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HARVEY BASIN ALLOCATION PLAN

ASSESSMENT OF FLORA AND VEGETATION VALUES

Report for the Proposed Harvey Basin Surface Water Allocation Plan

Report to the Water and Rivers Commission

Prepared by

Mattiske Consulting Pty Ltd

Report No. WRC005/43/97

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1. SUMMARY

Mattiske Consulting Pty Ltd was commissioned by the Water and Rivers Commission to assess the flora and vegetation values on six areas of native vegetation likely to be inundated by construction of the proposed Harvey Dam. Three inundation zones are being assessed by the Water and Rivers Commission, where 1 is at the lowest level and 3 at the highest level.

A total of 113 sites along 41 transects within 6 areas were surveyed in August 1997 and January 1998. A total of 230 vascular plant taxa from 55 families and 127 genera were recorded within the Harvey Basin survey area. Of these 230 taxa, 29 were introduced taxa. No Declared Rare Flora as gazetted under the Wildlife Conservation Act were located in the survey area. *Hibbertia silvestris* (Priority Four - P4) was located in Area 5 - site-vegetation types CQ and T (Inundation Zones 2 and 3), and Area 6 - site-vegetation types Q and U (Inundation Zone 2).

Thirteen site-vegetation types were identified in the Harvey Basin survey area: CQ, D, G, M, MG, Q, R, S, SR, SW, T, U and Y.

The following summarises areas of conservation value within the survey area:

- Relatively undisturbed native vegetation in south-western part of Area 1 (Reserve 24002) containing the Lowdon vegetation complex as defined by Heddle *et al.* (1980a) which is poorly represented in the conservation estate (Havel 1989). The representation of the Lowdon vegetation complex in the conservation estate in 1989 was 0.23%. Although this Harvey area is covered by the current Regional Forest Agreement process (Commonwealth and Western Australian Regional Forest Agreement 1998), it is unlikely that the representation of this complex will increase substantially through the Regional Forest Agreement as large sections of the Lowdon complex have been cleared for agriculture.

- Relatively undisturbed native vegetation in Area 2 (Reserve 15515 - southwest) containing the Forrestfield vegetation complex as defined by Heddle *et al.* (1980a) which is poorly represented in the conservation estate (Havel 1989);

- Relatively undisturbed native vegetation in upperslope northern part of Area 3 (Reserve 15515 - north), which is above the inundation zones;

- Undisturbed native vegetation with aesthetic and possibly old growth values in Area 4 (Reserve 10745). Area likely to be affected only in Inundation Zone 3;

- Relatively undisturbed native vegetation of the Helena vegetation complex, which is well represented in the conservation estate (Havel 1989), in Area 5 containing *Hibbertia silvestris* (P4). Area is currently set aside by private land owners for conservation purposes; and

- Relatively undisturbed native vegetation of the Helena vegetation complex, which is well represented in the conservation estate (Havel 1989), in Area 6 (Private Property) containing *Hibbertia silvestris* (P4).

- The occurrence of *Agonis flexuosa* in 45 of the 113 sites within the survey areas. This species is prime habitat for the Western Australian Ringtail Possum. As this tree species occurs in Zones 1, 2 and 3 some of the areas are not likely to be impacted by the proposed inundation and therefore there may be scope to negotiate with the Department of Conservation and Land Management the option of translocating some Western Australian Ringtail Possum populations to areas unlikely to be affected by this proposal or alternatively establish areas of *Agonis flexuosa* to enable translocation at a later date back to this area. It must be recognized that the possums prefer older trees and dense overstorey foliage in order to avoid predators.

With respect to conservation values, Zone 1 is the most favourable inundation option (avoiding impact on all of Area 4, 5 and 6 and most of Area 2), with Zone 2 being the next most favourable option (avoiding impact on all of Area 4, and some of Area 5 and 6), while Zone 3 is the least favourable option (avoiding impact only on vegetation in the upperslopes of Area 3).

2. INTRODUCTION

2.1 Harvey Basin Scheme

A new Harvey Dam has been proposed since the Water Corporation's (1995) Perth's Water Future Study. There are a number of outstanding issues associated with this proposal which need to be investigated further before any decisions on a new dam can be made. These include water quality issues, environmental water provisions, impacts on flora and fauna, impacts on recreational use and landowners, and potential divertible water yields. The allocation study will enable the Commission to determine if a new dam is acceptable and if so how much additional divertible water could be provided in an environmentally sustainable and socially acceptable manner.

The environmental impact of proposed options for increasing water supply were evaluated by Havel (1994a and 1994b) and Bamford and Bamford (1991). These options encompassed a broad geographical region, extending from Geraldton to the north of Perth and the Warren River to the south of Perth. Included in these options was the proposed Harvey Basin scheme. Havel (1994a) states that this set of schemes appears to have relatively minor impact on flora conservation, chiefly because the landscape that is likely to be affected by the scheme has already been highly disturbed by previous human activity such as clearing for pasture and establishment of exotic pine plantations. However, of noted concern was the impact of inundation after dam construction on several reserves (C22977 and C15515) in the upper reaches of the proposed Harvey Dam. An additional reserve (C24002) which is also likely to be

inundated has been largely modified by planting of exotic pines.

Harvey Weir was constructed in 1916, and was raised to its current capacity of 9 Mm^3 in 1931. In 1948, Stirling Dam of capacity 56 Mm^3 was constructed approximately 10 km upstream of Harvey Weir. Water from the Harvey River catchment is captured by the Harvey Weir and Stirling Dam and is then diverted to irrigation and public water supply purposes from the Harvey Weir. The total catchment area for Harvey River to Harvey Weir is 380 km^2.

The proposed Harvey Basin scheme entails conversion of the existing Harvey Weir into a new larger dam of maximum capacity of between 70-140 Mm^3 and a top water level of between 70-90 m ADH. It is anticipated that water from the Harvey-Stirling System would be used to supply the Perth Metropolitan Water Supply Scheme in approximately 2010.

2.2 Climate and Landform

The Harvey Weir, located approximately 120 km south of Perth, experiences a Mediterranean climate. Long term weather data is not available in the immediate vicinity of Harvey Weir. Minimum and maximum annual temperatures at nearby Wokalup Agricultural Research Station are 12°C and 23°C, respectively. Annual rainfall of the Harvey area (Harvey Post Office Station and Wokalup Station) is typically around 1000 mm. Annual rainfall at Harvey Weir is likely to be higher as it is situated on the Darling Scarp, while the abovementioned weather stations are located at the foot of the Scarp.

The geomorphology of the Harvey River catchment is typically of moderate relief with dissected lateritic soils overlaying ancient Archaean granites with doleritic intrusions. Undulating plateau and minor valleys in the upper regions give way to deeply incised mainstream valleys with steep rocky slopes in lower regions. Near Harvey Weir, the Lowdon landform is developed on metamorphic rocks (gneisses).

Churchward and McArthur (1980) undertook a study of landforms and geology in the Darling System. Havel (1994a) identified the following landform units in the vicinity of the Harvey Basin scheme (Havel 1994a):

Lowdon: Major valley slopes and scarps with little laterite and with mainly exposed weathered or unweathered surfaces; great relief.

Helena: Major valleys with steep slopes deeply incised into the plateau; shallow red and yellow earths with frequent rock outcrops.

Murray: Major moderately incised valleys with red and yellow earths on intermediate slopes; narrow alluvial terraces.

Forrestfield: Sandy gravel spurs of Red Hill Shelf fringing the Darling Scarp.

Darling Scarp: Steep rocky escarpment of the plateau; skeletal soils with numerous outcrops of granite.

2.3 Vegetation

The Harvey Basin survey area lies within the Darling Botanical District of the South-Western Botanical Province as recognised by Diels (1906) and later developed by Gardner (1942) and Beard (1979, 1980, 1990). The significance of climate, landform and soils in determining the distribution of plant communities in this area is widely published (Diels 1906; Williams 1932, 1942; Speck 1952, 1958; Churchill 1961; Smith 1974; Seddon 1972; Havel 1968, 1975a, 1975b; Heddle *et al.* 1980a ; Beard 1981).

Classification of plant communities into site-vegetation types by Havel on the Swan Coastal Plain (1968) and in the Northern Jarrah Forest (1975a and 1975b) emphasized the relationships between the underlying landforms, soils and the plant communities. These were the first studies that entailed detailed quantitative ecological studies within the Swan Coastal Plain and Darling Ranges. Site characteristics were included in the determination of groupings or site-vegetation types. Results indicated a close relationship between plant species groupings and site conditions, hence the term "site-vegetation types". Further work was undertaken by Heddle *et al.* (1980a) in the System 6 area in which vegetation maps at 1:250000 scale were produced for the Perth, Pinjarra and Collie areas. These authors incorporated the site-vegetation types of Havel (1975a, 1975b) into the definition of a series of vegetation complexes and correlated the vegetation to the major geomorphological units of Churchward and McArthur (1980).

The *Atlas of Natural Resources Darling System Western Australia* (Department of Conservation and Environment 1980) forms the basis of the major efforts to put conservation and land use in the region on a factual and logical basis. In addition to the above-mentioned vegetation maps compiled by Heddle *et al.* (1980a), the Atlas also includes land use and geology and mineral resource maps at a scale of 1:250000.

The following vegetation complexes as defined by Heddle *et al* (1980a) occur in the survey area:

Lowdon Complex:

Open Forest of *Eucalyptus marginata - Corymbia calophylla* and Low Open Forest of peppermint (*Agonis flexuosa*) on the lower valley slopes, to fringing Woodland of *Eucalyptus rudis - Melaleuca rhaphiophylla* along water courses, and a wandoo woodland on the slopes. The wandoo woodlands extend from the adjacent Darling Scarp complex. Dominant site-vegetation types C, Q, M and Y.

Helena Complex in Medium to High Rainfall:

Open Forest of *Eucalyptus marginata - Corymbia calophylla - Eucalyptus patens* on the lower slopes and valley floors, to Heaths on upper slope shallow soils, to Herblands and lithic complex on granite rocks. Dominant site-vegetation types G, R; less consistently C, Q and T.

Murray Complex in Medium to High Rainfall:

Vegetation ranges from Open Forest of *Eucalyptus marginata - Corymbia calophylla* with *Eucalyptus patens* on the slopes, to fringing Woodland of *Eucalyptus rudis - Melaleuca rhaphiophylla* on the valley floors. Dominant site-vegetation types C, Q, U, T; less consistently D, O, R, W.

Forrestfield Complex:

Open Forest of *Corymbia calophylla - Eucalyptus wandoo - Eucalyptus marginata* on heavy gravelly soils, to Open Forest of *Eucalyptus marginata - Corymbia calophylla - Allocasuarina fraseriana - Banksia* spp. on sandy soils, to fringing Woodland of *Eucalyptus rudis - Melaleuca rhaphiophylla* in dissecting gullies.

Darling Scarp:

Vegetation ranges from Low Open Woodland to lichens according to depth of soils. Woodland components chiefly *Eucalyptus wandoo* with *Eucalyptus laeliae* in the north, *Eucalyptus haematoxylon* in the south and *Corymbia calophylla* throughout the region. Dominant site-vegetation types R, G and M.

The site-vegetation types defined by Havel (1975a, 1975b) for the Northern Jarrah Forest cover the majority of the variation of plant communities in the Harvey Basin survey area. Although the plant communities in this area form a continuum, it is possible to classify the site-vegetation types by incorporating site descriptions (e.g. soils, topography, slope, aspect, soil moisture regimes), floristic information and structural information.

In the last twenty years, subsequent studies by E.M. Mattiske and Associates and Mattiske Consulting Pty Ltd in the Northern Jarrah Forest have recognised a series of new site-vegetation types not covered previously by Havel (1975a, 1975b). These include variations on the previously defined site-vegetation types (e.g. CQ) as well as additional site-vegetation types defined by E.M. Mattiske and Associates and Mattiske Consulting Pty Ltd.

Six areas of remnant vegetation likely to be inundated by the construction of the new Harvey Dam were identified by the Water and Rivers Commission as having environmental significance based on aerial photographs (Figure 1). Harvey Basin survey areas can be described as follows:

- Area 1 - Reserve C24002.
  Highly modified for recreation but still supports some Darling Scarp and Lowdon vegetation complexes.

- Area 2 - Reserve C15515 for Water Supply.
  Partially degraded vegetation which includes anomalous (inland from the Darling Scarp) Ridge Hill Shelf Forrestfield vegetation complex.

- Area 3 - Reserve C15515 for Water Supply
  Area supports pine plantations and Lowdon vegetation complex.

- Area 4 - Reserve 10745
  Interface of Murray and Lowdon vegetation complexes within Falls Brook Nature Reserve, somewhat modified by grazing. Reserve 10745 is a very small reserve nested within the larger Reserve C25727. It was initially proclaimed to preserve a "beauty spot", presumably the waterfall on Falls Creek.

- Area 5 - Private Property
  Lowdon and Helena vegetation complexes which appear to be in very good condition.

- Area 6 - Private Property
  Lowdon and Helena vegetation complexes in very good condition.

Three zones of inundation were presented by the Water and Rivers Commission for the Harvey Basin scheme. These inundation levels are indicated on Figure 1 (Zone 1 (most inundation) - grey; Zone 2 - blue; Zone 3 (least inundation) - pink). The area outside of all inundation zones is referred to as Zone 4 in this report (ie. white areas of Figure 1).

