REVIEW OF DATA ANALYSES AT HAPPY VALLEY

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STRATEGEN

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1. INTRODUCTION

Mattiske Consulting Pty Ltd was commissioned by Strategen to review the interpretative work undertaken to date on the Happy Valley data collected for Bemax.

This work involved reviewing the field data and previous reports by Bennett Environmental and Griffin (2008) by reviewing similarities with the Department of Environment and Conservation (DEC) regional data set and Priority and Threatened Ecological Communities based on listings held by the Department of Environment and Conservation (2009c and d).

2. OBJECTIVES

The objectives of this review were:

- To indicate if the vegetation of the proposal area is floristically similar to the regional FCT's as defined by Gibson et al. (1994), the TEC's as listed by the Department of Environment and Conservation (2009c) and the PEC's as proposed by Keighery *et al* (2008).
- To review the issues related to interpreting this work.
- To review the key factors associated with vegetation on the Whicher Scarp and the eastern fringes of the Swan Coastal Plain.

3. METHODOLOGY

Data analysis was undertaken on the old taxonomic nomenclature and repeated after all taxa had been updated using Florabase. Analysis also incorporated the total data list made available to us and an amended list based on Griffin's (2008) reconciled list. This involved reducing infra-specific names to the relevant species names and combining some taxa where confusion is known to have occurred in field observations and identifications (Griffin 2008).

Analysis involved the Bray-Curtis similarity index to indicate what sites were similar to each other and floristic groups. Dendrograms illustrating the relationship of sites to each other has been included in Appendices G, H and I.

Sites completed by Bennett include 2007-01 to 2007-09, HV01 to HV41 and EXTRA01 to EXTRA11.

In view of differences in opinion of what species should be included or excluded a range of analyses were undertaken:

a. On all species as originally collected by Bennett and DEC (Old Nomenclature) on the respective sites.
b. On all species as originally collected by Bennett and DEC (Old Nomenclature) on the respective sites minus weeds.
c. On all species as originally collected by Bennett and DEC (Old Nomenclature) but with edits as proposed by Griffin (2008).
d. On all species as originally collected by Bennett and DEC (Old Nomenclature) but with edits as proposed by Griffin (2008) minus weeds.
e. On all species as originally collected by Bennett and DEC but with edits based Florabase (New Nomenclature).
f. On all species as originally collected by Bennett and DEC but with edits based on Florabase (New Nomenclature) but minus weeds.
g. On all species as originally collected by Bennett and DEC but with edits based on Griffin (2008) and Florabase (New Nomenclature).

h. On all species as originally collected by Bennett and DEC but with edits based on Griffin (2008) and Florabase (New Nomenclature) but minus weeds.

i. On all species as originally collected by Bennett and DEC but with edits based on Florabase and Whicher Scarp Report.

j. On all species as originally collected by Bennett and DEC but with edits based on Florabase and Whicher Scarp Report, minus singletons.

k. On all species as originally collected by Bennett and DEC but with edits based on Florabase and Whicher Scarp Report, minus singletons minus weeds.

4. POTENTIAL PRIORITY AND THREATENED ECOLOGICAL COMMUNITIES

Based on Griffin's numerical analysis report (2008) the only recognised Swan Coastal Plain's Floristic Community Types on the data analysed were 01a, 01b and 21a. Sites were considered similar if their similarity index was higher than 0.6. Sites were also compared with the PEC's as defined by the Department of Environment and Conservation (2009c).

One Threatened Ecological Community (TEC) has been found previously in the southern Swan Coastal Plain, namely,

Eucalyptus calophylla woodlands on heavy soils of the southern Swan Coastal Plain.

This TEC was related to the FCT 01b, site WONN-2 by Griffin (2008).

Priority 3 Priority Ecological Community (PEC) has been defined previously at a range of sites. It has been described by (DEC2009c)as;

Eucalyptus haematoxylon - *Eucalyptus marginata* woodlands on Whicher foothills ('community type 1a') - Community occurs along the northern edge of State Forest along the base of the Whicher Range and is composed of *Eucalyptus haematoxylon – Corymbia calophylla* - *Eucalyptus marginata* forests and woodlands. Taxa virtually restricted to the type include *Acacia varia* subsp. *varia*, *Agonis grandiflora* and *Xanthosia pusilla*.

