Colac Otway Stormwater Management Plan

Volume 1 The Strategies

Colac Otway Shire Council

KBR

COLAC OTWAY STORMWATER MANAGEMENT PLAN

Volume 1
The Strategies

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1 Introduction

Colac Otway Shire Council in association with Corangamite Catchment Management Authority (CCMA) and Environment Protection Authority of Victoria (EPAV) has prepared the Colac Otway Stormwater Management Plan to improve the quality of urban stormwater discharged into local waterways.

1.1 WHAT IS THE PURPOSE OF THE COLAC OTWAY STORMWATER MANAGEMENT PLAN?

The aim of the Colac Otway Stormwater Management Plan is to 'identify actions to improve the environmental management of urban stormwater and protect the environmental values and beneficial uses of receiving environments'. It identifies urban activities that may adversely affect water quality and sets in place strategies to protect water quality and beneficial uses from stormwater runoff. The strategies include.

- *Reactive strategies:* developed in response to current threats and activities that have been identified as posing a priority risk to stormwater quality;
- *Management strategies:* developed to enhance existing management practices and in doing so avoid future adverse impacts on stormwater.

With its focus on protecting water quality, the Colac Otway Stormwater Management Plan does not seek to overcome hydraulic issues such as the capacity of the drainage system and flooding. Although in developing the recommendations to improve water quality, care has been undertaken to ensure that such actions do not cause flooding or drainage problems.

The Colac Otway Stormwater Management Plan establishes a common understanding and integrated approach between Council, various government agencies and the community to the protection of urban stormwater quality in the Shire.

1.2 WHAT AREAS DOES THE COLAC OTWAY STORMWATER MANAGEMENT PLAN COVER?

The Colac Otway Stormwater Management Plan addresses stormwater issues in the towns of Colac, Elliminyt, Apollo Bay and Marengo, the coastal settlements of Skenes Creek, Wye River, Kennett River and Separation Creek, the rural towns of Beeac, Birregurra and Cressy and the Otway towns of Forrest, Gellibrand, Lavers Hill and Beech Forest.

1.3 WHY PREPARE A STORMWATER MANAGEMENT PLAN?

Stormwater includes rainfall collected from roofs as well as road run-off, wash-down water and all other water that discharges into the drainage network, rivers, streams, creeks and lakes. Unlike sewage, stormwater is not generally treated before being discharged to local waterways.

Urban development can have a significant impact on stormwater. The clearing of land and the use of impervious surfaces can increase run-off and stormwater flows, which can also lead to erosion and sedimentation. The accidental and deliberate discharge of various pollutants from residential, commercial and industrial areas as well as from roads and other areas can flow into local drains and waterways. Their individual and cumulative impacts can have a major effect on water quality.

Improved stormwater management is critical in minimising the discharge of pollutants into local waterways. It can be achieved through structural works to capture pollutants and treat runoff (e.g. wetlands, gross pollutant traps and other physical works). It can also be achieved through non-structural measures designed to prevent stormwater being polluted (e.g. the use of planning controls to manage development, revised management practices, community education programmes and other measures).

1.4 WHAT IS THE FORMAT OF THE COLAC OTWAY STORMWATER PLAN?

The Colac Otway Stormwater Management Plan comprises two volumes:

- *Volume 1:* contains detailed recommendations to improve stormwater quality and management throughout the municipality summarises the objectives of the Colac Otway Stormwater Management Plan, along with the process used to develop the Plan, and the key issues identified during the preparation of the Plan.
- *Volume 2:* provides additional information, including a detailed analysis of stormwater threats, waterway values, priorities and various options to improve urban stormwater quality throughout the municipality. Volume 2 also contains supporting appendices.

This is Volume 1 of the Colac Otway Stormwater Management Plan.

1.5 WHO HAS BEEN INVOLVED IN THE PREPARATION OF THE COLAC OTWAY STORMWATER MANAGEMENT PLAN?

The Colac Otway Stormwater Management Plan was prepared by Kellogg Brown & Root Pty Ltd (KBR) under the supervision of a Steering Committee comprising representatives of Council, Corangamite Catchment Management Authority (CCMA) and Environment Protection Authority, Victoria (EPAV). A Project Working Group was also established to act as a reference group, providing input on local issues and management opportunities.

A list of participants is contained in Volume 2, Appendix A.

2 Stormwater planning

The Colac Otway Stormwater Management Plan has been prepared in a climate of heightened stormwater awareness and the need to protect water quality from the adverse impacts of urban development. It complements Landcare and other successful initiatives and helps improve overall catchment management by focussing on the water quality in urban areas. The following provides an overview of stormwater planning with further details provided in Volume 2, Section 2.

2.1 WHY HAS THE COLAC OTWAY STORMWATER MANAGEMENT PLAN BEEN PREPARED?

The Shire's waterways are valuable assets. In addition to carrying stormwater, they provide important ecological habitats, are attractive recreational areas and in some instances enhance property values. However, urban development can have a significant impact on water quality by increasing flows and the discharge of sediments, litter, chemicals and other pollutants to the waterways.

Historically, urban drainage systems have been designed to collect, convey and dispose of stormwater in order to minimise damage to property and threats to public safety. With changes in community expectations and legislation, the direction has shifted focus to also consider water quality issues.

The Colac Otway Stormwater Management Plan demonstrates Council's commitment to environmental and community sustainability.

2.2 WHAT OTHER STORMWATER INITIATIVES ARE IN PLACE?

Various Federal, State and Local government initiatives have been undertaken to improve water quality, including the preparation of State Environment Protection Policies and various regional catchment strategies. The need to improve stormwater quality features prominently in such plans along with the recommendations for councils to prepare their own stormwater plans.

In 2000, the State Government established the Victorian Stormwater Action Program (VSAP) and appointed the Victorian Stormwater Advisory Committee to oversee the programme. A sum of $22.5 million has been allocated to aid in the development and implementation of municipal stormwater plans and the completion of strategic projects to further advance best practice environmental management of urban stormwater.

3 Methodology

A risk-based approach has been used to prepare the Colac Otway Stormwater Management Plan. It has involved the identification of key issues and values and overall management issues. Recommendations have been developed in response to the priority areas of concern. The following provides an overview of the process with further details provided in Volume 2, Section 3.

3.1 HOW HAS THE COLAC OTWAY STORMWATER MANAGEMENT PLAN BEEN PREPARED?

The Colac Otway Stormwater Management Plan has been prepared in accordance with the revised version of Chapter 3 of the *Best Practice Environmental Management Guidelines—Urban Stormwater* (Melbourne Water, 2000). The process is summarised in Figure 3.1.

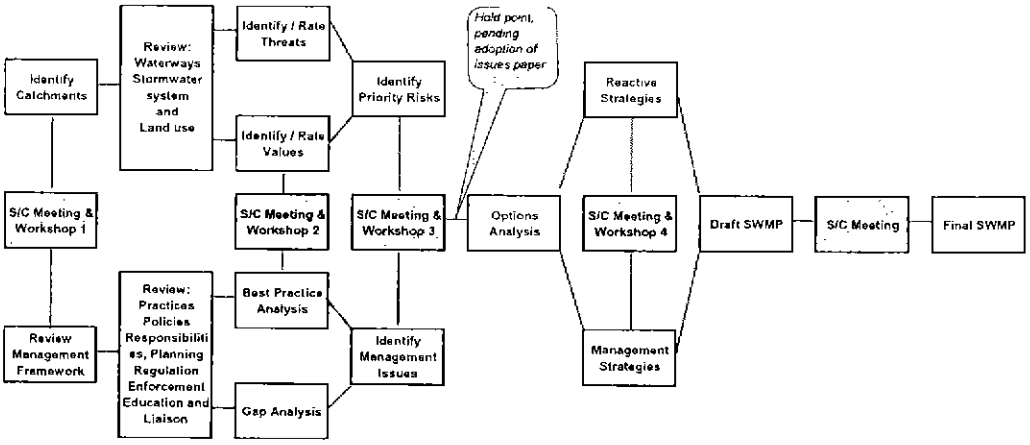


Figure 3.1
THE PROCESS

The process has involved:

- the identification of existing land uses, policies, strategies and responsibilities;
- the identification of existing environmental values and threats to water quality;
- a risk assessment based on the impacts of key stormwater threats on receiving environmental values;
- a review of existing stormwater management arrangements;

- the identification of priority management issues;
- the identification of management strategies to address priority issues;
- the identification of a framework that allows for implementation, review, and continuous improvement of the Colac Otway Stormwater Management Plan.