3. OBJECTIVES

The objective of this survey was to assess the environmental value of six areas of remnant vegetation which are likely to be affected by inundation after the proposed construction of Harvey Dam.

Specifically, the objectives of this survey were to:

- review the data base held by the Department of Conservation and Land Management on the rare and endangered flora species that may occur in the survey area;

- document the flora and vegetation occurring within the six areas that may be affected by the proposed Harvey Dam construction;

- review the local and regional significance of the flora and vegetation on the six areas that may be affected by the proposed Harvey Dam construction;
- review the potential effects of increasing dam water levels on flora and vegetation values; and
- prepare a report summarising the findings.

4. METHODS

Field assessment of the flora and vegetation values of six areas of remnant vegetation (Areas 1 to 6) of the New Harvey Dam survey area was conducted on 26-28 August 1997 by three personnel and on 29 January 1998 by two personnel from Mattiske Consulting Pty Ltd.

4.1 Flora

A review of the data base held at the Department of Conservation and Land Management on the rare and endangered flora species occurring in the Harvey Basin survey area was undertaken prior to the commencement of field work. No Declared Rare flora species have been recorded in the area. The following Priority flora species have previously been recorded in the Harvey region:

Priority One:	*Caladenia longicauda* ssp. *clivicola* ms
	Caladenia ulginosa ssp. *patulens* ms
	Carex tereticaulis
Priority Two:	*Boronia capitata* ssp. *gracilis*
	Grevillea prominens
Priority Three:	*Acacia semitrullata*
	Myriophyllum echinatum
	Rhodanthe pyrethrum
	Schoenus sp. Waroona (GJ Keighery 12235)
Priority Four:	*Acacia flagelliformis*
	Senecio leucoglossus

Detailed recording of vascular plant species in the field was carried out in conjunction with the vegetation mapping programme for the Harvey Basin survey area.

All plant specimens which were collected during the field programme were pressed, dried and fumigated in accordance with the requirements of the West Australian Herbarium. Plant specimens were identified using local and regional flora keys (e.g. Marchant *et al.* 1987) and by comparison with voucher specimens held at the West

Australian Herbarium where required. Current taxonomic names and introduced status where determined by the SEDIT data base developed by the Western Australian Plant specimens were submitted to the West Australian Herbarium if appropriate (e.g. previously unknown taxa, populations of rare or priority flora, range extensions for taxa, and taxa of unknown taxonomy or unusual forms of known taxa).

The conservation status of all recorded flora was also checked against the current lists published in the Governmental Gazette and available from the Department of Conservation and Land Management (1996).

A comprehensive list of annual introduced species was not obtained as the objective of the assessment was to identify areas of conservation value. However, dominant annual weed species with fertile material (to assist in plant identification) and perennial weed species were generally recorded.

4.2 Vegetation

In general, only areas of remnant native vegetation were intensively surveyed. All survey areas were firstly overviewed by car to delineate areas of native vegetation worthy of assessment. Recordings of remnant native vegetation were generally undertaken on a grid system of 200 m x 100 m within each area. This grid system ran perpendicular to the slope (ie. along the steepest gradient) because earlier studies by Havel have shown that one of the most consistent sources of variation in vegetation is topography so that sampling design should be based across the contours. Opportunistic occurrences of plant species between recording sites were also recorded. Additional recordings were made where changes in plant communities were observed. Fewer recordings were made where sites were highly disturbed (e.g. heavy weed invasion, pine plantations, cleared areas, etc.).

At each recording site the following information was collected:

Soil types	(clays, clay-loams, loams, sandy-loams, sands, sandy-gravels, sandy-loam gravels)
Topography	(ridge, upper slope, mid-slope, lower slope, valley floor, swamp)
Outcropping	(type - dolerite, granite, laterite) (quantity - few, moderate, numerous)
Dieback Occurrence	(presence or absence of *Phytophthora* spp.) (impact - low, medium, high, very high, very very high)
Logging History	(logging debris - light, moderate, heavy) (number of stumps within a 20 m radius)
Fire	(years since last fire)

Tree Deaths (possible cause of death - fire, presence of fungal diseases e.g. *Phytophthora, Armillaria*, drought, etc.)

A total of 113 sites was recorded. Species were ranked according to the scale developed by Havel (1975a):

Tree Species

Assessments were undertaken within a 20 m radius from the observation point.

0 - absent
1 - one or two trees
2 - three to five trees
3 - more than five trees, but contributing less than one third of a total stand
4 - between one third and one half of total stand
5 - more than one half of total stand

Understorey Species

Assessments were undertaken within a 5 m radius from the observation point.

0 - absent
1 - very rarely seen, only after a careful search
2 - present, observable, but in small numbers only
3 - common locally, but not uniformly over the whole area
4 - common over the whole area
5 - completely dominating the understorey

Physiological stress was determined for each species within a 20 m radius from the observation point and ranked according to the following scale. This system was developed by E.M. Mattiske and Associates and has been used previously in the Northern Jarrah Forest:

1 - healthy, no evidence of stress
2 - one or two stressed plants, near death
3 - scattered stressed, (2-4) dead plants around plot
4 - susceptible plants dying or dead (>4 plants)
5 - "graveyard" death

The time period since death was ranked for stress levels greater than 3:

R - Recent death (leaves recently desiccated or discoloured)
M - Medium death (bark but no leaves left on trees)
O - Old death (no leaves or bark left on trees)

Site-vegetation types, as defined by Havel (1975a and 1975b) and later updated by E.M. Mattiske and Associates, were determined for each recording site. Site-vegetation types occurring in the survey area were described, and a list of species by site-vegetation type was compiled.

5. RESULTS

5.1 Flora

A total of 230 vascular plant taxa from 55 families and 127 genera were recorded within the Harvey Basin survey area (Appendix A). Of these, 29 were introduced taxa. The distribution of taxa in the respective site-vegetation types is summarised in Appendix B.

Families with the highest number of taxa were:

Papilionaceae	-	22 taxa
Myrtaceae	-	20 taxa
Proteaceae	-	16 taxa
Mimosaceae	-	14 taxa
Cyperaceae	-	13 taxa
Poaceae	-	13 taxa
Anthericaceae	-	10 taxa

The total number of native taxa in each study block can be summarised as follows (Appendix C):

Area 1	-	114 native taxa
Area 2	-	98 native taxa
Area 3	-	49 native taxa
Area 4	-	88 native taxa
Area 5	-	78 native taxa
Area 6	-	49 native taxa

The total number of native taxa in each inundation zone can be summarised as follows (Appendix D). Zone 1 is adjacent to Harvey Weir, Zone 2 is intermediary, Zone 3 is the furthest from Harvey Weir, and Zone 4 is out of the inundation zone (Figure 1).

Zone 1	-	174 native taxa
Zone 2	-	224 native taxa
Zone 3	-	289 native taxa
Zone 4	-	64 native taxa

5.2 Rare and Priority Flora

No Declared Rare Flora as listed by the Department of Conservation and Land Management (1996) were located in the survey area.

One Priority Flora, *Hibbertia silvestris,* was located in nine sites in which is was fairly common (understorey rank of 2) to common (understorey rank of 3). Table 1 summarises the location, abundance ranking, site-vegetation type and inundation zone of each occurrence of *Hibbertia silvestris*.

Hibbertia silvestris (Priority 4 - P4) occurs in the Northern Jarrah Forest and has previously been recorded from Waroona, Collie, Barlee Brook, Glenoran, Dickson and Dwellingup (Conservation and Land Management 1996) and from some forested areas on the western fringes of the Darling Range.

Table 1: Occurrence of *Hibbertia silvestris* (P4) in Harvey Basin Survey Areas, August 1997

Area	Inundation Zone	Site-Vegetation Type	Location	Abundance Rank
5	2	CQ	B5T4/P2	3
5	2	CQ	B5T5/P1	2
5	3	T	B5T5/P2	2
5	3	Q	B5T6/P1	2
5	3	T	B5T6/P2	3
5	3	Q	B5T7/P2	2
6	2	Q	B6T4/P3	3
6	2	U	B6T5/P3	2
6	2	Q	B6T6/P3	3

5.3 Site-Vegetation Types

A total of 13 site-vegetation types was identified in the Harvey Basin survey area: CQ, D, G, M, MG, Q, R, S, SR, SW, T, U and Y. The code CQ is a subdivision of the C and Q types, the first letter denotes a dominance of this site-vegetation type in the joint code (so in this instance the indicator species from C and Q are present, but those from C dominate). These units were a combination of Havel's (1975a and 1975b) site-vegetation types, and are described in the following text. Representations of site-vegetation types in each survey area are summarised in Table 2.

Table 2: Representation of Site-Vegetation Types in Each Survey Area, Harvey Basin, August 1997

Note: Numbers denote number of sites representing a given site-vegetation type

Site-Vegetation Type	Survey Area						
	1	**2**	**3**	**4**	**5**	**6**	**Total**
CQ	1	1		3	7	8	20
D	9			1			10
G	8			4	1		13
M		2					2
MG		1	2				3
Q				1	3	8	12
R	9		2	4		1	16
S	1	7					8
SR	1	3					4
SW		2					2
T					5		5
U	2				3	4	9
Y		7	2				9
Total	31	23	6	13	19	21	113

Descriptions of site-vegetation types are as follows:

CQ: Open Forest of *Eucalyptus marginata - Corymbia calophylla - Eucalyptus patens* on lower slopes with a mixed understorey including *Trymalium floribundum, Agonis linearifolia* and *Astartea fascicularis* along the edges of the deeper incised valleys near the creek-lines. This type is a variant of site-vegetation types C and Q as defined by Havel (1975a) and in part reflects the narrow linear nature of the C type and the need to combine this type with the Q type for mapping purposes.

This type occurs largely within the deeper incised valleys of the western valley floors of loamy soils of the Lowdon, Helena and Murray vegetation complexes as defined by Heddle *et al.* (1980a). Its occurrence in the conservation estate has been restricted to some degree by the extent of dam construction in these valley systems (Heddle *et al.* 1980b; Department of Conservation and Land Management 1987). This site-vegetation type tends to be dominated by species which reflect the moister fertile soils of lower slopes and creek-beds (e.g.

Astartea fascicularis and *Agonis linearifolia*) and the species which reflect the moister and fertile slopes of the valley systems (*Trymalium floribundum*).

A total of 84 plant taxa was recorded in the CQ site-vegetation type (Appendix B). A total of 20 sites (17.7%) was recorded for this site-vegetation type (Table 2).

D: Open Forest of *Eucalyptus marginata - Corymbia calophylla* on lower slopes with mixed low understorey species, including *Baeckea camphorosmae* and *Acacia extensa* (site-vegetation type D as defined by Havel 1975a). This type occurs mainly within the Murray vegetation complex as defined by Heddle *et al.* (1980a).

This site-vegetation type occurs on the lower, less fertile slope with sandy clays to clay loams on the western valley systems in the Darling Ranges. This type is poorly represented in other conservation areas (Heddle *et al.* 1980b). Indicator dominant shrub species include those which occur on the moister and less fertile lower slopes of the valley systems (e.g. *Lepidosperma squamatum* formerly known as *Hypocalymma angustifolium* and *Baeckea camphorosmae* of site-vegetation type D).

A total of 89 plant taxa was recorded in the D site-vegetation type (Appendix B). A total of 10 sites (8.9%) was recorded for this site-vegetation type (Table 2).

G: Variable structural formation depending on the degree of outcrop exposure. The vegetation can range from herbfields to open woodlands (site-vegetation type G as defined by Havel 1975b) within the Helena and Darling Scarp vegetation complexes as defined by Heddle *et al.* (1980a).

This site-vegetation type occurs on the slopes of the undulating hills in deeply incised valleys and on steep position of the Darling Scarp. The site-vegetation type G is locally significant as it is associated with localised outcropping which allows diversity of flora, vegetation and fauna habitats on a local scale. The type is widespread in distribution within the Northern Jarrah Forest and is well represented in the conservation estate (Heddle *et al.* 1980b; Department of Conservation and Land Management 1987). This site-vegetation type tends to be dominated by specific shrub species which dominate the loamy slopes of the Darling Ranges (e.g. *Allocasuarina humilis, Borya sphaerocephala* and *Grevillea bipinnatifida*).

A total of 97 plant taxa was recorded in the G site-vegetation type (Appendix B). A total of 13 sites (11.5%) was recorded for this site-vegetation type (Table 2).

M: Open Forest to Open Woodland of *Eucalyptus wandoo* with mixed low understorey species, including *Macrozamia riedlei, Hakea lissocarpha* and (site-vegetation type M as defined by Havel 1975a). This type occurs mainly within the Lowdon and Darling Scarp vegetation complexes as defined by Heddle *et al.* (1980a).

This site-vegetation type occurs on the slopes with sandy loams to clay loams on the western fringes and eastern areas of the Darling Ranges. This type is well represented in other conservation areas (Heddle *et al.* 1980b). Indicator dominant shrub species include those which occur on the clay loam soils *(Macrozamia riedlei* and *Hakea lissocarpha* of site-vegetation type M).

A total of 40 plant taxa was recorded in the M site-vegetation type (Appendix B). This site-vegetation type was recorded in only 2 sites (1.8%) (Table 2).