This PEC was related to the Floristic Community Type (FCT) 01a by Griffin (2008). Multiple DEC sites have been classified as this FCT including; ACTON-1, boyan 02, dard01, dard03, Gibson02, kelly01, kemp01, Norm02, smith02, smith03, wicher01, will02, will04 and WONN-1.

Priority 3 Priority Ecological Community (PEC) has been defined previously at a range of sites on the fringes of the Swan Coastal Plain. It has been described (by DEC2009c) as;

This community is restricted to sand sheets at the base of the Whicher Scarp, the sand sheets on elevated ridges or the sand plain south of Bunbury. Structurally, this community type is normally *Banksia attenuata or Eucalyptus marginata – B.attenata woodlands.* Common taxa include *Acacia extensa, Jacksonia* sp. *Busselton, Laxmannia sessiliflora, Lysinema cilataum* and *Johnsonia acaulis.*

This PEC was related to the Floristic Community Type (FCT) 21b by Griffin (2008). Multiple DEC sites have been classified as this FCT including; OATES-1, boyan 01, buffer01, dard02, CARB-3, R116702, Plant03, Chid01, Chid02, gibson01, kelly02, CAPEL-2, RUAB-2, RUAB-1, MANEA-3, MGK03 and MGK04.

The PEC's as defined by the Department of Environment and Conservation (2009c) included (in addition to 1a, 21b):

- A1 – Central Whicher Scarp Mountain Marri woodland
- B2 – West Whicher Scarp Banksia attenuata woodland
- C1 – Central Whicher Scarp Jarrah woodland
- C2 – Whicher Scarp Jarrah woodland of deep coloured sands
- C5 – Dardanup Jarrah and Mountain Marri woodland on laterite
- F1 – Sabina River Jarrah and Marri woodland
- G2 – Shrublands of near permanent wetlands in creeklines
- Swan Coastal Plain Paluslope Wetlands

5. RESULTS

5.1 Similarity Indices When Old Nomenclature Was Analyzed

When all data was considered and not updated with current nomenclature the majority of sites that showed similarity were within the same group, i.e. EXTRA 06 is similar to EXTRA 02, 03 and 04. Sites that were similar outside their own grouping were; EXTRA 01 and HV01 (0.60), Chid 02 and R116702 (0.60), EXTRA01 and HV01 (0.60) and MANEA03 and MGK03 (0.69). Since both EXTRA and HV sites are Bennett sites the data indicates none of these sites were similar to previous DEC sites monitored.

When data minus weeds were considered, sites that were similar outside their own groupings were Chid 02 and R116702 (0.61), EXTRA 01 and HV01 (0.60) and MANEA03 and MGK03 (0.68). These results indicate that none of the Bennett sites were similar to DEC sites monitored.

When all the data was amended with Griffin's (2008) reconciled list the following similarity indices were observed for sites outside their own grouping;

- EXTRA08 and HAPP01 (0.60)
- HV01 and DAVE01 (0.71), DAVE02 (0.65), EXTRA01 (0.67), EXTRA03 (0.64), EXTRA07 (0.64), EXTRA08 (0.65) and, HAPP01 (0.63);
- HV08 and DAVE01 (0.61) and EXTRA08 (0.64);
- HV12 and DAVE01 (0.65), EXTRA06 (0.63);
- HV14 and DAVE04 (0.64);
- HV17 and DAVE01 (0.73) and EXTRA08 with 0.65,
- HV18 and DAVE01 (0.65) and DAVE02 (0.65);
- HV24 and DAVE01 (0.60);
- HV26 and DARP08 (0.62);
- HV36 and DAVE05 (0.65);

Table 1: Comparison of Groupings from All the Data with Old Nomenclature with Griffin's reconciled list on the basis of Similarity Indices (>0.6)

Sites	Griffin's Groupings
EXTRA01	C2
EXTRA03	C2
EXTRA07	C2
EXTRA08	C2
HV01	C2
HV08	C2
HV12	C2
HV14	C3
HV17	C2
HV18	C2
HV24	C2
HV26	C3
HV36	C4/C5

It was noted in the Griffin assessment (2008) that Keighery acknowledged similarities between FCT 1a and the C groupings.

