



# Culham Inlet management plan

June 2008



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**Australian Government**

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**Subject of cover photograph**  
*Culham Inlet 2007*

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*Some members of the Culham Inlet Steering Group  
April 2008*

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The preparation of this plan was funded by the National Action Plan for Salinity and Water Quality through South Coast Natural Resource Management Inc.

This plan was written and project managed by Mieke Bourne with assistance from Chris Gunby, Department of Water.

# Summary

Culham Inlet is recognised in the *South Coast Regional Strategy for Natural Resource Management* as an inlet with significant community values and a priority for management. The inlet is listed on 'A Directory of Important Wetlands in Australia' for its importance as a place of habitat and refuge, particularly for birds and for its historical significance.

Culham Inlet is a large shallow inlet which remains closed off from the ocean most of the time. It lies on the eastern boundary of the internationally recognised Fitzgerald River National Park and is 7 km west of Hopetoun in the Shire of Ravensthorpe.

Mining in the area has resulted in a recent increase in population and associated development. With this development it is expected that there will be an increase in pressures on the inlet. Catchment impacts through higher salt, sediment and nutrient loads also pose a risk to the inlet.

Culham Inlet, like most estuaries on the south coast, is managed by several different government agencies. There is no lead agency or endorsed management plan for the inlet.

In summary, Culham Inlet is important, valued by the community, at risk and has no integrated management. For these reasons this plan has been developed.

The preparation of the plan was guided by a steering group which was comprised of representatives from local and state government agencies, key organisations and the local community. The group first met in February 2007.

The plan is based on identifying, protecting and enhancing community values, while reducing threats to the inlet and promoting integrated management.

The plan was prepared using available information and knowledge. As such there are several information gaps which will be filled as the plan is implemented.

Community values for the inlet were identified through a survey, representation on the steering group and feedback as the plan was prepared. Threats to these values were then determined and background papers prepared. From this process came six management strategies:

- Managing for the future
- Planning access, recreation and development
- Promoting integrated sandbar management
- Improving water quality
- Increasing our understanding and protection of plants and animals
- Promoting community involvement and education.

Under each strategy are actions which, once implemented, are intended to either enhance a value or reduce a threat.

The plan's implementation will be overseen by a management group and coordinated by a project manager. The establishment of the group and manager are considered essential to ensure implementation of the plan. The progress of implementation will be measured using short- and long-term targets and reported back to the community. The plan will be reviewed after 5 years but it is expected that it will be updated constantly as new information becomes available.

## Linkages and legislation

This management plan for Culham Inlet aims to better address community aspirations and integrate existing management, but does not override existing plans or legislative responsibilities.

Culham Inlet is presently managed by different government agencies and some issues highlighted in this plan are best managed through their individual processes. Below is a list of these agencies, their management responsibilities and the main plans and legislation that relate to Culham Inlet:

- The Department of Environment and Conservation manages the Fitzgerald River National Park which includes the western foreshore of Culham Inlet. The *Fitzgerald River National Park Management Plan 1991–2001*, a statutory management plan under the *Conservation and Land Management Act*, outlines the activities that can be undertaken in the park.
- The Department of Fisheries manages the fish resource in the inlet. The *South Coast Estuarine Fisheries Management Plan* outlines the restrictions on commercial fishing at the inlet. Recreational fishing restrictions are outlined in the *Fish Resources Management Act 1994* and associated regulations.
- The Department for Planning and Infrastructure manages boat usage on the inlet through the Navigable Waters Regulations 1958 and the *Marine Act 1982*.
- The Shire of Ravensthorpe manages development and land use planning, which is particularly relevant to the area east of the inlet with the growth of Hopetoun. The Shire also, through its management of roads and reserves, has a major influence on access to the inlet.
- The Department of Water has general responsibilities for the management of water resources and on the south coast undertakes considerable research and monitoring of estuarine condition, as well as resource planning and protection.

Additionally, Ravensthorpe Agricultural Initiative Network has worked with the West River Catchment Group to develop the *West River Catchment Plan* which is currently being implemented.

The South Coast Management Group has prepared a strategy, called *Southern Shores*, to guide coastal and marine planning and management from 2001 to 2021. This document discusses estuarine management.

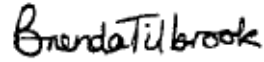
Background Paper Four for the *South Coast Regional Strategy for Natural Resource Management* considers water resources in the South Coast Region. This document outlines south coast estuarine values and threats and provides a framework for determining which systems, such as Culham Inlet, are priorities for management.

## Pledges of support

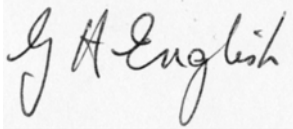
The following agencies endorse this management plan and pledge support for the cooperative implementation of its actions.



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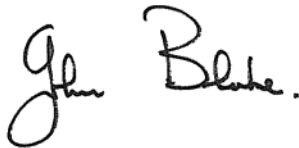
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# 1 Culham Inlet - an overview

## 1.1 Description

Culham Inlet is a large (approximately 11.3 km<sup>2</sup>) shallow inlet located approximately 7 km west of Hopetoun on the south coast of Western Australia (see map page 11). It falls within the internationally recognised Fitzgerald Biosphere established through the United Nations Educational, Scientific and Cultural Organisation (UNESCO) Man and the Biosphere Programme, and borders the Fitzgerald River National Park, which is noted for its great diversity of native vegetation.

Culham Inlet is one of 28 major estuaries on the south coast and is particularly noted for its bird populations and environmental values.

Hopetoun is experiencing rapid population growth and expansion as a result of mining and this is likely to increase visitor use of the park and inlet. Access to the inlet, however, is limited to Hamersley Drive where it crosses the inlet and the eastern shore at the end of Phillips River Rd.

Culham Inlet is fed by two rivers, with a combined catchment area of 2307 km<sup>2</sup> and unnamed drainage from the Eyre range (see map page 11). The Steere River originates 25 km north of the inlet and the Phillips River which has its headwaters 120 km inland. The major tributary of the Phillips River is the West River. These rivers are typical of those in the area as they normally have low flow, are naturally saline and experience unpredictable and sporadic flooding.

There are several Indigenous heritage sites recorded in the area but little written information is available on the importance of Culham Inlet to its Traditional Custodians. The report from a workshop, held at the inlet in December 2007, with representatives from Noongar families with a traditional link to the area, provides some initial information.

The first recorded European visit to the area was in 1835 when two English lads, James Newell and James Manning were marooned on the coast east of Esperance and succeeded in making their way on foot to King George Sound. In June 1841 Edward John Eyre camped at the base of East Mt Barren, which lies just to the west of the inlet; he called the inlet a salt lake and noted that there were natives in the middle of the lake carrying boughs and apparently fishing. In 1849 after returning from the Esperance area and while exploring the Phillips River area, John Septimus Roe named the inlet after the estate of his son-in-law.



*Sheep farming in the Culham Inlet catchment (photo by Tracy Calvert, 2007)*

The first pastoral leases were granted in the catchment in the late 1800s with most catchment clearing for agriculture commencing in the 1950s. Currently, within cleared areas, agricultural systems are predominantly broad acre cropping and livestock production. Mining historically and currently takes place in the upper Steere River catchment, primarily for gold and copper. In uncleared areas of the catchment the focus is on the conservation of unique native plants, animals and ecosystems.

The south coast generally experiences a Mediterranean climate with cool wet winters and hot dry summers. The area in and around the Culham Inlet catchment experiences a high variability and unpredictability in rainfall and can receive significant intensive summer rain events.

Culham Inlet is a shallow basin about 1 m below mean sea level. The inlet is separated from the sea by a 1 km long sand dune which acts as a bar and is quite high to 15 m, in places. Hamersley Drive, which provides eastern access to the Fitzgerald River National Park, runs along the inlet side of the sand dune.

Prior to 1993, Culham Inlet was considered permanently closed or a 'fossil estuary' as it had not breached its sandbar and opened to the ocean in over 70 years. The inlet varied in depth from around 4 m AHD (Australian Height Datum) to -1 m AHD (that is, empty) depending on river flow and periods of evaporation. All the following measurements in this plan are in AHD.

In 1989, above average rainfall resulted in water levels in the inlet of about 3.3 m and flooding of adjacent low-lying paddocks and roads. In 1990 a pipe with an internal diameter of 900 mm was installed on the eastern end of the bar, with an overflow level at 2.2 m. Then in 1992, high rainfall brought the inlet's water level to around 3.9 m. At this time water seeped through the sand dune along its length and flowed strongly in the location of the 1990 pipe.

By mid-March 1993 the water level had lowered to 2.2 m due to evaporation and seepage but by early May above average rainfall on a saturated catchment had brought the level back to 3.3 m, a high level at the beginning of winter. The decision was made to release some of the inlet's water without breaking the bar, so a cut was made on the western end of the dune which was considered the strongest part. However, more rain in late May, before the spillway could be completed, further raised the inlet's water level and water tore through the cut creating a large breach in the sandbar and destroying a 400–500 m section of Hamersley Drive. Available information suggests that the amount of water entering the inlet at this time could have raised the inlet level to 4.5 m and led to a natural sandbar opening if the cut had not been made. The sandbar reformed to a height of approximately 2.3 m within 3 months of the breach.

Following this event the road was realigned further inland where a causeway was built with culverts and a floodway (see picture on following page). Then, in January 2000, two 100 mm rainfall events within 10 days resulted in another breach of the sandbar and destroyed the new road structure. Since that time, the causeway has been rebuilt with two changes; the lowering of both the floodway and the sandbar. To protect the road structure it is now required that the water level in the inlet does not exceed 3 m. To ensure this, the sandbar on the western edge of the dune line needs to be kept at a maximum of 3 m.

Ernest Hodgkin suggested in 1997 that recent clearing in the catchment may have resulted in increased river flows which could be a factor in increased inlet levels and sandbar openings in more recent years.



