The Social Values of South West Water Resources

Beckwith Environmental Planning

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Sincerely,

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Limitations

Beckwith Environmental Planning Pty Ltd has prepared this report for the use of the Department of Water in accordance with the usual care and thoroughness of the consulting profession. It is based on generally accepted practices and standards at the time it was prepared. The methodology adopted and sources of information used by Beckwith Environmental Planning Pty Ltd are outlined in this report.

This report was prepared between March and December 2008 and is based on the conditions encountered and information reviewed at the time of preparation. Beckwith Environmental Planning Pty Ltd disclaims responsibility for any changes that may have occurred after this time. No responsibility is accepted for use of any part of this report in any other context or for any other purpose or by third parties.

Report Authorship

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Executive Summary

The inland water resources (e.g. aquifers, rivers and streams, wetlands and estuaries) of the South West are central to the Region's long-term socio-economic and ecological sustainability. Meeting the water resource needs of a wide range of sometimes competing social, economic and environmental values is a primary challenge facing the Region's water resource managers. The Department of Water (DoW), the lead State Government agency responsible for water resource management in Western Australia, seeks to balance the ecological needs and social expectations for water in the natural environment with society's need for water for economic benefit.

Study objectives

The DoW is undertaking a number of water resource management planning activities in the South West. These activates are guided by *Statewide Policy No 5 Environmental Water Provisions Policy for Western Australia* (WRC 2000). The policy describes WA's water allocation planning framework, which takes into account not only ecological but also social and economic values.

The DoW retained Beckwith Environmental Planning Pty Ltd to document, at a regional scale, the non-consumptive social values associated with inland water dependent features in the South West. The study area extends from Benger Swamp in the north to Augusta in the south and from the Indian Ocean in the west to east of Nannup.

Key findings

Summary of the key findings:

- In total, 67 water-dependent features with social values were identified.
- Each of the identified features fell into one of five categories: waterways (e.g. rivers, lakes, drains), wetlands, cave systems, estuaries and inlets, and forests/vegetation. The categories with the most features were waterways (37 features) and wetlands (12 features).
- The majority of identified social values fell into one of three categories: heritage, education, or recreation.
- The most commonly identified recreation values were: walking/jogging (27 features), birding (21 features), picnicking (17 features), and fishing (15 features).
- The water dependent features with the highest number of social values are: Lower Blackwood River (15 social values), Lower Collie River (14 social values), Margaret River (13 social values), the Leschenault Estuary (12 social values) and St John Brook (12 social values).
- The social value most frequently attributed to the cave systems, the majority of which are located along the Leeuwin-Naturaliste Ridge, was tourism.
- All of the water-dependent features have aesthetic value(s).

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1 Introduction

1.1 Purpose

The inland water resources (e.g. aquifers, rivers and streams, wetlands and estuaries) of the South West are central to the Region's long-term socio-economic and ecological sustainability. Meeting the water resource needs of a wide range of sometimes competing social, economic and environmental values is a primary challenge facing the Region's water resource managers. As the lead State Government agency responsible for the management of groundwater and surface water resources, the Department of Water (DoW) seeks to balance the ecological needs and social expectations for water in the natural environment with society's need for water for economic benefit.

Statewide Policy No 5: Environment Water Provisions Policy for Western Australia (WRC 2000) guides the development of water resource management plans. The key steps in the planning process are:

- Determination of ecological water requirements[1] (EWRs).
- Determination of social and economic value(s) and associated water requirements
- Determination of management objectives based on EWRs, social water requirements (SWRs) and potential consumptive requirements.
- Determination of environmental water provisions[2] (EWPs).
- Establishment of sustainable yields[3] and abstraction limits for the resource.

The DoW retained Beckwith Environmental Planning Pty Ltd to document, at a regional scale, the non-consumptive social values associated with inland water dependent features in the South West. As shown in Figure 1, the study area extends from Benger Swamp in the north to Augusta in the south and from the Indian Ocean in the west to east of Nannup.

1.2 Social values defined

Statewide Policy No 5 limits 'social' values to non-consumptive social values. Consumptive social values (e.g. irrigation and public water supply) are viewed as economic values. The Policy identifies the following as key social values that require consideration in determining social water requirements:

- Aboriginal and other Australian heritage,
- recreational and tourist pursuits,
- landscape and aesthetic aspects, and
- educational and scientific aspects (WRC 2000)

[1] Ecological Water Requirements (EWRs) are the water conditions needed to maintain ecological values of a water dependent ecosystem at a low level of risk.

[2] Environmental Water Provisions (EWPs) are the water regimes defined by the water allocation decision making process.

[3] Sustainable water yield is the amount of water that can be taken from a water resource without causing unacceptable impacts (WRC 2000).

Figure 1 Study area

In some instances, domestic and stock water uses are also considered social values.

> "Where there is small-scale domestic and stock water use of rivers and wetlands, it may be appropriate for this to be considered a part of the social water requirements … even though it is a consumptive use" (WRC 2000, p. 16).

In addition, social values may be derived from the knowledge that a water resource is maintained. These *non-use social values* include existence values, bequest values and philanthropic values (Randall 1991). *Existence value* is the satisfaction derived from knowledge that a feature of a water resource continues to exist, regardless of whether or not it might be of benefit to others. *Bequest value* is derived from the knowledge that a water resource will be passed on to future generations so that they will have the opportunity to enjoy it. *Philanthropic value* is the satisfaction gained from ensuring that resources are available to contemporaries in the current generation. Those who take a deep ecology perspective, view these ecosystems as having an *intrinsic value*.

1.3 Social water requirements

*S*ocial water requirements (SWRs) are the elements of the water regime identified to meet social (including cultural) values (WRC 2000). A water regime is the "description of the variation of flow rate or water level over time; it may also include a description of water quality" (WRC 2000, p. 12). In other words, a SWR is the water conditions (e.g. flow rate, water level, water quality) needed to maintain the social values of a water resource.

Poor water quality can diminish the social values of a water-dependent feature. Under *Statewide Policy 5*, when establishing EWPs, water quality problems resulting from regulation/abstraction activities are to be considered; where as those arising from land use activities are not.

The DoW will use the information gathered in this study to assist in establishing SWRs and EWPs for water resources in the South West.

1.3.1 Relationship to EWPs

The water regimes established by EWPs "… seek to maintain social values as well as ecological values" (WRC 2000, p. 7). *Statewide Policy No 5* provides guidance where there is conflict between the ecological and social water requirements. *Statewide Policy No 5* indicates that the SWRs will form part of the EWPs, "where they do not unacceptably impact on significant ecological values" (WRC 2000, p. 4).

1.3.2 Relationship to EWRs

In some instances, if the EWRs are satisfied, the associated social values will automatically be maintained. For instance, the scientific and education values of a wetland are unlikely to diminish as long as the water conditions required for a healthy ecosystem are present.

However, in some situations, the provision of water conditions above those needed to maintain the ecological values may be warranted. The example given in *Statewide Policy 5* is where protection of recreational values is of high importance and may require the maintenance of water levels in river pools during periods of low rainfall (WRC 2000). For example, a river reduced to a series of pools in summer may still be a healthy ecosystem but is unlikely to provide an acceptable canoeing experience.

The opposite can also be true. For instance, maintaining a scenic view (a social value) may only require the presence of open water. However, maintaining a healthy ecosystem may require more water than that needed to support the scenic view.

1.4 Organisation of document

The report is in two parts. Part A includes the study methodology, the recommended approach to Aboriginal stakeholder consultation and a summary of the water-dependent features and their social values. Part B includes detailed profiles for each of the water-dependent features.

Part A

2 Methodology

2.1 Identification of Water-Dependent Features

Features dependent on surface water and/or groundwater for their social values were identified in the following manner:

- Consultant knowledge and consultation with DoW staff
- Interviews with key stakeholders in the region (Appendix A)
- A desktop analysis of available data (e.g. research and management reports, plans, websites, heritage registers, maps)

The study identified 64 water-dependent features with associated social values (Table 1). The features fell into five general categories:

- wetlands
- waterways (e.g. rivers, lakes, drains)
- cave systems
- estuaries and inlets
- groundwater dependent terrestrial vegetation (e.g. forests)

Table 1 Water-dependent features with social values

Type of water-dependent feature	Number *	Percentage (N= 67)*
Waterways		
• River	37	55%
• Lakes	2	3%
• Drain	2	3%
Wetlands	12	18%
Cave systems	6	9%
Estuaries and Inlets		
• Estuary	2	3%
• Inlet	3	4%
Forests/vegetation	4	6%

* One feature is part wetland and part estuary and is included in both categories.

In some instances, the feature in its entirety possessed social value. For example, the entire Margaret River has social value as a permanent site on the WA Register of Aboriginal Sites. For some features, it was not the entire feature that possesses social value but specific locations associated with the feature. In the case of the Vasse River, three specific locations were identified as having social value.

2.2 Data collection and analysis

2.2.1 Social values

This study examined the social values identified in *Statewide Policy No 5* with the exception of domestic and stock water use. This included:

- Aboriginal and other Australian heritage,
- recreational and tourist pursuits,
- landscape and aesthetic aspects, and

- educational and scientific aspects (WRC 2000, p. 16).

Social values exist on both public and private property. This study focused on the values that were publicly accessible social values.

2.2.2 Characteristics

A profile was developed for each water-dependent feature. Using data templates, the same categories of data were collected, where available, for each water-dependent feature or specified location within a feature. For each, data was gathered on the following:

- Name of the feature
- Location/address
- Key data sources
- The social values (e.g. heritage, recreation, tourism, education, research)
- Specific activities (e.g. canoeing, swimming, fishing, marroning)
- Visitor numbers
- Visitor catchment
- Season of use
- Capacity
- Facilities
- Accessibility
- Surrounding land uses
- Management status
- Land security
- Condition of site
- Rare and/or endangered species
- Potential for increased social value
- Unique attributes

The rationale for the selected characteristics is provided in Table 2.

Table 2 Selected characteristics

Characteristic	Description/rationale
Visitor numbers	The number of visitors can provide an indication of the degree of value attributed to the site.
Visitor catchment	A site has higher social value if it attracts not only local users but regional users and beyond (e.g. State, Australia or overseas).
Season of use	The season of use will determine when water is needed to support social values. Some values will require water year round while others will require water only during certain seasons.
Capacity	The capacity of a site will provide perspective on the number of visitors and the ability of future site development.
Facilities	The facilities available indicate the types of social values that are likely to occur at a site. Facilities and their condition typically reflect the value placed on a site.
Accessibility	An inaccessible site is likely to have a lower social value (e.g. a site on private property, a site surrounded by fencing).

Characteristic	Description/rationale
Surrounding land uses	Sites next to land uses that complement or enhance the social values are more highly valued.
Management status	Sites actively managed are likely to have higher social values.
Land security	Sites located within National Parks and Conservation Reserves are less likely to be exposed to incompatible land use changes. This security gives the feature a higher social value.
Condition of site	Sites in 'good' condition tend to have higher social values.
Rare and/or endangered species	Any feature that is habitat for a declared rare species automatically warrants high management status (EPA 1993). Rare or endangered species or communities increase the education and research value of a site and its intrinsic value.
Potential for increased social value	Sites with the potential to increase their social values are more highly valued. For example, a site located close to an area of significant future population growth
Unique attribute	Sites that have a one of a kind use or value or would be very hard to substitute if the site/characteristic was lost have higher social value.

Where available, the following data pertaining to social water requirements was also documented for each water-dependent feature or specified location:

- The social value
- Existing condition and trends (e.g. water quality, changes in water quantity)
- Minimum acceptable conditions to maintain the social value (e.g. depth, flow, and water quality)
- Ideal conditions (e.g. depth of water, flow rates, and water quality)

The water condition(s) data will be used by the DoW in defining social water requirements.

All study data was entered into an Excel spreadsheet suitable for inclusion in the DoW's Geographic Information System (GIS) water resource database. This includes the data identified in Table 2 and the data pertaining to social water requirements.

2.2.3 Data sources

The sources of data used to compile the profiles of the water-dependent features were:

- The desktop analysis of available data (e.g. research and management reports, plans, websites, heritage registers, maps)
- Interviews with key stakeholders in the region (Appendix A)
- Site visits

Desktop analysis

A desktop analysis of available data (e.g. organisation websites, management reports) was undertaken. A list of the key data sources documents is contained in Appendix B.

The analysis included a review of heritage lists, registers and organizations, including:

- National Heritage List
- Commonwealth Heritage List
- Register of the National Estate
- State Register of Heritage Places

- Applicable Municipal Inventories
- National Trust
- WA Register of Aboriginal Sites

A description of each of the heritage lists, registers and organisations is contained in Appendix C.

The desktop analysis revealed that the social values of some water dependent features were well documented. For example, the Department of Environment and Conservation (DEC) collects visitor numbers (Table 2) in managing National Parks (e.g. Wellington National Park). However, for other features, there was little, if any, documentation.

Some water dependent features had few associated social values. This was typically attributed to limited public access. For example, many of the water features located along the Leeuwin-Naturaliste ridge are predominately surrounded by private property.

Stakeholder interviews

Key stakeholders interviews were used to acquire data on those features where there was insufficient documentation or the existing data was dated. Semi-structured in-depth interviews were conducted with 30 stakeholders between April 2008 and September 2008 (Appendix A).

Stakeholder representatives were contacted via telephone or email to arrange a convenient day, time and location for the interview. This initial contact was followed by a confirmation email. With permission from the interviewee, a cassette recorder was used to record the interviews. The interviewer also took handwritten notes.

To ensure consistency in data collection, the interviewer used standardized data sheets. As soon as possible after the interview, the interview was documented as typed notes based on the handwritten notes and tape recordings in an expanded note format.

During the interviews, stakeholders were also asked to describe the water conditions required to maintain social values of a site. Stakeholders commented on the features they knew well rather than on all the sites in the study area. For sites with multiple social values, stakeholders were asked to indicate the water requirement for each type of value.

Some stakeholders were able to identify the required water conditions as a specific depth of water. However, most stakeholders found the required water conditions difficult to describe in precise or empirical terms. Instead, they tended to provide more generalised and qualitative responses. For example, stakeholders indicated that “last summer the water levels were sufficient to support swimming”.

Site visits

Site visits were conducted in those instances where there was little documentation of the characteristics, the study was unfamiliar with the water-dependent feature, and public access was available. Again, the data sheets were used to ensure consistency in data collection.

3 Summary of Social Values

Table 3 identifies by location the 64 water-dependent features with associated social values. Table 4 provides a summary of the social values attributed to each of these features. Detailed profiles are provided in Part B.

Summary of the key findings:

- The majority of identified social values fell into one of three categories: heritage, education, or recreation.
- The most commonly identified recreation values were: walking/jogging (27 features), birding (21 features), picnicking (17 features) and fishing (15 features).
- The water dependent features with the highest number of social values are: Lower Blackwood River (15 social values), Lower Collie River (14 social values), Margaret River (13 social values), the Leschenault Estuary (12 social values) and St John Brook (12 social values).
- The social value most frequently attributed to the cave systems was tourism.
- All of the water-dependent features have aesthetic value(s). Because it is not a distinguishing characteristic and it has not been included in Table 4.

Table 3 Water-dependent features with social values in the South West

Profile	Water-dependent feature	Category
Brunswick River Catchment	Brunswick River	River
	Augustus River	River
	Benger Swamp	Wetland
Leschenault Estuary	Leschenault Estuary	Estuary
	Leschenault Inlet	Inlet
Bunbury and Surrounds	Big Swamp Reserve	Wetland
	Five Mile Brook	Drain
	Manea Park wetland	Wetland
	Loughton Park wetland	Wetland
	Hay Park wetland	Wetland
	Horseshoe Lake	Wetland
Lower Collie River Catchment	Lower Collie River	River
Preston River Catchment	Preston River	River
	Ferguson River	River
	Crooked Brook	River
	Noneycup Creek	River
	Picton Wetland	Wetland
	Child Side School wetland	Wetland
Capel River Catchment	Capel River	River
	Stirling Wetlands	Wetland
	Capel Wetlands	Wetland
Vasse-Wonnerup Estuary System	Vasse and Wonnerup Estuaries	Wetland/estuary
	Malbup Creek	River
	Ludlow River	River
	Abba River	River

Profile	Water-dependent feature	Category
	Sabina River	River
	Vasse River	River
	Vasse River Diversion Drain	Drain
	New River	River
	Broadwater Wetlands	Wetland
	Ambergate Reserve	Vegetation
	Ruabon-Tutunup Rail Reserve	Vegetation
	Tuart Forest National Park	Forest
Geographe Bay Coastline	Buayanup River	River
	Carbunup River	River
	Toby Inlet	Inlet
	Meelup Brook	River
	Dolugup Brook	River
	Dungulup Brook	River
	Dandatup Brook	River
	Jingarmup Brook	River
	Dunsborough Lakes	Lakes
Leeuwin-Naturaliste Ridge	Margaret River	River
	Ellen Brook	River
	Yallingup Brook	River
	Wilyabrup Brook	River
	Cowaramup Brook	River
	Boodjidup Brook	River
	Calgardup Brook	River
	Boranup Karri Forest	Forest
	Turner Brook	River
	Gunyulgup Brook	River
	Quinninup Brook	River
	Giants Cave	Cave
	Calgardup Cave	Cave
	Ngilgi Cave	Cave
	Mammoth Cave	Cave
	Lake Cave	Cave
	Jewel Cave	Cave
Blackwood River Catchment	Lower Blackwood River	River
	Hardy Inlet	Inlet
	West Bay Creek	River

Profile	Water-dependent feature	Category
	Chapman Brook	River
	St. John Brook	River
	Scott River	River
	Lake Jasper	Lake
	Lower Donnelly River	River

Table 4 Social values by feature

Water feature	Aboriginal heritage	Non-Aboriginal heritage	Recreation	Picnicking	Camping	Walking/jogging	Cycling	Canoeing/kayaking	Water skiing	Swimming	Fishing	Marroning	Boating	Crabbing	Kite surfing	Birding	Tourism	Education	Research
Brunswick River	✓	✓		✓	✓					✓	✓	✓					✓		
Augustus River	✓						✓												
Benger Swamp		✓														✓			
Leschenault Estuary	✓	✓			✓	✓				✓	✓	✓	✓	✓	✓	✓		✓	
Leschenault Inlet	✓	✓				✓		✓					✓			✓	✓	✓	
Big Swamp Reserve	✓					✓										✓		✓	
Five Mile Brook	✓																	✓	
Manea Park wetland						✓												✓	
Loughton Park wetland						✓													
Hay Park wetland																✓			
Horseshoe Lake																		✓	
Lower Collie River	✓	✓		✓	✓	✓	✓	✓		✓	✓	✓	✓	✓			✓	✓	
Preston River	✓	✓		✓				✓								✓		✓	
Ferguson River	✓	✓															✓		
Crooked Brook							✓											✓	
Noneycup Creek																		✓	

Water feature	Aboriginal heritage	Non-Aboriginal heritage	Recreation	Picnicking	Camping	Walking/jogging	Cycling	Canoeing/kayaking	Water skiing	Swimming	Fishing	Marroning	Boating	Crabbing	Kite surfing	Birding	Tourism	Education	Research
Picton Wetland																		✓	
Child Side School wetland																		✓	
Capel River	✓	✓		✓	✓			✓			✓					✓			
Stirling Wetlands																✓			
Capel Wetlands																		✓	✓
Vasse and Wonnerup Estuaries	✓	✓		✓							✓					✓		✓	✓
Malbup Creek																✓			
Ludlow River	✓																		
Abba River	✓																		
Sabina River	✓	✓																	
Vasse River		✓		✓												✓		✓	
Vasse River Diversion Drain											✓								
New River	✓																	✓	
Broadwater Wetlands	✓	✓																✓	
Ambergate Reserve						✓													
Ruabon-Tutunup Rail Reserve		✓																	✓

Water feature	Aboriginal heritage	Non-Aboriginal heritage	Recreation	Picnicking	Camping	Walking/jogging	Cycling	Canoeing/kayaking	Water skiing	Swimming	Fishing	Marroning	Boating	Crabbing	Kite surfing	Birding	Tourism	Education	Research
Tuart Forest National Park		✓		✓		✓													
Buayanup River		✓			✓						✓								
Carbunup River		✓				✓						✓							
Toby Inlet						✓		✓			✓					✓			✓
Meelup Brook	✓	✓		✓		✓												✓	
Dolugup Brook		✓																	
Dungulup Brook	✓																		
Dandatup Brook		✓																	
Jingarmup Brook	✓	✓																	
Dunsborough Lakes																		✓	
Margaret River	✓	✓		✓	✓	✓	✓	✓		✓	✓	✓				✓	✓	✓	
Ellen Brook	✓	✓				✓										✓	✓		
Yallingup Brook	✓	✓				✓												✓	
Wilyabrup Brook	✓			✓															
Cowaramup Brook	✓				✓	✓				✓						✓		✓	
Boodjidup Brook	✓					✓													
Calgardup Brook	✓					✓													
Boranup Karri Forest				✓	✓	✓										✓			

Water feature	Aboriginal heritage	Non-Aboriginal heritage	Recreation	Picnicking	Camping	Walking/jogging	Cycling	Canoeing/kayaking	Water skiing	Swimming	Fishing	Marroning	Boating	Crabbing	Kite surfing	Birding	Tourism	Education	Research
Turner Brook	✓					✓													
Gunyulgup Brook	✓					✓													
Quinninup Brook	✓					✓													
Giants Cave	✓																✓		
Calgardup Cave	✓																✓		
Ngilgi Cave	✓																✓		
Mammoth Cave	✓															✓	✓		
Lake Cave																	✓		
Jewel Cave																	✓		
Lower Blackwood River	✓	✓		✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	
Hardy Inlet	✓			✓		✓		✓	✓	✓	✓		✓			✓	✓		
West Bay Creek	✓																	✓	
Chapman Brook	✓			✓	✓			✓		✓	✓							✓	
St. John Brook	✓	✓		✓	✓	✓	✓	✓		✓	✓	✓				✓		✓	
Scott River	✓					✓													
Lake Jasper	✓	✓		✓	✓	✓				✓	✓	✓	✓			✓	✓	✓	
Lower Donnelly River	✓			✓	✓	✓		✓	✓	✓	✓	✓	✓				✓		

Part B

Brunswick River Catchment Profile

1 Background

From its headwaters on the Darling Scarp, the Brunswick River passes through the Shires of Collie and Harvey before reaching the Leschenault Estuary via the Collie River. The catchment is 228 km^2 in size.

In the upper catchment the primary land uses are State Forest and the Worsley Alumina Refinery. The major land uses in the lower catchment are agriculture and horticulture, until the catchment reaches Australind where the dominate land uses are lifestyle and residential properties.

The most prominent water feature in the catchment is the Brunswick River. The river has a number of tributaries, including Augustus River, Wellesley River, Ernest River, Lundenburgh River[4], Elvira Gully, and Flaherty Brook. The Benger Swamp is also located in the catchment.

2 Social values

2.1 Brunswick River

Much of the land abutting the river is in private ownership. In addition, the *Brunswick Catchment Area Water Source Protection Plan* (WRC 2001), for the now decommissioned Beela Dam, further restricts access. Access points include Bill Arthurs Bridge, Wellesley Road, the pools at Brunswick Junction and several small bridges in the upper catchment. In recent times, residential development[5] along the lower portion of the river has provided additional access to foreshore reserves and increased the potential number of river users.

The Brunswick River supports a number of *in situ* social values including recreational fishing. Popular fish species include marron and trout (Table 1). Marroning occurs along the length of the river, where access can be gained. While the Brunswick River is not the most popular marroning river, the Department of Fisheries (DoF) is vigilant about monitoring for poaching.

Trout fishing occurs from the South Western Highway upstream to the headwaters. Anglers fish where they can gain access to the river, including Department of Environment and Conservation (DEC) managed plantation access roads. The DoF annually stocks the river with rainbow trout[6] (*Oncorhynchus mykiss*). The Brunswick River is one of only four rivers[7] in the study area that is stocked.

[4] The Lunenburgh River has a number of tributaries including the Sophia River, the Matilda River, and the Orthro River.

[5] One example is Treendale. The development is located along the Brunswick River, north of where the Brunswick River meets the Collie River. As of February 2008, there are 600 families residing at Treendale and more development is underway (www.treendale.com.au).

[6] The RFAC Recreational Freshwater Fishing Sub-Committee is responsible for developing the annual trout stocking strategy.

[7] The other stocked rivers include Blackwood River, Collie River and Donnelly River.

Figure 1 Brunswick River catchment

Table 1 Brunswick River – marroning and trout fishing

Characteristic	Marroning	Trout fishing
Visitor numbers	No data	Approximately 2-4 people on weekends year round
Season of use	January/February	September to April
Visitor catchment	Local, regional, State	Local, regional, State
Facilities	No facilities	No facilities
Accessibility	Marroning occurs all along the river	Trout fishing occurs upstream of the South Western Highway where they can gain access. This may include 4WD access routes.
Surrounding land uses	Much of the surrounding land is privately owned	
Land security	No security	

2.1.1 Brunswick River pools

The Brunswick River pools are located along the South Western Highway at the northern edge of the Brunswick Junction town site. On the north side of the pools is a caravan park and to the south is a park and bowling club. The park has a picnic area and playground. The area is a popular spot for picnicking and swimming (Table 2) for both local residents and those visiting the adjacent caravan park. Tourists heading south occasionally stop at the site for a rest and to take advantage of the opportunity to swim.

Harvey Water is required to release of 1.5 GL per year to help maintain water levels in the Brunswick River pools.

Caravan Park adjacent to Brunswick Pool

Park adjacent to Brunswick Pool

Table 2 Brunswick River Pool – picnicking and swimming

Characteristic	Picnicking	Swimming
Visitor numbers	Up to 100 people (i.e. capacity) on weekends during summer	Up to 100 people on weekends during summer, many of whom will take a swim during their visit
Season of use	Most popular December to March	
Visitor catchment	Local, regional	Local, regional
Facilities	Picnic tables, barbeques, playground, toilets	
Accessibility	The site is immediately accessible from the South Western Highway (a sealed	

Characteristic	Picnicking	Swimming
	road).	
Surrounding land uses	The picnic area is adjacent to a bowling club and across the river from a caravan park	A caravan park is located on the north side of the Pool and a park with picnic facilities is located on the south side of the Pool.
Land security	Identified as public open space in the Greater Bunbury Region Scheme	Identified as public open space in the Greater Bunbury Region Scheme

2.1.2 Moonlight Pool and Treasure Bridge

There are two unofficial campsites along the Brunswick River - Moonlight Pool and Treasure Bridge (Table 3). The sites are located in State forest, including pine plantations managed by the Forest Products Commission, between Flynn Road Bridge and Big Tree Road Bridge and are adjacent to one another.

The informal campsites are not supported by the DEC. There are concerns about the risk that falling tree limbs pose to visitors. When visitors are found, the DEC officers typically ask them to 'move on'. To discourage use of the area, a number of tracks within the plantation areas have been gated. This prevents the use of off-road vehicles, an activity enjoyed by some campers.

Many of the visitors are local residents who have used the area for years and are attracted to the tranquillity of the campsites. Occasionally, tourists use the camping area as no fees are required.

The Moonlight Pool campsite was logged in late-2006/early-2007, reducing the attractiveness of the area.

Table 3 Moonlight Pool and Treasure Bridge - camping

Characteristic	Camping
Visitor numbers	On long-weekends the site will attract 3-4 families with 4-6 people per family.
Season of use	Year round
Visitor catchment	Local residents and a few people from the Perth area
Facilities	No facilities
Accessibility	The site is immediately accessible from a gravel road via 4WD.
Surrounding land uses	Plantations
Land security	DEC owned land, FPC managed plantation

2.1.3 Augustus River

The Augustus River is a tributary of the Brunswick River located at the top of the catchment. The river is 10.6 km long. Surrounding land uses include State Forest and the Worsley Alumina Refinery. The refinery[8] is licensed to take 2.1 GL/year from river.

Worsley Alumina is required to release water into the Augustus River at a minimum rate of 35 kL per hour during summer. This licence condition was set in 1996 to re-establish the summer[9] base flow, which had been reduced by water users along the river.

[8] The refinery processes and refines crushed bauxite ore from the Darling Plateau to produce alumina for export via the Bunbury Port.
[9] Summer is defined as being the period from 1 December to 31 March.

The Munda Biddi Trail runs along a short portion (about 5 km) of the Brunswick River, close to where the Augustus River meets the Brunswick River. The Munda Biddi is an off-road cycling trail.

2.1.4 Aboriginal heritage

There are a number of registered Aboriginal sites adjacent to or in the vicinity[10] of the Brunswick River and its tributaries. The sites listed as permanent are identified in Table 4. Other sites identified on the register are contained in Appendix D.

The entire Brunswick River is a registered mythological site.

Table 4 Permanent sites

Site name	Site ID	Site type[11]	Additional info
Marriott Road	4887	Artefacts/scatter	--
Refinery 35	5264	Artefacts/scatter	--
Refinery 05	5271	Artefacts/scatter	--
Brunswick River	17776	Mythological	Natural feature, water source

2.1.5 Non-Aboriginal heritage

There are several non-Aboriginal heritage features located along the Brunswick River and its tributaries (Table 5). Only one of these is listed on the Heritage Council of WA Register – Alverstoke Homestead. This site is described below.

Alverstoke Homestead is located on Clifton Road near Brunswick Junction. The property is adjacent to the Brunswick River. The homestead complex includes a brick house, a caretaker's cottage, a worker's cottage, timber outbuildings, a dairy, a schoolroom and a rose garden and old fruit trees. It was one of the original properties allocated to settlers of the Australind scheme and "has survived in a relatively intact state" (Heritage Council of Western Australia 2001, pg 1). The complex has the potential to be an important research site (Heritage Council of Western Australia 2001).

In 2002 conservation works were undertaken at the Homestead, including the strengthening of structures and the conservation of materials. These efforts were funded by a grant from the Heritage Council of WA. The site can now be hired for functions (e.g. weddings).

Alverstoke is promoted as a tourist site (e.g. the Harvey Visitors Centre website). During summer (December to March) the site hosts weddings on most weekends. The 200+ heritage roses are a greater attraction for visitors than the Brunswick River (Gardiner pers comm. 2008).

[10] For the sites that are identified as a box, if the box touches one of the water features it is included on the list.

[11] See Appendix C (Table 3C) for definitions of the various site types.

2.2 Benger Swamp

Benger Swamp is located along Mornington Creek 1 km east of Benger. The swamp originally covered an area of approximately 1,000 ha. Over the last century the area has been reduced to 572 ha through the construction of drains and levees (CALM 1987). Due to these developments, the system is no longer a part of the Mornington River system, but is instead dependent on inflow from farm drains (Australian Heritage Database n.d.). The inflow is artificially controlled via a gate. The gate is closed in winter to retain water depths and opened in mid-December to allow the area to dry out for cultivation.

Much of the surrounding land has been cleared and is used for agriculture (e.g. potatoes). The swamp has been used for agriculture since the early-1900s. Continuation of the agricultural land uses is part of the wetland management plan.

The swamp is a conservation category wetland and listed in the Directory of Important Wetlands in Australia. It is part of the Benger Swamp Nature Reserve, which is actively managed by the DEC via the Benger Swamp Nature Reserve Management Plan 1987-1992. Management activities include weed control (e.g. watsonia, arum lily, and typha), water monitoring, revegetation, fox baiting, and feral pig trapping.

The avian life attracts birders to the area (Table 6). This includes the highest number of Australasian bittern (*Botaurus poiciloptilus*) counted at any one site in Western Australia. The Australasian bitten is a declared threatened species under the WA *Wildlife Conservation Act*. The site is a regular breeding and moulting area for the Freckled duck (*Stictonetta naevosa*).

Table 6 Benger Swamp - birding

Characteristic	Birding
Visitor numbers	A limited number of birders
Season of use	No data
Visitor catchment	Regional, State
Facilities	No facilities
Accessibility	The site is immediately accessible from Swamp Road (a sealed road).
Surrounding land uses	The surrounding land is used for agriculture. The Kemerton Industrial Park is located to the west.
Land security	Benger Swamp is located within the Benger Swamp Nature Reserve. The area is managed by the DEC.

Table 5 Non-Aboriginal heritage sites

Site	Location	National Estate	Heritage Council of WA Register	Municipal inventory*	National Trust	Water dependence
Alverstoke Homestead Complex	Clifton Road, Brunswick Junction		✓	✓	✓	Located adjacent to the Brunswick River
Brunswick Road Bridge over Brunswick River *	South Western Highway, Brunswick			✓		Passes over the Brunswick River
Benger Swamp	Mitchell Road, Benger			✓		Site is a water feature (see section 2.2)
Old State Farmhouse	Lot 15 Clifton Road, Brunswick			✓		Located adjacent to the Brunswick River

* Shire of Harvey Municipal Inventory

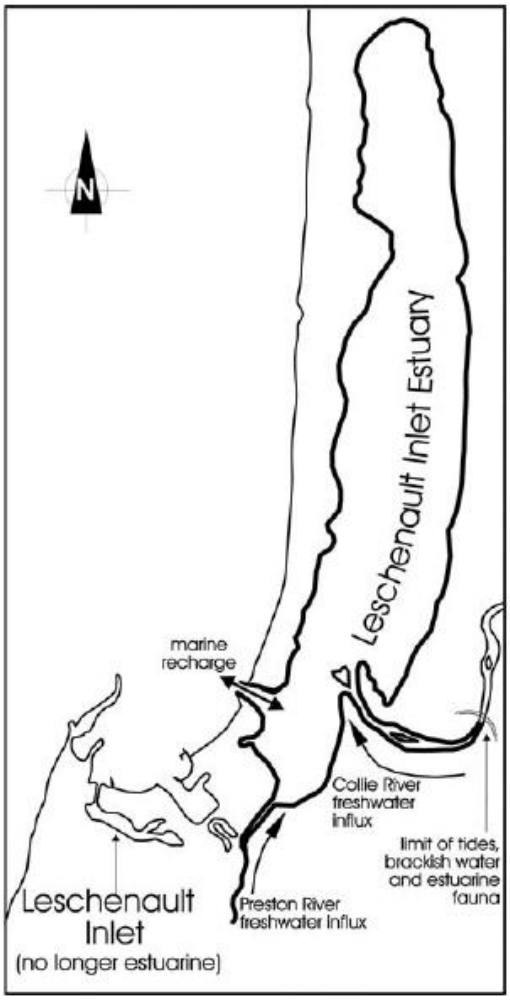
Leschenault Estuary Profile

1 Background

The Leschenault Estuary, a shallow, elongated water body, is located north of Bunbury. The majority of the Estuary is in the Shire of Harvey with a small southern portion in the City of Bunbury. The Estuary is approximately 13.5 km long and has a total surface area of about 25 km^2 (DoW 2007). It is separated from the Indian Ocean by the Leschenault Peninsula, a sand dune peninsula.

The Estuary's catchment extends for 1,981 km^2 and includes the Wellesley, Brunswick, Collie, Ferguson and Preston Rivers as well as a number of wetlands, creeks, waterways and drains. The Collie and Preston Rivers discharge directly into the Estuary.

The Leschenault Estuary has undergone a number of engineered changes since the 1950s. The original outlet to the ocean was filled in 1951 to stop the accumulation of silt in the old port (DoE 2004a) and a new 'cut' was made opposite the mouth of the Collie River. In 1968/69 the Preston River was realigned for construction of the Bunbury Inner Harbour, which meant it began discharging into the Leschenault Estuary. When the Inner Harbour was completed in 1976, the original outlet was reopened to enable water to circulate and to allow the passage of boats from Koombana Bay. The reopening resulted in the development of two water bodies – the Leschenault Estuary and the Leschenault Inlet.



2 Social values

2.1 Leschenault Estuary

When 'the Cut' was created, the Leschenault Estuary changed from a tide-dominated to a wave-dominated estuary. As a result the Estuary is more efficient at trapping sediment (DoE 2004a), which has become an ongoing management problem. The build up of sedimentation has led to a number of changes including: a decrease in Estuary depth, development of mudflats, alterations in the size and distribution of habitat (e.g. seagrass meadows), and increased turbidity (DoW 2007a).

As a wave-dominated system, salinity stratification is more likely to occur. This means that the denser saline water stays at the bottom of the Estuary while the freshwater stays at the top. This prevents the exchange of oxygen between two layers, promoting oxygen depletion in the bottom waters.

'The Cut' has also meant an increase in the exchange of water between the ocean and the Estuary[12]. The result has been a decrease in summer salinity levels and an increase in winter salinity levels (DoE 2004a). This has led to a gradual change in fringing and aquatic vegetation towards more salt-tolerant plants.

Although sedimentation and salinity have changed, nutrient levels in the Leschenault Estuary continue to meet ANZECC water quality guidelines (i.e. Australian accepted standards). This includes both nitrogen and phosphorous levels.

Contributions from the catchment

The Leschenault Estuary receives inputs from the Collie and Preston river catchments and the Parkfield Drain. Contributions from the Collie River have changed over time. Construction of the Wellington Dam, in 1933[13], resulted in decreased winter inflows. However, the dam allowed creation of the Collie Irrigation District[14], on the lower Collie River, in the 1930s and 1940s. The district has increased summer inflows to the Estuary through irrigation drainage and overflow. The Collie River has high salinity levels, as a result of land clearing for agriculture in the upper catchment prior to the 1960s, and experiences nutrient loading, from drainage of agricultural land uses. Extensive work is being done in the catchment to reduce salinity levels.

Table 1 Water quality issues

Water body	**Water Quality Issue**		
	Nutrients	**Sedimentation**	**Salinity**
Collie River	✓		✓
Brunswick River	✓	✓	
Wellesley River	✓	✓	✓
Preston River	✓	✓	
Parkfield Drain	✓		

The Brunswick River and Wellesley River (a tributary of the Brunswick River) contribute to the Estuary via the Collie River. The Brunswick River is fresh but experiences nutrient loading in the lower reaches from agricultural land uses. The Wellesley River has high salinity and nutrient levels. Both rivers suffer from erosion problems, resulting in sediment build in river pools.

The Preston River began discharging into the Leschenault Estuary in 1968/69, when it was realigned as part of the Bunbury Inner Harbour work. It has high nutrient levels, with phosphorous levels increasing closer to the river mouth. Erosion is an issue along a number of sections of the River, which contributes to the build-up of sediments.

The Parkfield Drain is located at the northern end of the Leschenault Estuary. The drain has high nutrient levels. This water is discharged into an area of the Estuary that has poor circulation.

[12] Prior to 'the cut', the Estuary's connection to the ocean acted as a bottleneck restricting the discharge of winter flood waters.
[13] The dam wall has been raised on several occasions, the last time being in 1960.
[14] The Collie Irrigation District covers an area of 16,608 ha, of which 4,930 ha is irrigated.

2.1.1 Recreation values

The Leschenault Estuary is a popular location for recreational fishing and crabbing (Table 4). Tailor and herring are found around 'the Cut'. Whiting, mullet, blue manna crabs and occasionally mulloway are found east of 'the cut'. The blue manna crabs are preferred by fishers to tailor and herring (G. Stokman and M. Burgess pers com. 2008) and are typically caught in the shallower waters.

Blue Manna Crab

The blue manna crab (*Portunus pelagicus*) typically spends its life in the ocean. Mating is one exception. Crabs mate in estuaries and sheltered embayments around the coastline. After mating, females return to the ocean to spawn. Juvenile crabs enter estuaries when they are about the size of a ten cent coin (DoE 2004) to mature.