When the data was amended with Griffin's (2008) reconciled list and weeds were not considered the following similarity indices were observed for sites outside their own grouping;

- EXTRA04 and HAPP01 (0.60);
- EXTRA08 and HAPP01 (0.60);
- HV01 and DAVE01 (0.71), DAVE02 (0.63), EXTRA01 (0.67), EXTRA03 (0.64), EXTRA07 (0.64), EXTRA08 (0.65), HAPP01 (0.64);
- HV08 and DAVE01 (0.61), EXTRA08 (0.64);
- HV12 and DAVE02 (0.65), EXTRA06 (0.63);
- HV14 and DAVE04 (0.64);
- HV17 and DAVE01 (0.73), EXTRA08 (0.65);
- HV18 and DAVE01 (0.65) and DAVE02 (0.65);
- HV24 and DAVE01 (0.64), HAPP01 (0.65);
- HV26 and DARPP08 (0.62);
- HV33 and DAVE05 (0.65);
- HV40 and EXTRA11 (0.61);

Table 2: Comparison of Groupings from All the Data with Old Nomenclature with Griffin's reconciled list Minus Weeds on the basis of Similarity Indices (>0.6)

Sites	Griffin's Groupings
EXTRA04	C2
EXTRA08	C2
HV01	C2
HV08	C2
HV12	C2
HV14	C3
HV17	C2
HV18	C2
HV24	C2
HV26	C3
HV33	C3
HV40	B1

It was noted in the Griffin assessment (2008) that Keighery acknowledged similarities between FCT 1a and the C groupings and between the FCT21b and the B groupings.

5.2 Similarity Indices When New Nomenclatures Was Analyzed

When all data was considered, sites that were similar outside their own groupings were: Chid02 and R116702 (0.61), HV01 and EXTRA01 (0.60) and, MANAEA-3 and MGK03 (0.68).

When data minus weeds were considered, sites that were similar outside their own groupings were; Chid 02 and R116702 (0.61), EXTRA 01 and HV01 (0.60) and MANEA03 and MGK03 (0.68). These results indicate that none of the Bennett sites were similar to DEC sites monitored.

When all the data was amended with Griffin's (2008) reconciled list the following similarity indices were observed for sites outside their own grouping;

- DAVE01 and EXTRA06 (0.62), EXTRA07 (0.63) and EXTRA08 (0.64);
- HAPP01 and EXTRA08 (0.60);
- HV01 and DAVE01 (0.71), EXTRA01 (0.67), EXTRA03 (0.64), EXTRA07 (0.64) and EXTRA08 (0.65);
- HV08 and DAVE01 (0.61);
- HV12 and DAVE02 (0.65) and EXTRA06 (0.63);
- HV14 and DAVE04 (0.64)
- HV17 and DAVE01 (0.73);
- HV18 and DAVE01 (0.65) and DAVE02 (0.65);
- HV24 and DAVE01 (0.64);
- HV26 and DARP08 (0.62);
- HV33 and DAVE05 (0.65);

Table 3: Comparison of Groupings from All the Data with New Nomenclature (based on Florabase) with Griffin's reconciled list on the basis of Similarity Indices (>0.6)

Sites	Griffin's Groupings
EXTRA01	C2
EXTRA03	C2
EXTRA06	C2
EXTRA07	C2
EXTRA08	C2
HV01	C2
HV08	C2
HV12	C2
HV14	C3
HV17	C2
HV18	C2
HV24	C2
HV26	C3
HV33	C3

It was noted in the Griffin assessment (2008) that Keighery acknowledged similarities between FCT 1a and the C groupings.