*Hamersley Drive crossing Culham Inlet, (photo by Mieke Bourne, 2007)*

Present road alignment

Old road alignment

Sandbar

Extreme variation in water flow makes Culham Inlet a naturally complex biological ecosystem. The inlet has been known to hold water for many years, from river flows that almost fill the inlet without breaking the bar. The inlet can also dry out completely following a break of the bar or after a long period without significant river floods and with high evaporation. With these drastic and unpredictable changes in the water volume, the salinity at different times varies from less than one third sea water when full to eight times that of sea water when shallow, producing sheets of salt crystals round the margins.

These natural changes in inlet water depth and salinity result in variations to both the plants and animals that live there. For example, when water levels are high the fringing vegetation can be flooded and die, but when the inlet dries up the rising salinity can result in mass fish deaths.

Biologically, there is limited information available on the plants and animals at the inlet due to limited studies in the past. The inlet is very important for birdlife and is listed on *A Directory of Important Wetlands in Australia* – its listing based partly on the large number of birds found there when conditions are favourable.

Culham Inlet has a low diversity of fish types with only ten different types caught during a study between 2002 and 2004. Black Bream are recreationally and commercially the most important fish in the inlet. When water levels have remained high for an extended period the Black Bream commercial fishery has been very productive with up to 77 tonnes caught in one year. These conditions have not occurred since 1993.

The local area has a diverse and remarkable geology with quartzite hills to the west of the inlet and flatter coastal plains to the east. There are many different rock types and formations around the inlet providing diverse habitats for both plants and animals.

The vegetation corridors along the rivers form an important link from the coast to the inland areas. In the case of the Phillips and West rivers, the foreshore vegetation is in very good condition with most fenced off from adjacent farmland. A recent assessment of the Steere River and its tributaries found that weed infestation was degrading the main river channel

and that the tributaries showed additional manifestations of degradation including erosion, excess sediment transport, secondary salinisation and water impoundment.

Recreational use of the inlet is limited and often focuses on observing nature, such as bird watching. However, at times when the inlet is full, fishing, canoeing and boating often take place.

## 1.2 Environmental conditions of concern

The current environmental condition of the inlet cannot be adequately defined due to the lack of baseline and monitoring data. What is known is summarised in the *Culham Inlet Condition Statement* (Forbes, 2007), some of which is repeated below.

### Catchment clearing

With almost 50 per cent of the catchment being cleared of native vegetation and farmed it can be assumed that water flows and quality of water entering the inlet from the catchment have been affected.

Removal of deep-rooted vegetation in the catchment has resulted in increased speed and volume of water run-off following rainfall in the catchment. This, in turn, could result in a slightly greater number of bar breaks in the altered system and associated emptying of the inlet's water.

### Sandbar management

It has been suggested that the design of the road structure and maintenance of the sandbar at a maximum of 3 m will result in a greater number of breaks. This is because when water levels reach above 3 m but below 4 m as occurred in 1989 and 1992 the bar will break, which it is unlikely to do if the bar were allowed to return to its natural height. When the bar breaks, most of the inlet's water is lost as the system is shallow and the culverts are set at a low level. Evaporation following a break can produce shallow, hypersaline and inhospitable conditions for plants and animals.

### Sedimentation

Tailings from the Elverdton mine were historically deposited into an unconfined tailings facility at the head of the Steere River catchment. These tailings have since been gradually washed downstream smothering vegetation and has resulted in the severe decline of existing river banks. Until confined, the tailings will continue to move downstream and swamp vegetation. The impact of these tailings on water quality and the inlet need to be further investigated.

There are no major recorded areas of erosion along the Phillips River or sedimentation of river pools, unlike many other rivers on the south coast. Sedimentation from areas along the Steere River has been identified as an area of concern but more information is needed on the impact of this sediment on the inlet.

### Nutrients

Nutrient levels in the inlet generally exceed national guidelines and while information on nutrient levels in the rivers is sparse, it is likely that they have increased since land use change in the catchment. The high nutrient levels may be a result of fertiliser application and livestock near rivers. The risks posed by nutrient enrichment to the ecology of the inlet are somewhat overshadowed by the extreme natural cycle of periodic flooding, evaporation and complete dry out which have a greater impact on the ecology.

Nevertheless, high nutrient concentrations can still prompt phytoplankton blooms under the right conditions, for example, after summer rainfall events when plant productivity is at its highest.



*Testing water at Culham Inlet (photo by Tracy Calvert, 2007)*

### Salinity

Catchment clearing has resulted in rising groundwater levels with trends indicating a rise of 0.35 m per year in the Ravensthorpe area. The rising groundwater brings salt to the surface which affects the productivity of the land and can make its way into waterways via water run-off and seepage. The impact of increased salt loads on the inlet is not well understood but is of concern. The inlet is naturally saline and at times hypersaline; however, an increased salt load from the catchment could exacerbate the impact of salinity on the ecology, particularly on Black Bream mortalities. Black Bream start to suffer under increased salinities and these levels could be reached earlier in the season and with greater frequency due to increased salt loads from the catchment. Additionally, increasing salt loads in river pools threatens the role of pools as a place of refuge for Black Bream escaping higher salinities in the inlet's basin.



*Dead fish at Culham Inlet following a fish kill in April 2001 (photo by Steeg Hoeksema, Centre for Fish and Fisheries Research, Murdoch University)*

### **Climate change, acid sulfate soils, recreation and invasive species**

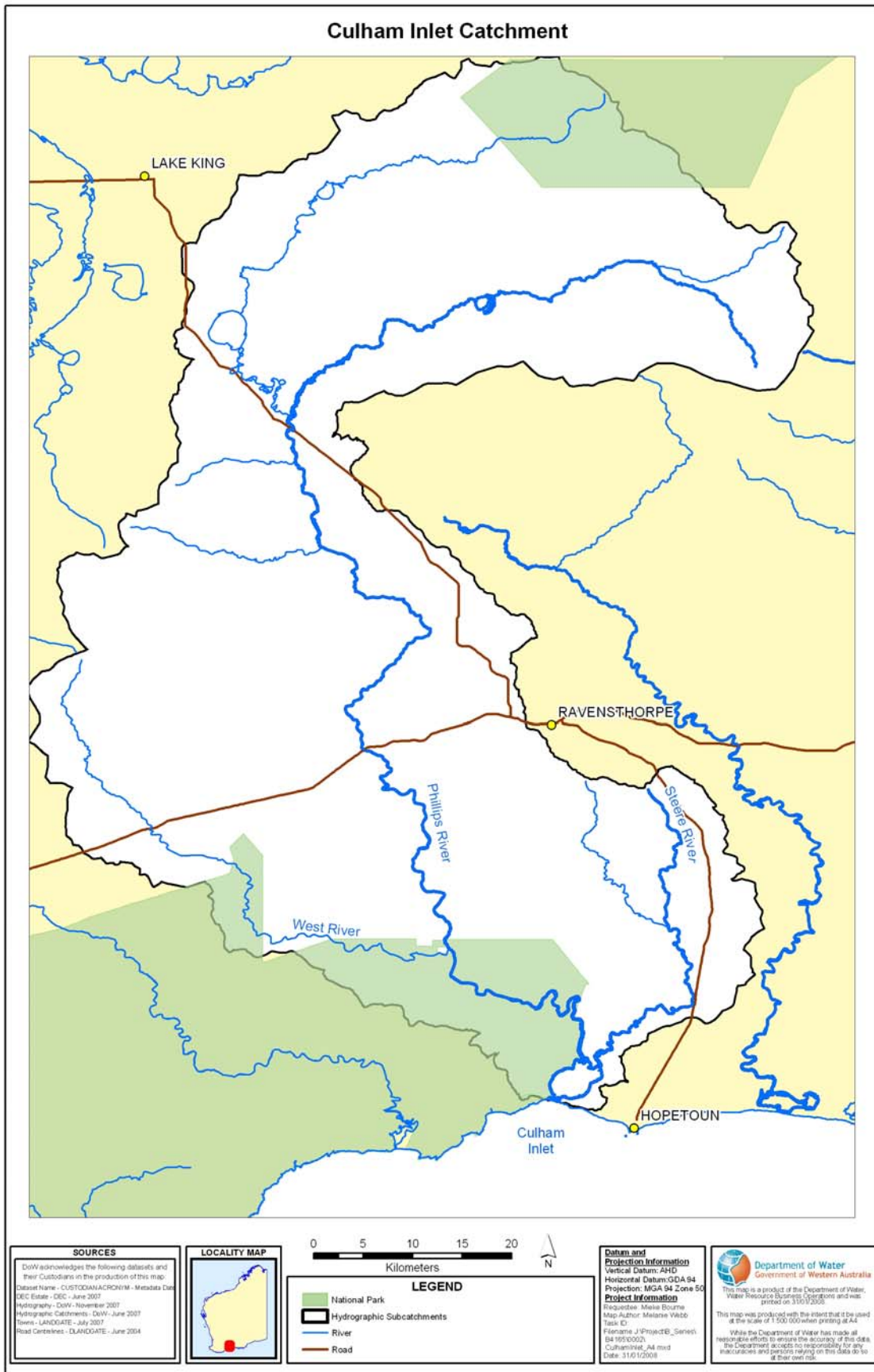
Climate change could have implications for the inlet in the form of rising sea level and changes in temperature and rainfall. Again, more information is needed to determine the extent of these impacts.

