of the Swan Coastal Plain to provide a more detailed floristic classification that considers not only more of the variation present, but explicitly recognises more of the variation present in formally described units.

Obviously, such a reworking would have some effect on what vegetation is considered rare on the Swan Coastal Plain. It needs to be stressed that it would be very unlikely to find that any of the vegetation currently considered to be rare on the basis of the SCP survey*'s* classification was not rare. On the other hand, it is likely that such a review would very probably consider to be rare some vegetation which is not currently considered rare.

1.4 Data provided

It is very important in comparing different sets of floristic data that they are comparable in the application of names, in the intensity of the survey (ie., the effort of searching resulting in similar proportion of the flora at sites being recorded) and in the size of the site recorded. If the data from different data sets is not comparable in these ways, it reduces the clarity of the results of the analyses carried out. If the discrepancy in the comparability of the data sets is large, the results may become meaningless.

No information was provided on the area sampled at each location. Preliminary investigation suggested that the provided sites might be low in a number of species. The 6 sites had an average of 26 species with the richest 41. The FCT of particular interest (20b) had an average of 62. Such observations have already been made by the

client (Bennett pers comm). Appendix 2 supports this and thus caution needs to be considered when making conclusions.

2.0 METHODS

2.1 Data Preparation

The data from the sites were provided in an excel table. These were incorporated into a standard MS Access based database designed for this type of data. One virtue of the database is that the species recorded at each site are stored against standard codes (numbers, those used by the Western Australian Herbarium) for each species. This facilitates ready comparison of data from different surveys stored in the same system.

After the data were incorporated into the database (containing the data from other projects), a process of reconciliation of flora species names with those used in the SCP survey was undertaken. This step was necessary at least because of changes in nomenclature over the last ten years and the potential of survey specific variations in the application of names. The reconciliation involved:

- reducing some infra-specific names to the relevant species name (it was not possible to infer an appropriate infra-specific name for the SCP data), and
- combining some taxa where confusion is known to have occurred in field observations and identifications.

The reconciliation process was relatively straight forward as most of the names had already been standardised. Most reconciliation was to conform with the methods that the SCP survey used to manage confusing taxa plus some nomenclatural changes (Appendix 1).

2.2 Comparability of datasets

It was concluded that sites 1 2 and 12 were may be reasonably compatible in nomenclature but the generally low richness suggests that there may have been taxa overlooked in the sites.

2.3 Comparisons made

The data from the sites plus the 509 sites from the SCP survey of the southern part of the Swan Coastal Plain (south of Gingin) were combined. This enabled various analyses to be performed.

The main purpose was intended to assign the individual sites to the Floristic Community Types (FCTs) defined in the SCP survey. These data are provided in PP.mdb.)

2.4 Analyses carried out

The approach was the use of numerical classification techniques (PATN) based on the similarity of the floristic composition of the sites to sites in the SCP survey data set.

2.4.1 PATN

Several modules of the numerical classification package PATN (Belbin 1987) were used for the analyses. The parameter values were the same as used by the SCP survey used to ensure consistency of analysis with that study.

The PATN modules used were ASO (calculation of similarity matrix), FUSE (classification based on the results of ASO), DEND (representation of classification) and NNB (determination of sites most similar to each site – nearest neighbours). The results of the analyses were imported into a database (UNK.mdb) so that site characteristics and previous classifications (eg., Floristic Community Types derived in earlier classifications) could be associated and various analyses based on these data could be performed.

The attempted assignment of floristic community types to the sites was made by summarising the results of two different methods:

- the classification, and
- the ten nearest neighbours.

Experience demonstrates that the results of these are likely to vary, but that from nearest neighbours is likely to make more sense for it is not directly influenced by group membership.

To the classification dendrogram of the combined dataset, the FCT assigned by the SCP survey was associated with the SCP survey sites. An attempt was made to assign FCTs to the sites by interpreting the position of these sites in the dendrogram (particularly by the way they joined to the SCP sites.

The 10 sites in the combined data set that were most similar to each of the sites were obtained from the nearest neighbour method (NNB). By associating those nearest neighbours from the SCP survey, the most likely FCTs for each of the sites were determined.

An attempt was then made to reconcile these different assignments of a Floristic Community Type.

3.0 LIMITATIONS

It has been found in earlier projects that the addition of new sites to the SCP survey data set to produce a combined classification disrupts the original classification. The more data added, the higher the level of the disruption. This problem can make it difficult to assign Floristic Community Types to new sites using this method.

Secondly, it is common for new data to group to their cohorts. In some cases this has proven to result from common deficiencies in the data, ie. whole groups of species missing. These absences tend to draw them together. The more sites in the added batch, the tighter they draw together. If they all have common deficiencies they also tend to draw together. This happened in this case.

The analyses are conducted without personal knowledge of the sites and no photographs were provided.

