

Lower Collie River Social Values Study



Beckwith Environmental Planning

Prepared for the Department of Water

November 2008

Acknowledgements

The authors would like to thank each individual who participated in the study. Your willingness to share with us your insights and knowledge of the lower Collie River was essential to the success of the study.

The funding and support of the Department of Water are appreciated. We would like to extend a special thank you to Brendan Kelly and Mike McKenna.

Sincerely,

A handwritten signature in blue ink that reads "Jo Ann Beckwith". The signature is written in a cursive style with a horizontal line through the middle.

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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 July and October 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

This report has been prepared on behalf of and for the exclusive use of the Department of Water, and is subject to and issued in accordance with the agreed terms and scope between the Department of Water and Beckwith Environmental Planning Pty Ltd.

Executive Summary

The lower Collie River starts at the Wellington Dam and flows west predominately through the Shires of Harvey and Dardanup before reaching the Leschenault Estuary. Like many surface water resources in the South West, the river does not have a water resource management plan. In the absence of a plan, the river system is vulnerable to over use.

The Department of Water (DoW) is the lead State Government agency responsible for water resource management planning in Western Australia. The DoW is undertaking a number of activities to support development of a water resource management plan for the Lower Collie River¹.

Study objectives

The DoW's water resource management activities 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.

In the water planning framework, social values are limited to non-consumptive social values. This includes Aboriginal and other Australian heritage, recreational and tourist pursuits, landscape and aesthetic aspects, and educational and scientific aspects (WRC 2000, p. 16). Consumptive social values, such as irrigation and public water supply, are viewed as economic values.

This report evaluates the social values of the lower Collie River, with the goal being to establish social water requirements (i.e. the water conditions needed to support the social values). Other study objectives included: identifying and consulting with key stakeholders and organisations links to sites with social values and identifying areas need to restoration to maintain and/or restore the values.

Study conclusions

Social value:

- The lower Collie River supports a variety of social values, including heritage, recreation, tourism, education, and aesthetics. These values are situated along two sections of the river.
- The first section extends from the base of Wellington Dam to Burekup Weir. This stretch is largely contained within the Wellington National Park It has well established recreation facilities and attracts visitors from across the South West.
- The second section extends from the South Western Highway to the river mouth at the Leschenault Estuary. This stretch draws people from the local and greater Bunbury area. It is on the doorstep of a growing residential population, which may add pressure to the river system (e.g. additional recreationalists).
- Interviewees did not identify any social values along the remaining stretch of river, between the Burekup Weir and the South Western Highway. This was attributed to the lack of public access points, steep foreshores and obstructions in this river section (e.g. fences).

¹ A separate planning exercise is being undertaken for the Upper Collie River Catchment. <http://portal.water.wa.gov.au/portal/page/portal/PlanningWaterFuture/AllocationPlanning/UpperCollie>

Water conditions required to support the social values:

- There are two significant management issues for long term maintenance of the social values of the lower Collie River. One is the maintenance of the flow regime between Wellington Dam and the Burekup Weir. The other is water quality concerns between the South Western Highway and the river mouth (e.g. nutrient and sedimentation build-up).
- Between the Wellington Dam and the Burekup Weir the current flow regime includes releases from the dam from about October to April for irrigated agriculture and June to August as part of the salinity scouring process. These releases mean that water is available in summer when other water features in the region experience decreased water levels or dry out. Interviewees expressed concerns that should there be changes in the flow regime (e.g. less water released for irrigation) the social values would be diminished.
- *Statewide Policy No 5* does not directly accommodate water quality issues associated with land use practices. However, most of the threats to social values between the South Western Highway and the river mouth are associated with land use practices. This means there needs to be a coordinated effort between the EWP process and land use managers.

River restoration:

- All interviewees thought it important to restore degraded areas along the river. The most commonly identified types of restoration included revegetation, rock pitching (to prevent erosion) and weeding.
- About half of the interviewees identified specific sites along the river that need restoration, the Eaton foreshore as the most commonly identified site. While the other half indicated that the DoW and/or the LCC were better positioned to identify and prioritise areas to be restored.

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1 Introduction

1.1 Background

The lower Collie River starts at the Wellington Dam and flows west through the Shires of Harvey and Dardanup and the City of Bunbury before reaching the Leschenault Estuary. The river and its tributaries serve a variety of consumptive (e.g. irrigated agriculture, industry) and non-consumptive uses (e.g. recreation, tourism, cultural values, and ecosystem maintenance). Similar to many South West waterways, the lower Collie River does not have a water resource management plan. In the absence of a plan, the river system is vulnerable to over use and potential conflict between uses.

The Department of Water (DoW) is the lead State Government agency responsible for water resource management in Western Australia. Water management plans identify ecological water requirements, establish sustainable water yields, set limits on abstraction and guide the DoW's approval of future licence applications to use water for consumptive purposes. In determining the management objectives of a water resource, the DoW considers not only ecological but also social and economic values dependent on the water resource.

The DoW is undertaking a number of technical studies to inform development of a water resource management plan for the lower Collie River². This includes investigations of ecological water requirements and both Aboriginal and non-Aboriginal social values associated with the lower Collie River.

1.2 Study objectives

The DoW's water resource management activities 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 ecological as well as social and economic values.

This report evaluates the social values of the lower Collie River. The study builds on recent regional-scale investigations (Beckwith Environmental Planning - in press) of social and cultural values of water dependent features in the South West.

The study goal was to define the water conditions needed to support the social values associated with the lower Collie River. This information will be used by the DoW to establish social water requirements (Section 1.4) for the lower Collie River. Other objectives included:

- To consult with key stakeholders (e.g. local and State government)
- To identify people and groups/organisations linked to sites and their connection to the sites
- To identify potential impacts on the social and cultural values if there are changes in the water conditions
- To identify priority areas needing restoration to maintain and/or restore the values.

1.2.1 Study area

The study area includes the lower Collie River from the base of Wellington Dam to where the Collie River joins the Leschenault Estuary and property within 300-metres either side of the River. The lower Collie River extends for approximately 45 km. It flows through the Shires of Harvey and Dardanup and the City of Bunbury before discharging into the Leschenault Estuary.

² A separate planning exercise is being undertaken for the Upper Collie River Catchment. <http://portal.water.wa.gov.au/portal/page/portal/PlanningWaterFuture/AllocationPlanning/UpperCollie>

1.3 Definition of social values

In the context of *Statewide Policy No 5*, social values are limited to non-consumptive social values. Consumptive social values, such as irrigation and public water supply, are viewed as economic values.

Statewide Policy No 5 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, p. 16).

In some instances domestic and stock water uses are considered social values. *Statewide Policy No 5* indicates that “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).

This study examined the above categories of social values with the exception of Aboriginal heritage values and domestic and stock water use. The Aboriginal heritage values are the subject of a separate DoW study.

In addition to those identified in *Statewide Policy No 5*, social values may be derived simply 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*.