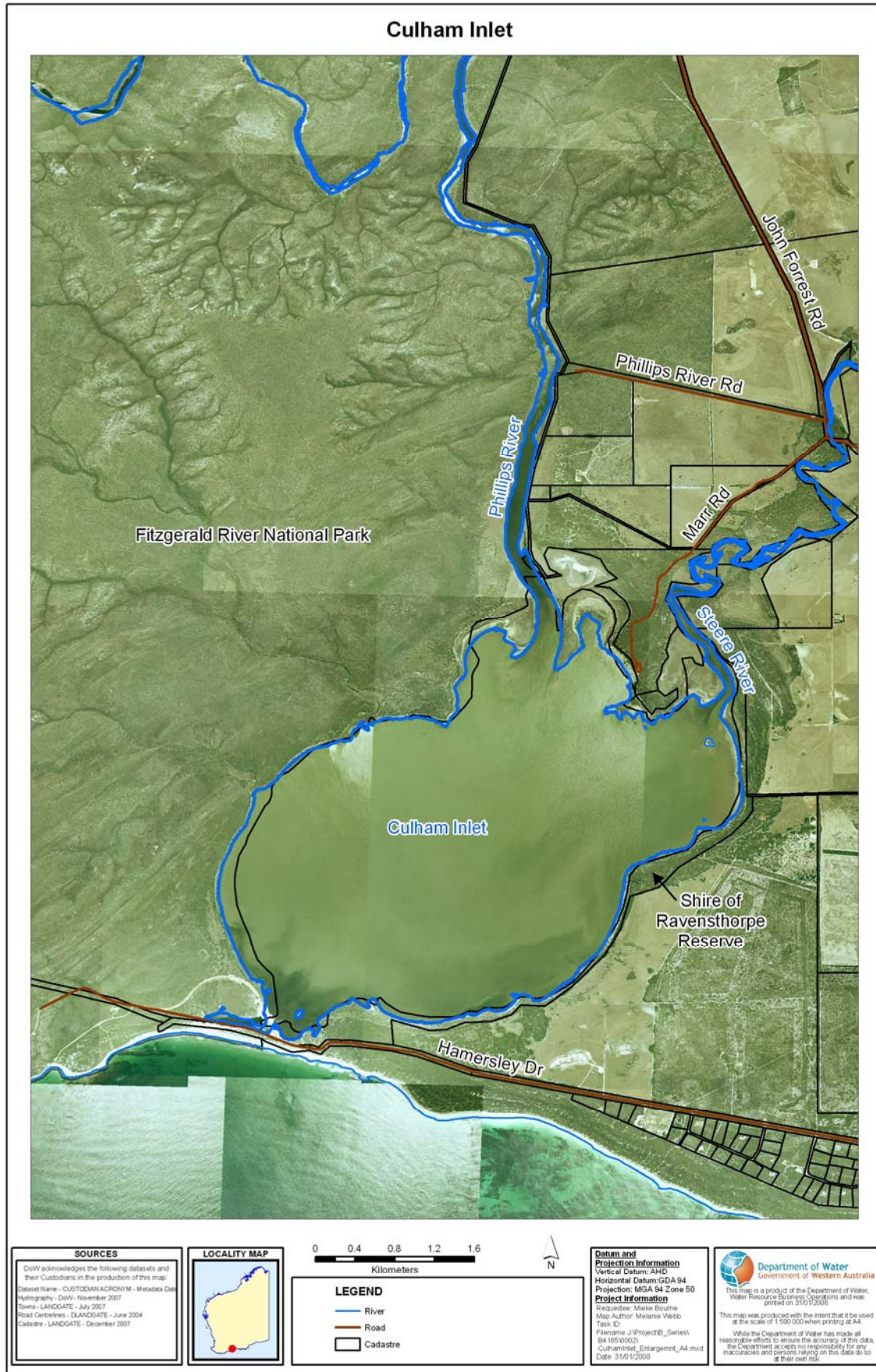
Almost half of the Ravensthorpe area is at moderate risk of subsurface acidity; low-lying areas are particularly at risk of acidification. This may pose a threat to waterways where acid can leach into them. More research is needed into the risk and impacts of this.

The environmental impacts of recreational use on the inlet are not known at this stage but are expected to be quite small due to its limited use for this purpose. Future developments near the inlet, if approved, are likely to magnify these impacts through increased access and use.

Weeds and feral animals also threaten the plants and animals of the inlet. Both weeds and ferals can move down the river corridors from the catchment to the inlet.

As identified above there are several information gaps which need to be filled to better understand the environmental condition and threats to the inlet. These will be addressed through actions in the plan.





### 1.3 Why the plan is needed

Culham Inlet is recognised in the *South Coast Regional Strategy for Natural Resource Management* as an inlet with significant community and environmental values.

Presently, there is no single agency or integrated approach to management of the inlet and so there is no coordinated approach to tackling any of the inlet's management issues. This is typical of many south coast estuaries.

Despite this there is considerable work being undertaken by agencies, catchment groups and landowners seeking to better protect and enhance the catchments that feed the inlet. An example of this is the important Landcare work being carried out by the Ravensthorpe Agricultural Initiative Network and catchment groups in the Phillips and West river catchments.

The benefits of having a plan for the inlet are that it can promote a more integrated approach to the work presently being undertaken, gain wider community input, better describe the inlet's values, and attract funding to implement important measures to enhance and protect these values.

### 1.4 How the plan was prepared

This plan has been prepared over twelve months, using available information, knowledge and expertise, and guided by a steering group representing a wide range of interested parties.

The plan has been prepared using an approach that has previously been applied successfully to other estuaries. Social values for the inlet were obtained through the use of a survey sent to local residents and from available literature. An assessment of the inlet's condition was also prepared using available monitoring data and information, and provided recommendations for further research. From this work, important issues and gaps in knowledge were identified by the steering group and background papers were prepared on these issues. The background papers included recommendations on actions that could be included in the draft management plan. These actions were considered by the steering group and were subject to considerable public input. Endorsement of the plan by agencies likely to be responsible for its implementation followed the consultation period.

The process used was chosen to minimise expense and stakeholder 'burn-out' and to maximise community ownership whilst also recognising the statutory role of several agencies. It provided guidance for some initial work to start at Culham Inlet in a very short time frame. With this approach there remain knowledge gaps, which are recognised, and the plan provides guidance on further research needs. It is expected that this plan will be frequently reviewed as new information arises from research.

It is expected that the integrated approach applied to the plan's preparation will continue through implementation assisted by good communication networks and an ongoing Culham Inlet Management Group.

This plan is a summary of an extensive amount of information, research and reports prepared and accessed during the plan's preparation. This information is listed in the reference section and briefly summarised in the plan. Readers are invited to obtain and

read the background information if they would like to gain a greater understanding of the actions contained in this plan.

## 2 Community values for Culham Inlet

A survey was undertaken to determine community attitudes to Culham Inlet and was distributed throughout the Shire of Ravensthorpe in mid 2007. Of the 47 respondents, 32 felt Culham Inlet was very important. When asked 'What are the things you value most about the inlet and its foreshores?', the values which received the greatest response were birdlife, beauty/scenery, unspoilt natural environment, flora and fauna (plants and animals), peace and solitude. These are listed below in table 1.

**Table 1 Community values for Culham Inlet**

<b>Value</b>	<b>Number of respondents</b>
Birdlife	16
Beauty/scenery	15
Natural environment/ecosystem	12
Unspoilt/untouched/not developed	10
Flora/fauna/vegetation	9
Fishing	9
Peace/solitude	4
Picnic facilities	3
Canoeing/kayaking	3
Good place to take family	2
Freedom to visit	2
Bushwalking	2
Boating	1
Unique	1
Swimming	1

*These values have been grouped and listed as the values for the inlet shown in table 2.*

Response to the survey was less than expected and it is possible that not all the communities' views on the inlet have been captured. It is likely that as more people become involved in this project the listed values for the inlet will expand.

Values identified by the steering group and in the available literature were generally similar to those identified by the community.

The Shire of Ravensthorpe provided a response to the survey which focused more on the inlet's value as a place for recreation and tourism given the growth of Hopetoun. This view has also been considered in this management plan.

## 3 Threats to the community values for the inlet and opportunities

### 3.1 Threats

The community was asked if they were concerned about the inlet's future and if so, why? Thirty out of the 44 responses to the survey indicated that they were very concerned. Development, human interference and population pressures were the greatest perceived threats. Additional threats to the identified values were obtained through available information and knowledge about the inlet. All these threats are listed in table 2.

Given the expansion of Hopetoun and private ownership of land near Culham Inlet, it is expected that population and development pressures will increase and therefore must be managed. For this reason they are covered in this plan.

It should also be noted that several of the threats are likely to increase with the increasing population of the local area and increasing development pressures.

Presently, access to the inlet is limited and this can be seen as both a positive aspect and as a threat. Restricting access limits human impact on the inlet but may also result in a lower appreciation of the area by the community. Often areas that are not visited or used are not as valued by the wider community and so can receive less protection. This concept is considered further as actions in this plan.

Catchment impacts such as increased sediment, salt and nutrient loads to the inlet can impact the quality of the water flowing into the inlet. These threats along with a number of others were discussed in section 1.2 as environmental conditions of concern.

### 3.2 Opportunities and management strategies

Currently, there is limited public use of the inlet but as local population increases, the community values are likely to change over time. This plan provides a great opportunity to plan for the future and consider managed access while protecting the environmental values.

By considering the community values and the threats for the inlet, six management strategies have been proposed. Each strategy has several actions which once implemented are intended to improve understanding, enhance values or reduce threats.

The management strategies identified for Culham Inlet are:

- **Strategy 1. Managing for the future:** Considers how the plan will be implemented and by whom.
- **Strategy 2. Planning of access, recreation and development:** Discusses what future development proposals near the inlet need to consider, and options for improved and defined access.
- **Strategy 3. Promoting integrated sandbar management:** Brings together aspects of the current sandbar management and considers additional options for the future.

- **Strategy 4. Improving water quality:** Focuses on the negative catchment impacts on water quality and how these can be measured and reduced.
- **Strategy 5. Increasing our understanding and protection of plants and animals:** Looks at what studies need to be undertaken to better understand the inlet's plants and animals.
- **Strategy 6. Promoting community involvement and education:** Suggests options for promoting community ownership of the inlet's management.