4.0 RESULTS

4.1 Determination of floristic community type by classification

The classifications indicated that the sites appeared to be the same plant community being located in one part of the dendrogram (Figure 1)

Figure 1. Relevant portion of Dendrogram

site	FCT	no	dendrogram
			0.2050 0.3644 0.5239 0.6833 0.8428 1.0022 1.16
			| | | | | |
1		41	_____
2		30	_____|_____
12		39	_____|_____
16		18	_____|____
9		18	_____|_____
10		12	_____ |
PRES-1	29a	23	_____|_____|_____
AMBR-3	4	57	_____ |
CAPEL-3	4	35	_____|_____ |
PAYNE-1	4	27	_____|_____ |

All new sites combined together, separately from the remainder of the SCP sites. The joining with PRES-1 is no indication that they belong to 29a (the FCT for PRES-1).

The influence of the depauperate sites was investigated by leaving out sites 9, 10 and 16. This produced a slightly different dendrogram which has the new sites grouping with each other and then with sites from FCT 3b.

site	FCT	no	dendrogram
			0.2050 0.3656 0.5261 0.6867 0.8472
			| | | | |
1		41	_____
2		30	_____|_____
12		39	_____|_____
BURNRD02	3b	45	_____ |
yarl03	3b	52	_____|_____ |
card12	3b	58	_____ | |
card13	3b	66	_____|_____ | |
waro 01	3b	74	_____ | | |
waro 02	3b	77	_____|___|_____ | |
DUNS-1	3b	65	_____ | | |
KOOLJ-5	3b	46	_____|_____|____|_____|_____
DUCK-1	3c	38	_____ |

Neither of these classifications produced results in which any confidence could be placed.

4.2 Determination of floristic community type using Nearest Neighbour method

The nearest neighbour analysis suggests that the sites have affinities with different communities even though they were more similar to each other than any other sites by

a substantial amount. None of the (dis)similarity values for sites from the SCP data sets were low enough (<0.5) to give confidence in the analysis (Table 1). Few were even less than 0.6.

Table 1. Results of Nearest Neighbour analysis

s	s1	f1	v1	s2	f2	v2	s3	f3	v3	s4	f4	v4	s5	f5	v5
1	2		0.314	12		0.4937	**low04**	21a	0.5814	**low06a**	21c	0.5854	9		0.5862
2	1		0.314	12		0.5362	16		0.5417	9		0.5833	**low04**	21a	0.6053
9	2		0.583	1		0.5862	12		0.614	**low04**	21a	0.6563	AUSTRA-1	21a	0.6571
10	12		0.725	9		0.7333	16		0.7333	2		0.7619	1		0.7692
12	1		0.493	2		0.5362	**low06a**	21c	0.5802	**KOOLJ-5**	3b	0.6	TWIN-8	21c	0.6049
16	2		0.541	12		0.614	1		0.6207	card11	6	0.6667	hymus04	21c	0.6818

Table 1 (cont)

s	s6	f6	v6	s7	f7	v7	s8	f8	v8	s9	f9	v9	s10	f10	v10
1	low12b	21a	0.5955	card7	21a	0.6098	16		0.620	low06b	21c	0.6322	low12a	21a	0.6364
2	card7	21a	0.6389	SHENT-1	28	0.6579	low06b	21c	0.662	low12a	21a	0.6667	AUSTRA-1	21a	0.6829
9	**low06a**	21c	0.6667	card7	21a	0.6667	HARRY-1	28	0.687	low06b	21c	0.6923	card9	20b	0.6944
10	PRES-1	29a	0.7714	KERO-2	24	0.8148	**low06a**	21c	0.814	WOODV-1	28	0.8214	WOODV-2	28	0.8276
12	16		0.614	9		0.614	card7	21a	0.629	BULLER-1	21a	0.6364	**low04**	21a	0.6471
16	**low04**	21a	0.6875	FL-5	21c	0.6949	low07	21c	0.694	hymus03	21c	0.7083	FL-6	21c	0.7143

s – the site being compared
VU- vegetation mapping unit
F- inferred FCT from VU
s1 to s10 – the 1st to 10th most similar sites
f1 to f10 – the FCT of the similar sites (only for SCP sites)
v1 to v10 – the dissimilarity value between the site and the similar sites (values above 0.6 tend to indicate low similarity)

Sites 1 and 12 appear modestly similar to low04 of FCT 21a and low06a of FCT 21c respectively. All other new sites have these sites amongst their most similar sites.

Appendix 2 lists the species in the new sites and the three most similar sites from SCP and the possible FCTs. (FCT 20b is a target FCT. The others are from the NNB analysis with FCT 21a and 21c the most likely.) The individual sites have Y indicating the presence of a species. Numbers represent the percentage of sites in each FCT with each species.

The new sites are missing many of the species common in sites from FCT 20b, 21a or 21c (see highlighted values.) Curiously, many of these (less than half) are also not present at low04 or low06a. These may form a distinct but unrecognised subgroup of FCT21.

4.4 Conclusion

It is concluded that the new sites are somewhat similar to the SCP "low" group of sites, many of which are attributed to FCT 21a or 21c. It is possible that they belong to FCT 20b but that does not seem as likely as it does that they belong to FCT 21a or 21c.