1.4 Social water requirements

Statewide Policy No 5 defines SWRs as the “elements of the water regime³ that are identified to meet social (including cultural) values” (WRC 2000, p. 12). In other words, the water conditions (e.g. flow rate, water level, water quality) needed to maintain the social values of the water resource.

In some instances, if the ecological water requirements 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.

It is not always the case that meeting the water requirements of the ecosystem will automatically maintain all social values. 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 No 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.

³ Water regime is defined as “a 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).

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

Where there is conflict between the ecological and social water requirements, *Statewide Policy No 5* provides the following guidance. “Water regimes identified to meet social value (i.e. social water requirements), will form part of EWRs [Environmental Water Provisions⁴] where they do not unacceptably impact on significant ecological values” (WRC 2000, p. 4).

1.4.1 Water quality

Statewide Policy No 5 indicates that “water quality issues need to be considered in four main areas when establishing EWRs/EWRPs” (WRC 2000, p. 18). These are where:

1. Part of an EWR requires a water quality problem to be addressed that is caused by surface water diversions or ground abstraction (e.g. rivers pools that were previously oxygenated by continuous flow)
2. EWP water regimes may need to have water quality parameters to ensure appropriate protection of ecological and social values (e.g. when water is released from a reservoir)
3. Mitigation water requirements⁵ are needed to provide for the flushing of algal blooms or the dilution of saline systems affected by dryland salinity or similar
4. Implementation of EWPs would not make a significant improvement to wetland or river health unless other actions are taken to improve water quality problems associated with catchment or waterway management (WRC 2000, p. 18).

For points 1 and 2, the water quality problems are assumed to be the result of regulation/abstraction activities (WRC 2000). The policy indicates that “it is appropriate that water quality criteria are specified as part of the EWRs and EWPs ... to ensure acceptable quality” (WRC 2000, p. 19).

For points 3 and 4, the water quality problems are related mostly to landowner activities in the catchment (WRC 2000). “In these cases, mitigation water requirements may be considerable and should not be considered to be part of the EWPs. Land use practices should be addressed through land planning and management processes” (WRC 2000, p. 19).

In summary, water quality problems resulting from regulation/abstraction activities will be considered in EWPs while water quality issues arising from land use activities will not.

2 Methodology

2.1 Define characteristics

The value of a water feature can be described based on its characteristics. Analysing these characteristics can aid in both determining the overall value of a feature and setting resource management priorities.

⁴ Environmental Water Provisions (EWPs) are the water regimes defined as a result of the water allocation decision making process.

⁵ Mitigation water requirements are “elements of the water regime that are identified to improve diminished water quality resulting from land use practices and developments in the catchment” (WRC 2000, p. 12).

To evaluate the social values of the lower Collie River a set of characteristics was developed (Table 1). The inclusion of ecological characteristics in the framework reflects the relationship between the ecological values and the social values. For example, a river stretch with little foreshore vegetation is less likely to be a desirable location for marroning than a river stretch with overhanging foreshore vegetation.

Table 1 Site 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).
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.

2.2 Data collection and analysis

2.1.1 Desktop analysis of existing data

A desktop analysis of available data (e.g. organisation websites, management reports) was undertaken. This analysis was used to identify:

- Sites along the lower Collie River with social values
- Data for each site based on the characteristics outlined in Table 1
- Key individuals, groups and organisations associated with each site

Tables 2 and 3 were developed to guide data collection. These assisted in the systematic collection of data.

Table 2 Data sheet

Name of site _____

Location _____

Social values		Level of use					Site characteristics							
Type of social value/use	Specific activities	Visitor numbers	Frequency of use	Season of use	Visitor catchment	Trends in use /planned changes	Capacity	Accessible	Facilities	Surrounding land uses	Status	Condition	Rare species	Unique attribute

Table 3 Water conditions required to maintain the values

Water Conditions							
Minimum acceptable conditions	Ideal conditions	Current condition of feature	Substitutability of use/value	Depth of water	Water quality	Flow rates	Key environmental values
							(e.g. need to maintain banksia to maintain the social value)

The desktop analysis found that some features, and their associated social values, were well documented. For example, the Department of Environment and Conservation (DEC) collects visitor numbers in managing the Wellington National Park. However, for other features, there was little, if any, documentation, particularly for the river stretch between the South Western Highway and the river mouth.

2.1.2 Stakeholder interviews

Key stakeholders, selected based on the desktop review and local knowledge of stakeholder networks, were interviewed. The interviews were used to acquire data on those features where there was insufficient documentation or the data was dated. The interviews focused on:

- The nature of the social values associated with a feature
- Water characteristics required to maintain the social values (Table 3)
- Potential impact(s) if there are changes in water conditions
- Areas that need restoration (and associated issues)

Interview process

Semi-structured in-depth interviews were conducted with 17 stakeholders between August 2008 and October 2008 (Appendix A). In-depth interviewing employs a conversational or discussion style process in which open-ended questions and a variety of prompts are used to elicit thoughtful comments from stakeholders (Minichiello et al. 1990).

The stakeholders 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 letter outlining the study and meeting logistics arranged (Appendix B).

With permission from the interviewee, a cassette recorder was used to record the interviews. The interviewer also took handwritten notes. 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.

Interview guide

The interviews were semi-structured through an interview guide (Appendix C) and data template (Appendix D). This ensured that all the interviews covered the same range of key themes and assisted in the systematic collection of qualitative data across all interviews.

Data analysis

Analysis of the interview data was an iterative process. Data was categorised into themes and sub-themes. Interview notes and recordings were re-examined several times to confirm the presence of themes identified prior to the interviews and to identify emergent themes. This is consistent with the research strategy known as Grounded Theory.

2.3 Database preparation

For each site, the location, social values, characteristics and water conditions (Tables 1-3), were compiled and entered into an Excel spreadsheet. The data will also be included in DoW's Geographic Information System (GIS) water resource database.

3 Lower Collie River social values

The lower Collie River 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.