When the data was amended according to Griffin's (2008) reconciled list and weeds were not considered the following similarity indices were observed for sites outside their own grouping:

- DAVE01 and EXTRA06 (0.62), EXTRA07 (0.63) and EXTRA08 (0.64);
- HAPP01 and EXTRA04 (0.60) and EXTRA08 (0.60);
- HV01 and DAVE01 (0.71), DAVE02 (0.63), EXTRA01 (0.67), EXTRA03 (0.64), EXTRA07 (0.64), EXTRA08 (0.65) and HAPP01 (0.64);
- HV08 and DAVE01 (0.61) and EXTRA08 (0.64);
- HV12 and DAVE02 (0.65) and EXTRA06 (0.63);
- HV14 and DAVE04 (0.64)
- HV17 and DAVE01 (0.73) and EXTRA08 (0.65);
- HV24 and HAPP01 (0.65);
- HV33 and DAVE05 (0.65);
- HV40 and EXTRA11 (0.61);

Table 4: Comparison of Groupings from All the Data with New Nomenclature (based on Florabase) with Griffin's reconciled list Minus Weeds on the basis of Similarity Indices (>0.6)

Sites	Griffin's Groupings
EXTRA01	C2
EXTRA03	C2
EXTRA04	C2
EXTRA06	C2
EXTRA07	C2
EXTRA08	C2
HV01	C2
HV08	C2
HV12	C2
HV14	C3
HV17	C2
HV24	C2
HV33	C3
HV40	B1

It was noted in the Griffin assessment (2008) that Keighery acknowledged similarities between FCT 1a and the C groupings and between the FCT21b and the B groupings.

5.3 Similarity Indices When Data Was Amended In Accordance With Whicher Scarp Report Species

When the data was amended in accordance with Whicher Scarp report and weeds and singletons were not considered the following similarity indices were observed for sites outside their own grouping:

- Boyan 01 and Buffer01 (0.61), dard02 (0.61), gibson01 (0.60);
- GAV05 and dard02 (0.63);
- Chid02 and R116702 (0.62);
- EXTRA01 and HV01 (0.60);
- MANEA-3 and MGK03 (0.68);
- SABI11 and smith03 (0.60).

Since both EXTRA and HV sites are Bennett sites the data indicates none of these sites were similar to previous DEC sites monitored.

When data was amended in accordance with Whicher Scarp report species and singletons were not considered the following similarity indices were observed for sites outside their own grouping:

- Boyan01 and buffer01 (0.61), dard02 (0.61) and, gibson01 (0.61);
- GAV05 and dard02 (0.61);
- EXTRA01 and HV01 (0.60);
- Chid02 and R116702 (0.61);
- MANEA-3 and MGK03 (0.69);
- SABI12 and WH06 (0.60);

Since both EXTRA and HV sites are Bennett sites the data indicates none of these sites were similar to previous DEC sites monitored.

When all the data was amended in accordance with the Whicher Scarp report species the following similarity indices were observed for sites outside their own grouping:

- ACTN02 and GIBB06 (0.62);
- Boyan01 and buffer01 (0.65), CAPEL-1 (0.62), dard02 (0.60), gibson01 (0.63) and kelly02 (0.61);
- CAPEL-1 and gibson01 (0.61);
- CHAM02 and GIBB02 (0.62) and TREE01 (0.61);
- Chid02 and buffer01 (0.60);
- BOYA01 and DAVE01 (0.61);
- Dard02 and GAV05 (0.65) and MANEA-3 (0.60);
- DAVE01 and HV17 (0.62);
- DAVE02 and HV12 (0.63), HV18 (0.61) and HV39 (0.62);
- EXTRA01 and HV01 (0.68) and HV26 (0.61);
- EXTRA06 and HV05 (0.61) and HV12 (0.64);
- EXTRA07 and HV26 (0.61);
- EXTRA08 and HV08 (0.66), HV12 (0.63) and HV17 (0.66);
- GAV05 and GWINDR03 (0.60);
- Gibson02 and HV19 (0.61);
- GOOD02 and DARP02 (0.61) and GWINDR01 (0.60);
- Kemp01 and GOUL01 (0.61)
- MANEA-3 and MGK03 (0.70), MGK04 (0.63) and RUAB-1 (0.61)
- SABI11 and TREE03 (0.60).

