Subdivision of lots 1588 and 10 Loc Canning 16, Harpenden Street, Southern River.

Pacesetter Homes

Report and recommendations
of the Environmental Protection Authority

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Summary and recommendations

Pacesetter Homes proposes to subdivide Lots 1588 and 10 Harpenden Street, Southern River into 89 residential allotments. This report provides the Environmental Protection Authority's (EPA's) advice and recommendations to the Minister for the Environment on the environmental factors, conditions and procedures relevant to the proposal.

Section 44 of the *Environmental Protection Act 1986* requires the EPA to report to the Minister for the Environment on the environmental factors relevant to the proposal and on the conditions and procedures to which the proposal should be subject, if implemented. In addition, the EPA may make recommendations as it sees fit.

Relevant environmental factors

Although a number of environmental factors were considered by the EPA in the assessment, it is the EPA's opinion that the following are the environmental factors relevant to the proposal, which require detailed evaluation in this report:

(a) Vegetation Communities - poorly represented regionally significant vegetation communities;

(b) Terrestrial Fauna - loss of habitat; and

(c) Wetlands - filling of wetlands.

Conclusion

The EPA has considered the proposal by Pacesetter Homes to subdivide lots 1588 and 10 Harpenden Street, Southern River, Gosnells, to create 89 residential allotments and has concluded that the proposal cannot be implemented to meet the objectives of the EPA without having an unacceptable impact on the remnant vegetation, fauna and wetlands.

Lots 1588 and 10 are entirely vegetated, supporting an example of the Southern River Vegetation complex. One third of the site (Lots 1588 and 10) is sumpland classified as a "Conservation" Wetland by WRC but without any protection status. Lots 1588 and 10 is a 7.5 hectare site contained within a larger area of remnant vegetation of 128 hectares identified as being regionally significant in order to achieve Government Policy (the conservation of 10% of all vegetation complexes) as outlined in the government endorsed 'Urban Bushland Strategy" (MfP, 1995). The larger area, of remnant vegetation which Lots 1588 and 10 are centrally located, is the largest remaining unprotected example of Southern River Vegetation Complex in the Swan Coastal Plain.

The EPA believes that the development of Lots 1588 and 10 should not proceed. The EPA recognises that there is an expectation for areas zoned "urban" to be used for that purpose. However, Lots 1588 and 10 are an integral part of a larger area requiring conservation and is an important element of the Government's Urban Bushland Strategy.

If, however, following the due process of considering the EPA report, a decision was taken to permit development of the land (Lots 1588 and 10) in accordance with it's zoning, the EPA has proposed in it's recommendations that such development be in accordance with the requirements as set out in the Conditions in Appendix 3.

Other advice

The EPA is aware that at some time in the future Harpenden Street may be extended south-east into the larger area of remnant vegetation considered to be of regional conservation significance in order to achieve the conservation of 10% of all vegetation complexes as outlined in the government endorsed 'Urban Bushland Strategy" (MfP, 1995). In addition, it is possible that Garden Street may be constructed which would also impact on this area. Although, the construction of these roads is beyond the context of the present assessment, their construction would also impact on the vegetation, flora, fauna and wetland values present in the part of the area north of Holmes Street.

Recommendations

The EPA submits the following recommendations to the Minister for the Environment:

1. That the Minister considers the report on the relevant environmental factors of Vegetation Communities, Terrestrial Fauna, and Wetlands set out is Section 3;

2. That the Minister notes the proposal is contained within an area forming an integral link with a larger area of remnant vegetation recommended for protection in order to achieve the conservation of 10% of all vegetation complexes as outlined in the government endorsed 'Urban Bushland Strategy" (MfP, 1995);

3. That the Minister notes the EPA has concluded that the proposal cannot be managed to meet the EPA's objectives pertaining to the management of vegetation communities and wetlands and thus the EPA recommends that the proposal not be implemented;

4. That the Minister note that whilst the EPA has recommended that the proposal not be implemented, it has provided advice that if, following consideration through due process, the Minister determines that the development of the land may be permitted it should be subject to the conditions and procedures consistent with Section 4 and set out in formal detail in Appendix 3 of this report; and

5. That the Minister notes "Other Advice" that construction of Garden Street and the south-east extension of Harpenden Street would result in the loss of remnant vegetation considered to be of regional conservation significance and that their construction would impact on the vegetation, flora, fauna and wetland values present in the part of the Bushplan area north of Holmes Street.

Conditions

The EPA recommends that the following conditions, which are set out in formal detail in Appendix 4, be imposed if the proposal by Pacesetter Homes Pty Ltd to subdivide lots 1588 and 10 Harpenden Street, Canning Location 16, Southern River is approved for implementation:

1. The Minister for the Environment, on advice of the Environmental Protection Authority and the Department of Conservation and Land Management, and the Minister for Planning, on advice of the Western Australian Planning Commission, identify that portion of remnant vegetation on Lots 1588 and 10 Harpenden Street to be protected from development, taking into account the conservation significance of the vegetation on the site as well as the linkages of remnant vegetation within the site and with remnant vegetation to be protected on adjoining land.

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1. Introduction and background

Pacesetter Homes proposes to subdivide Lots 1588 and 10 Harpenden Street, Southern River, City of Gosnells, to create 89 residential allotments.

The subject area was zoned as "Urban" in the Metropolitan Region Scheme Amendment (No 927/33) in July 1993 and subsequently, as "Residential 17.5" in the City of Gosnells Town Planning Scheme Amendment (No 455) in July 1997. At the time of rezoning the EPA did not have the legal authority to formally assess these amendments. An amendment to the Environmental Protection Act enabling the EPA to formally assess Town Planning Schemes under section 48A was promulgated in August 1996.

Prior to the Section 48A amendments, the EPA published Bulletin 717 in November 1993 providing advice and recommendations to the then State Planning Commission (now Western Australian Planning Commission) on the environmental impacts of Amendment 927/33.

The Bulletin did not specifically address the subject land, however, it detailed the environmental significance of the site and surrounding areas and highlighted the need for environmental protection. Subsequent to the release of Bulletin 717 further studies (MfP, 1995. Anon, 1997. DEP, 1997b. Gibson *et al,* 1994 and Trudgen and Keighery, 1995) available to the DEP have indicated the subject land supports regionally significant vegetation.

This subdivision proposal was subject to assessment under Part IV of the Environmental Protection Act. A targeted review document, consisting of a location map, subdivision plan, the proponent's proposal description and information addressing the relevant environmental factors, was collated by the DEP for the purposes of inviting public comment (DEP, 1997a). The targeted review document was advertised on the 10 January 1998 and open for public review until 31 January 1998. A number of issues were raised in the submissions and these were considered in the assessment of the proposal.

A description of the proposal is presented in Section 2 of this Report. Section 3 discusses environmental factors relevant to the proposal, while section 4 provides other advice to the Minister for the Environment. The Conditions to which the proposal should be subject to if the Minister determines that it may be implemented are set out in Section 5. Section 6 presents the EPA's conclusions and Section 7 the EPA's recommendations.

A list of people and organisations that made submissions is included in Appendix 1. References are listed in Appendix 2, and recommended conditions are provided in Appendix 3. A detailed statement of the vegetation on the subject and adjoining land is provided in Appendix 4.

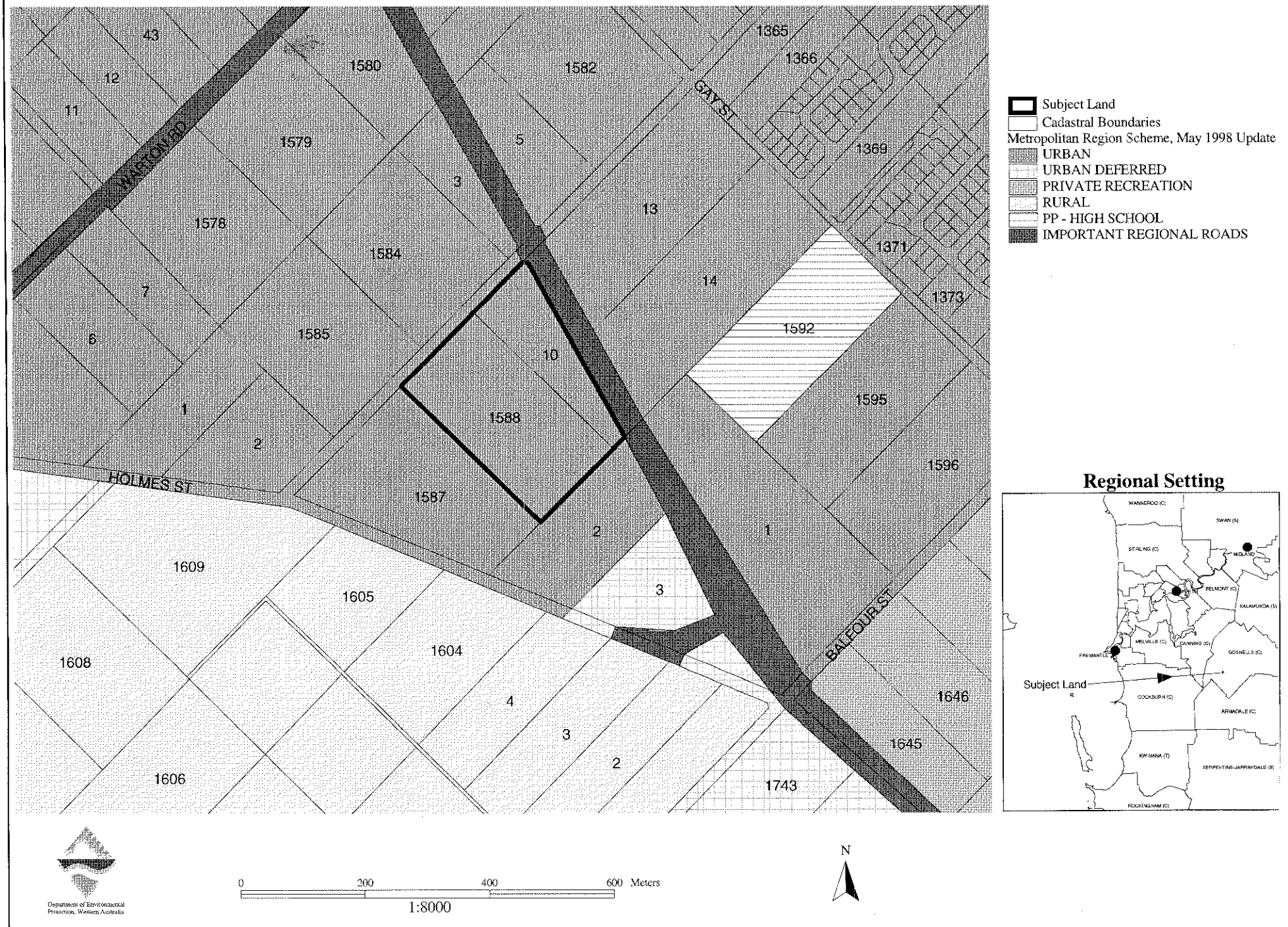
The DEP's summary of submissions and the proponent's response to those submissions has been published separately and is available in conjunction with this report.

2. The proposal

The subdivision application proposes to subdivide Lots 1588 and 10 (7.5 ha) (Figure 1) into 89 residential allotments and access roads (6.8ha), and an area of public open space (0.7ha) (Figure 2). The public open space reserve is proposed to be located on the southern corner of the site, featuring a small portion of the remaining wetland and remnant vegetation.

Lots 1588 and 10 are zoned "Urban" in the Metropolitan Region Scheme and "Residential 17.5" in the City of Gosnells Town Planning Scheme. Prior to any development consistent with this zoning, subdivision approval, which is the subject of this assessment, is required to be given by the City of Gosnells and the Ministry for Planning.

Figure 1. Location map.



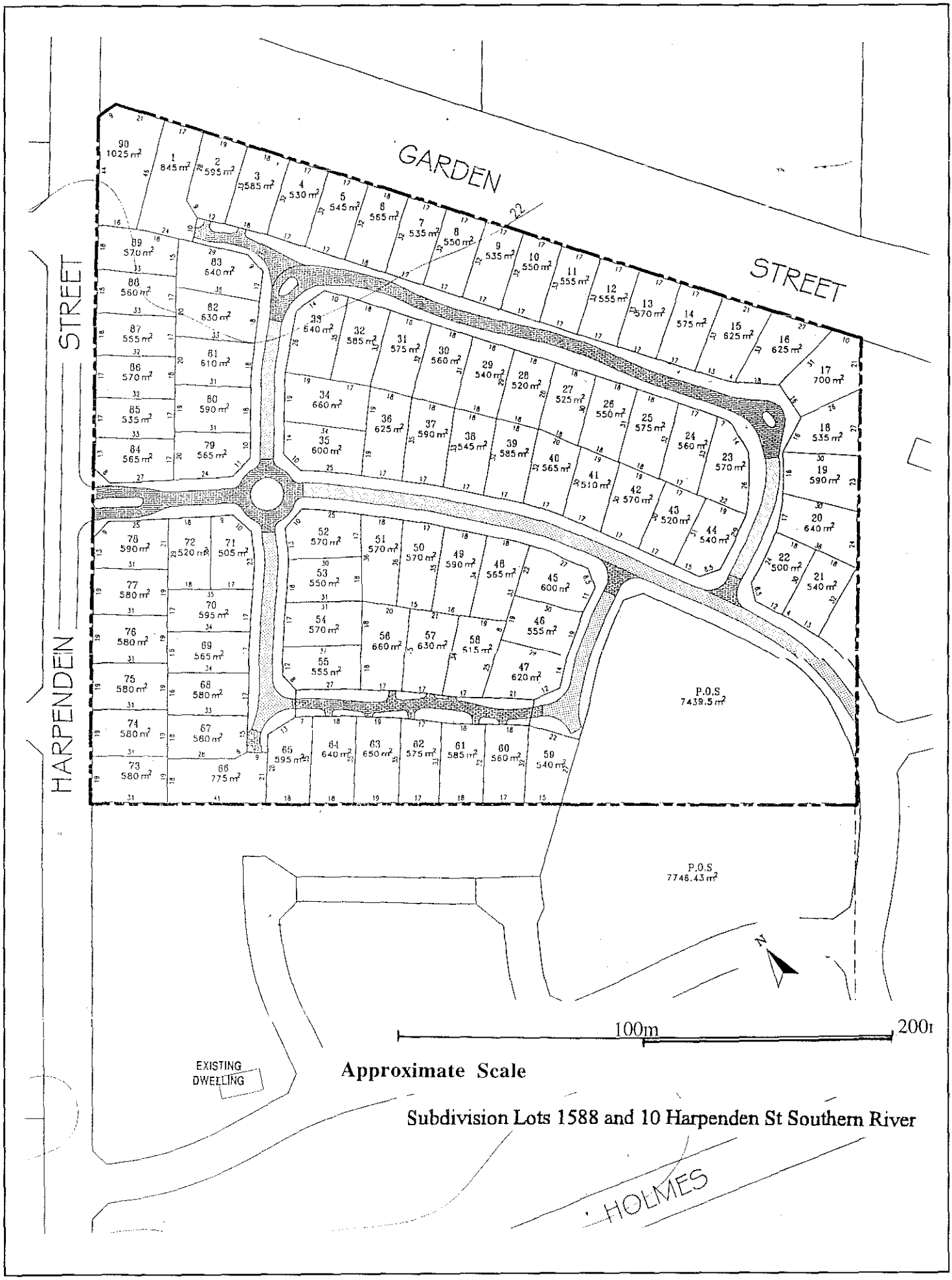


Figure 2. Subdivision plan.

The main characteristics of the proposal are summarised in Table 1 below.

Table 1. Summary of key proposal characteristics

Proposal Characteristic	Description
Proposed Subdivision	• Subdivide lots 1588 and 10 Harpenden Street, Southern River to create 89 residential (R17.5) allotments and access roads in 6.8 hectares and an additional 0.7 hectares of public open space.
Services	• Deep sewerage and internal drainage.
Lots 1588 and 10 Harpenden Street	• The entire subject site (7.5 hectares) supports the Southern River Vegetation Complex. • Approximately 1/3 of the subject area is a vegetated wetland (sumpland). • The subject site is a part of a larger area supporting the Southern River Vegetation Complex

3. Environmental factors

3.1 Relevant environmental factors

Section 44 of the *Environmental Protection Act 1986* requires the EPA to report to the Minister for the Environment on the environmental factors relevant to the proposal and on the conditions and procedures to which the proposal should be subject, if implemented. In addition, the EPA may make recommendations as it sees fit.