MG: Open Woodland of *Eucalyptus wandoo* and heath communities on slopes with mixed understorey species, including *Macrozamia riedlei, Darwinia citriodora, Grevillea bipinnatifida* and *Hakea lissocarpha* (site-vegetation types M and G as defined by Havel 1975a and 1975b). These types occur mainly within the Helena and Darling Scarp vegetation complexes as defined by Heddle *et al.* (1980a).

These site-vegetation types occur on the slopes with sandy loams to clay loams on the western fringes and eastern areas of the Darling Ranges near shallow soils which overlay outcropping. This type is well represented in other conservation areas (Heddle *et al.* 1980b). Indicator dominant shrub species include those which occur on the clay loam soils near shallow outcropping *(Macrozamia riedlei* and *Hakea lissocarpha* of site-vegetation type M and *Darwinia citriodora* and *Grevillea bipinnatifida* of site-vegetation type G).

A total of 48 plant taxa was recorded in the MG site-vegetation type (Appendix B). A total of 3 sites (2.7%) was recorded for this site-vegetation type (Table 2).

Q: Open Forest of *Eucalyptus marginata - Corymbia calophylla - Eucalyptus patens* on lower slopes with mixed understorey species including *Trymalium floribundum* and *Phyllanthus calycinus* (site-vegetation type Q as defined by Havel (1975a)). This type occurs largely within the Helena, Lowdon and Murray vegetation complexes as defined by Heddle *et al.* (1980a).

This site-vegetation type occurs on the lower slopes of the deeply incised valleys on the western fringes of the Darling Ranges. This type is widespread in the distribution within the Northern Jarrah Forest and is represented in the conservation estate, although its occurrence has been restricted to some degree by the extent of dam construction in the Murray valley systems (Heddle *et al.* 1980b; Department of Conservation and Land Management 1987). This site-

vegetation type tends to be dominated by specific shrub species which dominate the moist, fertile loams of the Darling Ranges (e.g. *Trymalium floribundum, Pteridium esculentum* and *Phyllanthus calycinus*).

A total of 47 plant taxa was recorded in the Q site-vegetation type (Appendix B). A total of 12 sites (10.6%) was recorded for this site-vegetation type (Table 2).

R: Open Woodland of *Eucalyptus marginata - Corymbia calophylla* on fringes of granite outcrops (site-vegetation type R as defined by Havel 1975a) within the Helena, Murray and Darling Scarp vegetation complexes as defined by Heddle *et al.* (1980a).

This site-vegetation type occurs on the shallow soils surrounding outcrops on the upland and valley systems on the Darling Ranges. The site-vegetation type R is locally significant as it is associated with localised outcropping which allows diversity of flora, vegetation and fauna habitats on a local scale. This type is restricted in distribution within the Northern Jarrah Forest, but is well represented in the conservation estate, e.g. the Monadncoks near Mt Cooke and Mt Windsor (Heddle *et al.* 1980b; Department of Conservation and Land Management 1987). This site-vegetation type tends to be dominated by specific shrub species which reflect the soils and moisture associated with outcrops on the Darling Ranges (e.g. *Trymalium ledifolium, Phyllanthus calycinus* and *Hypocalymma angustifolium*).

A total of 105 plant taxa was recorded in the R site-vegetation type (Appendix B). A total of 16 sites (14.2%) was recorded for this site-vegetation type (Table 2).

S: Open Forest of *Eucalyptus marginata - Banksia grandis - Allocasuarina fraseriana* with scattered understorey, including *Adenanthos barbiger, Leucopogon capitellatus* and *Styphelia tenuiflora* (site-vegetation type S as defined by Havel (1975a)). This type occurs on the upper slopes of the Darling Scarp and the Helena vegetation complexes and is more typically located within the Dwellingup vegetation complexes as defined by Heddle *et al.* (1980a)..

This site-vegetation type occurs on the upper slopes, and to a lesser degree mid slopes, of the undulating hills of the Darling Ranges. This type is widespread in distribution within the Northern Jarrah Forest and is well represented in the conservation estate (Heddle *et al.* 1980b; Department of Conservation and Land Management 1987). In this location, this site-vegetation type tends to be dominated by specific shrub species which dominate the gravelly slopes of the Darling Ranges (e.g. *Leucopogon capitellatus, Hakea lissocarpha* and *Xanthorrhoea gracilis*).

A total of 56 plant taxa was recorded in the S site-vegetation type (Appendix

B). A total of 8 sites (7.1%) was recorded for this site-vegetation type (Table 2).

SR Open Forest of *Eucalyptus marginata - Corymbia calophylla* with some mixtures of *Banksia grandis - Allocasuarina fraseriana* with scattered understorey, including *Adenanthos barbiger, Leucopogon capitellatus* and *Styphelia tenuiflora* (site-vegetation type S as defined by Havel (1975a)) and *Baeckea camphorosmae* and *Hypocalymma angustifolium* (reflecting the moister and shallow soils near outcropping of site-vegetation type R as defined by Havel (1975a)). This type occurs within the Helena, Murray and Darling Scarp vegetation complexes as defined by Heddle *et al.* (1980a).

This site-vegetation type occurs on the upper slopes, and to a lesser degree mid slopes, of the undulating hills of the Darling Ranges on soils near shallow granitic soils. This type is widespread in distribution within the Northern Jarrah Forest and is well represented in the conservation estate (Heddle *et al.* 1980b; Department of Conservation and Land Management 1987). In this location, this site-vegetation type tends to be dominated by specific shrub species which dominate the gravelly slopes over shallow soils of the Darling Ranges (e.g. *Baeckea camphorosmae, Cyatochaeta avenacea, Hakea lissocarpha, Hypocalymma angustifolium* and *Xanthorrhoea gracilis*).

A total of 46 taxa was recorded in the SR site-vegetation type (Appendix B). A total of 4 sites (3.5%) was recorded for this site-vegetation type (Table 2).

SW: Open forest of *Eucalyptus marginata - Corymbia calophylla - Banksia grandis* with scattered understorey, including *Adenanthos barbiger, Hypocalymma angustifolium* and *Styphelia tenuiflora* (this type is a variant of site-vegetation type S as defined by Havel (1975a) due to the presence of moisture indicators such as *Hypocalymma angustifolia* and *Baeckea camphorosmae*). This type occurs within the Darling Scarp, Helena and Murray vegetation complexes as defined by Heddle *et al.* (1980a).

This site-vegetation type is not well represented in the conservation estate as it appears to be a local variant of the S site-vegetation type (Heddle *et al.* 1980b; Department of Conservation and Land Management 1987). In this location this type tends to be dominated by specific shrub species which dominate the gravelly slopes and moist soil conditions of the Darling Ranges (e.g. *Leucopogon capitellatus, Leucopogon propinquus, Hovea chorizemifolia, Adenanthos barbiger* and *Banksia grandis* of site-vegetation type S and *Hypocalymma angustifolia* and *Baeckea camphorosmae* of the site-vegetation type W which dominates moister soils.

A total of 45 taxa was recorded in the SW site-vegetation type (Appendix B). A total of 2 sites (1.8%) was recorded for this site-vegetation type (Table 2).

T: Open Forest of *Eucalyptus marginata - Corymbia calophylla* with scattered understorey that includes *Leucopogon verticillatus, Pteridium esculentum* and *Clematis pubescens* (site-vegetation type T as defined by Havel 1975a)). This type occurs within the Helena and Murray vegetation complexes as defined by Heddle *et al.* (1980a).

This site-vegetation type occurs on the upper slopes and, to a lesser degree the mid slopes, of the undulating hills of the Darling Ranges. This type is widespread in distribution within the Northern Jarrah Forest and is well represented in the conservation estate (Heddle *et al.* 1980b; Department of Conservation and Land Management 1987). This site-vegetation type tends to be dominated by specific understorey species which dominate the more fertile loams of the Darling Ranges (e.g. *Pteridium esculentum* and *Clematis pubescens*).

A total of 44 taxa was recorded in the T site-vegetation type (Appendix B). A total of 5 sites (4.4%) was recorded for this site-vegetation type (Table 2).

U: Open Forest of *Eucalyptus marginata - Corymbia calophylla - Eucalyptus patens* with understorey including *Leucopogon capitellatus, Phyllanthus calycinus, Pteridium esculentum* and *Clematis pubescens* (site-vegetation type U as defined by Havel 1975a)). This type occurs within the Murray vegetation complex as defined by Heddle *et al.* (1980a).

This site-vegetation type occurs on the mid to upper slopes of the dissected western high rainfall zone of the Darling Ranges. This type is restricted to the western major valleys of the Darling Ranges in the Northern Jarrah Forest and is less well represented in the conservation estate (Heddle *et al.* 1980b; Department of Conservation and Land Management 1987). This site-vegetation type tends to be dominated by specific shrub species common on the more fertile loams of the Darling Ranges (e.g. *Phyllanthus calycinus* and *Pteridium esculentum).*

A total of 61 plant taxa was recorded in the U site-vegetation type (Appendix B). A total of 9 sites (8.0%) was recorded for this site-vegetation type (Table 2).

Y: Open forest of *Eucalyptus wandoo* with understorey including *Hakea lissocarpha, Hypocalymma angustifolium, Baeckea camphorosmae* and *Lepidosperma squamatum* (site-vegetation type Y as defined by Havel (1975a)). This site-vegetation type occurs within the wetter slopes of the Lowdon vegetation complex as defined by Heddle *et al.* (1980a).

This site-vegetation type occurs on the lower slopes of the valley systems of the Darling Ranges in the northern Jarrah Forest and is well represented in the conservation estate (Heddle *et al.* 1980b; Department of Conservation and Land

Management 1987). Locally the presence of Wandoo woodlands on lower seasonally moist slopes is significant as this provides a western extension of this site-vegetation type. This type is widespread on the eastern edges of the Darling Range, but is less common on the western edges of the Darling Range. This site-vegetation type tends to be dominated by species which reflect moister soil conditions and finer particle soils (*Hypocalymma angustifolium* and *Baeckea camphorosmae* and *Eucalyptus wandoo*).

A total of 71 plant taxa was recorded in the Y site-vegetation type (Appendix B). A total of 9 sites (8.0%) was recorded in this site-vegetation type (Table 2).

A number of site-vegetation types were found to be locally and regionally significant. These site-vegetation types are:

- The site-vegetation types R and G are locally significant as they are associated with localised outcropping which allows diversity of flora, vegetation and fauna habitats on a local scale. Both site-vegetation types are well represented in the conservation estate on a regional basis (Heddle *et al.* 1980a).

- The site-vegetation types Y and M are locally significant as they reflect the presence of Wandoo along the western fringes of the Darling Ranges. Both site-vegetation types are well represented in the conservation estate on a regional basis (Heddle *et al.* 1980a).

5.4 Description of Survey Areas

Descriptions of each survey area likely to be inundated by the construction of the Harvey Dam are as follows:

Area 1 - Reserve 24002

There are high weed numbers in this reserve, reflecting the disturbance which has occurred throughout most of Area 1. While the overstorey was generally intact, the condition of the understorey varied. Understorey growth was poor where weeds were particularly abundant (the northern part of Area 1 - Transects 1 to 4; site-vegetation types typically G and R). Pine plantations (*Pinus radiata*) were also located at the eastern ends of Transects 2, 3 and 4. Less disturbed understorey occurred in the south-western part of Area 1 near the gently sloping stream area (Transects 7 and 8; site-vegetation types typically combinations of R, D, G and C). The understorey varied in condition in the south-eastern part of Area 1 (near Harvey Weir wall), as weeds and planted Eastern States species were also common (Transects 5 and 6; site-vegetation types typically G and R). The planted Eastern States species *Acacia elata* was common in the over storey of the central part of Area 1. The steep areas to the north (Transects 3 and 4) were aesthetically appealing due to the terrain, although weeds

were prolific. Of conservation significance is the northern-most occurrence of *Agonis flexuosa,* which occurs south of Transect 1. Apart from this, the conservation value of this area generally appeared low due to the abundance of weed species, except for the south-western part (Transects 7, 8 and 9).

A total of 9 transects and 31 sites were assessed in this area. Dominant site-vegetation types were G, R and D (Table 2). The following number of native taxa were recorded in Area 1 inundation zones: Zone 1 - 93 taxa; Zone 2 - 38 taxa; and Zone 3 - 57 taxa (Appendix D).

Area 2 - Reserve 15515

Area 2 occurred in the southern part of Reserve 15515. Less disturbed native vegetation of higher conservation value occurred on the western part of the reserve in a narrow band between the gravel pit to the east and Harvey Weir to the west. This area has relatively low weed disturbance with higher native tree and understorey cover. Total removal of vegetation has occurred in the gravel pit area. Topography is steep towards the south of the area (Transect 7 and 8) and gentle towards the north of the area (Transects 1 and 2).

A total of 8 transects and 23 sites were assessed in this area. Dominant site-vegetation types were S on the slopes and Y on valley floors and lower slopes (Table 2). The following number of native taxa were recorded in Area 2 inundation zones: Zone 1 - 41 taxa; Zone 2 - 83 taxa; and Zone 3 - 53 taxa (Appendix D).

Area 3 - Reserve 15515

Area 3 occurred in the northern part of Reserve 15515. Pine plantations *(Pinus radiata* with some *Pinus pinaster)* occupied a sizeable portion through the middle of Area 3. Most other areas were very degraded due to heavy weed invasion by *Pinus radiata, Lavandula stoechas* and *Rhamnus alaternus*, particularly on the western edge where *Eucalyptus rudis* and *Agonis flexuosa* occurred in the creek and *Corymbia calophylla* occurred on the slopes. Consequently, only 4 transects covering remnant native vegetation were surveyed in this area. A small pocket of remnant native vegetation occurred on the western edge near Harvey Weir (Transects 1 and 2; site-vegetation type MG), while a comparatively large area of native vegetation occurred in the eastern half of Area 3 (Transects 3 and 4; site-vegetation type R).