The actions outlined under each strategy provide more detailed advice on how each strategy can be achieved.

It should be noted that some actions were implemented during the plan's preparation and so are not included in the plan. These include increasing the number and types of water samples taken from the inlet, a social survey and a workshop with Traditional Custodians, as well as completing a condition assessment of the Steere River's foreshore vegetation. The references and further reading section of this plan provides details on where reports on each of these work areas can be obtained.

**Table 2 Community values, threats and management strategies for Culham Inlet**

Community values	Threats to the values (perceived and / or recorded)	Management strategies to manage the threats and enhance the values
Beauty / scenery	Development	Managing for the future
Birdlife	Weeds / feral animals / dieback  Reduced water quality from catchment impacts, including Elverdton tailings	Planning of access, recreation and development
Healthy natural environment	Water level too low due to sandbar management or too high and flooding of road, farmland and vegetation  Access either too restricted or too much, such as illegal tracks	Promoting integrated sandbar management
Plants and animals	Population pressure / human interference  Overfishing / lack of fish, primarily Black Bream	Improving water quality
Solitude and peace	Speed boats / jet-skis  Climate change	Increasing our understanding and protection of plants and animals
Recreation	Fire either too much or too little  Rubbish  Insufficient and uncoordinated management  Lack of appreciation and understanding of inlet's values	Promoting community involvement and education

*Each value has a number of threats and each strategy covers many values and threats.*

## 4 Looking to the future

Work at Culham Inlet and in the catchment is likely to continue beyond the actions within this plan, most of which are expected to be completed over 5 years. Additionally, natural resource management work generally takes years to implement, with the results sometimes taking decades to become apparent. Therefore, it is useful to have an aspirational goal that looks further into the future.

Using the community survey, the steering group developed a vision for the inlet which is:

**‘Culham Inlet has a natural setting and a diversity of habitats supporting abundant plant and animal populations, with public access that enables enjoyment of, but not damage to, these natural attributes.’** This vision should be used to guide all future work.

It is also helpful to have measurable long-term targets set 10 to 20 years into the future to keep track of how the inlet’s management is progressing.

Long-term targets for Culham Inlet are based on bird populations, foreshore vegetation condition and water quality. These have been chosen as birdlife was the highest community value, foreshore vegetation has a major influence on visual amenity and provides habitat to animals and good water quality is important to maintain a healthy system. Long-term targets can be hard to measure and individually may not always accurately reflect the condition of the inlet. Outside factors such as climate and rainfall can also influence the targets. Due to this the targets may not always be achieved individually, therefore three have been selected so that collectively they can be used to judge whether the plan has been successful (table 3). If none of the targets are achieved then the community values for the inlet are not being met and the plan and its implementation may need to be revised.

**Table 3 Suggested long-term condition targets for 2028 for Culham Inlet**

Long-term targets	Reason chosen	Measure
Bird populations and diversity is maintained.	Birdlife at the inlet is highly valued by the community.	Surveys of birdlife, to be guided by surveys and involving Birds Australia and local interest groups.
Condition of the estuarine foreshore vegetation are maintained or improved.	The foreshore vegetation provides habitat for animals and is an integral part of the inlet’s beauty.	Quality and coverage of foreshore vegetation as assessed during regular surveys.  Baseline information will be provided through the foreshore condition survey proposed for 2008/2009.  Must be measured using historical information as well so that cyclic changes in condition are taken into account.

Long-term targets	Reason chosen	Measure
<p>A long-term target to measure water quality is needed as the quality of the water impacts the rest of the system. Little information is available on the water quality but actions in the plan will provide more baseline data. When more information is available a target will be developed. It is likely that the target will be based on nutrient levels as these are most likely to be impacted by planned on-ground works in the catchment.</p>		

## 5 Management strategies

Within this section of the plan are six broad strategies that are suggested to improve the condition of Culham Inlet. The actions listed under each strategy, when implemented, are intended to improve our understanding, enhance a value or reduce a threat to the inlet.

Each action is explained and a time frame for expected completion provided. A lead agency is nominated for each action. The lead is not expected to complete all the work independently as it is intended that implementation will be a cooperative effort. For actions with the Culham Inlet Management Group nominated as the lead, it is expected that the project manager will coordinate their implementation with guidance from the management group. While all actions are important, they have been given a priority as 1–high, 2–medium or 3–low to help with the staging of implementation.

### Strategy 1. Managing for the future

One of the most important considerations is the need for leadership and coordination in the implementation of the plan – unless somebody is dedicated to the plan's implementation and this role is funded, it is unlikely the plan will be successful. The appointment of a project manager and management group are considered the most important actions in this plan.

#### **Action F1 Establish a Culham Inlet Management Group to oversee implementation of the plan.**

**Explanation:** This group is to be established as the first priority for implementation and should be comprised of representatives from agencies and organisations such as the Department of Water, Department of Environment and Conservation, Department of Fisheries and Department of Agriculture and Food WA, Ravensthorpe Agricultural Initiative Network, West River Catchment Group, the Shire of Ravensthorpe, Main Roads and South Coast Natural Resource Management. Additionally, the community, including the Traditional Custodians, will need to be represented. Servicing of the group is presently being discussed, but this is expected to be undertaken by Ravensthorpe Agricultural Initiative Network or the Department of Water, with the assistance of South Coast NRM.

**Lead:** Ravensthorpe Agricultural Initiative Network / Department of Water

**Priority:** 1

**Time period:** 2008

**Action F2 That a project manager dedicated to assisting with implementation of this management plan is appointed.**

Explanation: It is important that there is a person to take the lead in helping to implement this plan and to act as a point of contact for matters relating to the management of the inlet. It is expected that the proposed lead agency and the Culham Inlet Management Group will play a role in appointing this person. The project officer would also need to have strong links with the proposed catchment officer.

Lead: Ravensthorpe Agricultural Initiative Network / Department of Water / Culham Inlet Management Group

Priority: 1

Time period: Appointed 2008 and employed for the duration of the plan (5 years)

**Action F3 Seek funding and develop methodology for a regional cultural heritage assessment of the inlet area and associated waterways.**

Explanation: A workshop took place in December 2007 with 16 Noongar families represented. The outcomes and recommendations arising from the workshop are covered in a report and incorporated within this plan as actions. One of the key recommendations from the workshop was to complete a community-driven large-scale archaeological study of the inlet's cultural history. The Culham Inlet Management Group should support the establishment of this project which could be run collaboratively using existing models, such as the one used on Gondwana link properties.

Lead: Culham Inlet Management Group

Priority: 2

Time period: Initiate discussions with community leaders in 2009



*Group photo from the Traditional Custodian workshop at Culham Inlet (photo by Mieke Bourne, 2007)*

**Action F4 Investigate options to change the inlet's tenure.**

Explanation: The western foreshore of the inlet and estuarine reach of the Phillips River are managed by the Department of Environment and Conservation and the eastern foreshore is managed by the Shire of Ravensthorpe. Currently the inlet itself is not vested in any management authority and has no designated purpose. It could be beneficial to have the inlet managed by one authority, such as the local government, and options for this should be investigated. Changes in tenure must involve public consultation and be accompanied by adequate resources so that the area can be managed effectively.

Lead: Culham Inlet Management Group

Priority: 2

Time period: Initiate investigation by 2010

**Action F5 Support a review of the Fitzgerald River National Park Management Plan.**

Explanation: The existing management plan for the park was from 1991–2001. There is a need for the plan to be updated and revised. The revision of the plan, where it refers to the western edge of the park, should take into consideration issues and recommendations identified in this plan for the inlet and its foreshores. The management group should ensure they are consulted in the review of the park plan.

Lead: Culham Inlet Management Group

Priority: 2

Time period: Ongoing

**Action F6 Consider findings from completed climate change studies in management of the inlet.**

Explanation: Studies into the impact of climate change across the south coast have been completed for only a few rivers that have the potential for future drinking water supplies. No studies have been carried out to estimate the impact on south coast estuaries, although it has been proposed a study be undertaken for Wilson Inlet. It is recommended that studies into climate change look at the implications for an eastern inlet as well. Implications for the inlet's management would have to be determined by the new management group.

Lead: Culham Inlet Management Group

Priority: 3

Time period: Initiated by 2011

## Strategy 2. Planning of access, recreation and development

Public access to the inlet and its foreshore is presently limited. The continued growth of Hopetoun will place more demand on such access. Private land to the east of the inlet may be developed in the future. Development could provide an opportunity to obtain enhanced foreshore reserves and management. Access needs to be managed to ensure the present environmental values are not compromised.

**Action ARD1 Prepare a foreshore management plan for the eastern side of Culham Inlet.**

Explanation: The foreshore area presently has no plan to guide recreational use and protection. A foreshore management plan provides a means of agreeing on the recreational facilities to be provided, at what locations and which are the most sensitive areas to protect. A plan enables community input to these ideas and is a means of acquiring funding to implement priority actions. Both protection of the environment and improved access can be integrated in a plan. The plan would need to take account of the entire inlet foreshore but concentrate on proposals with regards to the eastern foreshore. It is proposed the plan would contain information on:

- preferred access points, both pedestrian and vehicle
- possible walk trails, seating and viewing platforms
- appropriate facilities and suggested locations for these (including bird hides, toilets and BBQs)

- high conservation areas to be protected
  - suggestions for positioning of interpretive signage
  - cycle and bridle trails access (practicality and desirability)
  - revegetation and weed control
  - boat launching facilities
  - fire management
  - animal and plant protection
  - preferred location, demarcation and vesting of a foreshore reserve
- Findings from several of the studies (Action ARD2 and some of the Actions in Strategy 5) are needed before a comprehensive foreshore management plan can be completed. While this action can be initiated in the first year of implementation it will not be finalised until 2010. The plan will be made available for public comment and should consider the Traditional Custodians views relating to development use and access.