Regular meetings and workshops were held with the Steering Committee and Project Working Group to ensure that the Colac Otway Stormwater Management Plan responds to local priorities and that the recommended strategies and actions are owned by the stakeholders that are responsible for their implementation.

3.2 HOW HAVE THE RISKS BEEN DETERMINED?

A risk assessment process has been used to identify the priority issues of concern. It considers the probability of various threats and their impacts on waterway values. Both existing and potential threats and values have been identified. The values have been also been assessed equally in terms of both their local and regional significance. The process is summarised in Figure 3.2.

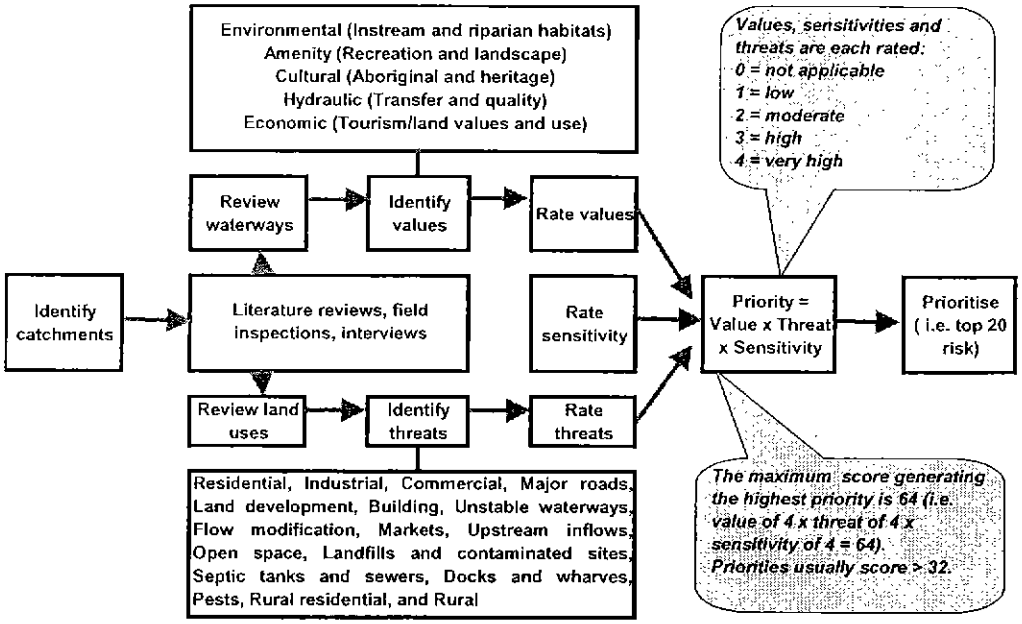


Figure 3.2
THE RISK ASSESSMENT

3.3 WHAT HAS THE MANAGEMENT REVIEW CONSIDERED?

The management review has involved the identification of current management practices, activities and programmes that contribute to stormwater management within the municipality. They include responsibilities, existing policies, stormwater knowledge, the planning framework, regulatory matters, local laws, community education, operational and contractual issues.

3.4 HOW HAVE THE RECOMMENDATIONS BEEN DEVELOPED?

The recommendations have been prepared in close consultation with Council officers and representatives of other agencies who have responsibility for the proposed actions.

The reactive strategies were developed through a process that progressively screened and evaluated a range of best practice management actions in order to identify the most effective options. Initially, a range of generic management actions were considered for each issue to eliminate responses that were not considered to be applicable to the specific stormwater threat. The options related to:

- education and awareness;
- planning and local laws;
- structural treatment measures including primary (e.g. litter traps and sediment traps), secondary (e.g. grass swales and porous pavements) and tertiary (e.g. artificial wetlands) treatment measures;
- maintenance activities;
- site specific works;
- information.

Potentially suitable options were then considered in more detail. This included the identification of specific locations for structural measures, consideration of the advantages and disadvantages of each option opportunity, the preparation of capital and ongoing (maintenance) cost estimates and an analysis of their cost effectiveness.

The management strategies were developed using a slightly different process that focussed on identifying gaps in existing management practices and procedures and developing recommendations aimed at improving specific elements of Council's management framework. Matters considered included:

- changes to the Planning Scheme, including the Municipal Strategic Statement (MSS), local policies and permit conditions;
- changes to specifications for service delivery (engineering standards);
- modifications to the local approvals process;
- opportunities to improve coordination and communication within Council;
- opportunities to improve coordination and communication with external agencies;
- improvements to strategic planning activities;
- ongoing management of infrastructure and operations;
- internal training and skill requirements.

The options were reviewed by the Steering Committee and Project Working Group to ensure that they were capable of being implemented.

An implementation framework was developed to provide Council with guidance on how to resource and coordinate the implementation of the Colac Otway Stormwater Management Plan.

4 Municipal profile

The Colac Otway Stormwater Management Plan addresses stormwater issues in the main settlements within the Colac Otway Shire. The following provides an overview of the study area, the catchments and the waterways with further details provided in Volume 2, Section 4.

4.1 WHAT ARE THE KEY CHARACTERISTICS OF THE AREA?

The Colac Otway Shire covers an area of approximately 3,533 km^2 in the south west of Victoria. It is located strategically astride three key traffic routes, Princes Highway, Hamilton Highway and the Great Ocean Road. The Shire forms the gateway to the Otways and the Western Plains.

The Shire contains the towns of Colac and Apollo Bay along with many smaller towns. The Colac Otway Stormwater Management Plan has been prepared for Colac, Elliminyt, Apollo Bay, Marengo, the coastal settlements of Skenes Creek, Wye River, Kennett River and Separation Creek, the rural towns of Beeac, Birregurra and Cressy and the Otway towns of (Forrest, Gellibrand, Lavers Hills and Beech Forest. (Refer Figure 4.1.)

The major urban centre of the Shire of Colac Otway is Colac that is located approximately 75 km west of Geelong, 140 km south west of Melbourne and 100 km south of Ballarat.

Colac performs an important role as the key industrial, commercial and service centre for the Shire and the surrounding region. Apollo Bay is a major tourist destination while also providing a local service function.

In 1997 the estimated population of the Shire was 21,523 people. Colac has an estimated population of 12,000 while Apollo Bay has a permanent resident population of approximately 1,000 people increasing to around 12,000 people during the peak holiday periods.

The Shire is characterised by a complex system of landscapes, including 'deeply incised luxuriant ridges and valleys of the Otways' which 'contrasts strongly with the open northern plains studded with crater lakes. This is an area of high soil and water quality which is showing signs of the cumulative effects of human intervention'. (MSS 1999, p 1-2).

There are a number of major industries within the Shire. Key industries include agriculture which is characterised by grazing of sheep and cattle, dairying which supplemented by a range of specialised producers of seed potatoes, onions and oilseeds. Within Colac there are a number of industries, including those related to food production, for example, Bonlac Foods Ltd, Regal Ice Cream, significant machinery dealerships, Colac Abattoir and Food Processing Plant and timber processing industry, saleyards, and grain store which are generally located to the east of Colac. Lake Colac also provides important eel culture waters, along with Cundare Pool which is partly within the Shire. In addition, there is a strong tourism industry particularly focused on the coastal areas such as Apollo Bay.