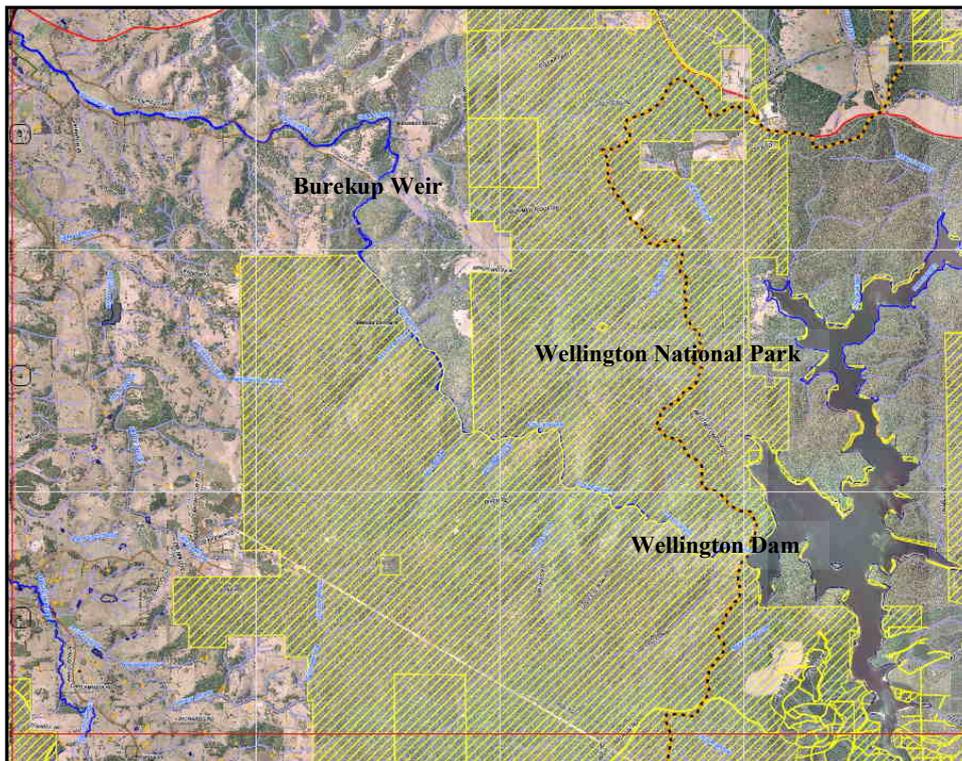
For the remaining river segment, between Burekup Weir and the South Western Highway Bridge, interviewees did not identify any social values. This was attributed to the lack of public access points, steep foreshores and obstructions in the river (e.g. fences).

3.1 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 reservoir⁶. 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 Water⁷ 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 releases⁸ and water losses from Harvey Water's open channel system.

The area around the Wellington Dam is managed by the Department of Environment and Conservation (DEC) (yellow on Map 1). The Wellington National Park covers 16,790 hectares (Map 1).



Map 1 Wellington National Park

⁶ Scouring begins when the difference in salinity level between the top and bottom reaches 400 mg/L.

⁷ Harvey Water is an irrigation cooperative that supplies water to three irrigation districts – Waroona, Harvey and Collie River.

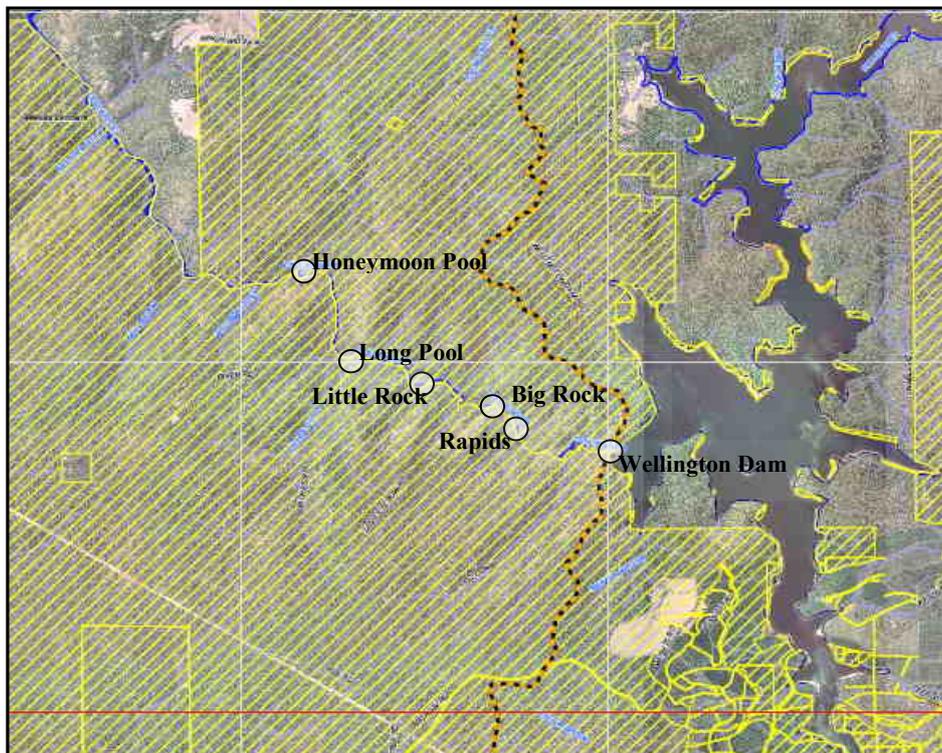
⁸ As part of its licence, Harvey Water is required to release a small amount of water annually to the Henty Brook, Ferguson River and the Brunswick River pools.

3.1.1 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 4, Map 2).

Table 4 Recreation sites below Wellington Dam (CALM 2005)

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



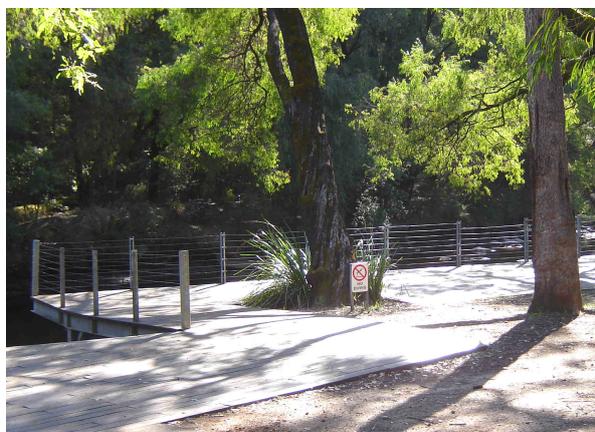
Map 2 Recreation sites downstream of Wellington Dam

Swimming is a popular activity at each of the five recreation sites (Tables 4 and 5). 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 round⁹, 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 5). 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 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.

⁹ The pool receives water released from the bottom of the reservoir. This is the coldest water in the reservoir.

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 websites¹⁰ 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 5 Swimming and canoeing

Characteristic	Swimming	Canoeing
Visitor numbers	No data	1,000 – 2,000 people including school and tour groups
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.	The pools are located in the DEC managed Wellington National Park.

Fishing and marroning are popular activities (Table 6). The water conditions at the recreation sites 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*

¹⁰ Websites include: <http://members.iinet.net.au/~rokhor/canoe/waterlevcoll.html> and http://www.harveywater.com.au/irrigator_information_releases.asp

fluviatilis). The Collie River is one of the few rivers in the south west¹¹ that is stocked with rainbow trout¹² by the Department of Fisheries (DoF)

Table 6 Fishing and marroning

Characteristic	Fishing	Marroning
Visitor numbers	4-6 people (spread across 2-3 groups) ¹³	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 7). 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.



A campsite at Stones Brook

¹¹ 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.