5.0 REFERENCES

Belbin, L. (1987) *PATN Reference Manual* (313p), *Users Guide* (79p), *Command Manual* (47p), and *Example Manual* (108p). CSIRO Division of Wildlife and Ecology, Lynham, ACT.

English, V., and Blyth, J. (1997) *Identifying and conserving threatened ecological communities (TECs) in the South West Botanical Province*. ANCA National Reserves System Cooperative Program: Project Number N702, Australian National Conservation Agency, Canberra

Gibson, N.G., Keighery, B.J., Keighery, G.J., Burbidge, A.H. and Lyons, M (1994). *A Floristic Survey of the Southern Swan Coastal Plain*. Unpublished report by the Department of Conservation and Land Management and the Conservation Council of Western Australia to the Australian Heritage Commission.

Trudgen, M.E. (1999). *A flora and vegetation survey of Lots 46 and 47 Maralla Road and Lexia Avenue, Ellenbrook*. Volumes 1-4. Unpublished report prepared for the Crown Solicitors Office, Government of Western Australia. December 1999.

APPENDIX 1

Species names combined for reconciliation purposes

Species_LUP.name	Species_LUP_1.name
Aira caryophyllea	Aira caryophyllea/cupaniana group
Amphibromus nervosus	Amphibromus neesii
Avena barbata	Avena barbata/fatua
Lepidosperma tenue	Lepidosperma sp. (Coastal terete BJK & NG 231)
Chamaescilla corymbosa	Chamaescilla spiralis/corymbosa
Burchardia umbellata	Burchardia umbellata/congesta
Disa bracteata	Monadenia bracteata
Drosera menziesii	Drosera menziesii subsp. menziesii
Pronaya fraseri var. fraseri	Pronaya fraseri
Eucalyptus marginata subsp. marginata	Eucalyptus marginata

APPENDIX 2
Species in Sites compared to selected FCTs

(numbers for FCTs are % of sites in FCT at which species is present)
(species in bold appear to be probably under represented in new sites)

FAM	name	1	2	12	9	10	16	low04	low06a	20b	21a	21c	6	3b	KOOLJ-5
011C	Pteridium esculentum										5				
016A	Macrozamia riedlei							Y			**64**	25		12	
031	Aira caryophyllea/cupaniana group	Y	Y					Y			46	31	11	62	Y
031	Aira praecox											12			
031	Amphibromus neesii						Y								
031	Amphipogon amphipogonoides										5				
031	Amphipogon turbinatus									**66**	12	12			
031	Austrodanthonia caespitosa											6			
031	Austrodanthonia occidentalis									11	**51**	25		37	
031	Austrodanthonia pilosa													12	
031	Austrodanthonia setacea													12	
031	Austrostipa compressa		Y				Y			11	7	18			
031	Austrostipa elegantissima												11		
031	Austrostipa flavescens										15	6		12	
031	Austrostipa pycnostachya													12	
031	Austrostipa semibarbata/campylachne									11	2			12	
031	Avena barbata/fatua					Y							22		
031	Briza maxima	Y	Y	Y			Y	Y		11	79	81	100	100	Y
031	Briza minor			Y							28	6		75	Y
031	Bromus diandrus	Y				Y					2		11		
031	Cynodon dactylon										2		11		
031	Dichelachne crinita										12			12	Y
031	Ehrharta calycina						Y				12	18	55		
031	Ehrharta longiflora			Y		Y				11	5	6	55	12	
031	Eragrostis curvula									11					

FAM	name	1	2	12	9	10	16	low04	low06a	20b	21a	21c	6	3b	KOOLJ-5
031	Eragrostis elongata												11		
031	Holcus setiger										2				
031	Hordeum leporinum					Y			Y			6			
031	Lolium perenne										2				
031	Lolium rigidum			Y		Y									
031	Microlaena stipoides	Y		Y					Y		28	31	11		
031	Neurachne alopecuroidea	Y								11		18	22	37	
031	Pentaschistis airoides/pallida									33	2		11	37	
031	Poa drummondiana										5				
031	Tetrarrhena laevis									11				12	
031	Vulpia bromoides	Y							Y		5	6	11		
031	Vulpia myuros										7	18		12	
032	Baumea juncea											6			
032	Cyathochaeta avenacea			Y					Y	11		12	33	50	
032	Cyathochaeta clandestina									11		6			
032	Isolepis cernua										5		33	12	
032	Isolepis marginata										7	18	22		
032	Isolepis oldfieldiana												11		
032	Lepidosperma angustatum/squamatum							Y	Y	**66**	**84**	43	11	75	Y
032	Lepidosperma costale													12	
032	Lepidosperma longitudinale										2				
032	Lepidosperma scabrum										2				
032	Lepidosperma sp. (Coastal terete BJK & NG 231)				Y						2	6			
032	Lepidosperma squamatum										7				
032	Mesomelaena graciliceps									22	5			37	Y
032	Mesomelaena pseudostygia									**66**	7	6	11		
032	Mesomelaena tetragona			Y						77	5	6	11	87	Y
032	Schoenus aff. brevisetis									44	2	6			
032	Schoenus clandestinus									11	2				
032	Schoenus curvifolius										5	37	11		
032	Schoenus discifer											6			
032	Schoenus grandiflorus											6			
032	Schoenus humilis												11		