It is the EPA's opinion that the following are the environmental factors relevant to the proposal, which require detailed evaluation in this report:

(a) Vegetation Communities - poorly represented regionally significant vegetation communities

(b) Terrestrial Fauna - loss of habitat; and

(c) Wetlands - filling of wetlands.

The above relevant factors were identified from the EPA's consideration and review of all environmental factors (preliminary factors) generated from the targeted review documentation (DEP, 1997a) and the submissions received, in conjunction with the proposal characteristics (including significance of the potential impacts), the adequacy of the proponent's response and commitments, the effectiveness of current management will ensure that the factors will be appropriately managed. On this basis, the EPA considers that the groundwater quality factor and other issues raised in the submissions do not require further evaluation by the EPA. The identification of relevant environmental factors is summarised in Table 2, and a summary of their assessment is set out in Table 3.

The relevant environmental factors are discussed in Sections 3.2 to 3.4 of this report.

3.2 Vegetation communities - poorly represented regionally significant vegetation communities

Description

Lots 1588 and 10 are entirely naturally vegetated, supporting bushland of regional conservation value. The lots are an important part of a larger area containing the Southern River Vegetation Complex (Heddle et al, 1980) supporting poorly reserved plant communities and habitat in very good to excellent condition being a prime example of the complex, both structurally and floristically.

Table 2: Identification of Relevant Environmental Factors

FACTOR	PROPOSAL COMPONENT WITH POSSIBLE IMPACT	GOVERNMENT AGENCY AND PUBLIC COMMENTS	IDENTIFICATION OF RELEVANT ENVIRONMENTAL FACTORS
BIOPHYSICAL			
Vegetation Communities - Clearing 6.8ha of Southern River Vegetation Complex.	6.8ha to be cleared and developed for residential uses. Lots 1588 and 10 (7.5ha) are naturally vegetated wetlands (damplands, sumplands) and uplands of Southern River Vegetation Complex, supporting poorly reserved plant communities and habitat and thus is of regional conservation value. It is estimated that less than 7% of this complex remains on the Swan Coastal Plain (10% metropolitan, 5% regional). Given Government Policy, to conserve 10% of all vegetation complexes in the metropolitan area lots 1588 and 10 are considered to be regionally significant. Vegetation on these lots are in excellent condition and are the largest remaining unprotected area of this complex in the Perth Metropolitan Area.	**Government:** Government's Policy outlined in the Urban Bushland Strategy (MfP 1995) aims to protect 10% of each vegetation complex. The Gosnells City Council acknowledges various studies identifying the subject area of regional significance and does not support the proposal. The Department of Environmental Protection (DEP) and the Ministry for Planning (MfP) developed the bushland strategies rating index identifying vegetation on the subject area to be in Good to Very Good condition. The Water and Rivers Commission (WRC) have classified the subject area as a 'conservation' management category. The Departments of Conservation and Land Management (CALM), DEP, MfP and WRC jointly development Perth's Draft Bushplan nominating lots 1588 and 10 as being regionally significant. **Public:** The Wildflower Society of Western Australia (WSWA), Conservation Council of Western Australia (CCWA) and Friends of Forrestdale (FF) believe subject area is regionally significant as it is the largest remaining unprotected example of Southern River Vegetation Complex. The Armadale Wildflower Society (AWS) and the Urban Bushland Council of Western Australia (UBCWA) supports the vegetation rating index and management categories developed by the DEP MfP and WRC. FF believe development will breach Government Policy to conserve of 10% of all vegetation. Waterbird Conservation Group (WCG), WSWA, AWS, FF and CCWA notes the Southern River Vegetation complex is a threatened ecological community with less than 7% remaining, given Government Policy to protect 10% of all vegetation complexes this area is regionally significant.	Considered to be a relevant factor

		CCWA acknowledges lots 1588 and 10 supports vegetation dominated by *Banksia attenuata* and *Banksia menziesii* having outstanding biodiversity values. WCG, CCWA and UBCWA acknowledge and support Perth's Draft Bushplan. WCG acknowledges the numerous Government reports all supporting the protection of regionally significant sites such as the subject area. **Proponent:** There is no factual evidence substantiating proportion of Southern River Vegetation Complex remaining in Western Australia, (GRA). Perth's Draft Bushplan is a broad document relying on aerial photo and ortho photo mapping not been adopted by government (GRA). Greg Rowe and Associates (GRA) on behalf of Pacesetter Homes (PH) acknowledges the City of Gosnells Survey of Remnant Vegetation and comments that it is clearly unrealistic to consider all existing vegetation has conservation value. The report acknowledges the area is an incomplete representation of the Southern River Vegetation Complex. GRA believes the environmental appraisal undertaken by the EPA identifying vegetation, flora and habitat values of the subject land appears to be lacking in depth and certainty, not recognising the fact that the vegetation is regrowth and not necessarily naturally vegetated bushland.	
Declared Rare and Priority Flora - Clearing resulting in of species.	Two species *Astroloma xerophyllum* and *Blancoa canescens* which are poorly conserved south of the river are identified in significant populations on lots 1588 and 10. In the larger area *Diuris purdiei, Caladenia huegelii* and *Drakaea elastica* declared rare, *Acacia lasiocarpa* var.*bracteolata* being priority one and *Schoenus benthamii* being priority three have been found and may occur in lots 1588 and 10.	**Public:** CC notes lots 1588 and 10 that there are large populations of two species of poorly conserved vegetation, *Astroloma xerophyllum* and *Blancoa canescans*, which are not represented in the Jandakot Botanical Park, and further it is likely that three rare and two priority plant may be present. **Proponent:** CALM has clearly identified a priority 3 species is likely to be on the subject site and that this is widely distributed over the northern Swan coastal (GRA).	These issues are part of the consideration of the relevant factor 'Vegetation Communities'

Fauna - Clearing resulting in loss of habitat.	The significant mammal species Quenda (*Isoodon obesulus*) has been identified to inhabit lots 1588 and 10.	**Public:** The subject area contains vegetation supporting the endangered Southern Brown Bandicoot *(Isoodon obesulus)* (CC, WCG). The subject area is adjacent to the Holmes-Balfour wetland which is a breeding sites for the endangered Freckled Duck *(Sictonetta naevosa)* (WCG). **Proponent:** The subject area is not the Holmes-Balfour wetland, nor do they support permanent or seasonal water bodies. Observations have not indicated waterbird breeding activity (GRA).	Considered to be a relevant factor
Wetlands - Filling of wetlands.	Lots 1588 and 10 support a vegetated wetland, which is seasonally inundated being classified as a "Conservation" category wetland.	**Government:** The primary objective of the Government's Wetland Conservation Policy for Western Australia (1997) it to prevent " the further loss or degradation of valuable wetlands and wetland types.....". Lots 1588 and 10 are identified in the Water Authority of Western Australia report, No WP160 " as a "Conservation" Management Category wetland. "Conservation" wetland management objectives are to - "Maintain and enhance natural attributes and functions" WRC believe that lots are part of a linked wetland system worthy of protection with a land use maintaining the natural values. **Public:** WSWA supports the identification of the Lots being wetlands requiring conservation. CCWA and members of the public believe the lots are critical providing a vital maintaining a network of key wetlands. Given the environmental fragmentation through deveopment conservation is essential to provide resilience and preserve biodiversity. UBCWA acknowledges and supports the view of the WRC. FF and CCWA acknowledges the lots are recognised as critical areas for waterbird breeding in *Wetlands of the Swan Coastal Plain,Wetland mapping, classification and evaluation.* (Balla, 1993). WCG highlighted that Bulletin 717 (EPA, 1993) recommended all "Category C" wetland areas near the proposed Holmes-Balfour wetland reserve should be protected and included. Recommendation No.1 calls for the 'protection of other significant wetlands. CC acknowledges and supports the Water Authority of Western Australia (WAWA) report, No WP160 CCWA believes the draining and filling could adversely impact on the hydrology of the Holmes-Balfour wetland impacting on the endangered Freckled Duck breeding sites. CCWA and FF believe breach the State Government's *Wetlands Conservation Policy for Western Australia,*.	To be considered a relevant factor

		Proponent: The Holmes-Balfour wetland is not contained on the subject area, further the EPA Bulletin 717 has no specific reference to the subject lots (GRA). Assumptions regarding the quality of the dampland were made during the preparation of the WAWA report No. WP160, as a specific site inspection was not conducted (GRA). GRA on behalf of Pacesetter Homes believes reservation is unreasonable as the subdivision includes a Public Open Space reservation incorporating a wetland area as natural reserve.	
POLLUTION			
Groundwater Quality	Lots 1588 and 10 feature a high watertable and are seasonally inundated.	**Government:** The City of Gosnells does not support the subdivision on the grounds it will not be able to meet the aims of Water Sensitive Urban Design. WRC recognise the subject area is identified in the Middle Canning Catchment Water Resources Management Plan as a Category 1 area. WRC believes the Western Australian Planning Commission Development Control Policy DC6.3 should apply as lots 1588 and 10 are a conservation management category (WRC). WRC believe the development proposal is inconsistent with the strategic stormwater management proposals. **Public**: UBCWA and CCWA acknowledge and support the views of the WRC. The proponent believes it is inappropriate for council to change it's view subsequent to the landowner significant resource commitment. Water sensitive urban design can be pursued through prudent engineering design at the development implementation stage (GRA). The presumption against urban development is inappropriate given the "Urban" zoning (GRA). However the proposal has identified and promoted the multiple use corridors objective of the study by the implementation of the Public Open Space system (GRA).	Not considered to be a relevant factor as the groundwater of the site is not a public water supply resource area.

OTHER			
Economic considerations and community expectations		**Public:** Given the cost of acquisition and maintenance of reserves, the use, need for and benefit of to the broader Community must be considered. **Proponent:** GRA on behalf of Pacesetter Homes believes the development of the subject area are important to justify the costs for extending infrastructure into the locality. Successful rezoning at state and local government level has lead to financial and commercial decisions based on the expectation of development.	These issues are not able to be considered as environmental factors.
Planning considerations		**Public:** The development represents an orderly and efficient land use, the exclusion from residential use will be a loss of economic use of roadways and urban services, and impact on the viability of shopping centres and schools. With other planned residential areas immediately to the north west, as well as the east in Huntingdale the retention of useful environmental values on lots with be difficult.	These issues are dealt with by the Ministry for Planning at a regional planning level. Factor does not require further EPA evaluation.

Abbreviation List of Submitters

CoG	City of Gosnells
WSWA	Wildflower Society of Western Australia
UBCWA	Urban Bushland Council of Western Australia
AWS	Armadale Wildflower Society
FF	Friends of Forrestdale
WRC	Water and Rivers Commission
WCG	Waterbird Conservation Group
CCWA	Conservation Council of Western Australia

Table 3: Summary of Assessment of Relevant Environmental Factors

RELEVANT FACTOR	RELEVANT AREA	EPA OBJECTIVES	DEP's ASSESSMENT	EPA ADVICE
Vegetation	Swan Coastal Plain.	Maintain the abundance, species diversity, geographic distribution and productivity of vegetation communities.	The DEP in of the view that Lots 1588 and 10 is of regional conservation significance because: a) the site represents an excellent example of Southern River Vegetation Complex identified by MfP and DEP to be in Good to Very Good condition; b) WRC have classified lots 1588 and 10 as a 'conservation' management category c) CALM, DEP, MfP and WRC jointly development Perth's Draft Bushplan nominating lots 1588 and 10 as being regionally significant. d) The Gosnells City Council acknowledge the various studies having identified the land as containing remnant vegetation in very good condition, of regional significance and does not support the proposal. e) Government's policy is to protect 10% of all vegetation complexes, currently approximately 6% of this complex is protected of approximately 17% of the original complex remains; f) the site represents 7.5 hectares incorporated within a larger 128.7 hectare segment representing approximately 8.3% of the total unsecured nominated area for protection to meet a conservation target of 11%; g) the larger 128ha site, of which the subject site is contained within, is the largest unprotected of the Southern River Vegetation Complex remaining in Very Good condition. h) the subject site supports large populations of *Astroloma xerophyllum* and *Blancoa canescens* which are poorly conserved and supports Jacksonia Sericea a priority 3 species.	• The EPA objective cannot be met if this proposal was to proceed. • The EPA advise Minister to make a decision on the protection of the subject area from development within the context of decisions to protect or otherwise the adjoining "urban" zoned land identified in the Draft Perth Bushplan.

			The subject area is a core segment of a larger area which is divided into two urban and rural zoned areas. The regional conservation value of the subject area is dependant on the conservation of the remaining urban zoned land.	
Terrestrial Fauna	South-east Corridor of the Perth Metropolitan Area.	Maintain the abundance, species diversity and geographical distribution of terrestrial fauna	Lot 1588 and 10 supports contains vegetation supporting the endangered Southern Brown Bandicoot (*Isoodon obsulus*). In addition the DEP is of the view that the subject site is likely to support diverse fauna species dependant on the two habitat types present which have suffered significant reduction on the Swan Coastal Plain.	• EPA objective cannot be met it this proposal was to proceed.
Wetlands	Swan Coastal Plain	Maintain the integrity, functions and environmental values of wetlands.	Approximately 1/3 of lots 1588 and 10 (total 7.5ha) are vegetated basin wetlands. The proposal has reserved a portion (0.7 ha) of the southern corner damplands as Public Open Space, however fills in the larger segment of wetland situated in the centre of the site. The DEP believes the site may be inappropriate for subdivision as; a) Water Authority of Western Australia report, No WP160, (1993), identified the subject site as "Conservation" Management Category wetland. b) WRC believe the lots form part of a linked wetland system which should be protected with a land use that maintains the natural values such as public open space.	• Based on advice from WAWA and WRC the EPA objective cannot be met.

The Southern River Vegetation Complex is inherently diverse due to the variability of the underlying landform/soil unit, forming an interzone between the higher parts of the Bassendean Dunes and Pinjarra Plain. The underlying unit is the Southern River unit of Churchward and McArthur (1980). This landform/soil unit is a "Sandplain with low dunes and many intervening swamps; iron and humus podzols, peats and clays." (Churchward and McArthur, 1980). The sand sheet of the Southern River unit represents the eastern fringe of the Bassendean Dunes where the sand sheet is thin, with the underlying clays (derived from the Darling Plateau) often exposed in the bottoms of the swamps. The soil is therefore more variable than in the Bassendean unit and the depth to water is often less. Three factors: variable topography, variable soil and variable water relations combine to give the Southern River Vegetation Complex a wide range of plant communities that occur in a mosaic fashion, often with many plant communities in a very small area. A further factor contributing to the diversity in the plant communities developed within the Southern River Vegetation Complex is the variation in climate that occurs over the range of the complex; likely to be important here is a significant drop in rainfall from south to north.

The Southern River Vegetation Complex originally occurred in several discrete blocks from near Bunbury to south-east of Gnangara Lake (Figure 3). However, this vegetation complex has been extensively cleared for agricultural, urban, commercial and industrial development. Trudgen and Keighery (1995, p12) estimated that 5-7% of the original extent of the complex remained on the Swan Coastal Plain and argued that "with at the most five to seven percent of it's total original area remaining, it should be considered to be a rare and endangered ecosystem". Dixon et al (1994, p61.) estimated that 18% of the Southern River Vegetation Complex originally in the Perth Metropolitan Area remains uncleared. However, this figure was based on earlier (prior to 1994) aerial photography and significant amounts of the complex within the Perth Metropolitan Area have been cleared or approved for development since that time. A significant proportion of the remaining Southern River Vegetation Complex is in small remnants. While these can maintain significant vegetation and flora conservation values, small remnants are less desirable for reserves due to the need for more intensive management and their lower values for maintaining populations of larger fauna and in the longer term other species (both flora and fauna). There are some larger remnants, including one at Perth Airport, much of which could be subject to development as proposed in the Perth International Airport, Preliminary Draft Master Plan and Environmental Strategy (1998), another south-east of Gnangara Lake, the one which Lots 1588 and 10 are in, one north of Forrestdale Lake and a few in the southern part of the distribution of the complex. Even these remnants have irregular outlines and some are crossed by powerlines and transport corridors.