Crabs will move into other areas, such as the Leschenault Estuary. This is dependent on salinity levels, wind and currents. Salinity levels must reflect those of seawater. As salinity levels are higher in summer than in winter in the Leschenault Estuary, crabs are more plentiful during the summer months. If the appropriate conditions do not exist, as in 1969, the Leschenault Estuary will not attract juvenile crabs (DoE 2004).

The Estuary is fished by families, particularly those with small kids. The water is calmer in the Estuary than the Ocean, providing safer conditions. When ocean swells are large (e.g. May to September) anglers usually prefer fishing in the Estuary over the Ocean (G. Stokman and M. Burgess pers com. 2008).

Recreational anglers used to compete with commercial fishers (Table 2). In December 2000, the Estuary became an exclusive recreational fishing zone. The six commercial, licensed fishers surrendered their licences voluntarily as part of the State's estuarine buy-out program.

Table 2 Leschenault Estuary – fishing and crabbing

Characteristic	Fishing	Crabbing
Visitor numbers	No data	Approximately 100 people on weekends December to March
Season of use	October to March and October to December for tailor and herring	December to March
Visitor catchment	Local, regional	Local, regional
Facilities	There are boat launching facilities at Taylor Road and Pratt Road on the lower Collie River, Ridley Place at Australind and Stirling Street and Power Boat Club on the Leschenault Inlet.	
Accessibility	The Estuary is immediately accessible from a variety of sites, including Cathedral Road, Old Coast Road and Estuary Drive (sealed roads).	
Surrounding land uses	The Leschenault Peninsula Conservation Park is located to the west; Australind and Eaton are located to the east; and Bunbury is to the south. Most of the foreshore is identified as public open space in the Greater Bunbury Region Scheme.	
Land security	Most of the Estuary's foreshore is identified as public open space in the Greater Bunbury Region Scheme.	

There are a number of popular birding locations around the Estuary (Table 3). This includes Ridley Place (A), Australind Swamp (B), Point Duoro (C), and the Cut and Preston River Mouth (D) (Birds Australia WA 2005) (Figure 1). Of these sites, the Preston River mouth is the rated as the best by birders (Birds Australia WA 2005).

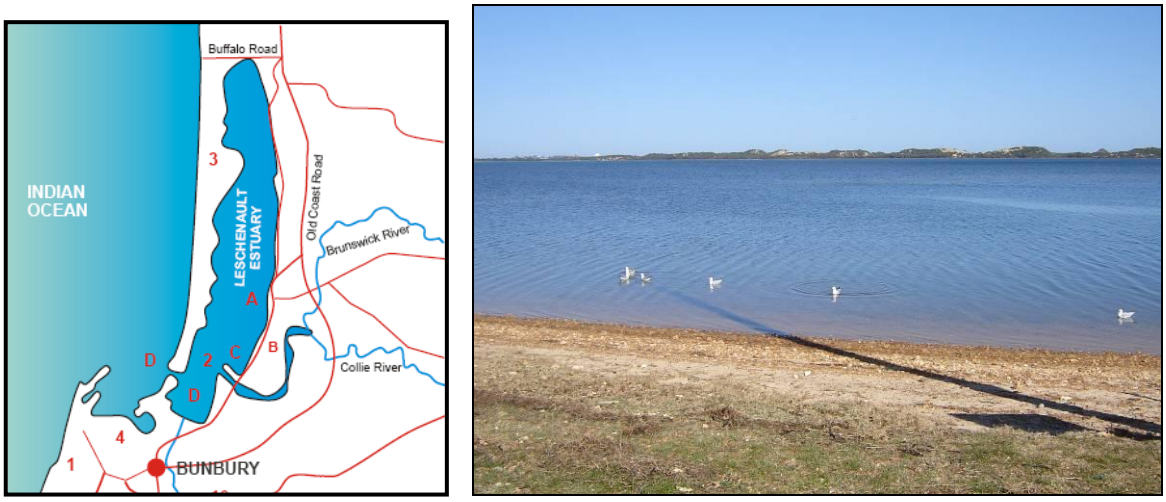


Figure 1 Popular birding locations around Leschenault Estuary (Birds Australia WA 2005a)

Other popular activities in the Estuary include swimming, power boating, kite surfing, and wind surfing. Kite and wind surfing are relatively new activities but are quickly growing in popularity (B. Deeley pers com. 2008) (Table 4). Although the Estuary typically provides calm conditions for swimming, many people prefer to swim in the ocean.

Table 3 Leschenault Estuary – birding and power boating

Characteristic	Birding	Power boating
Visitor numbers	No data	No data
Season of use	Year round	Year round, most popular in summer (November – April)
Visitor catchment	Local, regional, State	Local, regional
Facilities	No facilities	There are boat launching facilities at Taylor Road and Pratt Road on the lower Collie River, Ridley Place at Australind and Stirling Street and Power Boat Club on the Leschenault Inlet.
Accessibility	The Estuary is immediately accessible from a variety of sites, including Cathedral Road, Old Coast Road and Estuary Drive (sealed roads).	
Surrounding land uses	The Leschenault Peninsula Conservation Park is located to the west; Australind and Eaton are located to the east; and Bunbury is to the south. Most of the foreshore is identified as public open space in the Greater Bunbury Region Scheme.	
Land security	Most of the Estuary's foreshore is identified as public open space in the Greater Bunbury Region Scheme.	

Table 4 Leschenault Estuary – swimming and kite and wind surfing

Characteristic	Swimming	Kite and wind surfing
Visitor numbers	No data	No data
Season of use	Summer (November – April)	Year round
Visitor catchment	Local	Local, regional

Characteristic	Swimming	Kite and wind surfing
Facilities	No facilities	No facilities required
Accessibility	The Estuary is immediately accessible from a variety of sites, including Cathedral Road, Old Coast Road and Estuary Drive (sealed roads).	
Surrounding land uses	The Leschenault Peninsula Conservation Park is located to the west; Australind and Eaton are located to the east; and Bunbury is to the south. Most of the foreshore is identified as public open space in the Greater Bunbury Region Scheme.	
Land security	Most of the Estuary's foreshore is identified as public open space in the Greater Bunbury Region Scheme.	

2.1.2 Education values

The Leschenault Ribbons of Blue program[15] runs educational activities (e.g. macro-invertebrate sampling) for students at the Discovery Centre and the boat ramp at Ridley Place (Table 5). Both sites are located on the western side of the Estuary off of Old Coast Road. The Discovery Centre is an information centre about the estuary environment that is free and open 24 hours a day seven days a week.

Table 5 Leschenault Estuary - education

Characteristic	Discovery Centre	Boat ramp at Ridley Place
Visitor numbers	Approximately 480 students annually (60 students, 8 times per year)	Approximately 90 students annually
Season of use	Year round	Year round
Visitor catchment	Local	Local
Facilities	Interpretive signage, barbeques, toilets, car park, jetty	Boat ramp, playground, toilets, picnic tables
Accessibility	The Centre is immediately accessible from Old Coast Road (a sealed road).	The boat ramp area is immediately accessible from Paris Road and Old Coast Road (sealed roads).
Surrounding land uses	Public open space	
Land security	The Centre is located on land identified as public open space in the Greater Bunbury Region Scheme.	The area around the boat ramp is identified as public open space in the Greater Bunbury Region Scheme.

[15] The Ribbons of Blue program has coordinators across the State to assist schools and community groups in understanding and taking action for local waterways. Program coordinators undertake a number of activities (e.g. providing education information and equipment, running professional development and training sessions, conducting school visits and excursions, etc.)

2.1.3 Management status and land security

The Leschenault Estuary has a long management history (Table 6). In 2000, the Leschenault Inlet Management Authority and the Leschenault Catchment Coordinating Group amalgamated to form the Leschenault Catchment Council[16] (LCC). The LCC is the peak community consultative body for the catchment and works with the DoW in managing the Estuary. The LCC has prepared the *Leschenault NRM Sub-region Catchment Strategy* (Land Assessment Pty Ltd 2007) to guide this management.

In addition to the LCC, there are several other organisations which contribute to management of the Estuary, including Coastcare, Bushcare and Ribbons of Blue.

Table 6 Management history

Year	Management plan	Responsible organisation
1992	Leschenault Waterways Management Program	Leschenault Inlet Management Authority
1995	Management Strategy for the Leschenault Catchment	Leschenault Catchment Coordinating Group
1998	Leschenault Catchment Sub-Regional Strategy	Leschenault Catchment Coordinating Group
2002	Draft Leschenault Catchment Strategy	Leschenault Catchment Council
2002	South West Regional Strategy for Natural Resource Management	South West Catchments Council
2005	South West Regional Strategy for Natural Resource Management	South West Catchments Council
2007	Leschenault NRM Sub-Region Catchment Management Strategy	Leschenault Catchment Council

Source: Department of Water 2007

2.1.4 Surrounding land uses

Turkey Point Reserve is located 3 km north of Bunbury city centre on the south western foreshore of the Leschenault Estuary. It covers an area of approximately 4.5 ha. A portion of the reserve is covered by rehabilitated fly ash storage ponds, which were once used by the Bunbury Power Station. Although revegetated, this part of the reserve has been fenced to prevent access.

The reserve is now used for recreational pursuits, including fishing and swimming. Access to the area is via 4WD. There is a boat ramp and a fish cleaning facility is being developed. Due to increasing pressure from recreational use, the City of Bunbury is developing a master management plan for the Reserve.

2.2 Leschenault Inlet

The Leschenault Inlet is located along the northern boundary of the City of Bunbury. It is about 1,900 m in length and 200 m at its widest point. The Inlet has an urban catchment of approximately 50 ha (DoE 2004a). Koombana Bay is located to the north of the Inlet. Boats pass between the Inlet and the Bay via a cut at Point MacLeod (i.e. 'the Plug').

[16] The Leschenault Catchment Council has nineteen members. This includes twelve community, three local government, two industry and two State Government representatives (Department of Water). The Council helps manage the Leschenault Estuary and the Preston, Collie (upper and lower), Ferguson, Wellesley and Brunswick River systems.

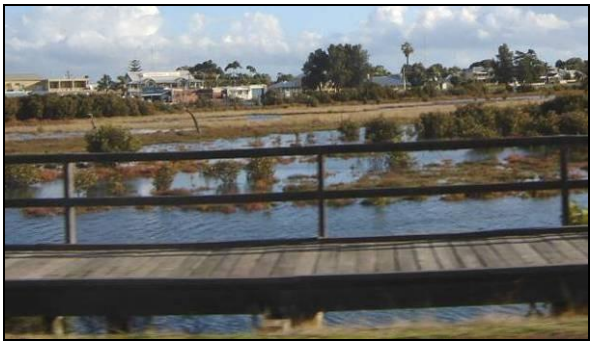
Prior to 1968/69 the Preston River discharged into the Inlet; in 1968/69 the river downstream of Australind Road Bridge was realigned to allow for construction of the Bunbury Inner Harbour. This has changed the estuarine system to a tide-dominated marine embayment (DoW 2007a). As a result, the Inlet is shallower and has experienced an increase in marine vegetation and fauna.

Water quality of the Leschenault Inlet is considered good (e.g. low nutrient levels). However, careful management of stormwater and recreational pressures is needed in order to maintain a healthy system (DoW 2007a).

2.2.1 Recreation values

The Mangrove Walk trail, a 5 km circuit, extends along the entire foreshore of the Leschenault Inlet (Table 7). The walk trail is used by walkers and cyclists and is wheelchair accessible. There are shelters, picnic areas and playgrounds along the trail.

A small portion of the trail is a boardwalk that extends out over the Inlet. From the boardwalk and the nearby bird hide, birds can be seen at various times feeding on the mudflats and in the shallow areas around the edge of the Inlet (Birds Australia WA 2005a).



Boardwalk along Leschenault Inlet

Path along Leschenault Estuary

Table 7 Leschenault Inlet – walking and birding

Characteristic	Walking	Birding
Visitor numbers	No data	No data
Season of use	Year round	No data
Visitor catchment	Local	Local, regional
Facilities	Shelters, picnic areas, playgrounds, toilets, car park	Bird hide, picnic areas, playgrounds, toilets, car park
Accessibility	The walk trail is immediately accessible off of Koombana Bay Drive, Stirling St, Blair St, Cobblestone Drive or Austral Parade (sealed roads).	The bird hide is immediately accessible off of Koombana Bay Drive (a sealed road).
Surrounding land uses	Residential, town site of Bunbury, Bunbury Golf Course and Dolphin Discovery Centre on Koombana Bay	
Land security	Most of the Inlet's foreshore is identified as public open space in the Greater Bunbury Region Scheme.	

The Inlet supports the following on water activities: dragon boating, power boating, and rowing. Boats can be launched from ramps on Stirling Street, the northern foreshore, and the Power Boat Club, the southern foreshore (Table 8). The Bunbury Rowing Club facilities are located on the southern foreshore, off of Cobblestone Drive. The club supports rowing teams, including a dragon boat team, school groups and competitive teams. The Rowing WA season starts in May and concludes in September with the State Championships. The Australian Rowing Championships are in March, training for this event starts in October. The club's facilities can be hired for functions (e.g. weddings, birthday parties etc).

Table 8 Leschenault Inlet – power boating and rowing

Characteristic	Power boating	Rowing
Visitor numbers	No data	No data
Season of use	Year round	Year round
Visitor catchment	Local, regional	Local, regional
Facilities	There are boat launching facilities at Stirling Street and Power Boat Club.	Bunbury Rowing Club is located on the southern foreshore. There are facilities to launch boats at the Club.
Accessibility	The Bunbury Power Boat Club is immediately accessible from Marabank Loop and Lyons Cove (sealed roads).	The Bunbury Rowing Club is immediately accessible from Cobblestone Drive (a sealed road).
Surrounding land uses	Residential, town site of Bunbury, Bunbury Golf Course, and Dolphin Discovery Centre on Koombana Bay	
Land security	The Bunbury Power Boat Club is located on land identified as public open space in the Greater Bunbury Region Scheme.	The Bunbury Rowing Club is located on land identified as public open space in the Greater Bunbury Region Scheme.

2.2.2 Education values

The 2nd Bunbury Sea Scouts has facilities on the southern foreshore of the Inlet off of Cobblestone Drive, next to the Bunbury Rowing Club (Table 9). Sea Scouts organise regular activities including hiking, camping, sailing, canoeing, and community service. These activities help youth, ages 6 to 18 years old, to develop important skills.

The Leschenault Ribbons of Blue program runs educational activities for students at the Inlet, adjacent to the mangroves (Table 9). Activities include macro-invertebrate sampling and walking through the mangroves.

Table 9 Leschenault Inlet - education

Characteristic	Sea Scouts	Ribbons of Blue
Visitor numbers	No data	Approximately 180 students annually
Season of use	Year round	Year round
Visitor catchment	Local	Local
Facilities	Sea Scout Hall on the southern foreshore of the Leschenault Inlet	Walk trail around/through the mangroves
Accessibility	The facilities are located immediately from Cobblestone Drive (a sealed road).	The site is immediately accessible from Koombana Drive (a sealed road).

Characteristic	Sea Scouts	Ribbons of Blue
Surrounding land uses	Residential, town site of Bunbury	Residential, town site of Bunbury, Dolphin Discovery Centre
Land security	The Sea Scout Hall is located on land identified as public open space in the Greater Bunbury Region Scheme.	The area is identified as regional open space in the Greater Bunbury Region Scheme.

2.2.4 Surrounding land uses

Bicentennial Square

Bicentennial Square is located across the street from the Leschenault Inlet at the intersection of Haley and Blair streets. It is adjacent to Graham Bricknell Memorial Music Shell. The Square is a popular outdoor venue for local events and festivals (e.g. Australia Day fireworks, Max Games and market days) due to its proximity to the City.

Koombana Bay

Koombana Bay is located north of the Leschenault Inlet and opens to the Indian Ocean. It is approximately 2.5 km wide and lies between Casuarina Point and Turkey Point. A dredged channel runs through the centre of the Bay with the deepest point being 12.5 m. This enables large ships to enter the Inner Harbour.

The Bay is popular for water skiing (e.g. up to 20 skiers in summer) and is used by the Koombana Bay Sailing Club. The Club has facilities on Anchorage Cove, which is located on the Bay's southern foreshore. The Club hosts races on Saturday afternoons and twilight sails on Wednesdays, which can attract up to 100 people in summer.

The Bunbury Dolphin Discovery Centre is located on the southern foreshore of the Koombana Bay, off of Koombana Drive. The Centre, opened in 1994, is run by a non-profit organisation. The focus is on dolphin research, education, conservation and tourism.

2.2.5 Unique characteristic

The Inlet supports the most southern white mangrove (*Avicennia marina*) community in Western Australia. The community was established approximately 2,500 year ago through seeds that were delivered via the Leeuwin current. The seeds came from the nearest mangrove community 500 km to the north at the Abrolhos Islands (DoW 2007a).

2.3 Leschenault Peninsula

The Leschenault Peninsula separates the Leschenault Estuary from the Indian Ocean. It is 11 km long and is approximately 1,071 ha in size. The Peninsula is identified as an eastward-moving dune system as dunes naturally erode at a rate of approximately one metre per year (DoW 2007a). This erosion is most evident at the southern end around 'the cut'. There are thin areas of foreshore that to extend into the Estuary referred to as dune sand fingers. These fingers create an undulating coastline and tidal lagoons.

From 1963 to 1990 the Peninsula was used as a disposal site for acid effluent produced as waste from the production of titanium dioxide. The area was then decommissioned and redevelopment. As part of the redevelopment process, recreation facilities were established at several nodes (e.g. the John Boyle O'Reilly Information Bay, Buffalo Beach, Belvidere Beach, Belvidere Camp, Tuart Grove and the Cut).

The top half of the Peninsula and the area around 'the cut' make up the Leschenault Peninsula Conservation Park. This area is managed by DEC via the *Leschenault Peninsula Management Plan 1998-2008* (Department of Conservation and Land Management 1998). The remaining length of the Peninsula is managed by DEC for conservation but is not part of the Conservation Park.

2.2.1 Recreation values

The Leschenault Peninsula has three campsites – Belvidere Camp, the Cut and Tuart Grove (Table 10 and 11). The Belvidere campsite is located on the north eastern side of the Peninsula. A 300 metre walk trail connects the Belvidere campsite with Belvidere Beach, on the Indian Ocean. Some visitors by-pass the campsite and spend the day at the Belvidere Beach swimming and picnicking.

The Tuart Grove campsite is located half way down the Peninsula while the campsite at the Cut is located at the southern end of the Peninsula. Both sites have access to the Estuary, including a jetty at Tuart Grove. Swimming and picnicking are popular activities, however, fishing is limited as most visitors prefer to fish from the ocean side of the Peninsula.

Only DEC staff can access the Tuart Grove and the Cut by vehicle, which is done in order to service the sites. The campsites are accessed via a walk/cycle trail or boat. The Ridge Trail starts at Belvidere campsites and extends 9 km to Tuart Grove and the Cut.

Table 10 Leschenault Peninsula - camping

Characteristic	Camping (Belvidere Camp)
Visitor numbers	Approximately 13,000 – 15,000 people annually. The campsite is full on most long weekends (80 – 100 people). On other weekends only 2-3 sites would be used (10-20 people). There are a total of 10 camp sites.
Season of use	Year round, but most popular in summer (November – April).
Visitor catchment	Local, regional
Facilities	Campsites, picnic tables, toilets, car park
Accessibility	The camp site is immediately accessible from a gravel track off of Buffalo Beach Road.
Surrounding land uses	Belvidere Beach
Land security	The campsite is part of the Leschenault Peninsula Conservation Park, managed by the DEC.

Table 11 Leschenault Peninsula - camping

Characteristic	Camping (The Cut)	Camping (Tuart Grove)
Visitor numbers	Approximately 1,000 people annually	Approximately 1,000 people annually
Season of use	Year round, but most popular in summer (November – April).	
Visitor catchment	Local	Local
Facilities	Campsites	Jetty, campsites
Accessibility	The site is immediately accessible from the Ridge Trail (via walking or cycling) and the Estuary (via boat).	
Surrounding land uses	Conservation park	
Land security	The campsite is part of the Leschenault Peninsula Conservation Park, managed by the DEC.	

There are two additional walk trails on the Peninsula. The Belvidere Interpretive Walk is 1.5 km long (Table 12). It documents the cultural history of Belvidere. The trail is used mostly by visitors to Belvidere campsite and Belvidere Beach as it passes by both locations. There are good spots along the trail for birding.

Table 12 Leschenault Peninsula - walking

Characteristic	Walking (Ridge Trail)	Walking (Belvidere Interpretive Walk)
Visitor numbers	No data	Approximately 13,000 – 15,000 people annually
Season of use	Year round, most popular in summer (November – April)	
Visitor catchment	Local	Local
Facilities	Toilets, picnic tables, jetty, campsites	Interpretive information, toilets, campsite, picnic tables, car park
Accessibility	The trail is immediately accessible from a gravel track off of Buffalo Beach Road. The trail starts at Belvidere Camp.	The trail is immediately accessible from a gravel track off of Buffalo Beach Road.
Surrounding land uses	Conservation Park, Tuart Grove, the Cut	Conservation Park, Belvidere campsite, Belvidere Beach
Land security	The trail is part of the Leschenault Peninsula Conservation Park, managed by the DEC.	

The John Boyle O'Reilly Wetland Trail is a 1 km interpretive walk that details O'Reilly's escape from prison[17] (Table 13). The trail is located near the Park's entrance, off of Buffalo Beach Road. Many visitors will stop to read the interpretive information (i.e. large boards with information) when they enter the Park.

There are a number of popular spots on the Leschenault Peninsula for birding (Birds Australia WA 2005) (Table 13). This includes the walk trails which showcase both water and bush birds. The DEC hopes to install a bird hide in the future along one of the trails.

Although the above locations attract visitors, the most popular site on the Peninsula is Buffalo Beach. The beach is located on the north eastern corner of the conservation park along the ocean. The site currently attracts about 60,000 visitors annually. The number of annual visitors increased after the Buffalo Road was bitumised (in 2001-2003).

Table 13 Leschenault Peninsula – walking and birding

Characteristic	Walking (John Boyle O'Reilly)	Birding
Visitor numbers	No data	No data
Season of use	Year round, most popular in summer.	Year round
Visitor catchment	Local, regional	Local, regional
Facilities	Interpretive information, toilets, car park, picnic tables	Walk trails

[17] John Boyle O'Reilly was a political prisoner sent from England to Australia in 1867. He escaped from prison in Australia and hid along the Peninsula until he was able to hop onboard a ship head to the US.

Characteristic	Walking (John Boyle O'Reilly)	Birding
Accessibility	The trail is immediately accessible from Buffalo Beach Road (a paved road).	No data
Surrounding land uses	Conservation Park, Buffalo Beach	Conservation Park
Land security	The trail is part of the Leschenault Peninsula Conservation Park, managed by the DEC.	The birding locations are part of the Leschenault Peninsula Conservation Park, managed by the DEC.

2.4 Heritage values

2.4.1 Aboriginal heritage

There are a number of sites listed on the Register of Aboriginal Sites which are adjacent to or in the vicinity of the Leschenault Estuary, Inlet and Peninsula. The permanent sites are identified in Table 14.

Table 14 Permanent listed sites

Site name	Site ID	Site type	Additional info
Estuary Drive 2	4493	Artefacts/scatter	--
Estuary Drive 1	4544	Artefacts/scatter	--
Leschenault Inlet	5450	Artefacts/scatter	--
Australind: Ashmore Hts Burial	15370	Ceremonial, skeletal material/burial, artefacts/scatter	Ochre
Australind: Buffalo Road Burial	15371	Ceremonial, skeletal material/burial	--
Collie River Waugal	16713	Mythological	Natural feature, water source
Preston River	19795	Mythological	--

2.4.2 Non-Aboriginal heritage places

There are six places with non-Aboriginal heritage values located along the Leschenault Estuary, Inlet and Peninsula (Table 15). Each site is listed on the City of Bunbury Municipal Inventory. The Leschenault Homestead is also listed on the National Estate and has been classified by the National Trust.

In addition, the Bunbury Heritage Trail has several stops along the Leschenault Inlet, which is accessible to walkers and cyclists. The trail has of two tracks. It is the Main Trail, a 12 km loop, which stops along the Leschenault Inlet (Heritage Council WA 1999). The second track – the City Trail – winds through Bunbury but does not pass any water dependent features.

Table 15 Non-Aboriginal heritage places

Site	Location	National Estate	Heritage Council of WA Register	Municipal inventory*	National Trust	Water dependence
Leschenault Homestead	9 Estuary Drive, Bunbury	✓		✓	✓	Located adjacent to the Leschenault Estuary
Turkey Point Tearooms and Reserve	Leschenault Drive at Turkey Point			✓		Located adjacent to the Leschenault Estuary
Woodchip Loader	Inner Harbour Road, Bunbury			✓		Located adjacent to the Leschenault Estuary
Floodgates – Storm surge barrier	Koombana Dr, Leschenault Inlet, Bunbury			✓		Located adjacent to the Leschenault Inlet
Leschenault Cottage	Estuary Drive, Bunbury			✓		Located adjacent to the Leschenault Estuary

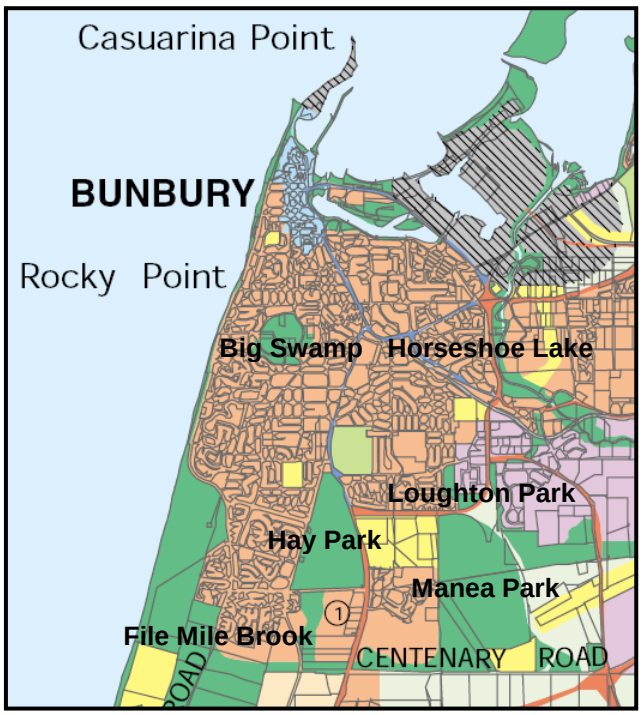
* City of Bunbury Municipal Inventory

Bunbury and Surrounds Profile

1 Background

The City of Bunbury, a port city, is located in the south west of Western Australia approximately 185 km from Perth. It is bounded on three sides by water – the Indian Ocean, Koombana Bay, and the Leschenault Inlet. The city covers approximately 65.7 km^2 and services a local[18] population of about 56,000 people and a regional population of over 140,000 (City of Bunbury 2007).

The City of Bunbury is home to a number of water-dependent features. These include Big Swamp Reserve, Five Mile Brook, Manea Park, Loughton Park, Hay Park and Horseshoe Lake.



2 Social values

2.1 Big Swamp

Big Swamp Reserve is 31.1 ha in size and is located along Prince Philip Drive in South Bunbury. Big Swamp, a conservation category wetland, is located at the centre of the reserve.

An adjustable weir was installed in the Hayward Street drain in the late 1970s to control summer water levels in the swamp. Water levels are currently maintained at 0.5 m AHD (Acacia Springs Environmental et al. 2005). Due to summer evaporation rates, water is diverted from 5 Mile Brook in late winter to help maintain the 0.5 m AHD. The swamp also receives water from stormwater drains along its northern and eastern boundaries. This artificial maintenance of water levels enables the swamp to be a year round water bird sanctuary (Heritage Council WA 1999).

2.1.1 Recreation values

In 1994, the wetland was modified to create a number of islands and channels as well as to establish a dual use path, boardwalk and bird hide (Table 1). The dual use path (i.e. walk and cycle) extends around the edge of the reserve and meets up with the boardwalk on the northern side. The boardwalk extends along the northern edge of the reserve and out over the swamp, allowing visitors to walk among the wetland vegetation. There is a bird hide along the boardwalk which provides an opportunity for visitors to bird watch. More than 70 bird species have been recorded at Big Swamp, including waterbirds, bush birds and birds of prey (City of Bunbury n.d. a).

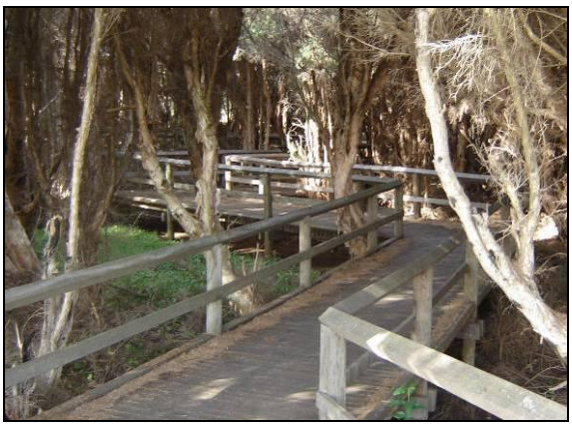
[18] Those located within a 15 km distance from the City of Bunbury.

Walkway adjacent to the Big Swamp

Big Swamp

Table 1 Big Swamp – walking and birding

Characteristic	Walking	Birding
Visitor numbers	50+ people on weekdays and 100+ on weekends year round	No data
Season of use	Year round	Year round
Visitor catchment	Local	No data
Facilities	Walk trail, bird hide, car park	
Accessibility	The site is immediately accessible from Prince Phillip Drive and Tuart Street (sealed roads).	
Surrounding land uses	Located south west of the reserve are Big Swamp Wildlife Park, a playground and dog exercise area.	
Land security	Big Swamp Reserve is identified as public open space in the Greater Bunbury Region Scheme.	



Boardwalk through paperbarks at Big Swamp

Big Swamp bird hide

2.1.2 Education values

The Leschenault Ribbons of Blue program frequently runs educational activities for students at Big Swamp (e.g. macro-invertebrate sampling and water quality monitoring) (Table 2). Big Swamp Reserve is a good venue for students because it is close to a number of Bunbury schools, has flat grassed banks for kids to sit on, and has water year round.

In the past, Edith Cowan University has run sampling programs (e.g. water quality monitoring and macro-invertebrate sampling) at the swamp. This is typically done as part of a university course to provide the students hands on experience.

Table 2 Big Swamp - education

Characteristic	Ribbons of Blue	Edith Cowan University
Visitor numbers	Approximately 360 students annually	No data
Season of use	Year round	Year round
Visitor catchment	Local	Local
Facilities	Walk trail, bird hide, car park	
Accessibility	The site is immediately accessible from Prince Phillip Drive and Tuart Street (sealed roads).	
Surrounding land uses	Located south west of the reserve are Big Swamp Wildlife Park, a playground and dog exercise area.	
Land security	Big Swamp Reserve is identified as public open space in the Greater Bunbury Region Scheme.	

2.1.3 Management status

Big Swamp Reserve is managed by the City of Bunbury with help from the Friends of Big Swamp. The Friends group has about 15 – 20 members and undertakes activities such as revegetation, rehabilitation, weeding, and feral fauna removal. The group is currently working with the City to develop a weed management plan.

In the past management was guided by the Big Swamp Development Plan (Masters 1995). The Big Swamp Master Management Plan is being prepared to update the existing plan.

2.1.4 Surrounding land uses

Big Swamp Wildlife Park is located across the street (south west) from Big Swamp Reserve. Visitors can see and interact with a variety of native fauna (e.g. birds and marsupials) while at the Park. The Park has picnic and barbeque facilities, a shop and café and interpretive centre. There is an entrance fee.

Next to the Wildlife Park is a playground and dog exercise area. There is a car park for easy access off of Prince Phillip Drive.

2.1.4 Unique characteristics

Big Swamp is a home and breeding ground for long-necked tortoises (Bunbury Visitors Centre n.d. a).

2.2 Five Mile Brook

The Five Mile Brook is an open drain that services the southern residential and semi-rural areas of the City of Bunbury. The drain receives water from a variety of sources, including Big Swamp, from across a 16 km^2 catchment (Thompson McRobert Edgeloe 2004).

Five Mile Brook discharges to the Indian Ocean between Dalyellup Beach and Stirling Beach. The ocean outlet is a flap gated twin culvert pipe (Thompson McRobert Edgeloe 2004), which helps control the flow of ocean water into the drain. There is a pumping station upstream of the outlet that pumps water from the drain into the ocean during periods of high tide.

2.1.2 Education values

Edith Cowan University does sampling along the Five Mile Brook as part of its academic program (Table 3). This includes water quality and macro-invertebrate sampling.

Table 3 Five Mile Brook - education

Characteristic	Education
Visitor numbers	Approximately 14 students annually
Season of use	Year round
Visitor catchment	Local
Facilities	No facilities
Accessibility	The drain is accessible from a number of sealed roads.
Surrounding land uses	Residential housing
Land security	No data

2.2.2 Management status and potential increase in use

A restoration plan was prepared in 2004 to transform the Five Mile Brook into a living stream. This would include constructing dual use pathways (i.e. cycle and walk) and benches for pedestrians to rest and enjoy the landscape. It was anticipated that the Brook could become a significant feature for people to enjoy (Thompson McRobert Edgeloe 2004). The plan will be implemented in 24 stages, as funding becomes available. The City of Bunbury is currently working on the first two stages.

2.3 Manea Park

Manea Park is located immediately off the South Western Highway in Davenport, City of Bunbury. It is 206 ha in size and is home to a variety of vegetation types, including wetlands with Melaleucas and drylands with Tuart, Peppermint, Jarrah, Marri and Banksia woodlands. Eedles Creek, a tributary to the Preston River, passes through the Park.

2.1.1 Recreation values

Manea Park has two trails (Table 4). One, Pultenaea Loop, is a 2.3 km walk trail and is accessible to walkers, cyclists and wheelchairs. The other track is a bridle trail.

Table 4 Manea Park - walking

Characteristic	Walking	Horse riding
Visitor numbers	Approximately 10 – 20 people daily	Approximately 1-2 people a week
Season of use	Year round	Year Round
Visitor catchment	Local	Local
Facilities	Walk trail	Bridle trail
Accessibility	The park is immediately accessible off of the South Western Highway (a sealed road).	
Surrounding land uses	Residential housing	
Land security	The park is identified as a mix of rural and regional open space in the Greater Bunbury Region Scheme.	

2.1.2 Education values

Manea Park is used by students from Edith Cowan University and TAFE (Table 5). Activities are undertaken in the park as part of their environmental course work. This includes water quality and macro-invertebrate sampling.

Table 5 Manea Park - education

Characteristic	Education
Visitor numbers	No data
Season of use	Year round
Visitor catchment	Local
Facilities	No facilities
Accessibility	The park is immediately accessible off of the South Western Highway (a sealed road).
Surrounding land uses	Residential housing
Land security	The park is identified as a mix of rural and regional open space in the Greater Bunbury Region Scheme.

2.3.3 Management status and land security

Manea Park is vested in the City of Bunbury (WAPC 2008) and managed by the City with help from the Friends of Manea Park. Management is guided by a plan prepared in 1999 by the Manea Park Management Committee and the City of Bunbury (WAPC 2008). In addition, weed and dieback management plans have been prepared.

2.3.4 Surrounding land uses

The Bunbury airfield is located to the west of Manea Park. The airfield supports the Bunbury Airport and the Bunbury Flying School.

2.3.5 Potential changes

The Ocean to Preston River Establishment Plan was released in April 2008 for public comment. The plan proposes to create a 7 km regional park, extending from the Indian Ocean west to the Preston River. Manea Park would be incorporated into the regional park.

The primary purpose of the regional park is land conservation and protection of biodiversity (WAPC 2008). However, it is recognized that there will be increasing demands for recreation infrastructure as use of the park increases. This infrastructure will be established at points close to existing urban areas.

2.3.6 Unique characteristics

The Park supports several threatened ecological communities and threatened flora and fauna (City of Bunbury n.d. b).

2.4 Loughton Park

Loughton Park is located along Armanta Road in Carey Park in the City of Bunbury. The Park is 6 ha in size and at the centre is a conservation category wetland. The wetland is damp year round but, even in winter, does not have open expanses of water. A number of culverts transfer drainage water to the area.

2.4.1 Management status and land security

The City of Bunbury hopes to establish a Friends of Loughton Park Group to help manage the Park. The City is currently seeking expressions of interest from the community.

2.5 Hay Park

Hay Park is located on the corner of Parade Road and Bussell Highway in Withers, City of Bunbury. It is 49.1 ha in size and is the City of Bunbury's primary sporting complex. It has facilities to support a large variety of sports, including: football, soccer, hockey, baseball, tennis, netball, badminton and croquet. The South West Sports Centre[19] is also located on site.

There is a small wetland in the Park. The surrounding dampland vegetation is in good condition (City of Bunbury n.d. c).

2.5.1 Recreation values

Hay Park is identified as a good spot for birding (Birds Australia WA 2005) (Table 6).

Table 6 Hay Park - birding

Characteristic	Birding
Visitor numbers	No data
Season of use	Year round
Visitor catchment	Local
Facilities	No birding facilities
Accessibility	The Park is immediately accessible off of Parade Road, Blair Street, and Bussell Highway (sealed roads).
Surrounding land uses	Residential housing
Land security	The Park is identified as public open space in the Greater Bunbury Region Scheme.

2.5.2 Potential changes

The wetland vegetation is regularly disturbed (e.g. children burning it) by visitors. As a result, the wetland is being fenced to reduce visitor access. The fence will have a series of gates to allow access to the wetland. The fencing will be flexible to enable movement of kangaroos and other fauna in and out of the wetland.

2.5.3 Unique characteristics

The Hay Park supports several threatened ecological communities (City of Bunbury n.d. c) and one critically endangered ecological community.

2.6 Horseshoe Lake

Horseshoe Lake is located between Sandridge Road and Bunning Boulevard, in the City of Bunbury, and is surrounded by residential properties. It is an oxbow lake, meaning it is crescent (or horseshoe) shaped and was formed from an abandoned river meander.

[19] The South West Sports Centre is owned and operated by the City of Bunbury. It is a leisure centre which offers a range of health and fitness opportunities.

2.6.1 Education values

As part of the Leschenault Ribbons of Blue program, students undertake macro-invertebrate and water quality sampling at the lake (Table 7).

Table 7 Horseshoe Lake - education

Characteristic	Education
Visitor numbers	Approximately 25-50 students annually
Season of use	Year round
Visitor catchment	Local
Facilities	No facilities
Accessibility	The site is immediately assessable from Fairway Court (a sealed road).
Surrounding land uses	Residential housing
Land security	The Park is identified as public open space in the Greater Bunbury Region Scheme.

2.7 Heritage values

2.7.1 Aboriginal heritage

There are a number of sites listed on the Register of Aboriginal Sites that are adjacent to or in the vicinity of the City of Bunbury water features. The permanent sites are identified in Table 8 and the other sites are identified in Table 9.

Table 8 Permanent sites

Site name	Site ID	Site type	Additional info
Bunbury 23	4873	Artefacts/scatter	--

Table 9 Other register sites

Site name	Site ID	Status	Site type	Additional info
Bunbury 10	4866	I	Artefacts/scatter	--
Bunbury 07	4917	I	Artefacts/scatter	--
Bunbury 08	4919	I	Artefacts/scatter	--
Sand Dune Cutting, Bunbury	5814	I	Artefacts/scatters	Camp
Bunbury/Preston River	5815	S	Artefacts/scatter	Camp
Back Breach 03 (Bb03)	21371	I	Mythological	Water source

Big Swamp has been identified as a place of significance to Noongar women. It has been "… described as a 'women's business place'" (Brad Goode and Associates 2007).