Lead: Culham Inlet Management Group

Priority: 1

Time period: 2008–2010

**Action ARD2 Investigate possibilities for improved access to Culham Inlet, considering feasibility, practicability, community support and associated costs.**

Explanation: Presently access is restricted to a few locations. Adjacent and nearby land will potentially be developed in a way that will create a greater demand for access and potentially provide a means of funding and catering for improved access. The options for improved access have been initially discussed in the inlet use and access background paper but need further exploring, consultation and agreement to become part of a foreshore management plan (Action ARD1). It is expected an options paper will be used to look at this and confirm community support for such access.

Lead: Culham Inlet Management Group

Priority: 1

Time period: 2008–2009



*Boat launching point at Culham Inlet at the end of Phillips River Rd (photo by Tracy Calvert, 2007)*

**Action ARD3 Provide advice on the development of land near the inlet to ensure its environmental and social values are protected.**

Explanation: The development of some land near the inlet is likely given the present Town Planning Scheme. This development may impact on the inlet and its values. These impacts could include increased use, unmanaged stormwater and wastewater disposal, loss of vegetation, visual intrusion of buildings and changes in landform by the use of fill. Developments need to be assessed to ensure they do not negatively impact on the inlet's values. It is recommended that a guidance note be prepared to influence the design, location and management of proposed areas of development. This should be given recognition in the Town Planning Scheme. The guidance note will need to take onboard recommendations from Actions ARD1 and ARD2 and complement these with suggestions on the appropriate development set back and foreshore width (also considered in Action PA6). It is further expected that a condition of development will be to assist with the implementation of the foreshore management plan under Action ADR1. Additionally developers should be made aware of their obligations under the *Aboriginal Heritage Act 1972* and the discovery of artefacts on the eastern side of the inlet.

Lead: Culham Inlet Management Group, Department of Water and the Shire of Ravensthorpe

Priority: 1

Time period: 2008–2010

**Action ARD4 Gazette the inlet as unsurveyed waters with the associated 8 knot speed limit.**

Explanation: Increased boating use is likely due to population growth and lifestyle changes, therefore, the impacts of boating will need better management. The water levels at Culham Inlet are generally very low and speed limits need to be enforced for safety reasons, and to reduce impacts on the inlet's birdlife and other recreational users. It is proposed that the waterway should be gazetted as unsurveyed and an 8 knot speed restriction applied to the entire area. On gazettal, signs to this effect will be erected at all boat launching areas. If there is a need to change the gazetting of the inlet in the future, the Department for Planning and Infrastructure will need to be contacted.

Lead: Department for Planning and Infrastructure

Priority: 2

Time period: 2008

### Strategy 3. Promoting integrated sandbar management

The management of the sandbar across Culham Inlet is critical as it influences the water levels on which the inlet's values are largely dependant. A breaching of the sandbar in 1993 led to the loss of the road into the Fitzgerald River National Park. Consultation on rebuilding the road and again after it was lost a second time in 2000, led to agreement on a road alignment and height that now requires management of the inlet's sandbar to a maximum height of 3 m AHD. It is generally agreed that the present valued road structure must be protected; therefore the sandbar cannot exceed 3 m in height and when the inlet is full at this sandbar height, the water level is sufficient for fish and other inlet values.

Many people consider that the design of the road and the artificial maintenance of the sandbar height will result in more frequent breaks, which is concerning, as these breaks practically empty the inlet. It is proposed that the release of water be better controlled to prevent reduced water levels. Given these circumstances and the cost of constructing the present the road structure it is recommended that the sandbar management strategy be updated, implemented and better publicised until such time as a full review of the road structure be undertaken.

**Action S1 Review the Sandbar Management Plan.**

Explanation: The present Sandbar Management Plan outlines the responsibilities of Main Roads, Shire of Ravensthorpe and Department of Environment and Conservation and guides the process of maintaining the road and sandbar. This was endorsed through public consultation in 1994 then revised and endorsed in 2000. After 2000 a final copy of the plan was never produced and since then has rarely been referred to. The plan needs to be updated to take into account lessons learnt and then finalised.

Lead: Main Roads and the Shire of Ravensthorpe

Priority: 1

Time period: 2008

**Action S2 Ensure community awareness of the Sandbar Management Plan.**

Explanation: There exists community confusion on the sandbar management and responsibility, and the present Sandbar Management Plan has not received any recent publicity. Few copies seem to exist and there is value in reconfirming endorsement, community engagement and knowledge of the plan. It is recommended that the Culham Inlet Management Group with the Shire of Ravensthorpe take the lead on this awareness raising given the main audience would be the population of Hopetoun.

Lead: Culham Inlet Management Group

Priority: 1

Time period: Ongoing

**Action S3 Replace and relocate the two existing gauging boards at the sandbar.**

Explanation: Gauging boards on the sandbar are used to easily indicate the sandbar height and are needed to accurately manage the sandbar so that maximum water levels are maintained whilst protecting the road. The present gauging boards are inaccurate and inappropriately located and need relocating and surveying.

Lead: Main Roads

Priority: 1

Time period: 2008

**Action S4 Implement the reviewed and endorsed Sandbar Management Plan.**

Explanation: Implementation of the reviewed management plan is required, including ongoing monitoring of sandbar levels. Annual review of the plan is recommended through the new inlet management group.

Lead: Culham Inlet Management Group

Priority: 1

Time period: Ongoing

**Action S5 Continue to upgrade and seal Hamersley Drive to the Culham Inlet causeway.**

Explanation: The Shire of Ravensthorpe is to upgrade Hamersley Drive to a sealed standard to improve the strength of the road whilst maintaining a finished surface level of 4.0 m AHD on the Culham Inlet causeway (i.e. east of the culverts).

Lead: Shire of Ravensthorpe  
Priority: 1  
Time period: 2008

**Action S6 Investigate the feasibility of putting gates on the 11 pipe culverts to retain water levels in the inlet after sandbar breaks.**

Explanation: It is recognised that the sandbar will need to be breached at 3 m AHD to protect the existing road. However, there is a desire to retain maximum water in the inlet. One means of doing this is to have gates on the culverts that can be closed once the sandbar is opened and the inlet level has dropped below 3 m. Studies are needed to assess the cost and practicality of doing this and if practical a funding source and lead agency to implement this action would then need to be found.

Lead: Main Roads (initial feasibility study)  
Priority: 1  
Time period: 2008



*Culverts under Hamersley Drive where it crosses Culham Inlet (photo by Ralph Cooper, January 2000)*

**Action S7 Undertake a full review of options for the sandbar and Hamersley Drive where it crosses the inlet.**

Explanation: Given the expense and effort involved in the construction of the present road it should be protected as best as possible. However, in the event that the road structure is destroyed by flooding as it was in 1993 and 2000, the management group needs to have considered options for a replacement structure. The management group will need to consider all the options for the road crossing and sandbar management and ensure there is

considerable consultation with the community and Traditional Custodians, on the issue before the road fails. These options should include, allowing a higher and more natural sandbar, using additional pipes and an investigation into opening the sandbar on the eastern side. The strategy should also consider the ongoing management of the area regardless of a road failure.

Lead: Culham Inlet Management Group  
Priority: 1  
Time period: Initial investigation 2009–2010 then ongoing

**Action S8 Determine the volume of sand stored in the sandbar and adjacent dunes and monitor long-term changes.**

Explanation: The sandbar across the inlet largely comprises a relic dune, meaning that it formed under different climate and sea level conditions than occur today. There may be a nett loss of sand from the dune due to opening the bar, along with long-shore drift from the beach. Eventually, there may not be an adequate sand supply to effectively close the bar once it has opened. Rising sea levels and storm surges as a result of climate change may further exacerbate the problem. By use of aerial photos, satellite imagery and contour mapping, estimates of volume of sand, both at the inlet mouth and in the greater 'Whale Bay' dune system need to be assessed for pre-1993, from 1993 to 2000 and at present, taking into account seasonal change. A full understanding of the dune dynamics and long-shore drift of sand in 'Whale Bay' is required for long-term management of the sandbar.

Lead: Culham Inlet Management Group  
Priority: 1  
Time period: Initial study 2008–2010

**Action S9 Investigate and amend the boundaries of Hamersley Road so that it lies within the Shire of Ravensthorpe road reserve and investigate appropriate vesting of the sandbar.**

Explanation: Realignment of Hamersley Drive has taken place, without a realignment of the road reserve and as a consequence, the road now extends out of the road reserve and into the national park. This provides inappropriate management responsibilities, which need to be corrected.

Lead: Shire of Ravensthorpe and Department of Environment and Conservation  
Priority: 2  
Time period: Initiated by 2010

## Strategy 4. Improving water quality

There are concerns about the water quality in Culham Inlet. Elevated nutrient levels have been recorded and while salinity levels are naturally high, it is suspected that salt loads from the catchment are increasing. Similarly, sediment loads from the catchment may have risen since land clearing but have not been measured. On-ground work in the catchment and along the river corridors is important to improve the water quality in the inlet. Within this strategy there are three main areas of work. Firstly, there is a need to support existing projects within the catchment, such as projects undertaken by Ravensthorpe Agricultural Initiative Network (RAIN) and landholders. Secondly, there is a need for more research and monitoring to better understand the changes in the catchment and their impact on the inlet. Thirdly, this strategy suggests on-ground works for the catchment to improve water quality.

**Action WQ1 Support existing on-ground work, research and monitoring projects in the catchment.**

Explanation: Landcare work such as fencing and revegetation has been taking place in the catchment for a long time and it is important that this work continues and is supported. An example of this is the *West River Catchment Plan*. Research and monitoring projects provide useful baseline and comparative information. Existing projects looking at rates of groundwater rise, water quality monitoring and soil health should be supported, continued and the results used.