The Shire is facing a number of key challenges including sustainability of development and protection for the Shire's key environmental features (for example, volcanic craters, lakes and plains, the Otway Ranges and the Otway coast); there is the need for an integrated approach to catchment management, coastal action and forest management. Of specific relevance to stormwater quality management is the 'need to protect water catchments and in particular retain/improve the quality of water supply and minimise the impact of salinity on agricultural land and introduce appropriate planning provisions where salinity has been identified' (MSS 1999, p1).

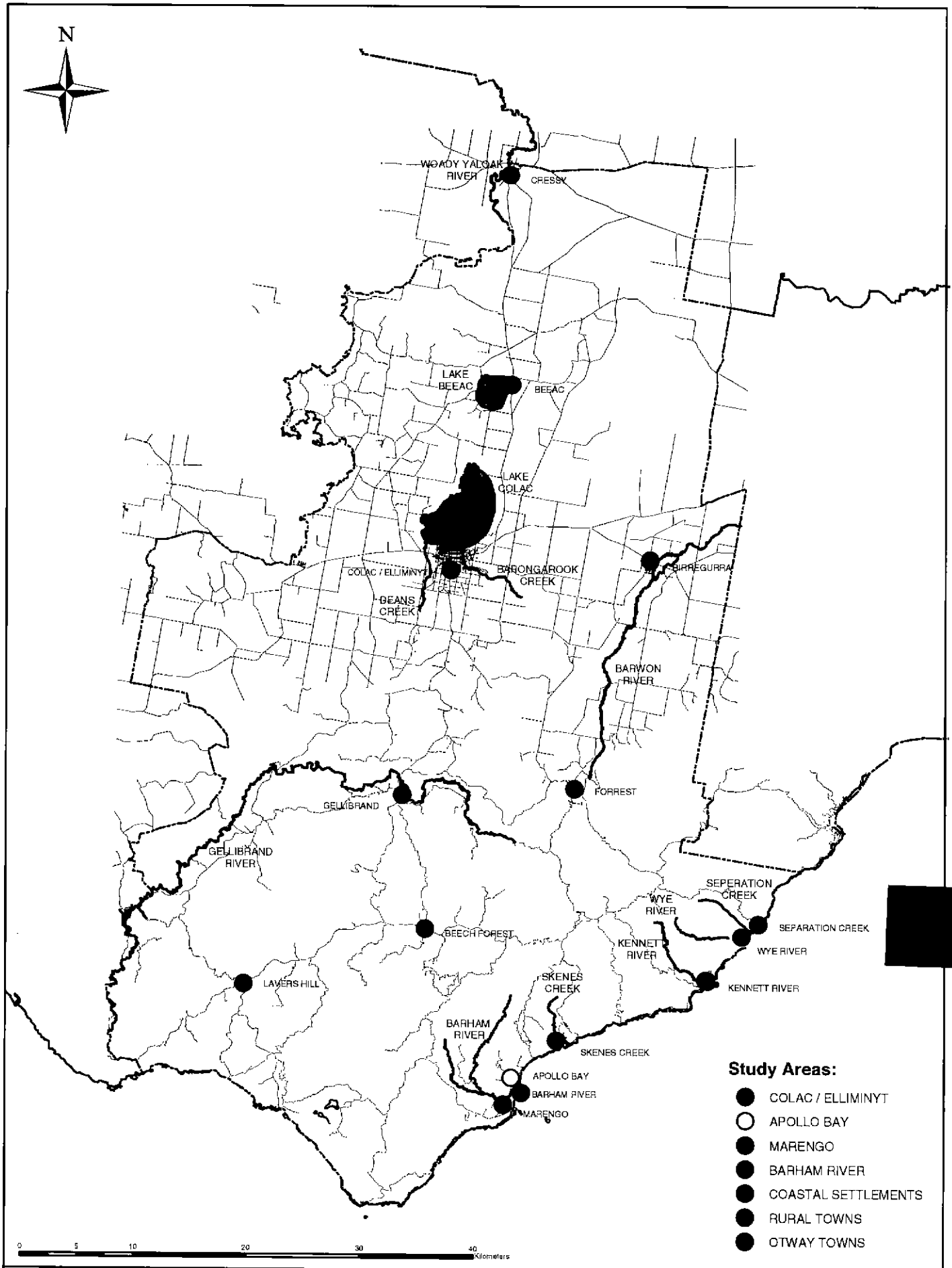
The preparation of the Colac Otway Stormwater Management Plan is one of a number of Council initiatives that is designed to meet these challenges and the Council's overall vision for the municipality.

4.2 WHERE ARE THE WATERWAYS AND CATCHMENTS?

Colac Otway Shire contains a number of important waterways, including Lake Colac which is the primary receiving waterway for Colac and Elliminyt, draining either directly to the Lake or via Deans Creek or Barongarook Creek. The Lake is a large permanent freshwater body, and has important tourism and recreational values as well as providing habitat for various bird and fish life. Other key waterways include Woady Yaloak River (near Cressy), Lake Beeac (near Beeac), Barwon River, Gellibrand River, Barham River near Marengo and Apollo Bay, Skenes Creek, Wye River, Kennett River and Separation Creek.

Figure 4.1 shows the main waterways and catchments in the Shire.

Tables 4.1 and 4.2 provide further details on the main waterways and catchments.



FINAL APPROVALS	
ENGINEERING APPR.	DATE
TECHNICAL APPR.	DATE
PROJECT APPR.	DATE
CLIENT APPR	DATE

LEGEND
Shire_Boundary
Coast_Line
Roads
Lakes

DATA SOURCE
Data: Otway Shire Council

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TITLE
FIGURE 4.1
COLAC OTWAY SHIRE

DRAWING NO.
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B

Table 4.1 The waterways

Waterway	Description
Lake Colac, Deans Creek and Barongarook Creek *(Colac and Elliminyt)*	Colac and Elliminyt drain via Deans Creek and Barongarook Creek to Lake Colac with large areas of Colac drainage directly to the lake. These towns are located on the Western Coastal Plains. 'High to very high nutrient levels have been recorded in Lake Colac' (CCLPB, 1997). Lake Colac has experienced toxic blue green algal blooms in recent years (Wes Report No. 105/96). Several fish species occur, and the recreational fishery is large and important (Williams 1992). The Lake's riparian environment is limited due to the high salinity levels. 'The swamps and lake margin provide nesting areas for many waterbirds, although habitat has been seriously reduced by clearing down to the margin of the lakes and by draining of the many swamps' (LCC 1996). There is a Bird Sanctuary on the Lake.
Barham River *(Apollo Bay and Marengo)*	'The Barham River has an important estuary environment' (Corangamite Catchment and Land Protection Board 1997). The Barham River holds good quality bream and mullet. In the Barham River 'the suitability of the water for domestic supply without treatment is affected by elevated concentrations of coliform bacteria. The likely source of contaminants is from dairy farms (Department of Water Resources, 1989). There are a range of fish species found in the river, including Australian Grayling (vulnerable), Common Galaxias (common), Short-finned Eel (common), Spotted Galaxias (restricted/rare), Tupong (common), Mountain Galaxias (common) and Brown Trout (introduced species).
Bass Strait *(Apollo Bay and Marengo)*	The area of coast near Apollo Bay and Marengo is identified in the Victorian Coastal Strategy 2002 as being in a Coastal Recreation Zone. This indicates that there are recreational opportunities for large numbers of people. This zone should be managed to minimise impacts on remnant values and the coastal environment. The Marengo Reefs near Marengo and Apollo Bay are a marine sanctuary as recognised by the Environment Conservation Council and marine parks.
Wye River, Kennett River, Separation Creek and Skenes Creek	The creeks and rivers are within the Otway Basin which drains the southern slopes of the Otway Ranges. All of the streams drain into the Southern Ocean. Within these creeks and rivers are a range of fish species including the Australian Grayling (vulnerable), Broad-finned Galaxias (restricted/rare), Common Galaxias (common), Short-finned Eel, Tupong, Yellow-eyed Mullet and Brown Trout (introduced (Water Resources, 1989).
Lake Beeac, Barwon River and Woady Yalloak River *(Beeac, Birregurra and Cressy)*	Moderate nutrient levels occur in the Woady Yalloak River (CCLPB, 1997). High to very high nutrient levels have been recorded in the middle reaches of the Barwon River' (CCLPB, 1997). Lake Beeac is a shallow ephemeral saline lake, aquifer fed. The lake is usually highly turbid and has a lack of aquatic vegetation which is reflective of its high salinity. The 'fauna is desperate so far as the number of invertebrate species is concerned. Three species of copepod occur. Birds are consistently associated with Lake Beeac when water is present, and seen feeding, are banded stilts. Other species recorded at the lake use the lake more as a refuge and resting site' (Williams 1992). Lake Beeac is one of nine lakes in the Western District Lakes Ramsar site. The Lake is recognised for its waterbirds, including summertime flocks of Avocets and Stilts feeding on tiny Fairy Shrimp. Waters carried by the Woady Yalloak River and other rivers and drainage lines, supplies the extensive network of lakes and wetlands of international importance that dominate the Basalt Plains.
Barwon River, Gellibrand River and various Otway Ranges streams *(Forrest, Gellibrand, Lavers Hill and Beech Forest)*	'The Otway streams contain predominantly native fish, with only 2 per cent containing Redfin and Mosquito fish, and collectively support a significant proportion of Victoria's native fish resources, while the Barwon River contains twelve species of native fish. Other small streams and tributaries contain isolated occurrences of threatened species, but the health of these populations is largely unknown' (CCLPB, 1997). 'Moderate nutrient levels have been recorded in the Gellibrand River' (CCLPB 1997). 'Streams in the Otway Ranges are highly rated for their environmental value and subsequently provide high quality water for domestic purposes in and outside the region (CCLPB 1997).