2.7.2 Non-Aboriginal heritage places

There are two places with non-Aboriginal heritage values located on or adjacent to the water features in the Bunbury area (Table 10). Both sites are listed on the City of Bunbury Municipal Inventory.

In addition, Big Swamp is a stop on the Bunbury Heritage Trail. Ephraim Mayo Clarke, the first elected Mayor of Bunbury, had a thriving vineyard on the southern edge of Big Swamp. Although the swamp is natural, it bears little resemblance to the original to wetland as a result of changing land uses. In the early 1900s the area was cleared for grazing and horticultural pursuits (Acacia Springs Environmental et al. 2005). From the early 1960s to the early 1970s a landfill operated on the south western and eastern sections of swamps.

Table 10 Non-Aboriginal heritage places

Site	Location	National Estate	Heritage Council of WA Register	Municipal inventory*	National Trust	Water dependence
Bushbelt – Ocean-Preston Regional Park	The proposed park extends from the Indian Ocean to the Preston River. It includes Manea Park.			✓		Wetlands are located within the Park
Big Swamp wetlands	Prince Phillip Drive and Tuart St, Bunbury			✓		Big Swamp is a water feature

*City of Bunbury Municipal Inventory

Lower Collie River Catchment Profile

1 Background

The Collie River starts in the Darling Ranges and flows westward through the Shires of Harvey and Dardanup before reaching the Leschenault Estuary. The Wellington Dam is a notional dividing line, separating the upper and the lower Collie River. The focus of this profile is on the lower Collie River, which extends from Wellington Dam west to the Leschenault Estuary.

The river has a number of tributaries, including the Brunswick and Wellesley River, which converge with the Collie River on the Swan Coastal Plain before the Collie River empties into the Leschenault Estuary. Other tributaries include Henty Brook, Flaherty Brook, Mill Brook, Williams Gully, Riches Gully, and Stones Brook.

2 Social values

The lower Collie River, and its tributaries, supports a variety of social values. These values are discussed below by river stretch. The first stretch extends from the base of the Wellington Dam to the Burekup Weir and the second stretch extends from the South West Highway Bridge to the river mouth.

For the remaining river segment, between Burekup Weir and the South Western Highway Bridge, no social values were identified. This was attributed to the lack of public access points, steep foreshores and obstructions in the river (e.g. fences).

2.1 Wellington Dam to Burekup Weir

The Wellington Dam is owned and operated by the Water Corporation. As part of the dam's maintenance process, the Water Corporation scours the base of the reservoir, typically between June and August. This involves releasing water downstream following the first saline inflows of the season and when a difference exists in salinity levels between the top and bottom of the reservoir[20]. This helps minimise the loss of fresh water over the top of the dam wall and removes the most saline water from the base of the reservoir.

Between October and April, the Water Corporation releases water from the reservoir for irrigated agriculture. The water is temporarily stored downstream at the Burekup Weir. It is then diverted into Harvey Water's channel system and delivered to agriculturalists in the Collie River Irrigation District (CRID). Harvey Water[21] is licensed to take 68 GL/year from the Wellington Reservoir (Economic Regulation Authority 2006). The majority of water is used for irrigated agriculture in the CRID, while the remainder goes to industrial uses (i.e. Doral Mining), historical releases[22] and water losses from Harvey Water's open channel system.

[20] Scouring begins when the difference in salinity level between the top and bottom reaches 400 mg/L.

[21] Harvey Water is an irrigation cooperative that supplies water to three irrigation districts – Waroona, Harvey and Collie River.

[22] As part of its licence, Harvey Water is required to release a small amount of water annually to the Henty Brook, Ferguson River and the Brunswick River pools.

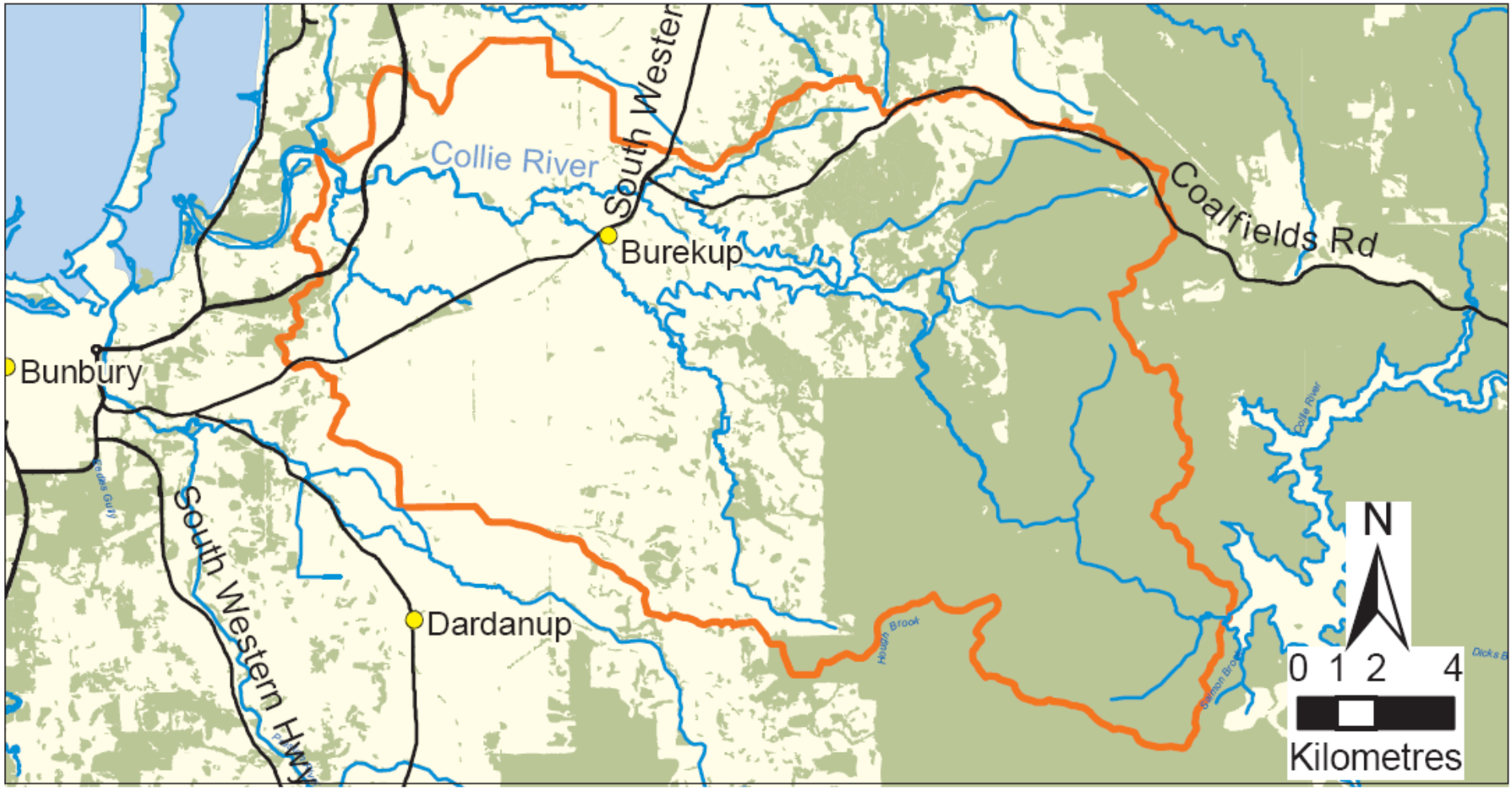


Figure 1 Collie River from Wellington National Park to the Leschenault Estuary

The area around the Wellington Dam is managed by the DEC (yellow on Figure 2). The Wellington National Park covers 16,790 hectares (Figure 2).

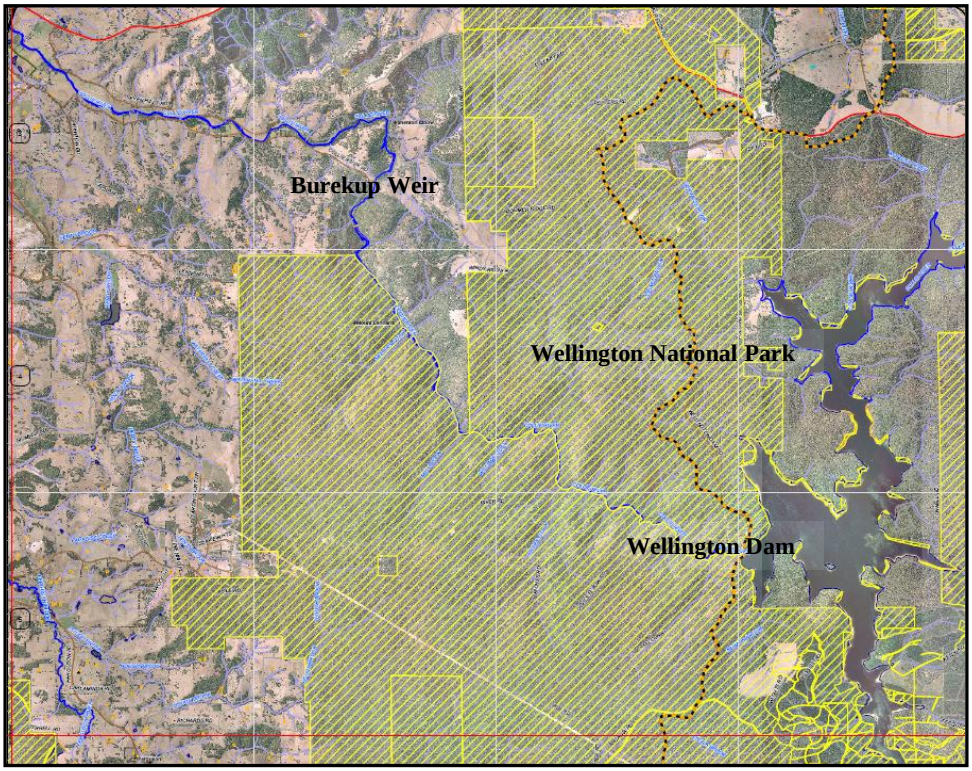


Figure 2 Wellington National Park

2.1.1 Recreation values

There are a number of popular recreation spots directly downstream of the Wellington Dam, including Honeymoon Pool, Long Pool, Rapids, Big Rock and Little Rock (Table 1).

Table 1 Recreation sites below Wellington Dam (CALM 2005)

Site	Marroning	Fishing	Swimming	Picnicking	Camping	Canoeing
Honeymoon Pool	✓	✓	✓	✓	✓	✓
Long Pool	✓	✓	✓	✓		✓
Rapids	✓	✓	✓	✓		✓
Big Rock	✓	✓	✓	✓		✓
Little Rock	✓	✓	✓	✓		✓

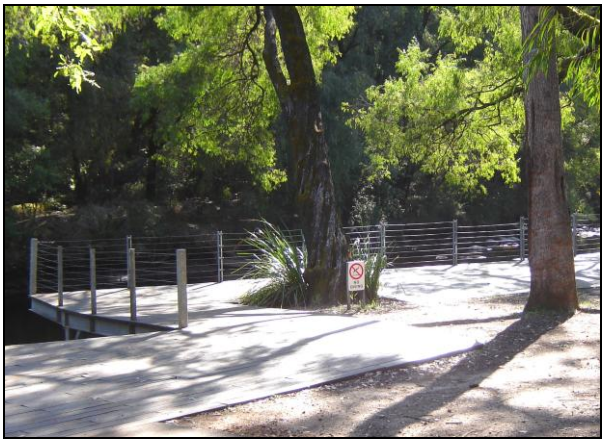
Swimming is a popular activity at each of the five recreation sites (Tables 1 and 2). A deck was recently installed at Honeymoon Pool to make swimming easier. The deck allows visitors to sit or dangle their feet in the water or launch canoes. The water is cold year round[23], which makes the deck an attractive swimming alternative for cooling off (e.g. dangling the feet in the water).

Canoeing occurs from the base of the dam wall to Burekup Weir (Table 2). The stretch of river below Wellington Dam to Honeymoon Pool provides good conditions for family canoeing (i.e. flat, calm water) and is the most popular area for canoeing. Between Honeymoon Pool and

[23] The pool receives water released from the bottom of the reservoir. This is the coldest water in the reservoir.

Burekup Weir the rapids increase in pace making conditions suited to more experienced canoeists. There is a good spot about 1 km downstream of the Burekup Weir for canoeists to get out of the river.

Most canoeists launch at the base of the dam or at the gauging station between Falcon Road and the Rapids picnic site. Those seeking to take advantage of the rapids typically launch at Honeymoon Pool or at Mt Lennard. Mt Lennard is accessible via a 4WD track, which is closed in winter by the DEC. Some canoeists launch at Honeymoon Pool, just to paddle the around the pool.



Platform at Honeymoon Pool

While most other canoeing locations in the south west are dry during summer, the releases from Wellington Reservoir ensure that canoeing can occur along the river in summer (October - April). Canoeists often plan trips to coincide with these releases (Beckwith Environmental Planning 2007). In order to do this, canoeists rely on key websites[24] to provide guidance on canoeing conditions and water releases. During winter, canoeing is limited to times when scour water is released (June – August) and overflow events occur. Overflow events at Wellington Dam do not occur every year.

Table 2 Collie River from Wellington Dam to Burekup Weir - swimming and canoeing

Characteristic	Swimming	Canoeing
Visitor numbers	No data	Approximately 1,000 – 2,000 people including school and tour groups annually
Season of use	Summer (December – April) when releases occur	Summer (October – April) and winter (June – August) when releases occur
Visitor catchment	Local, regional, State	Local, regional, State
Facilities	A platform at Honeymoon Pool, car park	Launch facilities exist at Honeymoon Pool and the Rapids, car park
Accessibility	The pools are immediately accessible from Lennard Drive (an unsealed road).	
Surrounding land uses	Wellington National Park	Wellington National Park, canoes can be rented from the Wellington Dam Kiosk
Land security	The pools are located in the DEC managed Wellington National Park.	

Fishing and marroning are popular activities (Table 3). The water conditions at the recreation sites

[24] Websites include: http://members.iinet.net.au/~rokhor/canoe/waterlevcoll.html and http://www.harveywater.com.au/irrigator_information_releases.asp

downstream of Wellington Dam are good for marroning but are less than optimal (i.e. rocky with rapids) for fishing. Anglers instead use 4WD tracks to access other sections of the river downstream of the dam for rainbow trout (*Oncorhynchus mykiss*) and redfin perch (*Perca fluviatilis*). The Collie River is one of the few rivers in the south west[25] that is stocked with rainbow trout[26] by the DoF.

Table 3 Collie River from Wellington Dam to Burekup Weir - fishing and marroning

Characteristic	Fishing	Marroning
Visitor numbers	Approximately 4-6 people (spread across 2-3 groups)[27] on weekends during trout season	Banks are full with marroners throughout the season.
Season of use	September to April for trout, year round for red fin perch	January/February
Visitor catchment	Local, regional, State	Local, regional, State
Facilities	Picnic and barbeque facilities, toilets, camp sites at Honeymoon Pool, kiosk	
Accessibility	The pools are accessible from Lennard Drive (an unsealed road). Access via 4WD tracks.	The pools are accessible from Lennard Drive (an unsealed road).
Surrounding land uses	Wellington National Park	
Land security	The pools are located in the DEC managed Wellington National Park.	

Honeymoon Pool is the only DEC managed site downstream of Wellington Dam that supports formal camping (Table 4). There are three camping sites within the Honeymoon Pool area - Honeymoon Pool, Gelcoat and Stones Brook. Campfires are allowed at Honeymoon Pool and Gelcoat but Stones Brook is fire free, instead the DEC has provided a camp kitchen with gas barbeques and gas pot boilers.

Camping fees are collected by the DEC to help maintain on-site facilities. There is no booking system. Instead, camping is on a 'first come first served' basis. As sites fill up quickly during public and school holidays, some visitors get to the sites several days before a holiday to reserve a space for their families.

There are informal camping sites along Lennard Track, including one site frequently used by the 4WD Association of Western Australia (CALM 2005). The Draft Wellington National Park Management Plan (CALM 2005) indicates that this camping will be prohibited once the draft plan is completed. Instead the DEC will promote the site as a day-use area.

There are picnic facilities at each of the Honeymoon Pool campsites as well as Big Rock, Little Rock, Long Pool, and the Rapids (Table 4). There are barbeque facilities at Honeymoon Pool and toilet facilities at Honeymoon Pool and the Rapids.

[25] Other stocked south west waterways include Blackwood River, Brunswick River, Donnelly River, Warren River, Harvey Dam and River, Glen Mervyn Dam, and Big Brook Dam.

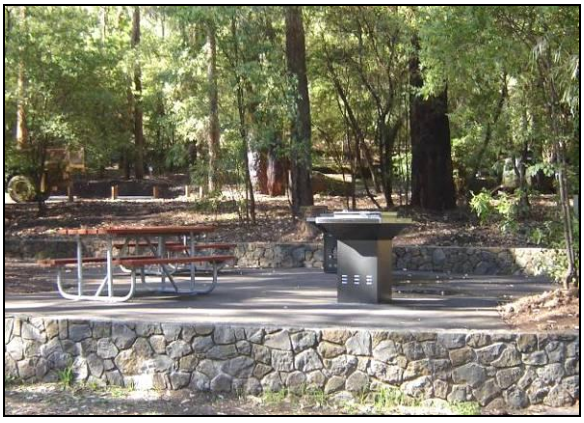
[26] The RFAC Recreational Freshwater Fishing Sub-Committee is responsible for developing the annual trout stocking strategy.

[27] Most serious anglers fish early in the morning or late in the evening. For this reason, it is difficult to accurately determine how many anglers use the river.

A campsite at Stones Brook

Table 4 Collie River from Wellington Dam to Burekup Weir - camping and picnicking

Characteristic	Camping	Picnicking
Visitor numbers	The campsites are full most long weekends, except in June. There are 22 campsites at Honeymoon Pool, 11 at Gelcoat, and 14 at Stones Brook.	No data
Season of use	Year round. Peak season is during public and school holidays (December to April).	
Visitor catchment	Local, regional, State	Local, regional
Facilities	Fire ring (Honeymoon Pool, Gelcoat), camp kitchen (Stones Brook), toilets, car park, deck over water, picnic tables, barbeque, canoe launch	Picnic tables, car park, water access, barbeque at Honeymoon Pool, Quarry
Accessibility	Honeymoon Pool is immediately accessible from Lennard Drive (an unsealed road).	The pools are immediately accessible from Lennard Drive (an unsealed road).
Surrounding land uses	Wellington National Park	
Land security	The pools are located in the DEC managed Wellington National Park.	



Picnic site at Honeymoon Pool

Mt. Lennard trails sign

The majority of campers and day trippers walk at least one of the three tracks during their stay (Table 5). The Jabitj Track, 6 km one-way, extends along the Collie River between Honeymoon Pool and the quarry. The Kurliny Tjenangitj Track, a 9.5 km loop, starts between Long Pool and

Little Rock. The Sika Circuit, a 9.3 km loop, starts at the Wellington Quarry and is used by walkers and cyclists.

Most of the cycle trails, with the exception of the Sika Circuit, are located in the Mt. Lennard area. The DEC has recently spent extensive time and money to establish new mountain biking trails in this area and to properly sign and mark existing trails. The DEC has been supported in their efforts by the South West Mountain Bike Club and South West 4WD Club (e.g. revegetation work, busy bees).

Several of the Mt Lennard trails are dual use (i.e. mountain bikes and 4WDs); while others are solely for mountain bikers. One dual use trail runs parallel to the Collie River. The buffer between trail and river ranges from 3 to 15 metres.

Mountain bikers access the trails year round; however, three of the trails are closed to 4WD users in winter to prevent degradation. The 4WD Association of Western Australia has signed a memorandum of understanding with the DEC, indicating that club members will not use the closed tracks in winter.

The Munda Biddi Trail, a popular mountain bike track, was recently been extended and now runs through the Wellington National Park. It passes Little Rock and Long Pool, before heading south towards Jarrahwood. The trail is still relatively new and unknown, so use is limited. With greater publicity and the opening of a hut (for overnight stays) in 2008, use is likely to increase.

It is illegal for off-road vehicles (ORVs) to use the Wellington National Park trails. However, it is common to see small groups of four to five riders on weekends using the trails. DEC rangers patrol the trails to reduce illegal use.

Table 5 Collie River from Wellington Dam to Burekup Weir - walking and cycling

Characteristic	Walking	Cycling
Visitor numbers	No data	Approximately 80 riders per week year round. The South West Mountain Bike Club (currently on hiatus) organises rides on Wednesdays and Saturdays.
Season of use	Year round, most popular in summer (December – April)	Year round, most popular in summer (December – April). Rides are organised by the South West Mountain Bike Club twice a week. These rides attract approximately 2-8 people in winter (per ride) and approximately 10-12 people in summer (per ride).
Visitor catchment	Local, regional, State	Local, regional, State
Facilities	Picnic tables, barbeques, campsites	Interpretive signage, hut on the Munda Biddi Trail, car park
Accessibility	The trails are immediately accessible from Lennard Drive (an unsealed road).	The Sika Circuit is accessible from Lennard Drive (an unsealed road). The Mt. Lennard area is accessible from Lennard Road (an unsealed road). The Munda Biddi Trail is immediately accessible from several roads including Coalfields Highway (sealed road) and Lennard Drive.
Surrounding land uses	Wellington National Park	

Characteristic	Walking	Cycling
Land security	The trails are located in the DEC managed Wellington National Park.	

The Wellington Dam quarry is one of the few places in the region suitable for abseiling and rock climbing (CALM 2005) (Table 6). It attracts small groups of experienced climbers, school groups and commercial tour operators[28]. However, the quarry will be closed in the near future, while the Water Corporation upgrades the dam wall. The closure may result in a slight decrease in visitor numbers temporarily, but numbers are likely to return once the quarry re-opens.

Table 6 Collie River from Wellington Dam to Burekup Weir - 4WD and abseiling

Characteristic	4WD	Abseiling and rock climbing
Visitor numbers	Approximately 80 drivers per week in summer	No data
Season of use	Summer. Three of the trails are closed in winter to prevent degradation.	Year round
Visitor catchment	Local, regional	Local, regional, State
Facilities	Trails, car park, day use site	Abseil anchor points, toilets, car park
Accessibility	The site is immediately accessible from Pile Road (an unsealed track).	The site is immediately accessible from Wellington Dam Road (a sealed road).
Surrounding land uses	Wellington National Park	Wellington National Park, Wellington Dam Kiosk
Land security	The DEC manages the Wellington National Park.	The quarry is located in the DEC managed Wellington National Park.

2.1.2 Education and tourism values

Abseiling combined with the nearby canoeing, camping and walking opportunities, provide a great setting for school groups and commercial tourism companies (Table 7). For example, Adrenalin, a commercial tour company, offers an abseiling and white water rafting adventure (http://www.adrenalin.com.au/abseiling-and-white-water/perth/water/12149). There are several other commercial tour companies that operate in the area.

Outdoor education was added as a WA Certificate of Education (WACE) subject in 2008[29]. In fulfilling the subject requirements, students plan and subsequently participate in a range of outdoor activities, including mountain biking, paddling, caving, abseiling, and fishing. This is likely to result in an increase in the number of school groups utilising the area below Wellington Dam.

[28] Commercial operators and not-for-profit groups working with dependent participants must be registered with the National Outdoor Leader Registration Scheme (or have an equivalent accreditation) and obtain a permit. Commercial operators must also have a commercial activity licence to operate in the park. Recreational climbers in groups of less than five are not required to have a permit or an accredited leader. Permits may limit the time of use, number of participants and sites where abseiling and climbing can occur (CALM 2005).

[29] The first outdoor education course exams will be held in 2009 (http://www.curriculum.wa.edu.au/internet/Senior_Secondary/Courses/Outdoor_Education/).

Table 7 Collie River from Wellington Dam to Burekup Weir - education and tourism

Characteristic	Education	Tourism
Visitor numbers	Approximately 400 - 1,250 students annually (20-25 school groups a year with 20-50 students per group)	No data
Season of use	Year round	Year round, most popular in summer
Visitor catchment	Local, regional, State	Local, regional, State
Facilities	Trails, camp sites	
Accessibility	The pools are immediately accessible from Lennard Drive (an unsealed road). The quarry (i.e. abseiling) is immediately accessible from Wellington Dam Road (a sealed road).	
Surrounding land uses	Wellington National Park	
Land security	The river pools and Wellington Dam quarry are located in the DEC managed Wellington National Park.	

The area along Seven Hills Road is another site that has been used by schools (Table 8). The Ribbons of Blue program[30] has been active along Seven Hills Road, just east of the South Western Highway. Activities include macro-invertebrate sampling, water quality monitoring and revegetating the foreshore.

Table 8 Collie River from Wellington Dam to Burekup Weir - education

Characteristic	Education
Visitor numbers	Approximately 120 students annually
Season of use	Winter (June – August)
Visitor catchment	Local
Facilities	No facilities
Accessibility	The site is immediately accessible from Seven Hills Road (a sealed road).
Surrounding land uses	Agricultural land uses
Land security	The site is on private property.

2.1.3 Management status and land security

The area directly downstream of the Wellington Dam is located in the Wellington National Park[31]. In 2005, the DEC released a draft management plan, entitled *Wellington National Park and*

[30] Ribbons of Blue is an environmental education program designed to increase awareness about local water-related issues. Coordinators work with local schools, and occasionally community groups, to integrate water-related issues into the curriculum and organise complementary field activities. Examples include: revegetating a waterway foreshore, macro-invertebrate sampling from a swamp, and water quality sampling of a drain. Much of the work undertaken focuses on water quality and maintaining a healthy catchment.

[31] National Parks are nationally significant due to their scenic, cultural or biological values. They are managed to conserve wildlife and the landscape, enable scientific study and preserve archaeological, historical or scientific features. National Parks provide recreational opportunities that do not adversely affect ecosystems.

Westralia Conservation Park[32] *Draft Management Plan* (CALM 2005). Once finalised, the plan will guide management of the park.

2.1.4 Surrounding land uses

The Wellington National Park supports a variety of social values upstream of the Wellington Dam. This includes Potter's Gorge, the only formal camping site upstream of the dam. The site is on the western side of the reservoir and is accessible from a small track off of Wellington Dam Road. It has camping, picnicking and barbeque facilities.

Informal camping and fishing occur along the eastern side of the reservoir, which some families have used for generations (Beckwith Environmental Planning 2007). The *Wellington National Park and Westralia Conservation Park Draft Management Plan* (CALM 2005) proposes development of eight formal camp sites, six on the eastern side and one of the western side of the reservoir. This would be a significant expansion of recreation facilities around the reservoir.

2.2 South Western Highway to river mouth

The lower Collie River is influenced in summer by tidal movements and saltwater intrusion and in winter by rainfall and catchment run-off. The tidal influence extends approximately four kilometres upstream, just upstream of the Australind Bypass (Figure 3).

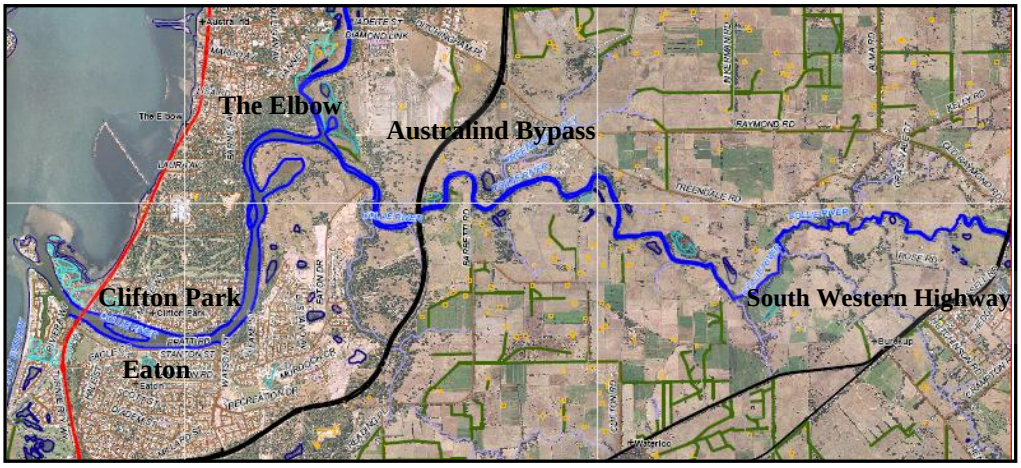


Figure 3 South Western Highway to the river mouth

Water quality

The lower Collie River experiences a number of water quality issues, including sedimentation build-up, nutrient loading and saltwater intrusion. As a result fish kills were recorded downstream of the South Western Highway Bridge in 2002, 2003 and 2004 (DoW 2007a).

The lower Collie River acts as a sink, or collection point, for sediment and nutrient discharges from the Brunswick and Wellesley river catchments as well as the Collie River catchment (DoW 2007a). Sediment builds up reducing the water depth at the river mouth. In 2007, the depth was reduced to half a metre during high tide, making it nearly impossible for boats to enter or exit the river. In response, the State Government provided funding to dredge[33][34] the river mouth in 2007; increasing the depth to a boat-friendly 1.2 metres.

[32] Conservation Parks are of regional or local significance. They are set aside to conserve wildlife and the landscape, enable scientific study and preserve archaeological, historical or scientific features. Conservation Parks provide recreational opportunities that do not adversely affect ecosystems.

[33] The last dredging occurred in 1982.

[34] The southern entrance was dredged, between Pelican Point and Bar Island.

Nutrient concentrations tend to increase in summer and autumn. For example, from 2000 to 2006 nitrogen and phosphorous levels were considered to be moderate to high in summer and autumn. In winter and early-spring freshwater run-off helps flush the system, reducing nutrient concentrations.

The river experiences saltwater intrusions during summer from the Leschenault Estuary and the Indian Ocean (DoW 2007a). Saline stratification occurs, in which the dense saline marine water moves upstream along the bottom of the river while the fresher river water moves along the surface. This prevents oxygen exchange between the two layers, promoting oxygen depletion in the bottom waters.

2.2.1 South Western Highway Bridge to the river mouth

The lower Collie River begins to narrow at the South Western Highway Bridge limiting recreation use (e.g. boating) upstream of the bridge. Downstream of the bridge the river supports a variety of social values.

There are boat launching sites at the Collie River Bridge (Taylor Road, Pelican Point), the Eaton Foreshore (Pratt Road, Eaton), at the Elbow Reserve (Barnes Avenue, Australind), and Ridley Place (Paris Road, Australind) (Table 9). Although boating occurs in the river, particularly around the canals at Pelican Point, the nearby Ocean is much more popular (e.g. 4-5 boats in the river and 50-100 boats in the ocean on warm summer days).

Collie River Bridge boat launch

Boat trailer parking at the Elbow

Anglers fish from boats, canoes and the foreshore for black bream (*Acanthopagrus butcheri*), mulloway (*Argyrosomus hololepidotus*), crabs and red fin perch (Table 9). The black bream, mulloway and crabs are found in the tidal influenced area where as red fin perch are found upstream of the tidal influence.

Black bream anglers typically prefer to fish for bream between the point where the Brunswick River meets the Collie River and the Australind Bypass. The black bream anglers use boats about 4-4.5 metres long that are designed specifically for recreational angling on rivers.

Black bream fishing competitions occur along the lower Collie River. Fish kills (e.g. 2002, 2003 and 2004) have prevented the competition from being held annually. In 2007, the competition attracted 15-16 boats, with 1-2 competitors per boat. The competitions are catch and release.

Trout can be found upstream of the tidal influence, because the DoF annually stocks the Collie River with trout. However, trout anglers often prefer to fish further upstream (e.g. downstream of the Wellington Dam, upstream of the Wellington Reservoir).

Table 9 Collie River downstream of the South Western Highway - fishing and boating

Characteristic	Fishing	Boating
Visitor numbers	Approximately 4-5 boats[35] daily in summer. On a long-weekend there can be up to 12 boats daily on the water.	Approximately 5-6 boats daily in summer.
Season of use	Generally year round. The trout open season is designated by the Department of Fisheries and extends September to April.	Year round
Visitor catchment	Local, regional, State	Local, regional
Facilities	There are boat launch sites at the Collie River Bridge (Taylor Road, Pelican Point), the Eaton Foreshore (Pratt Road, Eaton), at the Elbow Reserve (Barnes Avenue, Australind), and Ridley Place (Paris Road, Australind).	
Accessibility	All boat launch facilities are immediately accessible from sealed roads.	
Surrounding land uses	Residential properties, Australind and Eaton town site	
Land security	Each of the boat launching facilities is located on land identified as public open space in the Greater Bunbury Region Scheme.	

Canoeing and kayaking are popular activities (Table 10). Most canoeists paddle between Eaton Foreshore and the Australind Bypass, while some paddle as far upstream as the South West Highway. Canoeists also paddle from the river to the 'Cut' to see the dolphins.

The river is popular with families and recreational canoeists in summer. However, canoeists training for the Avon Descent typically rest during the summer and train February to August.

Table 10 Collie River downstream of the South Western Highway - canoeing

Characteristic	Canoeing
Visitor numbers	Approximately 5-10 people on weekends in summer
Season of use	Year round
Visitor catchment	Local, regional
Facilities	There are boat launch sites at the Collie River Bridge (Taylor Road, Pelican Point), the Eaton Foreshore (Pratt Road, Eaton), at the Elbow Reserve (Barnes Avenue, Australind), and Ridley Place (Paris Road, Australind).
Accessibility	All boat launch facilities are immediately accessibly from sealed roads.
Surrounding land uses	Residential properties, Australind and Eaton town site
Land security	Each of the boat launching facilities is located on land identified as public open space in the Greater Bunbury Region Scheme.

Swimming is not a popular activity due to sedimentation build up in the Collie River. Kids illegally jump off the various bridges that pass over the river. Once in the water they need to carefully weave around the boats, canoes and kayaks travelling along the river.

[35] Most serious anglers fish early in the morning or late in the evening. For this reason, it is difficult to accurately determine how many anglers use the river. Families typically fish during the day.

There are a couple of tourism ventures operating on the lower Collie River (Table 11). Three Water Cruises runs a variety of cruises including: morning tea with dolphins, Sunday barbeques, Friday sundowners, corporate events, eco and history tours and weddings.

Dekked Out Adventures runs kayaking tours on the lower Collie River. The tour launches its kayaks at the Collie River Bridge and paddles through the Leschenault Estuary to the Indian Ocean. The tour includes interaction with the dolphins[36] in the Leschenault Estuary.

Table 11 Collie River downstream of the South Western Highway - tourism

Characteristic	Cruises	Canoeing
Visitor numbers	No data. The Elandra, a 5-star coach boat, can carry up to 55 people.	Approximately 40 people per week during peak season
Season of use	Year round	Spring to Autumn, with peak season January – April
Visitor catchment	Local, regional, State	
Facilities	Heated and air conditioned cabin, toilets, sheltered outdoor area, full home theatre system	Boat launching facilities are located at the Collie River Bridge (Taylor Road, Pelican Point).
Accessibility	Pick-up locations include: Marlston Water front, Pump Jetty, Parade Hotel, Eaton Jetty and Grand Canal Jetty	Collie River Bridge is immediately accessible from Taylor Road, Pelican Point (a sealed road).
Surrounding land uses	Residential properties, Eaton town site	Residential properties, Eaton town site
Land security	The cruise stops at a private property upstream for lunch.	The boat launching facility is located on land identified as public open space in the Greater Bunbury Region Scheme.

2.2.2 The Elbow

The Elbow is a reserve located on the northern banks of the Collie River on the south eastern edge of the Australind town site (Map 2). Picnicking, walking and fishing are popular activities at the Elbow (Table 12).

Although some fishing occurs on the platforms at the Elbow, it is limited due to the fish kills that have occurred in the area. Instead anglers often launch their boats from the Elbow and fish up and downstream. The most popular species to catch in this area is black bream.

Table 12 The Elbow - picnicking, walking and fishing

Characteristic	Picnicking/walking	Fishing
Visitor numbers	Approximately 30 – 40 people use the Elbow for picnicking, walking and fishing on summer weekends	Approximately 10 people weekly year round
Season of use	Year round, but most popular during summer (November – March).	Year round
Visitor catchment	Local	Local, regional, State (black bream attracts State visitors)

[36] The tour operator has a wildlife interaction licence from the DEC.

Characteristic	Picnicking/walking	Fishing
Facilities	Car park with about 20 spaces, platform over the water, boat launch, picnic tables	
Accessibility	The reserve is immediately accessible from Barnes Avenue (a sealed road).	
Surrounding land uses	Residential properties	
Land security	The area is identified as public open space in Greater Bunbury Region Scheme.	

2.2.3 Eaton Foreshore and Clifton Park

The Eaton Foreshore Reserve, Watson Street Reserve and Apex Park are adjacent to one another, creating one public open space area that runs along the southern bank of the Collie River (Map 2). Eaton Foreshore Reserve is located on the western end and Watson Street Reserve on the eastern end while Apex Park is in the middle. The reserves support the following values: walking, cycling, picnicking, and camping.

Eaton Foreshore Walk is a popular walk and cycle trail (Table 13). It is a 5 km circuit extending from Eaton Foreshore Park to Watson Street Reserve along the Collie River foreshore. There are several picnic sites located along the walk trail (Table 13).

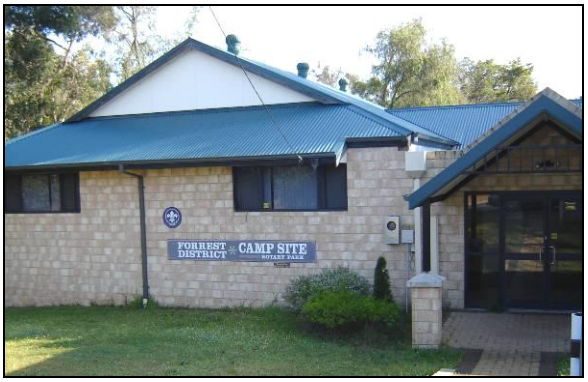
Table 13 Eaton foreshore - walking, cycling and picnicking

Characteristic	Walking/cycling	Picnicking
Visitor numbers	No data	Up to 200 people on weekends in summer
Season of use	Year round	Year round, but most popular in summer (November – March)
Visitor catchment	Local, regional	Local, regional
Facilities	Picnic tables, toilets, playground, gazebo, walk/cycle trail	Picnic tables, toilets, playground, gazebo
Accessibility	The site is immediately accessible from Pratt Road (a sealed road).	
Surrounding land uses	Eaton town site, reserves	
Land security	The Eaton Foreshore Reserve, Apex Park and Watson Street Reserve are identified as public open space in Greater Bunbury Region Scheme.	

Swimming occurs in summer along this river stretch (Table 14). Some people use the river to cool-off while others (e.g. members of the local triathlon group) occasionally train in the river. The number of people swimming is limited due to the build up of sedimentation.

The Scouts have established a campsite at the Watson Street Reserve, off of Leake Street in Eaton (Table 14). Located adjacent to the Collie River, the site has both camping facilities and dormitory accommodation (http://www.wa.scouts.org.au/about/facilities/eaton.asp and is used by scout groups and community groups. Some visitors use the site solely for accommodation while others take advantage of the proximity to the lower Collie River by swimming and canoeing.

In addition to the campsite, the 1st Leschenault Scout Group has facilities at the foreshore. The group owns a number of canoes which they use to paddle upstream, typically to where the Collie River meets Millars Creek or Brunswick River.