The reservation status of the Southern River Vegetation Complex is very poor with one small area in the Tuart Forest National Park (formally Ludlow State Forest) and six very small to moderate sized areas in nature reserves (Figure 3). Two of these are in the Perth Metropolitan Area, being Piara Nature Reserve and Forrestdale Lake Nature Reserve, the later being predominantly water body. Therefore, there are no major reserves of, or containing, significant amounts of the Southern River Vegetation Complex. In addition to this, some of the existing reserves (particularly those isolated in agricultural areas or containing service corridors) have been partly degraded by grazing, weed invasion and infection by dieback, the latter being a particular problem in lower lying areas of the Southern River Vegetation Complex.

The State Government's "Urban Bushland Strategy" (MfP. 1995, p5) aims to protect "not less than 10 percent of each vegetation complex" in "not less than five separate areas" in the Perth Metropolitan Area. It is desirable for remnants to be protected in larger areas, to maximise the long term nature conservation nature and minimise management costs. Depending on the exact amount of the Southern River Vegetation Complex remaining and how much of this is in the Perth Metropolitan Area, all of the larger blocks which remain in the Perth Metropolitan Area would need to be protected to meet the aim for this area. One of these areas, at Perth Airport, is on Commonwealth land and is not subject to State Government Control.

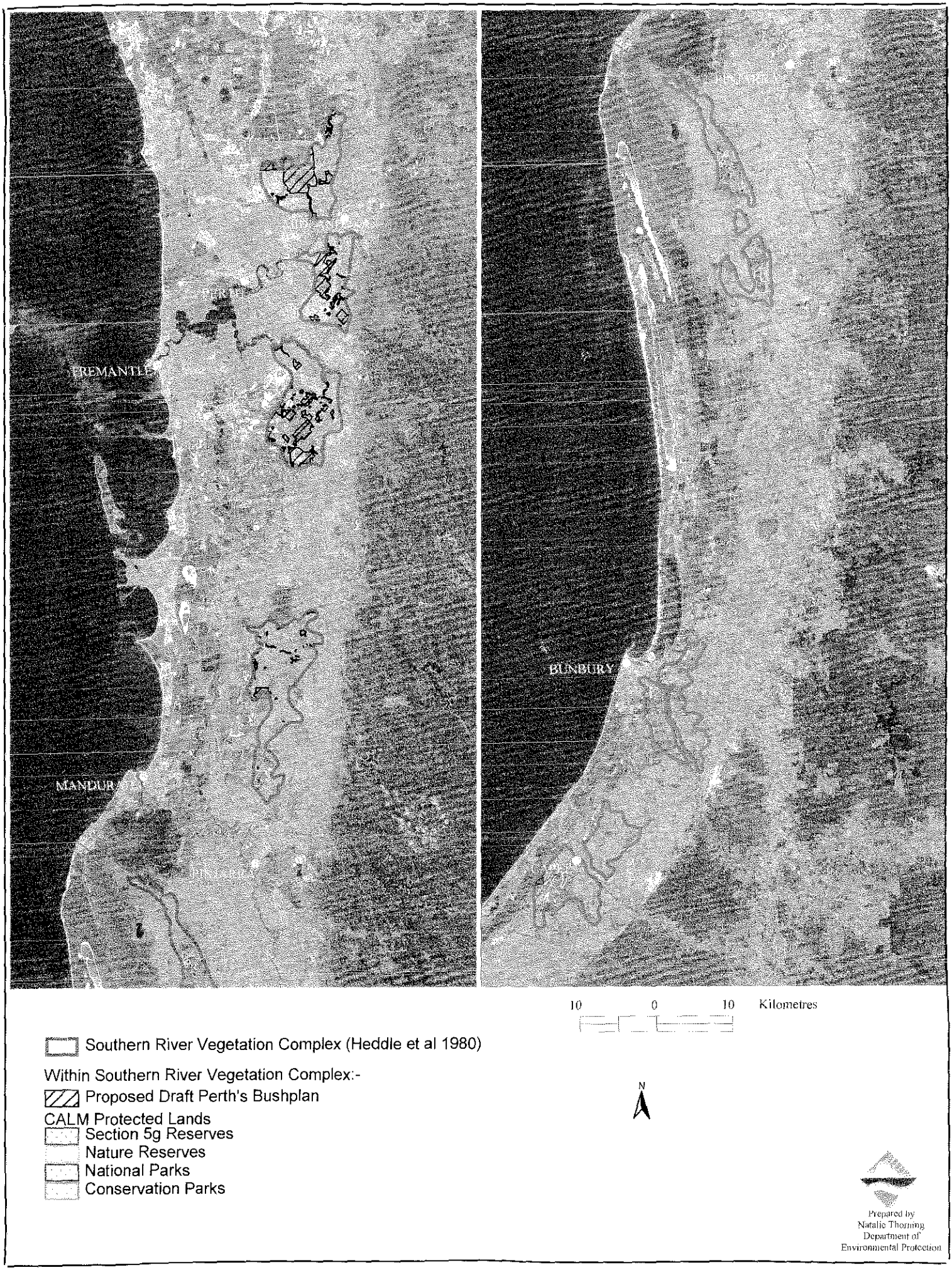


Figure 3. Distribution of the Southern River Vegetation Complex originally on the Swan Coastal Plain.

Lots 1588 and 10 are part of a remnant area (Figure 4) that Trudgen and Keighery (1995, p266) recommended should "be protected with the purpose of conservation of nature and recreation compatible with the conservation of nature." because of its conservation value, which they described in the following way:

> "This remnant (or group of remnants) has a range of habitat types and a large range of vegetation types, including:
>
> - a range of Banksia woodland vegetation from that found on very low sand drifts through to that found on moderate sized dunes.
> - a range of wetland vegetation including areas dominated by Melaleuca rhaphiophylla and other Melaleuca species.
> - a range of dampland vegetation types including areas with heaths, areas with Melaleuca preissiana (Paperbark) and various shrub and sedge communities (including some found on heavy soils). The Melaleuca preissiana stands include one that is probably the best remaining in the City of Gosnells, although it has been recently burnt (this species regenerates well from the branches).
>
> This vegetation is a good sample, although not a complete representation, of the vegetation of the Southern River Vegetation Complex. Consequently, the area has very high conservation value for the vegetation of the Southern River Vegetation Complex. It is probably one of the best remaining chances to protect a good sized area of the Southern River Vegetation Complex (although there may be some in the Armadale area that have similar size (but not necessarily the same values for vegetation and flora).
>
> Although the flora of the area has not been comprehensively surveyed, it is obvious from the lists of associated species in the site descriptions given above that the area has a large flora, as would be expected given the range of habitat and vegetation types represented. Consequently, the area has high value for the conservation of the flora species present. It is likely that this includes populations of a number of priority species, although searches for these were beyond the scope of this survey. One poorly collected species recorded was Villarsia violifolia, another is Levenhookia preissii, which has been recommended for placing on the CALM priority list.
>
> As well as having value for the conservation of vegetation and flora found in it, the area has other values:
>
> - it has significant landscape value.
> - it provides habitat for a significant number of birds and other animals, probably including bandicoots (the characteristic runs of bandicoots were seen at one locality).
> - it has very significant value as part of the network of remnant bushland remaining in the City of Gosnells and adjoining areas.
> - has very significant value for the protection of a range of geomorphological types found in the Southern River Soil unit.
> - it has very significant value for scientific research into vegetation, flora, fauna and geomorphology.
> - it is large enough to maintain conservation values while being used for appropriate levels of passive recreation and/or tourism.
> - it has significant value as an educational resource" (Trudgen and Keighery, 1995, p266)

Trudgen and Keighery's (1995) description of the vegetation is reproduced in Appendix 4.

The vegetation found on Lots 1588 and 10 contains a subset of that recorded for the overall remnant. Vegetation types present include:

> "On low sand dunes: *Banksia attenuata, Banksia menziesii* low woodland to low open forest with *Melaleuca thymoides* and *Eremaea pauciflora* prominent in the shrub layer and the poorly conserved *Blancoa canescens* common in the herb layer (Trudgen and Keighery 1995, see site 78 in Appendix 1, the same area revisited by Keighery in 1997);
>
> On the ecotone next to the wetlands: *Melaleuca preissiana* low open woodland with *Regelia* in the shrub layer and sedges in the lower layer (from observations in the adjoining block and aerial photograph interpretation);
>
> In the wetlands: a variety of vegetation including scattered *Melaleuca preissiana* (Paperbark) trees over *Pericalymma ellipticum, Regelia ciliata* heath with *Euchilopsis linearis, Phlebocarya ciliata* and *Schoenus rigens* common in the lower layers" (DEP 1997b).

The native vegetation plant communities found on Lots 1588 and 10 are typical of the variation found in the Southern River Vegetation Complex in the southern part of the Perth Metropolitan Area. The diversity found is what would be expected for an area of the size of the two lots.

Lots 1588 and 10 are centrally located in the area of remnant vegetation north of Holmes Street (Figure 4). However, areas of the remnant north of Holmes Street have been approved for development. Therefore the remnant north of Holmes Street will become an irregular strip parallel to Holmes Street equivalent to Perth's Draft Bushplan boundary (Figure 4). Lots 1588 and 10 lie in the centre of this strip. Clearing lots 1588 and 10 will significantly reduce the integrity and size of the remnant, reducing the part of the remnant north of Holmes Street by approximately 10% and the overall remnant by about 5% (excluding the areas already approved for development).

In addition to value for the Southern River Vegetation Complex and its plant communities the overall remnant, including Lots 1588 and 10, have value for flora species. Trudgen and Keighery (1995) recorded 185 native flora species for the overall remnant but did not visit the area in spring and did not attempt to compile a complete flora list. Detailed survey would be expected to show a total flora of about 300 native species for the overall remnant with more than 200 native species likely to occur on Lots 1588 and 10. The Declared Rare Flora Species *Diuris purdiei, Caladenia huegelii*, and *Drakaea elastica* and the Priority Flora species *Acacia lasiocarpa* var. *bracteolata* (Priority 1) and *Schoenus benthamii* (Priority 3) have been recorded in the overall remnant and may be present on Lots 1588 and 10 as suitable habitat occurs there. Significant populations of *Astroloma xerophyllum* and *Blancoa canescens* that are both poorly conserved south of the Swan River are present on Lots 1588 and 10. In the absence of a spring flora survey, the possible presence of other Declared Rare Flora or Priority Flora cannot be excluded.

The examination of Lots 1588 and 10 as part of Remnant 6 of Trudgen and Keighery (1995) gives an indication of the value of vegetation on the subject area as part of one of the largest remaining remnants of the Southern River Vegetation Complex. However, this does not adequately indicate the value of the subject area in context of the remaining native vegetation, wetlands and habitat for flora and fauna provided by the area surrounding Remnant 6. This value can be understood from examination of Figure 5. Lots 1588 and 10 are part of a network of linked areas of remnant vegetation of very high conservation value that is one of the best such groups in the Perth Metropolitan Area. Figure 5 shows the part of Remnant 6 of Trudgen and Keighery (1996) that is included in the draft of Perth's Bushplan, as part of a larger area that Evangelisti & and Associates et al (1996) map as "Category One" under their "Opportunities and Constraints to Urbanisation" mapping. Evangelisti & Associates et al

Figure 4. Distribution of remnant vegetation surrounding lots 1588 and 10, Harpenden Street, Southern River.

(1996) define category one areas as those "Areas considered inappropriate and/or unsuitable for any development".

The larger are of remnant vegetation can be broadly divided into northern and southern sections. The southern section is zoned "rural" while, the northern section, in which the subject area is centrally located, is zoned "urban" in both the Metropolitan Region Scheme (Figure 1) and the City of Gosnells Town Planning Scheme.

Submissions received from the Ministry for Planning (MfP), Conservation and Land Management (CALM), Water and River Commission (WRC), the City of Gosnells (CG), Wildflower Society of Western Australia (WSWA) Conservation Council of Western Australia (CCWA), Friends of Forestdale (FF),the Armadale Wildflower Society (AWS), Urban Bushland Council Western Australia (UBCWA) and the Waterbird Conservation Group (WCG) referred to this issue making similar points to the above information.

CG, CALM, WSWA, CCWA and FF believe that the subject area is regionally significant as it is the largest remaining unprotected example of Southern River Vegetation Complex. WCG, WSWA, AWS, FF and CCWA notes the Southern River Vegetation complex is a threatened ecological community with less than 7% remaining and, in the context of the Government Policy to protect 10% of all vegetation complexes, this area is regionally significant. WRC acknowledged the subject area's classification as a 'Conservation' management category wetland.

Greg Rowe and Associates (GRA) on behalf of the proponent, Pacesetter Homes, believes there is no factual evidence substantiating the proportion of Southern River Vegetation Complex remaining in Western Australia. Further GRA, states that the environmental appraisal undertaken by the EPA identifying vegetation, flora and habitat values of the subject land appears to be lacking in depth and certainty, not recognising the fact that the vegetation is regrowth and not necessarily naturally vegetated bushland.

In addition, GRA pointed out that the City of Gosnells Survey of Remnant Vegetation stated that the area is an incomplete representation of the whole range of the Southern River Vegetation Complex and commented that it is clearly unrealistic to consider all existing vegetation has conservation value.

Assessment

The area considered for assessment of this factor is the Swan Coastal Plain.

The EPA's objective in regard to this environmental factor is to maintain the abundance, species diversity, geographic distribution and productivity of vegetation communities. In addition the EPA acknowledges the Government's Urban Bushland Strategy target of reserving "not less than 10% of each vegetation complex" (MfP, 1995. p5) in the Perth Metropolitan Area.

The vegetation supported on Lots 1588 and 10 is considered to be of high regional significance, being an important part of an excellent example of the poorly conserved Southern River Vegetation Complex. The larger area of remnant vegetation in which the subject area is contained within is rated as an excellent example of the Southern River Vegetation Complex as it is one of the largest remaining remnants of the complex, having a high diversity of vegetation in very good to excellent condition with low weed invasion.

Lots 1588 and 10 form a key segment in the larger area of remnant vegetation north of Holmes Street. Thus clearing the lots would reduce the value of the overall remnant, particularly the section north of Holmes Street. The proportion of lots 1588 and 10 as compared to the larger area of remnant vegetation is not an accurate indication of their value, as their location provides an important link to other areas of remnant vegetation within this larger area. The reduction in value would be further exacerbated by the construction of Harpenden Street through to Holmes Street.

The protection of vegetation on the subject area and the surrounding larger area of remnant vegetation is very important for meeting both the EPA's objectives for protection of vegetation communities and the objectives of the State Government's Urban Bushland Strategy. The

Southern River Vegetation Complex is not well represented in any major national park or nature reserve.

Given the proposed lot sizes (500-1025m^2) and associated infrastructure, it cannot be expected that any vegetation would be protected within the development area other than the portion in the Public Open Space (7439m^2) proposed by the proponent. Due to the small area proposed for Public Open Space the long term protection of the vegetation values could not be assured without intensive management. The difficulty of management would be reduced if the area was contiguous with adjoining areas that became protected as a result of the Bushplan process.

As a consequence of the area's importance for meeting vegetation conservation objectives, Government policy, and the high values of the overall remnant, it has been nominated for protection under Perth's Draft Bushplan (MfP, 1998 in preparation). The Draft Bushplan contains nominations for the reservation throughout the Perth Metropolitan Area to achieve, as far as possible, a comprehensive representation of the original biological diversity of the region. Nominations for reservation include both "rural" and "urban" zoned land. It is understood that all nominated land zoned "rural" may be acquired and subsequently reserved.

The EPA believes that the development of Lots 1588 and 10 should not proceed. The EPA recognises that there is an expectation for areas zoned "urban" to be used for that purpose. However, Lots 1588 and 10 are an integral part of a larger area requiring conservation and is an important element of the Government's Urban Bushland Strategy.