¹² The RFAC Recreational Freshwater Fishing Sub-Committee is responsible for developing the annual trout stocking strategy.

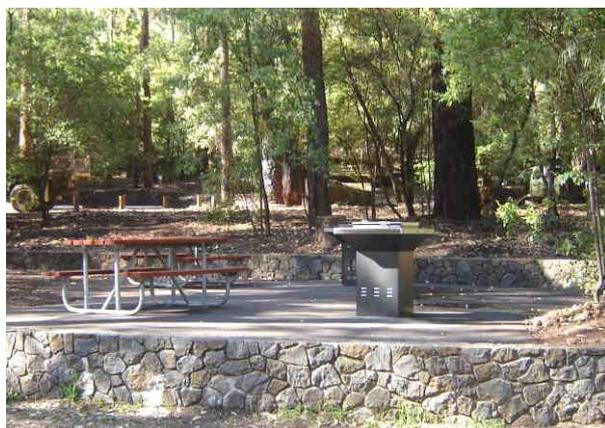
¹³ Most serious anglers fish early in the morning or late in the evening. For this reason, it is difficult to accurately determine how many anglers use the river.

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 7). There are barbeque facilities at Honeymoon Pool and toilet facilities at Honeymoon Pool and the Rapids.

Table 7 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

The majority of campers and day trippers typically walk at least one of the three tracks during their stay (Table 8). 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 8 Walking and cycling

Characteristic	Walking	Cycling
Visitor numbers	No data	Approximately 80 riders per week. 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	
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 9). It attracts small groups of experienced climbers, school groups

and commercial tour operators¹⁴. 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 9 4WD and abseiling

Characteristic	4WD	Abseiling and rock climbing
Visitor numbers	Approximately 80 drivers per week	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 sites are 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.

3.1.2 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 10). 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 2008¹⁵. 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.

Table 10 Education and tourism

Characteristic	Education	Tourism
Visitor numbers	400 - 1,250 (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	

¹⁴ 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).

¹⁵ The first outdoor education course exams will be held in 2009 (http://www.curriculum.wa.edu.au/internet/Senior_Secondary/Courses/Outdoor_Education/).

Characteristic	Education	Tourism
	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 11). The Ribbons of Blue program¹⁶ has been active along Seven Hills Road, just east of the South Western Highway. Activities include macro-invertebrate sampling and water quality monitoring.

Table 11 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.

3.1.3 Management status and land security

The area directly downstream of the Wellington Dam is located in the Wellington National Park¹⁷. In 2005, the DEC released a draft management plan, entitled *Wellington National Park and Westralia Conservation Park¹⁸ Draft Management Plan* (CALM 2005). Once finalised, the plan will guide management of the park.

3.1.4 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 camping 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.

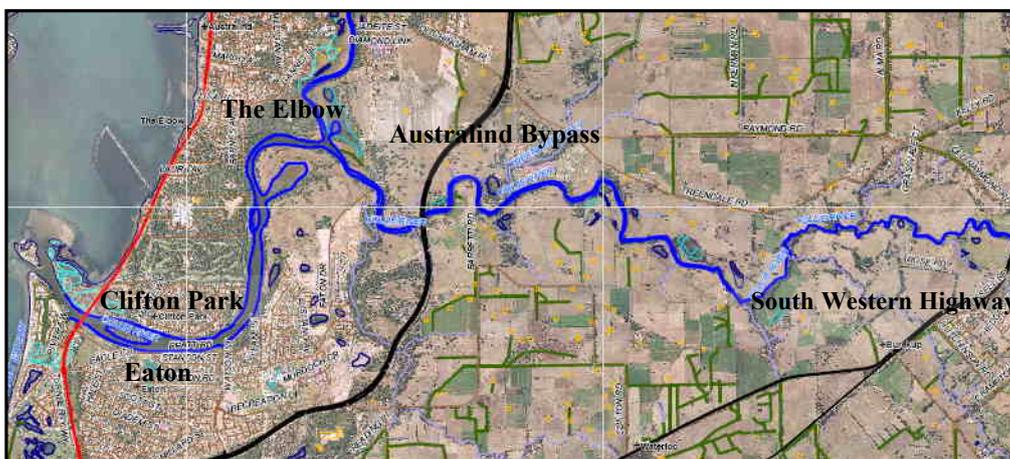
¹⁶ Ribbons of Blue is an environmental education program designed to increase community awareness about local water-related issues.

¹⁷ 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.

¹⁸ 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.

3.2 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 (Map 3).



Map 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 2007).

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 2007). 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 dredge¹⁹²⁰ the river mouth in 2007; increasing the depth to a boat-friendly 1.2 metres.

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 2007). 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.

3.2.1 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.

¹⁹ The last dredging occurred in 1982.

²⁰ The southern entrance was dredged, between Pelican Point and Bar Island.

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 12). 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 12). 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 12 Fishing and boating

Characteristic	Fishing	Boating
Visitor numbers	Approximately 4-5 boats ²¹ 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).	

²¹ 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.

Characteristic	Fishing	Boating
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 13). 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 13 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.

There are a couple of tourism ventures operating on the lower Collie River (Table 14). 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 dolphins²² in the Leschenault Estuary.

Table 14 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
Season of use	Year round	Spring to Autumn, with peak season January – April

²² The tour operator has a wildlife interaction licence from the DEC.

Characteristic	Cruises	Canoeing
Visitor catchment	Local, regional, State	
Facilities	Heated and air conditioned cabin, toilets, sheltered outdoor area, full home theatre system	Boat launch facilities at 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.

3.2.2 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 3). Picnicking, walking and fishing are popular activities at the Elbow (Table 15).

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 15 Picnicking, walking and fishing

Characteristic	Picnicking/walking	Fishing
Visitor numbers	30 – 40 people use the Elbow for picnicking, walking and fishing on summer weekends	10 people weekly
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)
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.	

3.2.3 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 3). 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 16). 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 16).

Table 16 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 17). 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 17). 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 17 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

Characteristic	Swimming	Camping
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 18). 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 18). This includes foreshore revegetation opposite Alexander Island²³.

Table 18 Walking and education

Characteristic	Walking	Education
Visitor numbers	No data	Approximately 60 students (2 classes) annually
Season of use	Year round	Winter (August)
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 sites are identified as public open space in the Greater Bunbury Region Scheme.	

3.2.4 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 2031²⁴ (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.

²³ Alexander Island is 5.4 km in size and is located in the Collie River opposite the Eaton Foreshore Reserve.

²⁴ This is based on the medium scenario population projection.

3.3 Non-Aboriginal heritage places

There are five places with non-Aboriginal heritage values located adjacent to or across the lower Collie River (Table 19). 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.

3.4 Non-use social values

Most respondents made mention of non-use social values of the lower Collie River and its surrounds (Section 1.3). This took the form of comments about the importance of maintaining the river for future generations (i.e. bequest value) and the intrinsic value of the waterway.