A total of 4 transects and 6 sites were assessed in this area. Dominant site-vegetation types were R on upper slopes, MG on lower slopes and Y on valley floors (Table 2). The following number of native taxa were recorded in Area 3 inundation zones: Zone 2 - 39 taxa; Zone 3 - 23 taxa; and Zone 4 - 18 taxa (Appendix D). Note that Zone 4 occurs out of the inundation zone options.

Area 4 - Reserve 10745

This area is of high conservation value, due to the intact condition of the vegetation and its northern boundary with Reserve 22797. The topography of the area is a steep valley, with occasional medium sized granite outcroppings. Due to the relative inaccessibility of the reserve and its close proximity with a large area of intact vegetation the level of weed infestation is small, confined to the western edge which shares a boundary with agricultural land. However, cattle grazing from the neighbouring property near this western edge is contributing to a growing problem with weed invasion. Some tall, magnificent *Eucalyptus patens* occur near this boundary within the Q site-vegetation type. Marri *(Corymbia calophylla)* was drought-affected also within the Q site-vegetation type.

Three transects and 113 sites were assessed in this area. Site-vegetation types were G and R on the slopes, and Q and CQ on slopes and valley floors (Table 2). A total of 88 native taxa was recorded in Area 4, all of which occurred within Inundation Zone 3 (Appendix D).

Area 5 - Private Property

The native vegetation was relatively undisturbed on the mid-to upper slopes of Area 5. Further towards the river edge, the native understorey was typically sparse, being dominated by low annual weed species. The over storey was intact throughout, with very tall *Agonis flexuosa* along with *Eucalyptus patens, Eucalyptus rudis* and *Corymbia calophylla* along the water course and replaced by *Eucalyptus marginata* and *Corymbia calophylla* on upper slopes. Disturbance by cattle was evident in the valley on the southern tip of the survey area (Transect 1).

A total of 7 transects and 19 sites were assessed in this area. Dominant site-vegetation types were C and Q on lower slopes and valley floors near watercourses and T, U and G on slopes (Table 2). The following number of native taxa were recorded in Area 5 inundation zones: Zone 2 - 31 taxa and Zone 3 - 72 taxa (Appendix D). The Priority Four species *Hibbertia silvestris* was located in Area 5 (and also in Area 6) within the CQ (Zone 2), T (Zone 3) and Q (Zone 3) site-vegetation types (Table 1). This increases the area's conservation significance. Priority Four Flora are defined as "taxa which are considered to have been adequately surveyed and which, whilst being rare (in Australia), are not currently threatened by any identifiable factors" (Department of Conservation and Land Management 1996). Thus, while there is no legal requirement to prevent the destruction of *Hibbertia silvestris* through inundation, its presence enhances the conservation value of Areas 5 and 6. Construction of the Harvey Basin scheme such that the inundation is restricted to Zone 1 would avoid destruction of any of the recorded locations of *Hibbertia silvestris*.

Area 6 - Private Property

The native vegetation was relatively undisturbed near the edge of the river (site-vegetation types typically combinations of C, Q and U), although closest to the river, the understorey was often sparse due to seasonal inundation. Slopes to the river are steep towards the northern end (Transect 1 and 2), with G site-vegetation type occurring further upslope with *Corymbia calophylla* to the outskirts of the granite outcrops. Partial clearing has been undertaken on the western edge of Harvey River at the southern tip of Area 6. Further south, river edges are relatively flat on the eastern side of Harvey River, but steep on the western side (Transect 6 and 7). Forest of *Eucalyptus marginata* - *Corymbia calophylla* over *Xanthorrhoea preissii* and *Hibbertia hypericoides* dominated the upper slopes of the northern part of the survey area. Erosion channels occur throughout the length of the survey area to the west of Harvey River near the river edge.

A total of 7 transects and 21 sites were assessed in this area. Dominant site-vegetation types were CQ and Q on lower slopes and valley floors near watercourses and U on mid slopes (Table 2). The following number of native taxa were recorded in Area 6 inundation zones: Zone 2 - 33 taxa and Zone 3 - 42 taxa (Appendix D). The Priority Four species *Hibbertia silvestris* was located in Area 6 within the Q (Zone 2) and U (Zone 2) site-vegetation types in which it was of scattered occurrence to common (Table 1).

6. DISCUSSION

The construction of the proposed Harvey Dam would impact predominantly on a strongly modified landscape (Havel 1994b). The majority of the land that would be inundated is private property, cleared mostly for pasture and orchards. Relocation of a considerable length of the Harvey-Quindanning Road would also be required due to inundation. Secondary land uses in the areas likely to be inundated include recreation, softwood timber production (*Pinus radiata* plantations) as well as conservation of flora and fauna. This assessment of six areas of remnant vegetation likely to be inundated after construction of the Harvey Dam indicated variable condition of the vegetation and flora in the areas surveyed.

Area 4 (within Reserve 10745) appears to be of greatest conservation value as it is a well preserved example of relatively rare and poorly conserved Lowdon vegetation complex (Heddle *et al.* 1980a; Havel 1989). Weed disturbance is generally low, due to the relative inaccessibility of this reserve, although some disturbance due to invading stock has occurred. The area also has aesthetic value due to the steep topography, intact vegetation and the falls on the Falls Creek. Old-growth forest values are also evident by the presence of very tall stands of *Eucalyptus patens* in the Murray vegetation complex. Havel (1994b) claims that, while inundation of this area by the proposed Harvey Dam would be minor and would not be of sufficient significance to halt the project, inundation could be entirely avoided by a relatively small modification

of design.

Area 2 also contains remnant vegetation of apparent conservation value. This survey area occurs in the southern part of Reserve 15515 in a narrow strip between a large gravel pit and Harvey Weir. Area 2 contains a pocket of remnant vegetation of relatively good condition and low weed disturbance and therefore warrants consideration to be set apart for conservation purposes. Area 2 was not previously included as an area of conservation value by Havel (1994b) because the southern part of Reserve 15515 was not surveyed due to the predominance of the gravel pit in this area. The vegetation of Area 2 consists of *Corymbia calophylla - Eucalyptus marginata* forest on the slopes with *Eucalyptus wandoo* and *Eucalyptus rudis* over an second storey of *Agonis flexuosa* on the valley floor immediately adjacent to Harvey Weir. The occurrence of *Eucalyptus wandoo* over *Agonis flexuosa* is unusual. Area 2 occurs on the Forrestfield vegetation complex, which is anomalous for the area, as Forrestfield more typically occurs on the Swan Coastal Plain near the base of the ranges.

Most of the remainder of Reserve 15515 is highly disturbed: a large area in the middle of the reserve is currently inundated by the Harvey Weir and a considerable proportion of the northern area of the reserve supports pine plantations, which in turn promotes weed invasion. Area 3 occurred in the northern area of Reserve 15515. While much of Area 3 is highly disturbed by weeds, a small pocket of native vegetation occurs on the western edge of Harvey Weir and a reasonably-sized area of native vegetation occurs in the eastern half of the survey area on the upper slopes.

Much of the vegetation occurring within the inundation zone is pine plantation and highly weed invaded small enclave of the Lowdon vegetation complex (*Corymbia calophylla* over a second storey of *Agonis flexuosa* invaded with *Rhamnus alaternus* in the second storey, *Lavandula stoechas* in the understorey, and thick Bridal Creeper (*Asparagus asparagoides*). This vegetation is important in terms of being the northern-most example of the Lowdon vegetation complex within a reserve. However, the high weed invasion obliterates the area's conservation value as it is a highly disturbed and therefore a poor representation of the Lowdon vegetation complex. There is only a small pocket of relatively undisturbed native vegetation within the area to be inundated. The bulk of relatively undisturbed native vegetation is above any likely inundation. Consequently, the impact of inundation on Area 3 would be minor with respect to conservation values.

Area 1, situated in Reserve C24002, is highly modified for recreation which has resulted in high weed disturbance, particularly to the north of the survey area. While the native understorey is disturbed where weed invasion is high, the overstorey remains intact throughout. This area represents conservation value, not due to the condition of the native vegetation, but to the fact that this area supports two poorly represented vegetation complexes - the Lowdon and Darling Scarp. Lowdon has a particularly low representation of native vegetation in reserves (0.23%), as this vegetation complex occurs on fertile soils which have largely been cleared for agricultural purposes (Havel

1989). These fertile soils also increase susceptibility of Lowdon vegetation complexes to weed invasion. A particularly good area of the Lowdon vegetation complex occurs in the south-western part of Area 1. However, conservation value of the remainder of Area 1 appears to be relatively low due to high weed disturbance and sparse native understorey.

The Darling Scarp vegetation complex is also poorly represented, although less so than Lowdon (1.53%, Havel 1989). This complex has also been a target for agricultural development. The northern section of Area 1 supports Darling Scarp vegetation, where granite outcropping is frequent. This area is more disturbed by weeds than the Lowdon vegetation complex of Area 1, often comprising a very sparse native understorey. Annual introduced grasses are prolific. However, this area is not as severely invaded by weeds as parts of Area 3, which was often dominated by the more aggressive weeds often dominating the understorey and midstorey.

Perhaps of greatest concern with respect to the impact of inundation of native vegetation is Area 5, which occurs on private property by owners committed to reserving the area for conservation purposes. The conservation significance of private property was not covered by Havel (1994a, 1994b); rather, assessments were limited to reserves. The native vegetation of Area 5 is in very good condition in the upper to mid slopes, and of reasonable condition towards Harvey River, although the understorey is sparse in areas which appear to have been seasonally inundated. A vineyard, situated on the lower slopes, lies within the inundation zone. The area occurs on the Helena vegetation complex in medium to high rainfall. This vegetation complex is well represented within reserves (26.84%, Havel 1989).

Area 6 is also of the Helena vegetation complex. The condition of vegetation in this area is reasonably good on the lower slopes near the river's edge, although seasonal inundation has resulted in sparse understorey close to the river. Slopes are reasonably steep on both sides of the river, such that inundation due to the Harvey Dam construction is likely to severely impact on lower slope vegetation, but not extend far up the slope. Erosion channels currently exist along the length of this area, possibly indicating the impact of stock movement on this steep area.

The Department of Conservation and Land Management classify flora of conservation significance as Declared Rare Flora (Extant or Presumed Extinct), or Priority One, Two, Three or Four, in order of most to least rarity. Section 23F of the Wildlife Conservation Act states it is illegal "to take" Declared Rare Flora. The term "to take" is defined in the Act as "to gather, pick, cut, pull up, destroy, dig up, remove or injure the flora or cause or permit the same to be done by any other means". Unlike Declared Rare Flora, it is not an offence "to take" Priority flora, although it is advisable to avoid their destruction where possible.

No Declared Rare Flora were located within the survey areas. The Priority Four species *Hibbertia silvestris* was located in the lower slopes near the river's edge in Areas 5 and 6, both of which occur on private property. As discussed on Page 20,

there is no legal requirement to avoid the destruction of Hibbertia silvestris through inundation, the conservation value of this area is still strengthened by it's presence.

A comparison of the impact of Inundation Zones 1 to 3 on native flora and vegetation indicates that restricting inundation to Zone 1 is the most favourable, and conversely, Zone 3 is the least favourable. Fewer native plant species would be affected if construction of the Harvey Basin scheme was restricted to inundation in Zone 1 (175 taxa) than Zone 2 (224 taxa) and Zone 3 (307 taxa). Further important adverse impacts of inundation in Zones 1, 2 and 3 are outlined below:

Inundation Zone 1:

- Flooding of vegetation in the south of Area 1 - less disturbed vegetation of poorly represented Lowdon vegetation complex); and

- Flooding of small northernmost tip of Area 2 - less disturbed vegetation of the anomalous occurring Forrestfield vegetation complex.

Inundation Zone 2:
Flooding of above, as well as:

- Flooding of most of Area 2 - less disturbed vegetation of the anomalous occurring Forrestfield vegetation complex; and

- Flooding of populations of *Hibbertia silvestris* (P4) in Areas 5 and 6 in less disturbed vegetation, well-represented Helena vegetation complex on private property.

Inundation Zone 3:
Flooding of above, as well as:

- Flooding of all of Area 2 - less disturbed vegetation of anomalous Forrestfield vegetation complex;

- Flooding of more populations of *Hibbertia silvestris* (P4) in Areas 5 and 6 in less disturbed vegetation, well-represented Helena vegetation complex on private property; and

- Flooding of the lower parts of Area 4 - relatively undisturbed vegetation with aesthetic and possible old-growth values.

It is therefore apparent that, with respect to conservation values, the most favourable inundation option is Zone 1. In determining the optimal scheme for the construction of the Harvey Dam, these conservation values need to be weighed against other factors, such as social and economical values.