If, however, following the due process of considering the EPA report, a decision was taken to permit development of the land (Lots 1588 and 10) in accordance with it's zoning, the EPA has proposed in it's recommendations that such development be in accordance with the requirements as set out in the Conditions in Appendix 3.

Having particular regard to:

(a) the commitment made by the proponent that only 0.7ha of the site will be included in Public Open Space to conserve remnant vegetation.

(b) the regional significance of the vegetation on the subject area; and

(c) the subject area representing a significant location with in the larger area of regionally significant vegetation.

(d) all remnant areas of Soothern River Vegetation Complex need to be conserved in order to achieve 70% of the government's target for conservation of this complex;

it is the EPA's opinion that the proposal cannot meet the EPA's objective for Vegetation Communities.

3.3 Terrestrial fauna - Clearing resulting in loss of habitat

Description

Lots 1588 and 10 contain two major fauna habitat types, *Banksia* woodlands and seasonal wetlands. The *Banksia* woodlands and wetlands each provide habitat for a wide range of fauna, including mammals, reptiles, amphibians (frogs), birds and insects. The presence of two habitat types together on lots 1588 and 10 have additional (synergistic) value as some species, such as the Southern Brown Bandicoot (*Isoodon obesulus*), use different habitats at specific times of the year, as compared to other species using both habitats. As a consequence of the habitat values they provide, Banksia woodlands have a significant role to play in retaining fauna species on the Swan Coastal Plain (How and Dell 1989). Wetlands, including ephemeral wetlands, have a similar role, particularly for amphibian species.

The fauna occupying *Banksia* woodlands varies according to the woodlands location on different geomorphic units of the Swan Coastal Plain. Greater reptile species richness occurs on the more western woodlands and greater amphibian diversity in the more eastern wetlands (How et al. 1996). The juxtaposition of *Banksia* woodlands and ephemeral swamps on the

Bassendean landform (part of which the Southern River Vegetation Complex occupies, see 3.2 above) plays an important part in providing diverse habitats for amphibians, birds and reptiles. The significant value for fauna in areas with such mixed habitats within the Southern River Vegetation Complex has been shown at Perth Airport, where adjacent ephemeral wetlands and Banksia woodlands support eight frogs, 20 reptiles and 84 bird species (How et al, 1996, p33-34). A similar diversity of fauna could be expected for the larger area of remnant vegetation in which Lots 1588 and 10 are contained.

Faunal assemblage data on remnant bushlands in the Perth Metropolitan Area has shown a highly significant and positive relationship between the area of bushland remnant and species richness for both bird and reptile assemblages (How et al. 1996, p94-95). Amphibian diversity is highly dependent on the presence of permanent or ephemeral waterbodies. These relationships between the size of remnants, habitat diversity and the size of the fauna present show that the continued reduction in the size of remnants such as the large area of remnant vegetation in which Lots 1588 and 10 are contained reduce the overall abundance of the fauna and can impact on the diversity of fauna present.

Submissions received from CCWA and WCG acknowledged the subject area contains vegetation supporting the endangered Southern Brown Bandicoot. GRA acknowledged that observations of local residents have not indicated waterbird breeding activity.

Assessment

The area considered for assessment of this factor is the Swan Coastal Plain.

The EPA's objective in regard to this environmental factor is to maintain the abundance, species diversity and geographical distribution of terrestrial fauna.

Having particular regard to the:

(a) the commitment made by the proponent that only 0.7ha of the site will be included in Public Open Space;

(b) subject land containing habitat supporting the Southern Brown Bandicoot;

(c) likely occurrence of diverse fauna on the subject land; and

(d) fauna species dependant on the two habitat types present on Lots 1588 and 10 have suffered significant reduction on the Swan Coastal Plain;

it is the EPA's opinion that the proposal cannot meet the EPA's objective for Terrestrial Fauna.

3.4 Wetlands - Filling of wetlands

Description

Approximately one third of Lots 1588 and 10 are seasonal wetlands or damplands having scattered *Melaleuca preissiana* (Freshwater Paperbark) over *Pericalymma ellipticum, Regelia ciliata* heath (DEP, 1997). These wetlands are part of the Bennet Brook group of wetlands, one of 32 wetlands suites mapped by C.A. Semeniuk between Gingin and Mandurah being "Depressions which intersect the water table" (Payne, 1993, p57).

These wetlands were referred to as the Holmes/Harpenden Street damplands and assigned as a "Conservation" category wetlands on the basis the mapping System of Semeniuk (1987a) and Bulletin 374 (EPA, 1990), (Payne, 1993, p25). "Conservation" category wetlands have a high degree of naturalness and a management objective to "Maintain and enhance natural attributes and functions." (Payne 1993, p. 16). These damplands are considered as wetlands due to their seasonal waterlogging and wetland vegetation sedges having " surface water for a few days or weeks following heavy rain events" (Payne 1993, p. 13).

"The southern damplands and sumplands are the most poorly understood and reserved of the City's wetlands" (Payne 1993, p. 16). "The City's damplands are especially important for their

floristic diversity and provide habitat for the Southern Brown Bandicoot. Conservation of these dampland habitats is important if the diversity of Perth's wetland types and species is to be maintained. The vegetated damplands and palausplain in the City of Gosnells are of regional importance as most of Perth's other seasonally waterlogged areas have been lost or severely degraded by development (Payne 1993, p. 16). In addition these wetlands have been recognised as prime breeding sites for waterbirds (S. Halse, CALM, pers. comm.) and as areas of botanical richness.

The wetlands on Lots 1588 and 10 are considered a "Category 1" area in the Middle Canning Catchment Water Resources Management Plan (Evangelisti and Associates, 1996). Category 1 is defined as an "area considered inappropriate and/or unsuitable for any development". The Waters and Rivers Commission (WRC) has expressed concern with regard to the proposed development on Lots 1588 and 10 as "it is a sensitive water resource area and Western Australian Planning Commission Development Control policy DC6.3 should apply" and that development proposal in this area is inconsistent with the strategic stormwater management proposals for the area. Development on this block is also inconsistent with the need to systematically implement responsibility and coordinated land and water planning as described in the Middle Canning Catchment study" (WRC, 1998).

In addition WRC has indicated that the site is part of a link of wetlands which should be protected and further advises that it considers the most appropriate use would one maintaining natural values such as public open space (WRC, 1998).

The wetlands on Lots 1588 and 10 are separated from the Holmes/Balfour sumpland by a low dune upon which Holmes Street is located. The Holmes/Balfour sumpland is a "Conservation" category wetland under the classification used in Bulletin 374 (EPA, 1990) and is a recorded breeding site for the Freckled Duck (*Stictonetta naevosa*). The dampland and other native vegetation on Lots 1588 and 10 provide a partial buffer for the Holmes/Balfour sumpland. In its submission the Waterbird Conservation Group stressed this value saying "Undoubtedly Holmes-Balfour wetland's values are protected and enhanced by the presence of the adjacent wetlands to the north at Harpenden Street and there is ample scientific studies published to support this view...".

The Government's Wetland Conservation Policy for Western Australia (1997) is relevant to the consideration of the wetland on Lots 1588 and 10. The primary objective of this policy is to prevent "the further loss or degradation of valuable wetlands and wetland types, and promote wetland conservation, creation and restoration".

Submissions received from WRC, WSWA, CCWA, FF, UBCWA and WCG referred to this issue making similar points to the above information.

WRC, CCWA, WCG, UBCWA and CC acknowledged the Water Authority of Western Australia's report, No WP160 recognising the subject area as a "Conservation" Management Category wetland and further suggested that lots 1588 and 10 are part of a linked wetland system worthy of protection with a land use maintaining the natural values.

GRA believes assumptions regarding the quality of the dampland were made during the preparation of the WAWA report No. WP160, as a specific site inspection was not conducted and further that the reservation is unreasonable as the subdivision includes a Public Open Space reservation incorporating a wetland area as natural reserve.

Assessment

The area considered for assessment of this factor is the Swan Coastal Plain

The EPA's objective in regard to this environmental factor is to maintain the integrity, functions and environmental values of wetlands.

The scale of value of the wetlands of the Swan Coastal Plain for fauna, and the scale of loss that has already occurred has been summed up in the following way (Balla 1993) "The wetlands of

the Swan Coastal Plain provide a habitat for many millions of animals and plants. Prior to European settlement the flora and fauna of these wetlands would have been as rich and diverse as the wetlands of Kakadu today. Many of the wetlands that once existed on the Swan Coastal Plain have been filled, drained, mined for peat or clay, or cleared of vegetation."

The proponent has made a commitment to reserve a 0.7ha area of wetland as Public Open Space from the 7.5ha subject site. It is the proponent's intention that this small portion of wetland featured will join with an additional 0.7ha of public open space in a future development proposal (Figure 2). Development of the remainder of the lots will lead to the loss of 1.7ha of "Conservation" category wetlands

Having particular regard to the:

(a) existence of a 2.5ha "Conservation" category wetland on the site;

(b) commitment made by the proponent that only 0.7ha of "Conservation" category wetland on the site will be included in Public Open Space; and

(c) advice from the WRC pertaining to the protection of "Conservation" management category;

it is the EPA's opinion that the proposal cannot meet the EPA's objective for Wetlands.

4. Other advice

The EPA is aware that at some time in the future Harpenden Street may be extended south-east into the larger area of remnant vegetation considered to be of regional conservation significance in order to achieve the conservation of 10% of all vegetation complexes as outlined in the government endorsed 'Urban Bushland Strategy" (MfP, 1995). In addition, it is possible that Garden Street may be constructed which would also impact on this area. Although, the construction of these roads is beyond the context of the present assessment, their construction would also impact on the vegetation, flora, fauna and wetland values present in the part of the area north of Holmes Street.

5. Conditions

Section 44 of the *Environmental Protection Act 1986* requires the EPA to report to the Minister for the Environment on the environmental factors relevant to the proposal and on the conditions and procedures to which the proposal should be subject, if implemented. In addition, the EPA may make recommendations as it sees fit.

In developing recommended conditions for each project, the EPA's preferred course of action is to have the proponent provide an array of commitments to ameliorate the impacts of the proposal on the environment. The commitments are considered by the EPA as part of its assessment of the proposal, and following discussion with the proponent the EPA may seek additional commitments.

The EPA recognises that not all of the commitments are written in a form which makes them readily enforceable, but they do provide a clear statement of the action to be taken as part of the proponent's responsibility for and commitment to continuous improvement in environmental performance. The commitments, modified if necessary to ensure enforcability, then form part of the conditions to which the proposal should be subject if it is to be implemented.

The EPA may, of course, also recommend conditions additional to that relating to the proponent's commitments.

Having considered the proposal by Pacesetter Homes and the information provided in this report, the EPA has developed a condition which the EPA recommends be imposed if the proposal by Pacesetter Homes to subdivide lots 1588 and 10 Harpenden Street, Southern River, is approved for implementation. This condition is presented in Appendix 3.

Matters addressed in the conditions include:

1. The Minister for the Environment on advice of the Environmental Protection Authority and the Department of Conservation and Land Management, and the Minister for Planning on advice of the Western Australian Planning Commission identify the portion of remnant vegetation on Lots 1588 and 10 Harpenden Street to be protected from development, taking into account the conservation significance of the vegetation on the site as well as the linkages of remnant vegetation within the site and with remnant vegetation to be protected on adjoining land.

6. Conclusions

The EPA has considered the proposal by Pacesetter Homes to subdivide lots 1588 and 10 Harpenden Street, Southern River, Gosnells, to create 89 residential allotments and has concluded that the proposal cannot be implemented to meet the objectives of the EPA without having an unacceptable impact on the remnant vegetation, fauna and wetlands.

Lots 1588 and 10 are entirely vegetated, supporting an example of the Southern River Vegetation complex. One third of the site (Lots 1588 and 10) is sumpland classified as a "Conservation" Wetland by WRC but without any protection status. Lots 1588 and 10 is a 7.5 hectare site contained within a larger area of remnant vegetation of 128 hectares identified as being regionally significant in order to achieve Government Policy (the conservation of 10% of all vegetation complexes) as outlined in the government endorsed 'Urban Bushland Strategy" (MfP, 1995). The larger area, of remnant vegetation which Lots 1588 and 10 are centrally located, is the largest remaining unprotected example of Southern River Vegetation Complex in the Swan Coastal Plain.

The EPA believes that the development of Lots 1588 and 10 should not proceed. The EPA recognises that there is an expectation for areas zoned "urban" to be used for that purpose. However, Lots 1588 and 10 are an integral part of a larger area requiring conservation and is an important element of the Government's Urban Bushland Strategy.

If, however, following the due process of considering the EPA report, a decision was taken to permit development of the land (Lots 1588 and 10) in accordance with it's zoning, the EPA has proposed in it's recommendations that such development be in accordance with the requirements as set out in the Conditions in Appendix 3.

7. Recommendations

Section 44 of the *Environmental Protection Act 1986* requires the EPA to report to the Minister for the Environment on the environmental factors relevant to the proposal and on the conditions and procedures to which the proposal should be subject, if implemented. In addition, the EPA may make recommendations as it sees fit.

The EPA submits the following recommendations to the Minister for the Environment:

1. That the Minister considers the report on the relevant environmental factors of Vegetation Communities, Terrestrial Fauna, and Wetlands set out is Section 3;
2. That the Minister notes the proposal is contained within an area forming an integral link with a larger area of remnant vegetation recommended for protection in order to achieve the conservation of 10% of all vegetation complexes as outlined in the government endorsed 'Urban Bushland Strategy" (MfP, 1995);
3. That the Minister notes the EPA has concluded that the proposal cannot be managed to meet the EPA's objectives pertaining to the management of vegetation communities and wetlands and thus the EPA recommends that the proposal not be implemented;
4. That the Minister note that whilst the EPA has recommended that the proposal not be implemented, it has provided advice that if, following consideration through due process, the Minister determines that the development of the land may be permitted it should be

subject to the conditions and procedures consistent with Section 4 and set out in formal detail in Appendix 3 of this report; and

5. That the Minister notes "Other Advice" that construction of Garden Street and the south-east extension of Harpenden Street would result in the loss of remnant vegetation considered to be of regional conservation significance and that their construction would impact on the vegetation, flora, fauna and wetland values present in the part of the Bushplan area north of Holmes Street.

Appendix 1

List of submitters

List of organisations and individual who made submissions

Organisations:

Greg Rowe and Associates
City of Gosnells
Wildflower Society of Western Australia
Urban Bushland Council of Western Australia
Armadale Wildflower Society
Friends of Forestdale
Water and Rivers Commission
Waterbird Conservation Group
Conservation Council of Western Australia

Individual:

J. Payne, Mt Lawley
E. Dove, North Perth
D. James, Forrestdale
S. & M. Telford, Armadale
P.J. Logan, Southern River

Appendix 2

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References

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Waterbird Conservation Group (Inc.), letter to The Chairman, Environmental Protection Authority, dated 30/1/1998.

Appendix 3

Ministerial Condition

Statement No.

STATEMENT THAT A PROPOSAL MAY BE IMPLEMENTED (PURSUANT TO THE PROVISIONS OF THE ENVIRONMENTAL PROTECTION ACT 1986)

SUBDIVISION OF LOTS 1588 AND 10 HARPENDEN STREET, SOUTHERN RIVER CITY OF GOSNELLS

Proposal:	*The subdivision of lot 1588 certificate of title volume 1079 and folio 342 and lot 10 certificate of title volume 1311 and folio 680 Harpenden Street, Southern River, City of Gosnells, for residential lots, roads and public open space.*
Proponent:	*Pacesetter Homes Pty Ltd*
Proponent Address:	*2 Sleat Street, APPLECROSS WA 6153*
Assessment Number:	*1166*

Report of the Environmental Protection Authority: *Bulletin 895*

The proposal to which the above report of the Environmental Protection Authority relates may be implemented subject to the following conditions and procedures:

1 Implementation

1-1 The proponent shall only subdivide or develop the site consistent with the outcomes resulting from procedure 2 below, to the requirements of the Minister for the Environment on advice of the Western Australian Planning Commission and the Department of Environmental Protection.