The most frequently mentioned non-use social value was aesthetic value. For example, the importance of river views to the walk trails along the lower Collie River. It was evident from the interviews that landholders viewed the river as an important landscape feature.

Interviewees identified a number of new residential developments being built along the lower Collie River and acknowledged the river as an attractive asset for marketing these properties. Real estate agents and property buyers have long been aware of the 'waterfront effect'. A home situated by a stream, lake or river costs more to buy or rent than a more distant one (e.g. Benson et al. 1998; Lansford & Jones 1995).

4 Required water conditions

4.1 Stakeholder perceptions

Stakeholders were asked to describe the water conditions required to maintain the social values of a site. Stakeholders commented on the sites 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. The social water requirements identified by stakeholders are displayed in Table 20 and Table 21.

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 "over the past few summers the water levels have been sufficient to support swimming".

In some instances, stakeholders indicated that if the water conditions met the ecological needs of the site (e.g. to maintain a healthy ecosystem) this would be adequate to support the social values. In such cases, the ecological water requirements and the social water requirements are the same. The few people who spoke about the relationship between ecological and social water requirements, thought it more important to meet the ecological needs than social needs of a system.

Overall, many of the social values identified are supported by the current water regime. The exception being the water quality issues, which have diminished the social values, between the South Western Highway and river mouth (Section 4.2).

4.2 Wellington Dam to Burekup Weir

Water is released from Wellington Dam October to April for irrigated agriculture and June to August as part of the scouring process (Section 3.1). These releases mean that (1) water is available in summer and (2) water levels can fluctuate considerably in a short period of time.

Table 19 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		✓	✓ ¹		Crosses the Collie River
Highland Valley Homestead	Collie River Road, Burekup			✓ ²		Located adjacent to the Collie River
Hough Homestead	Lusitano Ave, Eaton			✓ ²		Located adjacent to the Collie River
Upper Collie River Bridge	South Western Highway, Roelands			✓ ³		Passes over the Collie River
Lower Collie River Bridge	Old Coast Road, Australind			✓ ³		Passes over the Collie River

¹ Shire of Collie Municipal Inventory

² Shire of Dardanup Municipal Inventory

³ Shire of Harvey Municipal Inventory

The availability of water in summer means that the river, between Wellington Dam and Burekup Weir, can support a variety of activities when other water features in the region experience decreased water levels or dry out. Several interviewees noted that it is this variety of available activities that attracts visitors to the area, particularly commercial tour operators and school groups. Visitors can partake in a number of activities without driving long distances. Interviewees noted that this added significant social value to the releases from Wellington Dam.

The releases from Wellington Dam mean that water levels fluctuate between Wellington Dam and Burekup Weir (Box 1). For example, a rise (or fall) of 1-1.5 metres can occur in a couple of days. Due to the fluctuations, there are periods when the water levels get low. One interviewee noted that the DEC receives complaints from recreationalists several times a year about low water levels. The complainants know that the DEC does not control the water releases; however, because the recreation sites are on DEC managed land, the DEC receives the complaints.

Box 1. Releases from Wellington Dam

Water released from Wellington Dam takes approximately 20 hours to reach the Burekup Weir downstream. It can be tricky timing the releases because the Burekup Weir can store only a one-day supply of water for irrigators. In addition, the water levels need to be high enough for water to flow from the weir into the irrigation channel because the irrigation channel connects at the top of the weir instead of the bottom.

The amount and timing of water released is currently dependent on irrigator needs. Interviewees noted that the largest amounts of water are typically released during the work week (Monday to Friday) in mid-to-late summer when evaporation rates are highest. They highlighted a mismatch between recreational water needs (weekends) and irrigation needs (weekday). A couple of interviewees recommended using Harvey Water's website, which provides information on water releases, to plan recreation outings. Others were unsure of the best course of action to meet both irrigation and recreation demands.

Water is currently distributed to irrigators in the Collie River Irrigation District (CRID) via an open channel system, however, this could change in the future. The salinity levels in the Wellington Reservoir currently restrict the types of crops (e.g. higher value horticultural crops) that can be grown in the CRID. Several interviewees indicated that if the salinity levels were to decrease, converting the open channel system to a piped system²⁵ would be economically feasible. The conversion would significantly reduce the amount of water lost to leakage and evaporation and enable irrigators to use more water efficient technology (e.g. pivot systems)²⁶.

Several interviewees indicated that the CRID system piping would likely begin at the Burekup Weir. This would allow summer releases from Wellington Dam to continue to meet the social values directly downstream of the dam. However, one interviewee questioned if the amount of water released would remain the same. For example, the amount released would no longer need to factor in leakage and evaporation losses.

²⁵ The Harvey and Waroona irrigation districts, both operated by Harvey Water, have recently been converted from channel systems to piped systems.

²⁶ Tailwater is the most significant factor contributing to river flow during irrigation season. Other factors include recharge, baseflow and interflow. A reduction in tailwater will result in a reduction in summer flows. The smaller CRID river systems (e.g. Ferguson River) are more vulnerable to the predicated changes than the larger systems (e.g. Collie River). For example, tailwater contributes 48% of flow in Ferguson River in January where as it contributes 15% of flow in the Collie River in January (GHD 2008).

One interviewee recommended using Honeymoon Pool as a reference site for social water requirements between Wellington Dam and Burekup Weir. Honeymoon Pool was recommended for three reasons:

- When water levels decrease, recreationalists typically gravitate towards Honeymoon Pool and Long Pool as they are the deepest river pools and typically maintain water year round. Based on this, it is most important to maintain water in Honeymoon Pool and Long Pool.
- Honeymoon Pool supports the largest suite of activities. This includes swimming, canoeing, camping, picnicking, walking and marroning.
- Honeymoon Pool is the furthest downstream recreation site. Thus if it has sufficient water resources, it is likely that the upstream sites also have sufficient water resources.

Although interviewees were aware that salinity is an issue in the Collie River (Box 2), they did not see it as limiting the social values of the river. However, several interviewees wondered if salinity levels were reduced (e.g. to drinking water standards) whether the water release regime (i.e. frequency, volume and timing) would be changed. For example, several interviewees wondered if scouring would still be necessary. They were concerned that a reduction in flows would negatively impact the downstream social and ecological values.

Box 2. Salinity in the Collie River

In 1933, the water in the Wellington Reservoir was fresh at about 280 mg/L total dissolved solids (TDS) (Water and Rivers Commission 2001). Prior to the 1960s, the land was cleared for agriculture and deep-rooted annual crops were replaced with pastures in the Upper Collie River catchment. As a result, salt stored in the soils was brought to the surface and flowed into the streams. By 1990, clearing controls and reforestation had helped to arrest the increasing salinity in the Wellington Reservoir. In 2001, the water salinity levels were marginal at 845 mg/L TDS (DoW 2006). The State Salinity Strategy set a target of 500 mg/L TDS by 2015 for the Wellington Reservoir. 500 mg/L would mean the water is fresh and of drinking water quality.