7. CONCLUSIONS

The findings of this assessment indicate that the following areas likely to be inundated by the construction of Harvey Dam should be considered for their conservation value:

Area 1 (Reserve 24002): Although some weed invasion, contains poorly represented Lowdon (to the south) and Darling Scarp (to the north) vegetation complexes;

Area 2 (Reserve 15515): Native vegetation of Forrestfield vegetation complex in very good condition in a narrow strip between Harvey Weir and the gravel pit;

Area 4 (Reserve 10745): Native vegetation of extremely good condition with aesthetic and possible old-growth forest values at interface of Lowdon and Murray vegetation complexes, impact of inundation likely to be only at the lowest topographic position;

Area 5 (Private Property): Native vegetation of well-represented Helena vegetation complex in relatively undisturbed vegetation on the slopes which is currently set aside by land owners for conservation purposes, except for a vineyard area; and

Area 6 (Private Property): Relatively undisturbed native vegetation of the well-represented Helena vegetation complex in good condition.

Severe weed invasion in most of the area within the inundation zone in Area 3 suggests minor impact of the Harvey Dam construction in this area, despite its occurrence in the northernmost limit of the Lowdon vegetation complex within a reserve.

The following lists Inundation Zone options from most to least favourable with respect to conservation values:

Zone 1 - avoiding impact on all of Area 4, 5 and 6 and most of Area 2;

Zone 2 - avoiding impact on all of Area 4, and some of Area 5 and 6; and

Zone 3 - avoiding impact only on good condition vegetation in the upper slopes of Area 3.

8. LIST OF PARTICIPANTS

The following personnel were involved in various stages of the project:

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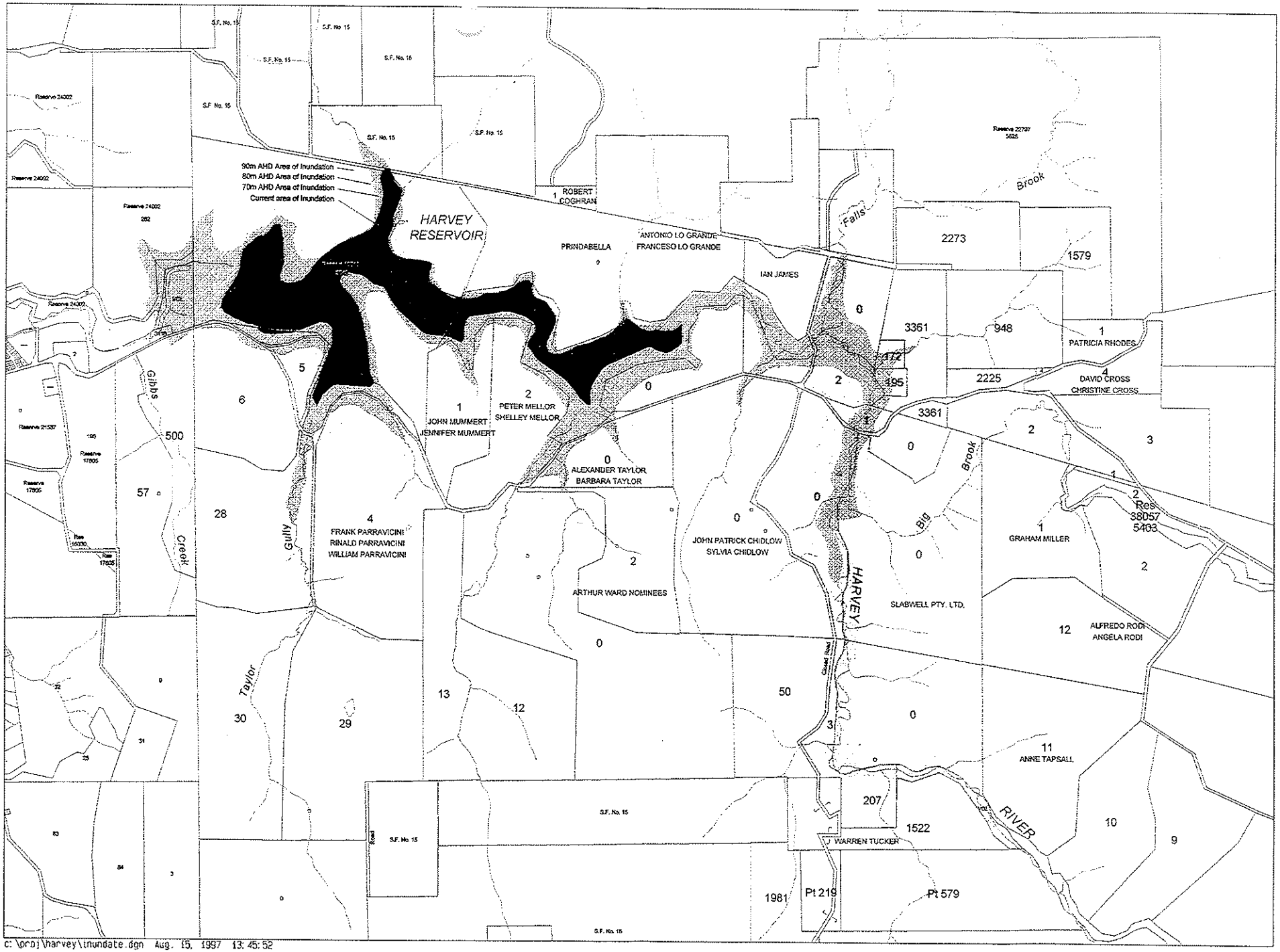
FIGURE 1:

LOCATION OF INUNDATION ZONES,

HARVEY BASIN

Key:

Grey Shading	-	Inundation Zone 1
Light Blue Shading	-	Inundation Zone 2
Pink Shading	-	Inundation Zone 3
White (Background)	-	Inundation Zone 4



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AREA 3.

AREA 5

APPENDIX A: VASCULAR PLANT TAXA RECORDED IN HARVEY BASIN SURVEY AREA, AUGUST 1997 AND JANUARY 1998

Family		Genus	Species
Adiantaceae		*Adiantum*	*aethiopicum*
		Cheilanthes	*austrotenuifolia*
Dennstaedtiaceae		*Pteridium*	*esculentum*
Zamiaceae		*Macrozamia*	*riedlei*
Pinaceae	*	*Pinus*	*pinaster*
aceae	*	*Aira*	*caryophyllea*
		Austrostipa	*semibarbata*
	*	*Avena*	*barbata*
	*	*Avena*	sp.
	*	*Briza*	*maxima*
	*	*Briza*	*minor*
	*	*Cynodon*	*dactylon*
		Neurachne	*alopecuroidea*
	*	*Paspalum*	*dilatatum*
		Poa	*serpentum*
		Tetrarrhena	*laevis*
		Themeda	*triandra*
		Poaceae	spp.
Cyperaceae		*Baumea*	*articulata*
		Cyathochaeta	*avenacea*
		Lepidosperma	*drummondii*
		Lepidosperma	*effusum*
		Lepidosperma	*leptostachyum*
		Lepidosperma	*squamatum*
		Lepidosperma	*tenue*
		Lepidosperma	*tetraquetrum*
		Mesomelaena	*tetragona*
		Schoenus	*curvifolius*
		Tetraria	*capillaris*
		Tetraria	*octandra*
		Tricostularia	*compressa*
Araceae	*	*Zantedeschia*	*aethiopica*
Restionaceae		*Desmocladus*	*fasciculatus*
		Loxocarya	*cinerea*

APPENDIX A: VASCULAR PLANT TAXA RECORDED IN HARVEY BASIN SURVEY AREA, AUGUST 1997 AND JANUARY 1998

Family		Genus	Species
Restionaceae (cont.)		*Meeboldina*	*coangustata*
		Meeboldina	*scariosa*
		Stenopa	*ramosissima*
Juncaceae	*	*Juncus*	*articulatus*
	*	*Juncus*	*microcephalus*
		Juncus	*pallidus*
		Luzula	*meridionalis*
Asparagaceae	*	*Asparagus*	*asparagoides*
Dasypogonaceae		*Lomandra*	*caespitosa*
		Lomandra	*micrantha*
		Lomandra	*nigricans*
		Lomandra	*odora*
		Lomandra	*preissii*
		Lomandra	*purpurea*
		Lomandra	*sericea*
		Lomandra	*sonderi*
		Lomandra	sp.
Xanthorrhoeaceae		*Xanthorrhoea*	*gracilis*
		Xanthorrhoea	*preissii*
Hypoxidaceae		*Stypandra*	*glauca*
Anthericaceae		*Agrostocrinum*	*scabrum*
		Borya	*sphaerocephala*
		Caesia	*occidentalis*
		Chamaescilla	*corymbosa*
		Corynotheca	*micrantha*
		Dichopogon	*capillipes*
		Sowerbaea	*laxiflora*
		Thysanotus	*dichotomus*
		Thysanotus	*multiflorus*
		Tricoryne	*elatior*
Colchicaceae		*Burchardia*	*congesta*
Haemodoraceae		*Conostylis*	*aculeata*
		Conostylis	*serrulata*

APPENDIX A: VASCULAR PLANT TAXA RECORDED IN HARVEY BASIN SURVEY AREA, AUGUST 1997 AND JANUARY 1998

Family		Genus	Species
Haemodoraceae (cont.)		*Conostylis*	*setigera*
		Conostylis	*setosa*
		Haemodorum	*laxum*
		Haemodorum	*simulans*
		Haemodorum	sp.
		Tribonanthes	*brachypetala*
Amaryllidaceae		Amaryllidaceae	sp.
Hypoxidaceae		*Hypoxis*	*occidentalis*
Iridaceae	*	*Gladiolus*	*angustus*
	*	*Romulea*	*rosea*
		Patersonia	*occidentalis*
		Patersonia	*umbrosa*
		Patersonia	*umbrosa var. xanthina*
Orchidaceae		*Diuris*	*longifolia*
		Prasophyllum	sp.
		Pyrorchis	*nigricans*
Casuarinaceae		*Allocasuarina*	*humilis*
Proteaceae		*Banksia*	*grandis*
		Banksia	*littoralis*
		Dryandra	*bipinnatifida*
		Dryandra	*lindleyana*
		Dryandra	*sessilis*
		Grevillea	*bipinnatifida*
		Grevillea	*diversifolia*
		Grevillea	*pilulifera*
		Hakea	*amplexicaulis*
		Hakea	*lasianthoides*
		Hakea	*lissocarpha*
		Hakea	*prostrata*
		Isopogon	*sphaerocephalus*
		Persoonia	*longifolia*
		Synaphea	*gracillima*
		Synaphea	*petiolaris*
Polygonaceae		*Persicaria*	*decipiens*

APPENDIX A: VASCULAR PLANT TAXA RECORDED IN HARVEY BASIN SURVEY AREA, AUGUST 1997 AND JANUARY 1998

Family	Genus	Species
Ranunculaceae	*Clematis*	*pubescens*
	Ranunculus	*colonorum*
Lauraceae	*Cassytha*	*racemosa*
Droseraceae	*Drosera*	*erythrorhiza*
	Drosera	*stolonifera*
	Drosera	sp.
Pittosporaceae	*Billardiera*	*floribunda*
	Billardiera	*variifolia*
	Billardiera	sp.
	Sollya	*heterophylla*
Mimosaceae	*Acacia*	*alata*
	Acacia	*applanata*
	Acacia	*celastrifolia*
	Acacia	*drummondii ssp. drummondii*
*	*Acacia*	*elata*
	Acacia	*extensa*
	Acacia	*lateriticola*
	Acacia	*obovata*
*	*Acacia*	*podalyrifolia*
	Acacia	*pulchella*
	Acacia	*saligna*
	Acacia	*stenoptera*
	Acacia	*teretifolia*
	Acacia	*willdenowiana*
Caesalpiniaceae	*Labichea*	*punctata*
Papilionaceae	*Bossiaea*	*aquifolium*
	Bossiaea	*eriocarpa*
	Bossiaea	*linophylla*
	Bossiaea	*ornata*
	Chorizema	*cordatum*
	Chorizema	*rhombeum*
	Daviesia	*decurrens*
	Daviesia	*horrida*
	Daviesia	*preissii*
	Gompholobium	*knightianum*

APPENDIX A: VASCULAR PLANT TAXA RECORDED IN HARVEY BASIN SURVEY AREA, AUGUST 1997 AND JANUARY 1998

Family		Genus	Species
Papilionaceae (cont.)		*Gompholobium*	*marginatum*
		Gompholobium	*polymorphum*
		Hardenbergia	*comptoniana*
		Hovea	*chorizemifolia*
		Hovea	*pungens*
		Hovea	*trisperma*
		Kennedia	*coccinea*
		Kennedia	*prostrata*
		Mirbelia	*dilatata*
	*	*Trifolium*	*angustifolium*
	*	*Trifolium*	*campestre*
		Viminaria	*juncea*
Geraniaceae		*Geranium*	*retrorsum*
Oxalidaceae	*	*Oxalis*	*corniculata*
	*	*Oxalis*	*glabra*
	*	*Oxalis*	*purpurea*
Rutaceae		*Eriostemon*	*spicatus*
Tremandraceae		*Platytheca*	*galioides*
		Tetratheca	*hirsuta*
		Tremandra	*diffusa*
		Tremandra	*stelligera*
Euphorbiaceae		*Phyllanthus*	*calycinus*
Stackhousiaceae		*Stackhousia*	*monogyna*
Sapindaceae		*Dodonaea*	*ceratocarpa*
Rhamnaceae		*Cryptandra*	*arbutiflora*
	*	*Rhamnus*	*alaternus*
		Trymalium	*floribundum*
		Trymalium	*ledifolium*
Dilleniaceae		*Hibbertia*	*acerosa*
		Hibbertia	*amplexicaulis*
		Hibbertia	*commutata*
		Hibbertia	*hypericoides*