Table 4.2 The study area catchments

Catchment	Description
Colac (Lake)	The catchment includes two areas of Colac, generally described as the central urban/residential area and the urban area on the eastern periphery of the town. The catchment contains a number of land uses including residential, open space and major roads; a commercial area within the centre of town, generally north of the Colac and Camperdown Railway; and industrial areas on the eastern edge of town. Colac and parts of Elliminyt along with Apollo Bay are the only two centres with reticulated sewerage. The area is served by underground drains which drain into Lake Colac which is the Shire's largest natural lake.
Colac (Deans Creek)	The catchment is located on the western side of Colac and includes a large portion of Elliminyt. However, most of the run off from Elliminyt is retained in a large detention basin, preventing its discharge to the Creek. The catchment contains a number of land use types including residential, open space and a number of major roads such as the Princes Highway which carries traffic from Camperdown and beyond. There is a significant amount of land within this catchment that is zoned Residential 1 (RDZ1) under the planning scheme which has not been developed to date. This needs to be taken into consideration when planning for future stormwater quality management measures in these areas.
Colac (Barongarook Creek)	The catchment takes in a section of 'central' Colac and drains the rest of Elliminyt that does not drain into Deans Creek. The catchment contains a number of land use types, including residential, industrial (for example, timber processing and Regal cream), commercial activities along Murray Street etc. and a number of major roads.
Apollo Bay	The catchment is the urban area of Apollo Bay that drains directly to Bass Strait. The catchment is primarily residential with a commercial area fronting Collingwood Street (Great Ocean Road). Apollo Bay 'has developed from speculative residential subdivisions created after the Great Ocean Road was built in the 1920s (MSS 1999). Apollo Bay has a highly variable number of residents, largely due to its role as a major tourist centre. Apollo Bay is the only fully serviced settlement along this part of the coast. It has a full range of urban facilities including a hospital, primary and P-12 school, shops and various offices. It has a small but significant fishing industry and safe harbour for pleasure craft. The MSS identified Apollo Bay as having 'great potential for considerable additional development with opportunities for both much higher urban densities and new residential areas on the fringes of the existing urban area'. Apollo Bay drains via the Barham River to Bass Strait.
Apollo Bay and Marengo (Barham River)	The catchment is the urban areas of Apollo Bay and Marengo that drain to the Barham River. The catchment contains a combination of land use types including residential, industrial (concrete batching plant, airport/strip etc, light industrial area north of Apollo Bay). The northern area of Apollo Bay generally drains via Andersons Creek into the Barham River which ultimately drains into Bass Strait. The area of Marengo drains via the wetland/estuarine area into the Barham River, near where the river flows into Bass Strait.
Marengo	The catchment is the urban area of Marengo that drains directly to Bass Strait. The area is predominantly residential.
Coastal settlements	Wye River, Kennett River, Separation Creek and Skenes Creek are small coastal settlements which are primarily residential with surrounding rural residential properties. In most instances there is a general convenience store and petrol station. Similarly, there is a usually a foreshore camping/caravan park and small reserve/playground. There have been high *E. coli* levels recorded in some of these streams (Wye River in particular). These settlements drain via the creeks and rivers that pass through the settlement directly into Bass Strait.
Rural towns	Beeac, Birregurra and Cressy are small rural towns. The primary land uses in these townships is residential, with the limited commercial strip along the main roads through the townships providing limited services. Beeac drains to Lake Beeac a Ramsar wetland, located to the west of the township. Cressy drain to the Woady Yalloak River to the west of the township and Birregurra drains to the Barwon River. Birregurra has a small timber processing industry. These townships are not connected to reticulated sewer.
Otway towns	Forrest, Gellibrand, Lavers Hill and Beech Forest are small rural towns in the Otway Ranges. The primary land uses in these towns is residential, with a limited commercial strip along the main roads through the towns which provides limited convenience services. Forrest drains to the west branch of the Barwon River. Gellibrand drains to the Gellibrand River. Lavers Hill drains to various Otway streams, some of which eventually drain into the Gellibrand River which provides potable water to Warrnambool. Beech Forest drains to various Otway forest streams. Forrest has a small timber processing industry. These townships are not connected to reticulated sewerage.

5 Values

The key goal of the Colac Otway Stormwater Management Plan is to protect and enhance the values of the waterways. A range of values have been identified, including environmental, amenity, cultural, stormwater and economic values. The following provides a summary of the values with further details provided in Volume 2, Section 5.

5.1 WHAT IS A WATERWAY VALUE?

The principal values to be protected by the Colac Otway Stormwater Management Plan are as described in Table 5.1.

Table 5.1 Typical values

Value category	Specific types	Description
Environmental	In-stream habitat	In-stream ecological values based on water quality, habitat quality and diversity, flora and fauna species, extent of invasion by exotic species and general in-stream condition and stability.
	Riparian habitat/flora	Waterway condition and ecological values based on extent and quality of remnant (native) vegetation, weed infestation and stability of riparian zone.
Amenity	Recreational amenity	Public access and utilisation for passive and active recreation including shared tracks, formal linkages, utilisation for activities involving primary and secondary contact, extent of open space, facilities such as car parks and picnic areas, continuity of open space and visual attractiveness.
	Visual/landscape amenity	Aesthetic appreciation of the natural and built environment including consideration of natural and man made structures, landscapes and places of importance, visual access and relationships to adjacent facilities.
Cultural	Indigenous cultural heritage	Places and sites of Indigenous Heritage value such as artefact scatters, landscape and places of significance (e.g. relating to story telling), ceremonial sites (e.g. Bora rings), campsites, shell middens and trails.
	European cultural heritage	Places and sites of European Heritage value, possibly including sites of pioneering significance, historical buildings and infrastructure, trails and transport routes.
Stormwater	Flood and conveyance	Contribution to protection against flooding including consideration of waterway capacity, designated floodwalls and flood protection infrastructure (e.g. levees).
	Water quality treatment	Contribution to water quality management (including stormwater). This may include existing wetlands or other infrastructure that has been developed to improve water quality.
Economic	Property and tourism	Property value associated with proximity to water and tourist destinations. These may include values associated with visual amenity, access and enjoyment.
	Extraction and use	Other economic benefits associated with receiving waters (e.g. water supply for irrigation and stock use).