Table 20 Perceived required water conditions Wellington Dam to Burekup Weir

Social value		Stakeholder views
Recreation	Swimming	Maintain water year round at Honeymoon Pool and Long Pool. When the water is reduced to approximately 0.3 metres (or 1 foot), it is too low for swimming. Swimming is most popular in summer (December – April).
	Canoeing	A reading of 1.2 metres at the gauging station downstream of Wellington Dam is excellent. A reading of 0.8 metres is “just paddleable” (Khorshid n.d.). Canoeing is most popular during the release periods (October – April and June-August).
	Marroning	The availability of marron attracts large numbers of visitors during marron season (January/February). Maintain water conditions year round to support marron.
	Fishing	The two most popular fish species are rainbow trout (<i>Oncorhynchus mykiss</i>) and redfin perch (<i>Perca fluviatilis</i>). Trout season extends from September to April. Support water conditions year round to maintain trout and redfin perch populations.
	Camping	Honeymoon Pool is the only recreation site directly downstream of Wellington Dam with formal camping sites. Camping occurs year round but peak season during public and school holidays. Maintain water year round at Honeymoon Pool.
	Picnicking	Picnicking occurs at Honeymoon Pool, Long Pool, Little Rock, Big Rock and the Rapids. Picnicking occurs year round but peak season during

Social value	Stakeholder views
	public and school holidays. Maintain open expanses of water year round at these sites.
Walking	Walk trails follow the Collie River between Wellington Dam and Honeymoon Pool. Maintain water year round. Walking occurs year round but is most popular in summer (December – April). Maintain water conditions to support foreshore vegetation year round.
Cycling	Maintain water conditions through the Mt Lennard area to support the vegetation that forms a buffer between the cycle trail and the river. Cycling occurs year round but is most popular in summer (December – April).
Education	School groups use the Collie River. This often includes mountain biking, canoeing, and abseiling. Maintain water year round at a depth to support canoeing. This would mean a minimum water depth of 0.8 m.
Education	The Ribbons of Blue program organises educational activities along the Collie River. Maintain water in winter to a depth of 0.5 metres to support macro-invertebrate sampling at Honeymoon Pool.
Tourism	Commercial tour operators organise canoeing and abseiling tours in the Wellington National Park. Maintain water year round at a depth to support canoeing. This would mean a minimum water depth of 0.8 m.

4.3 South Western Highway to the river mouth

For the river stretch between the South Western Highway and the river mouth, most interviewee responses focused on water quality. The dominant water quality issues identified were fish kills and the build-up of sedimentation. These issues negatively impact on the social values of the river.

The fish kills, which occurred in 2002, 2003 and 2004, were attributed to increased nutrient run-off from upstream residential and agricultural land uses. Interviewees noted that the kills prevent fishing and marroning from occurring. For example, the black bream competition has been called off in some years due to fish kills.

A couple of interviewees recommended releasing pulses of water from the Wellington Dam/Burekup Weir in summer to flush out the build up of nutrients.

Sediments build-up in lower Collie River reduces depth at the river mouth. One interviewee noted that the build-up of sediments makes the river unattractive to most swimmers. Another interviewee indicated that the reduction in river depth can limit boat access and mobility. It was noted that dredging has normally rectified this problem.

Several interviewees commented on the saltwater that intrudes into the lower Collie River. They noted the importance this saltwater plays in creating a habitat to support fish species such as black bream and mulloway. However, they expressed concern that too much saltwater would change the system enabling the intrusion of marine species, which would out compete and diminish existing black bream and mulloway populations.

Logs and rocks in the river provide habitat for aquatic species. Interviewees thought it important to maintain the existing logs and rocks in the river and in some instances, add additional ones to further support marroning and fishing.

A few interviewees noted that the rocks and logs can create riffles, which could help prevent fish kills by oxygenating the river. The depletion of oxygen is often what causes fish kills.

Overhanging fringing vegetation (e.g. tree branches, tall grasses) was identified by several interviewees as important in providing aquatic fauna and helping regulate water temperatures.

Table 21 Perceived required water conditions South Western Highway to the River Mouth

Site	Social value	Activity	Stakeholder views
South Western Highway to River Mouth	Recreation	Marroning	Marron season is in summer (January/February). Maintain water conditions year round to support marron.
		Fishing	Popular fish species include: red fin perch, black bream, and mulloway. Anglers also catch crabs. Maintain water conditions to support these species.
		Fishing	Fishing occurs from the foreshore and boats. To support boats, maintain water depth at a minimum of 750 millimetres.
		Fishing	Fish kills occurred in 2002, 2003, and 2004. The kills diminish the social value. Measures are needed to reduce the occurrence of fish kills (See below).
		Canoeing	Canoeing is a popular activity year round but is most popular in summer. Maintain water depth at a minimum of 0.6 metres. A depth of 1.2 metres to 1.5 metres would provide good canoeing conditions.
		Tourism	Maintain the water conditions to support boating year round.
		Tourism	Maintain water conditions to support canoeing/kayaking. This type of tourism occurs spring to autumn, with peak season January – April.
The Elbow	Recreation	Fishing	Anglers fish for black bream between the Brunswick River and the Australind Bypass. Maintain water conditions to support black bream along this river stretch.
		Picnicking	Picnicking is a popular activity. Maintain water so as to provide the current views of open water.
Eaton Foreshore	Recreation	Walking, cycling, picnicking	The Eaton foreshore is a popular spot for walking, cycling and picnicking. Maintain current water conditions. Water levels need to be maintained to provide the current views of open water.
		Camping	Approximately half of the campers take part in activities onsite, including canoeing, fishing and swimming. Conditions should be maintained to support these activities. Too much flow would be dangerous. Current condition of 1.8 – 2.2 metres depth in the centre of the river is sufficient.
		Swimming	Swimming is limited in the Collie River. The build up of siltation makes the river unattractive to swimmers. To enhance the social value, measures should be taken to reduce siltation (See below).
Clifton Park	Recreation	Walking	Maintain water so as to provide the current views of open water.
		Walking	Maintain water conditions to support foreshore vegetation.
	Education	Maintain water conditions to support foreshore vegetation.	

4.4 Development of social water requirements

Social water requirements are the “... elements of the water regime that are identified to meet social (including cultural) values” (WRC 2000, p. 12).

Social water requirements are the water conditions required to meet the social values attributed to a water feature. The water conditions are described in three ways: flow rates, water levels and water quality. The DoW will translate the information provided in Tables 20 and 21 into social water requirements, including a description of the required flow rates, water levels and in some cases the water quality.

4.5 Management considerations

Management issues were raised in a couple of interviews and included climate change, scientific uncertainty and the potential for changes in releases from Wellington Dam. The interviewees that commented wanted to know how these issues would be addressed during the water management process.