Scout camping accommodation

1st Leschenault Scout Group

Table 14 Eaton foreshore - swimming and camping

Characteristic	Swimming	Camping
Visitor numbers	Limited due to the build up of silt	Approximately 50 – 60 people most weekends. There are 68 beds available at the accommodation.
Season of use	Summer	Year round
Visitor catchment	Local	Local, regional
Facilities	No facilities	Dormitory accommodation, hall, kitchen, dining room, covered activity area, outdoor activity area, camping spaces, barbeques
Accessibility	Swimming can be done from a number of locations. Including Pratt Road (a sealed road) and Leake Street (a sealed road).	The site is immediately accessible from Leake Street (a sealed road).
Surrounding land uses	Eaton town site, reserves	Eaton town site, Watson Street Reserve
Land security	The Eaton Foreshore Reserve, Apex Park and Watson Street Reserve are identified as public open space in Greater Bunbury Region Scheme.	The site is located in an area identified as public open space in the Greater Bunbury Region Scheme. The Scout Association has a perpetual lease through the Shire of Dardanup.

Across the river from the Eaton Foreshore and Watson Street Reserve is Clifton Park, a residential development (Table 15). The foreshore has been reserved as public open space. Local residents use this area for walking and refer to it as Lot 131.

The Ribbons of Blue program has been active along the Clifton Park foreshore (Table 15). This includes foreshore revegetation opposite Alexander Island[37].

Table 15 Clifton Park - walking and education

Characteristic	Walking	Education
Visitor numbers	No data	Approximately 60 students (2 classes) annually
Season of use	Year round	Winter (August)

[37] Alexander Island is 5.4 km in size and is located in the Collie River opposite the Eaton Foreshore Reserve.

Characteristic	Walking	Education
Visitor catchment	Local	Local
Facilities	No facilities	
Accessibility	The site is immediately accessible from Lucy Victoria (a sealed road).	
Surrounding land uses	Residential housing	
Land security	The site is identified as public open space in the Greater Bunbury Region Scheme.	

2.2.4 Planned changes and potential for increased use

The greater Bunbury Region is expected to experience substantial population growth. Projections indicate an increase from 65,264 in 2001 to 100,000 in 2031[38] (WAPC 2008). This growth will bring more people into the region, which may add pressure to the river system (e.g. additional recreationalists). Some of this growth will be housed along the river. For example, Meadow Landing is a new residential development just east of the Australind Bypass abutting the Collie River.

2.3 Heritage places

2.3.1 Aboriginal heritage

There are a number of sites listed on the Register of Aboriginal Sites which are adjacent to or in the vicinity of the City of Bunbury water features. The permanent sites are identified in Table 16 and the other sites are identified in Table 17.

Table 16 Permanent sites

Site name	Site ID	Site type	Additional info
Jack Slaven's Camp	16710	Man-made structure	Camp
Collie River Waugal	16713	Mythological	Natural feature, water source
Brunswick River	17776	Mythological	Natural feature, water source

The entire Collie River is a registered site (ID 16713). The River is connected to Ngarngungudditj Walgu, a mythical water snake thought to have created the Collie River, the Collie River valley hills and the Leschenault Inlet (CALM 2005).

Table 17 Register sites with insufficient information

Site name	Site ID	Status	Site type	Additional info
Collie River Campsites	16715	I	Historical	Camp
Collie River Bridge Campsite	16716	I	Man-made structure	Camp
Treedale Road Camp	17773	I	Man-made structure	Camp, water source
Burekup Gravel Pit – Shenton Road	17774	I	Man-made structure, historical	Camp, water source
E/01 Swamp (Waugyl Site)	21039	L	Mythological	Water source
E/02 – Creek (Waugyl Site)	21040	L	Mythological	Water source

[38] This is based on the medium scenario population projection.

2.3.2 Non-Aboriginal heritage places

There are five places with non-Aboriginal heritage values located adjacent to or across the lower Collie River (Table 18). Each is listed on the municipal inventory of its local government. One place is also listed on the WA Heritage Register – the Wellington Dam Precinct. The Precinct includes the Wellington Dam, the pumping station, the hydro-electric station, and the caretaker's quarters.

Table 18 Non-Aboriginal heritage places

Site	Location	National Estate	Heritage Council of WA Register	Municipal inventory	National Trust	Water dependence
Wellington Dam	Wellington Dam Road, West of Collie, Collie		✓	✓*		Crosses the Collie River
Hough Homestead	Lusitano Ave, Eaton			✓**		Located adjacent to the Collie River
Upper Collie River Bridge	South Western Highway, Roelands			✓***		Passes over the Collie River
Lower Collie River Bridge	Old Coast Road, Australind			✓***		Passes over the Collie River

*Shire of Collie Municipal Inventory

**Shire of Dardanup Municipal Inventory

***Shire of Harvey Municipal Inventory

Preston River Catchment Profile

1 Background

The headwaters of the Preston River catchment start 80 km inland on the Darling Scarp; and flow westward passing through the Shires of Donnybrook-Balingup, Capel, Dardanup and Bunbury before meeting the Leschenault Estuary. In total the catchment covers an area of 1,136 km^2.

The most prominent water feature in the catchment is the Preston River. Tributaries to the river include: Ferguson River, Crooked Brook, Joshua Creek, Coolington Brook, Gavin Gully, Noneycup Creek, Minninup Brook and Thomson Brook. There are several wetlands in the catchment including Picton Wetland and the wetland at Child Side School.

Although the catchment is large, this study focuses on the catchment from where the Thomson Brook meets the Preston River west. This is about 6 km east the Donnybrook town site.

Figure 1 Lower Preston River Catchment

2 Social values

2.1 Preston River

The Preston River moves from a forested catchment on the Darling Scarp west to the Leschenault Estuary. The river passes through long stretches of irrigated agriculture, including the Preston River Irrigation District[39], and the town sites of Donnybrook and Boyanup.

Modifications

The lower Preston River was redirected in 1969/70, as part the Bunbury Inner Harbour development, to discharge to the Leschenault Estuary. This resulted in the depositing of sediments at the southern end of the Estuary creating a fan delta. This delta is now vegetated and provides habitat for waterbirds (Department of Water 2007).

BUNBURY - Preston River levees breached during 1964 flooding.

Levees have been constructed along the lower Preston River, between the mouth and where the river crosses the South Western Highway, to control flooding. The river flooded in 1964 (150 year ARI[40]) and 1974 (10 year ARI) (WRC 2000).

Water quality

These modifications have exacerbated the water quality problems, including sediment build-up, nutrient loading and salinity. Severe erosion along sections of the river contributes to sediment build-up. Phosphorous levels increase closer to the mouth of the river, while nitrogen levels are generally moderate. Salinity levels in the lower reaches are affected by the tides in the Leschenault inlet and are fresh to brackish; whereas the upper reaches (and its tributaries) are fresh.

2.1.1 Recreation values

There are a picnic spots along the Preston River at Trigwell Place Recreation Area and Apex Park in the Donnybrook townsite and at the arboretum west of the Donnybrook townsite (Table 1 and Table 2).

Table 1 Preston River near Donnybrook townsite - picnicking

Characteristic	Trigwell Place	Apex Park
Visitor numbers	Approximately 40-50 families on long weekends in summer	
Season of use	Year round, but more popular in summer (November – April)	
Visitor catchment	Local	Local
Facilities	Picnic tables, barbeques, toilets	
Accessibility	This site is immediately accessible from the South Western Highway (a sealed road).	
Surrounding land uses	Donnybrook town site	

[39] The Preston Valley Irrigation Co-operative supplies water to the Preston River Irrigation District. The Co-operative has a licence to abstract 896 ML per annum from the Glen Mervyn Dam, which is located on a tributary to the Preston River (Department of Water 2007).

[40] Average recurrence interval (ARI) is the average period in years between the occurrences of a flood of a given size (or larger). For example, a 150 year ARI flood event will occur on average once every 150 years.

Characteristic	Trigwell Place	Apex Park
Land security	The site is zoned parks and recreation in the Shire of Donnybrook-Balingup Town Planning Scheme.	

The arboretum is also a popular spot for birding (Table 2). Other popular birding locations are the Donnybrook Country Club and the tidal flats at the mouth of the Preston River (Birds Australia WA 2005) (Table 3). The flats are an important feeding ground for waterbirds.

Table 2 Preston River arboretum – picnicking and birding

Characteristic	Picnicking	Birding
Visitor numbers	No data	No data
Season of use	Year round, but more popular in summer (November – April)	Year round
Visitor catchment	Local	Local, regional
Capacity	No data	No data
Facilities	No facilities	
Accessibility	The site is immediately accessible from Irishtown Road (a sealed road).	
Surrounding land uses	Agricultural land uses and State forest	
Land security	The site (and surrounding land) is zoned parks and recreation in the Shire of Donnybrook-Balingup Town Planning Scheme.	

Table 3 Preston River - birding

Characteristic	Donnybrook Country Club	Preston River mouth
Visitor numbers	No data	No data
Season of use	Year round	
Visitor catchment	Local	Local, regional
Facilities	No facilities	No facilities
Accessibility	This site is immediately accessible from the South Western Highway.	The site is immediately accessible from Estuary Drive.
Surrounding land uses	Donnybrook town site, Donnybrook Golf Course	Bunbury Inner Harbour
Land security	The site is located on the Donnybrook Golf Course.	The delta is identified as public open space in the Greater Bunbury Region Scheme.

Canoeing occurs along several stretches of the Preston River (Table 4). The Donnybrook town site, near the Donnybrook Amphitheatre[41], is popular for family canoeing as the water conditions are calm and safe for children. This stretch has water in summer when the weir is put in place; however, the water levels are too low in winter for canoeing.

Canoeing also occurs between Boyanup and the Australind Bypass Bridge, a 26 km stretch (Table 4). This river stretch is used by more experienced and avid paddlers. For example, Bunbury

[41] The amphitheatre is located on the Preston River foreshore in the Donnybrook town site. It can sit up to 600 people. An additional 600 people can be accommodated if chairs are added. The open air venue is used for events, performances and private functions.

residents competing in the Avon Descent will use the river several times a year for training. Canoeing this stretch is dependent on rainfall, as water levels need to be high enough to avoid the numerous obstructions (e.g. fallen trees).

Table 4 Preston River - canoeing

Characteristic	Donnybrook town site	Boyanup and Australind Bypass
Visitor numbers	No data	No data
Season of use	Summer (November to April)	Winter
Visitor catchment	Local	Local, regional
Facilities	Toilets, picnic tables, Donnybrook Amphitheatre	Toilets, picnic tables,
Accessibility	The site is immediately accessible from the South Western Highway.	The site is immediately accessible from several locations: the Boyanup side of the Boyanup- Picton Road bridge, and the West Dardanup Road Bridge.
Surrounding land uses	Donnybrook town site	Boyanup town site, agricultural land uses
Land security	No data	Between Boyanup and the South Western Highway most of the Preston River is abutted by private property. Between South Western Highway and mouth most of the abutting land is identified as public open space in the Greater Bunbury Region Scheme.

2.1.2 Education values

The Leschenault Ribbons of Blue Program[42] runs educational activities (e.g. macro-invertebrate sampling) for students on the Preston River at the Boyanup town site (Table 5).

Table 5 Preston River near the Boyanup town site – education

Characteristic	Education
Visitor numbers	Approximately 20 students annually
Season of use	Winter (July – August)
Visitor catchment	Local
Capacity	No data
Facilities	Picnic tables, toilets
Accessibility	The site is immediately accessible from the Boyanup-Picton Road (a sealed road).
Surrounding land uses	Boyanup town site
Land security	The site is identified as a mix of public open space, urban, and rural in the Greater Bunbury Region Scheme.

[42] The Ribbons of Blue program has coordinators in a number of regions across the State, including the Leschenault Catchment (which includes the Preston River), to assist schools and community groups in understanding and taking action for local waterways. Program coordinators undertake a number of activities (e.g. providing education information and equipment, running professional development and training sessions, conducting school visits and excursions, etc.).

2.1.3 Land security and surrounding land uses

Most of land adjacent to the Preston River between Padbury Road and the mouth is identified as public open space in the Greater Bunbury Region Scheme. Much of the river between the Padbury Road and Donnybrook is bordered by private property, with a few small stretches of land dedicated to parks and recreation and State forest.

2.1.4 Potential changes

There are plans to expand the Bunbury Inner Harbour. This would require realignment of the lower reaches of the Preston River (Thompson McRobert Edgeloe 2007). A pre-feasibility study recommended the Preston River be diverted around the Inner Harbour extension, but continue to discharge into the Leschenault Estuary at its current location (Maunsell Australia Pty Ltd 2004).

There are plans to establish an industrial park (light and general industry) in the Preston area (WAPC 2000) (Figure 2). The Preston River flows through southwest corner of the proposed park. The Environmental Protection Authority (EPA) provided strategic advice in early 2008 on the WAPC's plans to develop a structure plan for the Preston Industrial Park. The EPA identified a variety of issues to be addressed when developing the plan, including wetland buffers, water quantity and quality, acid sulphate soils and floodwater management.

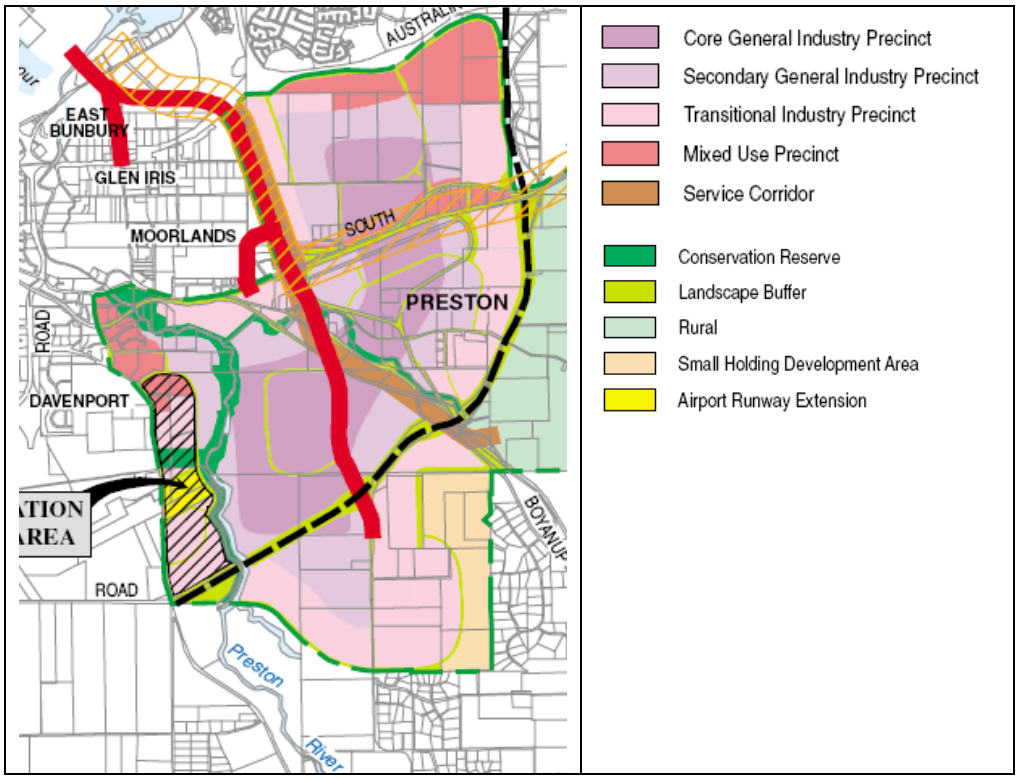


Figure 2 Preston Industrial Park (WAPC 2000)

2.2 Ferguson River

The Ferguson River is a tributary to the Preston River. The Ferguson River starts on the Darling Scarp south of the Wellington Reservoir and flows westward until it meets the Preston River. The bulk of the Ferguson River is located in the Shire of Dardanup, with a small part extending into the City of Bunbury.

2.2.2 Tourism

The Ferguson Valley is promoted as a tourist destination (www.fergusonvalley.net.au/index.htm). A number of the Valley's attractions are located adjacent to the Ferguson River (e.g. wineries, galleries and Gnomesville[43]). The proximity to the River, and resulting river views, is a selling point for some of the attractions.

2.2.2 Land security

Much of the Ferguson River is abutted by private property. This limits public access and the types of social values attributed to the river.

2.3 Crooked Brook

Crooked Brook is a tributary of the Preston River. It starts on the Darling Scarp and flows northwest meeting the Preston River near Poad Road. The Brook is located entirely in the Shire of Donnybrook-Balingup.

A short stretch of the Crooked Brook is bounded by the Crooked Brook Forest. A dam was constructed, on one of the Brook's tributaries, to create a billabong within the forest. During winter, the dam overflows creating a waterfall and an attraction for visitors.

2.3.1 Recreation values

There are four walk trails in the Crooked Brook Forest. Forest Path, a 600 m trail, is wheelchair accessible and has picnic and barbeque facilities and interpretive information boards. The Wildlife Walk is a 3 km circuit for walkers. The Marri Walk is a 10 km circuit and the Jarrah Walk is a 1.5 km circuit (Table 6).

Table 6 Crooked Brook – walking

Characteristic	Walking
Visitor numbers	No data
Season of use	Year round
Visitor catchment	Local
Facilities	Toilets, barbeque facilities
Accessibility	The forest is immediately accessible off of Boyanup Ferguson Road (an unsealed road).
Surrounding land uses	The area is surrounded by State forest and agricultural land uses.
Land security	The site is managed by the DEC.

2.3.2 Education values

The Leschenault Ribbons of Blue Program runs educational activities for students and members of Friends of Crooked Brook at the dam in Crooked Brook forest (e.g. macro-invertebrate sampling and tree planting) (Table 7).

[43] Gnomesville is located towards the top of the Ferguson catchment. It is home to over a thousand Gnomes and has picnic facilities available for visitors.

Table 7 Crooked Brook – education

Characteristic	Education
Visitor numbers	300+ people annually
Season of use	Year round
Visitor catchment	Local
Facilities	Toilets, barbeque facilities
Accessibility	The forest is immediately accessible off of Boyanup Ferguson Road (an unsealed road).
Surrounding land uses	The area is surrounded by State forest and agricultural land uses.
Land security	The site is managed by the DEC.

2.3.3 Management status and land security

Since 1994, the Friends of Crooked Brook, in conjunction with the DEC, have managed the Crooked Brook Forest. This has included construction of a dam, walk trails and interpretative signage, and picnic areas.

2.4 Noneycup Creek

Noneycup Creek starts south of the Donnybrook town site and flows north through the town site before discharging into the Preston River. The Creek has a catchment area of approximately 17 km^2. The catchment includes agricultural, industrial and urban land uses.

Noneycup Creek flows during winter. Contributing to this flow is run-off from the Donnybrook town site. The creek acts as a stormwater drain for much of the town site. In summer, the Creek becomes a damp watercourse with several pools (Malone 2008).

2.4.1 Education values

Noneycup Creek flows behind the Donnybrook District High School, making it an opportune location for educational activities (Table 8). The Leschenault Ribbons of Blue Program has run a number of activities on site, including revegetation and clean drains.

Table 8 Noneycup Creek – education

Characteristic	Education
Visitor numbers	Approximately 60 students annually
Season of use	Winter (June – September)
Visitor catchment	Local
Facilities	Donnybrook District High School
Accessibility	The site is immediately accessible from Bentley Street (a sealed road).
Surrounding land uses	Donnybrook District High School, Donnybrook town site
Land security	The site is located at the back of the Donnybrook District High School.

2.4.2 Management status

In 2008, in response to community concerns, the Shire of Donnybrook-Balingup prepared the draft Noneycup Creek Management Plan. The plan will guide future management of the Creek. It provides recommendations on general maintenance, stormwater management, erosion and continued Shire support for on ground works.

2.5 Picton Wetland

The Picton Wetland is an EPP wetland[44]. It is located off the South Western Highway in Picton, just outside of Bunbury.

2.5.1 Education values

The Leschenault Ribbons of Blue Program runs educational activities for students and Vietnam Veterans at Picton Wetland (e.g. macro-invertebrate sampling and tree planting) (Table 9). The program has also organised professional development days at the wetland for teachers.

Table 9 Picton Wetland – education

Characteristic	Education
Visitor numbers	Approximately 400 people annually
Season of use	Year round
Visitor catchment	Local
Facilities	Observation platform
Accessibility	The site is immediately accessible from the South Western Highway (a sealed road).
Surrounding land uses	Industry, residential housing
Land security	The site is identified as public open space in the Greater Bunbury Region Scheme.

2.5.2 Management status

In 2006, LCC received funding[45] to undertake revegetation and weeding activities at the wetland. The LCC engaged volunteers from a number of groups (e.g. Vietnam Veterans, school groups and Green Corps[46]) to help. The purpose of the project was to improve the water quality of the wetland.

Since the first revegetation project, the Vietnam Veterans and Green Corps have continued their involvement with the wetland. The Veterans have taken ownership of the wetland and regularly (10 people 20 times a year) undertake activities on site (e.g. revegetation and weeding). A Green Corps team recently constructed an observation platform at the Picton Wetland, which will make collecting water samples easier for the Ribbons of Blue program.

2.6 Child Side School

Child Side School is located in Boyanup. The school has one onsite wetland and a second wetland is being created.

[44] EPP Wetlands are protected by an Environmental Protection Policy, which aims to prevent degradation of valuable wetlands.
[45] Funding was received in 2006 through a community water grant from the Federal Government.
[46] The Green Corps is an Australian Government youth development and environmental training program for those aged between 17 and 20 years. Through the program, young people have an opportunity to volunteer their time to conserve, preserve and restore Australia's natural environment and cultural heritage.

The Leschenault Ribbons of Blue Program runs educational activities for students at the onsite wetland (e.g. macro-invertebrate sampling) (Table 10). The school also runs education activities at the wetland.

Table 10 Child Side School – education

Characteristic	Education
Visitor numbers	60+ students annually
Season of use	Year round
Visitor catchment	Local
Facilities	Child Side School
Accessibility	The site is immediately accessible from Armstrong Street in Boyanup (a sealed road).
Surrounding land uses	Child Side School, Boyanup town site
Land security	The wetlands are located on the school grounds.

2.7 Heritage values

2.7.1 Aboriginal heritage

There are a number of sites listed on the Register of Aboriginal Sites that are adjacent to or in the vicinity of the water features in the Preston River catchment. The permanent sites are identified in Table 11 and the other sites are identified in Table 12.

Table 11 Permanent sites

Site name	Site ID	Site type	Additional info
Bunbury 13	4869	Artefacts/scatter	--
Bunbury 23	4873	Artefacts/scatter	--
Moorland, Bunbury	5449	Skeletal material, burial, artefacts/scatter	--
Ga-#1	18900	Artefacts/scatter	--
Preston River	19795	Mythological	--
Ferguson River	19796	Mythological	--

Table 12 Other register sites

Site name	Site ID	Status	Site type	Additional info
Bunbury 12	4868	I	Artefacts/scatter	--
Bunbury 25	4874	I	Artefacts/scatter	--
Bunbury 06	4917	I	Artefacts/scatter	--
Bunbury 07	4918	I	Artefacts/scatter	--
Bunbury 08	4919	I	Artefacts/scatter	--
Bunbury-Preston Road	5544	I	Skeletal material/burial	--
Bunbury/Preston River	5815	S	Artefacts/scatter	Camp
Bunbury/No. 1 Highway	5816	S	Artefacts/scatter	--

Site name	Site ID	Status	Site type	Additional info
Horry Calgarate's Camp	17781	S	Man-made structure, historical	Camp
Boyanup Picton Road Camps	17782	S	Man-made structure, historical	Camp
Preston River Camp	17786	I	Man-made structure, historical	Camp, water source
Gynudup Brook Ephemeral Creeks	18941	S	Mythological	Water source

2.7.2 Non-Aboriginal heritage places

There are seven places with non-Aboriginal heritage values located near water features in the Preston River catchment (Table 13). All seven of the places are listed on their respective Municipal Inventories.

In addition to the Municipal Inventory, the Anchor and Hope Inn is listed on the National Estate and the National Trust. The Inn is located along the Preston River, near the Donnybrook town site. George Lawrence built the Inn in 1865. It is the oldest homestead in the district and now operates as a restaurant.

Table 13 Non-Aboriginal heritage places

Site	Location	National Estate	Heritage Council of WA Register	Municipal inventory	National Trust	Water dependence
Anchor and Hope Inn	South Western Hwy, Donnybrook	✓		✓[1]	✓	Located adjacent to the Preston River
Preston Railway Bridge	Preston River, Boyanup			✓[2]		Passes over the Preston River
Runnymead School	Shenton Road, Gwindinup			✓[2]		Located adjacent to the Preston River
Riverbend Homestead	Gwindinup Road, Boyanup			✓[2]		Located adjacent to the Preston River
Forrest's Leschenault Water Mill & Mill Race Site	South Western Hwy on Preston River, Picton			✓[3]		Located adjacent to the Preston River.
Moonlight Bridge Site	Preston River opposite Moorlands Homestead, Bunbury			✓[3]		Passes over the Preston River
Gnomesville Park	Junction of Wellington Mill and Ferguson Road, Dardanup			✓[4]		Located adjacent to the Ferguson River

[1] Shire of Donnybrook-Balingup Municipal Inventory

[2] Shire of Capel Municipal Inventory

[3] City of Bunbury Municipal Inventory

[4] Shire of Dardanup Municipal Inventory

Capel River Catchment Profile

1 Background

From its headwaters on the Darling Scarp, the Capel River passes through the Shires of Donnybrook-Balingup and Capel before discharging into the Geographe Bay. The catchment covers approximately 653 km^2.

The lower and upper portions of the catchment are dominated by agricultural land uses. This includes dairy and beef farming, fruit orchards and viticulture (White and Comer 1999). In the upper catchment, there are also small areas of State forest. The fact that most of the land is in private ownership, access is limited to a few key locations.

The catchment's most prominent water feature is the Capel River, which has a number of tributaries: Gynudup Brook, Tren Creek, Mullalyup Brook, Maidenhair Gully, Layman Gully, and Camp Gully. Other water features include the Stirling Wetlands and the Capel wetlands (Figure 1).

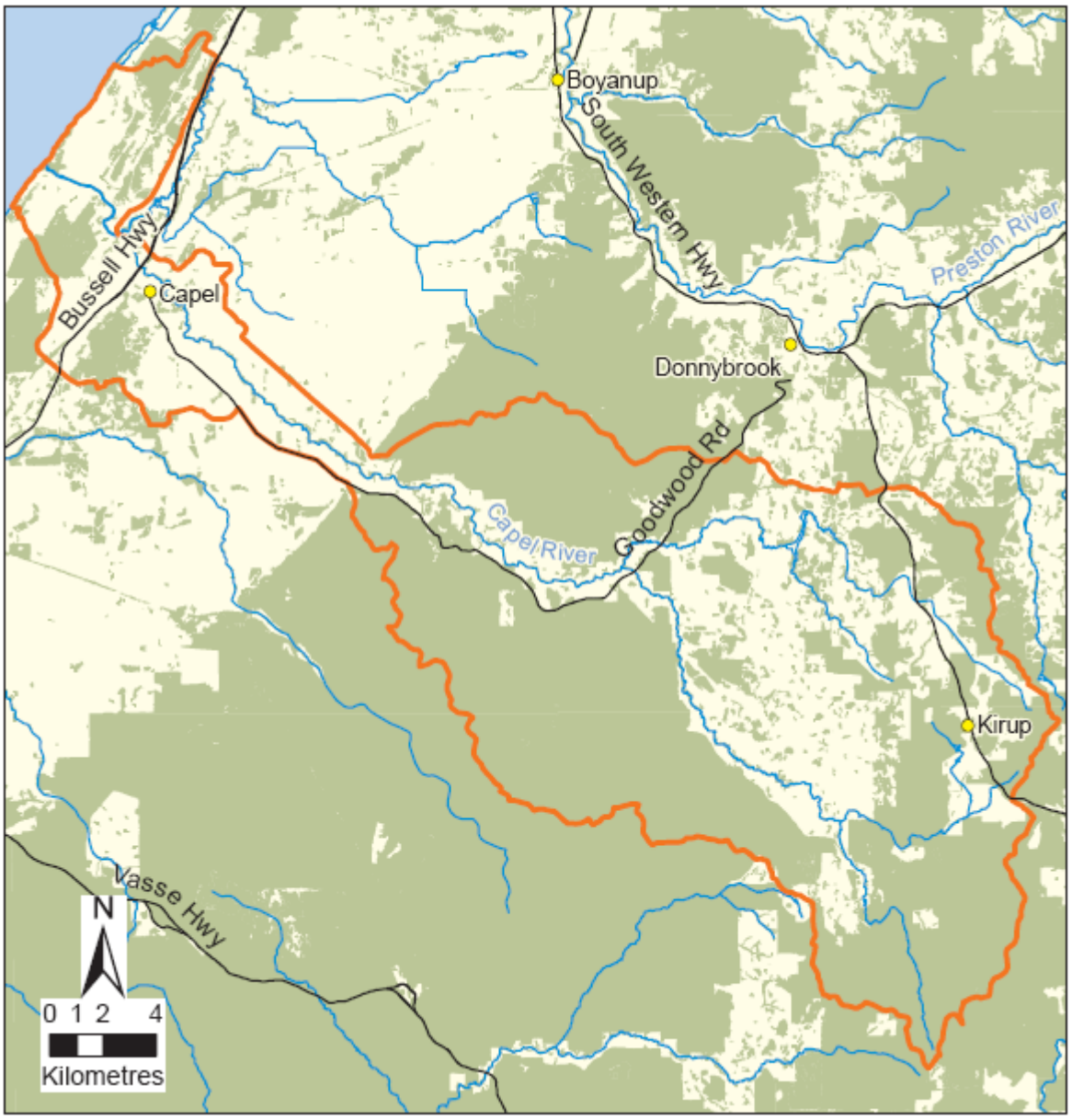


Figure 1 Capel River Catchment

2 Social values

2.1 Capel River

The Capel River starts on the Darling Scarp and empties into the Geographe Bay. There is a notional dividing point between the upper and lower portions of the River at Goodwood Road. It is at this point that the terrain changes from rolling hills to coastal plain and the two branches of the Capel River converge.

The river has not always flowed into Geographe Bay; it used to flow into the Vasse-Wonnerup estuaries through a series of connected wetlands. In 1874, in order to control flooding, the Colonial Works Office cut an artificial river mouth through sand dunes so that the River would flow into Geographe Bay. Although the McCourt's or Capel Cut was considered a success by local landholders at the time, it eventually led to problems. Seawater started entering the Stirling wetlands and a sand bar developed at the River's mouth. Weirs and levee banks were built to stop the salt water intrusion to the wetlands and River. A sand bar still forms at the mouth but is broken when seasonal rains create strong river flows.

2.1.1 Ironstone Gully Falls

The Ironstone Gully Falls are located along Goodwood Road, west of Johnson Road. The falls are created when a small tributary to the Capel River runs over a nine metre ledge before flowing into the Capel River (Shire of Capel n.d.). The area attracts visitors when the falls are following and when the wildflowers are abundant.

Camping at Ironstone Gully Falls

Ironstone Gully Falls

The area has a history of recreational use. It was set aside in 1903 for the recreational pursuits of the Capel River settlers (Birds Australia WA 2005b). Today, there are picnic and camping facilities adjacent to the falls (Table 1) and is a popular area for birding (Birds Australia WA 2005b) (Table 2).

Table 1 Ironstone Gully Falls – picnicking and camping

Characteristic	Picnicking	Camping
Visitor numbers	The area is popular when the falls are flowing and the wildflowers are abundant. Weekends during these times, the site can attract up to 100 people.	
Season of use	Winter (June – September) when the water is flowing over the falls and during the wildflower season (August - October).	
Visitor catchment	Local, regional	
Facilities	There are two picnic tables, approximately 6 camp sites, composting toilets and a car park.	
Accessibility	The site is immediately accessible from Goodwood Road (a sealed road).	

Characteristic	Picnicking	Camping
Surrounding land uses	The site is surrounded by State forest.	
Land security	The site is managed by the Shire of Capel.	

Table 2 Ironstone Gully Falls - birding

Characteristic	Birding
Visitor numbers	The area is popular when the falls are flowing and the wildflowers are abundant. Weekends during these times, the site can attract up to 100 people. Birds Australia WA recommends looking for the following species: raptors, red-tailed and long-bill black cockatoo and scarlet robin.
Season of use	No data
Visitor catchment	Local, regional
Facilities	Approximately 6 camp sites, two picnic tables, composting toilets and a car park.
Accessibility	The site is immediately accessible from Goodwood Road (a sealed road).
Surrounding land uses	The site is surrounded by State forest.
Land security	The site is managed by the Shire of Capel.

2.1.2 Capel town site

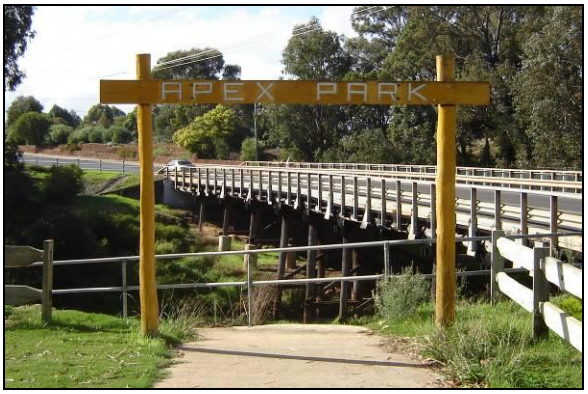
Where the Capel River passes through the Capel town site, the primary *in situ* social values are recreational fishing (Table 3) and picnicking (Table 4). The main Capel River fish species of interest to recreational fishers are red fin perch and marron. There are limited access points for recreational fishing along the river. The main access points are at Apex Park and behind the Challenge Dairy[47].

Table 3 Capel River near the Capel town site – fishing and marroning

Characteristic	Apex Park	Challenge Dairy
Visitor numbers	One or two anglers on weekends year round. Increased numbers occur during marron season.	
Season of use	Fishing occurs year round. Marroning occurs during a two week period in January/February.	
Visitor catchment	Local residents	
Facilities	There are no facilities.	
Accessibility	Apex Park is located off of Weld Road in the Capel town site.	Behind the Challenge Dairy at the end of Roe Road.
Surrounding land uses	Apex Park, which has picnicking facilities.	The site is located adjacent to the Challenge Dairy.
Land security	The site is managed by the Shire of Capel.	The site is managed by the Challenge Dairy.

[47] Challenge Dairy Co-operative is owned by Western Australian farmers and is located at the historic Capel Dairy site.

Apex Park is located adjacent to the river off of Weld Road in the Capel town site. The park has picnicking facilities (Table 4); however, the facilities are rarely used.



Apex Park

Picnic tables at Apex Park

Table 4 Capel River near the Capel town site - picnicking

Characteristic	Picnicking
Visitor numbers	Use is limited
Visitor catchment	Local residents
Facilities	Picnic tables and a car park
Accessibility	The site is located off of Weld Road (a sealed road through Capel town site).
Surrounding land uses	Apex Park is located in the Capel town site adjacent to a petrol station.
Land security	The area is managed by the Shire of Capel.

2.1.3 Mouth of the Capel River

Canoeing and fishing are popular activities at the mouth of the Capel River (Table 5). Canoeing occurs between the river mouth and where Gyundup Brook meets the Capel River. Access to the river is limited to Mallokup Bridge. Experienced canoeists use the river to train for the Avon Descent; new canoeists use the river to learn to paddle.

Canoeists access the river year round. However, there is concern about the future of summer canoeing. Iluka has been discharging water into Tren Creek for many years. As Iluka reduces its presence in the Capel area, there is concern the discharges will be reduced and will negatively affect flows in the Capel River.

Fishing occurs between the river mouth and Bussell Highway. The fish species of interest include marron, red fin perch, black bream and mulloway. Black bream and mulloway require estuarine environments. They are present when the river mouth breaks allowing salt water to move upstream.

Fishing occurs from the foreshore as the river is too shallow to fish from a boat. Access is limited to Mallokup Bridge and Peppermint Grove beach. Some fishers drive north along Peppermint Grove beach to reach the river's mouth.

Table 5 Capel River mouth – canoeing and fishing/marroning

Characteristic	Canoeing	Fishing/Marroning
Visitor numbers	No data	Access limits the number of people using the river. The number of anglers increases when the river mouth breaks allowing black bream and mulloway into the river.
Season of use	Canoeists access the river year round.	Year round; marroning is limited to January/February
Visitor catchment	Local	
Facilities	No facilities	
Accessibility	Canoeists start at Mallokup Bridge on Mallokup Road.	Access points exist at Mallokup Bridge on Mallokup Road and Peppermint Grove Beach via 4 WD.
Surrounding land uses	The Stirling Wetlands and private property are located adjacent to the mouth of the Capel River.	
Land security	No data	

2.1.4 Management status

The Capel River Action Plan was published in 1999 (White and Comer 1999). The Gynudup Brook and Tren Brook River Action Plan was published in 2003 (GeoCatch 2003). The river action plans provide recommendations for improving the waterways. Geographe Catchment Council (GeoCatch) and the Capel Land Conservation District Committee (Capel LCDC) together implement these recommendations.

The Capel LCDC has approximately eight members. The group receives funding annually from the Shire to carry out management activities (e.g. revegetation, weed control). There are several reserves that receive attention from the group, including one at Hutton's property and another on Pain's property.

2.1.5 Potential for increased social values

The WAPC has purchased land adjacent to the Capel River directly upstream of the Bussell Highway Bridge. The area was identified as public open space in the Greater Bunbury Region Scheme and has been bought to fulfil this purpose. The WAPC is revegetating the area. Once completed, the WAPC will hand over management of the area to the Shire. The Shire hopes to develop walk trails, including interpretive information, along this area.

2.2 Stirling Wetlands

The Stirling Wetlands are located at the mouth of the Capel River, east of the small community of Peppermint Grove. Water from the wetlands system flows to the Vasse-Wonnerup estuaries. The wetlands system supports a variety of uses including agricultural land uses (e.g. grazing).

The Stirling Wetlands are a popular birding location (Table 6). The area attracts birders and interested tourists staying at Peppermint Grove.

Table 6 Stirling Wetlands - birding

Characteristic	Birding
Visitor numbers	No data
Season of use	Year round
Visitor catchment	Local, regional, State
Facilities	There are no birding facilities at the site.
Accessibility	Access is limited
Surrounding land uses	The wetlands are surrounded by agricultural land uses. There is tourist accommodation at Peppermint Grove.
Land security	The area is managed by surrounding landholders, Shire of Capel and the Water Corporation.

2.2.1 Potential for increased social values

The Shire of Capel plans to develop a walk trail around the western side of the Stirling Wetlands. The walk trail will improve access to the wetlands and provide opportunities for birding. The Shire is currently exploring funding options to begin this work.

2.3 Capel Wetlands

The Capel Wetlands were constructed in 1985 when Iluka Resources Limited[48] decided to rehabilitate its sand mine pits near Capel. Iluka Resources commissioned the Royal Australasian Ornithologists Union to create a suitable habitat for waterbirds. In total fifteen wetlands (or lakes) were constructed from the mine pits.

The Capel Wetlands Centre was developed adjacent to the wetlands along Tuart Drive. Iluka Resources placed a perimeter fence around the Centre and the wetlands. The fence is opened and closed by Centre staff.

In the 1980s, the wetlands received artificial recharge from the effluent water from the nearby Iluka processing plants. The recharge continued through 2000, but has now ceased (Scott et al. 2006) as operations have been wound back.