The values have been independently assessed for their local and regional significance. Accordingly a very high local value has been given the same level of significance as a very high regional value. In this way both local and regional values have been considered equally.

Consideration has been given to potential values to cover those instances where a change in conditions may improve the environmental, amenity or economic values of a waterway.

In order to identify the priorities, waterway values in the urban areas have been rated as Very High, High, Moderate, Low or Non-existent/Not applicable.

5.2 WHAT ARE THE MOST IMPORTANT VALUES?

Key waterway values (i.e. high and very high values) in the Shire of Colac Otway include:

- *Environment (in-stream habitat):* the receiving waterways are valued for their in-stream habitat, with the Lakes near Beeac and Cressy, the Otway rivers, and the Barham River all being of very high value;
- *Environment (riparian habitat):* each of the receiving waterways are valued for their riparian habitat, with Lake Colac and Lake Beeac having very high riparian values;
- *Amenity (recreation):* there are a range of passive and active recreational opportunities presented by the waterways and their immediate surrounds which is of significant value to the local and regional communities. These include the use and enjoyment of Lake Colac and coastal beaches, along the Great Ocean Road;
- *Amenity (landscape):* the waterways and their environs provide an important natural landscape feature, in particular areas through the Otway Ranges and along the Great Ocean Road and residential views of Lake Colac;
- *Cultural (Aboriginal):* the waterways (rivers, creeks and ocean) are traditionally important to the Aboriginal community, particularly as a food source. The Barham River is of particular importance;
- *Cultural (non-Aboriginal):* the waterways have an important historical role, being the focus of early development;
- *Economic (property and tourism):* the urban environment is enriched by the proximity of the waterways. Similarly, a number of waterways serve as attractions for visitors, such as Lake Colac. The coastal towns and settlements through which the Great Ocean Road passes are important regional tourism resources. In addition, property values (particularly residential) are high in these coastal areas particularly in Apollo Bay, which can largely be attributed to its proximity to the coast and waterways.

Table 5.2 and Figure 5.1 provide a summary of the key waterway values.

Table 5.2 Waterway values

Catchment	Colac	Colac	Colac	Apollo Bay	Barham River	Marengo	Coastal settlements	Rural towns	Otway towns
Waterway	Lake Colac	Deans Creek	Barongarook Creek	Ocean	Barham River	Ocean	Creeks/Ocean	Various rivers	Various rivers
VALUES:									
In-stream habitat	High	High	High	Moderate	High	High	High	Very High	Very High
Riparian habitat	Very High	High	High	Low	High	Low	High	Very High	High
Recreation	Very High	Moderate	Moderate	Very High	High	High	Very High	Moderate	Moderate
Landscape	High	Moderate	Moderate	Very High	High	High	High	Moderate	Moderate
Aboriginal	Moderate	Moderate	Moderate	Moderate	Very High	High	Moderate	High	Moderate
Non-aboriginal	High	Low	Moderate	High	Moderate	Moderate	High	High	Moderate
Conveyance	High	High	High	Moderate	High	Moderate	Moderate	Moderate	Moderate
Water quality treatment	Low	Moderate	Moderate	Low	Moderate	Moderate	High	Low	Moderate
Property and tourism	High	Moderate	Moderate	Very High	High	High	Very High	Low	Moderate
Extraction and use	Moderate	Low	Moderate	Low	Moderate	Low	Low	Low	High

RIPARIAN HABITAT

RURAL TOWNS	
HIGH	VERY HIGH
ABORIGINAL NON ABORIGINAL	INSTREAM HABITIAT RIPARIAN HABITIAT

COASTAL SETTLEMENTS	
HIGH	VERY HIGH
INSTREAM HABITAT RIPARIAN HABITAT LANDSCAPE NON ABORIGINAL WATER QUALITY TREATMENT	RECREATION PROPERTY & TOURISM

PROPERTY AND TOURISM

COLAC (LAKE)	
HIGH	VERY HIGH
INSTREAM HABITAT NON ABORIGINAL CONVEYANCE LANDSCAPE PROPERTY & TOURISM.	RIPARIAN HABITAT RECREATION

COLAC (DEANS CREEK)	
HIGH	VERY HIGH
INSTREAM HABITAT RIPARIAN HABITAT CONVEYANCE	

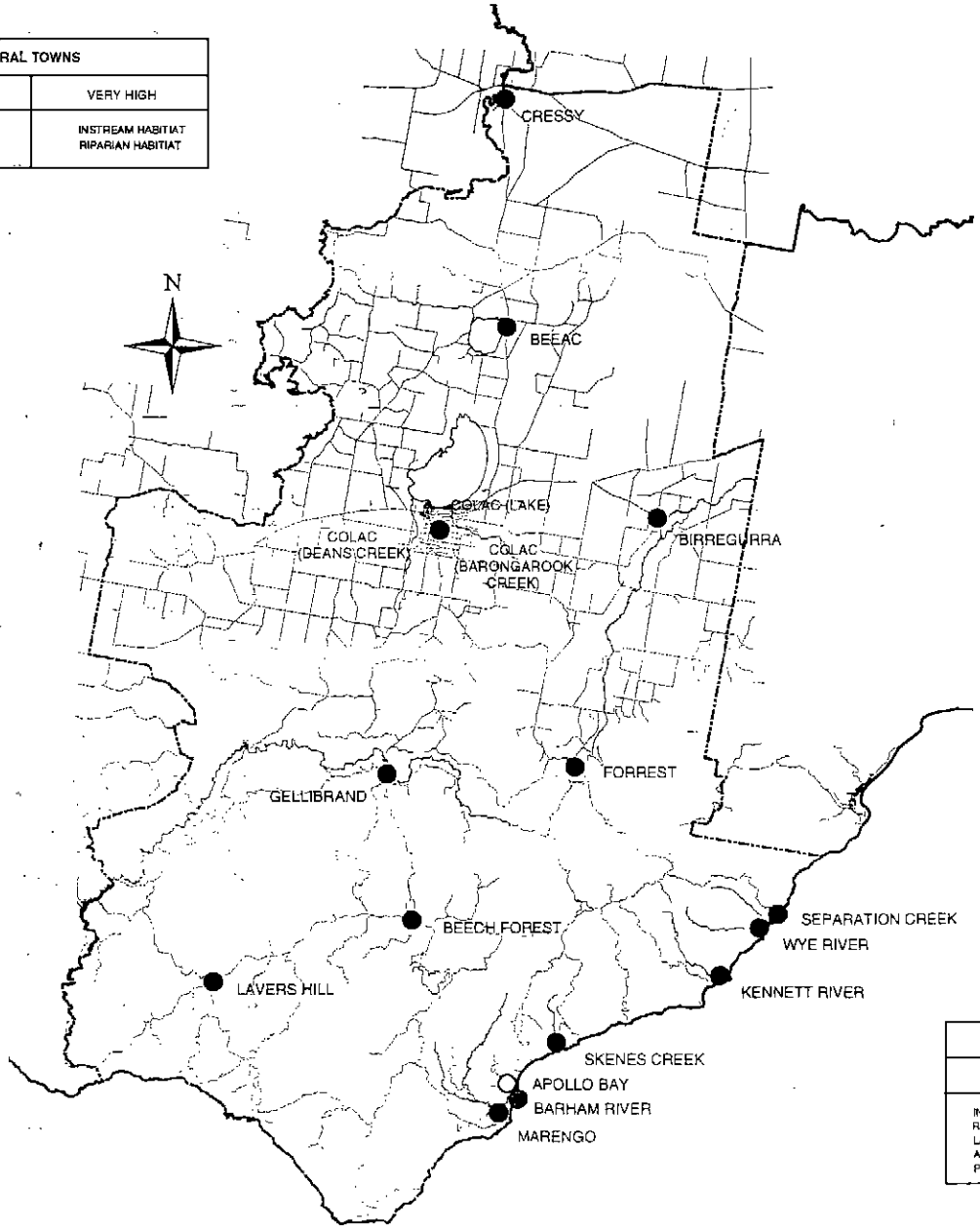
APOLLO BAY (BASS STRAIT)	
HIGH	VERY HIGH
NON ABORIGINAL	RECREATION LANDSCAPE PROPERTY & TOURISM