APPENDIX A: VASCULAR PLANT TAXA RECORDED IN HARVEY BASIN SURVEY AREA, AUGUST 1997 AND JANUARY 1998

Family	Genus	Species
Dilleniaceae (cont.)	*Hibbertia*	*perfoliata*
	Hibbertia	*silvestris*
Violaceae	*Hybanthus*	*floribundus ssp. floribundus*
Thymelaeaceae	*Pimelea*	*ciliata*
	Pimelea	*imbricata*
	Pimelea	*rosea*
	Pimelea	*suaveolens*
Myrtaceae	*Agonis*	*flexuosa*
	Agonis	*grandiflora*
	Agonis	*linearifolia*
	Agonis	*parviceps*
	Astartea	*fascicularis*
	Baeckea	*camphorosmae*
	Corymbia	*calophylla*
	Darwinia	*citriodora*
	Eucalyptus	*laeliae*
	Eucalyptus	*marginata*
	Eucalyptus	*megacarpa*
	Eucalyptus	*patens*
	Eucalyptus	*rudis*
	Eucalyptus	*wandoo*
	Hypocalymma	*angustifolium*
	Hypocalymma	*cordifolium*
	Hypocalymma	*robustum*
	Melaleuca	*lateritia*
	Melaleuca	*pauciflora*
	Melaleuca	*scabra*
Haloragaceae	*Gonocarpus*	*benthamii*
	Gonocarpus	*cordiger*
	Gonocarpus	*hexandrus ssp. integrifolius*
Apiaceae	*Pentapeltis*	*peltigera*
	Xanthosia	*candida*
Epacridaceae	*Andersonia*	*lehmanniana*
	Astroloma	*ciliatum*
	Astroloma	*pallidum*

APPENDIX A: VASCULAR PLANT TAXA RECORDED IN HARVEY BASIN SURVEY AREA, AUGUST 1997 AND JANUARY 1998

Family		Genus	Species
Epacridaceae (cont.)		*Leucopogon*	*capitellatus*
		Leucopogon	*propinquus*
		Leucopogon	*pulchellus*
		Leucopogon	*verticillatus*
Primulaceae	*	*Anagallis*	*arvensis*
Asclepiadaceae	*	*Gomphocarpus*	*fruticosus*
Goodeniaceae		*Cyanostegia*	*corifolia*
Lamiaceae		*Hemiandra*	*pungens*
		Hemigenia	*incana*
	*	*Lavandula*	*stoechas*
Orobanchaceae	*	*Orobanche*	*minor*
Plantaginaceae	*	*Plantago*	*lanceolata*
Rubiaceae		*Opercularia*	*echinocephala*
		Opercularia	*hispidula*
		Opercularia	*vaginata*
Goodeniaceae		*Dampiera*	*alata*
		Dampiera	*linearis*
		Scaevola	*calliptera*
Stylidiaceae		*Stylidium*	*amoenum*
		Stylidium	*brunonianum*
		Stylidium	*piliferum*
		Stylidium	*repens*
		Stylidium	*rhynchocarpum*
Asteraceae	*	*Hypochaeris*	*glabra*
		Lagenifera	*huegelii*
	*	*Senecio*	*diaschides*
		Trichocline	*spathulata*

APPENDIX B: PLANT TAXA PRESENT IN SITE-VEGETATION TYPES, HARVEY BASIN SURVEY AREA AUGUST 1997 AND JANUARY 1998

Note: + =present in site, * =introduced taxa

	Site-Vegetation Types												
Species	**CQ**	**D**	**G**	**M**	**MG**	**Q**	**R**	**S**	**SR**	**SW**	**T**	**U**	**Y**
Acacia alata	+	+	+			+	+				+	+	
Acacia applanata		+											
Acacia celastrifolia							+						
Acacia drummondii ssp. drummondii													+
Acacia elachantha		+										+	
**Acacia elata*		+	+					+					
Acacia extensa		+	+				+	+		+		+	
Acacia lateriticola			+					+	+	+	+	+	+
Acacia obovata								+	+	+			+
**Acacia podalyrifolia*	+	+											
Acacia pulchella	+	+	+	+	+		+	+		+		+	+
cia saligna		+		+									
Acacia stenoptera		+					+						
Acacia teretifolia		+											
Acacia willdenowiana													+
Adiantum aethiopicum	+					+					+	+	
Agonis flexuosa	+	+		+		+	+	+			+	+	+
Agonis grandiflora									+				
Agonis linearifolia	+		+										
Agonis parviceps							+						
Agrostocrinum scabrum		+						+					+
**Aira caryophyllea*			+				+						
Allocasuarina humilis			+										
Amaryllidaceae sp.		+											
**Anagallis arvensis*		+		+									
Andersonia lehmanniana			+					+					+
**Asparagus asparagoides*			+	+			+					+	+
Astartea fascicularis	+												
Astroloma ciliatum	+		+	+	+			+		+		+	+
Astroloma pallidum								+	+	+			
trostipa semibarbata							+						
**Avena barbata*		+											
**Avena sp.*		+	+	+			+		+	+		+	+
Baeckea camphorosmae	+	+	+		+				+				+
Banksia grandis											+		
Banksia littoralis	+												
Baumea articulata	+												
Billardiera sp.													+
Billardiera floribunda	+												
Billardiera varifolia							+						
Borya sphaerocephala			+										
Bossiaea aquifolium	+					+	+					+	
Bossiaea eriocarpa	+		+				+	+	+	+			
Bossiaea linophylla											+		
Bossiaea ornata				+				+	+				+
**Briza maxima*	+	+	+	+	+		+	+				+	
**Briza minor*			+										
Burchardia congesta			+				+						
Caesia occidentalis		+											+
Cassytha racemosa			+				+						
Chamaescilla corymbosa			+				+	+	+	+			+
Cheilanthes austrotenuifolia			+	+		+	+						

APPENDIX B: PLANT TAXA PRESENT IN SITE-VEGETATION TYPES, HARVEY BASIN SURVEY AREA AUGUST 1997 AND JANUARY 1998

Note: + =present in site, * =introduced taxa

	Site-Vegetation Types												
Species	CQ	D	G	M	MG	Q	R	S	SR	SW	T	U	Y
Chorizema cordatum	+	+	+	+		+	+	+			+	+	
Chorizema rhombeum								+		+			
Clematis pubescens	+					+					+		
Conostylis aculeata	+	+	+			+	+		+		+	+	
Conostylis serrulata	+		+									+	
Conostylis setigera										+			
Conostylis setosa									+				
Corymbia calophylla	+	+	+	+	+	+	+	+	+	+	+	+	+
Corynotheca micrantha	+						+						
Cryptandra arbutifolia			+										
Cyanostegia corifolia													+
Ehrharthochaeta avenacea	+	+	+				+	+	+			+	+
Cynodon dactylon	+												
Dampiera alata	+	+	+		+				+				+
Dampiera linearis	+	+	+	+	+			+	+	+	+		+
Darwinia citriodora	+	+	+		+	+	+					+	
Daviesia decurrens		+	+										
Daviesia preissii							+						
Daviesia horrida		+	+		+		+						
Desmocladus fasciculatus		+					+	+	+	+			
Dichopogon capillipes		+	+		+		+						+
Diuris longifolia		+	+										
Dodonaea ceratocarpa	+		+				+						
Drosera erythrorhiza		+					+	+	+	+			+
Drosera sp.		+	+		+		+						
Drosera stolonifera			+		+								
Dryandra bipinnatifida					+					+			
Dryandra lindleyana		+	+	+	+		+	+	+	+	+		+
Dryandra sessilis							+						
Eriostemon spicatus	+	+					+	+	+	+		+	+
Eucalyptus laeliae	+												
Eucalyptus marginata	+	+	+	+		+	+	+	+	+	+	+	+
Eucalyptus megacarpa												+	
Eucalyptus patens	+					+					+	+	
Eucalyptus rudis	+												+
Eucalyptus wandoo	+			+	+								+
Geranium retrorsum			+			+	+				+	+	
**Gladiolus angustus*	+	+	+				+				+	+	+
**Gomphocarpus fruticosus*			+				+						
Gompholobium knightianum							+						
Gompholobium marginatum		+	+		+		+	+	+				+
Gompholobium polymorphum							+						
Gonocarpus benthamii												+	
Gonocarpus cordiger	+												
Gonocarpus hexandrus ssp. integrifolius	+												
Grevillea bipinnatifida		+	+		+								
Grevillea diversifolia						+							
Grevillea pilulifera			+		+								
Haemodorum laxum	+	+	+	+			+						+
Haemodorum simulans		+		+									
Haemodorum sp.		+	+	+	+		+						+
Hakea amplexicaulis	+	+		+	+	+	+	+	+	+	+	+	+

APPENDIX B: PLANT TAXA PRESENT IN SITE-VEGETATION TYPES, HARVEY BASIN SURVEY AREA AUGUST 1997 AND JANUARY 1998

Note: + =present in site, * =introduced taxa

	Site-Vegetation Types												
Species	CQ	D	G	M	MG	Q	R	S	SR	SW	T	U	Y
Hakea lasiantha	+												
Hakea lasianthoides	+	+				+	+						
Hakea lissocarpha		+	+	+	+	+	+	+	+			+	+
Hakea prostrata			+								+		
Hardenbergia comptoniana							+						
Hemiandra pungens							+						
Hemigenia incana	+		+				+						+
Hibbertia acerosa		+											
Hibbertia amplexicaulis	+			+			+	+			+		
Hibbertia commutata	+			+			+	+			+		
Hibbertia hypericoides	+	+	+	+	+	+	+	+	+	+	+	+	+
bertia perfoliata						+	+				+		
Hibbertia silvestris	+					+					+	+	
Hovea chorizemifolia	+												
Hovea pungens			+										
Hovea trisperma		+	+	+						+	+		+
Hybanthus floribundus ssp. floribundus													+
Hypocalymma angustifolium	+	+	+		+		+		+	+	+		+
Hypocalymma cordifolium	+												
Hypocalymma robustum							+						
**Hypochaeris glabra*	+	+	+	+	+	+	+	+	+	+	+	+	+
Hypoxis occidentalis			+										
Isopogon sphaerocephalus										+			
**Juncus articulatus*	+												+
**Juncus microcephalus*			+										
Juncus pallidus		+					+						
Kennedia coccinea						+		+		+			
Kennedia prostrata		+	+										
Labichea punctata								+				+	
Lagenifera huegelii	+	+	+	+	+	+	+	+	+	+	+	+	+
vandula stoechas				+	+		+		+				+
Lepidosperma drummondii			+										
Lepidosperma effusum							+						
Lepidosperma leptostachyum									+			+	
Lepidosperma squamatum	+	+	+	+			+		+			+	+
Lepidosperma tenue	+	+	+	+	+	+	+	+	+	+		+	+
Lepidosperma tetraquetrum	+					+						+	
Leucopogon capitellatus	+	+	+		+	+	+	+		+	+	+	
Leucopogon propinquus	+	+	+		+	+	+				+	+	
Leucopogon pulchellus			+										
Leucopogon verticillatus						+							
Lomandra caespitosa							+						
Lomandra micrantha					+								
Lomandra nigricans			+				+						
Lomandra odora										+			
Lomandra preissii			+				+						
Lomandra purpurea								+					+
Lomandra sericea	+		+				+	+	+	+	+		
Lomandra sonderi	+					+							
Lomandra sp.		+					+		+				+
Loxocarya cinerea			+				+						
Luzula meridionalis							+						

APPENDIX B: PLANT TAXA PRESENT IN SITE-VEGETATION TYPES, HARVEY BASIN SURVEY AREA AUGUST 1997 AND JANUARY 1998

Note: + =present in site, * =introduced taxa

	Site-Vegetation Types												
Species	CQ	D	G	M	MG	Q	R	S	SR	SW	T	U	Y
Macrozamia riedlei	+	+	+	+	+	+	+	+		+	+	+	+
Meeboldina coangustata		+											
Meeboldina scariosa	+												
Melaleuca lateritia							+						
Melaleuca pauciflora		+			+								
Melaleuca scabra							+						
Mesomelaena tetragona	+	+	+	+	+	+	+		+			+	+
Mirbelia dilatata	+	+					+					+	+
Neurachne alopecuroidea		+	+						+				+
Opercularia echinocephala		+			+			+					
Opercularia hispidula						+							
Opercularia vaginata		+											
Orobanche minor		+					+						
Oxalis corniculata	+	+	+	+	+	+	+	+		+		+	+
**Oxalis glabra*	+					+	+						+
**Oxalis purpurea*	+												
**Paspalum dilatatum*							+						
Patersonia occidentalis	+	+	+	+	+		+	+	+		+	+	+
Patersonia umbrosa		+										+	+
Patersonia umbrosa var. xanthina													+
Pentapeltis peltigera								+	+	+			
Persicaria decipiens	+												
Persoonia longifolia						+		+		+	+	+	
Phyllanthus calycinus	+	+	+		+	+	+	+			+	+	+
Pimelea ciliata	+					+	+					+	
Pimelea imbricata			+										
Pimelea rosea								+					
Pimelea suaveolens							+						
**Pinus pinaster*	+	+	+		+		+						+
**Plantago lanceolata*		+	+				+	+	+			+	+
Stytheca galioides						+							
Poa serpentum												+	
Poaceae spp.			+										
Prasophyllum sp.		+											
Pteridium esculentum	+					+					+	+	
Pyrorchis nigricans										+			
Ranunculus colonorum			+										
**Rhamnus alaternus*			+				+					+	
**Romulea rosea*		+	+		+		+		+				
Scaevola calliptera	+	+	+	+	+		+	+	+	+			+
Schoenus curvifolius			+				+		+				
**Senecio diaschides*											+		
Sollya heterophylla											+		
Sowerbaea laxiflora		+											
Stackhousia monogyna		+	+		+								
Stenopa ramosissima												+	
Stylidium amoenum								+	+	+		+	
Stylidium brunonianum	+		+		+		+						+
Stylidium piliferum		+					+	+		+	+	+	
Stylidium repens							+						
Stylidium rhynchocarpum	+												
Stypandra glauca		+	+				+						