Lead: Culham Inlet Management Group

Priority: 1

Time period: Ongoing

**Action WQ2 Undertake a waterway nutrient, acidity and salinity snapshot in the catchment.**

Explanation: High nutrient levels have been recorded in the inlet, but their source is not known. A catchment snapshot will indicate which waterways have high nutrient concentrations and may indicate nutrient sources. Salinity should be recorded at the same time to indicate main salinity sources. As acid sulfate soils are a concern in the catchment, it would be useful to measure acidity (pH) as well. The snapshot should include the full catchment and follow methodology used for similar snapshots. It should take in at least two sampling occasions to cover both high and low flow periods and could include additional parameters, such as organic matter. Where possible the snapshot should include catchment landholders.

Lead: Department of Water

Priority: 1

Time period: 2008–2010

**Action WQ3 Develop a water quality monitoring program that expands on existing monitoring of the rivers and inlet.**

Explanation: Water quality sampling takes place at Culham Inlet every three months and this will continue, subject to funding. Additional inlet sampling following significant rainfall events and analysis of all inlet water samples for phytoplankton would provide useful additional information. Sampling of the Steere and Phillips rivers has been limited in the past and needs to be improved to better understand the nutrient, salt and sediment loads entering the inlet from the catchment. The monitoring program could include fortnightly or monthly sampling of these rivers and additional sampling during high flow events. Samples should be taken from the lower reaches of the rivers before they enter the inlet. If possible, local community members should be trained and employed to do this sampling. Analysis should include salinity, pH and nutrients at a minimum. Mercury was detected in Black Bream in the inlet and metal concentrations have been recorded in the water of the upper Steere River. These results suggest some monitoring for heavy metals in the water and sediment should be incorporated into any monitoring program.

Lead: Department of Water

Priority: 1

Time period: Prepared by 2009 then ongoing

**Action WQ4 Plan and carry out on-ground works in degraded areas along the Steere River as identified in the assessment of its condition and values.**

Explanation: A foreshore condition report was completed in early 2008 for the Steere River and its tributaries. On-ground rivercare works such as fencing and revegetation as well as weed removal should be planned and implemented in degraded areas where work is needed. All works will be subject to agreement by landholders.

Lead: Ravensthorpe Agricultural Initiative Network and Department of Water

Priority: 1

Time period: 2008–2012

**Action WQ5 Complete planned catchment works and support best farming practice in the catchment.**

Explanation: Ravensthorpe Agricultural Initiative Network is responsible for most on-ground works and education in the catchment with respect to natural resource management. They have several projects already underway and more planned that should assist in the reduction of sediment, nutrient and salt exports from the catchment to the rivers and inlet. Some of the ways this is achieved is through encouraging minimum till farming, soil testing, contouring, surface water retention and retention of vegetative buffers next to waterways. Also, implementation of these soil improvement strategies will result in an increase in soil water retention. Specific works will need to be identified and prioritised to reflect research and monitoring findings.

Lead: Ravensthorpe Agricultural Initiative Network

Priority: 1

Time period: Ongoing

**Action WQ6 Work towards containment of the Elverdton tailings dump and stop further encroachment of the tailings downstream while ensuring the community is informed on the issue.**

Explanation: Tailings from mining activities at Elverdton have been dumped in a pile at the head of the Steere River catchment since 1957. The dump covered approximately 6 ha and had drifted over an additional 8 ha by 2004. Part of the dump is not confined and is slowly spreading downstream, and the plume is swamping and killing vegetation as it moves. There are many legal and ownership issues associated with dealing with this dump but until such time as it is removed or completely confined, it will continue to move downstream and impact on river values. The agency responsible for this issue is the Department of Industry and Resource so any efforts to resolve this issue should involve them. The management group should pursue the resolution of this issue by means available to them while ensuring the local community is informed on the issue.

Some initial water samples were taken downstream of the dump by the Department of Water to test for heavy metals. The results were not conclusive and the group should consider further sampling, perhaps of sediments, as part of Action WQ3.

Lead: Culham Inlet Management Group

Priority: 1  
Time period: Ongoing



*Steere River,  
downstream from the  
Elverdton tailings site  
(photo by Steve  
Janicke, 2004)*

**Action WQ7 Calculate the flow rate curve for Pitchie Ritchie on the Phillips River so that flow rates and inputs to the inlet can be determined.**

Explanation: Pitchie Ritchie is located approximately 7.5 km upstream of where the Phillips River meets the inlet. Water level measurements have been recorded at Pitchie Ritchie since 1997. To convert these measurements to flow rates, a flow rate curve must be calculated for the site. Once flow rates are determined, water volume, as well as nutrient, salt and sediment loads from the Phillips River into Culham Inlet can be calculated. Estimates for the Steere River should also be made at this time. It is suggested that loads are calculated in 2010 when more water quality data from the rivers is available.

Lead: Department of Water  
Priority: 2  
Time period: 2008-2010

**Action WQ8 Encourage improvements in weather monitoring in the catchment.**

Explanation: Rainfall in the catchment can be very patchy and inconsistent. Rainfall measurements in the catchment are often different from those from the Ravensthorpe town site. Currently, rainfall data in the Culham Inlet catchment is collected by a handful of landholders who submit their measurements monthly to the Bureau of Meteorology for uploading on their website. The establishment of automated weather stations or rain gauges in the catchment would provide valuable data on rainfall and could provide some warning of approaching floods. The locations of monitoring stations should represent the different systems in the catchment. The Bureau of Meteorology has funding for works of this kind and should be encouraged to invest in the catchment.

Lead: Ravensthorpe Agricultural Initiative Network and Culham Inlet Management Group  
Priority: 2  
Time period: Ongoing

**Action WQ9 Investigate the rates of sedimentation and the impact of sediment on the inlet and river pools.**

Explanation: Sedimentation of inlets is a natural process. In many catchments this process has been rapidly accelerated following catchment clearing and this may be the case for Culham Inlet. Filling of an inlet and river pools with sediment can have a negative impact on their value as habitat for fish and other animals. There is no information on sedimentation rates for Culham Inlet and so the threat of sedimentation cannot be determined. Possible methods that could be used to determine sedimentation rates and movement include coring, site differential levelling surveys, bathymetric surveys and aerial photography.

Lead: Department of Water

Priority: 2

Time period: 2010–2012

**Action WQ10 Undertake further investigation of groundwater and hydrology trends for the catchment.**

Explanation: The *Ravensthorpe Area Catchment Appraisal 2006* states that the northern third of the catchment has a high risk of being affected by shallow watertables. More investigation is required in the upper catchment to determine salinity predictions, threat to the inlet and management options. In the Steere River catchment there are no bores. Drilling new bores, monitoring existing bores and analysis of the results could provide better information on the risks and impacts associated with secondary salinisation. The Department of Agriculture and Food WA may be able to provide help and advice for this action.

Lead: Ravensthorpe Agricultural Initiative Network

Priority: 2

Time period: 2010

**Action WQ11 Continue dialogue with landholders to protect areas of remnant vegetation and encourage revegetation in the catchment.**

Explanation: Remnant vegetation in the catchment provides an important role in suppressing rising salty groundwater and enhances biodiversity in the catchment. Any attempt to protect vegetation or revegetate areas helps to reduce salinisation and erosion and should be supported. If these areas are near waterways then the benefits for Culham Inlet are likely to be greater. This work should take place through the catchment groups where possible.

Lead: Ravensthorpe Agricultural Initiative Network

Priority: 2

Time period: Ongoing

**Action WQ12 Bring together research findings to determine the main threats to the inlet's water quality and options for management.**

Explanation: Studies to better understand the salt, sediment and nutrient inputs from the catchment and overall condition of the inlet are proposed for the period 2008 to 2012. Once information is available from these studies, it would be valuable to hold a workshop with experts in the field of water quality to look at the results and determine the environmental condition of the inlet, the main threats to it and management options in light of this new information.

Outcomes from the workshop should be used in the review of this plan and guide on-ground works.

Lead: Culham Inlet Management Group  
Priority: 2  
Time period: 2012

## Strategy 5. Increasing our understanding and protection of plants and animals

The plants and animals of Culham Inlet are valued by the community, with birdlife being one of the main attractions. With the exception of a few studies on the ecology and birdlife of the inlet, very little is known about the plants and animals that use the inlet and, therefore, it is very difficult to propose how the inlet should be managed to best protect them. Much of this strategy is focused on increasing our understanding of the plants and animals so that we can use this knowledge when making decisions about how the inlet is accessed, used and managed.

### **Action PA1 Undertake a long-term study of birdlife populations in and around the inlet.**

Explanation: Culham Inlet is recognised as a waterbody of National Importance in Western Australia based partly on the recorded presence of over 1% of the estimated Australian population of Banded Stilts. Many different types of birds have been recorded at the inlet including some which are considered rare. Culham Inlet is an important drought refuge when other waterbodies further inland are drying up. No comprehensive birdlife study has been completed for the inlet to consider its role in the region and how it is used. The study would need to consider Culham Inlet as part of a chain of waterbodies in a region. Any study must be long term (more than 10 years) to take into account climatic variations and resulting bird movement. The survey should consider species present, abundance and habitats. The study could also consider threats to the birds such as motorised boats and degradation of habitat through flooding, fires, bees, etc. The survey should provide management recommendations and suggest what facilities, like bird hides, would improve bird-watching and make suggestions on where they could be placed. The background paper on birdlife at Culham Inlet, August 2007, should be used as a basis for this study. Birds Australia should be invited to participate in this project along with local groups.