RECREATION

BARHAM RIVER	
HIGH	VERY HIGH
INSTREAM HABITAT RIPARIAN HABITAT RECREATION LANDSCAPE CONVEYANCE PROPERTY & TOURISM	ABORIGINAL

COLAC (BARONGAROOK CREEK)	
HIGH	VERY HIGH
INSTREAM HABITAT RIPARIAN HABITAT	

OTWAY TOWNS	
HIGH	VERY HIGH
RIPARIAN HABITAT EXTRACTION & USE	INSTREAM HABITAT



MARENGO (BASS STRAIT)	
HIGH	VERY HIGH
INSTREAM HABITAT RECREATION LANDSCAPE ABORIGINAL PROPERTY & TOURISM	

0 5 10 20 30 40 Kilometers

FINAL APPROVALS			
ENGINEERING APPR	DATE	PROJECT APPR	DATE
TECHNICAL APPR	DATE	CLIENT APPR	DATE

LEGEND: Shire_Boundary; Roads; Lakes

DATA SOURCE: Colac Otway Shire Council

KBR

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TITLE: FIGURE 5.1
KEY WATERWAY VALUES

DRAWING NO: MN1064-WD-003

REVISION: B

6 Stormwater threats

Urban development can have a major impact on stormwater. The Colac Otway Stormwater Management Plan aims to identify activities that pose the greatest threat to stormwater quality. The following provides a summary of the key threats with further details provided in Volume 2, Section 6.

6.1 WHAT IS A STORMWATER THREAT?

A stormwater threat is an activity or land use with the potential to damage the receiving environment, via impacts to stormwater quantity or quality. Common stormwater threats are described in Table 6.1.

Table 6.1 Typical threats

Threat	Cause	Key pollutants and impacts
Residential land use runoff.	Atmospheric deposition and build-up from traffic, washing cars, fertiliser application, poor waste management (domestic refuse), lawn clippings and vegetation.	Increased flow, sediment, nutrients, litter, oxygen depleting material, hydrocarbons, pathogens, trace metals, pesticides, surfactants.
Industrial land use runoff.	Atmospheric deposition and build-up from traffic, poor waste management, accidental spills and illegal discharges.	Increased flow, sediment, nutrients, litter, oxygen depleting material, hydrocarbons, pathogens, trace metals, pesticides, surfactants.
Commercial land use runoff.	Atmospheric deposition and build-up from traffic, poor waste management practices.	Increased flow, sediment, nutrients, litter, oxygen depleting material, hydrocarbons, pathogens, trace metals, surfactants.
Major road runoff.	Atmospheric and vehicular deposition and accumulation.	Sediment, litter, trace metals, hydrocarbons increased flows.
Residential development.	Poor sediment and erosion control, uncontrolled wash down of equipment, deposition of sediment, vehicles and spills from construction process (e.g. concreting).	Sediments, nutrients and increased flows.
Building site runoff (lot scale).	Poor management of building site waste and materials.	Sediment and litter.
Unstable and degraded waterways.	Poorly controlled stock and recreational access, weed infestation, damage from waterway works, development encroachment, vegetation loss, and eroded and unstable riparian zones.	Sediment, nutrients, oxygen depleting material.
Flow modification.	Extraction of water for agricultural purposes.	Reduced flows.
Markets and events	Poor waste management (litter and commercial waste), illegal discharges, atmospheric deposition and build up from traffic and wind blown litter.	Oxygen depleting material, pathogens, sediments, nutrients, litter and surfactants.

Table 6.1 continued

Threat	Cause	Key pollutants and impacts
Upstream inflows.	Runoff from upstream catchments, entering via creeks and waterways.	Sediment, nutrients, litter and pathogens, fertiliser and chemicals.
Open space runoff (e.g. golf course and sporting grounds).	Wash off of nutrients (fertilisers) and litter from public gardens, parks, sporting facilities, golf courses and discharge of poor quality water from ornamental lakes.	Nutrients, litter, oxygen depleting materials and fertiliser.
Landfill and contaminated sites.	Runoff or leaching from landfills and contaminated sites.	Oxygen depleting material, pathogens, sediments, nutrients, litter, trace metals, hydrocarbons and toxicants.
Septic and sewer.	Infiltration and overflow from sewerage systems and septic tanks.	Oxygen depleting material, pathogens and nutrients.
Docks and wharves.	Runoff from wharf areas including atmospheric deposition, spilt raw product, erosion from unsealed areas and accidental spills.	Sediment, raw product (oxygen depleting materials), oils and greases, trace metals and toxic substances.
Pests.	Weed invasion and feral pests, including carp.	Sediment, nutrients, oxygen depleting material.
Rural residential.	Runoff from unmade roads and septic tanks.	Sediment, nutrients, oxygen depleting material.
Rural.	Runoff from unmade roads, septic tanks and intensive activities such as poultry sheds, landscape suppliers etc.	Sediment, nutrients, oxygen depleting material.

Source: Chapter 3, Best Practice Environmental Management Guidelines (2000).

In order to identify the priorities, the threats have been rated as Very High, High, Moderate, Low or Non-existent/Not applicable. The ratings are based on the quantity, type and frequency of the pollutant load generated.

The threats include activities that are currently having an impact on stormwater and those that have the potential to impact on stormwater, including those activities where management approaches may already be in place to minimise the risks.

6.2 WHAT ARE THE MAIN STORMWATER THREATS?

There are a number of high and very high threats to urban stormwater in the Shire. These include activities that are currently having or could have an adverse impact on water quality including:

- *Residential:* the residential areas of each of the towns under investigation present a potential source of contaminants within all catchments;
- *Industrial:* there are a number of industrial estates/precincts throughout the municipality, including a number of large scale industries (for example, Bonlac Foods Ltd, Regal Ice Cream and Colac Abattoir and Food Processing Plant) fuel depots and machinery wash down in Colac with the potential to threaten stormwater quality. Other industries in other parts of the municipality that form part of the study area, include timber related industries (saw milling etc.) in towns such as Colac, Otway towns such as Gellibrand, Forrest, Lavers Hill etc; fishing industry (abalone and crayfish) in Apollo Bay; and construction related industries such as the concrete batching plant/stock feed facility in Apollo Bay and Colac;

- *Commercial:* there are a number of commercial areas within the various towns and settlements. Colac has a large commercial precinct CBD performing a regional role; Apollo Bay and other coastal settlements have commercial centres, serving both the resident and transit tourist population;
- *Major roads:* the municipality has a number of major roads, including the Princes Highway, the Great Ocean Road and a number of major rural roads. Given the large volumes of traffic carried by the roads, particularly during the summer holiday period and timber harvesting period, there is a threat presented, in the form of atmospheric deposits, load spillages, sediment/nutrient, zinc from tyres etc;
- *Land development:* in a number of towns there is land development (subdivision currently taking place), for example in Apollo Bay. There are also areas of land within Colac, particularly within the Deans Creek catchment which may present a potential threat in the event of land being subdivided;
- *Upstream inflows:* the municipality has a large agricultural industry, which includes dairy, grazing (sheep and cattle), timber industry (including agroforestry) etc. These land uses may present a potential threat in terms of increased nutrient levels entering the waterways further upstream, for example chemicals used on farms including spraying, fertilisers, manure, antibiotics;
- *Landfills:* there is a disused landfill in the Colac (Lake) catchment and the Marengo transfer station within the Barham River catchment which pose a potential threat to stormwater quality of the receiving waterways;
- *Septic and sewer:* Colac, Elliminyt, Apollo Bay and Marengo are sewered, the remaining towns that form part of this investigation are unsewered (these include, Forrest, Gellibrand, Lavers Hill, Beech Forest, Wye River, Kennett River, Separation Creek, Beeac, Cressy, Birregurra, Marengo and Skenes Creek). Skenes Creek is proposed to be sewered in 2004. The recently completed Wastewater Strategy (2001) indicates that sewer seepage is a significant issue threatening the water quality of the municipality's waterways, particularly in unsewered coastal areas;
- *Pests:* throughout the municipality pests such as weeds, feral animals all present a potential threat to the water quality of waterways.