2 Regionally Significant Remnant Vegetation (Procedure)

2-1 The Minister for the Environment on advice of the Environmental Protection Authority and the Department of Conservation and Land Management, and the Minister for Planning on advice of the Western Australian Planning Commission identify the portion of remnant vegetation on Lots 1588 and 10 Harpenden Street to be protected from development, taking into account the linkages of remnant vegetation within the site and with remnant vegetation to be protected on adjoining land.

3 Proponent

3-1 The proponent for the time being nominated by the Minister for the Environment under section 38(6) or (7) of the Environmental Protection Act is responsible for the implementation of the proposal until such time as the Minister for the Environment has exercised the Minister's power under section 38(7) of the Act to revoke the nomination of that proponent and nominate another person in respect of the proposal.

3-2 Any request for the exercise of that power of the Minister referred to in condition 3-1 shall be accompanied by a copy of this statement endorsed with an undertaking by the proposed replacement proponent to carry out the proposal in accordance with the conditions and procedures set out in the statement.

3-3 The proponent shall notify the Minister for the Environment of any change of proponent contact name and address within 30 days of such change.

4 Commencement

4-1 The proponent shall provide evidence to the Minister for the Environment within five years of the date of this statement that the proposal has been substantially commenced.

4-2 Where the proposal has not been substantially commenced within five years of the date of this statement, the approval to implement the proposal as granted in this statement shall lapse and be void. The Minister for the Environment will determine any question as to whether the proposal has been substantially commenced.

4-3 The proponent shall make application to the Minister for the Environment for any extension of approval for the substantial commencement of the proposal beyond five years from the date of this statement.

4-4 Where the proponent demonstrates to the requirements of the Minister for the Environment on advice of the Environmental Protection Authority that the environmental parameters of the proposal have not changed significantly, then the Minister may grant an extension not exceeding five years for the substantial commencement of the proposal.

Appendix 4

Vegetation description of remnant bushland area 6

Description of the vegetation and the conservation value of the remnant that Lots 1588 and 10 form part of (area six of Trudgen and Keighery 1995).

From Trudgen and Kieghery (1995).

"5.6 Gosnells remnant bushland area six

Identification

1a: Vegetation ID	Gosnells remnant bushland area six
1b: Nearest Street intersection	Irregular shape, west from Lindsay Street to Gay Street and south from Warton Road to Balfour Street.
2: Date	
3: Recorder:	M.E. Trudgen
4: Page	one of twenty-nine
5: Photograph	-
6: Does the patch still exist?	Yes
7: Are the boundaries accurate?	Reasonably, see maps in this report for accurate boundaries.

Disturbance/Condition

8: Has there been a recent fire? Parts of the remnant have been burnt recently, others have not been burnt for more than ten years (see site descriptions for more details).

9: Partial clearing

grassed areas	Yes; around some of the houses.
mowing	No
mining	No
grazing by domestic animals	Some small areas grazed
damage from rabbits	Yes, but slight
internal tracks	Yes
internal firebreaks	Yes
service corridors	Roads and easements for roads
drains	No
other	Several houses and some small to medium sized areas under cultivation.
total cleared area > 30%	No

10: Rubbish dumping Yes/no

11: Overall appreciation of condition: The overall condition of the remnant is very good, with most parts of it in good, very good or excellent conditon. Some parts of the remnant have what must be some of the least disturbed vegetation in the Metropolitan Area. That the remnant contains a wide range of vegetation as well is significant in the condition assessment, as it is unusal to have so many vegetation types in such good condition in one area.

Landscape features

12: Landscape features (cultural): None (some drains and houses excepted).

13: Landscape features (natural): This block has low relief, with slight dunes separated by damplands and a few wetlands. It consists of a number of smaller blocks.

Other notes

14: The floristic recording sites Gosnells 03 (in the same place as releve site 33), 04, 12 and 13 were located in this remnant.

15: There are some areas with deaths of trees, which may be the result of infection with a Phytophthorra species or some other fungal pathogen. However, the deaths are not widespread and seem to be effecting relatively few species. This would indicate that if a Phytophthorra species is involved, then it is one of the less virulent species. Certainly, there does not seem to be any infection by Phytophthorra cinnamomi, the virulent fungal pathogen that causes "Jarrah Dieback".

Vegetation present

This large block has a commensurately large range of vegetation present, with different types from dune crests, dune slopes, damplands and sesonal wetlands (the larger two of these might be "permanent" in years with wet winters and summers). While much of the area is dunes or damplands, the areas of these habitat types have a very significant range of vegetation. The two larger seasonal wetlands also have a significantly different vegetation from each other. A noticeable feature of the dunes present is a range from those with etremely gentle slopes and low relief (sand drifts) to others with more steeply sloping slopes. These have quite different vegetation types.

- dune slopes and crests

Banksia attenuata, Allocasuarina fraseriana, low woodland over Adenanthos cygnorum high open shrubland over Acacia pulchella, Jacksonia sericea (swamp form), Gompholobium tomentosum, Bossiaea eriocarpa low shrubland to open heath over Dasypogon bromeliaefolius, Phlebocarya ciliata, Hypolaena exsulca, Amphipogon turbinatus herbland/sedgeland

Site 14. Almost flat area between a low dune and a sand drift, ecotonal between a sand dune and a dampland (put with the dunes because of the Banksia attenuata, Allocasuarina fraseriana tree layer). Grey sand. The area had not been burnt for more than five years (> 10?). There was significant tree death which may have been from fire or possibly a Phytophthorra cinnamomi species. The vegetation was assessed as in good to very good condition. Weed invasion was low, with *Ursinia anthemoides and *Ehrharta calycina the only species recorded. Some rubbish had been dumped in the area but was mostly of types that could be easily removed. Associated species recorded were: Petrophile linearis, Boronia sp., Trachymene pilosa, Waitzia suaveolens, Anigosanthos manglesii, Melaleuca seriata, Phlebocarya filifolia, Lyginia barbata, Burchardia umbellata, Siloxerus humifusus, Scholtzia involucrata, Loxocarya fasciculata, Banksia menziesii, Nuytsia floribunda, Hensmannia turbinata, Schoenus sub-bulbosus, Stylidium piliferum, Calytrix flavescens, Acacia pulchella, Lomandra sericea, Eriostemon spicatus, Gonocarpus pithyoides, Laxmannia squarrosa, Hovea trisperma, Caesia occidentaslis, Acacia stenoptera, Jacksonia aff. sericea (swamp form), Tricoryne tenella, Hemiandra pungens and Thysanotus multiflorus.

Banksia attenuata, Banksia ilicifolia low forest to low closed forest over Melaleuca hymoides high shrubland over Xanthorrhoea preissii low open shrubland over Gompholobium tomentosum, Bossiaea eriocarpa, Acacia pulchella (low form) low open shrubland over Phlebocarya ciliata, Hypolaena exsulca, Phlebocarya filifolia, Tricoryne tenella herbland/ sedgeland

Site 15. A very gentle slope to the north-east near the base of a sand drift. The surface soil was light brown humus rich sand. The vegetation was in very good condition. No weeds were recorded except *Ursinia anthemoides. The site had not been burbnt for five to ten years. While obviously dry enough to have a dense cover of Banksia species, the site is low lying enough to have an understorey that has species associated with damplands in it. Associated species were: Banksia menziesii, Acacia pulchella (tall), Boronia sp., Schoenus sub-bulbosus, Dasypogon bromeliaefolius, Thysanotus multiflorus, Jacksonia aff. sericea (swamp form), Petrophile linearis, Calytrix flavescens, Arnocrinum preissii, Loxocarya fasciculata, Hovea trisperma, Lomandra sericea, Acacia pulchella, Conostylis aurea, Loxocarya flexuosa, Hibbertia racemosa, Patersonia occidentalis, Nuytsia floribunda and Lyginia barbata.

Banksia attenuata, Banksia menziesii, Allocasuarina fraseriana low forest over Acacia pulchella shrubland to open heath over Gompholobium tomentosum low open shrubland over Calytrix flavescens, Bossiaea eriocarpa low open heath and Dasypogon bromeliaefolius, Phlebocarya ciliata herbland.

Site 16. Near the crest of a slight sand drift. Light brown, humus rich sand with a greyish surface. The vegetation was in very good condition, with no weeds being recorded and not having been burn for five to ten years. In places there was a layer of Melaleuca thymoides tall shrubland. In some areas of the stand Scholtzia involucrata was abundant in the lower shrub layer. Associated species recorded were: Xanthorrhoea preissii, Macrozamia reidlei, Jacksonia furcellata, Kunzea ericifolia, Eriostemon spicatus, Petrophile linearis, Phlebocarya filifolia, Arnocrinum preissii, Drosera sp. (climbing), Loxocarya flexuosa, Scholtzia involucrata, Dampiera linearis, Tricoryne tenella, Stylidium brunonianum, Adenanthos cygnorum, Burchardia umbellata, Lomandra sericea, Acacia pulchella, Loxocarya flexuosa,

Hibbertia racemosa, Persoonia saccata, Stylidium repens, Laxmannia squarrosa, Acacia huegelii, Lomandra caespitosa, Eremaea asterocarpa, and Lobelia tenuior.

Banksia attenuata, Banksia menziesii, Banksia ilicifolia low open woodland to low open forestforest over Adenanthos cygnorum high open shrubland over Acacia pulchella, Calytrix fraseri, Macrozamia reidlei, Melaleuca thymoides open shrubland over Eremaea pauciflora, Scholtzia involucrata, Stirlingia latifolia, Calytrix flavescens low open heath over Lyginia barbata, Loxocarya flexuosa, Amphipogon turbinatus, Patersonia occidentalis herbland/sedgeland.

Site 17. Slight to gentle slope to south-east near crest of low dune, grey sand. The vegetation was in excellent condition, with the time to the last fire being ten years or longer. Weed invasion was low with *Gladiolus caryophyllaceus, *Briza maxima, *Ursinia anthemoides, *Carpobrotus edulis and *Ehrharta calycina (the latter near the firebreak only) being recorded. The Banksia ilicifolia was only a minor component and the Stirlingia latifolia was not very abundant. The Acacia pulchella was dying out. There were occasional rabbit burrows and what appeared to be bandicoot runs and scratchings. Associated species were Nuytsia floribunda, Thysanotus arbuscula, Petrophile linearis, Jacksonia furcellata, Thysanotus multiflorus, Burchardia umbellata, Trachymene pilosa, Dasypogon bromeliaefolius, Hensmannia turbinata, Eriostemon spicatus, Phlebocarya filifolia, Hovea trisperma, Arnocrinum preissii, Gompholobium tomentosum, Leucopogon conostephioides, Calytrix angulata, Conostylis aurea, Conostephium preissii, Nemcia capitata, Hibbertia racemosa, Pithocarpa pulchella, Hibbertia aurea, Lomandra sericea, Stipa compressa, Acacia hugelii, Lomandra nigricans, Astroloma xerophila and Allocasuarina humilus.

Kunzea ericifolia closed scrub over Xanthorrhoea preissii low open shrubland over *Briza maxima, *Hypochaeris glabra, annual grassland/herbland.

Site 18. It was hard to decide whether or not this site had been cleared at some time in the past and regenerated to the Kunzea ericifolia. There was no sign of physical disturbance but, the understorey seemed too sparse to be natural. Assuming the stand was the result of disturbance, it is assessed as in poor condition (it is a small part of the remnant). Associated species were Loxocarya flexuosa, Phlebocarya ciliata, Bossiaea eriocarpa, Calytrix flavescens and Corynotheca sp.

Banksia attenuata, Allocasuarina fraseriana, Banksia ilicifolia, Banksia menziesii low woodland to low open forest over Kunzea ericifolia, Adenanthos cygnorum high open shrubland over Acacia pulchella, Melaleuca thymoides, Xnthorrhoea preissii open shrubland over Gompholobium tomentosum, Calytrix flavescens, Bossiaea eriocarpa low open shrubland over Phlebocarya ciliata, Dasypogon bromeliaefolius, Loxocarya flexuosa dense herbland/sedgeland

Site 19. Lower slope of low dune, light brownish-grey sand over white sand. The vegetation was in very good to excellent condition (closer to excellent) with the time to the last fire assessed as more than five years. Weed invasion was very low, with *Briza maxima the only weed recorded. There had been some timbergetting (probably for firewood). Associated species recorded were: Anigosanthos manglesii, Tricoryne tenella, Jacksonia furcellata, Patersonia occidentalis, Petrophile linearis, Schoenus sub-bulbosus, Conostephium pendulum, Burchardia umbellata, Lobelia tenuior, Eriostemon spicatus, Stylidium brunonianum, Hibbertia racemosa, Hibbertia aurea, Hibbertia subvaginata, Lepidosperma angustatum and Laxmannia squarrosa.

Banksia attenuata, Banksia menziesii low open forest over Adenanthos cygnorum high open shrubland over Melaleuca thymoides, Acacia pulchella, Macrozamia reidlei shrubland over Scholtzia involucrata, Calytrix flavescens, Gompholobium tomentosum, Bossiaea eriocarpa low open shrubland over Loxocarya flexuosa sedgeland/herbland.

Site 20. South facing mid-slope of a low dune, brownish-grey sand. The vegetation was in very good to Excellent (closer to the latter) condition. Weed invasion was very low with *Briza maxima the only species recorded. There had been some timbergetting. This unit differs from the one upslope (site 17) in

not having Eremaca pauciflora or Stirlingia latifolia and from the unit downslope (site 19) in having a more open herb/sedge layer. There were some patches of Kunzea ericifolia present. Associated species were: Dasypogon bromeliaefolius, Burchardia umbellata, Conostephium pendulum, Lomandra sericea, Stipa compressa, Calytrix angulata, Petrophile linearis, Lobelia tenuior, Thysanotus arbuscula, Patersonia occidentalis, Leucopogon styphelioides, Lobelia alata, Stylidium brunonianum, Lomandra nigricans?, Conostylis aculeata, and Stylidium repens.

Banksia attenuata, Banksia menziesii, Allocasuarina fraseriana, Banksia ilicifolia low woodland to low open forest over Xanthorrhoea preissii shrubland over Melaleuca sp. B,
Gompholobium tomentosum, Adenanthos cygnorum low open shrubland over Phlebocarya ciliata, Dasypogon bromeliaefolius, Hypolaena exsulca, Patersonia occidentalis, Bossiaea eriocarpa herbland/sedgeland

Site 32. Low sand drift, surface soil brownish grey (humus rich). The site had not been burnt for about five to ten years. The vegetation was assessed as being in very good condition, it would have been assessed as in excellent condition except, that there were quite a few dead Banksia trees. The cause of death was not obvious, although it seems unlikely that it was dieback caused by Phytophthorra cinnamomi. Weed invasion was very low, with *Gladiolus caryophyllaceus the only species recorded and this present in low numbers (there were more weeds at the edge of the road and a track (*Briza maxima, *Ehrharta calycina, *Hypochaeris glabra, *Ursinia anthemoides). There were a few big Kunzea ericifolia individuals (not enough to consitute a tall open shrubland) however, there were a number of younger ones, indicating that the species may be increasing). Associated species were: Nuytsia floribunda, Phlebocarya filifolia, Burchardia umbellata, Stylidium piliferum, Acacia pulchella, Tricoryne tenella, Loxocarya fasciculata, Boronia sp., Kunzea ericifolia, Hibbertia vaginata, Dampiera linearis, Arnocrinum preissii, Lyginia barbata, Stylidium repens, Trachymene pilosa, Laxmannia ramosa, Conostylis juncea, Hibbertia racemosa, Gonocarpus pithyoides, Thysanotus thyrsoideus, Acacia stenoptera, Hibbertia aurea, Hovea trisperma, Lepidosperma angustatum, Monotaxis grandiflorus, Jacksonia aff. sericea (swamp form), Petrophile linearis, Stylidium carnosum, Lomandra sericea, Leucopogon pendulum and Hensmannia turbinata.