APPENDIX B: PLANT TAXA PRESENT IN SITE-VEGETATION TYPES, HARVEY BASIN SURVEY AREA AUGUST 1997 AND JANUARY 1998

Note: + =present in site, * =introduced taxa

	Site-Vegetation Types												
Species	CQ	D	G	M	MG	Q	R	S	SR	SW	T	U	Y
Synaphea gracillima		+					+			+			
Synaphea petiolaris			+										
Tetraria capillaris	+				+		+	+		+	+	+	+
Tetraria octandra	+	+	+	+	+	+	+	+	+	+	+	+	+
Tetrarrhena laevis	+	+				+	+	+			+	+	+
Tetratheca hirsuta										+			
Themeda triandra			+									+	
Thysanotus dichotomus				+		+							+
Thysanotus multiflorus			+										
Tremandra diffusa	+											+	
Tremandra stelligera						+	+						
)onanthes brachypetala		+											
richocline spathulata	+								+				
Tricoryne elatior		+	+	+									+
Tricostularia compressa							+						
**Trifolium angustifolium*							+						
**Trifolium campestre*		+	+		+	+					+	+	+
Trifolium spp.			+										
Trymalium floribundum	+					+							
Trymalium ledifolium	+		+		+		+				+		+
Viminaria juncea		+											
Xanthorrhoea gracilis	+	+	+	+	+		+	+	+	+			+
Xanthorrhoea preissii	+	+	+	+	+	+	+	+	+	+	+	+	+
Xanthosia candida								+					+
**Zantedeschia aethiopica*	+					+							

APPENDIX C: PLANT TAXA PRESENT IN EACH SURVEY AREA, HARVEY BASIN, AUGUST 1997 AND JANUARY 1998

Note: + =present at site, * =introduced taxa

Species	Survey Area					
	1	2	3	4	5	6
Acacia alata	+			+	+	
Acacia applanata	+					
Acacia celastrifolia	+					
Acacia drummondii ssp. drummondii		+				
Acacia elachantha	+					
**Acacia elata*	+					
acia extensa	+	+				+
Acacia lateriticola		+			+	
Acacia obovata		+				
**Acacia podalyrifolia*	+					
Acacia pulchella	+	+	+	+	+	+
Acacia saligna	+	+				
Acacia stenoptera	+		+	+		
Acacia teretifolia	+					
Acacia willdenowiana		+				
Adiantum aethiopicum				+	+	+
Agonis flexuosa	+	+			+	+
Agonis grandiflora		+				
Agonis linearifolia	+			+	+	+
Agonis parviceps				+		
Agrostocrinum scabrum	+	+				
ira caryophyllea				+		
Allocasuarina humilis	+					
Amaryllidaceae sp.	+					
Andersonia lehmanniana	+	+			+	
**Anagallis arvensis*	+	+				
**Asparagus asparagoides*	+	+	+			
Astartea fascicularis				+		
Astroloma ciliatum	+	+	+		+	
Astroloma pallidum		+				
**Avena barbata*	+					
**Avena sp.*	+	+	+			
Austrostipa semibarbata	+					
Baeckea camphorosmae	+	+		+		
Banksia grandis					+	
Banksia littoralis						+
Baumea articulata					+	
Billardiera floribunda				+		
Billardiera sp.		+				

APPENDIX C: PLANT TAXA PRESENT IN EACH SURVEY AREA, HARVEY BASIN, AUGUST 1997 AND JANUARY 1998

Note: + =present at site, * =introduced taxa

Species	Survey Area					
	1	2	3	4	5	6
Billardiera variifolia				+		
Borya sphaerocephala	+			+		
Bossiaea aquifolium				+	+	+
Bossiaea eriocarpa	+	+		+		
Bossiaea linophylla					+	
Bossiaea ornata		+				
Briza maxima	+	+	+	+		
Briza minor				+		
Burchardia congesta	+					
Caesia occidentalis	+	+				
Cassytha racemosa				+		
Chamaescilla corymbosa	+	+	+	+	+	
Cheilanthes austrotenuifolia	+	+	+	+	+	
Chorizema cordatum	+	+			+	
Chorizema rhombeum		+				
Clematis pubescens				+	+	
Conostylis aculeata	+			+	+	+
Conostylis serrulata	+			+		
Conostylis setigera		+				
Conostylis setosa	+					
Corymbia calophylla	+	+	+	+	+	+
Corynotheca micrantha				+		
Cryptandra arbutiflora				+		
Cyanostegia corifolia		+				
Cyathochaeta avenacea	+	+		+		
Cynodon dactylon					+	
Dampiera alata	+	+	+			
Dampiera linearis	+	+	+		+	
Darwinia citriodora	+		+	+	+	+
Daviesia decurrens	+				+	
Daviesia preissii				+		
Daviesia horrida	+		+	+		
Desmocladus fasciculatus	+	+				
Dichopogon capillipes	+	+	+			
Diuris longifolia	+					
Dodonaea ceratocarpa				+		
Drosera erythrorhiza	+	+				
Drosera sp.	+		+			
Drosera stolonifera	+		+			

APPENDIX C: PLANT TAXA PRESENT IN EACH SURVEY AREA, HARVEY BASIN, AUGUST 1997 AND JANUARY 1998

Note: + =present at site, * =introduced taxa

Species	Survey Area					
	1	2	3	4	5	6
Dryandra bipinnatifida		+				
Dryandra lindleyana	+	+	+	+	+	
Dryandra sessilis	+					
Eriostemon spicatus	+	+		+	+	
Eucalyptus laeliae				+		
Eucalyptus marginata	+	+	+	+	+	+
Eucalyptus megacarpa						+
Eucalyptus patens				+	+	+
Eucalyptus rudis		+			+	+
Eucalyptus wandoo		+	+			
Geranium retrorsum	+		+		+	+
**Gladiolus angustus*	+	+			+	
**Gomphocarpus fruticosus*	+					
Gompholobium knightianum				+		
Gompholobium marginatum	+	+	+	+		
Gompholobium polymorphum				+		
Gonocarpus benthamii						+
Gonocarpus cordiger						+
Gonocarpus hexandrus ssp. integrifolius					+	
Grevillea bipinnatifida	+	+		+		
Grevillea diversifolia						+
Grevillea pilulifera	+	+			+	
Haemodorum laxum	+	+	+	+		
Haemodorum simulans	+	+				
Haemodorum sp.	+	+	+			
Hakea amplexicaulis	+	+		+	+	+
Hakea lasiantha						+
Hakea lasianthoides	+					+
Hakea lissocarpha	+	+	+	+	+	+
Hakea prostrata				+	+	
Hardenbergia comptoniana				+		
Hemiandra pungens	+					
Hemigenia incana	+	+		+	+	
Hibbertia acerosa	+					
Hibbertia amplexicaulis	+	+	+	+	+	
Hibbertia commutata		+	+		+	+
Hibbertia hypericoides	+	+	+	+	+	+
Hibbertia perfoliata			+	+	+	
Hibbertia silvestris					+	+

APPENDIX C: PLANT TAXA PRESENT IN EACH SURVEY AREA, HARVEY BASIN, AUGUST 1997 AND JANUARY 1998

Note: + =present at site, * =introduced taxa

Species	Survey Area					
	1	2	3	4	5	6
Hovea chorizemifolia				+		
Hovea pungens				+		
Hovea trisperma	+	+			+	
Hybanthus floribundus ssp. floribundus		+				
Hypocalymma angustifolium	+	+	+	+	+	
Hypocalymma cordifolium				+		+
Hypocalymma robustum				+		
**Hypochaeris glabra*	+	+		+	+	
Hypoxis occidentalis				+		
Isopogon sphaerocephalus		+				
**Juncus articulatus*		+				
**Juncus microcephalus*				+		
Juncus pallidus	+					
Kennedia coccinea		+			+	
Kennedia prostrata	+					
Labichea punctata		+			+	
Lagenifera huegelii	+	+	+	+	+	
**Lavandula stoechas*		+	+			
Lepidosperma drummondii				+		
Lepidosperma effusum				+		
Lepidosperma leptostachyum	+	+				
Lepidosperma squamatum	+	+		+		+
Lepidosperma tenue	+	+	+	+		+
Lepidosperma tetraquetrum				+	+	+
Leucopogon capitellatus	+	+	+	+	+	+
Leucopogon propinquus	+		+		+	
Leucopogon pulchellus				+		
Leucopogon verticillatus				+		
Lomandra caespitosa	+					
Lomandra micrantha		+				
Lomandra nigricans	+					
Lomandra odora		+				
Lomandra preissii	+					
Lomandra purpurea		+				
Lomandra sericea	+	+		+	+	
Lomandra sonderi						+
Lomandra sp.	+	+				
Loxocarya cinerea	+		+	+	+	
Luzula meridionalis	+					

APPENDIX C: PLANT TAXA PRESENT IN EACH SURVEY AREA, HARVEY BASIN, AUGUST 1997 AND JANUARY 1998

Note: + =present at site, * =introduced taxa

Species	Survey Area					
	1	2	3	4	5	6
Macrozamia riedlei	+	+	+	+	+	+
Meeboldina coangustata	+					
Meeboldina scariosa				+		
Melaleuca lateritia	+					
Melaleuca pauciflora	+	+				
Melaleuca scabra				+		
Mesomelaena tetragona	+	+	+			+
Mirbelia dilatata	+	+		+	+	+
Neurachne alopecuroidea	+	+				
Opercularia echinocephala	+	+	+			
Opercularia hispidula						+
Opercularia vaginata	+					
**Orobanche minor*	+					
Oxalis corniculata	+	+	+		+	+
**Oxalis glabra*	+	+			+	+
**Oxalis purpurea*					+	
**Paspalum dilatatum*	+					
Patersonia umbrosa var. xanthina		+				
Pentapeltis peltigera		+				
Persicaria decipiens					+	
Persoonia longifolia		+			+	+
Phyllanthus calycinus	+	+	+	+	+	+
Pimelea ciliata			+		+	+
Pimelea imbricata				+		
Pimelea rosea		+				
Pimelea suaveolens				+		
**Pinus pinaster*	+	+	+			
**Plantago lanceolata*	+	+	+			+
Platytheca galioides					+	
Poa serpentum	+					
Poaceae spp.				+		
Prasophyllum sp.	+					
Pteridium esculentum					+	+
Pyrorchis nigricans		+				
Ranunculus colonorum	+					
**Romulea rosea*	+		+			
Scaevola calliptera	+	+	+	+	+	
Schoenus curvifolius	+			+		
**Senecio diaschides*					+	

APPENDIX C: PLANT TAXA PRESENT IN EACH SURVEY AREA, HARVEY BASIN, AUGUST 1997 AND JANUARY 1998

Note: + =present at site, * =introduced taxa

Species	Survey Area					
	1	2	3	4	5	6
Sollya heterophylla					+	
Sowerbaea laxiflora	+					
Stackhousia monogyna	+		+			
Stenopa ramosissima					+	
Stylidium amoenum		+			+	
Stylidium brunonianum		+	+		+	
Stylidium piliferum	+	+			+	
Stylidium repens				+		
Stylidium rhynchocarpum					+	
Stypandra glauca	+					
Synaphea gracillima	+	+		+		
Synaphea petiolaris					+	
Tetraria capillaris	+	+	+	+	+	
Tetraria octandra	+	+	+	+	+	+
Tetrarrhena laevis	+	+	+	+	+	+
Tetratheca hirsuta		+				
Themeda triandra	+					
Thysanotus dichotomus		+				+
Thysanotus multiflorus	+					
Tremandra diffusa					+	+
Tremandra stelligera				+		+
Tribonanthes brachypetala	+					
Trichocline spathulata		+			+	+
Tricoryne elatior	+	+	+			
Tricostularia compressa	+					
**Trifolium angustifolium*	+					
**Trifolium campestre*	+	+	+		+	+
**Trifolium spp.*				+		
Trymalium floribundum		+		+	+	+
Trymalium ledifolium	+	+	+	+	+	
Viminaria juncea	+					
Xanthorrhoea gracilis	+	+	+	+	+	
Xanthorrhoea preissii	+	+	+	+	+	+
Xanthosia candida		+				
**Zantedeschia aethiopica*					+	+