Table 6.2 provides a summary of threats in each catchment.

Table 6.2 Waterway threats

Catchment waterway	Colac	Colac	Colac	Apollo Bay	Barham River	Marengo	Coastal settlements	Rural towns	Otway towns
Threat	Lake Colac	Deans Creek	Barongarook Creek	Ocean	Barham River	Ocean	Creek/Ocean	Various rivers	Various rivers
THREATS:									
Residential	High	High	High	High	High	High	Moderate	Moderate	Low
Industrial	Very High	Moderate	High	Moderate	High	High	Not applicable	Moderate	Moderate
Commercial	High	Moderate	High	Very High	Low	Low	Low	Moderate	Low
Major roads	High	High	High	High	Moderate	Moderate	Moderate	Moderate	Moderate
Land development	Moderate	Very High	High	Very High	Very High	Very High	Moderate	Low	Low
Building sites	Moderate	Very High	High	Very High	High	High	High	Low	Low
Unstable waterways	Low	Moderate	High	Moderate	High	High	Very High	Low	Moderate
Flow modification	Moderate	Moderate	Moderate	Low	Moderate	Moderate	Low	Moderate	Low
Markets and events	High	Low	Not applicable	Low	Not applicable	Not applicable	Low	Not applicable	Low
Upstream inflows	Very High	High	High	High	Moderate	Moderate	Moderate	High	Moderate
Open space	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Low	Low	Moderate
Landfills	Very High	Not applicable	Not applicable	Not applicable	High	Not applicable	Not applicable	High	Low
Septic and sewer	Low	High	Moderate	Moderate	High	Moderate	Very High	Very High	Very High
Docks and wharves	Low	Not applicable	Not applicable	High	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
Pests	High	High	High	Moderate	High	High	Moderate	Moderate	Moderate
Rural residential	Low	Low	Low	Moderate	Moderate	Moderate	Not applicable	Low	Not applicable
Rural	Low	High	High	Low	Low	Low	Not applicable	Low	Not applicable

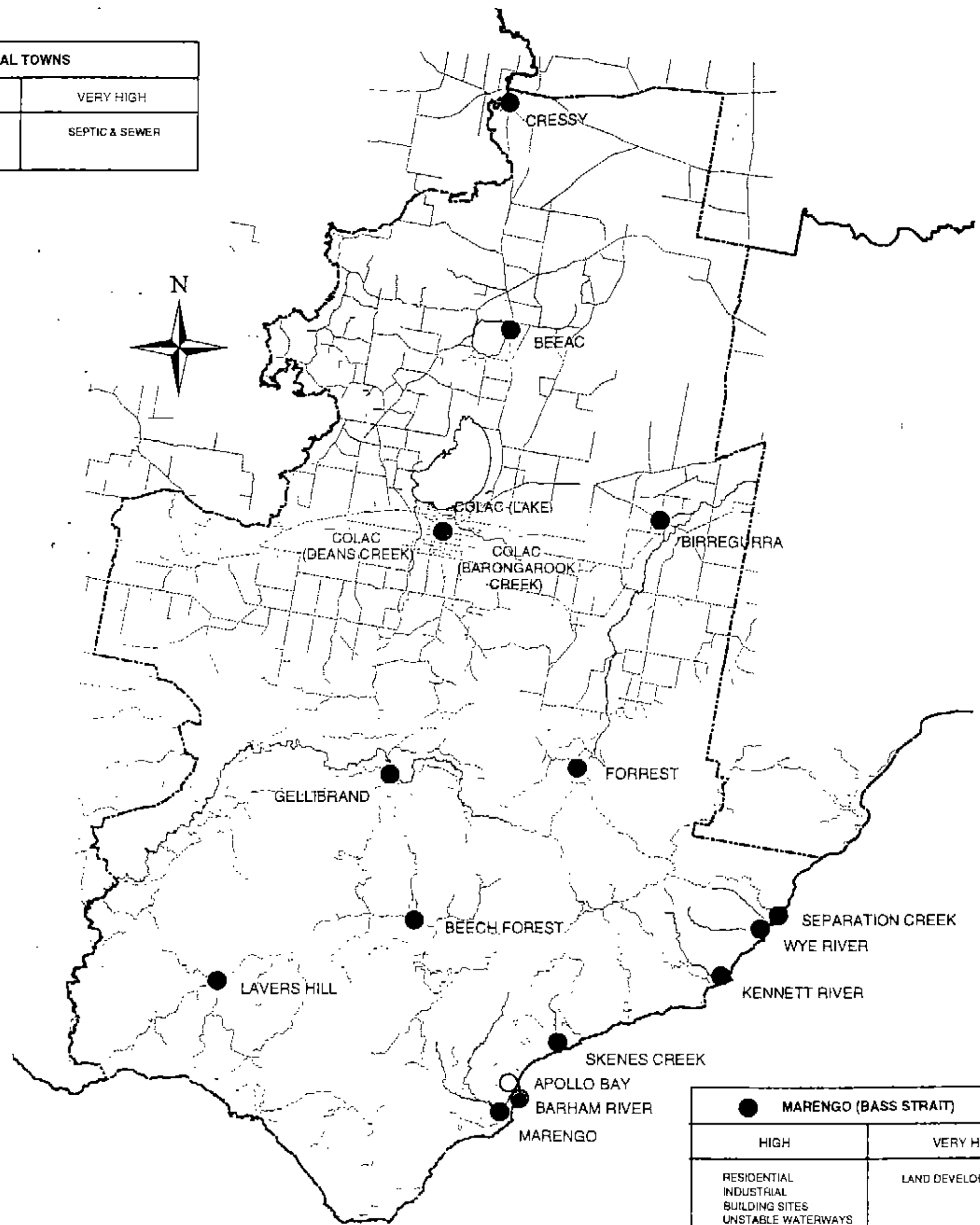
● RURAL TOWNS	
HIGH	VERY HIGH
UPSTREAM INFLOWS LANDFILLS	SEPTIC & SEWER

● COLAC (LAKE)	
HIGH	VERY HIGH
RESIDENTIAL COMMERCIAL MAJOR ROADS MARKETS & EVENTS	INDUSTRIAL UPSTREAM INFLOWS LANDFILLS

● COLAC (DEANS CREEK)	
HIGH	VERY HIGH
RESIDENTIAL MAJOR ROADS UPSTREAM INFLOWS SEPTIC & SEWER PESTS	LAND DEVELOPMENT BUILDING SITES

● COLAC (BARONGAROOK CREEK)	
HIGH	VERY HIGH
RESIDENTIAL INDUSTRIAL COMMERCIAL MAJOR ROADS LAND DEVELOPMENT BUILDING SITES UNSTABLE WATERWAYS UPSTREAM INFLOWS PESTS	

● OTWAY TOWNS	
HIGH	VERY HIGH
	SEPTIC & SEWER

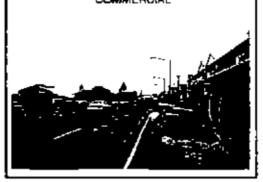


● COASTAL SETTLEMENTS	
HIGH	VERY HIGH
BUILDING SITES	UNSTABLE WATERWAYS SEPTIC & SEWER

○ APOLLO BAY (BASS STRAIT)	
HIGH	VERY HIGH
RESIDENTIAL MAJOR ROADS UPSTREAM INFLOWS DOCKS & WHARVES	COMMERCIAL LAND DEVELOPMENT BUILDING SITES