Banksia attenuata, Banksia menziesii, Banksia ilicifolia, Allocasuarina fraseriana low woodland to low open forest over Adenanthos cygnorum high open shrubland over Melaleuca thymoides high shrubland over Stirlingia latifolia, Leucopogon conostephioides, Hibbertia hypericoides, Scholtzia involucrata, Calytrix flavescens, Gompholobium tomentosum low open heath over Blancoa canescens, Hensmannia turbinata, Amphipogon turbinatus, Conostylis sp., Patersonia occidentalis herbland/grassland.

Site 73. A north facing moderate slope of a medium sized dune. Grey sand. Most of the area was burnt in the preceding summer but, an area on the road verge was unburnt for more than ten years, allowing the vegetation structure to be recorded. There was a small amount of rubbish. Weed invasion was low with *Ehrharta calycina and *Briza maxima recored. The stand was assessed as being in good condition (if unburnt for some time it would probably return to very good to excellent). Associated species recorded were Thysanotus multiflorus, Lyginia barbata, Bossiaea eriocarpa, Macrozamia reidlei, Stylidium repens, Stipa compressa, Haemodorum spicatum, Acacia pulchella, Nuytsia floribunda, Arnocrinum preissii, Conostylis aurea, Hibbertia racemosa, Thysanotus sparteus, Conostephium pendulum, Eremaea asterocarpa, Hibbertia hypericoides and Schoenus sub-bulbosus. This unit differed from the unit on the lower slope (see site 74) in the composition of the herb layer, especially in having a significant amount of Blancoa canescens.

Banksia attenuata, Banksia menziesii, Banksia ilicifolia low woodland to low open forest over Melaleuca thymoides high shrubland over Melaleuca seriata?, Bossiaea eriocarpa low shrubland over Phlebocarya ciliata, Dasypogon bromeliaefolius, Hypolaena exsulca herbland/sedgeland.

Site 74. Gentle lower slope of a medium sized dune. Grey sand. Burnt the preceding summer with some Banksia trees killed (more than 10%). Weed invasion was very low with none recorded away from the road. There were no rabbit scratchings. The stand was assessed as being in good to very good condition

(if unburnt for some time it would probably return to very good to excellent). Associated species included Hibbertia subvaginata, Lomandra sericea, Hensmannia turbinata, Stipa compressa, Schoenus sub-bulbosus, Eriostemon spicatus, Lyginia barbata, Petrophile linearis, Xanthorrhoea preissii (small scattered patches), Haemodorum spicatum and Eremaea asterocarpa.

To the north of this site (towards sies 72 and 73) there is a large area on a dune (with Banksia attenuata, Banksia menziesii woodland over Stirlingia latifolia, Hibbertia hypericoides shrubland over Blancoa canescens, Phlebocarya ciliata herbland) that has been burnt. There was some *Briza maxima and *Ehrharta calycina on the firebreak.

Banksia attenuata, Banksia menziesii, Allocasuarina fraseri low open forest over Stirlingia latifolia low shrubland over Blancoa canescens, Dasypogon bromeliaefolius, Phlebocarya ciliata, Schoenus sub-bulbosus herbland/ sedgeland.

Site 75. Gentle dune slope, south-east facing. Grey sand with humus layer to five centimetres thick (where not burnt by recent fire). Burnt previous summer, with the fire apparently quite hot. Weed invasion was very low with *Gladiolus caryophyllaceus, *Hypochaeris glabra and an introduced Poaceae species recorded. The site was assessed as being in good to very good condition. It would have been assessed as being in very good condition, except for the number of trees killed by the reccent fire. Associated species included Arnocrinum preissii, Dryandra nivea, Eucalyptus marginata (emergent trees), Siloxerus humifusus, Haemodorum spicatum (abundant), Kennedia prostrata, Bossiaea eriocarpa, Haemodorum spicatum, Nuytsia floribunda, Centrolepis drummondii, Acacia stenoptera, Scaevola repens, Pronanya fraseri and Dasypogon bromeliaefolius. Lyperanthus nigricans and Haemodorum paniculatum were recorded nearby.

Eucalyptus calophylla, Eucalyptus marginata, Allocasuarina fraseriana woodland to open forest over Xanthorrhoea preissii open shrubland over Stirlingia latifolia, Bossiaea eriocarpa low open shrubland over Phlebocarya ciliata mid-dense herbland.

Site 76. Almost flat area. Grey sand. Weed invasion was low with *Gladiolus caryophyllaceus and *Aira? recorded.. The area was burnt in the preceding summer. The condition of the site was assessed as good to very good, if the site had not been burnt, this would have been increased to very good to excellent. Associated species included Loxocarya fasciculata, Trachymene pilosa and Lomandra sericea.

Banksia attenuata, Banksia menziesii low woodland to low open forest over Melaleuca thymoides high open shrubland over Eremaea pauciflora open heath over Scholtzia involucrata, Calytrix flavescens low shrubland over Phlebocarya ciliata, Lyginia barbata, Blancoa canescens herbland/sedgeland.

Site 78. Gentle dune slope. Grey sand. The site had not been burnt for more than fifteen years. Weed invasion was very low with *Briza maxima, *Gladiolus caryophyllaceus and *Ursinia anthemoides recorded in the vegetation and *Ehrharta calycina along the firebreak. There were numerous scratchings, but no rabbit droppings. The site was assessed as in excellent to pristine condition. Associated species included Bossiaea eriocarpa, Petrophile linearis, Schoenus sub-bulbosus, Burchardia umbellata, Hypolaena exsulca, Macrozamia reidlei, Calytrix fraseri, Acacia pulchella, Amphipogon turbinatus, Loxocarya flexuosa, Hensmannia turbinata, Gompholobium tomentosum, Petrophile linearis, Dasypogon bromeliaefolius, Phlebocarya filifolia, Hibbertia subvaginata, Patersonia occidentalis, Eriostemon spicatus, Thysanotus multiflorus and Leucopogon conostephioides.

Banksia attenuata, Banksia menziesii, Banksia ilicifolia, Eucalyptus marginata, Allocasuarina fraseriana low woodland to low open forest over Xanthorrhoea preissii open shrubland to shrubland over Gompholobium tomentosum, Bossiaea eriocarpa, Conostephium pendulum low shrubland to low open heath over Phlebocarya ciliata, Dasypogon bromeliaefolius, Lyginia barbata, Loxocarya flexuosa herbland/sedgeland.

Site 83. Very gentle dune slope. Pale grey sand. Probably not burnt for more than ten years. Weed invasion was very low. There were no rabbit burrows but there were scratchings that appeared to be different (Bandicoots?). There were three old car bodies dumped in the area. The condition of the stand was assessed as very good to excellent. Associated species included Kunzea ericifolia, Lepidosperma angustatum, Patersonia occidentalis, Tricoryne tenella, Petrophile linearis, Hensmannia turbinata, Eremaea pauciflora, Melaleuca thymoides, Acacia pulchella, Lomandra sericea, Jacksonia aff. sericea (swamp form), Loxocarya fasciculata, Conostephium pendulum, Persoonia saccata, Hibbertia huegelii and Burchardia umbellata. Next to Gay Street there was an area with some Melaleuca preissiana and Adenanthos obovatus.

Banksia attenuata, Banksia menziesii, Allocasuarina fraseriana, Banksia ilicifolia low woodland to low open forest over Xanthorrhoea preissii, Melaleuca thymoides open shrubland over Melaleuca seriata, Leucopogon conostephioides, Scholtzia involucrata, low open heath over Phlebocarya ciliata, Lyginia barbata, Patersonia occidentalis, Blancoa canescens herbland/ sedgeland.

Site 84. Gentle dune slope. Pale grey sand. Not burnt for more than ten years. Weed invasion was very low with *Ursinia anthemoides and *Ehrharta calycina in a small disturbed area where garden rubbish had been dumped and along the firebreaks. There was some rubbish (an old sofa and a gate). There were some animal scratchings (Bandicoot?). The condition of the stand was assessed as being very good to excellent. Associated species includd Burchardia umbellata, Phlebocarya filifolia, Dasypogon bromeliaefolius, Petrophile linearis, Hypolaena exsulca, Amphipogon turbinatus and Siloxerus humifusus. Upslope there was Banksia attenuata, Banksia menziesii woodland over Eremaea pauciflora shrubland.

Eucalyptus marginata, Allocasuarina fraseriana open woodland (scattered trees) over Regelia ciliata, Xanthorrhoea preissii closed heath over Dasypogon bromeliaefolius, Hypolaena exsulca, Lyginia barbata, Phlebocarya ciliata herbland/sedgeland.

Site 85. Very gentle slope. Grey sand. Weed invasion was very low with *Gladiolus caryophyllaceus recorded. The area had not been burnt for five to eight years. There were some rabbit droppings and diggings. The condition of the site was assessed as very good. Associated species included Hemiandra pungens, Stylidium piliferum, Adenanthos cygnorum, Schoenus rodwayanus, Gompholobium tomentosum, Phlebocarya filifolia and Adenanthos obovatus.

Banksia attenuata, Banksia menziesii, Eucalyptus todtiana low woodland to low open forest over Kunzea ericifolia, Jacksonia furcellata high shrubland to open shrubland over Leucopogon conostephioides, Conostephium pendulum, Gompholobium tomentosum, Scholtzia involucrata, Bossiaea eriocarpa, low open shrubland to low shrubland over Loxocarya flexuosa, Lyginia barbata, Patersonia occidentalis, Conostylis setosa, Dasypogon bromeliaefolius mid-dense sedgeland/herbland.

Site 90. Gently sloping lower part of a sand drift. Grey sand. Not burnt for more than five years. Numerous animal scratchings but, no rabbit droppings. Weed invasion was low with *Briza maxima, *Ursinia anthemoides and *Gladiolus caryophyllaceus recorded. The condition of the site was assessed as very good. Associated species included Stipa compressa, Arnocrinum preissii, Burchardia umbellata, Acacia pulchella, Conostephium pendulum, Hensmannia turbinata, Macrozamia reidlei, Petrophile linearis, Stylidium repens, Lobelia tenuior, Leucopogon pendulus, Hibbertia subvaginata, Stylidium piliferum, Thysanotus multiflorus, Xanthorrhoea preissii, Melaleuca thymoides and Phlebocarya filifolia.

- seasonal wetland areas

The seasonal wetlands present included areas with heavy soils, and areas with sandier soils.

Melaleuca preissiana low open woodland to low open forest over Astartea aff. fascicularis closed scrub.

Site 21. A small to medium sized swamp, mostly dried out at the time visited (20/11/94) but still with some water in the northen part. Soil was a thick humus layer at the norhtern edge. Part of the north-west corner had been burnt about five years before the visit but other parts not for longer. The vegetation

was assessed as in very good to excellent condition, with some fire scarring of the trees. The north-west corner (at the edge) was a bit weedy (*Briza maxima, *Sonchus oleraceus, *Solanum nigrum, *Lotus suaveolens, *Rumex acetosella, *Vulpia myuros and *Cyperus alterniflorus?) as was the western edge (next to the firebreak) but areas within the swamp were mostly weed free (except for *Juncus bufonus and recent germination of other species). There was one patch of Lepidosperma longitudinale tall sedgeland at the western edge. The swamp was noted as the habitat of a large population of "Gilgies". Associated species included Regelia ciliata, Calothamnus lateralis, Schoenus sub-bulbosus, Isolepis marginata, Isolepis stellata, Kennedia prostrata, Juncus pallidus, Cassytha racemosa, Stylidium guttatum and Lobelia alata. The presence of a variety of lichen species on the bark of the Melaleuca preissiana and on the stems of the Astartea aff. fascicularis was also noted.

Melaleuca preissiana low open woodland to low woodland over Pericalymma ellipticum closed heath over Hypocalymma angustifolium low open shrubland to low open heath over Schoenus rodwayanus, Phlebocarya ciliata, Hypolaena exsulca, Laxmannia ramosa open to mid-dense sedgeland/herbland.

Site 29. A seasonal wetland, humus rich brownish-grey sand. Appeared to have not been burnt for more than ten years. The stand was assessed as being in excellent condition. There was some Nuytsia floribunda in the tree layer and scattered individuals of Xanthorrhoea preissii in the shrub layer. No weeds were recorded. Associated species were: Calothamnus lateralis, Acacia pulchella (1.3 m tall), Dampiera linearis, Lechenaultia exspansa, Boronia sp., Adenanthos obovatus and Regelia ciliata.

Melaleuca preissiana low open woodland over Leptocarpus tall open sedgeland over Pericalymma ellipticum, Astartea aff. fascicularis, shrubland to open heath over Lepidosperma longitudinale, Cyathochaete avenacea sedgeland

Site 30. A seasonal wetland, very damp at the time recorded (25/11/94) with a few centimetres of water still over the surface in the lower parts. The vegetation was assessed as in very good to excellent condition, and would have been assessed as in excellent condition except that there were some vehicle ruts through the stand. The Leptocarpus was 2-2.3 metres tall! Weed invasion was very low with no weeds observed in the centre of the stand but, *Hypochaeris glabra, *Sonchus oleraceus, *Ehrharta calycina and annual poaceae species at the edge near the road. Associated species included: Calothamnus lateralis, Boronia sp., Lyginia barbata, Leptocarpus scariosus, Leptocarpus aristatus, Leptocarpus roycei?, Gnaphalium sphaericum and Schoenus rodwayanus.

Melaleuca preissiana low open woodland to low woodland over Astartea aff. fascicularis closed heath over Leptocarpus sp. tall open sedgelandover Lepidosperma longitudinale, Lepidosperma sp. (terete) sedgeland to tall sedgeland.

Site 31. Part of a seasonal wetland, still with a few centimetres of water in places at the time surveyed (25/11/94). The stand was assessed as in very good to excellent condition, and would have been assessed as in excellent condition except that there were some vehicle ruts through it. There were no weeds in the centre of the stand but *Briza maxima and *Hypochaeris glabra were recorded near the road. Associated species were Melaleuca lateritia, Drosera nitidula and Cassytha sp.

Melaleuca rhaphiophylla mallee low open woodland over Melaleuca incana, Melaleuca teretifolia high shrubland over Astartea sp. Brixton Street shrubland over Leptocarpus sp. tall dense sedgeland.

Site 96. Large seasonal wetland. Clayey grey sand. Not burnt for more than fifteen (twenty?) years. Weedy on soil piles next to the firebreak but not in the undisturbed vegetation, *Hypochaeris glabra, *Sonchus oleraceus, *Monopsis simplex and some Poaceae species were recorded. The stand was asessed as in excellent condition. Associated species included Melaleuca lateritia, Banksia grandis, Centrolepis mutica, Centrolepis drummondii, Villarsia parnassifolia?, Pimelea hispida, Lemna disperma, Alternanthera nodosa, Epilobium hirtigerum, Stylidium utricularioides? and a Cassytha species.

Melaleuca rhaphiophylla mallee low woodland to low open forest over Melaleuca lateritia shrubland over Leptocarpus sp. tall open sedgeland.

Site 97. Large seasonal wetland . Humus rich clayey surface soil. Not burnt for more than fifteen (twenty?) years. Weed invasion was very low with weeds only observed along the firebreak. The site was assessed as in very good to excellent condition (closer to excellent). Cassytha was abundant on the Melaleuca rhaphiophylla. Associated species were Astartea sp. Brixton Street, Lemna disperma, Crassula natans, Villarsia violifolia (a poorly collected species), Isolepis producta, Stylidium longitubum, Triglochin procera, Gratiola peruviana and Melaleuca teretifolia.

Melaleuca incana, Melaleuca viminea, Melaleuca rhaphiophylla low open heath over Leptocarpus sp. tall sedgeland.

Site 79. Very slight slope at the edge of a seasonal wetland (below a Melaleuca preissiana unit). Grey sand with clayey, humus rich surface. Has been inundated and the soil was still wet when surveyed (13/12/94). Burnt about five years ago (adjoining areas burnt ca. one year ago). Weed invasion was very low except next to Warton Road, species recorded were *Hypochaeris glabra, *Juncus bufonus and *Polypogon monspiclensis. Although the stand is still less than full height (especially the Melaleuca rhaphiophylla which would form an overstorey although, because of the heavy soils this would be a tall shrub layer rather than a tree layer - as in site 80). The stand was assessed as in very good condition (if not burnt this stand would return to excellent condition). Associated species included Stylidium dichotomum, Stylidium longitubum (a priority species), Cotula coronopifolia, Goodenia pulchella, Lepidosperma longitudinale, Isolepis cernua, Melaleuca teretifolia, Agrostis avenacea, Isolepis marginata, Siloxerus humifusus, Cassytha glabella and aquatic species (dried out). The area assigned to this "unit" has quite varied vegetation and if it had not been burnt would have been divided into several units in a more detailed study. Variation included areas with a Cyathochaete avenacea sedge layer and a different Melaleuca species co-dominant.