The Centre was closed in December 2007. Visitors can no longer access the Centre or the wetlands. Some of the *in situ* social values have moved off site. For example, the Leschenault Nursery has offered to train TAFE students who used to attend the Centre.

Other social values, including education and research, no longer take place at the site (Table 7). Local schools (e.g. Busselton, Capel) used to take part in educational activities run by Capel Wetland Centre staff. The Capel Wetlands Centre used to host a variety of university research projects (e.g. honour's student projects).

Table 7 Capel Wetlands – education and research

Characteristic	Education	Research
Visitor numbers	Approximately 2,000 students annually until 2007	No data
Season of use	Year round	Year round

[48] Iluka Resources conducts mining sand mining operations in the Capel area. This includes processes at the North Capel Processing Operation and the Capel Dry Plant.

Characteristic	Education	Research
Visitor catchment	Local, regional	Local, regional, State
Facilities	The Capel Wetlands Centre is located on site.	
Accessibility	Access is controlled by Capel Wetland Centre staff.	
Surrounding land uses	Private property	
Land security	The site was managed by Iluka Resources Limited.	

2.3.1 Potential for increased social values

Although there is longer access to the area, it is hoped that someone will reopen the Centre. If this were to happen, the former social values could be re-established.

2.4 Heritage values

2.4.1 Aboriginal heritage values

There are a number of registered Aboriginal sites adjacent to or in the vicinity of the Capel River. The sites listed as permanent are in identified in Table 8 and all other listed sites are identified in Table 9.

Table 8 Sites listed as permanent on the Register

Site name	Site ID	Site type	Additional info
Capel River	20061	Mythological, historical	--
Capel/01 – Northern Creek	22161	Mythological	Water source
Ironstone Gully	23866	Ceremonial, historical	Meeting place, camp, natural feature

Table 9 Other registered sites

Site name	Site ID	Status	Site type	Additional info
Gynudup Brook Ephemeral Creeks	18941	S	Mythological	Water source
Goodwood Road Isolated Find	23911	L	Artefacts/scatter	--

The Wardandi people are the group of Nyungar people who occupied the coastal area of the Geographe Bay area. Anecdotal evidence from Nyungar descendants in the Busselton area suggests that the Capel Aboriginal community consisted of 30-40 people and that the Capel River was a traditional tribal boundary between local clan groups (White and Comer 1999).

The lower Capel River shores were used as a burial ground for local people until 1841, when a massacre occurred. The skeletons of those killed were left at the foreshore and the area was subsequently avoided by Aboriginal people (White and Comer 1999).

2.4.2 Non-Aboriginal heritage values

There are a number of sites with non-Aboriginal heritage values located along the Capel River (Table 10). The sites listed on the Heritage Council of WA Register are discussed below.

Lexden Park is located at 2 Jamieson Road on the banks of the Capel River. The Park includes a homestead, school site, mill site, shed, and water tank. The homestead is an intact example of an Old Colonial Georgian style residence. The 1855 section is a rare example of an intact timber framed residence. The homestead "together with the bridge, river and mature fig tree, form a picturesque rural historic environment" (Heritage Council WA 2008, pg 2).

Higgins Cut is the "earliest substantial drainage work" to be undertaken in Western Australia (Heritage Council WA 2004, pg 1) and is the first attempt by a private landholder to drain the Capel District floodplains for agriculture. Henry Higgins and Thomas Williams, early settlers, excavated the channel by hand. The Cut contributes to the understanding of early occupation of the Capel River area.

Table 10 Non-Aboriginal heritage sites

Site	Location	National Estate	Heritage Council of WA Register	Municipal inventory*	National Trust	Water dependence
Lexden Park	Jamieson Road, Capel		✓	✓		Located adjacent to the Capel River
Higgins Cut	Ludlow Road North, Capel		✓	✓		Located at the mouth of the Capel River
Ardenvale	Goodwood Road, Capel			✓	✓	Located adjacent to the Capel River
Capel River Footbridge	Barlee Road, Capel			✓		Passes over the Capel River
Capel River Road Bridge	Capel Drive, Capel			✓		Passes over the Capel River
Capel River School (1)	Goodwood Road, Capel			✓		Located adjacent to the Capel River
Ironstone Gully Falls	Goodwood Road, Capel			✓		Located on a tributary to the Capel River
Timber Tramways	North side of Capel River, Capel			✓		Located adjacent to the Capel River
Tren Creek Homestead and Staging Post	Bussell Highway, Capel			✓		Located adjacent to the Tren Creek
Thirteena Swimming Hole	End of Roe Road, Capel			✓		Located on the Capel River
The Causeway and Norton's Bridge	Mallokup Road, Capel			✓		Passes over the Capel River

*Shire of Capel Municipal Inventory

Vasse-Wonnerup Estuary System Profile

1 Background

The Vasse-Wonnerup System is located just east of the town site of Busselton on the Swan Coastal Plain in the Shire of Busselton (Figure 1). The system is 1,115 ha in size (CALM 2003). This includes numerous wetland areas, the Vasse and Wonnerup Estuaries and the Wonnerup Inlet. The Vasse-Wonnerup System is shallow. Most of the system has a maximum water depth of less than 1 metre, with large areas drying out in late summer (CALM 2003).

Figure 1 Vasse Wonnerup Estuary System

In 1990, the Vasse-Wonnerup System was listed as a wetland of international importance under the Ramsar Convention[49]. The area supports "tens of thousands of resident and migrant waterbirds of a wide variety of species and the largest regular breeding colony of Black Swans (*Cygnus atratus*) in the south-western Australia" (CALM 2003).

[49] The site was expanded in 2000.

The Vasse-Wonnerup estuaries receive contributions from a number of rivers. This includes Ludlow, Sabina, Abba and Vasse Rivers, located south of the estuaries, and the New River and Broadwater Wetlands, located south west of the estuaries.

There are a number areas near or adjacent to the Vasse-Wonnerup System that support groundwater dependent vegetation. These include Ambergate Reserve, Ruabon-Tutunup Rail Reserve and Tuart Forest National Park.

2 Social values

2.1 Vasse and Wonnerup Estuaries

The Vasse and Wonnerup Estuaries are no longer true estuaries because of the estuary floodgates, which prevent seawater inflow. The estuaries act as compensating basins for the Ludlow, Sabina, Abba and Vasse rivers.

The floodgates[50] were installed on the outlet channels in 1908 and replaced in 1927 and again in 2004[51]. When the water level in the estuaries rises above sea level, hydrostatic pressure opens the valves in the floodgates. This allows water to flow to the Wonnerup Inlet and into the Indian Ocean. When the level drops the valves close, preventing the inflow of seawater.

The Wonnerup Inlet provides the estuaries with an opening to Geographe Bay and the Indian Ocean. At any time of the year a sandbar can form in front of the Inlet. This bar can re-open naturally. However, one or more times a year it is artificially opened (e.g. via backhoe, hydraulic excavator) (WAPC 2005a), particularly in winter to prevent flooding.

In addition to preventing seawater inflow, the floodgates minimise the flooding of adjoining lands. This has enhanced the agricultural land uses and the value of the area as water bird habitat, by retaining fresh water in the estuaries. However, the floodgates have greatly reduced the flushing of nutrients from the system to the ocean (Hanran 2002a). This change combined with an increase in the nutrients entering the system has resulted in poor water quality in the wetlands (Hanran 2002a).

The nitrogen and phosphorous levels in the Vasse-Wonnerup estuaries exceed the ANZACC water quality guideline (Table 1). The high levels of nitrogen and phosphorous have resulted in algal blooms (sometimes of toxic cyanophyta) and fish kills and have required the erection of public health warning signs (CALM 2003).

Table 1 Nutrient emissions to the Vasse-Wonnerup estuaries and Geographe Bay

Source type	**Source**	**Total Nitrogen**		**Total Phosphorous**	
		tonnes	per cent	tonnes	per cent
Diffuse	Pastures	322	62	16	37
	Other	86	17	4.9	11
Point	Septic Tanks	73	14	15	35
	Dairy Sheds	31	6	5.3	12
	Other	6	1	2.3	5
	TOTAL	**517**		**43**	

Source: DoE 2004b

[50] The floodgates are managed by the Water Corporation.
[51] The new weirs have remotely operated fish gates to help reduce fish kills in the area.

The estuaries are fresh in winter but become saline in summer. This is attributed to floodgate leaks and some seawater being allowed to enter the estuaries. In March/April, the estuaries can become hyper-saline.

2.1.1 Recreation values

There are a number of popular birding sites[52] around the estuaries (Table 2). This includes the Vasse Estuary which is accessible from Estuary View Drive, Vasse Estuary floodgates from Layman Road, Wonnerup estuary floodgates at Forrest Beach Road; for a full list see: http://www.geographebay.com.au/pages/nature-lovers/. Birds are abundant when the water recedes, making the plant and animal life more accessible (December to February), and during the breeding season (September to November)

The floodgates (weirs) are a popular spot for recreational fishing (Table 2). Although popular, the floodgates are not supposed to be used for fishing. Anglers usually target black bream. Other popular species include flounder, flathead, eels, and crabs.

Vasse Estuary Floodgates

Table 2 Vasse Wonnerup Estuaries –birding and fishing

Characteristic	Birding	Fishing
Visitor numbers	No data	Approximately 6 people on weekends year round
Season of use	Year round, but most popular September - February	Year round
Visitor catchment	Local, regional, State	Local
Facilities	No facilities	Floodgates
Accessibility	The site is immediately accessible from a variety of paved roads, including Layman Road and Tuart Drive (sealed roads).	The site is immediately accessible from Layman Road (a paved road).
Surrounding land uses	Agricultural land uses, Tuart Forest National Park	Vasse and Wonnerup estuaries
Land security	No data	The site is managed by the Water Corporation.

[52] A survey conducted in January 1986 found more than 33,000 waterbirds present at the estuaries. Over time, more than 80 bird species have been recorded at the site (CALM 2003).

2.1.2 Education values

The Geographe Ribbons of Blue program annually organises activities for students to estuaries. The students typically do bird identification activities at the Vasse Estuary near Port Geographe (Table 3).

Table 3 Vasse Wonnerup Estuaries – education

Characteristic	Education
Visitor numbers	Approximately 50 students annually
Season of use	Year round
Visitor catchment	Local
Facilities	No facilities
Accessibility	The site is immediately accessible from Layman Road.
Surrounding land uses	Vasse estuary, residential development
Land security	No data

2.1.3 Potential for increased use

The Shire of Busselton is developing an eco-tourism attraction at the estuaries - the Busselton Bird Observatory and Wetlands Experience. The project has three components: design and development of a network of walk trails, design and development of a wetlands eco-centre and bird observatory, and conservation and rehabilitation of the wetlands. The Concept and Business Plan[53] was finalised in November 2005. In mid-2007 a conceptual walk trails master plan was released (Transplan Pty Ltd and Mike Halliburton Associates 2007); which proposed to develop of 19 trails. The Shire subsequently prepared a detailed trail development plan and applied for funding to develop the first trail.

The Shire of Busselton has prepared a Local Tourism Strategy (Sustainable Development Facilitation 2008). The strategy provides recommendations for future tourism developments in the Shire. This includes recommendations for developments along the coast at Busselton, Dunsborough and Yallingup.

The Shire of Busselton is experiencing population growth. In 2006 26,638 people lived in the Shire. This population is projected to grow to 36,500 by 2021 (WAPC 2005b). This growth increases the number of potential users of the estuaries and other water features in the area.

2.1.4 Management status

The Busselton Wetlands Conservation Strategy, prepared in 2005, provides direction for management of the Vasse and Wonnerup estuaries and the Broadwater and New River wetlands (WAPC 2005a). One objective of the strategy is to "encourage implementation of … optimal water-levels and water quality regimes …" (WAPC 2005a, p 10). This includes establishing environmental water quantity and quality targets. The other objectives focus on the protection and conservation of biodiversity and raising community awareness about the environmental values of the wetland system.

[53] The South West Development Commission contributed funds to development of the plan.

2.2 Malbup Creek

The Malbup Creek is a shallow channel that winds through farmland on either side of Layman Road. It discharges into the Vasse Estuary. During winter, when the water levels are high, the Creek connects the Vasse and Wonnerup estuaries via culverts under Layman Road. In summer-autumn, the Creek becomes a series of pools or dries out completely.

2.2.1 Recreation values

Malbup Creek is a popular spot for birding (Birding Australia WA 2005c) (Table 4). The DEC has built a bird hide to facilitate birding. Across the road from the Layman Road picnic area is a short limestone path, which leads to a boardwalk and the Malbup Creek bird hide.

Table 4 Malbup Creek - birding

Characteristic	Birding
Visitor numbers	No data
Season of use	Year round, but most popular September – February
Visitor catchment	Local, regional
Facilities	Bird hide
Accessibility	The site is immediately accessible from Layman Road (a paved road).
Surrounding land uses	Agricultural land uses, Tuart Forest National Park
Land security	No data

2.3 Ludlow, Abba, and Sabina Rivers

The Ludlow, Abba, and Sabina rivers, located south east of the Vasse and Wonnerup estuaries. The Ludlow River is the northern most of the three rivers. It starts in State forest on the Blackwood Plateau and flows until it meets the Wonnerup Estuary. The river flows through the Shires of Capel and Busselton. Tiger Gully is the Ludlow River's primary tributary.

The Abba River is located south of the Ludlow River. It starts on the Blackwood Plateau and flows north meeting the Vasse Estuary. It is contained wholly in the Shire of Busselton.

The Sabina River is located south of the Abba River. It starts in State forest on the Blackwood Plateau and flows north until empting into the Vasse Estuary. It is contained wholly in the Shire of Busselton.

Flow from the upper Sabina River is diverted to the Vasse Diversion Drain (Section 2.5) via the Green Gully drain. The upper section of Woddidup Creek, the Sabina River's main tributary, is diverted to Green Gully via a drain at Sidebottom Road (Hanran-Smith 2002a).

Although the Ludlow, Abba and Sabina rivers pass through State forest and small areas of nature reserve (e.g. Tuart Forest National Park, Sabina Nature Reserve), the catchments are dominated by agricultural land uses. Artificial drainage systems have been developed to accommodate the agricultural practices. The drainage systems have resulted in large increases in river flow (Hanran-Smith 2002a).

The Ludlow, Abba and Sabina Rivers experience water quality problems. This includes: nutrient loading, deoxygenation leading to fish deaths, sedimentation build-up and increased salinity levels.

2.3.1 Management status

The River Action Plans for the Sabina, Abba and Ludlow rivers (Hanran-Smith 2002a; Hanran-Smith 2002b; Hanran-Smith 2002c) help guide management of these systems. The plans provide an assessment of the foreshore vegetation and recommendations for improving the waterways. The Geographe Catchment Council[54] (GeoCatch) is responsible for implementing the plans.

2.4 Vasse River

The Vasse River starts in State forest on the Blackwood Plateau and flows north to the Vasse Estuary for approximately 45 km long. It drains a catchment of 270 km^2. The river has several tributaries including Cane Break Creek, Green Gully and Boxer Gully.

Flow from the Vasse River to the Vasse Estuary is controlled by a check board structure at the Butter Factory. The structure helps to maintain was levels in the lower Vasse River during summer and is managed by the Shire of Busselton.

Flow from the upper catchment is diverted to the Geographe Bay via the Vasse Diversion Drain (Section 2.5). Flow from the lower catchment enters the Vasse Estuary. This is controlled by a check board structure at the Butter Factory. The structure helps to maintain water levels in the lower Vasse River during summer. The check boards are managed by the Shire of Busselton.

The upper catchment is dominated by private property and agricultural land uses. This limits access to the river for recreational activities. The lower catchment includes both agricultural and urban (i.e. Busselton) land uses.

Water quality issues in the Vasse River include: nutrient loading, deoxygenation leading to fish deaths, sedimentation build-up and increased salinity levels. The lower river has on occasion been closed to public use, particularly during warmer months. This has been due to nutrient inputs and reduced flows, which have led to eutrophic conditions, including algal (cyanobacteria) blooms.

2.4.1 Recreation values

There are picnicking facilities available at Rotary Park and Busselton Heritage Park[55] (Table 5). Rotary Park is located on the southern foreshore of the Vasse River near the Busselton Visitors Centre and Busselton Shire Offices. Across the river is the Busselton Heritage Park.

Another popular activity is birding (Table 6). Recommended sites include the Busselton Shire Office and the Busselton Visitors Centre (Birds Australia 2005c) as well as behind the Butter Factory, at the first bend on Pioneer Cove and at the end of Ford Road[56]. Each of these sites provides direct access to the river.

[54] GeoCatch was formed in 1997 to address land and water issues in the Geographe Bay area using an integrated catchment management approach. The Council consists of 11 community representatives, including the Presidents of the Capel and Busselton Shires, as well as representatives from Department of Water, Department of Environment and Conservation, Department of Planning and Infrastructure and the Department of Food and Agriculture WA.

[55] Busselton Heritage Park has a range of sculptures that link the past and present. The Busselton Heritage Trail starts at the Park and includes the Aboriginal Interpretive Gardens, the Ballarat Steam Engine, St Mary's Anglican Church and Pioneer Cemetery. http://www.busselton.wa.gov.au/book/export/html/15

[56] Further details can be found at: http://www.geographebay.com.au/pages/nature-lovers/.

Vasse River behind the Busselton Shire Office

Table 5 Vasse River near the Busselton town site - picnicking

Characteristic	Rotary Park	Busselton Heritage Park
Visitor numbers	No data	No data
Season of use	Year round	Year round
Visitor catchment	Local	Local
Facilities	Picnic tables, barbeques, interpretive signage, car park, playground, toilets	Picnic tables, interpretive signage, sculptures
Accessibility	The site is immediately accessible from Causeway Road (a sealed road).	The site is immediately accessible from Causeway Road and Peel Terrace (sealed roads).
Surrounding land uses	Busselton Visitors Centre, Busselton town site, Guide Hall, Scout Hall, Busselton Shire Office	Busselton Visitors Centre, Busselton town site
Land security	No data	No data

Table 6 Vasse River near the Busselton town site - birding

Characteristic	Birding
Visitor numbers	No data
Season of use	Year round
Visitor catchment	Local
Facilities	Toilets
Accessibility	The site is immediately accessible from Causeway Road, Peel Terrace, Pioneer Cove (sealed roads) and Ford Road (an unsealed track).
Surrounding land uses	Busselton town site
Land security	No data

2.4.2 Education values

The Geographe Ribbons of Blue program runs educational activities along the lower Vasse River (Table 7). The primary focus is on water quality sampling adjacent to the Busselton light industrial area.

Table 7 Lower Vasse River – education

Characteristic	Education
Visitor numbers	Approximately 150 students annually
Season of use	Year round
Visitor catchment	Local
Facilities	No facilities
Accessibility	The site is accessible from the Busselton Bypass (a paved road).
Surrounding land uses	Busselton town site, Busselton light industrial area
Land security	The site is located within the Busselton light industrial area.

2.4.3 Management status

The Vasse River Action Plan (Scott et al. 2000), prepared in 2000, helps guide management of the river system. The plan provides an assessment of the foreshore vegetation and recommendations for improving the waterways. GeoCatch is responsible for implementing the plan.

GeoCatch also coordinates the Lower Vasse River Cleanup Program in partnership with the Shire of Busselton and the DoW. The program was established in response to ongoing water quality issues in the lower Vasse River. Program activities include foreshore rehabilitation and waterway revegetation, dredging to remove nutrient rich sediment, implementation of best practice stormwater management, public education campaigns and monitoring. Due to the complexity of the water quality problems and the amount of degradation, it will take a number of years before significant improvements are experienced.

The Goldfish Control Program was established in 2004 to control the number of feral goldfish (*Carassius auratus*) in the lower Vasse River[57] (Centre for Fish and Fisheries Research 2006). The initiative is supported by GeoCatch, Fishcare WA, and Fisheries WA and is being carried out by researchers from Murdoch University. The project provides an opportunity to control the biomass of goldfish species and to better understanding the biology and ecological impact of goldfish.

2.5 Vasse Diversion Drain

The Vasse Diversion Drain drains an area of approximately 277 km^2. It was built in 1926 to prevent flooding in Busselton. To further control the water movement, 7.5 km of the drain is leveed.

The drain receives water from 65% of the Sabina River catchment and 90% of the Vasse River catchment (Hanran-Smith 2002a). This water is diverted away from the Vasse-Wonnerup Estuary to Geographe Bay. As a result, flows have been reduced in the lower Vasse River and the Vasse Estuary.

The drain was originally designed to contain the 100 year ARI flood event. However, the drain overflowed in August 1997. The Busselton Regional Flood Study Review (JDA Consultant Hydrologists 1998) found that Busselton had 20 year ARI protection instead of 100 year ARI protection. The review recommended construction of large compensating basins in the Vasse River catchment. Construction of the basins began in 2000-01. The Department of Water (then the Water and Rivers Commission) was responsible for on going maintenance costs.

[57] Goldfish are "known to be vectors for disease introduction, may prey on native fishes and their effs and larvae, reduce aquatic plant biomass and re-suspend nutrients further fuelling algal blooms" (Centre for Fish and Fisheries Research 2006, pg 3).

2.5.1 Recreation values

Fishing is a popular activity along the diversion drain (Table 8). Popular locations include the bridge and the banks of high school. Anglers catch bream, juvenile salmon and mullet. The drain is a good spot for kids to develop their fishing skills.

Table 8 Vasse Diversion Drain - fishing

Characteristic	Fishing
Visitor numbers	Approximately 6 people on weekends year round
Season of use	Year round
Visitor catchment	Local
Facilities	No facilities
Accessibility	The drain is immediately accessible from Bussell Highway, Queen Elizabeth Avenue, Thurkle Street and Busselton Bypass (paved roads).
Surrounding land uses	Busselton town site
Land security	No data

2.6 New River and Broadwater Wetlands

The New River starts in Busselton at the Broadwater Nature Reserve and flows north east to the Vasse Diversion Drain. The river, east of the drain, continues to flow north east and empties into the lower Vasse River. The river flows through low-lying, flood-prone land that is seasonally inundated (WAPC 2005a).

The Broadwater Wetlands are located at the start of the New River. The wetlands cover an area of about 31 ha and are predominately contained within the Broadwater Nature Reserve. The wetlands are in poor condition, but still provide important habitat for birds (WAPC 2005a).

2.6.1 Education values

The Geographe Ribbons of Blue program runs variety of activities along the New River and Broadwater Wetlands (Table 9). Macro-invertebrate sampling is undertaken at the Broadwater Wetlands. There are open, grassed areas around the wetlands, making it easy for students to set-up and view their samples.

The Ribbons of Blue coordinator takes about two-thirds of the students involved with the program to the New River. The students do macro-invertebrate sampling behind the Busselton High School. The site is a convenient location for activities as several schools are located within walking distance and there is a grassed area for students to use.

Table 9 New River and Broadwater Wetlands – education

Characteristic	New River	Broadwater Wetlands
Visitor numbers	Approximately 375 students annually	Approximately 50 students annually
Season of use	July to September	
Visitor catchment	Local	Local
Facilities	No facilities	The site has an open grassed area for students to sit on.
Accessibility	The site is immediately accessible	The site is immediately accessible from

Characteristic	New River	Broadwater Wetlands
	from Bussell Highway and Queen Elizabeth Avenue (sealed roads).	Broadwater Blvd (a sealed road).
Surrounding land uses	Busselton town site	
Land security	The site is located at the back of Busselton Senior High School.	The wetlands are predominately located in the Broadwater Nature Reserve.

2.7 Ambergate Reserve

Ambergate Reserve is located west of the Vasse River, near the intersection of Doyle Road and Queen Elizabeth Avenue in the Shire of Busselton. It is 75 ha in size. The reserve is located in an area identified as potentially groundwater dependent.

The reserve is managed by the Busselton Naturaliste Club. Management is guided by the *Ambergate Reserve: Draft Management Plan* (Massey 2003).

2.7.1 Recreation

Ambergate Reserve has a 4 km walk trail. The trail shows off the variety of flora and fauna present in the reserve (e.g. ring tailed possum).

2.7.2 Rare species

The reserve supports a variety of flora and fauna. The tufted plumed featherflow (*verticordia plumose* var. *ananeotes*), an endangered species, has been found at the site (Department of Environment, Water, Heritage and the Arts n.d.a).

2.8 Ruabon-Tutunup Rail Reserve

The Ruabon-Tutunup Rail Reserve is located along Ruabon and Tutunup Roads in the Shire of Busselton. The reserve is located in an area identified as potentially groundwater dependent.

Ruabon-Tutunup Rail Reserve Preservation Group, a local volunteer group, helps manage the reserve. Management is guided by the *Management Plan for the Ruabon-Tutunup Rail Reserve* (Ecosystem Solutions 2007).

2.8.1 Rare species/scientific research

The reserve contains 8 threatened and 13 priority species of flora and two threatened ecological communities (Ecosystem Solutions 2007). This includes Royce's waxflower (*Chamelaucium sp. C Coast Plain) (R.D. Royce 4872)*), a vulnerable species (Department of Environment, Water, Heritage and the Arts n.d.b), and the Southern Ironstone Threatened Ecological Community (Ecosystem Solutions 2007).

2.9 Tuart Forest National Park

The Tuart Forest National Park runs parallel to Bussell Highway through the Shires of Capel and Busselton. It is 2,049 ha in size and is managed by the DEC. The national park is located in an area identified as potentially groundwater dependent.

2.9.1 Recreation

The Tuart Forest National Park is a popular spot for visitors to stop while travelling. For example, visitors utilise the picnicking facilities available at the Layman Road picnic area, located on Layman Road 0.2 km south of the Wonnerup House entrance (Section 2.7.2).

The possum night spotlighting trail starts at the Layman Road picnic area. It is a 1.5 km track. The trail is lined with information plaques that highlight the presence of the western ringtail possum in the national park.

Table 10 Tuart Forest National Park - picnicking

Characteristic	Picnicking
Visitor numbers	No data
Season of use	Year round
Visitor catchment	Local, regional
Facilities	Toilets, car park, picnic tables, walk trail
Accessibility	The site is immediately accessible from Tuart Drive (a sealed road).
Surrounding land uses	The Vasse-Wonnerup wetlands system
Land security	The National Park is managed by the DEC.

2.9.3 Unique characteristic

The national park protects the largest remaining pure forest of tuart (*Ecualyptus gomphocephala*) in the world (DEC n.d.a). It also has the tallest and largest tuart specimens on the Swan Coastal Plain.

2.9.4 Rare species

The Tuart Forest National Park is home to the largest remaining wild population of endangered western ringtail possum in Western Australia (DEC n.d.a). This is largely because the tuart trees contain hollows to house the possums and peppermint trees, which are part of the dense understory, to feed the possums.

2.10 Heritage values

2.10.1 Aboriginal heritage

There are a number of sites listed on the Register of Aboriginal Sites adjacent to or in the vicinity of the Vasse Wonnerup estuaries, the Ludlow, Abba, Sabina, Vasse and New rivers, the Vasse Diversion Drain and the Broadwater Wetlands. The permanent sites are identified in Table 11 and the other sites are identified in Table 12.

Table 11 Permanent sites

Site name	Site ID	Site type	Additional info
Busselton: Armitage Drive	767	Skeletal material/burial	--
Wonnerup Scarred Tree	4402	Modified tree	--
Korilya Stud	4932	Skeletal material/burial	--
Busselton	5613	--	Camp
Busselton Fringe Camp 01	15085	--	Camp
The New River	16807	Mythological	Hunting place, water source
Sabina River	17353	Mythological, historical	--
Abba River	17354	Mythological, historical	--
Uligugillup Mission	17355	Historical	Camp

Site name	Site ID	Site type	Additional info
Tutunup South Artefact Cluster 001	22884	Artefacts/scatter	--

Table 12 Other register sites

Site name	Site ID	Status	Site type	Additional info
Broadwater Lakes Burial	675	I	Skeletal material/burial	--
Wonnerup, Busselton	5863	S	Skeletal material/burial	--
Ludlow River	5864	I	Artefacts/scatter	--
Broadwater Burial Ground	15086	I	Skeletal material/burial	--
Hithergreen Farm	15999	I	--	Camp, Other: Spiritual significance
Sabina River	16609	S	Artefacts/scatter	--
Sabina River Camp Ground	17350	I	Artefacts/scatter, historical	Archaeological deposit, camp
Old Broadwater Farm 1	18396	L	Artefacts/scatter	--
Old Broadwater Farm 2	18397	L	Artefacts/scatter	--
Old Broadwater Farm 3	18398	L	Artefacts/scatter	--
Old Broadwater Farm 4	18399	L	Artefacts/scatter	--
Old Broadwater Farm 5	18400	L	Artefacts/scatter	--
Scarred tree – Vasse Highway deviation	19272	L	Modified tree	--
Ludlow Mining Lease 70/86 – Isolated artefacts	20809	L	--	Other: Isolated artefact
Honey Trees and Bardi Grubs	21550	L	--	Hunting place, natural feature

2.10.2 Non-Aboriginal heritage places

There are sixteen places with non-Aboriginal heritage values located near the Vasse Wonnerup estuaries, the Ludlow, Abba, Sabina, Vasse and New rivers, the Vasse Diversion Drain and the Broadwater Wetlands (Table 13). Each of the places is listed on the Busselton Municipal Inventory. Three of these places also listed on the Heritage Council of WA Register.

The Wonnerup House and Grounds (Wonnerup Precinct) is owned by the National Trust and is a tourist attraction (Table 14). The site illustrates the evolution of European settlement in the south west in the nineteenth and early twentieth century. For example, the school room and teacher's house on site demonstrate government involvement in education in the district between 1872 and 1912. The spearing of George Layman took place at the site in 1841, "an event which illustrates the mixed nature of the relationship between the Aborigines and European settlers at the time" (Heritage Council of WA 1996). The Heritage Council of WA noted that the site has potential for further development as a teaching and research site.

Table 14 Wonnerup House - tourism

Characteristic	Tourism
Visitor numbers	About 3,000 visitors annually
Season of use	Year round but most popular during school holidays and on long weekends
Visitor catchment	Local, regional, State
Facilities	Wonnerup House and Grounds, tours are self-guided
Accessibility	The site is immediately accessible from Layman Road (a sealed road).
Surrounding land uses	Vasse and Wonnerup estuaries, agricultural land uses
Land security	The site is owned and managed by the National Trust of WA.

Although the Vasse and Wonnerup floodgates have been removed, the site still retains heritage value. The floodgates were in continuous operation from 1907/08 until their removal in 2004. They were important to the local community for their role in development and maintenance of farmland in the Busselton area (Heritage Council of WA 2005). Ballarat Bridge was the first railway bridge constructed to carry a locomotive in Western Australia.

The Old Butter Factory was established by the State Government in 1918 to assist WA's dairy industry in becoming self-sufficient (Heritage Council of WA 2003). The factory allowed for the supply of long-life dairy products to areas over long distances. It is an important reminder of the early development and settlement of Busselton. The Old Butter Factory Historical Precinct Conservation Plan was prepared in 1999 for the Shire of Busselton.

Table 13 Non-Aboriginal heritage places

Site	Location	National Estate	Heritage Council of WA Register	Municipal inventory*	National Trust	Water dependence
Wonnerup House and Grounds	935 Layman Road, Wonnerup	✓	✓	✓	✓	Located adjacent to the Vasse and Wonnerup estuaries
Wonnerup School and Teacher's House	936 Layman Road, Wonnerup	✓		✓	✓	Located adjacent to the Vasse and Wonnerup estuaries
Site of Ballarat Bridge, Vasse and Wonnerup Floodgates	Layman Road, Wonnerup		✓	✓		Cross the Vasse and Wonnerup estuaries
Old Butter Factory	76 Peel Terrace, Busselton		✓	✓		Located adjacent to the Vasse River
Ludlow Forestry Mill and Settlement	Corner of Ludlow Road North & Tuart Drive, Ludlow		✓			Located adjacent to the Tuart Forest National Park
The Island Farmhouse	148 Forrest Beach Road, Wonnerup	✓		✓	✓	Adjacent to the Wonnerup Estuary
Lockeville Homestead	26 Floodgate Road, Wonnerup	✓		✓	✓	Adjacent to the Vasse and Wonnerup estuaries
Wonnerup Jetty Site	Off Layman Road, Busselton			✓		Adjacent to the Wonnerup Estuary
Membenup Homestead	40 Membenup Road, Wonnerup			✓	✓	Adjacent to the Wonnerup Estuary
Vasse River (and Estuary)	Layman Road, Wonnerup			✓		The site is a water feature
Ballarat Timber Mill Site	Mouth of the Vasse Estuary, Wonnerup			✓		Adjacent to the Vasse Estuary
Locke Swamp Floodgates	Busselton Highway, Busselton			✓	✓	Crosses the New River
Glew Homestead	On Vasse River, Busselton			✓		Located adjacent to the Vasse River
Fairlawn Lane Crossing	Fairlawn Road, Busselton			✓		Crosses the Vasse River
Ford Road Causeway	Ford Road, Busselton			✓	✓	Crosses the Vasse River

Site	Location	National Estate	Heritage Council of WA Register	Municipal inventory*	National Trust	Water dependence
Busselton-Boyanup Rail Line	Busselton to Boyanup, Busselton			✓		Located adjacent to the Ruabon-Tutunup Rail Reserve
Mullgarnup Aboriginal Mission	Mullganrup Road, Wonnerup			✓		Located adjacent to the Sabina River
Broadwater Wetlands (part)	Between Bussell Hwy & Rendezvous Road, Busselton	✓		✓		The site is a water feature

* Shire of Busselton Municipal Inventory

Geographe Bay Coastline Profile

1 Background

The Geographe Bay extends from Cape Naturaliste[58] past the towns of Dunsborough and Busselton and ends near the City of Bunbury. There are a number of water features along the coastline between Busselton and Cape Naturaliste. These include: the Buayanup, Carbunup, and Mary rivers, the Annie, Meelup, Dolugup, Jingarmup, Dugulup, and Dandatup brooks and the Toby Inlet. Each of the water features discharges into Geographe Bay (Figures 1).

The water features are predominately surrounded by private property. This limits access and reduces the social value for the broader community. Those features with public access are discussed below.

Figure 1 Geographe Bay Coastline

[58] This profile does not include the New River or Broadwater Wetlands. Although these features are on the coastline they do not drain directly into Geographe Bay, they empty into the Vasse Estuary.

2 Social values

2.2 Buayanup River

The headwaters of the Buayanup River are located on the Blackwood Plateau in the Shire of Augusta-Margaret River. From here, the River flows northward for 71 km through the Shire of Busselton and discharges into Geographe Bay, near the Locke Nature Reserve. The River has two tributaries: Ironstone Gully and Dawson Gully.

The Buayanup River used to flow into the Vasse-Wonnerup Estuary system (DoE 2004). However, to control flooding, the lower reaches of the river have been converted into a drain.

A number of management issues have been identified for the Buayanup River. These include: weeds, erosion (e.g. from uncontrolled stock access), and nutrient loading (Spatial Vision Innovations 2008).

2.1.1 Locke Nature Reserve

Locke Nature Reserve is located east of Siesta Park along Caves Road. The Buayanup River flows along the eastern boundary of the Reserve, while Locke Swamp Drain flows along the western boundary. The reserve supports 17 campsites, which are leased by a variety of community organizations (Table 1).

Table 1 Locke Nature Reserve - camping

Characteristic	Camping
Visitor numbers	There are 17 campsites.
Season of use	Year round
Visitor catchment	Local
Facilities	No data
Accessibility	The site is immediately accessible from Caves Road.
Surrounding land uses	Private property
Land security	The reserve is vested in the Shire of Busselton.

2.1.2 Peppermint Park Eco Village

Peppermint Park Eco Village is located on the eastern foreshore of Buayanup River, opposite Locke Nature Reserve (Table 2). The Park has a variety of facilities, including accommodation, playgrounds, barbeques, camp kitchens, game room, toilets and a fish cleaning area. The Park's brochure promotes the Buayanup River as a good fishing spot and identifies bream, whiting and crabs as popular species.

Table 2 Peppermint Park Eco Village – camping and fishing

Characteristic	Camping	Fishing
Visitor numbers	The site provides 172 accommodation sites. This includes a mix of cabins, caravans and campsites.	No data
Season of use	Year round	
Visitor catchment	No data	No data
Facilities	Playground, camp kitchen, barbeques, fish cleaning area, games room, toilets	

Characteristic	Camping	Fishing
Accessibility	The site is immediately accessible from Caves Road (a sealed road).	
Surrounding land uses	Private property, residential housing	
Land security	The Eco Village is privately owned.	

2.1.3 Management status

The GeoCatch is developing a river action plan for the Buayanup River. The plan will provide recommendations for improving and protecting the health of the river. GeoCatch will be responsible for implementing the plan.

2.2 Carbunup River

The Carbunup River's headwaters are located on the Blackwood Plateau in the Shire of Augusta-Margaret River. The River flows northward for 36 km passing through the Carbunup River town site. The river covers a catchment are of 170 km^2 before discharging into Geographe Bay west of Siesta Park, in the Shire of Busselton.

2.2.1 Carbunup Reserve

The Carbunup River runs through a small portion of the Carbunup River Reserve. The Reserve straddles the Bussell Highway, covering 31 hectares south of the Carbunup River Bridge. Local residents use the reserve for bushwalking and marroning. Marroning is popular at the Carbunup River pools, located in the southeastern corner of the reserve (Elscot 2002) (Table 3).

Table 3 Carbunup River Reserve – marroning and walking

Characteristic	Marroning	Walking
Visitor numbers	No data	No data
Season of use	Summer (January/February)	Year round
Visitor catchment	Local	
Facilities	No facilities	Walk trail
Accessibility	The Carbunup Reserve is immediately accessible from the Bussell Highway (a sealed road).	
Surrounding land uses	Carbunup River town site, private property	
Land security	The Carbunup Reserve is vested in the Shire of Busselton.	

2.2.2 Management status

The Carbunup River Action Plan (Community Environmental Management 2000) provides an assessment of the foreshore vegetation and the river health. It identifies management issues, including uncontrolled stock access, erosion, loss of foreshore vegetation, water quality problems and weed invasion. The plan provides recommendations for addressing these issues, which GeoCatch is responsible for implementing.

GeoCatch's management efforts are supported by the Carbunup Reserve Management Group. The group was formed in 2001, as a sub-group of the Sussex Land Conservation District Committee (LCDC), to help manage the reserve.

2.3 Toby Inlet

The Toby Inlet is situated in the southern corner of the Swan Coastal Plain, south east of the Dunsborough town site in the Shire of Busselton. It runs parallel to Geographe Bay for approximately 5.6 km before discharging to the ocean. The bulk of the Inlet is separated from the ocean by high beach ridges formed by waves and wind (Clay 2005).

The Inlet is influenced by tidal movements in summer and by rainfall in winter (Clay 2005). The water regime has been significantly altered as the result of artificial drainage. This has included the rerouting of several waterways that originally flowed into the Toby Inlet (e.g. the Carbunup River).

The Toby Inlet has water quality problems, including nutrient loading and the build-up of sediments. These have been attributed to surrounding land uses and changes in the water regime in the catchment.

2.3.1 Recreation

Toby Inlet supports several recreational activities: walking, fishing, birding (Clay 2005) and canoeing (Tables 4 and 5). Although there are no formal walk trails the Inlet foreshore provides a popular walking and birding destination for local residents. Motorised boats are not allowed on the Inlet, so any fishing that occurs is from the foreshore.