FAM	name	1	2	12	9	10	16	low04	low06a	20b	21a	21c	6	3b	KOOLJ-5
032	Schoenus odontocarpus													12	
032	Schoenus pedicellatus											6			
032	Schoenus rigens											6	22		
032	Schoenus sp. aff. breviculmis									11	2	6			
032	Schoenus subbarbatus (Royce 2872)									11	2				
032	Schoenus subbulbosus									11		6			
032	Schoenus subflavus									11					
032	Schoenus unispiculatus													12	
032	Tetraria capillaris									11				25	
032	Tetraria octandra	Y	Y							100	7			100	Y
035	Zantedeschia aethiopica										10	6			
039	Alexgeorgea nitens											6			
039	Anarthria gracilis											6			
039	Chordifex sinuosus									**77**		6			
039	Desmocladus fasciculatus	Y	Y	Y	Y				Y	100	23	31		100	Y
039	Desmocladus flexuosus							Y			**69**	37	22		
039	Dielsia stenostachya											6	22		
039	Hypolaena exsulca			Y					Y	44	48	56	22	50	Y
039	Hypolaena fastigiata												11		
039	Lepidobolus preissianus									11					
039	Leptocarpus canus												11		
039	Leptocarpus coangustatus												22		
039	Lepyrodia macra											6			
039	Lepyrodia muirii												11		
039	Loxocarya cinerea	Y	Y				Y				2				
039	Loxocarya pubescens										2				
039	Lyginia barbata								Y	11	**66**	**87**	11	12	
039	Restio leptocarpoides												22		
040	Aphelia cyperoides												33	12	
040	Centrolepis alepyroides												11		
040	Centrolepis aristata									22	2		33	12	
040	Centrolepis drummondiana										12	31	22	25	
047	Cartonema philydroides										2	12			

FAM	name	1	2	12	9	10	16	low04	low06a	20b	21a	21c	6	3b	KOOLJ-5
050	Philydrella pygmaea													12	
052	Juncus bufonius												11		
052	Juncus capitatus												11	25	
052	Juncus pallidus			Y									11		
052	Luzula meridionalis										20			25	Y
054C	Calectasia cyanea									**55**	2	6			
054C	Dasypogon bromeliifolius	Y	Y	Y			Y	Y		100	71	56	22	12	
054C	Dasypogon obliquifolius									22					
054C	Kingia australis									44				37	
054C	Lomandra brittanii													25	
054C	Lomandra caespitosa							Y	Y	11	**66**	**81**	11	37	
054C	Lomandra hermaphrodita				Y			Y	Y	77	58	50	11	75	
054C	Lomandra micrantha	Y									28	12		12	Y
054C	Lomandra nigricans								Y	33	35	6			
054C	Lomandra preissii		Y							33	15				
054C	Lomandra purpurea									11	5			25	Y
054C	Lomandra sericea									**55**	**51**		11	25	
054C	Lomandra sonderi										2				
054C	Lomandra suaveolens										28	12			
054D	Xanthorrhoea brunonis	Y	Y	Y			Y				7	6			
054D	Xanthorrhoea gracilis									11		6		25	
054D	Xanthorrhoea preissii	Y	Y		Y			Y	Y	88	38	43	22	100	Y
054E	Dianella revoluta										10	6	11	12	Y
054E	Stypandra glauca									11	2		11		
054F	Agrostocrinum scabrum			Y						22	23			37	Y
054F	Arnocrinum preissii									11	5	12			
054F	Caesia micrantha			Y				Y			23		22	87	Y
054F	Caesia micrantha (Blue flowered form GJK										5		11		
054F	Caesia micrantha (Large swamp form BJK & NG										2				
054F	Caesia occidentalis										12			25	
054F	Chamaescilla spiralis/corymbosa		Y					Y	Y	100	58	43	11	75	
054F	Corynotheca micrantha										7	6			
054F	Dichopogon capillipes							Y			30			37	