Melaleuca rhaphiophylla, Melaleuca viminea high mallee shrubland to open scrub.

Site 80. Floor of a seasonal wetland. Humus rich surface (over sand?). Not burnt for more than fifteen years. Weed invasion was very low with one grass species recorded in the stand although, there were more weeds next to Warton Road on fill material. There is an old track throught the stand but it is not very intrusive visually (you have to look to see it although it has not grown over). There were rabbit dropings but no diggings. The site was assessed as in very good to excellent condition. Asociated species recorded were Cotula coronopifolia, Melaleuca leptoclada and annual sedges. There were also the dried out remnants of aquatic species.

Astartea sp. Brixton Street, Regelia ciliata shrubland to open heath over Leptocarpus diffusus sedgeland.

Site 93. Seasonal wetland, almost flat. Grey sand. Not burnt for more than ten years. Weed invasion was very low (to moderate in some patches), *Hypochaeris glabra, *Monopsis simplex and *Eragrostis curvula were recorded. The condition of the stand was assessed as very good. Associated species included Siloxerus humifusus, Pericalymma ellipticum, Hakea varia, Centrolepis glabra, Agrostis avenacea, Eragrostis elongata, Isolepis marginata, Stylidium guttatum, Stylidium divaricatum, Stylidium calcaratum, Drosera occidentalis? and a Calandrinia species (dead).

Melaleuca rhaphiophylla high open shrubland over Leptocarpus aristatus sedgeland.

Site 94. Seasonal wetland. Pale grey sand with setting surface over pale brownish sand. The last fire was more than ten years ago. Weed invasion was low to moderate (but not aggresive species) with *Hypochaeris glabra, *Cyperus tenellus and *Vulpia myuros recorded (most of the weeds were on piles of rabbit droppings. The site was assessed as being in very good condition. Associated species included

Hypolaena exsulca, Hakea varia, Centrolepis aristata, Aphelia cyperoides, Agrostis avenacea and Cotula coronopifolia.

- dampland areas

Melaleuca preissiana low open woodland over Pericalymma ellipticum, Calothamnus lateralis, Xanthorrhoea preissii, Regelia ciliata heath.

Site 22. Almost flat area next to swamp, grey sand. The area may have been partly cleared at some time in the past. The vegetation was assessed as in good condition with weed invasion moderate to high (*Hypochaeris glabra, *Briza maxima, *Sonchus oleraceus, *Carpobrotus edulis, *Aira praecox and *Lotus suaveolens). Associated species were: Kunzea ericifolia, Siloxerus humifusus, Centrolepis caespitosa, Patersonia occidentalis, Stipa compressa, Regelia ciliata and Dampiera linearis.

Melaleuca preissiana low open woodland to low forest over Pericalymma ellipticum, Xanthorrhoea preissii closed heath over Schoenus rodwayanus open sedgeland.

Site 23. Almost flat area, grey sand. The presence of the Pericalymma ellipticum indicates that the site would be seasonally damp to wet. There are occasional Nuytsia floribunda trees scatterd through the stand, at the base of these there are patches of Dasypogon bromeliaefolius herbland and shrubs not common in the stand. The vegetation was in very good to excellent condition. There was a moderate moderate level of weed invasion (particularly annual grasses), probably reflecting the natural absence (due to seasonal flooding) of a herb layer, species recorded were *Briza maxima, *Aira?, *Hypochaeris glabra and *Ursinia anthemoides. Associated species were: Nuytsia floribunda, Eucalyptus todtiana, Calothamnus lateralis, Jacksonia sericea (swamp form), Lomandra sp., Boronia sp., Dasypogon bromeliaefolius, Siloxerus humifusus, Regelia ciliata (in small patches only), Astartea aff. fascicularis, Conostylis juncea, Melaleuca sp. B, Adenanthos obovatus and Hypocalymma angustifolium.

Melaleuca preissiana low open woodland to open woodland over Xanthorrhoea preissii open shrubland to shrubland over Hypocalymma angustifolium, Melaleuca sp. B low open shrubland to low open heath over Phlebocarya ciliata, Dasypogon bromeliaefolius, Patersonia occidentalis, Schoenus sub-bulbosus herbland/sedgeland.

Site 24. Almost flat, brownish-grey sand. Slightly better drained than site 23. The vegetation was assessed as in very good to excellent condition, with low weed invasion, weed species recorded were *Briza minor and Banksia menziesii. This stand was quite variable, and included small areas of Phlebocarya ciliata herbland that would be described as a separate unit in a more detailed study. Associated species were: Nuytsia floribunda, Adenanthos obovatus, Lobelia tenuior, Eriostemon spicatus, Siloxerus humifusus, Acacia pulchella (a low form), Leucopogon gracillima, Loxocarya fasciculata, Boronia sp., Cassytha racemosa, Stylidium repens, Asteridea pulverulenta, Hemiandra pungens, Stylidium piliferum, Waitzia suaveolens, Dryandra nivea, Lomandra sericea, Verticordia densiflora, Schoenus aff. breviculmis, Conostylis juncea, Restio leptocarpoides, Hibbertia vaginata and Amphipogon turbinatus.

Hypocalymma angustifolium, Melaleuca sp. B low open heath (varies to Hypocalymma angustifolium, Kunzea recurva or Hypocalymma angustifolium, Astartea aff. fascicularis low open heath) over Restio leptocarpoides sedgeland.

Site 25. A slight depression on almost flat area, grey sand. The vegetation was assessed as in excellent condition. with very low weed invasion (*Briza maxima, *Hypochaeris glabra, *Ursinia anthemoides and *Ehrharta calycina, the latter only at the edges of tracks). The Restio leptocarpoides had greater than 20% cover. The composition of the shrub layer varied within the depression and would probably be divided into more units in a more detailed study. Associated species were: Lyginia barbata, Siloxerus humifusus, Hypolaena exsulca, Lobelia tenuior, Pericalymma ellipticum, Schoenus rigens, Thysanotus multiflorus, Haemodorum spicatum and Podotheca angustifolia.

Melaleuca preissiana low open woodland over Xanthorrhoea preissii shrubland to high shrubland over Phlebocarya ciliata, Hypolaena exsulca herbland/sedgeland.

Site 26. Almost flat area, grey sand. The vegetation was in good to very good condition, althought it was moderately weedy with more species recorded than at most sites. Weed species recorded were: *Ehrharta calycina, *Gladiolus caryophyllaceus, *Avena sp., *Briza maxima, *Hypochaeris glabra, *Ursinia anthemoides and *Petrorhagia sp. Associated species were: Asteridea pulverulenta, Eucalyptus todtiana, Haemodorum spicatum, Crassula colorata, Lyginia barbata, Allocasuarina fraseriana, Bossiaea eriocarpa, Patersonia occidentalis, Loxocarya fasciculata and Jacksonia aff. sericea (swamp form).

Melaleuca preissiana, Eucalyptus todtiana, Allocasuarina fraseriana low woodland over Xanthorrhoea preissii, Gompholobium tomentosum, Adenanthos obovatus shrubland over Phlebocarya ciliata, Dasypogon bromeliaefolius, Patersonia occidentalis herbland

Site 27. Slight to gentle slope next to seasonal dampland/wetland. Grey sand. Not burnt for about ten years. The vegetation was reduced to a narrow strip by clearing adjacent to the adjoining road but, this unit may not have been much wider. In places, Tricoryne tenella was significant in the herb layer. Can probably be considered a variant of an adjoining unit (site 28, see below) but the transition was quite abrupt, coinciding with a change in slope. Weed invasion was low to moderate (the weedier areas being at the edges and in a small disturbed area. Weed species recorded were: *Briza maxima, *Briza minor, *Sonchus oleraceus, *Ehrharta calycina, *Avena sp., *Gladiolus caryophyllaceus, *Ursinia anthemoides, *Lupinus (blue) and *Hypochaeris glabra. The overall condition of the stand was assessed as very good. Associated species were: Stylidium brunonianum, Burchardia umbellata, Boronia sp., Dampiera linearis, Regelia ciliata. Melaleuca thymoides, Lobelia tenuior, Hypolaena exsulca, Jacksonia aff. sericea (swamp form) and the fungus Polyporus cinnabarinus. At the ecotone to the adjoining seasonal wetland, there were small patches of Hypocalymma angustifolium.

Allocasuarina fraseriana, Nuytsia floribunda, Eucalyptus todtiana, Melaleuca preissiana low open woodland over Xanthorrhoea preissii open shrubland to high open shrubland over Melaleuca sp. B., Gompholobium tomentosum, Acacia pulchella, low shrubland over Phlebocarya ciliata, Lyginia barbata, Hypolaena exsulca, Stylidium repens, Tricoryne tenella, Laxmannia ramosa dense herbland/sedgeland.

Site 28. Almost flat area next to a seasonal wetland, grey sand. probably not burnt for more than ten years. The Melaleuca preissiana is only in the lower part of the stand, which was assessed as being in excellent condition. Weed invasion was very low, except near the road. The only weed recorded away from the road was *Ursinia anthemoides, which was present in very low amounts (the density of the herb/sedge layer would reduce the ingress of weeds). The Eucalyptus todtiana was present right through the stand, even close to the adjoining seasonal wetland. This suggest that the stand has had the same or dryer conditions in the recent past (rather than wetter ones). This unit is obviously close to the one above (site 27) in its species composition. Associated species were: Phlebocarya filifolia, Calytrix flavescens, Stylidium piliferum, Adenanthos obovatus, Leucopogon sp., Arnocrinum preissii, Hemiandra pungens, Dasypogon bromeliaefolius, Hypocalymma angustifolium (few), Hensmannia turbinata, Amphipogon turbinatus, Eriostemon spicatus, Jacksonia aff. sericea (swamp form), Burchardia umbellata, Pericalymma ellipticum (few), Lobelia tenuior and Dampiera linearis.

Melaleuca preissiana low woodland to low open forest over Pericalymma ellipticum shrubland over Hypocalymma angustifolium, Acacia pulchella, Gompholobium tomentosum low open shrubland over Phlebocarya ciliata, Dasypogon bromeliaefolius, Hypolaena exsulca, Schoenus rodwayanus mid-dense herbland/sedgeland.

Site 33. A small seasonal dampland/wetland. Grey sand. Weed invasion was low to moderate, with the moderate areas around localised disturbance. Weed species recorded were *Aira caryophyllea, *Briza maxima, *Hypochaeris glabra and *Ursinia anthemoides. The stand had not been burnt for about five to ten years. The vegetation was assessed as in very good condition (it would have been assessed as in excellent condition, except for some localised disturbance). Associated species recorded were: Siloxerus

humifusus, Asteridea pulverulenta, Aphelia cyperoides, Schoenus odontocarpus, Centrolepis aristata, Restio leptocarpoides, Poranthera microphylla, Centrolepis drummondii, Drosera palacea, Selaginella gracillima, Quinettia urvillei, Leucopogon gracillima, Drosera glanduligera, Euchilosis linearis, Melaleuca sp. B, Stylidium repens, Cassytha racemosa, Stylidium guttatum, Amphipogon laguroides, Thysanotus thyrsoideus, Caesia occidentalis, Hemiandra pungens, Xanthosia huegelii, Stylidium calcaratum, Homalosciadium homalocarpum, Stylidium repens, Dampiera linearis, Boronia sp., Stylidium brunonianum, Lobelia tenuior, Hemiandra pungens, Waitzia suaveolens, Trachymene pilosa, Stipa compressa, Danthonia pilosa and Conostylis juncea. This releve site was recorded at the same location as the quadrat for the floristic site Gosnells 03.

Melaleuca preissiana low open woodland over Xanthorrhoea preissii open shrubland to high open shrubland over Pericalymma ellipticum, Melaleuca sp. B, Hypocalymma angustifolium, Adenanthos obovatus open heath over Schoenus rodwayanus, Schoenus sub-bulbosus, Hypolaena exsulca, Patersonia occidentalis, Lyginia barbata, Phlebocarya ciliata, Dasypogon bromeliaefolius sedgeland/herbland.

Site 34. A gently sloping to almost flat area. Grey sand. The actual area recorded was in very good to excellent condition but most of the stand had been disturbed by machinery and was rated as very poor to very good. Weed invasion varied with the disturbance (from low to moderate), with species recorded being *Eragrostis curvula (on the track), *Hypochaeris glabra, *Anagallis arvensis (orange flowers), Lupinus sp. and *Ursinia anthemoides. Rabbitt droppings were noted in the area. Associated species recorded were Boronia sp., Laxmannia ramosa, Siloxerus humifusus, Stylidium repens, Stylidium guttatum, Thysanotus triandrus, Pimelea hispida, Amphipogon laguroides, Stylidium piliferum, Daviesia decurrens, Hibbertia stellaris, Schoenus rigens, Jacksonia aff. sericea (swamp form), Cassytha sp., Mesomelaena graciliceps, Lomandra micrantha, Schoenus asperocarpus, Schoenus aff. breviculmis, Verticordia densiflora and occasional individuals of Evandra pauciflora.

Melaleuca preissiana low open woodland over Xanthorrhoea preissii high open shrubland over Pericalymma ellipticum closed heath over Phlebocarya ciliata, Schoenus rodwayanus, Dasypogon bromeliaefolius, Cyathochaete avenacea open herbland/sedgeland.

Site 35. A flat to very gently sloping area. Grey sand. The vegetation was in very good to excellent condition and appeared not to have been burnt for more than ten years. Weed invasion was very low. Asociated species were Boronia sp., Melaleuca sp. B, Cyathochaete avenacea, Adenanthos obovatus, Conostylis juncea, Acacia pulchella, Cassytha flava?, Astartea aff. fascicularis, Lobelia tenuior and Pimelea hispida.

Melaleuca preissiana low woodland to wooland over Pericalymma ellipticum open shrubland over Hypocalymma angustifolium, Xanthorrhoea brunonis? low open shrubland to low shrubland over Phlebocarya ciliata mid-dense herbland.

Site 77. Seasonal dampland in small depression on a dune. Burnt in the preceding summer. Weed invasion was low with *Ursinia anthemoides and *Gladiolus caryophyllaceus recorded. The condition of the site was assessed as good to very good, if the site had not been burnt this would proabably have been increased to very good to excellent or excellent. Associated species included Dasypogon bromeliaefolius, Acacia pulchella, Hypolaena exsulca, Burchardia umbellata and Stipa compressa.

Melaleuca preissiana open woodland to woodland over Xanthorrhoea preissii open shrubland over Hypocalymma angustifolium low shrubland to low open heath over Cyathochaete avenacea, Schoenus rodwayanus, Phlebocarya ciliata, Dasypogon bromeliaefolius sedgeland/herbland.

Site 81. Dampland on gentle lower slope of dune next to seasonal wetland (also extends between two dune sto the south-east of the wetland). Grey sand. Burnt about two years ago. Weed invasion was very low, with only *Hypochaeris glabra recorded. There were rabbit droppings but no diggings. The site was assessed as in good to very good condition (would go to very good to excellent or excellent if not burnt for some time). This must be one of the largest Melaleuca preissiana stands remaining in the survey area

and must be quite stunning when not burnt. It has high consevation value in its own right. There was regrowth of Marri (Eucalyptus calophylla) and some stumps indicating that there had been selective cutting of this species. Associated species included Levenhookia preissii (recommended for placing on the CALM priority list), Stipa compressa, Haemodorum spicatum, Kennedia prostrata, Astartea aff. fascicularis, Boronia sp., Xanthorrhoea brunonis?, Jacksonia aff. sericea (swamp form), Thysanotus multiflorus, Eriostemon spicatus, Lechenaultia exspansa, Patersonia occidentalis, Dasypogon bromeliaefolius, Caesia occidentalis?, Acacia pulchella, Agrostis avenacea, Adenanthos obovatus and Dampiera linearis. In places, the herb/sedge layer included Lepidosperma longitudinale.