Climate change and reduced rainfall over time may result in decreased flows in the lower Collie River. Interviewees believed that this would likely require trade-offs between uses. Concern was expressed that non-consumptive uses (e.g. ecological and social values) would lose out to consumptive uses if trade-offs are needed.

A couple of interviewees noted that although scientists use the best available data and information, there is still a degree of uncertainty in science based decisions. These interviewees wanted the DoW to err on the side of caution when allocating water to meet ecological values.

One interviewee applauded the efforts by the DoW and agriculturalists to reduce salinity levels in the Collie River catchment. The interviewee noted that the scouring regime at the Wellington Dam, has changed the downstream environment. If salinity levels drop, will scouring still be required? If scouring is not longer required, how will this impact downstream social and ecological values?

5 Restoration of the lower Collie River

5.1 Lower Collie River Action Plan

The *River Action Plan for the Lower Collie River* (Taylor 2008) (RAP) provides an assessment of the health and current state of the river and recommendations for addressing key management issues. This includes the loss of native fringing vegetation, weed invasion, erosion, and water quality issues.

In developing the plan, a foreshore condition assessment was completed (Box 3). The assessment indicates that much of the foreshore is in poor condition (Grade C), with the exception of the Wellington National Park (Grade A). There are short stretches around Burekup Weir and between the Australind Bypass Bridge and Eaton that are in reasonable condition (Grade B).

Box 3. Foreshore Assessment

The lower Collie River foreshore was assessed using the Dr Luke Pen and Margaret Scott Foreshore Condition Assessment method. The method grades the foreshore into four categories. Grade A areas are pristine or near pristine condition. Grade B areas are weed infested but still have tree cover. Grade C areas are eroding or are prone to erosion and Grade D areas are ditches or drains.

As resources become available, the DoW and the Leschenault Catchment Council (LCC) would like to undertake restoration works along the lower Collie River (e.g. revegetation, spraying weeds). This will, in part, be guided by the RAP. Other factors that will be considered include foreshore access (e.g. steep banks, publicly owned), the amount of money available, and support from community groups (e.g. volunteers available to revegetate an area).

5.2 Restoration

During the interview process, stakeholders were asked to identify areas along the lower Collie River they thought needed restoration. Most responded first by identifying areas that have been restored. Restoration efforts identified were:

- The Shire of Dardanup with support from the LCC, DoW and Green Corps²⁷ revegetated a 700 metre stretch of the southern foreshore, on either side of the Hough Homestead²⁸.
- The LCC has coordinated, in conjunction with the DoW and Green Corps, extensive restoration of the Elbow. On-going efforts have included fencing and bollards to prevent 2 and 4WD vehicles from accessing and eroding the walk trails.
- The LCC, in conjunction with Crystal Global Inorganic Chemicals²⁹ and the DoW, has undertaken restoration works along the river foreshore, adjacent to CGIC's Plant (Lot 4, Old Coast Road, Australind). This has included weed control, revegetation and development of walk trails. These works were completed as part of the Liking Communities Project, to link Clifton Park and Australind.
- The Leschenault Ribbons of Blue program has coordinated a variety of revegetation projects. Students helped to revegetate the foreshore of two agricultural properties along Seven Hill Road. In conjunction with the Clifton Community Reserve Committee, students revegetated the foreshore at Clifton Park.
- Revegetation has also been undertaken along Millars Creek, a tributary of the lower Collie River. MillBridge Estate is a residential development along Millars Creek, a tributary of the lower Collie River. The developer, Ardross Estates, has established a number of walk trails long the creek and in the process has revegetated a number of stretches. These works were undertaken as part of their development responsibilities outlined in a Foreshore Management Plan.

5.3 Areas identified for restoration

All of the interviewees thought it important to restore degraded areas along the lower Collie River. The most commonly cited types of restoration were revegetation, rock pitching and weeding. Interviewees noted that restoration works can help to stabilise the river bank, preventing further erosion and the build up of sediments in the river. A couple of interviewees noted that revegetation can provide habitat for fauna and corridors for flora and fauna movement.

About half of the interviewees identified specific sites/areas in need of restoration. The most often identified stretch was the Eaton Foreshore, which is identified as Grade C in the RAP. It was recommended that the area be revegetated and rocks used to stabilise the bank and prevent further erosion. A couple of interviewees identified the river stretch between the South Western Highway

²⁷ 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.

²⁸ The Hough Homestead is listed on the Shire of Dardanup Municipal Heritage Inventory. It is located off of Lusitano Avenue in Eaton.

²⁹ Formerly Millennium Chemicals

and the Australind Bypass and one interviewee identified the agricultural properties between Burekup Weir and the South Western Highway as areas in need of restoration.

The other individuals found it difficult to identify specific areas. A couple of interviewees thought it important to restore all degraded areas along the river. Others thought the DoW and/or the LCC were better positioned than other stakeholders in identifying areas in need of restoration.

5.4 Restoration considerations

Interviewees identified several factors that influence where future restoration works can be undertaken, including access and community support. Interviewees noted that much of the lower Collie River is surrounded by private property. In such cases, landholder approval is needed before restoration can be undertaken. Steep banks were also identified as limiting river access.

The importance of on-going management, monitoring and protection of restored areas was raised. The interviewees cited examples where revegetation efforts have been undone. In one case, a lawn mower was accidentally driven over newly planted vegetation during routine upkeep of the area. Others noted that vandalism and illegal use by ORVs have destroyed restored foreshore vegetation.

Several interviewees noted that in a few areas local residents have not appreciated revegetation works. Residents have vandalized (i.e. ripped out the newly planted vegetation) the revegetated public open spaces in an effort to restore their unobstructed views of the river.

6 Conclusions

Social value:

- The lower Collie River supports a variety of social values, including heritage, recreation, tourism, education, and aesthetics. These values are situated along two sections of the river.
- The first section extends from the base of Wellington Dam to Burekup Weir. This stretch is largely contained within the Wellington National Park. It has well established recreation facilities and attracts visitors from across the South West.
- The second section extends from the South Western Highway to the river mouth at the Leschenault Estuary. This stretch draws people from the local and greater Bunbury area. It is on the doorstep of a growing residential population, which may add pressure to the river system (e.g. additional recreationalists).
- Interviewees did not identify any social values along the remaining stretch of river, between the Burekup Weir and the South Western Highway. This was attributed to the lack of public access points, steep foreshores and obstructions in this river section (e.g. fences).

Water conditions required to support the social values:

- There are two significant management issues for long term maintenance of the social values of the lower Collie River. One is the maintenance of the flow regime between Wellington Dam and the Burekup Weir. The other is water quality concerns between the South Western Highway and the river mouth (e.g. nutrient and sedimentation build-up).
- Between the Wellington Dam and the Burekup Weir the current flow regime includes releases from the dam from about October to April for irrigated agriculture and June to August as part of the salinity scouring process. These releases mean that water is available in summer when other water features in the region experience decreased water levels or dry out. Interviewees expressed concerns that should there be changes in the flow regime (e.g. less water released for irrigation or scouring, changes in the CRID) the social values would be diminished.