APPENDIX D: PLANT TAXA PRESENT IN FOUNDATION ZONES IN EACH SURVEY AREA, HARVEY BASIN, AUGUST 1997 AND JANUARY 1998

Note: + = present in site, * = introduced taxa, Z = zone

Species	Survey Area													
	1			2			3			4	5		6	
	Z1	Z2	Z3	Z1	Z2	Z3	Z2	Z3	Z4	Z3	Z2	Z3	Z2	Z3
**Acacia elata*	+													
Acacia extensa	+			+	+								+	
Acacia lateriticola					+	+						+		
Acacia obovata					+	+								
**Acacia podalyrifolia*	+													
Acacia pulchella	+	+	+	+	+		+	+	+	+		+	+	+
Acacia saligna	+			+										
Acacia stenoptera	+						+			+				
Acacia teretifolia	+													
Acacia willdenowiana					+									
Adiantum aethiopicum										+	+	+	+	+
Agonis flexuosa	+			+	+						+	+	+	+
Agonis grandiflora						+								
Agonis linearifolia	+									+	+	+		+
Agonis parviceps										+				
Agrostocrinum scabrum	+				+	+								
**Aira caryophyllea*										+				
Allocasuarina humilis	+													
Amaryllidaceae sp.	+													
**Anagallis arvensis*	+			+										
Andersonia lehmanniana		+			+							+		
**Asparagus asparagoides*	+	+	+	+	+		+		+					
Astartea fascicularis										+				
Astroloma ciliatum	+			+	+	+	+					+		

APPENDIX D: PLANT TAXA PRESENT IN INUNDATION ZONES IN EACH SURVEY AREA, HARVEY BASIN, AUGUST 1997 AND JANUARY 1998

Note: + = present in site, * = introduced taxa, Z = zone

Species	Survey Area													
	1			2			3			4	5		6	
	Z1	Z2	Z3	Z1	Z2	Z3	Z2	Z3	Z4	Z3	Z2	Z3	Z2	Z3
Astroloma pallidum					+	+								
Austrostipa semibarbata	+													
**Avena barbata*	+													
**Avena sp.*	+	+	+		+	+	+	+						
Baeckea camphorosmae	+		+	+	+					+				
Banksia grandis												+		
Banksia littoralis													+	+
Baumea articulata											+	+		
Billardiera floribunda										+				
Billardiera sp.					+									
Billardiera variifolia										+				
Borya sphaerocephala		+	+							+				
Bossiaea aquifolium										+		+	+	+
Bossiaea eriocarpa	+	+	+	+	+	+								
Bossiaea linophylla												+		
Bossiaea ornata					+	+								
**Briza maxima*	+	+	+		+		+	+	+	+				
**Briza minor*										+				
Burchardia congesta		+	+											
Caesia occidentalis	+					+								
Cassytha racemosa										+				
Chamaescilla corymbosa			+	+	+	+	+			+		+		
Cheilanthes austrotenuifolia	+	+	+	+			+		+	+		+		
Chorizema cordatum	+	+	+		+						+	+		

APPENDIX D: PLANT TAXA PRESENT IN INUNDATION ZONES IN EACH SURVEY AREA, HARVEY BASIN, AUGUST 1997 AND JANUARY 1998

Note: + = present in site, * = introduced taxa, Z = zone

Species	Survey Area													
	1			2			3			4	5		6	
	Z1	Z2	Z3	Z1	Z2	Z3	Z2	Z3	Z4	Z3	Z2	Z3	Z2	Z3
Chorizema rhombeum				+	+									
Clematis pubescens										+	+	+		
Conostylis aculeata	+	+	+							+		+	+	
Conostylis serrulata			+							+				
Conostylis setigera						+								
Conostylis setosa			+											
Corymbia calophylla	+	+	+	+	+	+	+	+	+	+	+	+		+
Corynotheca micrantha										+				
Cryptandra arbutifolia										+				
Cyanostegia corifolia						+								
Cyathochaeta avenacea	+		+		+					+				
Cynodon dactylon											+			
Dampiera alata	+			+	+	+	+	+						
Dampiera linearis	+				+	+		+				+		
Darwinia citriodora	+						+			+		+	+	+
Daviesia decurrens	+	+	+									+		
Daviesia horrida	+						+			+				
Daviesia preissii										+				
Desmocladus fasciculatus	+		+		+	+								
Dichopogon capillipes	+	+	+		+			+						
Diuris longifolia	+		+											
Dodonaea ceratocarpa										+				
Drosera erythrorhiza	+		+	+	+									
Drosera sp.	+	+	+				+							

APPENDIX D: PLANT TAXA PRESENT IN FOUNDATION ZONES IN EACH SURVEY AREA, HARVEY BASIN, AUGUST 1997 AND JANUARY 1998

Note: + = present in site, * = introduced taxa, Z = zone

Species	Survey Area													
	1			2			3			4	5		6	
	Z1	Z2	Z3	Z1	Z2	Z3	Z2	Z3	Z4	Z3	Z2	Z3	Z2	Z3
Drosera stolonifera		+						+						
Dryandra bipinnatifida					+	+								
Dryandra lindleyana	+	+	+	+	+	+	+	+	+	+		+		
Dryandra sessilis		+												
Eriostemon spicatus	+			+	+	+				+		+		
Eucalyptus laeliae										+				
Eucalyptus marginata	+	+	+	+	+	+	+		+	+		+	+	+
Eucalyptus megacarpa													+	
Eucalyptus patens										+	+	+	+	+
Eucalyptus rudis				+	+						+	+	+	+
Eucalyptus wandoo				+	+	+	+	+						
Geranium retrorsum	+		+						+			+		+
**Gladiolus angustus*	+	+	+		+						+	+		
**Gomphocarpus fruticosus*	+	+												
Gompholobium knightianum										+				
Gompholobium marginatum	+	+	+		+	+	+		+	+				
Gompholobium polymorphum										+				
Gonocarpus benthamii														+
Gonocarpus cordiger														+
Gonocarpus hexandrus ssp. integrifolius												+		
Grevillea bipinnatifida	+				+					+				
Grevillea diversifolia														+
Grevillea pilulifera	+				+							+		
Haemodorum laxum	+	+	+	+	+		+	+	+	+				

APPENDIX D: PLANT TAXA PRESENT IN INUNDATION ZONES IN EACH SURVEY AREA, HARVEY BASIN, AUGUST 1997 AND JANUARY 1998

Note: + = present in site, * = introduced taxa, Z = zone

Species	Survey Area												
	1			2			3			4	5		6	
	Z1	Z2	Z3	Z1	Z2	Z3	Z2	Z3	Z4	Z3	Z2	Z3	Z2	Z3
Haemodorum simulans	+				+									
Haemodorum sp.	+	+	+	+	+		+	+						
Hakea amplexicaulis	+				+	+				+		+		+
Hakea lasianthoides	+												+	+
Hakea lissocarpha	+		+		+	+	+			+		+		+
Hakea prostrata										+		+		
Hardenbbergia comptoniana										+				
Hemiandra pungens	+													
Hemigenia incana	+	+	+	+	+					+		+		
Hibbertia acerosa	+													
Hibbertia amplexicaulis	+			+	+				+	+		+		
Hibbertia commutata				+	+		+					+		+
Hibbertia hypericoides	+		+	+	+	+	+	+		+		+	+	+
Hibbertia perfoliata									+	+		+		
Hibbertia silvestris											+	+	+	
Hovea chorizemifolia										+				
Hovea pungens										+				
Hovea trisperma	+	+			+	+						+		
Hybanthus floribundus ssp. floribundus					+									
Hypocalymma angustifolium	+		+	+	+	+	+	+		+		+		
Hypocalymma cordifolium										+				+
Hypocalymma robustum										+				
**Hypochaeris glabra*	+	+	+		+	+				+	+	+		
Hypoxis occidentalis										+				

APPENDIX D: PLANT TAXA PRESENT IN INUNDATION ZONES IN EACH SURVEY AREA, HARVEY BASIN, AUGUST 1997 AND JANUARY 1998

Note: + = present in site, * = introduced taxa, Z = zone

Species	Survey Area													
	1			2			3			4	5		6	
	Z1	Z2	Z3	Z1	Z2	Z3	Z2	Z3	Z4	Z3	Z2	Z3	Z2	Z3
Isopogon sphaerocephalus						+								
**Juncus articulatus*				+	+									
**Juncus microcephalus*										+				
Juncus pallidus	+													
Kennedia coccinea					+						+			
Kennedia prostrata	+													
Labichea punctata						+						+		
Lagenifera huegelii	+	+	+	+	+	+	+			+	+	+		
**Lavandula stoechas*				+	+		+	+						
Lepidosperma drummondii										+				
Lepidosperma effusum										+				
Lepidosperma leptostachyum			+		+									
Lepidosperma squamatum	+	+	+		+					+				+
Lepidosperma tenue	+		+	+	+	+	+	+	+	+			+	+
Lepidosperma tetraquetrum										+	+	+	+	+
Leucopogon capitellatus	+				+	+	+			+	+	+	+	+
Leucopogon propinquus	+	+					+		+		+	+		
Leucopogon pulchellus										+				
Leucopogon verticillatus										+				
Lomandra caespitosa			+											
Lomandra micrantha					+									
Lomandra nigricans	+	+												
Lomandra odora					+									
Lomandra preissii	+	+												

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	1			2			3			4	5		6	
	Z1	Z2	Z3	Z1	Z2	Z3	Z2	Z3	Z4	Z3	Z2	Z3	Z2	Z3
Lomandra purpurea					+	+								
Lomandra sericea	+			+	+	+				+		+		
Lomandra sonderi													+	+
Lomandra sp.	+		+		+	+								
Loxocarya cinerea		+	+				+			+		+		
Luzula meridionalis			+											
Macrozamia riedlei	+	+	+	+	+	+	+		+	+	+	+	+	+
Meeboldina coangustata	+													
Meeboldina scariosa										+				
Melaleuca lateritia	+													
Melaleuca pauciflora	+				+									
Melaleuca scabra										+				
Mesomelaena tetragona	+	+	+	+	+		+	+					+	+
Mirbelia dilatata	+			+	+					+	+	+		+
Neurachne alopecuroidea	+	+	+		+									
Opercularia echinocephala	+				+			+						
Opercularia hispidula														+
Opercularia vaginata	+													
**Orobanche minor*	+		+											
Oxalis corniculata	+		+	+	+			+				+	+	+
**Oxalis glabra*	+				+						+		+	+
**Oxalis purpurea*												+		
**Paspalum dilatatum*	+													
Patersonia occidentalis	+	+	+	+	+	+	+	+				+		+

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	Z1	Z2	Z3	Z1	Z2	Z3	Z2	Z3	Z4	Z3	Z2	Z3	Z2	Z3
Patersonia umbrosa	+				+							+		
Patersonia umbrosa var. xanthina						+								
Pentapeltis peltigera					+	+								
Persicaria decipiens											+	+		
Persoonia longifolia				+	+	+						+	+	+
Phyllanthus calycinus	+		+		+	+	+	+	+	+		+	+	+
Pimelea ciliata									+		+	+	+	+
Pimelea imbricata										+				
Pimelea rosea						+								
Pimelea suaveolens										+				
**Pinus pinaster*	+	+	+	+			+	+						
**Plantago lanceolata*	+	+	+		+	+			+					+
Platytheca galioides											+			
Poa serpentum	+													
Poaceae spp.										+				
Prasophyllum sp.	+													
Pteridium esculentum											+	+	+	+
Pyrorchis nigricans						+								
Ranunculus colonorum			+											
**Rhamnus alaternus*	+	+	+						+					
**Romulea rosea*	+	+	+				+	+						
Scaevola calliptera	+		+	+	+	+	+			+	+			
Schoenus curvifolius		+	+							+				
**Senecio diaschides*												+		

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	Z1	Z2	Z3	Z1	Z2	Z3	Z2	Z3	Z4	Z3	Z2	Z3	Z2	Z3
Sollya heterophylla												+		
Sowerbaea laxiflora	+													
Stackhousia monogyna	+						+							
Stenopa ramosissima												+		
Stylidium amoenum					+	+						+		
Stylidium brunonianum				+	+		+	+				+		
Stylidium piliferum	+		+		+	+						+		
Stylidium repens										+				
Stylidium rhynchocarpum												+		
Stypandra glauca	+		+											
Synaphea gracillima	+					+				+				
Synaphea petiolaris												+		
Tetraria capillaris			+		+	+	+			+	+	+		
Tetraria octandra	+	+	+		+	+	+	+		+	+	+	+	+
Tetrarrhena laevis	+				+			+		+	+	+	+	+
Tetratheca hirsuta						+								
Themeda triandra			+											
Thysanotus dichotomus					+								+	+
Thysanotus multiflorus			+											
Tremandra diffusa											+		+	
Tremandra stelligera										+			+	
Tribonanthes brachypetala	+													
Trichocline spathulata						+					+	+		+
Tricoryne elatior	+	+			+		+							

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	Z1	Z2	Z3	Z1	Z2	Z3	Z2	Z3	Z4	Z3	Z2	Z3	Z2	Z3
Tricostularia compressa			+											
**Trifolium angustifolium*		+												
**Trifolium campestre*	+	+	+		+		+	+				+		+
**Trifolium spp.*										+				
Trymalium floribundum				+						+	+	+	+	+
Trymalium ledifolium		+	+	+	+		+	+	+	+		+		
Viminaria juncea	+													
Xanthorrhoea gracilis	+	+	+		+	+	+	+		+		+		
Xanthorrhoea preissii	+	+	+	+	+	+	+		+	+	+	+	+	+
Xanthosia candida					+									
**Zantedeschia aethiopica*											+	+	+	