FAM	name	1	2	12	9	10	16	low04	low06a	20b	21a	21c	6	3b	KOOLJ-5
054F	Dichopogon preissii										2				
054F	Johnsonia aff. pubescens (GJK 5249)									33		6			
054F	Johnsonia pubescens									22					
054F	Laxmannia ramosa											6			
054F	Laxmannia sessiliflora subsp. australis									22		6			
054F	Laxmannia squarrosa							Y		22	20	12			
054F	Sowerbaea laxiflora							Y		22	**48**	6		75	Y
054F	Thysanotus arbuscula								Y		7	25			
054F	Thysanotus arenarius										5				
054F	Thysanotus multiflorus										12			12	
054F	Thysanotus patersonii/manglesianus							Y	Y	11	46	**81**	33		
054F	Thysanotus sparteus										17	6		12	Y
054F	Thysanotus thyrsoideus		Y	Y						11	10			62	Y
054F	Thysanotus triandrus									33	2			25	
054F	Tricoryne elatior	Y		Y	Y				Y	11	7	31		25	
054F	Tricoryne humilis									11					
054F	Tricoryne tenella							Y	Y		15	12			
054J	Burchardia bairdiae												22		
054J	Burchardia multiflora											6			
054J	Burchardia umbellata/congesta			Y			Y	Y	Y	88	82	56	11	87	Y
054L	Borya scirpoidea													12	
055	Anigozanthos humilis									22	2				
055	Anigozanthos manglesii									11	7	18		50	Y
055	Conostylis aculeata										**64**	37		25	Y
055	Conostylis aurea									11					
055	Conostylis juncea							Y	Y	**66**	**74**	43		75	Y
055	Conostylis serrulata	Y													
055	Conostylis setigera			Y						66		12		12	
055	Conostylis setosa									33	2				
055	Haemodorum laxum	Y		Y						66	2	6		50	
055	Haemodorum loratum									11				25	
055	Haemodorum simplex												11		
055	Haemodorum sparsiflorum									11				25	Y

FAM	name	1	2	12	9	10	16	low04	low06a	20b	21a	21c	6	3b	KOOLJ-5
055	Haemodorum spicatum									11	2				
055	Phlebocarya ciliata									44	**69**	25		25	
055	Phlebocarya filifolia									33	2				
055	Tribonanthes australis												22		
060	Gladiolus caryophyllaceus											25			
060	Hesperantha falcata												22		
060	Moraea flaccida												44		
060	Orthrosanthus laxus										2				
060	Patersonia juncea									33				25	
060	Patersonia occidentalis	Y		Y			Y	Y	Y		58	68		37	Y
060	Patersonia sp.Swamp form(N.Gibson & M.Lyons										2		11		
060	Romulea rosea										7	6	55	25	
060	Watsonia meriana/bulbifera										2				
066	Caladenia discoidea									22	12				
066	Caladenia ferruginea													25	
066	Caladenia flava	Y	Y	Y	Y			Y	Y	55	69	56	11	62	Y
066	Caladenia paludosa										2		11		
066	Caladenia reptans								Y	22		6			
066	Caladenia sericea											6			
066	Caladenia speciosa										5				
066	Cyrtostylis huegelii										2				
066	Cyrtostylis robusta											6			
066	Diuris aff. amplissima										2				
066	Diuris longifolia										10			25	
066	Elythranthera brunonis								Y		12	12			
066	Elythranthera emarginata				Y										
066	Eriochilus dilatatus									11	20		11		
066	Leporella fimbriata							Y	Y	**55**	15	31		12	
066	Microtis media										5				
066	Microtis unifolia										2				
066	Monadenia bracteata				Y					11	12	6	55	25	
066	Prasophyllum drummondii													12	
066	Prasophyllum elatum										2				

FAM	name	1	2	12	9	10	16	low04	low06a	20b	21a	21c	6	3b	KOOLJ-5
066	Prasophyllum parvifolium									11				25	
066	Pterostylis aff nana								Y		30	37	11		
066	Pterostylis aff. sanguinea										2				
066	Pterostylis aff. vittata											6			
066	Pterostylis recurva	Y						Y	Y	11	15	12	11		
066	Pterostylis sanguinea										5				
066	Pterostylis vittata									33	33	18		50	Y
066	Pyrorchis nigricans									**55**	35	37		25	
066	Thelymitra aff. holmesii										2	6			
066	Thelymitra canaliculata	Y	Y												
066	Thelymitra crinita									22				25	
066	Thelymitra fuscolutea										2				
066	Thelymitra pauciflora												11		
070	Allocasuarina fraseriana	Y	Y	Y		Y	Y	Y	Y	11	28	12		12	
070	Allocasuarina humilis									**66**	5	6		25	
070	Allocasuarina thuyoides									11					
090	Adenanthos cygnorum											18			
090	Adenanthos meisneri									33	12	6		12	
090	Adenanthos obovatus										2				
090	Banksia attenuata	Y	Y	Y	Y	Y	Y	Y	Y	77	87	87	11		
090	Banksia grandis	Y	Y	Y					Y	22	12	6		12	
090	Banksia ilicifolia			Y			Y		Y		20	37			
090	Banksia menziesii	Y	Y	Y	Y	Y	Y	Y	Y	44	25	68	11		
090	Conospermum capitatum										2			12	
090	Conospermum stoechadis									22		6		12	
090	Dryandra nivea									**88**	7	12	33	75	
090	Grevillea bipinnatifida													25	
090	Grevillea crithmifolia										2				
090	Grevillea pilulifera									**55**				25	
090	Grevillea quercifolia													12	
090	Grevillea wilsonii									11				12	
090	Hakea candolleana											6			
090	Hakea lissocarpha									11	2		11		