Table 4 Toby Inlet – walking and fishing

Characteristic	Walking	Fishing
Visitor numbers	No data	
Season of use	Year round	
Visitor catchment	Local	
Facilities	No facilities	
Accessibility	The Inlet is immediately access from Geographe Bay Road and Caves Road (sealed roads).	
Surrounding land uses	Private property, Dunsborough town site, Shire of Busselton reserves	
Land security	The Inlet foreshore is predominately vacant crown land and Shire of Busselton reserve. The Inlet is located in an area designated as a Wetland Amenity Area under the Leeuwin Naturaliste Ridge Statement of Planning Policy.	

Table 5 Toby Inlet – birding and canoeing

Characteristic	Birding	Canoeing
Visitor numbers	No data	
Season of use	Year round	
Visitor catchment	Local	
Facilities	No facilities	
Accessibility	The Inlet is immediately access from Geographe Bay Road and Caves Road (sealed roads).	
Surrounding land uses	Private property, Dunsborough town site, Shire of Busselton reserves	
Land security	The Inlet foreshore is predominately vacant crown land and Shire of Busselton reserve. The Inlet is located in an area designated as a Wetland Amenity Area under the Leeuwin Naturaliste Ridge Statement of Planning Policy.	

2.3.2 Education values

The GeoCatch Ribbons of Blue coordinator runs activities at the Toby Inlet (e.g. macro-invertebrate sampling) (Table 6). The Inlet is surrounded by a flat, grassed area, which is good for students to sit and/or work on.

Table 6 Toby Inlet – education

Characteristic	Education
Visitor numbers	Approximately 40-50 students annually
Season of use	School term 3 (July - Sept)
Visitor catchment	Local
Facilities	No facilities
Accessibility	The Inlet is immediately access from Geographe Bay Road and Caves Road (sealed roads).
Surrounding land uses	Private property, Dunsborough town site, Shire of Busselton reserves
Land security	The Inlet foreshore is predominately vacant crown land and Shire of Busselton reserve. The Inlet is located in an area designated as a Wetland Amenity Area under the Leeuwin Naturaliste Ridge Statement of Planning Policy.

2.3.3 Management status

The *Management Plan for the Toby Inlet Foreshore and Waters* (Clay 2005) guides management of the Inlet. The objective of the plan is to improve the water quality of Geographe Bay by protecting and conserving the Inlet. Recommended actions include:

- Revegetating the foreshore (with native providence plants) to reduce erosion, bank slumping and nutrient loading
- Establishing a protocol for opening the ocean entrance
- Investigating the removal of sediments from the waterway
- Working with landholders to address issues relating to water quality and the riparian zone

The plan is implemented by the Shire of Busselton with support from the Tobey Inlet Catchment Group (TICG).

2.4 Meelup and Dolugup Brooks

The Meelup and Dolugup brooks flow through Meelup Regional Park (Section 2.4.1). Meelup Brook starts near the intersection of Cape Naturaliste Road and Eagle Bay Road. It flows eastward through the park and discharges to Geographe Bay at Meelup Beach.

Dolugup Brook is contained entirely within the Meelup Regional Park. The Brook starts near Meelup Beach Road and flows eastward discharging into Castle Bay. Vegetation along the Brook is typically very dense (White 2006), preventing access. For this reason, recreational use is limited to the mouth of the Brook.

2.4.1 Meelup Regional Park

The 571 ha Meelup Regional Park is vested in the Shire of Busselton for the purposes of conservation and recreation. Recreation activities include: sightseeing, walking, swimming, snorkelling, surfing, fishing, canoeing, boating and picnicking. Many of these activities, and associated facilities, occur along the coast. One exception is a walk trail that extends along Meelup Brook from the coast to where the Brook leaves the Park (Table 7).

Table 7 Meelup Regional Park – recreation

Characteristic	Walking	Picnicking
Visitor numbers	No data	
Season of use	Year round, most popular in summer	
Visitor catchment	Local	
Facilities	Walk trail	Picnic tables and barbeques at the mouths of Meelup and Dolugup brooks
Accessibility	Meelup Regional Park is immediately accessible from Meelup Beach Road and Eagle Bay Meelup Road (both sealed roads).	
Surrounding land uses	Agricultural land uses, Dunsborough town site	
Land security	The Meelup Region Park is vested in the Shire of Busselton and is managed in conjunction with the Meelup Regional Park Management Committee.	

In addition to the Meelup and Dolugup brooks, there are several depressions in Meelup Regional Park that fill with water in winter. These are referred to as Frog Ponds. These ponds are used by the GeoCatch Ribbons of Blue program (Table 8). Students take part in water sampling and revegetation activities.

Table 8 Meelup Regional Park – education

Characteristic	Education
Visitor numbers	Approximately 50 students annually
Season of use	Term three (July – September)
Visitor catchment	Local
Facilities	No facilities
Accessibility	Meelup Regional Park is immediately accessible from Meelup Beach Road and Eagle Bay Meelup Road (both sealed roads).
Surrounding land uses	Agricultural land uses, Dunsborough town site
Land security	The Meelup Region Park is vested in the Shire of Busselton and is managed in conjunction with the Meelup Regional Park Management Committee.

The Meelup Regional Park Management Committee[59] recently prepared the *Draft Meelup Regional Park Management Plan* (Meelup Regional Park Management Committee 2008). Local community volunteers play an important role in on-ground management (e.g. tree planting, vegetation pruning).

2.4.2 Management status

The *River Action Plan for the Cape Naturaliste Streams: Jingarmup Brook, Meelup Brook, Dolugup Brook, Dandatup Brook and Dugulup Brook* (White 2000) identifies key management issues for the waterways. These include:

- Weed invasion
- Removal of foreshore vegetation

[59] Committee members are appointed by the Shire of Busselton and include eight community members and two councillors.

- Erosion
- Unrestricted stock access, which is evident in the upper reaches of the Meelup Brook.
- It is important water is released from dams during periods of low flow. Dolugup Brook is the only Brook in the river action plan without a dam, because it is located entirely within the Meelup Regional Park.

The River Action Plan provides recommendations for addressing these management issues and improving the health of the waterways. GeoCatch is responsible for implementing the plan.

2.5 Dugulup, Dandatup, and Jingarmup Brooks

The Dugulup, Dandatup and Jingarmup brooks extend through Cape Naturaliste and discharge to Geographe Bay. Dungulup Brook starts near Vidler Road, west of Dunsborough. The brook flows eastward through the Dunsborough town site and discharges to Geographe Bay near the intersection of Gifford Road and Geographe Bay Road.

Dandatup Brook has three main branches that converge at Cape Naturaliste Road. The brook then flows through the Dunsborough town site and discharges into Geographe Bay at Vincent Street.

Jingarmup Brook starts along the Leeuwin-Naturaliste Ridge near Vidler Road. It flows northward passing through the Eagle Bay town site before emptying into Eagle Bay near Fern Road. The majority of the catchment has been extensively cleared for agricultural development, except for the western portion that flows through the Leeuwin-Naturaliste National Park (White 2006).

2.5.1 Management status

The *River Action Plan for the Cape Naturaliste Streams: Jingarmup Brook, Meelup Brook, Dolugup Brook, Dandatup Brook and Dugulup Brook* (White 2000) identifies key management issues for the waterways. These include:

- Weed invasion is most severe along the Dugulup and Dandatup brooks.
- Foreshore vegetation helps reduce the sediment and nutrient loads entering a waterway. The incremental clearing of foreshore vegetation is particularly a problem on the Dugulup and Dandatup brooks.
- Removal of woody debris can exacerbate erosion problems and reduces the available habitat for in-stream fauna. This has primarily occurred along the Dandatup Brook.
- Erosion is particularly apparent along the Dandatup Brook.
- Unrestricted stock access contributes to nutrient loading and erosion and is a problem in the upper reaches of the Jingarmup and Dandatup brooks.
- The release of flows from dams.
- Dugulup is the only brook with water quality monitoring data. Data identified faecal colifrom bacteria, which is attributed to the nearby septic systems (White 2000).

The River Action Plan provides recommendations for addressing these management issues and improving the health of the waterways. GeoCatch is responsible for implementing the plan.

2.6 Dunsborough Lakes

Dunsborough Lakes Estate is a residential development adjacent to the Dunsborough town site. The Estate includes an 18-hole golf course and an Enterprise Park. Several water features (e.g. the Dunsborough Lakes) were created along the northern edge of the estate during the first stage of development.

2.6.1 Education values

The Geographe Ribbons of Blue coordinator runs activities at the Dunsborough Lakes (e.g. macro-invertebrate sampling) (Table 9). The lakes are surrounded by flat, grassed areas, which are good for students to sit and/or work on.

Table 9 Dunsborough Lakes – education

Characteristic	Education
Visitor numbers	Approximately 60 students annually
Season of use	Term 2 (April – July)
Visitor catchment	Local
Facilities	No facilities
Accessibility	The Dunsborough Lakes are immediately accessible from Caves Road (a sealed road).
Surrounding land uses	Dunsborough town site
Land security	The lakes are located in a residential development.

2.7 Heritage values

2.7.1 Aboriginal heritage

There are a number of sites listed on the Register of Aboriginal Sites that are adjacent to or in the vicinity of the water features along the Geographe Bay coastline. The permanent sites are identified in Table 10 and other listed sites are displayed in Table 11.

Table 10 Permanent sites

Site name	Site ID	Site type	Additional info
Marybrook 1	23	Camp	--
Marybrook 2	24	Camp	--
Dunsborough	5511	Artefacts/scatter	--
Busselton	5613	Camp	--
DI01 – Two Trees (DI02 & DI05)*	21243	Ceremonial, mythological	Natural feature

*This is a male only site.

Table 11 Other register sites

Site name	Site ID	Status*	Site type	Additional info
Castle Bay	4558	I	Artefacts/scatter	--
Vasse Drain	5337	I	Skeletal material/burial	--
Dunsborough Cemetery Camping Grounds	20020	L	--	Camp
Turner Street Camping Ground	20021	L	--	Camp
Unnamed Creek (Dugulup Brook)	21307	I	Mythological	Natural feature, water source

Site name	Site ID	Status*	Site type	Additional info
Naturaliste Estate Isolated Finds	21308	S	Artefacts/scatter	Other: Isolated finds

2.7.2 Non-Aboriginal heritage places

Nine places with non-Aboriginal heritage values are associated with the water features along the Geographe Bay coastline (Table 12). In some cases, the water feature itself is deemed to have heritage value, while other places are located adjacent to a water feature.

The Old Vasse School is the only place listed on the WA Heritage Register. The school was opened in 1894 and is representative of the single-teacher, one-classroom schools that were established throughout WA during the late 19th and early 20th centuries. "The building itself has a pleasing simplicity and an attractive bush setting with good trees nearby" (Heritage Council of WA 1992).

Old Vasse School
Source: http://www.register.heritage.wa.gov.au/comprehensivereport.html?place_seq=418

Table 12 Non-Aboriginal heritage places

Site	Location	National Estate	Heritage Council of WA Register	Municipal inventory*	National Trust	Water dependence
Old Vasse School	21 Kaloorup Road, Vasse	✓	✓	✓	✓	Adjacent to Buayanup River
Lennox River Channel Weir	Junction of Lennox Drain and Carbunup River, Siesta Park			✓	✓	Adjacent to Carbunup River
Newton Hall (Vasse Hall)	Kaloorup Road, Vasse			✓	✓	Adjacent to Buayanup River
Meelup Brook	Meelup Road, Cape Naturaliste, Eagle Bay			✓		Site is a water feature
Meelup Reserve Precinct	Eagle Bay to Curtis Bay Meelup to Dunsborough			✓		Meelup, Dolugup and Jingarmup brooks flow through the site
Nature Reserve 28665 and Big Rock Nature Reserve	Caves Road, Dunsborough			✓		A tributary of Dugulup Brook flows through the site
Hutchings Museum, formerly Blythe's House	8 Newberry Street, Dunsborough			✓		Adjacent to Dandatup Brook

* Shire of Busselton Municipal Inventory

Leeuwin Naturaliste Profile

1 Background

The Leeuwin Naturaliste Ridge extends from Cape Naturaliste in the north to Cape Leeuwin in the south, passing through the Shires of Busselton and Augusta-Margaret River (Figures 1 and 2). The 95 km ridge varies in width between 7 km and 14 km. It is composed mostly of granite capped by limestone and sand dunes.

The Leeuwin-Naturaliste National Park extends along much of the ridge, stretching for 120 km from Bunker Bay in the north to Augusta in the south. The park covers an area of 15,600 hectares (CALM 1989). It is managed by the Department of Environment and Conservation via the *Leeuwin-Naturaliste National Park Management Plan 1989-1999*[60] (CALM 1989).

Land management, outside of the national park, is guided by the *Statement of Planning Policy No. 6.1: Leeuwin-Naturaliste Ridge Policy* (WAPC 1998). The plan was developed to address rapid growth and completing land uses within the ridge.

A number of water features are located along the Leeuwin Naturaliste Ridge. The most prominent water features are: Margaret River, Ellen Brook, Yallingup Brook, Wilyabrup Brook, Cowaramup Brook, Boodjidup Brook, Calgardup Brook, Boranup Karri Forest, Turner Brook, Gunyulgup Brook, Quinninup Brook and the Leeuwin Naturaliste Ridge cave systems. The social values attributed to each of these features are described below.

Many of the water features along the ridge are surrounded predominately by private property. This limits access and the development of social values. No social values were identified for some of the water features. This includes Wyadup Brook, Miamup Brook and Biljedup Brook.

2 Margaret River social values

"Margaret River is the most socially important river in the region.
It is a large river close to an urban centre."

The headwaters of the Margaret River are located in State forest on the Blackwood Plateau. The River flows through Shire of Augusta-Margaret for approximately 60 km before discharging into the Indian Ocean. The river receives inputs from its 470 km^2 catchment, which includes State forest, agricultural areas (e.g. dairies, vineyards and olive groves), the Margaret River town site, and lifestyle properties.

The water supply for the Margaret River Town Water Supply Scheme comes from the Water Corporation's Ten Mile Brook Dam. The scheme provides water to the town sites of Margaret River, Prevelly, Gnarabup and Cowaramup. When the reservoir does not have enough water to meet demand, water levels are augmented by a pumpback on the Margaret River.

[60] The DEC is developing an updated management plan. It has not yet been released for public comment.

Figure 1 Leeuwin-Naturaliste Ridge north of Margaret River

Figure 2 Leeuwin-Naturaliste Ridge south of Margaret River

The Margaret River Town Water Supply Scheme is protected by the *Margaret River Catchment Area (including Ten Mile Brook Catchment) Drinking Water Source Protection Plan* (DoE 2005). The plan seeks to ensure water from the catchment meets national drinking water quality standards through appropriate catchment management. This includes limiting recreational use in the catchment, to an area downstream of the dam. Exceptions include bushwalking and swimming at designated sites in the State forest.

The Margaret River Action Plan was published in 2003 (Hanran-Smith 2003). It provides an assessment of the river health and foreshore vegetation and recommendations for improving the health of the river. The Cape-to-Cape Catchment Group is responsible for implementing the recommendations.

2.1 Mouth of the Margaret River

The mouth of the Margaret River is a popular spot for canoeing (Table 1). Visitors can use their own canoe, hire a canoe or take part in a canoeing tour to paddle upstream to (approximately) Caves Road. One operator offers guided canoe tours[61] along the Margaret River[62]. The tour starts at the mouth and moves upstream about 2 km, taking in the cliffs and caves along the route. The tours incorporate educational activities (e.g. environmental and Aboriginal heritage). When the weather is warm, the tours stop during their canoeing trips to swim in the river.

Table 1 Margaret River mouth – canoeing

Characteristic	Canoeing	Tourism (canoeing)
Visitor numbers	No data	Approximately 20 people per week in winter and 60-80 people per week in summer
Season of use	Year round, most popular in summer	Year round, most popular in summer (October to April)
Visitor catchment	Local	Local, regional, State
Facilities	No facilities	No facilities
Accessibility	The site is immediately accessible from Rivermouth Road (a sealed road).	
Surrounding land uses	Margaret River town site, Prevelly town site, private property	
Land security	No data	

The mouth is a popular spot for swimming, paddleboats (Table 2) and fishing (Table 3). Typically, visitors prefer to swim in the nearby Indian Ocean; however, on windy days, when the waves are large, visitors often opt to swim in the river. Families with small children typically prefer the calm conditions of the Margaret River.

[61] http://www.bushtuckertours.com/river.html

[62] The operator is licensed by the Shire of Augusta-Margaret River to run tours from the mouth of the river.

Table 2 Margaret River mouth – swimming and paddle boats

Characteristic	Swimming	Paddle boats
Visitor numbers	No data	Approximately 5-6 people on weekends in summer
Season of use	Summer (December – April)	Year round, but most popular in summer (December – April)
Visitor catchment	Local, regional	Local
Facilities	No facilities	No facilities
Accessibility	The site is immediately accessible Rivermouth Road (a sealed road).	
Surrounding land uses	Margaret River town site, Prevelly town site, private property	
Land security	No data	

Table 3 Margaret River mouth - fishing

Characteristic	Fishing
Visitor numbers	Approximately 5-15 people on weekends year round
Season of use	Year round
Visitor catchment	Local
Facilities	No facilities
Accessibility	The site is immediately accessible Rivermouth Road (a sealed road).
Surrounding land uses	Margaret River town site, Prevelly town site, private property
Land security	No data

School groups often organise canoeing and swimming trips for students at the mouth of the Margaret River (Table 4). There are a few tour operators[63] that work with schools in organising such outings.

In 2008, students took part in the first annual Margaret River Festival. It was organised by Cape-to-Cape Catchment Group (Table 4). The festivities incorporated educational activities focused on the natural assets of the Margaret River (e.g. nature walks, canoe trips).

Table 4 Margaret River mouth - education

Characteristic	Education (canoeing)	Education (festival)
Visitor numbers	Approximately 300 students annually	Approximately 150 students at the event
Season of use	Year round	March
Visitor catchment	Local, Regional	Local
Facilities	No facilities	No facilities
Accessibility	The site is immediately accessible Rivermouth Road (a sealed road).	

[63] For example: http://www.outdoordiscoveries.com.au/canoe.html

Characteristic	Education (canoeing)	Education (festival)
Surrounding land uses	Margaret River town site, Prevelly town site, private property	
Land security	No data	

2. 2 Margaret River town site

2.2.1 Wilmot Farm Weir and Margaret River Town Weir

Wilmot Farm Weir is located on the western edge of the Margaret River town site. The Margaret River Town Weir is located on the eastern side of the town site. The weirs are popular swimming spots (Table 5) and provide river crossing points for walkers and cyclists using the various trails that extend along the Margaret River (Section 2.2.2 and 2.2.3).

The Riverview Tourist and Caravan Park is located at the eastern edge of the Margaret River town site near the Margaret River Town Weir. The Park hires canoes for use between the Margaret River Town Weir and the Willmot's Farm Weir (Table 5).

Table 5 Wilmot Farm Weir and Margaret River Town Weir – swimming and canoeing

Characteristic	Swimming	Canoeing
Visitor numbers	Approximately 10-40 people on weekends December to April	No data
Season of use	December to April	December to April
Visitor catchment	Local	Local, tourists
Facilities	No facilities	No facilities
Accessibility	The river stretch is immediately accessible from Carters Road (a sealed road) and Barrett Street (a sealed Road)	
Surrounding land uses	Margaret River town site	
Land security	The site is located within the Bramley National Park.	

2.2.2 Rotary Park

Rotary Park is located on Bussell Highway, at the northern edge of the Margaret River town site. The Park is a memorial to pioneers of the timber industry. This is evident in the timber industry memorabilia on display in the Park.

Rotary Park is a convenient stopping point for tourists entering and leaving Margaret River. It has a number of facilities, including: picnic tables, barbeques, playground equipment, and toilets (Table 6).

The Park is the starting point for three walk trails. The River Walk is a 2 km circuit along the river. The Karri Walk is a 1.5 km walk through bushland. The Bridge Walk is a 3 km trail that passes by the 'old town swimming hole', which was used by early settlers.

The Park has a small bridge that crosses over the Margaret River. The bridge takes visitors from Rotary Park to the Old Settlement Historical Museum. Privately owned, the Museum is a monument to the Group Settlement farms, which used to exist in the area. Visitors are able to walk through a historic village of farm buildings and farm machinery.

Table 6 Rotary Park - picnicking

Characteristic	Picnicking	Walking
Visitor numbers	Approximately 15-20 people daily on sunny days in January/December	Approximately 15 people daily. The number of walkers can increase to 40 people daily in summer
Season of use	Year round. Most popular on sunny days in January and December.	Year round, but is most popular in summer.
Visitor catchment	Local, regional	
Facilities	Picnic table, barbeque, toilets	
Accessibility	The site is immediately accessible from Bussell Highway (a sealed road).	
Surrounding land uses	Old Settlement Historical Museum, State forest, Margaret River town site, National Park	
Land security	The site is located in the Bramley National Park.	

Marroning is a popular activity from Rotary Park upstream to the Ten Mile Brook Dam (Table 7). Along the Margaret River, marroning is limited to snaring.

Table 7 Rotary Park - marroning

Characteristic	Marroning
Visitor numbers	No data
Season of use	January/February
Visitor catchment	Local
Facilities	No facilities
Accessibility	The river is immediately accessible from the River Walk Trail, Ten Mile Brook Dam Cycle/Walk Trail and the Margaret River Town Weir.
Surrounding land uses	Old Settlement Historical Museum, State forest, Margaret River town site, National Park
Land security	The site is located in the Bramley National Park.

2.2.3 Ten Mile Brook Dam

The Ten Mile Brook Dam Cycle/Walk Trail extends from Rotary Park to the 10 Mike Brook Dam Picnic site (Table 8). The trail, 15 km round trip, runs parallel to the Margaret River. As the name implies it is a dual use path (i.e. cycle and walk). A short portion of the trail is bitumized; the bitumized stretch is also referred to as the River Walk trail (Section 2.2.2).

The Ten Mile Brook Dam Cycle/Walk Trail is a good spot for birding (Birds Australia WA 2005d). Visitors can see a variety of bush birds while walking (e.g. Western Rosella, Red-capped Parrots).

From the 10 Mike Brook Dam Picnic site there is a short trail, 1.2 km loop, which leads up to the Ten Mile Brook Dam. This provides visitors with an opportunity to view the dam.

Table 8 Ten Mile Brook Dam – walking and picnicking

Characteristic	Walking	Picnicking
Visitor numbers	Approximately 10-15 people daily.	No data
Season of use	Year round, but most popular in summer	
Visitor catchment	Local	Local
Facilities	Walk trail, picnic tables, barbeque, toilets	
Accessibility	The site is immediately accessible from Neilson Road (an unsealed road).	
Surrounding land uses	Residential developments, Margaret River town site, State forest	
Land security	The site is located in the Bramley National Park.	

Marroning used to be a popular activity but is no longer allowed east of the Ten Mile Brook Dam. There are two species of marron found in WA. Smooth marron (*Cherax cainii*) are found in most rivers and dams in the South West. Hairy marron are found almost exclusively in the upper reaches of the Margaret River. The smooth marron appear to out-compete the hairy marron. The DoF is undertaking work to assist the recovery of hairy marron in the Margaret River.

2.2.4 Darch Brook

Darch Brook runs parallel to Darch Road, discharging to the Margaret River just east of the Margaret River town site. There is an informal walk trail that extends along the Brook. It is popular with local residents (Table 9). Additional residential developments (e.g. Rapids Landing) are currently being established along the Brook, which may increase the future use of the trail.

Darch Brook is located within walking distance of the Margaret River High School (Table 9). The Cape-to-Cape Ribbons of Blue program organises activities at the brook for students from the high school (e.g. revegetation and water quality sampling).

Table 9 Darch Brook – walking and education

Characteristic	Walking	Education
Visitor numbers	Approximately 10 people daily	Approximately 20 students weekly during Term 2
Season of use	Year round	Term 2 (April – July)
Visitor catchment	Local	Local
Facilities	No facilities	No facilities
Accessibility	The site is immediately accessible from Darch Road (an unsealed road).	
Surrounding land uses	Residential developments, Margaret River town site	
Land security	The river runs through residential developments.	

2.2.5 Kevill Road waterfall

The Kevill Road waterfalls are popular with local residents during summer (Table 10). The waterfalls provide a picturesque background for picnicking and a spot to cool off when the weather is warm. The waterfalls are not well known, so it is a place where residents can escape the influx of tourists in summer.

Table 10 Kevill Road waterfall - picnicking

Characteristic	Picnicking
Visitor numbers	At capacity (i.e. 10 people) on weekends in summer (December – January)
Season of use	Year round, but most popular on weekends during December and January.
Visitor catchment	Local
Facilities	No facilities
Accessibility	The site is immediately accessible from Kevill Road (a sealed road).
Surrounding land uses	The site is located adjacent to the Waterfall Cottages.
Land security	The site located adjacent to the Waterfall Cottages.

2.2.6 Yalgardup Brook

Yalgardup Brook, a tributary to the Margaret River, is located on the western edge of the Margaret River town site. It discharges to the Margaret River west of the Kevill Waterfalls.

The Cape-to-Cape Ribbons of Blue program has been active along the Yalgardup Brook (Table 11). Activities include revegetation and macro-invertebrate and water quality monitoring.

Table 11 Yalgardup Brook - education

Characteristic	Education
Visitor numbers	Approximately 30 students annually
Season of use	Term 2 (April to July)
Visitor catchment	Local
Facilities	No facilities
Accessibility	The site is immediately accessible Kevill Road.
Surrounding land uses	Margaret River town site
Land security	No data

2.3 Canebreak Pool

Canebreak Pool is located in the upper reaches of the Margaret River catchment within the Rapids Conservation Park. The conservation park is managed by the DEC.

Canebreak Pool is a popular location for camping, picnicking, swimming and canoeing (Table 12). The surrounding conservation park offers opportunities for bushwalking and mountain biking.

Table 12 Canebreak Pool – recreation activities

Characteristic	Recreation
Visitor numbers	Approximately 13,500 visits annually. This equates to approximately 30 – 40 people daily during summer.
Season of use	Year round, most popular in summer and public holidays

Characteristic	Recreation
Visitor catchment	Local, regional
Facilities	Picnic tables, barbeques, camp site, toilets, walk trails, cycle trails
Accessibility	The site is immediately accessible from Cane Break Road.
Surrounding land uses	Rapids Conservation Park, State forest
Land security	The site is located within the Rapids Conservation Park, which is managed by the DEC.

2.4 Heritage Values

2.4.1 Aboriginal heritage values

There are a number of registered Aboriginal sites adjacent to or in the vicinity of the Margaret River. The sites listed as permanent are in identified in Table 13 and all other listed sites are identified in Table 14.

Table 13 Sites listed as permanent on the Register

Site name	Site ID	Site type	Additional info
Margaret River	4495	Mythological	Waugal
Cliffs at Wallcliffe	5848	Mythological, artefacts/scatter	Rockshelter

Table 14 Other registered sites

Site name	Site ID	Status	Site type	Additional info
Margaret River	5849	I	Skeletal material/burial, artefacts/scatter	--
Margaret River Damsite 1	4522	S	Artefacts/scatter	--
Margaret River Damsite 2	4523	S	Artefacts/scatter	--
Wcm/01 – Red Gum Tree	21037	S	--	Plant resource, natural feature, medicinal purposes
Walcliffe House	21899	L	Skeletal material/burial	Camp
Burnswide Road Artefact Scatter #1	22115	L	Artefacts/scatter	--

The entire Margaret River is listed as a permanent site (ID 4495) on the WA Register of Aboriginal Sites. The river was created by Wooditch, a medicine man who could transform things by using his magic wand. Wooditch fell in love with Milyan; however, Ngungaroot, her father, would not allow the two to marry. One day Wooditch and Milyan ran off together, Ngungaroot followed them. Wooditch created the Margaret River in order to separate himself and Milyan from Ngungaroot. The river flowed with such force that Ngungaroot could not cross it, thus keeping Wooditch and Milyan safe from Ngungaroot. Eventually, Ngungaroot accepted the love between Wooditch and Milyan (Goode and Irvine 2006).

2.4.2 Non-Aboriginal heritage values

There are two locations with non-Aboriginal heritage values adjacent to the Margaret River. These are identified in Table 15.

3 Ellen Brook social values

The Ellen Brook extends for 40 km between Bussell Highway and the Indian Ocean, discharging to the ocean between the town sites of Gracetown and Gnarabup. Much of the 29 km^2 is dominated by agricultural land uses and a growing number of residential developments. A small portion of the brook flows through the Leeuwin Naturaliste National Park.

3.1 Meekadarribee Falls

The Meekadarribee Falls are located in the Leeuwin-Naturaliste National Park adjacent to the Ellen Brook. A short, 2 km, walk trail connects the Ellensbrook Homestead to the Meekadarribee Falls. The falls are a popular attraction within the national park.

3.2 Rare species

The area around the Ellensbrook Homestead and the Meekadarribee falls is home to the *Austroassiminea letha*, a rare semi-aquatic snail[64]. It is found only in the Cape-to-Cape Region and no where else in the world (McKinney 2005a).

3.3 Management status

The Ellen Brook Action Plan (McKinney 2005a) helps guide management of the system. It provides an assessment of the foreshore vegetation and recommendations for improving the health of the brook. The Cape-to-Cape Catchment Group and GeoCatch are responsible for implementing the plan.

3.4 Heritage Values

3.4.1 Aboriginal heritage values

There are a number of registered Aboriginal sites adjacent to or in the vicinity of Ellen Brook (Table 16).

Table 16 Register sites

Site name	Site ID	Status	Site type	Additional info
Gnoocardup	5178	S	Artefacts/scatter	--
Ellenbrook Complex	5283	P	Mythological, artefacts/scatter, midden/scatter	Archaeological deposit
Ellen Brook	5476	P	Artefacts/scatter	--
Ellen Brook	5850	P	Artefacts/scatter	Camp
Ellen Brook	5852	I	Artefacts/scatter	--

[64] It lives in densely vegetated, limestone (calcium carbonate) rich water seeps in the Cape to Cape region.

Table 15 Non-Aboriginal heritage sites

Site	Location	National Estate	Heritage Council of WA Register	Municipal inventory[1]	National Trust	Water dependence
Ellenbrook Farmhouse, Dam & Waterfall	Off Ellen Brook Road, Margaret River	✓		✓	✓	Located adjacent to Ellen Brook
Caves House	Yallingup Beach Road, Yallingup	✓		✓	✓	Located adjacent to Yallingup Brook.
Kate-Steam Locomotive	Rotary Park, Bussell Highway, Margaret River			✓	✓	Located adjacent to the Margaret River
Burnside	Burnside Road, Margaret River			✓		Located adjacent to the Margaret River

[1]Shire of Augusta-Margaret River Municipal Inventory

3.5.2 Non-Aboriginal heritage values

There is one location with non-Aboriginal heritage value adjacent to the Ellen Brook – the Ellenbrook Farmhouse, Dam & Waterfall (Tables 15 and 17). The farmhouse is referred to as the Ellenbrook Homestead by the National Trust.

The Ellensbrook Homestead is located in the Leeuwin Naturaliste National Park adjacent to Ellen Brook. The homestead was built in 1857 by pioneer settlers Alfred and Ellen Bussell and maintained by the Bussell family for more than 100 years. Today, the homestead is important due to its association with the pioneering development of dairy, sheep and cattle farming industries in the Augusta-Margaret River area.

The property is owned and operated by the National Trust[65]. Visitors are welcome to tour the homestead on weekends, public holidays or by prior appointment.

There is a grassy clearing adjacent to the homestead. The clearing is a good spot for birding (Birds Australia WA 2005d). Visitors can see a variety of bush birds while walking (e.g. Elegant Parrot, Grey Butcherbird).

Table 17 Ellensbrook Homestead – heritage/tourism

Characteristic	Heritage/Tourism
Visitor numbers	About 900 – 1,000 visitors annually
Season of use	Year round
Visitor catchment	Local, regional
Facilities	Ellensbrook Homestead is operated by the National Trust. Toilet block, picnic tables and function area are managed by the DEC.
Accessibility	The site is immediately accessible from Ellen Brook Road.
Surrounding land uses	Leeuwin-Naturaliste National Park, Meekadarribee Falls
Land security	The site is owned by the National Trust. It is located in the Leeuwin-Naturaliste National Park.

4 Yallingup Brook social values

Yallingup Brook starts in the Leeuwin-Naturaliste National Park near Caves Road. It flows for 5.5 km westward, discharging into the Indian Ocean at the town site of Yallingup. It is wholly contained within the Shire of Busselton.

The upper portion of Yallingup Brook is seasonal. The lower portion is perennial, with a permanent freshwater seep from the limestone formations within the Leeuwin Naturaliste Ridge (Taylor and Tinley 1999).

[65] The homestead was donated to the National Trust in 1979. Major restoration works have been undertaken by the National Trust.

4.1 Social values

Ghost Trail links the Yallingup town site to the Caves House Hotel. It runs adjacent to the Yallingup Brook and at one point passes over the brook via a bridge. It is a popular walk trail, in fact "... it is likely to be one of the most visited paths in the Shire of Busselton" (Taylor and Tinley 1999).

A second trail connects Caves House Hotel complex with the Leeuwin Naturaliste National Park. This trail crosses the Yallingup Brook east of the Ghost Trail.

The Geographe Ribbons of Blue program has, in the past, organised revegetation outings for students along Yallingup Brook. This work has complemented the revegetation efforts made by the Yallingup LCDC.

Table 18 Yallingup Brook – walk trails and education

Characteristic	Walking	Education
Visitor numbers	No data	Approximately 25 students annually
Season of use	Year round	July to September
Visitor catchment	Local, regional	Local
Facilities	Walk trail	No facilities
Accessibility	The site is immediately accessible from Yallingup Beach Road (a sealed road).	
Surrounding land uses	Yallingup town site, Caves House Hotel, Ngilgi Cave, private property	
Land security	The site is located within the Leeuwin Naturaliste National Park.	

4.2 Management status

The Yallingup Brook Action Plan (Taylor and Tinley 1999) helps guide management of the system. It provides an assessment of the foreshore vegetation and recommendations for improving the health of the brook. The Cape to Cape Catchment Group and Yallingup LCDC are responsible for implementing the plan.

4.3 Heritage Values

4.3.1 Aboriginal heritage values

There is one registered Aboriginal site adjacent to or in the vicinity of the Yallingup Brook (Table 19).

Table 19 Register sites

Site name	Site ID	Status	Site type	Additional info
Yallingup Brook	18498	L	Mythological	Plant resource, natural feature, water source, Dreaming legend featured in the Ngilgi

4.3.2 Non-Aboriginal heritage values

There is one location with non-Aboriginal heritage value adjacent to the Yallingup Brook (Table 15). Caves House Group is a collection of building. It includes: two timber-framed main buildings constructed in 1912 in the Federation Filigree and Federation Bungalow styles; a hotel built in 1938-39 in the Inter-War Old English style; and several supporting function buildings.

The group of buildings was developed and owned by the Government of Western Australia from 1902 to 1968 to provide accommodation for visitors to the Yallingup Cave (now known as Ngilgi Cave - Section 12.2). Development of the place as a resort is one of the earliest example's of the State's ownership and development of a tourist destination.

The hotel was originally built in 1905; it burnt down in 1935 and was rebuilt in 1938. Seashells Hospitality Group bought and restored it and continues to operate the facility as a hotel today.

5 Wilyabrup Brook social values

The Wilyabrup Brook is 20 km in length. It flows through the Shires of Busselton and Augusta-Margaret River covering a total catchment of 89 km^2. The main branch of the Wilyabrup Brook starts east of the Cowaramup town site. The north branch and main branch meet east of Caves Road and then flow westward discharging to the Indian Ocean.

Like many waterways along the Leeuwin-Naturaliste Ridge, the Wilyabrup Brook has been extensively modified. For example, there are approximately 100 dams along the Brook, which alter the quantity and timing of flows and act as a barrier to fish movements (Jury 2006).

Much of the brook flows through agricultural land uses (84% of the catchment), including viticulture, olive groves, grazing and pasture, and dairies. The dominance of private property limits the social values along the brook.

5.1 Pioneer Park

The Wilyabrup Brook flows past Pioneer Park, which is located within the Cowaramup town site (Table 20). The Park is a popular spot among locals for picnicking and socializing. The venue is used for a number of events throughout the year (e.g. the Vintage Stomp, Sunday Sundowners in January/February).

Table 20 Wilyabrup Brook – gathering/events

Characteristic	Gathering/Events
Visitor numbers	No data
Season of use	Year round, most popular December – April
Visitor catchment	Local
Facilities	Picnic tables, barbeques, toilets
Accessibility	The site is immediately accessible from Bussell Highway (a sealed road).
Surrounding land uses	Cowaramup town site
Land security	The site is a reserve managed by the Shire of Augusta-Margaret River.

5.3 Aboriginal heritage values

There is one registered Aboriginal site adjacent to or in the vicinity of the Wilyabrup Brook (Table 20).

Table 20 Register sites

Site name	Site ID	Status	Site type	Additional info
Willyabrup Brook	5659	P	Artefact/scatter	--

5.4 Management states

The Wilyabrup Brook Action Plan (Jury 2006) helps guide management of the system. It provides an assessment of the foreshore vegetation and recommendations for improving the health of the brook. The Cape-to-Cape Catchment Group are responsible for implementing the plan.

6 Cowaramup Brook social values

The Cowaramup Brook starts south of the Cowaramup town site and flows westward. It passes through a variety of land uses including agriculture (e.g. dairies and vineyards), lifestyle blocks, residential development, and the Leeuwin Naturaliste National Park. The brook discharges to the Indian Ocean at Cowaramup Bay, just north of Gracetown.

The dominance of private property limits the social values along the brook. There are a few exceptions; for example the river mouth.

6.1 River mouth

The mouth of the Cowaramup Brook and adjacent Cowaramup Bay is a popular recreation spot, particularly for the nearby Gracetown residents (e.g. swimming, fishing, camping, surfing) (Table 21). The area is surrounded by a reserve managed by the Shire of Augusta-Margaret River. In summer, illegal camping regularly[66] occurs at the reserve.

A walk trail extends from the reserve directly upstream a short distance. The walk trails runs parallel to the Cowaramup Brook. It is a good spot for birding, enabling visitors to see a variety of birds (e.g. Brush Bronsewing, Red-tailed Black-Cockatoo) (Birds Australia WA 2005d).

Table 21 Cowaramup Brook mouth - recreation

Characteristic	Recreation
Visitor numbers	No data
Season of use	Year round, most popular December – February
Visitor catchment	Local
Facilities	No facilities

[66] 1-2 camp sites exist most summer days.

Characteristic	Recreation
Accessibility	The site is immediately accessible from Cowaramup Bay Road (a sealed road).
Surrounding land uses	Reserve, Gracetown town site, Leeuwin-Naturaliste National Park
Land security	The reserve is managed by the Shire of Augusta-Margaret River.

6.2 Education values

The Cape-to-Cape Ribbons of Blue program annually organises activities for students along the Cowaramup Brook (e.g. macro-invertebrate sampling) (Table 21). The activities typically take place during term two (April to July), when the upper and lower reaches dry out. This means that sampling occurs at pools along the middle reaches of the brook.

Table 21 Cowaramup Brook

Characteristic	Education
Visitor numbers	Approximately 30 students annually
Season of use	Term 2 (April – July)
Visitor catchment	Local
Facilities	No facilities
Accessibility	No data
Surrounding land uses	Agricultural land uses
Land security	Private property

6.3 Unique characteristics

There are several informal walk trails along the Cowaramup Brook. The trails allow residents to view the rare flora and fauna found along the foreshore of the brook (e.g. orchids and ring tailed possums).