Table 5: Comparison of Groupings from All the Data with New Nomenclature (based on Florabase) and the Whicher Scarp report on the basis of Similarity Indices (>0.6)

Sites	Griffin's Groupings
HV12	C2
HV17	C2
HV18	C2
HV19	C2
HV39	C3

Some of the EXTRA and HV sites are similar; however these are all Bennett Happy Valley sites. It was noted in the Griffin assessment (2008) that Keighery acknowledged similarities between FCT 1a and the C groupings.

5.4 PATN Dendrograms When Old Nomenclature Was Analyzed

Results in Appendix G1 illustrates that only one Happy Valley site, namely, HV25 was broadly similar to site Norm02 which is classified as a recognized PEC relating to FCT 01a.

Table 6: Comparison of Groupings from All the Data with Old Nomenclature on the basis of the PATN Analysis

Sites	Griffin's Groupings
HV25	A/E

Results illustrated in Appendix G2 are similar to those found in G1 with site HV25 showing broad similarity to Norm02.

Table 7: Comparison of Groupings from All the Data with Old Nomenclature Minus Weeds on the basis of the PATN Analysis

Sites	Griffin's Groupings
HV25	A/E

Results of the dendrogram illustrated in Appendix G3 do not represent the broad similarity between HV25 and Norm02. Rather, it indicates that HV14, HV29, HV33, HV13, HV32, HV37, HV21, HV30 and HV31 are broadly similar to boyan 02, kelly01 and dard03, classified as FCT 01a, a recognized PEC. Also sites HV26, HV05, HV19, HV06 and HV15 are closely related to gibson02, classified as FCT 01a.

Table 8: Comparison of Groupings from All the Data with Old Nomenclature with Griffin's reconciled list on the basis of PATN Analysis

Sites	Griffin's Groupings
HV05	C3
HV06	C2
HV13	C3
HV14	C3
HV15	C2
HV19	C2
HV21	C3
HV25	A/E
HV26	C3
HV29	C3
HV30	C3
HV31	C3
HV32	C3
HV33	C3
HV37	C3

Results illustrated in Appendix G4 show sites HV14, HV29, HV33, HV13, HV32, HV37, HV09, HV30 and HV31 showing broad similarity to boyan 02, kelly01 and dard03, all classified as FCT 01a. Also sites HV26, HV05, HV19, HV06 and HV15 show broad similarity to gibson02 classified as FCT 01a.

These dendrograms illustrate that only broad similarities are found when comparing Bennett and DEC data with old nomenclature and generally with the C2, C3 which have similarities with FCT 01a.

5.5 PATN Dendrograms When New Nomenclature Was Analyzed

Results illustrated in Appendix H1 indicate no broad similarity between Bennett sites and DEC sites. Appendix H2 also illustrates no broad similarity between Bennett sites and DEC sites.

Results illustrated in Appendix H3 indicate that sites HV14, HV29, HV33, HV13, HV32, HV37, HV21, HV30 and HV31 are broadly similar to boyan 02, Kelly01 and dard03, all classified as FCT 01a. Also sites HV26, HV05, HV19, HV06 and HV15 are broadly similar to gibson02 classified as FCT 01a.