FAM	name	1	2	12	9	10	16	low04	low06a	20b	21a	21c	6	3b	KOOLJ-5
090	Hakea ruscifolia									**66**				12	
090	Hakea stenocarpa									33					
090	Persoonia angustiflora									11		6			
090	Persoonia comata										2	6			
090	Persoonia elliptica						Y								
090	Persoonia saccata										20				
090	Petrophile linearis							Y	Y	**77**	**79**	**56**		12	
090	Petrophile macrostachya									11					
090	Petrophile media var. juncifolius Ms											12			
090	Petrophile serruriae													12	
090	Petrophile striata									11				12	
090	Stirlingia latifolia	Y						Y		66	30	18	22	12	
090	Synaphea spinulosa										7				
090	Xylomelum occidentale	Y	Y	Y	Y	Y	Y	Y		66	25				
092	Leptomeria cunninghamii										2				
092	Leptomeria empetriformis										2				
097	Nuytsia floribunda						Y			11	5	18	11	12	
103	Rumex acetosella										2	6			
106	Ptilotus drummondii							Y			2				
110	Carpobrotus edulis											6			
110A	Macarthuria aff. australis (Capel)											6			
110A	Macarthuria australis											6			
111	Calandrinia granulifera										2				
113	Cerastium glomeratum										5				
113	Petrorhagia velutina										20				
113	Silene gallica										5		11		
113	Stellaria media										5				
119	Ranunculus sessiliflorus var. sessiliflorus													12	
131	Cassytha flava										10			12	
131	Cassytha glabella									11	2			12	
131	Cassytha micrantha									11					
131	Cassytha racemosa										12				
138	Heliophila pusilla										10		11		

FAM	name	1	2	12	9	10	16	low04	low06a	20b	21a	21c	6	3b	KOOLJ-5
138	Stenopetalum robustum										2				
143	Drosera erythrorhiza	Y		Y	Y				Y	100	64	56	22	75	Y
143	Drosera gigantea											6	33	12	
143	Drosera glanduligera									22			33	37	
143	Drosera macrantha							Y		**55**	28	12	22	12	
143	Drosera macrantha (Swan coastal plain form BJK										2			12	
143	Drosera marchantii subsp. marchantii													12	
143	Drosera menziesii subsp. menziesii			Y									33		
143	Drosera menziesii subsp. penicillaris									33	25	31		25	
143	Drosera neesii subsp. neesii												11		
143	Drosera paleacea							Y		**55**	15	25	33		
143	Drosera pallida										33	6		12	
143	Drosera pulchella												11		
143	Drosera rosulata										2			12	
143	Drosera stolonifera	Y	Y	Y	Y			Y		44	61	18		75	Y
149	Crassula colorata									11	7	12	22	12	
149	Crassula decumbens												11		
149	Crassula pedicellosa											6			
149	Crassula peduncularis										2			12	
152	Billardiera variifolia				Y						20			12	
152	Pronaya fraseri		Y							44	7		11	62	
163	Acacia barbinervis subsp. barbinervis									11				12	
163	Acacia cochlearis										2				
163	Acacia extensa										7				
163	Acacia flagelliformis										5				
163	Acacia huegelii										15	18			
163	Acacia lasiocarpa										2		11		
163	Acacia nervosa													12	
163	Acacia pulchella										28	18		12	
163	Acacia saligna										5		44		
163	Acacia semitrullata										2	6			
163	Acacia sessilis									22		6			
163	Acacia stenoptera									11	20			37	

FAM	name	1	2	12	9	10	16	low04	low06a	20b	21a	21c	6	3b	KOOLJ-5
163	Acacia willdenowiana									22	15			50	
164	Labichea punctata									**66**				12	
165	Aotus procumbens											6	11		
165	Bossiaea eriocarpa									**88**	**79**	25		100	Y
165	Bossiaea ornata									11					
165	Chorizema glycinifolium													12	
165	Daviesia decurrens									11				25	
165	Daviesia divaricata									22	7				
165	Daviesia physodes									44	10			12	
165	Daviesia preissii													12	
165	Daviesia triflora									22	5				
165	Euchilopsis linearis											6			
165	Gompholobium aristatum													12	
165	Gompholobium capitatum											6			
165	Gompholobium confertum									11	5				
165	Gompholobium knightianum									33				12	
165	Gompholobium marginatum													62	
165	Gompholobium polymorphum										2			25	
165	Gompholobium preissii									22					
165	Gompholobium tomentosum							Y	Y	**55**	**79**	**62**	11	25	Y
165	Hardenbergia comptoniana										38			12	
165	Hovea chorizemifolia									11					
165	Hovea pungens											6			
165	Hovea trisperma var. grandiflora									11				25	
165	Hovea trisperma var. trisperma									22	48			37	Y
165	Isotropis cuneifolia										30				
165	Jacksonia aff. sericea (swamp form)										2	12			
165	Jacksonia densiflora / floribunda complex											6			
165	Jacksonia furcellata			Y							25	37	11	12	
165	Jacksonia lehmannii									11					
165	Jacksonia sp.Busselton(G.J.Keighery 4482)										5				
165	Jacksonia sternbergiana									33	12	12	11		
165	Kennedia prostrata	Y	Y								28	12	11	50	Y