6.4 Aboriginal heritage values

There are two registered Aboriginal sites adjacent to or in the vicinity of the Cowaramup Brook (Table 22).

Table 22 Register sites

Site name	Site ID	Status	Site type	Additional info
Gracetown, Cowaramup	5846	I	Skeletal material/burial	Spirit place
Cowaramup Brook	15820	S	Artefacts/scatter	Archaeological deposit

6.5 Management states

The Cape-to-Cape Catchment Group is developing a river action plan for the Cowaramup Brook. This will help guide management of the system. It will provide an assessment of the foreshore vegetation and recommendations for improving the health of the brook.

7 Boodjidup Brook social values

The Boodjidup Brook is located south of the Margaret River. It flows predominately through private property (e.g. vineyards, wineries), except for a short stretch that passes through the Leeuwin-Naturaliste Park. The brook discharges to the Indian Ocean at Boodjidup Beach. The entire catchment is contained in the Shire of Augusta-Margaret River.

The dominance of private property limits the social values along the brook. A number of the private properties are wineries (e.g. Leeuwin Estate), which utilise the aesthetic values of the brook (e.g. restaurants that over look the brook).

One access point exists at the Cape-to-Cape Walk Trail. A bridge has been constructed not far from the river mouth to enable walkers to pass over the brook.

7.1 Aboriginal heritage values

There are two registered Aboriginal sites adjacent to or in the vicinity of the Boodjidup Brook (Table 23).

Table 23 Register sites

Site name	Site ID	Status	Site type	Additional info
Witchcliffe Rockshelter	635	P	Artefacts/scatter	Camp
Rose Brook Road (Margaret River Lore Ground)	4494	S	Ceremonial	Meeting place, camp, battleground

7.2 Management states

The Cape-to-Cape Catchment Group is developing a river action plan for the Boodjidup Brook. This plan will help guide management of the system. It will provide an assessment of the foreshore vegetation and recommendations for improving the health of the brook.

8 Calgardup Brook social values

Calgardup Brook starts near Sebbes Road and flows northward to Caves Road. From here it flows westward, passing through a small portion of the Leeuwin-Naturaliste Ridge before discharging to the Indian Ocean near Redgate Beach. Redgate Beach is a popular recreation site for swimming and surfing and is used by locals and tourists.

The Cape-to-Cape Walk Trail passes over Calgardup Brook near Isaacs Rock. There are toilet facilities near this crossing.

8.1 Aboriginal heritage values

There are two registered Aboriginal sites adjacent to or in the vicinity of the Calgardup Brook (Table 24).

Table 24 Register sites

Site name	Site ID	Status	Site type	Additional info
Mouth of Calgardup Brook	5792	P	Artefacts/scatter	--
Ruddock's Cave	5793	I	Artefacts/scatter	Camp

9 Boranup Karri Forest social values

The Boranup Karri Forest is located north west of the Karridale town site in the Leeuwin-Naturaliste National Park. The forest provides a contrast to the surrounding coastline, with its tall karri trees[67], some reaching 60 metres or higher, dominating the hilly slopes and valleys of the area. The Boranup Forest exists within a potentially groundwater dependent area (DoW 2006).

9.1 Social values

The Boranup Forest has facilities for walking, picnicking and camping. The only formal walk trail is the Cape to Cape Walk Trail, which extends through the northern portion of the forest (Section 11).

Picnic facilities can be found at the Boranup Lookout and the Boranup Forest Camping Area. The Boranup Lookout provides picnickers views of the forested area and Indian Ocean (i.e. Hamelin Bay) (Table 25). The Boranup Forest Camping Area, as the name implies, provides camping facilities for visitors. Fees apply for using the facilities and are collected by DEC rangers.

The Boranup Forest is a popular location for birding (Birds Australia WA 2005d). Visitors can see a variety of bush birds (e.g. Purple-crowned Lorikeet, Splendid Fairy-wren).

Table 25 Boranup Forest – picnicking and camping

Characteristic	Picnicking	Camping
Visitor numbers	Approximately 35,000 visits* annually	
Season of use	Year round	Year round
Visitor catchment	Local, regional	Local, regional
Facilities	Picnic tables, barbeques, toilets	Picnic tables, barbeques, toilets, camp sites
Accessibility	The site is immediately accessible from Boranup Drive (an unsealed road).	
Surrounding land uses	Leeuwin-Naturaliste National Park	
Land security	The site is part of the Leeuwin-Naturaliste National Park.	

* Visitor data provided by the DEC is provided by the number of visits not the number of visitors.

The Boranup Karri Forest is referred to locally as the 'Kodak corner', because of its picturesque views. Materials used to market the Margaret River area often include photos of the forest.

[67] The current forest is about 100 years old. The karri trees have regenerated following logging in the area in the late nineteenth century.

9.2 Management status

The Boranup Forest is managed by the DEC. Management is guided by the *Leeuwin-Naturaliste National Park Management Plan 1989-1999* (CALM 1989). The management plan is currently being updated.

9.3 Unique characteristic

The Boranup Karri Forest is the furthest west that karri trees grow. The forest is isolated from the main belt of karri trees, located 100 km east. In the Boranup Forest, the karri trees grow in limestone-based soils, whereas elsewhere in the South West karri trees grow in deep red clay loam.

10 Turner Brook

The Turner Brook starts near Bussell Highway south of Karridale town site. The brook flows southward passing through the Stockdill Road Nature Reserve and the Leeuwin-Naturaliste National Park before discharging to the Indian Ocean at Deepdene.

The Cape-to-Cape Walk Trail passes over the Turner Brook within the Leeuwin-Naturaliste National Park.

10.1 Aboriginal heritage values

There are two registered Aboriginal sites adjacent to or in the vicinity of the Turner Brook (Table 26).

Table 26 Register sites

Site name	Site ID	Status	Site type	Additional info
Deepdene Cliffs	5794	P	Artefacts/scatter	Rockshelter
Turner Brook	5795	I	Artefacts/scatter	--

11 Gunyulgup Brook social values

The Gunyulgup Brook is located south of Yallingup Brook. It starts near Abbeys Farm Road and flows northward discharging to the Indian Ocean at Smiths Beach. In total, the catchment covers 47 km^2.

Like many waterways along the Leeuwin-Naturaliste Ridge, the Gunyulgup Brook has been extensively modified by development. For example, large areas of foreshore have been cleared and approximately 110 dams have been built that impede the brook's flow (McKinney 2005b).

The catchment is dominated by private property, which limits access to the brook and the development of social values. One access point exists at the Cape-to-Cape Walk Trail.

11.1 Management states

The Gunyulgup Brook Action Plan (McKinney 2005b) helps guide management of the system. It provides an assessment of the foreshore vegetation and recommendations for improving the health of the brook. The Cape-to-Cape Catchment Group is responsible for implementing the plan.

11.2 Aboriginal heritage values

There is one registered Aboriginal site adjacent to or in the vicinity of the Gunyulgup Brook (Table 27).

Table 27 Register sites

Site name	Site ID	Status	Site type	Additional info
Moses Cave	5851	I	Skeletal material/burial	--

12 Quininup Brook social values

The Quininup Brook stars at Quininup Road and flows southward discharging to the Indian Ocean at Quininup Beach. The catchment is dominated by private property, which limits access to the brook and the development of social values. One access point exists at the Cape to Cape Walk Trail.

12.1 Aboriginal heritage values

There are five registered Aboriginal sites adjacent to or in the vicinity of the Quininup Brook (Table 28).

Table 28 Register sites

Site name	Site ID	Status	Site type	Additional info
Quininup Brook 1	5513	P	Artefacts/scatter	--
Quininup Brook 2	5514	P	Artefacts/scatter	Water source, blowout
Quininup Brook 3	5515	P	Man-made structure, artefacts/scatter	Camp, water source, blowout
Moses Rocks	5516	P	Artefacts/scatter	Camp

12.2 Management states

When funding becomes available, the Cape-to-Cape Catchment Group would like to develop a river action plan for the Quininup Brook to help guide management of the system.

13 Cape to Cape Walk Trail social values

The Cape to Cape Walk Trail extends from the lighthouse at Cape Naturaliste in the north to the lighthouse at Cape Leeuwin in the south. The 135 km trail hugs the coastline and is almost wholly within the Leeuwin-Naturaliste National Park.

The trail varies from old 4WD tracks and constructed pathway, to rough stony paths and sandy beaches. The path is demarcated by pine posts with metal markers showing the track logo. It passes over a number of water features as it extends through the Leeuwin-Naturaliste Ridge.

13.1 Recreation values

The Cape to Cape Walk Trail has numerous access points. This means that walkers can take a one to two hour stroll or spend several days hiking. Walkers choosing a multi-day trek can stay at one of the seven campsites near the track or take advantage of the accommodation offered at the various town sites (e.g. Margaret River) along the way.

There are four wild campsites located along the trail – Mt Duckworth, Moses Rock, Ellensbrook and Deepdene. Each of the sites has a rainwater tank, toilets and picnic tables. There is no charge for using these facilities. They are 'walk in' only, meaning that there is no vehicular access.

There are three formal campsites located close to the trail – Conto Field Camp Area, Point Road Camping Area (Table 29) and Boranup Forest Camping Area (Section 9.1). Conto Field Camping Area is located just off Conto Road, not far from the Caveworks Visitor Centre. Point Road Camping Area is located along Point Road and is only accessible via 4WD. The Boranup Forest Camping Area is located along Boranup Drive, not far from the Boranup Lookout and Picnic Site. Each of the campsites is located in the Leeuwin-Naturaliste National Park and managed by the DEC. A small fee applies for using these sites.

Table 29 Cape to Cape Walk Trail - camping

Characteristic	Conto Field Camping Area	Point Road Camping Area
Visitor numbers	Approximately 4,500 visits* annually	Approximately 3,500 visits* annually The site can accommodate up to 40 people.
Season of use	Year round, but most popular November to April	Year round
Visitor catchment	Local, regional	Local, regional
Facilities	Barbeques, toilets, picnic tables	Barbeques, bush toilets, fire ring, picnic tables
Accessibility	The site is immediately accessible from Conto Road (an unsealed road).	The site is immediately accessible from Point Road (an unsealed road). A 4WD is recommended.
Surrounding land uses	Leeuwin-Naturaliste National Park, Caveworks Visitor Centre	Leeuwin-Naturaliste National Park
Land security	The site is located in the Leeuwin-Naturaliste National Park and managed by the DEC.	

* Visitor data provided by the DEC is provided by the number of visits not the number of visitors.

13.2 Management status

The walk trail is managed by the DEC with support from the Friends of the Cape to Cape Track. Management, in part, is guided by the *Leeuwin-Naturaliste National Park Management Plan 1989-1999* (CALM 1989). The plan is currently being updated.

Formed in 1998, the Friends of the Cape to Cape Track is a not-for-profit community-based organisation. The group's objectives are: to support the DEC in developing and maintaining the trail and to encourage community appreciation of the track.

14 Social values of the cave systems

The young Tamala Limestone present along the Leeuwin Naturaliste Ridge is ideal for the formation of caves because it is softer than the more commonly found crystalline limestone. Caves are formed when water seeps or flows through the limestone. The calcium carbonate that is dissolved by the water is redeposited to form an array of stalactites, shawls, flowstones and other decorations (DEC n.d. b).

The majority of caves along the Leeuwin Naturaliste Ridge are located in one of five areas - Augusta, Witchcliffe, Margaret River, Cowaramup and Yallingup. The caves open to visitors are described below. Appendix E provides a list and brief description of other caves found along the Leeuwin-Naturaliste Ridge.

14.1 Giants and Calgardup Caves

The Giants and Calgardup Caves are located on Caves Road south of the Margaret River town site. Giants Cave is one of the largest and deepest caves on the Leeuwin-Naturaliste Ridge. It has a surveyed length of 575 metres and extends approximately 86 metres underground. Calgardup Cave goes to a depth of 27 metres.

Visitors are equipped with helmets, lamps and information brochures to undertake self-guided tours of these caves. Giants Cave is a 'through fare' style cave, meaning it has a separate entrance and exit points some distance apart. Calgardup Cave has steps and boardwalks to prevent degradation.

Water covers the floor of two caverns in the Calgardup Cave. The reflections created by the 'lakes' are a popular tourist attraction. A stream system trickles through the cave year round, feeding the 'lakes' and carrying nutrients to the small creatures that inhabit the 'lakes'.

The DEC manages the caves, with support from the Leeuwin-Naturaliste National Park Cave Management Advisory Committee. The DEC charge visitors a small fee. The caves are opened daily.

14.1.1 Aboriginal heritage values

There are two registered Aboriginal sites adjacent to or in the vicinity of Giants Cave and Calgardup Cave (Table 30).

Table 30 Register sites

Site name	Site ID	Status	Site type	Additional info
Calgardup Cave	19268	L	Historical	Natural feature
Giants Cave	19269	L	Historical	Natural feature

14.1.2 Unique characteristics

Moonmilk, a special feature of some caves, can be seen on the walls and ceilings in several places of Giants Cave. Moonmilk is a living culture that resembles ricotta cheese. It absorbs nutrients from the decay of organic matter and chews up limestone until it becomes crumbly.

14.1.3 Rare species

The root mat, produced by marri trees (*Corymbia*), in Calgardup Cave is home to aquatic communities. These communities have been assessed by the WA Threatened Ecological Communities Advisory Committee as being critically endangered[68].

Root mat communities exist in three other caves on the Leeuwin-Naturaliste Ridge – Easter Cave, Strongs Cave, and Kudjal Yolgah Cave. Each of the communities has been assessed as being critically endangered.

Streams run through each of the caves, feeding the root mat. The streams form part of a westward flowing drainage system. They are either from groundwater or are a continuation of surface creaks that flow into the karst topography of the Leeuwin-Naturaliste Ridge (CALM 2000).

Work has been undertaken by the DEC to protect the root mat communities. These efforts are guided by *Aquatic root mat communities numbers 1-4 of caves of the Leeuwin-Naturaliste Ridge: Interim Recovery Plan 2000-2003* (CALM 2000).

14.2 Ngilgi Cave

Ngilgi Cave (formerly known as Yallingup Cave) is located a short distance north of Yallingup town site. The name is derived from the cave's association with an Aboriginal legend of the battle between a good spirit (Ngilgi) and an evil spirit (Wolgine).

The cave is managed by the Cape Naturaliste Tourism Association. The association charges visitors an entry fee. The cave is open daily and tours operate every half hour. Some visitors take advantage of the adventure tours which involve two and a half hours of crawling and rock climbing.

There are a number of on-site facilities. These include: an interpretive area, which details the cave's history, a café, playground and barbeques.

14.2.1 Aboriginal heritage values

There is one registered Aboriginal site adjacent to or in the vicinity of Ngilgi Cave (Table 31).

Table 31 Register sites

Site name	Site ID	Status	Site type	Additional info
Yallingup Cave	17071	S	Mythological	--

[68] An ecological community is listed as 'critically endangered' when it has been surveyed and is found to be facing an extremely high risk of total destruction in the immediate future.

14.3 Mammoth, Lake, Moondyne and Jewel Caves

Mammoth Cave is located south of Calgardup Cave along Caves Road. The cave is open daily to visitors. Tours through Mammoth Cave are self-guided.

Lake Cave is located just off Caves Road, adjacent to the Caveworks Eco Interpretive Centre. The cave is open daily. Guided tours are offered once every hour.

Jewel Cave is located 12 km north of the Augusta town site. The cave is open daily. Guided tours are offered once every hour.

Stairs and walkways have been established in each of the caves to support visitors and to prevent degradation to the caves. The caves are managed by the Augusta-Margaret River Tourist Association from the Caveworks Eco Interpretive Centre. The centre has displays and relevant learning materials for visitors. Entry is free when visitors purchase a ticket to tour Mammoth, Lake or Jewel cave.

The Caveworks Centre is often utilised by researchers when work is being undertaken at the nearby cave systems.

Moondyne is an adventure cave, but has been closed by the Augusta-Margaret River Tourist Association because it was not financially viable.

14.3.1 Recreation

The area surrounding Mammoth Cave (e.g. the area adjacent to the parking lot) is a good spot for birding (Birds Australia WA 2005d). Visitors can see a variety of birds (e.g. Purple-crowned Lorikeets, Sacred Kingfisher).

14.3.2 Aboriginal heritage values

There is one registered Aboriginal site adjacent to or in the vicinity of Mammoth Cave (Table 33).

Table 33 Register sites

Site name	Site ID	Status	Site type	Additional info
Mammoth Cave	5327	P	Skeletal material/burial, artefacts/scatter	--

14.3.3 Unique characteristics

Jewel Cave has one of the longest straw stalactites to be found in any tourist cave in the world.

Blackwood River Catchment Profile

1 Background

The Blackwood River is the largest river, by flow volume, in the South West. It extends inland approximately 330 km and has a catchment area of 22,550 km^2. This study includes the lower Blackwood River, which extends from just east of the Nannup town site to the Hardy Inlet, where the river discharges to the Southern Ocean. It flows through the Shires of Nannup and Augusta-Margaret River (Figure 1).

The Blackwood River has over 40 tributaries. Those within the study that were identified with social values include: West Bay Creek, Chapman Brook, Upper Chapman Brook, Scott River, Rosa Brook, Milyeannup Brook and St. John Brook.

Social water requirements have already been established by the Department of Water for several of the water features identified below. These include: Sues Pool, Hut Pool, St John Brook and Lake Jasper (DoW 2007b).

2 Lower Blackwood River

The lower Blackwood River catchment is dominated forests (State forest and national parks). Other land uses include tourist accommodation, aquaculture, agriculture, and town sites at Augusta and Nannup.

The lower Blackwood River experiences several water quality issues: salinity, sedimentation and nutrient loading. The clearing of native vegetation in the middle and upper catchments has, over time, resulted in increasing salinity levels in the lower Blackwood River. Due to efforts in the catchment, salinity levels have now stabilised, however, the river remains moderately saline.

Sedimentation has negatively affected river pools in the lower Blackwood River and the Hardy Inlet (e.g. reducing the pool depths). Nutrient loading and algal blooms have occurred in the middle reaches of the Blackwood River and the Hardy Inlet, resulting in the fish deaths.

2.1 Hardy Inlet

The Blackwood River drains into the Hardy Inlet, which discharges to the Southern Ocean at Flinders Bay. The 890 ha Inlet is located entirely in the Shire of Augusta-Margaret River.

The Inlet is accessible from several locations. This includes: the Augusta town site, located on the western foreshore, East Augusta, located on the eastern foreshore and Molloy Island, which is located at the confluence of the Blackwood River, Scott River and Hardy Inlet.

The Hardy Inlet is a popular recreation site for picnicking, fishing, birding, boating, kite surfing, crabbing, kayaking, and jet skiing. One particularly popular picnicking destination is the foreshore in front of Colourpatch Café, in the Augusta town site (Table 1).

Anglers fish from the Inlet upstream to Alexandra Bridge for black bream, whiting, flat head, salmon trout, herring and crabs (Table 1). Anglers fish from both the foreshore and boats.

Figure 1 Blackwood River Catchment Profile

Table 1 Hardy Inlet – picnicking and fishing

Characteristic	Picnicking	Fishing
Visitor numbers	Approximately 100+ weekends in summer	No data
Season of use	Year round but most popular in summer (December – April)	Year round, but most popular during long weekends.
Visitor catchment	Local, regional	Local, regional, State
Facilities	No facilities	Boat ramps are located at Molloy Island and at several spots along the Augusta town site foreshore. Anglers also fish from the foreshore.
Accessibility	The site is immediately accessible from Albany Terrace (a sealed road).	Boat ramps are immediately accessible from Hillview Road, Vitoria Parade, Victoria Parade, Albany Terrace, and Davies Road in Augusta town site (sealed roads).
Surrounding land uses	Augusta town site, Colourpatch Café	Augusta town site, Molloy Island residents
Land security	No data	No data

Table 2 Hardy Inlet – birding and kite surfing

Characteristic	Birding	Kite surfing
Visitor numbers	No data	Approximately 20-30 surfers weekend days from December to March
Season of use	Year round	Most popular December to March
Visitor catchment	Local, regional, State	
Facilities	No facilities	
Accessibility	The site is immediately accessible from a variety of sealed roads.	
Surrounding land uses	Augusta town site, East Augusta, private property	
Land security	No data	

There are several tourism ventures that operate within the Hardy Inlet. Examples include:

- The Blackwood River Houseboats hires houseboats to visitors interested in exploring the Blackwood River. The boats depart from Augusta.
- Miss Flinders Eco Tours operates eco-focused boat tours up and down the Blackwood River departing from Augusta. The ferry operates September to May.
- Augusta Absolutely Eco Cruises operates cruises up and down the Blackwood River. The boat departs from Ellis Street Fisherman's Jetty in Augusta from September to May. The operators also hire kayaks to interested visitors.

Table 3 Blackwood River - tourism

Characteristic	Houseboats	Cruises
Visitor numbers	The boats are booked out much of the year. 6-8 people per boat with 3 boats available for hire.	No data
Season of use	Year round, but most popular December – January	September to May
Visitor catchment	Local, regional	
Facilities	There are 3 boats available for hire.	Boats for the cruises
Accessibility	The boat hire facility is located at West Bay, which is immediately accessible from Bussell Highway.	No data
Surrounding land uses	Augusta town site	
Land security	No data	

2.2 Alexandra Bridge

The Alexandra Bridge is located where the Brockman Highway crosses the Blackwood River. It is also the point where the estuarine environment of the mouth of the Blackwood River and Hardy Inlet meets the fresh water flows of the Blackwood River.

The change in water conditions at the Alexandra Bridge means that the fish species found in the river change at this point. Downstream of the bridge anglers catch black bream, whiting, flathead, and herring. Trout fishing and marroning occur from Alexandra Bridge upstream beyond the Nannup town site. Trout anglers typically take advantage of any river access point available[69]. Many trout anglers have a 'special spot' they return to year after year. Anglers rarely share the location of their 'special spot' with others.

The Alexandra Bridge Camping and Picnic Area, a popular recreation destination, is located just north of Alexandra Bridge on the eastern foreshore of the Blackwood River (Table 4). The site is managed by the Shire of Augusta-Margaret River.

Table 4 Alexandra Bridge – camping and picnicking

Characteristic	Camping	Picnicking
Visitor numbers	No data	
Season of use	Year round, but most popular in summer (December – April)	
Visitor catchment	Local, regional	
Facilities	Campsites (caravan and tent), picnic tables, barbeques, toilets, boat ramp	
Accessibility	The site is immediately accessible from Clark Drive (a sealed road).	
Surrounding land uses	Private property	

[69] The Blackwood River is one of several rivers stocked with trout in the South West. The others include the Brunswick River, Collie River and Donnelly River.

Characteristic	Camping	Picnicking
Land security	The site is managed by the Shire of Augusta-Margaret River.	

The Cape-to-Cape Ribbons of Blue program organises saltwatch sampling activities for students at Alexandra Bridge (Table 5). Saltwatch is a statewide Ribbons of Blue program that collects and evaluates data on salinity levels in waterways.

Table 5 Alexandra Bridge - education

Characteristic	Education
Visitor numbers	Approximately 5-10 students annually
Season of use	Winter (May - July)
Visitor catchment	Local
Facilities	No facilities
Accessibility	The site is immediately accessible from Brockman Highway (a sealed road).
Surrounding land uses	Private property, Alexandra Bridge Picnicking and Camping area
Land security	No data

2.3 Hut Pool

Hut Pool is located just east of the point where the Great North Road crosses the Blackwood River, upstream of Alexandra Bridge and downstream of Sues Bridge. The site is located within the Blackwood National Park, which is managed by the DEC. A management plan has not yet been developed for the park.

Hut Pool Picnic Area is located adjacent to Hut Pool (Table 6). It is a popular recreation spot for day trips as there are no overnight accommodation facilities. Activities include picnicking and boating.

Table 6 Hut Pool - recreation

Characteristic	Recreation
Visitor numbers	Approximately 4,800 visits* annually
Season of use	Year round
Visitor catchment	Local, regional
Facilities	Picnic tables, barbeques
Accessibility	The site is immediately accessible from the Great North Road (an unsealed road).
Surrounding land uses	Blackwood National Park
Land security	The site is located in Blackwood National Park, managed by the DEC.

* Visitor data provided by the DEC is provided by the number of visits not the number of visitors.

2.4 Sues Pool

Sues Bridge is located at the point where Sues Road crosses the Blackwood River. Sues Pool is located just downstream of Sues Bridge in the Blackwood National Park.

The Sues Bridge Camping and Picnic Area is located on the southern foreshore of the Blackwood River, adjacent to Sues Pool (Table 7). It is a popular spot for camping, picnicking, swimming, marroning and canoeing.

The area around Sues Bridge is shallow and sandy, making the area less than ideal for fishing. Better fishing conditions are found upstream of the Nannup town site. However, some visitors (e.g. families) may choose to fish in the area.

Table 7 Sues Bridge - recreation

Characteristic	Recreation
Visitor numbers	Approximately 14,500 visits annually
Season of use	Year round
Visitor catchment	Local, regional, State
Facilities	Campsites, barbeques, picnic tables, toilets, purpose built canoe launching facility
Accessibility	The site is immediately accessible from Sues Road (a sealed road).
Surrounding land uses	National Park
Land security	The site is located in Blackwood National Park, managed by the DEC.

The Cape to Cape Ribbons of Blue coordinator organises saltwatch sampling activities for students at Sues Bridge (Table 8).

Table 8 Sues Bridge - education

Characteristic	Education
Visitor numbers	Approximately 5-10 students per year annually
Season of use	Winter (May - July)
Visitor catchment	Local
Facilities	No facilities
Accessibility	The site is immediately accessible from Sues Road (a sealed road).
Surrounding land uses	National Park
Land security	The site is located in Blackwood National Park, managed by the DEC.

2.5 Milyeannup Brook

The Milyeannup Brook is a tributary of the Blackwood River. It discharges to the river at Milyeannup Ford. The Brook is surrounded entirely by State forest and National Park within the Shire of Nannup.

The Blackwood Ribbons of Blue program organises for students to visit Milyeannup Brook several times a year to observe the native fish (Table 9). This is facilitated by the fish traps placed in the brook by Murdoch University.

Table 9 Nannup – education

Characteristic	Education
Visitor numbers	Approximately 40 students annually
Season of use	Spring (October/November) and autumn (May/June)
Visitor catchment	Local
Facilities	Fish traps
Accessibility	No data
Surrounding land uses	State forest, National Park
Land security	The site is surrounded by State forest and National Park.

2.6 Nannup

The Nannup town site is located on the Blackwood River foreshore. The river is a popular recreation spot. This includes fishing, marroning, birding, canoeing and swimming (Table 10).

Table 10 Nannup – swimming

Characteristic	Swimming
Visitor numbers	Approximately 15 people daily in summer (February – March)
Season of use	Most popular February – March
Visitor catchment	Local
Facilities	Amphitheatre
Accessibility	The site is immediately accessible from Brockman Street (a sealed road).
Surrounding land uses	Nannup town site
Land security	The site is located within the Nannup town site.

Canoeing is particularly popular downstream of the Nannup town site. Water is available year round for canoeing between Nannup and the Hardy Inlet. There are several operators that hire canoes and organise tours. Examples include:

- Blackwood River Canoeing is located downstream of Milyeannup Brook off of Poison Swamp Rover. The operator organises tours that take place anywhere between several hours to several days. The operator also hires canoes to interested visitors.
- Explorus organizes canoeing adventures for school groups along various stretches of the Blackwood River.

The Blackwood Ribbons of Blue program runs a number of activities along the Blackwood River foreshore behind the Nannup Visitor Centre (Table 11). This includes macro-invertebrate and water quality sampling, Frog Watch[70] activities, revegetation and annual events (e.g. Confluence).

Table 11 Nannup – education

Characteristic	Education
Visitor numbers	Approximately 600 students annually (approximately 400 students take part in sampling and 200 students take part in events)
Season of use	Year round (4 classes per term)
Visitor catchment	Local
Facilities	Amphitheatre
Accessibility	The site is immediately accessible from Brockman Street (a sealed road). The site is within walking distance from the local school.
Surrounding land uses	Nannup town site
Land security	The site is located within the Nannup town site

The Blackwood Ribbons of Blue program conducts sampling (e.g. water quality) activities at Tanjanerup Dam with students (Table 12). The dam is located east of the Nannup town site on the Tanjanerup Creek, a tributary to the Blackwood River. The dam is managed by the Water Corporation and water from the dam is used to supply the Nannup town site.

Table 12 Tanjanerup Dam – education

Characteristic	Education
Visitor numbers	Approximately 100 students annually
Season of use	Year round (Term 1, 2, or 4)
Visitor catchment	Local
Facilities	No facilities
Accessibility	No data
Surrounding land uses	Nannup town site
Land security	The dam is managed by the Water Corporation.

A number of annual events (e.g. music festival, flower and garden festival) are organised in Nannup. The events bring visitors to the area who recreate along the Blackwood River.

3 West Bay Creek

West Bay Creek starts north of Kudardup town site. It flows southward discharging into the Hardy Inlet at West Bay, just north of the Augusta town site. The catchment is dominated by private property (e.g. agricultural properties).

[70] The Alcoa Frog Watch Program is coordinated through the Western Australian Museum. It aims to provide information on Western Australian frogs. The Ribbons of Blue program contributes monitoring data to the program.

The Cape-to-Cape Ribbons of Blue program organises activities along the creek for students (e.g. macro-invertebrate sampling, catchment tours) (Table 13).

Table 13 West Bay Creek – education

Characteristic	Education
Visitor numbers	Approximately 60 students annually
Season of use	Term 2 and 3 (April – September)
Visitor catchment	Local
Facilities	No facilities
Accessibility	No data
Surrounding land uses	Private property, Augusta town site
Land security	No data

4 Chapman Brook

The Chapman Brook is composed of two braches. One branch starts south of the Witchcliffe town site and the second starts south east of Rosa Brook. The two branches flow southward towards the Blackwood River and meet approximately 3 km north of the River. From this meeting point the branches flow as one system through the Blackwood National Park into the Blackwood River.

The 183 km^2 Chapman Brook catchment is dominated by agricultural land uses, including dairy, viticulture, olive groves and tree plantations. Other land uses include lifestyle properties, State forest and National Park.

The dominance of private property limits the social values along the Brook, except for the short stretch that extends through the Blackwood National Park.

4.1 Chapman Pools

The Chapman Pool is located at the confluence of the Chapman Brook and the Blackwood River, in the Blackwood National Park. The Park is managed by the DEC.

The Warner Glen Recreation Site is located on the foreshore of the Chapman Pool and is managed by the DEC (Table 14). It is a popular spot for camping, fishing, swimming, canoeing, and picnicking. Campers are charged a small fee by the DEC.

Table 14 Warner Glen Recreation Site

Characteristic	Recreation
Visitor numbers	Approximately 12,000 visits annually
Season of use	Year round, but most popular December to April
Visitor catchment	Local, regional
Facilities	Picnic tables, barbeques, campsites, toilets

Characteristic	Recreation
Accessibility	The site is immediately accessible from a park access track (an unsealed road) off of Warner Glen Road.
Surrounding land uses	National park, Warner Glen Bridge
Land security	The site is located within the Blackwood National Park, managed by the DEC.

The Cape to Cape Ribbons of Blue coordinator organises saltwatch sampling activities for students at Warner Glen Bridge (Table 15).

Table 15 Chapman Pool - education

Characteristic	Education
Visitor numbers	Approximately 5-10 students annually
Season of use	Winter (May - July)
Visitor catchment	Local
Facilities	No facilities
Accessibility	The site is immediately accessible from Warner Glen Road (a sealed road).
Surrounding land uses	National Park, Warner Glen Recreation Site
Land security	The site is located in Blackwood National Park, managed by the DEC.

4.2 Education values

The Cape to Cape Ribbons of Blue program organises sampling (e.g. macro-invertebrates) opportunities for students along the Upper Chapman Brook (Table 16). Although the site typically used has limited environmental values, it is still a good sampling location because it is easily accessed.

Table 16 Upper Chapman Brook

Characteristic	Education
Visitor numbers	Approximately 10 students annually
Season of use	No data
Visitor catchment	Local
Facilities	No facilities
Accessibility	The site is a farm and is easily accessed.
Surrounding land uses	Agricultural land uses
Land security	The site is located on private property.

4.3 Unique characteristic

The white-bellied frog (*Geocrinia alba*) has found within the Chapman Brook catchment. The frog is listed as an endangered species under the *Environment Protection and Biodiversity Conservation Act 1999* (Cth). Decreasing water quality and habitat destruction are threats to the

survival of the frog within the Chapman Brook catchment. This includes changes in surface and sub-surface streamflow which can damage or flood their habitat.

5 Scott River

The Scott River flows westward along the Scott Coastal Plain for approximately 40 km. It passes through the Scott National Park before discharging to the Hardy Inlet and Blackwood River at Molly Island.

Along the Scott River extensive areas have been cleared for irrigated agriculture. Land clearing and agricultural production have resulted in waterlogging along the plain. This, in turn, has caused problems for the existing agricultural land uses.

5.1 Scott River National Park

The Scott River passes through the Scott River National Park before discharging to the Blackwood River. The park covers 3,273 ha and is managed by the DEC. A management plan is currently being developed.

One formal recreation site exits within the national park and is located along the Blackwood River. Twinhams Bend is a popular spot for picnicking and water skiing (Table 17). It is accessible via boat or on foot.

Table 17 Twinhams Bend

Characteristic	Recreation
Visitor numbers	No data
Season of use	Year round, but most popular in summer
Visitor catchment	Local, regional
Facilities	Barbeques, toilet, picnic tables
Accessibility	The site is accessible via boat or by foot.
Surrounding land uses	Scott River National Park
Land security	The Park is managed by the DEC.

No formal campsites have been established within the national park. Visitors must get permission from the local rangers before camping in the park.

6 St John Brook

The St John Brook is located west of the Nannup town site. It starts near Vasse Highway and flows southward discharging to the Blackwood River just south of Mowen Road.

The St John Brook is located entirely within the St John Brook Conservation Park. The Park covers 3,440 ha and is managed by the DEC. A draft management plan was developed in 2005.

St John Brook is a popular trout fishing destination. The trout fishing season occurs from September to April. Other popular fish species caught along the brook include cobbler and mullet.

In addition to fishing, the brook supports a number of recreation activities. Many of these activities (e.g. swimming, marroning) are concentrated at Barrabup Pool and Workman's Pool.

6.1 Barrabup Pool

The Barrabup Pool is located upstream of Workman's Pool. Popular activities include: camping, picnicking, walking, cycling swimming, fishing, marroning and canoeing (Table 18).

Barrabup Pool "serves as the town pool for Nannup residents". Many residents visit the area during hot summer days.

Table 18 Barrabup Pool - recreation

Characteristic	Recreation
Visitor numbers	Approximately 18,000 visits per year
Season of use	Year round, most popular October to April
Visitor catchment	Local, regional, State
Facilities	Campsite, toilets, picnic tables, barbeques, walk trails, jetty for swimming
Accessibility	The site is immediately accessible from Barrabup Pool Road (an unsealed road).
Surrounding land uses	St. John Conservation Park
Land security	The site is located within the St. John Conservation Park.

The carp-a-thon, an annual event, takes place at Barrabup Pool (Table 19). A prize is given to the person who catches the most carp. The intent is to rid the pool of carp, which is a feral species. The Blackwood Ribbons of Blue program organises annual trips for students to support this work, in removing carp from the pool.

Table 19 Barrabup Pool – carp removal

Characteristic	Carp-a-thon	Education
Visitor numbers	Approximately 60 people annually	Approximately 100 students annually (25 students x 4 visits per year)
Season of use	March	Year round
Visitor catchment	Local	Local
Facilities	Campsite, toilets, picnic tables, barbeques, walk trails	
Accessibility	The site is immediately accessible from Barrabup Pool Road (an unsealed road).	
Surrounding land uses	St. John Conservation Park	
Land security	The site is located within the St. John Conservation Park.	

6.2 Workman's Pool

Workman's Pool is located downstream of Barrabup Pool. It is a popular recreation spot (Table 20). Activities include: camping, swimming, picnicking, walking, fishing (trout), and cycling.

Table 20 Workman's Pool - recreation

Characteristic	Recreation
Visitor numbers	No data
Season of use	Year round, most popular October to April
Visitor catchment	Local, regional, State
Facilities	Campsite, toilets, picnic tables, barbeques, walk trails
Accessibility	The site is immediately accessible from Barrabup Pool Road (an unsealed road).
Surrounding land uses	St. John Conservation Park
Land security	The site is located within the St. John Conservation Park.

Old Timberline Trail, a dual use trail (i.e. walking and cycling), extends from Nannup town site to Cambray Siding (Table 21). It passes by both Barrabup Pool and Workman's Pool. There is a hut located at Sleeper Hewers' Camp for overnight stays. Facilities include a campsite, hut, water and toilets. The intent is to incorporate the trail into the Mundi Biddi Trail, when it is extended further south.

Table 21 Old Timberline Trail

Characteristic	Old Timberline Trail
Visitor numbers	Approximately 400 visits per year.
Season of use	Year round
Visitor catchment	Local, regional
Facilities	Facilities exist at Barrabup Pool, Workman's Pool and Sleeper Hewers' Camp
Accessibility	The site is immediately accessible Barrabup Pool Road (an unsealed road), Cambray Road (an unsealed road) and Vasse Highway (a sealed road).
Surrounding land uses	St. John Conservation Park
Land security	The site is located within the St. John Conservation Park.

7 Lower Donnelly River

The study area includes the lower Donnelly River, from east of the Vasse Highway to where the Donnelly River discharges to the Southern Ocean.

7.1 Boat Landing Road

Boat Landing Picnic Area is located at the point where Boat Landing Road meets the Donnelly River, within the D'Entrecasteaux National Park (Table 22). It is a popular spot for picnicking, fishing (trout), camping, canoeing and boating. The site is managed by the DEC.

Table 22 Boat Landing Road – recreation

Characteristic	Recreation
Visitor numbers	No data
Season of use	Year round

Characteristic	Recreation
Visitor catchment	Local, regional
Facilities	Picnic tables, boat ramp
Accessibility	The site is immediately accessible from Boat Landing Road (an unsealed road).
Surrounding land uses	D'Entrecasteaux National Park
Land security	The park is managed by the DEC.

7.2 Downstream of Boat Landing Road

Between Boat Landing Road and the Southern Ocean, the Donnelly River is only accessible via boat. This stretch of river is a popular recreation spot. Activities include: fishing, canoeing, boating and water skiing.

Anglers fish for trout, silver and black bream, salmon trout and herring (table 23). Fishing upstream of Boat Landing Road is predominately limited to trout fishing[71] and marroning.

Table 23 Downstream of Boat Landing Road - fishing

Characteristic	Fishing
Visitor numbers	No data
Season of use	Year round
Visitor catchment	Local, regional, State
Facilities	Boat ramp at Boat Landing Road
Accessibility	The site is only accessible via boat.
Surrounding land uses	D'Entrecasteaux National Park
Land security	The National Park is managed by the DEC.

Donnelly River Cruises runs tours of the lower Donnelly River, downstream of Boat Landing Road. The cruises meander up and down the river for four hours, showing the diversity of ecosystems located along the river.

Accommodation downstream of Boat Landing Road is limited. There are a few people who have established holiday huts along this stretch of river. Otherwise visitors can camp upstream at the Boat Landing Picnic Area or Carey Brook Camping Area[72].