Lead: Culham Inlet Management Group  
Priority: 1  
Time period: Study initiated in 2008–2009



*Mass of Stilts on  
Culham Inlet (photo by  
Ralph Cooper,  
December 2005)*

**Action PA2. Undertake a foreshore vegetation condition assessment of the inlet.**

Explanation: Foreshore vegetation provides important habitat to animals and adds to the inlet's visual amenity value. To date, a comprehensive assessment of the inlet's foreshore vegetation has not been completed. An assessment should be completed for the inlet and estuarine reaches of the Phillips and Steere rivers to determine vegetation type, distribution, condition, weed invasion and optimal environmental conditions. The assessment is expected to focus on the eastern side of the inlet and could also consider the dunes at the mouth of the inlet as these areas are likely to be subject to greater development pressure than the western side, which is in the national park. The report should make management recommendations. Repeat surveys are proposed to determine vegetation changes over time. The Department of Environment and Conservation should be consulted with respect to the western side of the inlet.

Lead: Department of Water  
Priority: 1  
Time period: 2008

**Action PA3 Complete a desktop study to map the main habitats at the inlet.**

Explanation: A range of habitats exist at the inlet such as open water, fringing vegetation, mud flats and rocky areas. The availability of these habitats to animals will change with seasonal and water level variations. It is important to map these different habitats and determine which animals might use them and what environmental conditions favour each. This information can then be used when planning additional access points, desired foreshore widths and identifying areas that should not be developed. The Department of Environment and Conservation and the biodiversity officers with South Coast NRM may be able to assist with this action.

Lead: Culham Inlet Management Group  
Priority: 1  
Time period: 2009

**Action PA4 Complete terrestrial animal trapping on the eastern foreshore of the inlet.**

Explanation: There have been no recent assessments of animals utilising the inlet's foreshore. It is suggested that trapping take place on the eastern foreshore to determine what species are there and in what abundance. This information should be used when determining necessary foreshore width and development set-back areas (see Actions ARD1 and PA6). There is also a need to have this information as basic baseline data to monitor animal species over time. The Department of Environment and Conservation could advise on trapping techniques. There may need to be a number of trapping events to take into account climatic and inlet water depth variations. Trapping should be repeated every 5 years to monitor the species that are most sensitive to changes in the environment.

Lead: Culham Inlet Management Group  
Priority: 1  
Time period: First trapping event in 2009

**Action PA5 Work with landholders to control feral animals near the inlet, with a focus on declared vermin.**

Explanation: Feral animals such as cats, foxes, rabbits, dogs, pigs, goats and feral bees may use the inlet and surrounding area. These animals are not part of the natural environment and threaten the native animals. The Department of Environment and Conservation control declared vermin (pigs, foxes and rabbits) within the lands that they manage; this includes the western foreshore of the inlet and lower Phillips River corridor. Other areas around the inlet are not actively managed for feral animals. The Culham Inlet project manager should work with landholders, the Shire and the Department of Environment and Conservation to control feral animals focusing on declared vermin using necessary methods.

This action could consider the control of feral bees, possibly through restriction of apiaries to within 2 km of the inlet and river foreshores or eradicating bees from hollows.

Lead: Culham Inlet Management Group with the Department of Environment and Conservation

Priority: 1

Time period: Ongoing

**Action PA6 Use information from completed studies on plants and animals to determine the desired foreshore and macro-corridor width on the eastern side of the inlet.**

Explanation: Studies completed as part of this plan, which look at habitat values, vegetation condition, animal presence and birdlife, will provide valuable information when determining the width of vegetation required around the inlet to protect its plant and animal values. The proximity of the inlet to the Fitzgerald River National Park and the role the inlet plays as a buffer should also be considered. This information should be used in any development planning. The Department of Water, Shire of Ravensthorpe, the Department of Environment and Conservation and landowners will need to be involved in this action.

Lead: Culham Inlet Management Group

Priority: 2

Time period: 2010

**Action PA7 Publicise the fishing regulations and restrictions for the inlet.**

Explanation: As the local population increases there is likely to be an increase in recreational fishing at the inlet, when water levels and fish stocks allow. With an increase in fishing effort, there is a need to advertise the restrictions on the fishery through signage at the main access points and through media articles or other communication methods as considered appropriate.

Lead: Department of Fisheries

Priority: 2

Time period: Initiated by 2010

**Action PA8 Develop and implement a plan for controlling weeds at the inlet and lower river foreshore areas.**

Explanation: Vegetation condition surveys of the Steere, Phillips and West rivers have identified key species and areas of weed invasion. Little is known about the

threat weeds pose to the inlet but the proposed foreshore condition survey for the inlet (Action PA2) will consider this. Weeds along the river corridors pose a threat to the inlet as they may spread downstream. Priority areas for eradication should be the inlet foreshore and areas along the rivers closer to the inlet. The plan will need to consider how to best control the identified weeds and its implementation will need to include the Department of Agriculture and Food WA, landholders, Shire of Ravensthorpe and the Department of Environment and Conservation for areas near the park.

Lead: Culham Inlet Management Group

Priority: 2

Time period: Initiated by 2010

**Action PA9 Follow the best management practices for dieback management.**

Explanation: The introduced dieback fungus (*Phytophthora cinnamomi*) is known to exist in the Fitzgerald River National Park and in other areas throughout the Shire of Ravensthorpe. Dieback kills many types of plants. The primary vectors of introduction and movement through the landscape are from moist mud or soil containing the fungus being transported to a new location and then moved around in water and by root-to-root contact. *The Shire of Ravensthorpe Dieback Management Plan* will identify best management practices for all earthworks and these should be followed when any work is being undertaken near the inlet. Additionally, any options for increased access should consider the implications for the spread of dieback.

Lead: Culham Inlet Management Group

Priority: 2

Time period: Ongoing

**Action PA10 Support the use of planning controls to prohibit the keeping of domestic pets near the inlet.**

Explanation: Domestic animals, particularly dogs and cats, can threaten native animals that live at the inlet. Any new developments near the inlet should be encouraged to use planning controls to prohibit the keeping of household pets that could threaten native animals.

Lead: Culham Inlet Management Group and Shire of Ravensthorpe

Priority: 2

Time period: Ongoing

**Action PA11 Carry out a survey of aquatic invertebrates to determine presence and diversity.**

Explanation: Macroinvertebrates are animals without a backbone and can be seen with an unaided eye. They are easy to catch and often provide a good indication of estuarine health. Macroinvertebrates were last sampled in the inlet in 1994 shortly after the bar opened for the first time in 70 years. Another survey to compare what lives there now and what was there over 10 years ago would provide valuable information on how the system has changed over time. Sampling should take place in spring and could provide a great opportunity to involve the community and local schools.

Lead: Department of Water

Priority: 3

Time period: 2012

## Strategy 6. Promoting community involvement and education

### **Action CE1 Prepare and implement a communication strategy.**

Explanation: It is important that at the beginning of implementation, the plan's project manager and management group consider how they want to communicate to people and engage the community throughout the project. The strategy will need to identify audiences, methods and timing of communication.

Methods could include:

- letters or newsletters to interested community members to provide updates
- media releases
- presentations
- workshops or field days
- information on websites
- leaflets

Lead: Culham Inlet Management Group

Priority: 1

Time period: Prepared in 2008

### **Action CE2 Develop and implement an education program focused on the inlet's values.**

Explanation: Culham Inlet lies within the zone of cooperation of the internationally recognised Fitzgerald Biosphere. It borders the Fitzgerald River National Park which is noted for the great diversity of native vegetation with nearly 20 per cent of the total number of plant species in Western Australia represented and some species found nowhere else in the world. Culham Inlet has many additional values of its own which are not well understood or appreciated. An education program aimed at the local community, visitors to the inlet, catchment landholders and local schools should be developed to share information about the inlet, including results from the studies conducted at the inlet as part of this plan. Interpretative signage could also be developed as part of this action. Information provided should cover Noongar history of use of the area, birdlife, the commercial fishery, natural hydrological cycles of the inlet and other environmental values.

Lead: Culham Inlet Management Group

Priority: 1

Time period: Program developed 2008–2009

### **Action CE3 Encourage community involvement in the plan's implementation and protection of the inlet.**

Explanation: To ensure long-term protection of the inlet it is important that the local community is involved in its management from the beginning. Additional to representation on the management group and on-ground works on individual properties, the community needs to be included. This could be encouraged initially through community walks and workshops, rubbish clean-up days or tree planting and could eventually result in the development of a 'friends of Culham Inlet' group. Recording oral histories of the area could also be considered as a way to engage the community.

Lead: Culham Inlet Management Group  
Priority: 1  
Time period: Ongoing

**Action CE4 Encourage and promote Traditional Custodian involvement in management of the inlet.**

Explanation: Few Traditional Custodians live in the local area so additional communication methods will be required to ensure they are included in the ongoing management of the inlet. The report from a Traditional Custodian workshop at Culham Inlet held in December 2007 makes a number of suggestions on how to achieve this, including:

- Organise a follow-up meeting for family representatives that attended the December 2007 workshop for December 2008.
- Work with community leaders to develop a working party to establish a method for Traditional Custodian representatives to attend management group meetings.
- Develop a mechanism whereby environmental reports and new findings can be communicated to interested Traditional Custodians.

Initially, it is advised that the project manager visit established groups in Albany and Esperance to discuss this issue with the elders.

Lead: Culham Inlet Management Group  
Priority: 1  
Time period: Ongoing

## 6 Implementation

As outlined in Strategy 1, Managing for the Future, implementation of this plan will be supported by a proposed Culham Inlet Management Group, which is expected to meet approximately every three months and be coordinated by a dedicated project manager.

At this stage servicing of the group is still being discussed, but it is hoped Ravensthorpe Agricultural Initiative Network or the Department of Water, with financial assistance through South Coast NRM will host the project manager and as such service the management group. The project manager will coordinate implementation of the plan with strong links with the catchment officer and other agencies.