FAM	name	1	2	12	9	10	16	low04	low06a	20b	21a	21c	6	3b	KOOLJ-5
165	Lotus angustissimus													12	
165	Lotus suaveolens	Y	Y	Y					Y		2	6			
165	Nemcia aff. capitata										2				
165	Nemcia capitata										7			25	Y
165	Nemcia reticulata									11	2				
165	Ornithopus compressus										5		11	12	
165	Ornithopus pinnatus										2				
165	Sphaerolobium medium										2			12	
165	Sphaerolobium vimineum													25	
165	Templetonia biloba									11				25	
165	Trifolium arvense										2		11		
165	Trifolium campestre									11	23				
165	Viminaria juncea													12	
167	Erodium botrys												11		
175	Boronia crenulata								Y			6			
175	Boronia ramosa										2	12			
175	Philotheca spicata									**55**	**56**	12		62	
182	Platytheca galioides										5			12	
182	Tetratheca hirsuta									22	7	6		12	
182	Tetratheca hirsuta (glabrous)										10				
183	Comesperma calymega									11	5	12			
183	Comesperma confertum										5				
183	Comesperma virgatum									33	10			37	
185	Monotaxis grandiflora	Y	Y							11	2				
185	Monotaxis occidentalis										7			12	
185	Phyllanthus calycinus										10			25	
185	Poranthera microphylla								Y	11	12	37		12	
185	Stachystemon vermicularis									33	5				
202	Stackhousia monogyna									11	7			12	
202	Tripterococcus brunonis									11	2			12	
215	Cryptandra pungens													12	
223	Thomasia grandiflora													12	
226	Hibbertia acerosa									44	7			12	

FAM	name	1	2	12	9	10	16	low04	low06a	20b	21a	21c	6	3b	KOOLJ-5
226	Hibbertia amplexicaulis									11					
226	Hibbertia commutata												11	12	
226	Hibbertia cunninghamii										2			12	
226	Hibbertia huegelii				Y			Y		77	2	6			
226	Hibbertia hypericoides	Y	Y	Y	Y			Y		77	89	12		100	Y
226	Hibbertia racemosa										48	31			
226	Hibbertia rhadinopoda										5				
226	Hibbertia subvaginata										20	37			
226	Hibbertia vaginata			Y				Y		55	20	31		12	
243	Hybanthus calycinus		Y								5				
243	Hybanthus floribundus													12	
263	Pimelea imbricata var. piligera													25	
263	Pimelea lehmanniana	Y	Y												
263	Pimelea rosea										7			12	
263	Pimelea suaveolens									33				12	
263	Pimelea sulphurea									11					
273	Agonis flexuosa										15			12	
273	Astartea aff. fascicularis												11		
273	Baeckea camphorosmae									**55**	10		11	50	
273	Beaufortia macrostemon									11					
273	Calytrix angulata									22	2	6			
273	Calytrix flavescens									22	15	18	11		
273	Calytrix fraseri										7	12			
273	Eremaea asterocarpa									11					
273	Eremaea pauciflora									44	5	6	11		
273	Eucalyptus calophylla	Y								11	35	18	11	87	Y
273	Eucalyptus gomphocephala										10				
273	Eucalyptus marginata	Y	Y	Y	Y	Y		Y	Y	55	64	12		87	Y
273	Eucalyptus rudis											6	11		
273	Eucalyptus wandoo												11		
273	Hypocalymma angustifolium			Y							7	18	55	12	Y
273	Hypocalymma robustum									**55**	28				
273	Kunzea ericifolia							Y	Y		33	**50**			

FAM	name	1	2	12	9	10	16	low04	low06a	20b	21a	21c	6	3b	KOOLJ-5
273	Kunzea littericola Ms												22		
273	Melaleuca acerosa									11	5				
273	Melaleuca lateriflora subsp. acutifolia												11		
273	Melaleuca preissiana											31	11		
273	Melaleuca rhaphiophylla												11		
273	Melaleuca scabra										2				
273	Melaleuca sp.B Perth Flora(F.W.Humphreys)											18	22		
273	Melaleuca thymoides									11	41	37			
273	Melaleuca viminea												22		
273	Pericalymma ellipticum										2	18	11		
273	Regelia ciliata											12	33		
273	Scholtzia involucrata								Y	33	10	**56**	11		
273	Verticordia densiflora											6	22		
276	Gonocarpus pithyoides										7	12			
281	Daucus glochidiatus										25	6			
281	Eryngium pinnatifidum subsp. palustre													12	
281	Eryngium pinnatifidum subsp. pinnatifidum										10			25	Y
281	Homalosciadium homalocarpum										33	12		62	Y
281	Hydrocotyle callicarpa										2				
281	Hydrocotyle capillaris											6			
281	Hydrocotyle pilifera var. pilifera													12	
281	Pentapeltis peltigera									22				12	
281	Platysace compressa										23	12			
281	Trachymene pilosa	Y						Y	Y	44	79	81	22	25	
281	Xanthosia ciliata										2				
281	Xanthosia huegelii									**66**	**56**	12		62	
288	Andersonia lehmanniana									22	5				
288	Astroloma ciliatum										10				
288	Astroloma pallidum									**55**	28		11	25	Y
288	Astroloma stomarrhena									44					
288	Brachyloma preissii										15	18			
288	Conostephium minus										2	6			
288	Conostephium pendulum									**77**	**51**	6	11		