7.3 Barlee Brook

Barlee Brook is a tributary to the Donnelly River. The headwaters are located south east of Nannup townsite. It flows southward passing through a number of national parks, including the Hilliger and D'Entrecasteaux national parks. The brook discharges to the Donnelly River just downstream of where the Donnelly River passes under the Vasse Highway.

[71] The Donnelly River is one of several rivers in the south west stocked by the Department of Fisheries with trout. The other stocked rivers include Blackwood River, Collie River and Brunswick River.

[72] Carey Brook Camping Area is located along Carey Brook. It is managed by the DEC. It has camping facilities, toilets and picnicking tables.

Barlee Brook is a popular spot for trout fishing. Trout will move into the small Barlee Brook tributaries in winter (Table 24). Anglers fish from these small tributaries until they dry out, typically in October. Anglers then move onto the Barlee Brook from September to December/January to fish. There is a spawning point along the river, which is closed in winter to support spawning.

Table 24 Barlee Brook - fishing

Characteristic	Fishing
Visitor numbers	5-10 people weekends from October to December/January
Season of use	October to December/January
Visitor catchment	Local, regional
Facilities	No facilities
Accessibility	Intermittent access along the brook
Surrounding land uses	Private property, national park
Land security	No data

8 Lake Jasper

Lake Jasper is located west of the Donnelly River in the D'Entrecasteaux National Park. It is the deepest freshwater lake in the south-west of Australia (DoW 2007b). The lake is recognised as a conservation category wetland because it provides habitat for freshwater fish and is a significant breeding site for birds (DoW 2007b). The Gingilup-Jasper Wetland System, which includes Lake Jasper, is listed in the Directory of Important Wetlands in Australia (Environment Australia 2001).

Lake Jasper is a popular recreation spot. The DEC manages the Lake Jasper Camping Area on the southern side of the Lake. Activities include: picnicking, camping, boating, birding swimming, canoeing, fishing and marroning. The site is accessible from Lake Jasper Road (an unsealed road).

Lake Jasper is a particularly important location for Aboriginal people. This is evidenced by the number of permanent sites listed on the WA Register of Aboriginal Sites (Table 25).

9 Heritage Values

9.1 Aboriginal heritage values

There are a number of registered Aboriginal sites adjacent to or in the vicinity of the Blackwood River, Chapman Brook, St John Brook, Scott River and Donnelly River. The sites listed as permanent are in identified in Table 25 and all other listed sites are identified in Table 26.

Table 25 Sites listed as permanent on the Register

Site name	Site ID	Site type	Additional info
Lake Jasper 06	4482	Artefacts/scatter	--
Lake Jasper 04	4516	Quarry, artefacts/scatter	--
Lake Jasper 07	4517	Artefacts/scatter	Camp
Lake Jasper 10	4518	Artefacts/scatter	--
Lake Jasper 05	4534	Artefacts/scatter	--
Lake Jasper 08	4535	Artefacts/scatter	--
Lake Jasper 09	4536	Artefacts/scatter	--
Lake Jasper 02	4598	Quarry, artefacts/scatter	Archaeological deposit
Lake Jasper 03	4599	Artefacts/scatter	Archaeological deposit
Kybra (Dunnet's farm)	4882	Ceremonial, engraving	--
Donnelly River	5278	Skeletal material/burial, artefacts/scatter	--
Hardy Inlet	5764	Artefacts/scatter	Archaeological deposit, camp
Rushy Creek/Mcleod Creek	5768	Artefacts/scatter	--
Upper Chapman Brook	5769	Artefacts/scatter	--
Brennan Ford/Scott River	5771	Artefacts/scatter	--
Nannup 01	15083	Artefacts/scatter	--
Lake Jasper	16878	Ceremonial, mythological	Camp, named place, natural feature
Blackwood River	20434	Mythological	--

Table 26 Other registered sites

Site name	Site ID	Status	Site type	Additional info
Barlee Brook	4562	I	Artefacts/scatter	--
Lake Jasper 01	4649	I	Artefacts/scatter	Archaeological deposit
West Bay Creek, Augusta	5766	I	Artefacts/scatter	Camp
Mcleod Creek/Blackwood	5767	I	Camp	--
Nannup	5817	S	Artefacts/scatter	Camp
Augusta Flat Granite Rock	18879	L	Historical	Meeting place, natural feature
West Bay, Bussell Highway, Augusta	19714	L	Skeletal material/burial	Plant resource
Blackwood River Ochre Deposit	20435	L	--	Ochre

Site name	Site ID	Status	Site type	Additional info
Barrabup Pool	21149	L	Mythological, historical	Water source
Nbp05 – Blackwood Riverbank	21150	L	Mythological	Natural feature
Sue's Bridge	21929	L	--	Meeting place, camp, hunting place
Barlee Brook Ochre Deposit	22925	L	--	Ochre
Scott River Road Ochre Deposit	22926	L	--	Ochre
Scott River	22928	L	Mythological	Water source

9.2 Non-Aboriginal heritage values

There are 11 locations with Non-Aboriginal heritage values adjacent to the Blackwood River, Chapman Brook, St John Brook, Scott River and Donnelly River. These are identified in Table 27.

Table 27 Non-Aboriginal heritage sites

Site	Location	National Estate	Heritage Council of WA Register	Municipal inventory	National Trust	Water dependence
Jalbarragup House	Stacey Road, Nannup		✓	✓*	✓	Adjacent to the Blackwood River
Flinders Bay Railway	Jetty Flinders Bay			✓**	✓	Adjacent to the Blackwood River
Jalbarragup Bridge (ruin)	Jalbarragup Road, Jalbarragup on the Blackwood River			✓*		Adjacent to the Blackwood River
Callcup Stock Route	Via Vasse Highway & Warren Bridge from Nannup			✓*		Adjacent to the Blackwood River
Barrabup Stongroom Site	Corner Barrabup Pool and Mowen Roads, Nannup			✓*		Adjacent to St John Brook
Old Alexandra Bridge (ruin) & New Alexandra Bridge, over Blackwood River	Brockman Highway, Karridale			✓**		Passes over the Blackwood River
The Land Place – Cairn	Albany Terrace, near Loch Street, August			✓**		Adjacent to the Blackwood River
The Adelphi – site	Old Road/Brockman Highway , near Old Alexandra Bridge, Karridale			✓**		Adjacent to the Blackwood River
Sues Bridge over Blackwood River	Sues Road, 9 km from Brockman Highway Turnoff, Margaret River			✓**		Passes over the Blackwood River
Flinders Bay Jetty	Davies Street, Flinders Bay			✓**		Adjacent to the Blackwood River
Ellis House East Augusta	Tattersall Street, East Augusta			✓**		Adjacent to the Blackwood River

*Shire of Nannup Municipal Inventory
**Shire of Augusta-Margaret Municipal Inventory

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Appendix A Interviewees

Contact	Affiliation
State Government	
Beverley Gardiner	Department of Environment and Conservation
Peter Vickridge	Department of Environment and Conservation
Tiffany Fowler	Department of Environment and Conservation
Ryan Boylan	Department of Environment and Conservation
Troy Jones	Department of Sport and Recreation
Graham Brimage	Department of Sport and Recreation
Yvette Peterson	Department of Sport and Recreation
Gilbert Stokman	Department of Fisheries
Mike Burgess	Department of Fisheries
Peter Gianatti	Department for Planning and Infrastructure
Local government	
Ben Deeley	City of Bunbury
Mark Chester	Shire of Dardanup
Peter Kay	Shire of Harvey
Allan Whitfield	Shire of Busselton
Will Oldfield	Shire of Busselton
Mathilde Breton	Shire of Busselton
Rae McPherson	Shire of Capel/Capel LCDC
Key interests	
	Recreational Freshwater Fisheries Stakeholder Sub-Committee
Sean Forward	WA Bream Tournaments
Anne-Marie Gardiner	Harvey Visitors Centre
Valerie Vallee	Margaret River Visitors Centre
Debbie Blake	Leschenault Region Ribbons of Blue
Jen Mitchell	Geographe Region Ribbons of Blue
Hayley Rolfe	Cape to Cape Region Ribbons of Blue
Jack Buntain	Blackwood Region Ribbons of Blue
Cass Jury	Cape to Cape Catchments Group
Alan Briggs	National Trust
Andrew Hobbs	Birds Australia
Robyn Harris	South West Canoe Club
John Leyendekkers	Dekked Out Adventures

Contact	Affiliation
Brian Easton	Brunswick River Restoration Action Group
Tricia Easton	Brunswick River Restoration Action Group
Debbie Payne	Brunswick River Restoration Action Group
Judyth Salom	Brunswick River Restoration Action Group
Kevin Taylor	Brunswick River Restoration Action Group
Brandon Brooksbank	Brunswick River Restoration Action Group

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Appendix C Protection of heritage values

Table C1 Description of heritage lists, registers and organisations

List/register	Government administration	Description
National Heritage List	Commonwealth	The list includes places or groups of places with outstanding heritage value to Australia. This includes places with natural, Indigenous and/or historic values. The listed places are protected under the *Environmental Protection and Biodiversity Conservation Act 1999 (Cth)* (EPBC Act). The Act requires that approval be obtained before any action takes place that has, will have, or is likely to have a significant impact on the national heritage values of a listed place.
Commonwealth Heritage List	Commonwealth	The list includes natural, Indigenous and historic heritage places owned or controlled by the Commonwealth. This includes places connected with defence, communications, customs and other government activities that reflect Australia's development as a nation. The listed places are protected under the EPBC Act. The Act requires that approval be obtained before any action takes place that has, will have, or is likely to have a significant impact on the environmental values, including national heritage values, of a listed place.
Register of the National Estate	Commonwealth	The register lists natural, Indigenous and historic heritage places throughout Australia. In February 2007 the Register was frozen, meaning that no places can be added to or removed from the list, because of overlap between the National Estate and heritage lists at the national, state and territory and local government levels. A five-year transition period (ending February 2012) has been provided to allow government to consider whether the places on the Register should receive protection under other statutory lists or heritage registers. After this period, the Register of the National Estate's statutory basis will be removed.
State Register of Heritage Places	Western Australia	The Heritage Council of WA maintains the register. The register recognises a place's cultural heritage significant to Western Australia. Anyone can nominate a place for listing on the register. The Heritage Council evaluates nominations based on the following criteria: aesthetic value, historic value, scientific value, social value, rarity, and the representativeness. The Minister based on advice from the Heritage Council enters places into the register. Once listed on the register, the place is legally protected. Any development proposal (e.g. demolition relocation, subdivision, amalgamation, alteration, addition or new development) regarding a registered place is referred to the Heritage Council for advice.
Municipal Inventory	Local government authorities	Local government authorities (LGAs) are required under the *Heritage of Western Australia Act 1990 (WA)* (Section 45) to prepare a Municipal Inventory. The inventory recognises places with heritage importance to the local community. Inventories assist LGAs in protecting a cultural and historic record of the local area, development local government conservation policies and providing local heritage information that may be required under a town planning scheme. Places listed on a Municipal Inventory do not have legal protection, unless they are listed on a separate heritage listed linked to the town planning scheme or another register.
National Trust	Not-for-profit organization	The National Trust is a not-for-profit organization that concentrates its efforts on five key areas: properties and collections, natural heritage, education and learning, heritage services, and membership. The Trust maintains a list of Classified Places. The list includes places of historic, natural and Aboriginal significance. There are no legal implications for the listed places. Several listed places are owned and/or managed by the Trust.

WA Register of Aboriginal Sites	Western Australia	The Department of Indigenous Affairs maintains WA Register of Aboriginal Sites. Under the *Aboriginal Heritage Act 1972 (WA)* (AHA) it is an offence to knowingly disturb or destroy an Aboriginal site without the express consent of the Minister for Indigenous Affairs. The AHA provisions provide protection for 'permanent sites' and 'lodged and insufficient information sites' (Table C2), until they are assessed as places to which the AHA no longer applies. The provisions do not apply to 'stored data sites' unless additional information is supplied requiring a reassessment of the site. Not all sites of significance to Aboriginal people are listed on the WA Register of Aboriginal Sites. Sites not listed are still protected by the AHA provisions.

Table C2 Status of Aboriginal heritage sites

Category	Definition
Lodged (L)	Lodged and placed on the Register but not assessed
Insufficient Information (I)	Lodged and placed on the Register, assessed as having insufficient information to complete the assessment
Permanent (P)	Lodged and placed on the Register, the lodged information is assessed as meeting the terms of Section 5 of the AHA
Stored Data (S)	Lodged and placed on the Register, lodged information is assessed as not meeting the terms of Section 5 of the AHA

Table C3 Description of Aboriginal sites

Type of site	Description
Artefact	A place where human activity is identifiable by the presence of a portable object(s) (e.g. stone, glass, bone, shell) utilised or modified by Aboriginal people in relation to traditional cultural life, past or present.
Fish trap	A stone, wood or other similar structure made by Aboriginal people for catching fish. These structures are typically found on the coast or in lakes and rivers.
Man-made structure	The placement or arrangement by Aboriginal people of stone, wood or other material in a structure for ceremonial or utilitarian purposes.
Mythological	A site connected to the great spiritual ancestors, in their various manifestations, of the 'Dreamtime'.
Repository/ cache	A site where cultural or utilitarian objects were/are taken, stored, by Aboriginal people.
Ceremonial	A site used for a formal act (or series of acts) prescribed by a ritual, belief in a mythological manifestation, religious belief/observance, protocol or convention that is connected with the traditional cultural life of Aboriginal people.

Type of site	Description
Grinding patches/grooves	Smoothed areas or grooves on rock surfaces (non-portable) that have been created by grinding activity associated with food production such as seed milling, the preparation of pigments, tool manufacturing and/or maintenance, and ritual.
Midden	A site with an accumulation of shell refuse that is derived from the exploitation of mollusc resource by Aboriginal people.
Painting	Sites painted (including daubings, drawings, stencils, prints) by Aboriginal people. The paintings can be figurative or non-figurative markings or motifs on surfaces such as rocks, rock walls and trees.
Skeletal material/burial	A site where Aboriginal skeletal material is buried and/or where mortuary practices occurred.
Engraving	A (figurative or non-figurative) motif on a rock surface produced by percussion or abrasion.
Historical	A site with historical associations with Aboriginal people and may or may not contain physical evidence of those associations.
Modified or scarred tree	A site with one (or more) tree, living or dead, that has been modified by Aboriginal people by removing the bark or wood resulting in the formation of a scar.
Quarry	A site with evidence that stone or ochre have been extracted.

Appendix D Brunswick River Catchment Profile Aboriginal Heritage Sites

Site name	Site ID	Status	Site type	Additional info
Smelter Site 1	4752	S	Artefacts/scatter	--
Smelter Site 2	4753	S	Artefacts/scatter	--
Refinery 38	5193	S	Artefacts/scatter	--
Refinery 39	5194	I	Artefacts/scatter	--
Refinery 40	5195	S	Artefacts/scatter	--
Refinery 41	5196	S	Artefacts/scatter	--
Refinery 42	5197	S	Artefacts/scatter	--
Refinery 43	5198	S	Artefacts/scatter	--
Refinery 44	5199	S	Artefacts/scatter	--
Refinery 45	5200	S	Artefacts/scatter	--
Refinery 47	5202	S	Artefacts/scatter	--
Refinery 48	5203	S	Artefacts/scatter	--
Refinery 49	5204	S	Artefacts/scatter	--
Refinery 10	5221	S	Artefacts/scatter	--
Refinery 11	5222	S	Artefacts/scatter	--
Refinery 12	5223	S	Artefacts/scatter	--
Refinery 13	5224	S	Artefacts/scatter	--
Refinery 14	5225	S	Artefacts/scatter	--
Refinery 15	5226	S	Artefacts/scatter	--
Refinery 16	5227	S	Artefacts/scatter	--
Refinery 17	5228	S	Artefacts/scatter	--
Refinery 18	5229	S	Artefacts/scatter	--
Refinery 19	5230	S	Artefacts/scatter	--
Refinery 20	5231	S	Artefacts/scatter	--
Refinery 21	5232	S	Artefacts/scatter	--
Refinery 22	5233	S	Artefacts/scatter	--
Refinery 23	5234	S	Artefacts/scatter	--
Refinery 24	5235	S	Artefacts/scatter	--
Refinery 25	5236	S	Artefacts/scatter	--
Refinery 26	5237	S	Artefacts/scatter	--
Refinery 27	5238	S	Artefacts/scatter	--
Refinery 28	5239	I	Artefacts/scatter	--
Refinery 29	5240	S	Artefacts/scatter	--
Refinery 30	5241	S	Artefacts/scatter	--

Site name	Site ID	Status	Site type	Additional info
Refinery 31	5242	S	Artefacts/scatter	--
Refinery 32	5243	S	Artefacts/scatter	--
Refinery 33	5244	S	Artefacts/scatter	--
Refinery 34	5245	S	Artefacts/scatter	--
Refinery 36	5246	I	Artefacts/scatter	--
Refinery 37	5247	S	Artefacts/scatter	--
Refinery 01	5267	S	Artefacts/scatter	--
Refinery 02	5268	S	Artefacts/scatter	--
Refinery 03	5269	S	Artefacts/scatter	--
Refinery 04	5270	S	Artefacts/scatter	--
Refinery 06	5272	S	Artefacts/scatter	--
Refinery 07	5273	S	Artefacts/scatter	--
Refinery 08	5274	I	Artefacts/scatter	--
Refinery 09	5275	S	Artefacts/scatter	--
Westrail survey 16	5318	S	Artefacts/scatter	--
Westrail survey 17	5319	I	Artefacts/scatter	--
Benger Swamp Potato Shed	17784	S	Man-made structure, historical	--
Howson Drive Lagoon	20057	I	Mythological	--
Brunswick Burial Site	20822	I	Skeletal material/burial	--

Appendix E Additional cave systems along the Leeuwin-Naturaliste Ridge

Cave number	Cave Name	Location	Description
6AU – 1	Deepdene Cave	Augusta	Length: 112 m, vertical extent: 23 m; large joint-controlled horizontal tunnel; systematically explore, no obvious leads; damp environment
6AU – 2	Bone Cave	Augusta	Length: 20 m, vertical extent: 8 m; small single dome chamber; systematically explore, no obvious leads; dusty environment
6AU – 3	Bottomless Hole	Augusta	Vertical extent: 30 m; small complex extensive narrow tube follows dip; reasonably explore, some unexplored leads
6AU – 4	Unknown	Augusta	Systematically explore, no obvious leads
6AU – 5	Unknown	Augusta	Length: 90 m, vertical extent: 36; narrow deep inclined tunnel rock-filled
6AU – 6	Harleys Cave	Augusta	Length: 72, vertical extent: 25 m; systematically explore, no obvious leads
6AU – 7	Unknown	Augusta	No data
6AU – 8	Skull Cave	Augusta	Length: 76 m, vertical extent: 33 m; systematically explore, no obvious leads
6AU – 9	Old Kudardup Cave	Augusta	Length: 107 m, vertical extent: 28 m; large dry chambers; systematically explored, no obvious leads
6AU – 10	Unknown	Augusta	Damp environment
6AU – 11	Moondyne Cave	Augusta	Length: 270 m, vertical extent: 26 m; large dry chambers; reasonably explored, no leads noticed; damp environment
6AU – 12	Unknown	Augusta	Length: 36 m, vertical extent: 15 m
6AU – 13	Augusta Jewel Cave	Augusta	Length: 1,900 m, vertical extent: 35 m; extensive phreatic network with large chambers; reasonably explored, no leads noticed; wet environment
6AU – 14	Easter Cave	Augusta	Length: 7,655 m, vertical extent: 35 m; extensive active phreatic network with large chambers; reasonably explored, no leads noticed; wet environment
6AU – 15	Deeondeeup Cave	Augusta	No data
6AU – 16	The Labyrinth	Augusta	Length: 1680 m, vertical 35 m; reasonably explored, no leads noticed; wet environment

Cave number	Cave Name	Location	Description
6AU – 17	Unknown	Augusta	Semi-daylight rock-filled gently sloping entrance; systematically explored, no obvious leads
6AU – 18	Leeuwin Cave	Augusta	Cursorily explore, some unexplored leads
6AU – 19	Unknown	Augusta	No data
6AU – 20	Lloyds Dig	Augusta	Length: 20 m; small hole
6AU – 21	Unknown	Augusta	Systematically explored, no obvious leads
6AU – 22	Deepdene Cliffs	Augusta	Systematically explored, no obvious leads
6AU – 23	Deepdene	Augusta	Systematically explored, no obvious leads
6AU – 24	Unknown	Augusta	Systematically explored, no obvious leads
6AU – 25	Unknown	Augusta	Systematically explored, no obvious leads
6AU – 26	Leeuwin Water Wheel Spring	Augusta	Systematically explored, no obvious leads; wet environment
6AU – 27	Unknown	Augusta	Wet environment
6AU – 28	Foundation Cave	Augusta	Length: 107 m, vertical extent: 25 m; systematically explore, no obvious leads; dry environment
6AU – 29	Clematis Cave	Augusta	Length: 8 m, vertical extent: 5 m; systematically explored, no obvious leads
6AU – 30	Jims Dig	Augusta	Length: 10 m, vertical extent: 12 m; deep narrow daylight blind shaft; systematically explore, no obvious leads; wet environment
6MR – 1	Witchcliffe Cave	Margaret River	Length: 50 m, vertical extent: 10 m; phreatic resurgence watercourse; systematically explored, no obvious leads
6MR – 2	Blackboy Hollow Cave	Margaret River	Length: 140 m, vertical extent: 56: large dry stream bed with rockfall; systematically explored, some unexplored leads; damp environment
6MR – 3	Rainbow Cave	Margaret River	Length: 10 m, vertical extent: 10 m; systematically explored, no obvious leads; dry environment
6MR – 4	Wallcliffe Cave	Margaret River	Length: 116 m, vertical extent: 10 m; low rockfall chambers; systematically explored, no obvious leads; damp environment
6MR – 5	Unknown	Margaret River	Unexplored, may not be cave
6MR – 6	Unknown	Margaret River	Unexplored, may not be cave

Cave number	Cave Name	Location	Description
6MR – 7	Unknown	Margaret River	Reasonably explored, no leads noticed
6MR – 8	Unknown	Margaret River	Reasonably explored, no leads noticed
6MR – 9	Foxhole Cave	Margaret River	Length: 75 m, vertical extent 18 m
6MR – 10	Unknown	Margaret River	Length: 53 m, vertical extent: 6 m; dry stream passage; systematically explore, no obvious leads
6MR – 11	Unknown	Margaret River	Length: 8 m, vertical extent: 6 m; dry stream passage; systematically explore, no obvious leads; dry environment
6MR – 12	Unknown	Margaret River	Unexplored, may not be a cave
6MR – 13	Unknown	Margaret River	Unexplored, may not be a cave
6MR – 14	Unknown	Margaret River	Unexplored, may not be a cave
6MR – 15	Unknown	Margaret River	Unexplored, may not be a cave
6MR – 16	Unknown	Margaret River	Systematically explore, no obvious leads
6MR – 17	Unknown	Margaret River	Systematically explore, no obvious leads
6MR – 18	Unknown	Margaret River	Doline
6MR – 19	Milligans Cave	Margaret River	Length: 85 m, vertical extent: 20 m; large dry stream passage; systematically explored, no obvious leads
6YA – 1	Yallingup Cave	Yallingup	Length: 730 m, vertical extent: 39 m; extensive dry shallow cave with large rambling rock-filled passages; damp environment
6YA – 2	Northcote Grotto	Yallingup	Length: 157 m, vertical extent: 18 m; active horizontal vadose stream cave; reasonably explored, no leads noticed; wide moisture range
6YA – 3	Unknown	Yallingup	Length: 60 m; semi-daylight entrance; reasonably explored, no leads noticed
6YA – 6	Unknown	Yallingup	Vertical extent: 3 m; doline
6YA – 7	Unknown	Yallingup	Vertical extent: 10 m; doline
6YA – 8	Unknown	Yallingup	Vertical extent: 6 m; doline
6YA – 9	Unknown	Yallingup	Doline

Cave number	Cave Name	Location	Description
6YA – 10	Karri Cave	Yallingup	Length: 24 m, vertical extent: 8 m; short simple cave with entrance shaft; systematically explore, no obvious leads
6YA – 11	Unknown	Yallingup	Steep entrance leads to short horizontal passage; reasonably explore, no leads noticed
6YA – 12	Terrible Cave	Yallingup	Length: 100 m; complex rock-filled passages; reasonably explored, no leads noticed
6YA – 13	Warrigal Cave	Yallingup	Length: 30 m, vertical extent: 9 m; dry horizontal old outflow cave; systematically explored, no obvious leads; wide moisture range
6YA – 14	Unknown	Yallingup	Length: 10 m, vertical extent: 10 m; short dry cave; systematically explored, no obvious leads; dry environment
6YA – 15	Unknown	Yallingup	Length: 12 m; dry small cave; systematically explored, no obvious leads; dry environment
6YA – 16	Unknown	Yallingup	Length: 10 m; short fissure; systematically explore, no obvious leads
6YA – 17	Unknown	Yallingup	Length: 20 m; medium-sized dome; systematically explore, no obvious leads; wet environment
6YA – 18	Unknown	Yallingup	Length: 20 m; medium-sized dome; systematically explore, no obvious leads; wet environment
6YA – 19	Unknown	Yallingup	Vertical shaft
6YA – 20	Unknown	Yallingup	Old dry high-level cave small; systematically explore, no obvious leads
6YA – 21	Unknown	Yallingup	Length: 3 m; small crawl; systematically explored, no obvious leads
6YA – 22	Unknown	Yallingup	Cursorily explore, some unexplored leads
6YA – 23	Unknown	Yallingup	Active spring leads from rockfall
6YA – 24	Unknown	Yallingup	Vertical extent: 5 m; narrow fissure
6YA – 25	Unknown	Yallingup	Vertical extent: 5 m; short shallow fissure; reasonably explored, no leads noticed
6YA – 26	Unknown	Yallingup	Length: 28 m, vertical extent: 36 m; short low crawl; reasonably explored, no leads noticed
6YA – 27	Ketalack Cave	Yallingup	Length: 174, vertical extent: 36 m; complex interconnected rock-filled cave; cursorily explored, no leads noticed
6YA – 28	Unknown	Yallingup	Length: 3 m; small inclined fissure cave; cursorily explored, some unexplored leads
6YA – 29	Unknown	Yallingup	Length: 25 m, vertical extent: 12 m; small rock filled cave; systematically explored, no obvious leads

Cave number	Cave Name	Location	Description
6YA – 30	Unknown	Yallingup	Length: 14 m, vertical extent: 4 m; small shallow cave; systematically explored, no obvious leads; dry environment
6YA – 31	Unknown	Yallingup	Vertical extent 5 m; blind valley
6YA – 32	Unknown	Yallingup	Blind valley
6YA – 33	Unknown	Yallingup	Length: 30 m, vertical extent: 12 m; systematically explored, no obvious leads
6YA – 34	Unknown	Yallingup	No data
6YA – 35	Unknown	Yallingup	No data
6YA – 36	Unknown	Yallingup	Length: 10 m; small shallow cave
6YA – 37	Unknown	Yallingup	Vertical extent: 4 m; short vertical shaft; cursorily explored, some unexplored leads
6YA – 38	Unknown	Yallingup	No data
6YA – 39	Beam Pot	Yallingup	Medium-sized cave; reasonably explore, no leads noticed
6YA – 40	Barbilla Cave	Yallingup	Length: 150 m; large cave with daylight entrance chamber; systematically explored, no obvious leads; dry environment
6YA – 42	Unknown	Yallingup	Length: 26 m; medium-sized cave; systematically explored, no obvious leads; wet environment
6YA – 43	Unknown	Yallingup	Length: 20 m; medium-sized cave; systematically explored, no obvious leads; wet environment
6YA – 44	Unknown	Yallingup	Length 6 m; small part submerged cave; systematically explored, no obvious leads; wet environment
6YA – 45	Unknown	Yallingup	Length: 100 m; large rock-filled cave with small chambers; wet environment
6YA – 46	Unknown	Yallingup	Length: 10 m; wet environment
6YA – 47	Unknown	Yallingup	Length: 100 m; extensive cave with large chambers; wet environment
6YA-48	Unknown	Yallingup	Length: 60 m; systematically explored, no obvious leads; wet environment
6YA – 49	Injidup Doline & Shaft 1	Yallingup	Large rockfall section; cursorily explored, no leads noticed; dry environment
6YA – 50	Injidup Doline 2	Yallingup	Large rock-filled doline; cursorily explored, no leads noticed; dry environment
6YA – 51	Lost Pearl Cave	Yallingup	Length: 126 m; large rock-filled passage; systematically explored, no obvious leads

Cave number	Cave Name	Location	Description
6WI – 1	Unknown	Witchcliffe	Length: 15 m, vertical extent: 6 m; systematically explored, no obvious leads
6WI – 2	Green Cave	Witchcliffe	Length: 284 m, vertical extent: 60 m; spacious stream passage with rockfall; reasonably explored, no leads noticed
6WI – 3	Unknown	Witchcliffe	Systematically explored, no obvious leads
6WI – 4	Unknown	Witchcliffe	Systematically explored, no obvious leads
6WI – 5	Midgie Cave	Witchcliffe	Length: 18 m, vertical extent: 24 m; systematically explored, no obvious leads
6WI – 6	Goanna Cave	Witchcliffe	Length: 18 m, vertical extent: 16 m; systematically explored, no obvious leads; dusty environment
6WI – 7	Skittle Cave	Witchcliffe	Length: 60 m, vertical extent: 20 m; systematically explored, no obvious leads
6WI – 8	Unknown	Witchcliffe	Systematically explored, no obvious leads
6WI – 9	Kudjal Yolgah	Witchcliffe	Length: 260 m, vertical extent: 26 m; reasonably explored, no leads noticed; wet environment
6WI – 10	Unknown	Witchcliffe	Length: 15 m; systematically explored, no obvious leads
6WI – 11	Unknown	Witchcliffe	Length: 20 m, vertical extent: 10 m; systematically explored, no obvious leads
6WI – 12	Unknown	Witchcliffe	Systematically explored, no obvious leads
6WI – 13	Golgatha Cave	Witchcliffe	Length: 350 m, vertical extent: 25 m; large entrance leads to extensive dry passage; reasonably explored, no leads noticed
6WI – 14	Unknown	Witchcliffe	Length: 30 m, vertical extent: 10 m; reasonably explored, no leads noticed; dry environment
6WI – 15	Kens Cave	Witchcliffe	Cursorily explored, some unexplored leads
6WI – 16	Unknown	Witchcliffe	Systematically explored, no obvious leads
6WI – 17	Mordang Dar	Witchcliffe	Length: 125 m, vertical extent: 60 m; large single chamber with extensive rockfall; systematically explored, no obvious leads; dry environment
6WI – 18	Unknown	Witchcliffe	Length: 35 m, vertical extent: 25 m; systematically explored, no obvious leads; dry environment
6WI – 19	Unknown	Witchcliffe	No data
6WI – 20	Unknown	Witchcliffe	No data
6WI – 21	Giants Cave	Witchcliffe	Length: 575 m, vertical extent: 83 m; large rock-filled spacious rockfall chambers; systematically

Cave number	Cave Name	Location	Description
			explored, no obvious leads; dry environment
6WI – 22	Giants Cave	Witchcliffe	No data
6WI – 23	Kangaroo Pot	Witchcliffe	Length: 66 m, vertical extent: 25 m; systematically explored, no obvious leads; dry environment
6WI – 24	Bridge Cave	Witchcliffe	Length: 190 m, vertical extent: 61 m; systematically explored, no obvious leads; dry environment
6WI – 25	Crustacea Cave	Witchcliffe	Length: 46 m, vertical extent: 17 m; small cave; systematically explored, no obvious leads; dry environment
6WI – 27	Unknown	Witchcliffe	Systematically explored, no obvious leads
6WI – 28	Unknown	Witchcliffe	Systematically explored, no obvious leads; dry environment
6WI – 29	Unknown	Witchcliffe	Systematically explored, no obvious leads
6WI – 30	Lake Cave	Witchcliffe	Length: 50 m, vertical extent: 76 m; systematically explored, no obvious leads; wet environment
6WI – 31	Museum Cave	Witchcliffe	Vertical extent: 28 m; reasonably explored, no leads noticed; damp environment
6WI – 32	Unknown	Witchcliffe	No data
6WI – 33	Tunnel Cave	Witchcliffe	Length: 70 m, vertical extent: 14 m; systematically explored, no obvious leads; dry environment
6WI – 34	Unknown	Witchcliffe	Systematically explored, no obvious leads
6WI – 35	Unknown	Witchcliffe	Length: 35 m, vertical extent: 21 m; systematically explored, no obvious leads; dry environment
6WI – 36	Unknown	Witchcliffe	Systematically explored, no obvious leads; dry environment
6WI – 37	Orchid Cave	Witchcliffe	Length: 15 m, vertical extent: 7 m; systematically explored, no obvious leads; dry environment
6WI – 38	Mammoth Cave	Witchcliffe	Length: 410 m, vertical extent: 25 m; large horizontal stream passage; systematically explored, no obvious leads; damp environment
6WI – 39	Unknown	Witchcliffe	No data
6WI – 40	Unknown	Witchcliffe	Systematically explored, no obvious leads
6WI – 41	Unknown	Witchcliffe	Systematically explored, no obvious leads; dry environment
6WI - 42	Terry Cave	Witchcliffe	Length: 430 m, vertical extent: 43 m; reasonably explored, no leads noticed; damp environment
6WI – 43	Terry Cave	Witchcliffe	No data

Cave number	Cave Name	Location	Description
6WI – 44	Conference Cave	Witchcliffe	Length: 460 m, vertical extent: 40 m; systematically explored, no obvious leads; wet environment
6WI – 45	Unknown	Witchcliffe	Length: 102 m, vertical extent: 24 m; systematically explored, no obvious leads
6WI – 46	Unknown	Witchcliffe	No data
6WI – 47	Terry Cave	Witchcliffe	No data
6WI – 48	Connelly Cave	Witchcliffe	Length: 1,980 m, vertical extent: 35 m; reasonably explored, not leads noticed; wet environment
6WI – 49	Calgardup Cave	Witchcliffe	Length: 880m, vertical extent: 27 m; systematically explored, no obvious leads; damp environment
6WI – 50	Unknown	Witchcliffe	Streamsink; systematically explored, no obvious leads
6WI – 51	Rudducks Cave	Witchcliffe	Length: 200 m, vertical extent 8 m; meandering narrow gently sloping stream passage with small phreatic dry high-level chamber; systematically explored, no obvious leads; wet environment
6WI – 52	Unknown	Witchcliffe	No data
6WI – 53	Zamia Nut Cave	Witchcliffe	Length: 20 m, vertical extent: 8 m; small low cave; systematically explored, no obvious leads; dry environment
6WI – 54	Breakneck Gully	Witchcliffe	Active gently sloping watercourse leads to short rock-filled inflow; systematically explored, no obvious leads
6WI – 55	Unknown	Witchcliffe	Length: 65 m, vertical extent: 13 m; systematically explored, no obvious leads
6WI – 56	Arumvale Pipe	Witchcliffe	Length: 185, vertical extent: 40 m; systematically explored, no obvious leads
6WI – 57	Arumvale Cave	Witchcliffe	Length: 525 m, vertical extent: 58 m; systematically explored, no obvious leads
6WI – 58	Blue Rock Cave	Witchcliffe	Length: 3 m, vertical extent 2m; systematically explored, no obvious leads
6WI – 59	Mill Cave	Witchcliffe	Length: 220 m, vertical extent: 30 m; old stream passage; systematically explored, no obvious leads; damp environment
6WI – 60	Nannup Cave	Witchcliffe	Length: 360 m, vertical extent: 29; systematically explored, no obvious leads; damp environment
6WI – 61	Devil's Lair	Witchcliffe	Dusty environment
6WI – 62	Crystal Cave	Witchcliffe	Length: 750 m, vertical extent: 45 m; reasonably explored, no leads noticed
6WI – 63	Strong's Cave	Witchcliffe	Length: 660 m, vertical extent: 32 m; systematically explored, no obvious leads; wet environment

Cave number	Cave Name	Location	Description
6WI – 64	Soil Chute Cave	Witchcliffe	Steep death trap; reasonably explored, not leads noticed
6WI – 65	Unknown	Witchcliffe	Systematically explored, no obvious leads
6WI – 66	Unknown	Witchcliffe	Small doline with holes
6WI – 67	Acoustic Cave	Witchcliffe	Reasonably explored, some unexplored leads
6WI – 68	Unknown	Witchcliffe	Vertical extent: 14 m; systematically explored, no obvious leads
6WI – 69	Unknown	Witchcliffe	Vertical extent: 50 m; unexplored, may not be a cave
6WI -70	Unknown	Witchcliffe	No data
6WI – 71	Dingo Cave	Witchcliffe	Length: 200 m, vertical extent: 32 m; systematically explored, no obvious leads
6WI – 72	Unknown	Witchcliffe	No data
6WI – 73	Unknown	Witchcliffe	No data
6WI – 74	Unknown	Witchcliffe	Systematically explored, no obvious leads
6WI – 75	Unknown	Witchcliffe	Unexplored, may not be a cave
6WI – 76	Unknown	Witchcliffe	No data
6WI – 77	Unknown	Witchcliffe	Systematically explored, no obvious leads
6WI – 78	Unknown	Witchcliffe	Systematically explored, no obvious leads
6WI – 79	Unknown	Witchcliffe	No data
6WI – 80	Unknown	Witchcliffe	Systematically explored, no obvious leads
6WI – 81	Unknown	Witchcliffe	No data
6WI – 82	Bob’s Hollow Resurgence	Witchcliffe	Length: 400 m, vertical extent: 15 m; systematically explored, no obvious leads; wet environment
6WI – 83	Unknown	Witchcliffe	Reasonably explored, no leads noticed
6WI – 84	Unknown	Witchcliffe	Systematically explored, no obvious leads
6WI – 85	Unknown	Witchcliffe	No data
6WI – 86	Unknown	Witchcliffe	No data

Cave number	Cave Name	Location	Description
6WI – 87	Swamp Inflow	Witchcliffe	Streamsink; systematically explored, no obvious leads
6WI – 88	Unknown	Witchcliffe	Streamsink; systematically explored, no obvious leads
6WI – 89	Unknown	Witchcliffe	Unexplored but definitely a cave
6WI -90	Unknown	Witchcliffe	Wet environment
6WI – 91	Unknown	Witchcliffe	Wet environment
6WI – 92	Unknown	Witchcliffe	Streamsink
6WI – 93	Arnor Cave	Witchcliffe	Length: 80 m, vertical extent: 8 m; systematically explored, no obvious leads
6WI – 94	Unknown	Witchcliffe	Streamsink; systematically explored, no obvious leads
6WI -95	Unknown	Witchcliffe	Length: 33 m, vertical extent: 35 m; systematically explored, no obvious leads
6WI – 96	Unknown	Witchcliffe	Reasonably explored, no leads noticed
6WI – 97	Tunnel Cave	Witchcliffe	No data
6WI - 98	Unknown	Witchcliffe	No data
6WI – 99	Unknown	Witchcliffe	No data
6WI – 100	Unknown	Witchcliffe	No data
6WI – 101	Tight Entrance Cave	Witchcliffe	Length: 220 m; systematically explored, no obvious leads
6WI – 102	Unknown	Witchcliffe	Streamsink; systematically explored, no obvious leads
6WI – 104	Unknown	Witchcliffe	Systematically explored, no obvious leads

Source: Australian Speleological Federation www.caves.org.au/kid