Table 9: Comparison of Groupings from All the Data with New Nomenclature (Florabase) with Griffin's reconciled list on the basis of PATN Analysis

Sites	Griffin's Groupings
HV05	C3
HV06	C2
HV13	C3
HV14	C3
HV15	C2
HV19	C2
HV21	C3
HV26	C3
HV29	C3
HV30	C3
HV31	C3
HV32	C3
HV33	C3
HV37	C3

Results illustrated in Appendix H4 indicate sites HV14, HV29, HV33, HV13, HV32, HV37, HV09, HV30 and HV31 are broadly similar to boyan 02, kelly01 and dard03, all classified as FCT 01a. Also sites HV26, HV05, HV19, HV06 and HV15 are broadly similar to gibson02 classified as FCT 01a. Another grouping is recognised on this dendrogram that hasn't previously been recognised; HV23, HV39, HV02, HV11, HV07, HV34, HV22 and HV10 are broadly similar to will02 and OATES-1, classified as FCT 01a and FCT21b.

Table 10: Comparison of Groupings from All the Data with New Nomenclature (Florabase) with Griffin's reconciled list Minus Weeds on the basis of PATN Analysis

Sites	Griffin's Groupings
HV02	B1
HV05	C3
HV06	C2
HV07	B1/A
HV09	C2/C3
HV10	B1/A
HV11	B1
HV13	C3
HV14	C3
HV15	C2
HV19	C2
HV22	A
HV23	A/B
HV26	C3
HV29	C3

Table 10: Comparison of Groupings from All the Data with New Nomenclature (Florabase) with Griffin's reconciled list Minus Weeds on the basis of PATN Analysis (continued)

Sites	Griffin's Groupings
HV30	C3
HV31	C3
HV32	C3
HV33	C3
HV34	B1/A
HV37	C3
HV39	C3

These dendrograms illustrate that there are some broad similarities with the FCT01a and to a lesser extent FCT21b.

5.6 PATN Dendrograms Following Florabase and Whicher Scarp Listings

Following requests to DEC and EPA to review the needs to include weeds and singletons (i.e. when species only occurred in 1 of all of the sites), a response was received to rely on the Floristic Survey of the Whicher Scarp (Keighery 2008). Consequently, the analyses were continued and the results are illustrated in Appendix I1 to I3 utilizing the species reconciliation tables as supplied in this latter publication.

Before reporting on the later analyses it is important to stress that the species reconciliation was not always consistent in the Whicher Scarp report (e.g. *Grevillea pulchella* versus *Grevillea* subspecies of this species). Additionally, no response was received on the apparent inclusion of weeds in the Whicher Scarp report. The inclusion of weeds in the definition of the communities (as a result of their inclusion in the data sets) seems contrary to the inherent need to define native communities using native species. Despite requests to accept that weeds should be excluded, no response was received from the EPA/DEC units.

Results illustrated in Appendix I1 which is the preferred option from a listing perspective indicates that there is a broad grouping between GAV03, GAV04, davies04, WH01, GOOD01 with 2007-01, 2007-02, HV28, HV36, 2007-03, 2007-04, 2007-09, 2007-06, 2007-05, 2007-07, HV25.

Table 11: Comparison of Groupings from All the Data with New Nomenclature (Florabase) with Whicher Scarp list Minus Weeds on the basis of PATN Analysis

Sites	Griffin's Groupings
2007-01	A5/C4
2007-02	C
HV28	C3/C4
HV36	C4/A5
2007-03	A5/C1
2007-04	C4
2007-09	A5
2007-06	A5/C
2007-05	E/F
2007-07	A5
HV25	A/E

On the basis of the PATN analyses, the results when using species aligned with Florabase and the Whicher Scarp Report (minus singletons and minus weeds) indicate that none of the Bennett sites were similar to the TEC as delineated by Griffin (2008). On the basis of *Corymbia haematoxylon* and associated understorey species in some of the sites there is some broad association with the A, C and F groupings that have some similarities with the PEC's 1a, C2, A1 and F1 as defined by the Department of Environment and Conservation (2009c). It should be noted that these groupings are very broad and less apparent than with other prepared listings as discussed in the previous sections.

6. DISCUSSION

Based on Griffin's numerical analysis report (2008) the only recognised Swan Coastal Plain's Floristic Community Types on the data analysed were 01a, 01b and 21a. Sites were considered similar if their similarity index was higher than 0.6. Sites were also compared with the PEC's as defined by the Department of Environment and Conservation (2009c).