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0Melaleuca preissiana low woodland to woodland over Viminaria juncea high shrubland to open scrub over Xanthorrhoea preissii shrubland to high shrubland over Lepidosperma longitudinale, Cyathochaete avenacea, Lepidosperma sp. tall, mid-dense sedgeland.

Site 82. Dampland on gentle slope at base of low dune. Grey sand. The Viminaria (Swishbush) was largely killed by the last fire but is regenerating well. The area was burnt about one to two years ago. The only weed species recorded was *Lythrum hysopifolium. There were rabbit droppings and a few burrows. There was some fire damage to trees but most survived well. Some Xanthorrhoea preissii were killed and burnt by the fire. The site was assessed as being in good to very good condition, if not burnt for some time it would go to very good to excellent or excellent condition. Associated species included Dampiera linearis, Thysanotus multiflorus, Lepidosperma angustatum, Leucopogon australis, Isolepis marginata, Haemodorum sparsiflorum, Villarsia parnassifolia?, Acacia pulchella (which will become dense in 2-3 years) and Schoenus rodwayanus. There were some small patches with Astartea aff. fascicularis shrubland. There were also some small depressions with Hypolaena exsulca, Agrostis avenacea, Astartea aff. fascicularis, Centella asiatica, Goodenia pulchella, and with shrubs of Astartea sp. Brixton Street at the edges.

Melaleuca preissiana low open woodland to low woodland over Regelia ciliata, Pericalymma ellipticum, Xanthorrhoea preissii closed heath over Schoenus rodwayanus sedgeland.

Site 86. Almost flat area of seasonal dampland. Grey sand. Burnt about five or six years ago. Weed invasion was very low with *Ehrharta calycina recorded on the tracks. The condition of the stand was assessed as very good.

Site 87. Extension of the area site 86 was recorded in, the vegetation was very similar to site 86, except for the presence of stands of Eucalyptus calophylla (Marri) which is not common locally (although it is further east in the City of Gosnells).

Evandra pauciflora tall dense sedgeland with Pericalymma ellipticum open heath over Schoenus rodwayanus, Hypolaena exsulca sedgeland.

Site 88. Seasonal dampland, almost flat area. Grey sand. Not burnt for more than five years. Weed invasion was very low, with only *Ursinia anthemoides recorded. The condition of the stand was assessed as very good to excellent. There were some animal scratchings, either from Rabbits or Bandicoots. Associated species included Leucopogon gracillima, Adenanthos obovatus, Hypocalymma angustifolium, Eriostemon spicatus, Melaleuca preissiana (stunted), Cassytha sp., Laxmannia ramosa, Stylidium repens and Lechenaultia exspansa.

Melaleuca preissiana, Nuytsia floribunda low open woodland (scattered trees) over Kunzea ericifolia high open shrubland (scattered patches) over Hypocalymma angustifolium, Pericalymma ellipticum, Astartea sp. low open heath to open heath over Schoenus rodwayanus, Hypolaena exsulca, Restio leptocarpoides mid-dense sedgeland.

Site 89. Seasonal dampland, very gentle slope. Grey sand. Not burnt for more than five (> 10?) years. Weed invasion was low with *Ursinia anthemoides, *Ehrharta calycina and *Briza maxima recorded. Some animal scratchings but, no rabbit droppings. There were many dead bushes of Pericalymma

ellipticum, although there was no sign of recent fire. Possibly the adjoining drain has lowered the water table (and possibly in conjunction with the recent series of dry winters and summers) this has caused the deaths. The sight was assessed as in very good condition, or possibly good to very good. Associated species included Patersonia occidentalis, Siloxerus humifusus, Verticordia densiflora, Adenanthos obovatus, Dasypogon bromeliaefolius and Waitzia suaveolens.

Melaleuca preissiana, Eucalyptus todtiana, Allocasuarina fraseriana, Banksia attenuata low open woodland over Regelia ciliata, Xanthorrhoea preissii, Melaleuca thymoides shrubland over Mpink low open shrubland over Bossiaea eriocarpa, Gompholobium tomentosum low open shrubland over Phlebocarya ciliata, Patersonia occidentalis, Hypolaena exsulca herbland/sedgeland.

Site 91. Seasonal dampland/wetland, almost flat. Grey sand. Last fire more than five years ago. Weed invasion was very low but there were small patches of *Ehrharta calycina and *Eragrostis curvula along the firebreaks (also *Ursinia anthemoides and *Briza maxima). The stand was assessed as being in very good condition. Associated species included Lomandra sericea, Burchardia umbellata, Dampiera linearis, Leucopogon styphelioides, Xanthosia huegelii, Phlebocarya filifolia, Siloxerus humifusus, Loxocarya fasciculata, Waitzia suaveolens, Stylidium piliferum, Kunzea ericifolia, Stylidium brunonianum and Evandra pauciflora (on the ecotone to site 92).

Regelia ciliata closed heath to Closed scrub over Schoenus rodwayanus sedgeland.

Site 92. Seasonal dampland/wetland, almost flat. Grey sand. Not burnt for more than ten years. Weed invasion was very low- no weeds were seen except where there was physical disturbance next to the firebreak, where there was *Hypochaeris glabra and an introduced daisy. The condition of the stand was assessed as very good to excellent (and closer to the latter). Associated species included Cyathochaete avenacea, Boronia sp., Dampiera linearis, Siloxerus humifusus and Pericalymma ellipticum. There were some patches in the stand where the Regelia ciliata was replaced by Pericalymma ellipticum.

Pericalymma ellipticum closed heath over Schoenus rodwayanus, Cyathochaete avenacea, Hypolaena exsulca mid-dense sedgeland over Dryandra nivea herbland.

Site 95. Seasonal dampland, almost flat. Grey sand. The last fire was more than five (and possibly more than ten years ago. Weed invasin was very low. There were rabbit droppings present but no burrows. The site was assessed as being in very good condition. Associated species included Stylidium brunonianum, Siloxerus humifusus, Byblis grandiflora (four plants, one in flower: this species was only recorded at this site during this survey), Phlebocarya ciliata, Boronia sp., Melaleuca seriata?, Lyginia barbata, Stylidium sp., Thysanotus sp. and Hakea sulcata.

Assessment of conservation value

This remnant (or group of remnants) has a range of habitat types and a large range of vegetation types, including:

- a range of Banksia woodland vegetation from that found on very low sand drifts through to that found on moderate sized dunes.

- a range of wetland vegetation including areas dominated by Melaleuca rhaphiophylla and other Melaleuca species.

- a range of dampland vegetation types including areas with heaths, areas with Melaleuca preissiana (Paperbark) and various shrub and sedge communities (including some found on heavy soils). The Melaleuca preissiana stands include one that is probably the best remaining in the City of Gosnells although, it has been recently burnt (this species regenerates well from the branches).

This vegetation is a good sample, although not a complete representation, of the vegetation of the Southern River Vegetation Complex. Consequently, the area has very high conservation value for the

vegetation of the Southern River Vegetation Complex. It is probably one of the best remaining chances to protect a good sized area of the Southern River Vegetation Complex (although there may be some in the Armadale area that have similar size (but not necessarily the same values for vegetation and flora).

Although the flora of the area has not been comprehensively surveyed, it is obvious from the lists of associated species in the site descriptions given above that the area has a large flora, as would be expected given the range of habitat and vegetation types represented. Consequently, the area has high value for the conservation of the flora species present. It is likely that this includes populations of a number of priority species, although searches for these were beyond the scope of this survey. One poorly collected species recorded was Villarsia violifolia, another is Levenhookia preissii, which has been recommended for placing on the CALM priority list.

As well as having value for the conservation of vegetation and flora found in it, the area has other values:

- it has significant landscape value.

- it provides habitat for a significant number of bird s and other animals, probably including bandicoots (the characteristic runs of bandicoots were seen at one locality).

- it has very significant value as part of the network of remnant vegetation remaining in the City of Gosnells and adjoining areas.

- has very significant value for the protection of a range of geomorphological types found in the Southern River Soil unit.

- it has very significant value for scientific research into vegetation, flora, fauna and geomorpholy.

- it is large enough to maintain conservation values while being used for appropriate levels of passive recreation and/or tourism.

- it has significant value as an educational resource."

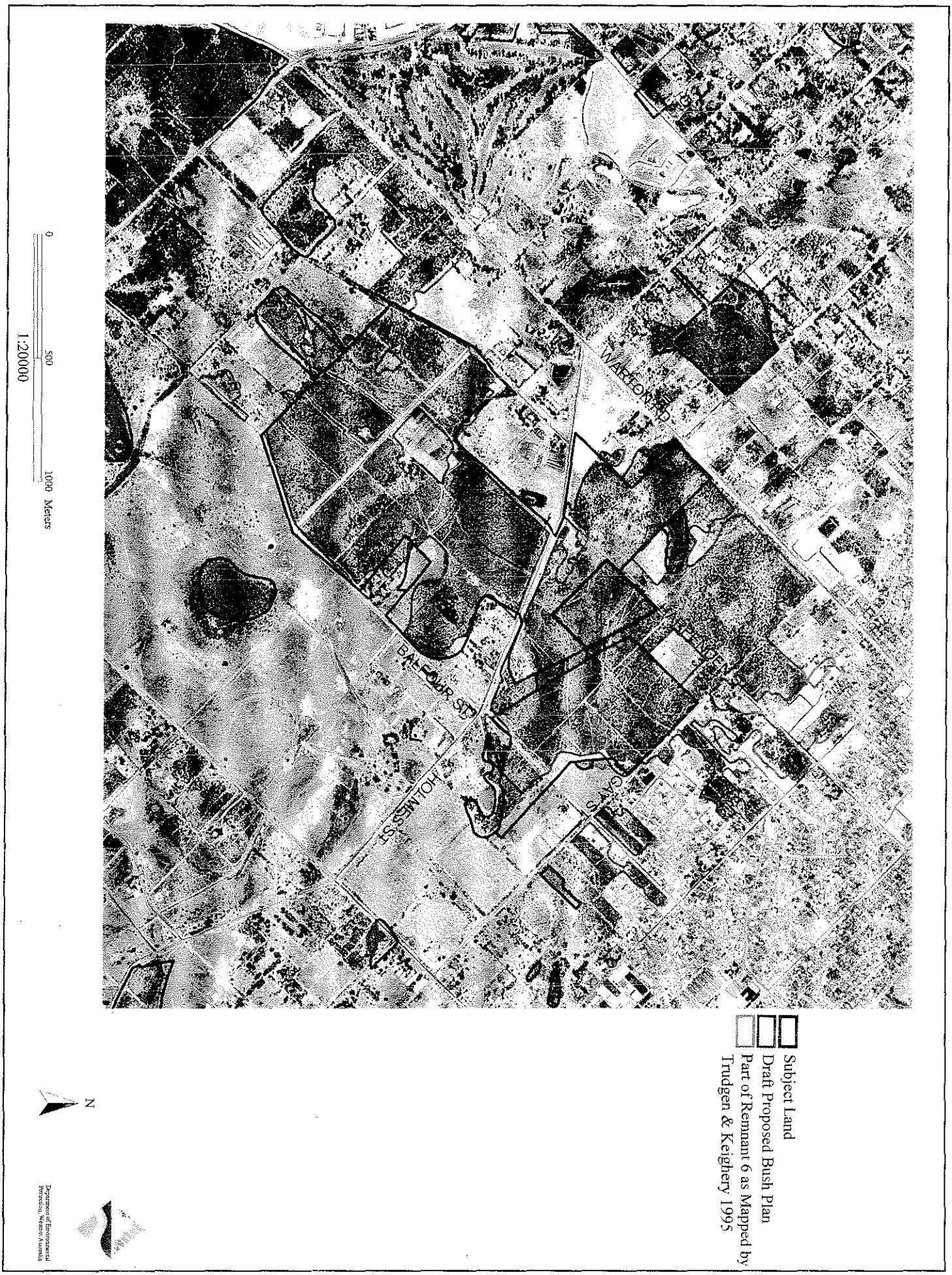

Figure 4. Distribution of remnant vegetation surrounding lots 1588 and 10, Harpenden Street, Southern River.

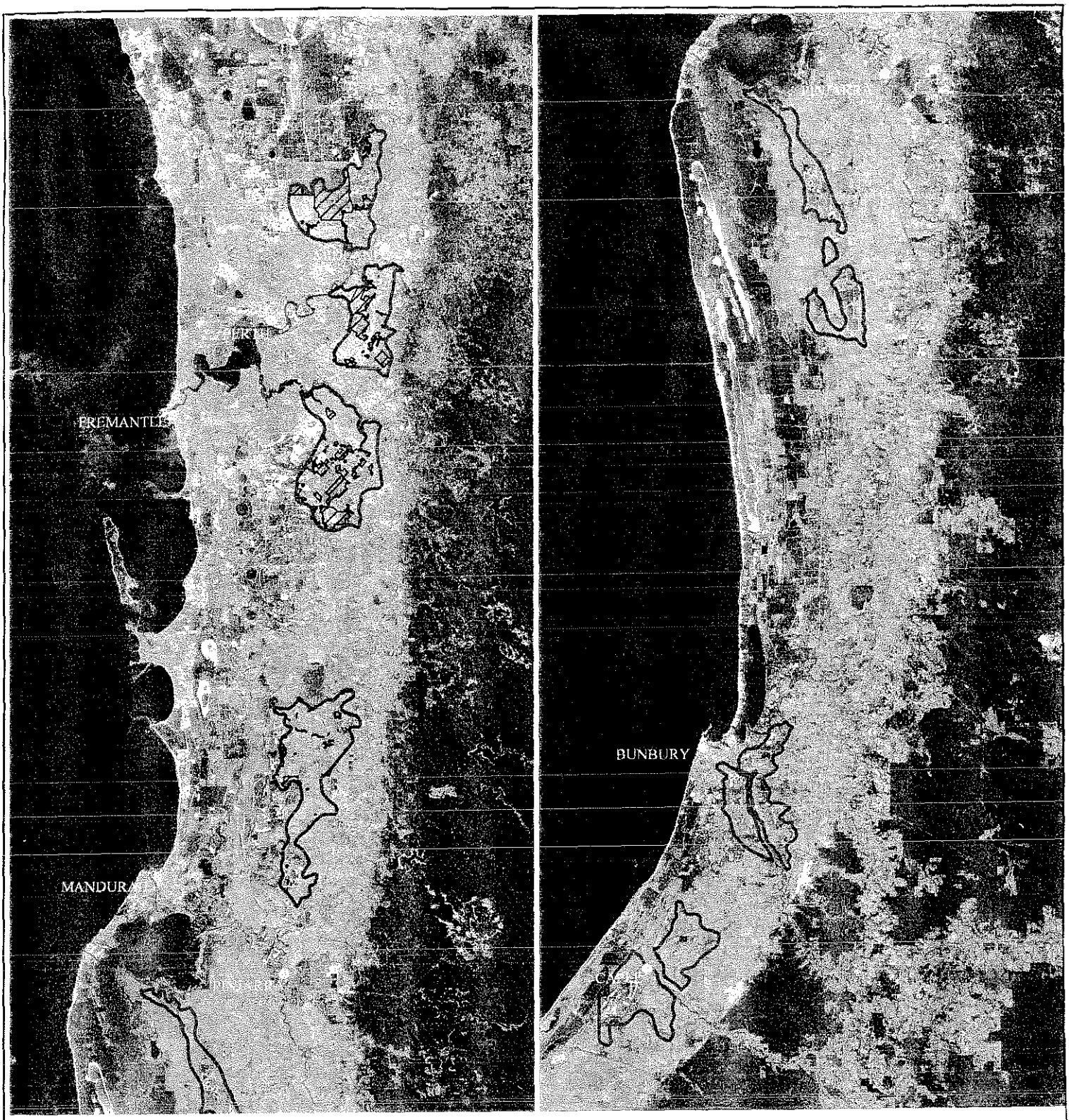

Figure 3. Distribution of the Southern River Vegetation Complex originally on the Swan Coastal Plain.