- *Statewide Policy No 5* does not directly accommodate water quality issues associated with land use practices. However, most of the threats to social values between the South Western Highway and the river mouth are associated with land use practices. This means there needs to be a coordinated effort between the EWP process and land use managers.

River restoration:

- All interviewees thought it important to restore degraded areas along the river. The most commonly identified types of restoration included revegetation, rock pitching (to prevent erosion) and weeding.
- About half of the interviewees identified specific sites along the river that need restoration, the Eaton foreshore as the most commonly identified site. While the other half indicated that the DoW and/or the LCC were better positioned to identify and prioritise areas to be restored.

References

- Beckwith Environmental Planning. in press. South West Social Water Requirements Study. Prepared for the Department of Water. Perth, Western Australia.
- Beckwith Environmental Planning. 2007. Upper Collie Water Management Plan: Issue Scoping Report. Prepared for the Department of Water. Perth, Western Australia.
- Benson, E.D., J.L. Hansen, A.L. Schwartz, Jr, and G.T. Smerch. 1998. Pricing residential amenities: The value of a view. *Journal of Real Estate Finance and Economics*. 16(1): 55-73.
- Department of Conservation and Land Management. 2005. Wellington National Park and Westralia Conservation Park Draft Management Plan. Perth, Western Australia.
- Department of Water. 2007. The Leschenault Estuarine System, South-Western Australia: Condition statement and recommendations for management. Perth, Western Australia.
- Economic Regulation Authority. 2006. Issues Paper: Inquiry on Harvey Water Bulk Water Pricing. Perth, Western Australia.
- Environmental Protection Authority (EPA). 1993. A Guide to Wetland Management in the Perth and Near Perth Swan Coastal Plain Area. Bulletin 686. Perth, Western Australia.
- GHD. 2008. Draft Report for Collie River Irrigation System Planning: Interim Environmental Report. Western Australia.
- Lansford, N.H. and L.L. Jones. 1995. Marginal price of lake recreation and aesthetic: An hedonic approach. *Journal of Agricultural and Applied Economics*. 27(1): 212-23.
- Khorshid, R. n.d. Canoeing in Western Australia - Collie River Level. Perth, Western Australia.
- Randall. 1991. Total and Non-Use Values. In Braden, J. and Kolstad, C. (eds.). *Measuring Demand for Environmental Quality*. New York.
- Water and Rivers Commission (WRC). 2000. Statewide Policy No. 5: Environmental Water Provisions Policy for Western Australia. Perth, Western Australia.
- Western Australian Planning Commission. 2008. Draft Ocean to Preston River Regional Park Establishment Plan. Perth, Western Australia.
- Western Australian Planning Commission. 2000. Greater Bunbury Region Scheme: Scheme Report. Perth, Western Australia.

Appendix A Interviewed stakeholders

Affiliation	Interviewee
State government	
Department of Environment and Conservation	Ryan Boylan
Department for Planning and Infrastructure	Peter Gianatti
Water Corporation	Peter Buckley
Local government	
Shire of Dardanup	Alana Keane
Shire of Harvey	Peter Kay
City of Bunbury	Ben Deeley
Industry	
Harvey Water	Geoff Calder
South West Development Commission	Tom Busher
Recreation	
WA Bream Tournaments	Sean Forward
Scouts WA (Eaton campsite)	Noel Ward
South West Canoe Club	Robyn Harris
Tourism	
Dekked Out	John Leyendekkers
Education	
Leschenault Ribbons of Blue	Debbie Blake
Environmental groups	
South West Environment Centre	John Sherwood Susan Hill John Vukovich
Dardanup LCDC	Mike Bell

Appendix B Confirmation letter

Date

Stakeholder name

Address

Dear stakeholder name,

Thank you for your willingness to participate in our study on social values of the lower Collie River. In this instance, the term 'social value' includes recreation, Aboriginal and non-Aboriginal heritage, aesthetic, tourism, education and research values.

I look forward to meeting with you on <insert date> at <insert date> at <insert location>. If you need to change the date, time or location of our meeting, please contact me at my office on (08) 9450 8711 or my mobile on 0424 369 025.

The interview will focus on:

- Sites along the lower Collie River with social values
- Water conditions (e.g. water levels, water quality) required to maintain the social values
- Areas that require restoration on the lower Collie River

Our firm, Beckwith Environmental Planning, is conducting the interviews on behalf of the Department of Water (DoW). The DoW is undertaking water resource management planning in the lower Collie River catchment. A key early step in this process is the determination of Social Water Requirements (SWRs). SWRs are the water conditions and characteristics needed to maintain the social values of a water resource. Outcomes of this study will be used by the DoW in establishing SWRs and making water resource management decisions.

All interviewees will receive a copy of the summary report on the outcomes of the participant interviews.

If you have any questions prior to our meeting, please do not hesitate to contact me.

Sincerely,



Sabrina Genter

Contact Information

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Appendix C Interview guide

Introduction

Explanation of the project; purpose of interviews, confidentiality and reporting

Theme 1: Social values

What areas/sites along the lower Collie River support social values? Explain.

Describe these sites. Refer to template.

Are there particular groups that frequently use these sites?

What attracts you to this particular site (e.g. facilities, water levels)? Describe the features/characteristics that attract you to the site.

Theme 2: Water conditions required to maintain the social values

Describe the current condition of the site (e.g. water level, water quality, flow, riparian vegetation).

If the water regime is altered, how will this impact your value/use of the site? Describe the impact (negative and positive) a drop/increase in water level would have on the social values of the site. (E.g. If the water levels drop will the activity still be able to occur.)

Describe the impact (negative and positive) a change in water quality would have on the social values of the site.

Theme 3: Areas requiring restoration

Are there areas along the lower Collie River that require restoration? Are there degraded sites that should be improved? Where are these sites? Refer to map.

What type of restoration is required at these sites (e.g. revegetation)?

If you were given the task of deciding where to spend limited restoration funds, which locations would you select?

What criteria would you use to assess how these funds are spent (e.g. most ecologically degraded, most frequently used by recreationalists)?

Appendix D Data template

Site/location: _____

Social values

Type of social value/use: _____

Specific activities: _____

Level of use

Visitor numbers: _____

Visitor catchment: _____

Capacity: _____

Seasonality of use: _____

Trends in use: _____

Planned changes: _____

Site characteristics

Size: _____

Accessibility: _____

Facilities: _____

Surrounding land uses: _____

Management status: _____

Land security: _____

Rare species: _____

Unique attributes: _____

Water conditions

Current site condition: _____

Substitutability of use/value: _____

Depth (minimum, ideal): _____

Water quality (minimum, ideal): _____

Flow rates (minimum, ideal): _____

Key environmental values: _____