FAM	name	1	2	12	9	10	16	low04	low06a	20b	21a	21c	6	3b	KOOLJ-5
288	Conostephium preissii									22	15	12			
288	Leucopogon conostephioides										12	**50**			
288	Leucopogon parviflorus										5				
288	Leucopogon polymorphus										2				
288	Leucopogon propinquus										33	6		25	
288	Leucopogon racemulosus										7				
288	Leucopogon squarrosus										10				
288	Lysinema ciliatum									22					
288	Styphelia tenuiflora									22					
293	Anagallis arvensis									11	23		22		
293	Samolus junceus												11		
302	Logania serpyllifolia									11	2			12	
302	Phyllangium paradoxum										5	12			
303	Cicendia filiformis												11	12	
313	Hemiandra pungens/linearis									11	25	6			
315	Solanum americanum										2				
315	Solanum nigrum			Y							2				
316	Bellardia trixago												11		
316	Dischisma capitatum												11		
316	Parentucellia latifolia												11	25	
316	Parentucellia viscosa												22		
320	Orobanche minor					Y					2			37	
323	Utricularia multifida												11		
323	Utricularia tenella												11		
331	Opercularia apiciflora										2			12	
331	Opercularia hispidula										12			37	Y
331	Opercularia vaginata										7				
339	Wahlenbergia preissii										12	6		12	
340	Isotoma hypocrateriformis										2				
340	Lobelia tenuior									11	30			12	
341	Dampiera alata									11					
341	Dampiera linearis			Y						33	46	18		37	
341	Goodenia pulchella												11		

FAM	name	1	2	12	9	10	16	low04	low06a	20b	21a	21c	6	3b	KOOLJ-5
341	Lechenaultia biloba									44				50	
341	Lechenaultia expansa											6			
341	Lechenaultia floribunda											6			
341	Scaevola calliptera									11	2			12	
341	Scaevola canescens										5				
341	Scaevola phlebopetala													37	
341	Scaevola repens var. repens									11	2				
341	Velleia trinervis									11					
343	Levenhookia pusilla									11	2			50	
343	Levenhookia stipitata							Y		11	15	6		12	
343	Stylidium adpressum/cygnorum										7				
343	Stylidium amoenum											6			
343	Stylidium brunonianum									**55**	33	**50**		12	
343	Stylidium calcaratum										5	12		37	
343	Stylidium carnosum										15	6		12	
343	Stylidium dichotomum												11	12	
343	Stylidium junceum										2	6			
343	Stylidium piliferum							Y		**66**	38	37		50	
343	Stylidium repens									22	7	**56**	33	12	
343	Stylidium schoenoides									33	48	12			
345	Arctotheca calendula					Y					2			12	Y
345	Asteridea pulverulenta	Y									23	6		12	
345	Brachyscome iberidifolia												11		
345	Carduus pycnocephalus	Y													
345	Conyza albida										2	6			
345	Craspedia sp.A Perth Flora										12			12	
345	Helipterum corymbosum										2				
345	Hyalosperma cotula									11	15	6	11	37	
345	Hypochaeris glabra	Y	Y	Y	Y		Y	Y	Y	44	87	81	100	100	Y
345	Lagenifera huegelii							Y		11	**74**	31		50	Y
345	Millotia tenuifolia										17	12			
345	Olearia elaeophila										2				
345	Olearia paucidentata													25	

FAM	name	1	2	12	9	10	16	low04	low06a	20b	21a	21c	6	3b	KOOLJ-5
345	Podolepis gracilis							Y		11	20			12	
345	Podolepis gracilis (Swamp form GJK 13126)										2				
345	Podolepis lessonii												11		
345	Podotheca angustifolia										5	6			
345	Podotheca chrysantha										5	18			
345	Pseudognaphalium luteoalbum												11		
345	Pterochaeta paniculata							Y		11	2	6			
345	Quinetia urvillei									22	28	12	11	25	
345	Rhodanthe citrina										7			12	
345	Siloxerus humifusus									22	5	6	11		
345	Sonchus oleraceus										20	6	11		
345	Trichocline spathulata									11	2		11	12	
345	Ursinia anthemoides	Y	Y				Y	Y		55	56	50	66	37	
345	Vellereophyton dealbatum												11		
345	Waitzia suaveolens										5	6			