At the beginning of implementation and for each year of implementation an operational plan will be developed, with annual work priorities. The first few years of work are likely to be dominated by gathering information through research and monitoring. Later on, on-ground work will play a greater role in implementation. This on-ground work should then continue for the life of the plan and beyond.

Costing for the completion of actions has not been included in this plan but will be determined prior to applications for funding. Funding for implementation of this plan will be sought through the next round of state and federal natural resource management funding through South Coast Natural Resource Management Inc as well as from partner organisations in the form of in-kind support and completion of discrete projects. Other grant options will also be explored.

This management plan was prepared through cooperation and integration and it is expected that the implementation phase will continue in this way

The management plan will be reviewed 5 years from the beginning of implementation. This review should take into account learnings from implementation and available new information.

## Reporting

Reporting progress on the plan and any changes to the inlet's condition will be an important role for the project manager. Annual reports to the community are expected. These reports will need to consider the Management Action Targets and the long-term targets.

The project manager will need to provide updates to the Culham Inlet Management Group at each meeting as well as complete the required reporting to any funding body.

As well as reports, other means of communication will be used to inform the community on the progress of the plan. These means will be detailed in the communication plan and should take into account the diverse range of inlet stakeholders.

## 7 Measuring progress

To measure the progress of the implementation phase, a number of Management Action Targets were selected to broadly cover the main work areas in the plan. Completion of these targets will indicate the plan is being implemented successfully.

<b>Management Action Target</b>	<b>Reason chosen</b>	<b>How it will be measured</b>
MAT 1 Appointment of a project manager to coordinate implementation of the plan by December 2008.	Relates to Action F2 under Strategy 1. The most important overarching action in the plan.	Based on appointment. Determined by the Culham Inlet Management Group.
MAT 2 Complete a foreshore management plan for the eastern side of the inlet by December 2010.	Relates to Action ARD1 under Strategy 2. Important in guiding future development, recreation and access at the inlet.	On completion of the plan. Determined by the Culham Inlet Management Group.
MAT 3 Endorsement of the Sandbar Management Plan by the Shire of Ravensthorpe, Main Roads and the Department of Water and the Department of Environment and Conservation by December 2008.	Relates to Action S1 under Strategy 3. The plan's endorsement is important in clarifying the roles of different organisations in the on-going management of the sandbar to protect the road.	On endorsement of the reviewed plan prepared by Main Roads.
MAT 4 Develop a water quality monitoring plan for the inlet and rivers by December 2009.	Relates to Action WQ3 under Strategy 4.	On completion of the plan. Determined by the Department of Water.
MAT 5 Provide results from the first four years of a long-term study of birdlife populations for the inlet by December 2012.	Relates to Action PA1 under Strategy 5. Birdlife was the aspect of the inlet most valued by the community.	On presentation of the results as determined by the Culham Inlet Management Group.
MAT 6 Education program initiated to share information about the inlet with the community by June 2009.	Relates to Action CE2 under Strategy 6.	Media article, brochure or presentation completed.

## Appendix A - Summary of Actions

Action	Lead	Priority
F1 Establish a Culham Inlet Management Group to oversee implementation of the plan.	Ravensthorpe Agricultural Initiative Network / Department of Water	1
F2 That a project manager dedicated to assisting with implementation of this management plan is appointed.	Ravensthorpe Agricultural Initiative Network / Department of Water / Culham Inlet Management Group	1
F3 Seek funding and develop methodology for a regional cultural heritage assessment of the inlet area and associated waterways.	Culham Inlet Management Group	2
F4 Investigate options to change the inlet's tenure.	Culham Inlet Management Group	2
F5 Support a review of the Fitzgerald River National Park Management Plan.	Culham Inlet Management Group	2
F6 Consider findings from completed climate change studies in management of the inlet.	Culham Inlet Management Group	3
ARD1 Prepare a foreshore management plan for the eastern side of Culham Inlet.	Culham Inlet Management Group	1
ARD2 Investigate possibilities for improved access to Culham Inlet, considering feasibility, practicability, community support and associated costs.	Culham Inlet Management Group	1
ARD3 Provide advice on the development of land near the inlet to ensure its environmental and social values are protected.	Culham Inlet Management Group / Shire of Ravensthorpe / Department of Water	1
ARD4 Gazette the inlet as unsurveyed waters with the associated 8 knot speed limit.	Department for Planning and Infrastructure	2
S1 Review the Sandbar Management Plan.	Main Roads / Shire of Ravensthorpe	1
S2 Ensure community awareness of the Sandbar Management Plan.	Culham Inlet Management Group	1
S3 Replace and relocate the two existing gauging boards at the sandbar.	Main Roads	1
S4 Implement the reviewed and endorsed Sandbar Management Action Plan.	Culham Inlet Management Group	1
S5 Upgrade and seal Hamersley Drive to the Culham Inlet causeway.	Shire of Ravensthorpe	1
S6 Investigate the feasibility of putting gates on the 11 pipe culverts to retain water levels in the inlet after sandbar breaks.	Main Roads	1
S7 Undertake a full review of options for the sandbar and Hamersley Drive where it crosses the inlet.	Culham Inlet Management Group	1
S8 Determine the volume of sand stored in the sandbar and adjacent dunes and monitor long-term changes.	Culham Inlet Management Group	1
S9 Investigate and amend the boundaries of Hamersley Road so that it lies within the Shire of Ravensthorpe road reserve and investigate appropriate vesting of the sandbar.	Shire of Ravensthorpe / Department of Environment and Conservation	2
WQ1 Support existing on-ground work, research and	Culham Inlet Management	

monitoring projects in the catchment.	Group	1
WQ2 Undertake a waterway nutrient, acidity and salinity snapshot in the catchment.	Department of Water	1
WQ3 Develop a water quality monitoring program that expands on existing monitoring of the rivers and inlet.	Department of Water	1
WQ4 Plan and carry out on-ground works in degraded areas along the Steere River as identified in the assessment of its condition and values.	Ravensthorpe Agricultural Initiative Network / Department of Water	1
WQ5 Complete planned catchment works and support best farming practice in the catchment.	Ravensthorpe Agricultural Initiative Network	1
WQ6 Work towards containment of the Elverdton tailings dump and stop further encroachment of the tailings downstream. Ensure the community is informed on the issue.	Culham Inlet Management Group	1
WQ7 Calculate the flow rate curve for Pitchie Ritchie on the Phillips River so that flow rates and inputs to the inlet can be determined.	Department of Water	2
WQ8 Encourage improvements in weather monitoring in the catchment.	Ravensthorpe Agricultural Initiative Network / Culham Inlet Management Group	2
WQ9 Investigate the rates of sedimentation and the impact of sediment on the inlet and river pools.	Department of Water	2
WQ10 Undertake further investigation of groundwater and hydrology trends for the catchment.	Ravensthorpe Agricultural Initiative Network	2
WQ11 Continue dialogue with landholders to protect areas of remnant vegetation and encourage revegetation in the catchment.	Ravensthorpe Agricultural Initiative Network	2
WQ12 Bring together research findings to determine the main threats to the inlet's water quality and options for management.	Culham Inlet Management Group	2
PA1 Undertake a long-term study of birdlife populations in and around the inlet.	Culham Inlet Management Group	1
PA2 Undertake a foreshore vegetation condition assessment of the inlet.	Department of Water	1
PA3 Complete a desktop study to map the main habitats at the inlet	Culham Inlet Management Group	1
PA4 Complete terrestrial animal trapping on the eastern foreshore of the inlet.	Culham Inlet Management Group	1
PA5 Work with landholders to control feral animals near the inlet with a focus on declared vermin.	Culham Inlet Management Group / Department of Environment and Conservation	1
PA6 Use information from completed studies on plants and animals to determine the desired foreshore and macro-corridor width on the eastern side of the inlet.	Culham Inlet Management Group	2
PA7 Publicise the fishing regulations and restrictions for the inlet.	Department of Fisheries	2
PA8 Develop and implement a plan for controlling weeds at the inlet and lower river foreshore areas.	Culham Inlet Management Group	2
PA9 Follow the best management practices for dieback management.	Culham Inlet Management Group	2
PA10 Support the use of planning controls to prohibit the keeping of domestic pets near the inlet.	Culham Inlet Management Group / Shire of Ravensthorpe	2

PA11 Carry out a survey of aquatic invertebrates to determine presence and diversity.	Department of Water	3
CE1 Prepare and implement a communication strategy.	Culham Inlet Management Group	1
CE2 Develop and implement an education program focused on the inlet's values.	Culham Inlet Management Group	1
CE3 Encourage community involvement in the plan's implementation and protection of the inlet.	Culham Inlet Management Group	1
CE4 Encourage and promote Traditional Custodian involvement in management of the inlet.	Culham Inlet Management Group	1

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- Community Attitudes Towards Culham Inlet – compilation of community and organisation questionnaire response 2007
- Issues Paper – prepared in 2007
- Culham Inlet workshop with Traditional Custodians – report prepared in 2008
- An assessment of condition and values of the Steere River and its tributaries – prepared by Andrew Chapman 2007
- Culham Inlet Observations 1989–2007 - unpublished report prepared by Ralph Cooper in 2007.
- Background papers:
  - **Catchment** – Ravensthorpe Agricultural Initiative Network
  - **Flora and Fauna** – compiled by the Department of Water
  - **Fish and Fisheries** – Department of Fisheries, the Centre for Fish and Fisheries Management, Murdoch University and the South Coast Licensed Fishermen’s Association
  - **Birdlife** – Merle Bennett (community member)
  - **Water Level and Sandbar Management** – Main Roads WA
  - **Land Use Development** – Shire of Ravensthorpe
  - **Inlet Use and Access** – Shire of Ravensthorpe
  - **Elverdton Mine Tailings** – compiled by the Department of Water
  - **Inlet and Foreshore Management** – Department of Water
  - **Information on European Heritage** – Ravensthorpe Historical Society

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