On the basis of recent interpretations and re-analyses of the datasets, the Similarity Indices indicated no difference when old and new nomenclature data sets were used. When the data set was reconciled with Griffin's (2008) list a lot more similarities were apparent between Bennett and DEC sites compared to the full data set. These similarities were still quite broad (>0.6) and not adequate enough to confidently group sites together.

The PATN analyses using the different combinations of all species, all species minus weeds, all species using Griffin's reconciliation tables, all species using Griffin's reconciliation tables without weeds, all species after Florabase work, all species after Florabase work and without weeds, all species after Florabase work and reconciliation with the Whicher Scarp Report (Keighery et al. 2008), all species after Florabase work and reconciliation with the Whicher Scarp Report (Keighery et al. 2008) minus singletons and all species after Florabase work and reconciliation with the Whicher Scarp Report (Keighery et al. 2008) minus weeds and singletons reflect that there are no strong relationships between the Happy Valley sites and the TEC - FCT1b (based on Gibson *et al.* 1994) and as highlighted by Griffin (2008). The similarity indices and associations results reflected some broad similarities and clustering with FCT1a and C2 mainly and occasionally with FCT21b, A1 and F1.

In interpreting the results there should be a clear set of guidelines on which taxa or species should be used, for example – a reliance on the Florabase listings (Department of Environment and Conservation 2009a).

Results indicate that there have been inconsistent changes in species names in the analyses undertaken by Griffin and in the Whicher Range studies, for example:

- The reconciliation tables as presented in Appendix 3a and 5d of the Whicher Scarp report (Keighery et al 2008) are inconsistent in relation to *Grevillea pulchella* and its related subspecies and *Astartea* species.

- the reconciliation of some of these species are not consistent with the Florabase standards as defined by the Department of Environment and Conservation (2009a), for example:
    - *Grevillea pulchella* subsp. *ascendens* (G.J.Keighery & B.J. Keighery 938) is recognized as *Grevillea pulchella* in the Florabase,
    - *Pithocarpa melanostigma* as suggested in Which Scarp report is not current according to Florabase,
    - *Cyathochaeta* sp. Sabina (SAB103&06) as suggested in Whicher Scarp report is not current according to Florabase,
    - *Pterostylis nana* as suggested in Whicher Scarp report is not current according to Florabase,

- a significant range of species were incorrectly named (see Appendix B) and therefore the latest reconciled list based on the Florabase standards (where possible, e.g. confusion over *Grevillea pulchella* and the inclusion of weeds) was used in the analyses (Appendix B).

- in the industry it is generally accepted the native communities should not include introduced or weeds in delineating the communities. Generally it is acceptable to include their occurrence in a particular community, but not to include it in the delineation of the community. Some of the analyses undertaken to date include the introduced species and weeds.

- in many analytical approaches one does not include the singletons (species that occur only once).

. some of the key indicator species (e.g. *Corymbia* species) were merged in the Griffin data base; the latter is particularly surprising as the *Corymbia haematoxylon* is one of the keystone species in the defined PEC's on the Whicher Scarp).

. some site Whicher Range and southern Swan Coastal Plain indicative species (e.g. were deleted from the Griffin data base, but included in the other analysis options).

Ideally, there should be a clear and transparent process for confirming the relationships between site data as collected and the floristic communities as defined by previous workers. One of the difficulties of relating some of the data may reflect the continuum nature of our environments (with species occurring in relation to different determining factors).

If the relationships are based on qualitative factors then this should be clearly defined. Further, as many of the floristic communities as defined by Gibson *et al*. (1994) are based on extreme sites, then species that occur on slightly different sites may not be significantly correlated as subtle changes occur along the continuums on the escarpments. The latter exceptions to this interpretation may occur in very wet sites or shallow and exposed sites (granites, ferricrete, ironstone areas).

In relation to the Happy Valley situation, it appears that there is a range of interpretations and that if there is acceptance of some of the principles underpinning the interpretation by all parties then clarity should result in the EIA processes in this State.

7. REFERENCES

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