BUILDING SITES

COMMERCIAL



● MARENGO (BASS STRAIT)	
HIGH	VERY HIGH
RESIDENTIAL INDUSTRIAL BUILDING SITES UNSTABLE WATERWAYS PESTS	LAND DEVELOPMENT

● BARHAM RIVER	
HIGH	VERY HIGH
RESIDENTIAL INDUSTRIAL BUILDING SITES UNSTABLE WATERWAYS LANDFILLS SEPTIC & SEWER PESTS	LAND DEVELOPMENT

FINAL APPROVALS			
ENGINEERING APPR.	DATE	PROJECT APPR.	DATE
TECHNICAL APPR.	DATE	CLIENT APPR.	DATE

LEGEND: Shire_Boundary; Roads; Lakes

DATA SOURCE: Colac Otway Shire Council

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LEVEL 3, 441 ST KILDA ROAD MELBOURNE VICTORIA 3004

TITLE: FIGURE 6.1 KEY THREATS

DRAWING NO: MN1064-WD-006

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7 Priority risks

Stormwater priorities have been determined using a risk based methodology that correlates the threats and values in order to identify the level of risk and the priorities within each catchment. The following provides a summary of the results, with further details provided in Volume 2, Section 7.

7.1 WHAT ARE THE MAIN STORMWATER RISKS?

Waterway values are susceptible to a range of different impacts. For instance, landscape values are primarily susceptible to litter and erosion whereas in-stream habitat values are susceptible to a full range of impacts including the discharge of sediments, pesticides, herbicides and oils into the waterways.

Stormwater priorities have been developed by correlating the threats and their impacts on the waterways with the waterway values and their susceptibility to the water quality impacts posed by the threats.

The priority risks, which pose a very high risk, include:

- *Septic and sewer*: septic and sewer discharges pose a significant, if not the most significant threat to stormwater quality within the Shire. They result in a very high risk to in-stream habitat values to waterways within the rural and Otway towns. In addition, septic and sewer discharges present a very high threat to the coastal settlements' waterways where it threatens in-stream habitat and recreation values. They also present a high risk to in-stream habitat values within the Colac (Deans Creek) catchment in Colac. Septic and sewer sewage seepage in the Barham River catchment poses a high risk to recreation values of the river. Within Otway towns, extraction and use values are threatened as are riparian habitat values in the rural towns;
- *Industrial:* industrial discharges particularly from the Bruce Street drain pose a very high threat to in-stream habitat and recreation values within the Colac (Lake) catchment. Industrial land uses also present a high threat to in-stream habitat values within Barongarook Creek, Barham River, Marengo, Rural towns, and Otway towns' waterways;
- *Upstream inflows*: inflows from tributaries higher up the catchment pose a very high risk to recreation values of Lake Colac and a high threat to in-stream habitat and riparian habitat values. The inflows also have a high impact on recreation in Apollo Bay. Within Rural towns, inflows pose a high threat to in-stream habitat values;
- *Landfills*: the landfill within the Colac (Lake) catchment poses a very high threat to recreation values within the lake, and a high threat to in-stream habitat values.

Within the rural towns the landfill(s) pose a high threat to in-stream habitat values;

- *Land development:* discharges associated with land development activities pose a very high risk to recreation values within Apollo Bay. In addition, this activity poses a high risk to in-stream habitat values of Deans Creek catchment in Colac, Barham River and Marengo. Similarly, land development within Barham River and Marengo poses a high threat to recreation values;
- *Building sites*: runoff from building sites creates a very high risk to recreation values within Apollo Bay, whilst it presents a high risk to in-stream habitat and property and tourism values. It presents a high risk to in-stream habitat values within the Deans Creek catchment in Colac and recreation values within the coastal settlements' waterways;
- *Unstable waterways:* the impacts of unstable waterways in the coastal settlements poses a very high threat to recreation values of the receiving waterways and a high threat to in-stream habitat values;
- *Residential*: residential land use has the potential to pose a high risk to recreation values within Colac (Lake) catchment and Bass Strait at Apollo Bay;
- *Major roads*: within the Colac (Lake) catchment major roads pose a high risk to in-stream habitat, riparian habitat and recreation values. Within the Colac (Deans Creek), Colac (Barongarook Creek) catchment, in-stream habitat values are also threatened by major roads. Within Apollo Bay major roads pose a high threat to recreation values;
- *Markets and events:* within the Colac (Lake) catchment, the sale yards, markets and events pose a high risk to recreation values;
- *Pests*: the impacts of pests (such as carp and weeds) poses a high risk to in-stream habitat, riparian habitat and recreation values within Colac (Lake) catchment. Pests also pose a high threat to in-stream habitat values within the Colac (Barongarook Creek) catchment, Barham River, Marengo (Bass Strait), Rural and Otway towns;
- *Commercial:* within Apollo Bay commercial land use activities pose a high risk to recreation values of Bass Strait. Colac ?

The major beneficiaries of improved water quality are environmental values (e.g. in-stream and riparian habitat) and contact values (e.g. recreation and extraction values). A large number of the identified risks relate to stormwater impacts on conveyance functions, landscape values and other characteristics that are less susceptible to changes in water quality.

Table 7.1 summarises the very high and high risks concerning the environmental and contact values and in doing so provides a list of the priority areas of concern.

Table 7.1 Water quality priorities

Risk Score	Catchment	Threat	Value
VERY HIGH PRIORITIES			
64	Rural towns	Septic and sewer	In-stream habitat
64	Otway towns	Septic and sewer	In-stream habitat
48	Colac (Lake)	Industrial	In-stream habitat and recreation
48	Colac (Lake)	Upstream inflows	Recreation
48	Colac (Lake)	Landfills	Recreation
48	Apollo Bay	Land development	Recreation
48	Apollo Bay	Building sites	Recreation
48	Coastal settlements	Unstable waterways	Recreation
48	Coastal settlements	Septic and sewer	In-stream habitat and recreation
HIGH PRIORITIES			
36	Colac (Lake)	Residential	Recreation
36	Colac (Lake)	Major roads	In-stream habitat, riparian habitat and recreation
36	Colac (Lake)	Markets and events	Recreation
36	Colac (Lake)	Upstream inflows	In-stream habitat
36	Colac (Lake)	Landfills	In-stream habitat
36	Colac (Lake)	Pests	In-stream habitat, riparian habitat, recreation
36	Colac (Deans Creek)	Major roads	In-stream habitat
36	Colac (Deans Creek)	Land development	In-stream habitat
36	Colac (Deans Creek)	Building sites	In-stream habitat
36	Colac (Deans Creek)	Septic and sewer	In-stream habitat
36	Colac (Deans Creek)	Pests	In-stream habitat
36	Colac (Barongarook Creek)	Industrial	In-stream habitat
36	Colac (Barongarook Creek)	Major roads	In-stream habitat
36	Colac (Barongarook Creek)	Pests	In-stream habitat
36	Apollo Bay	Residential	Recreation
36	Apollo Bay	Major roads	Recreation
36	Apollo Bay	Upstream inflows	Recreation
36	Barham River	Industrial	In-stream habitat
36	Barham River	Land development	In-stream habitat and recreation
36	Barham River	Septic and sewer	Recreation
36	Barham River	Pests	In-stream habitat
36	Marengo	Industrial	In-stream habitat
36	Marengo	Land development	In-stream habitat and recreation
36	Marengo	Pests	In-stream habitat
36	Coastal settlements	Building sites	Recreation
36	Coastal settlements	Unstable waterways	In-stream habitat
36	Rural towns	Upstream inflows	In-stream habitat
36	Rural towns	Landfills	In-stream habitat
36	Otway towns	Septic and sewer	Extraction and use
32	Colac (Lake)	Industrial	Riparian habitat and extraction and use

Table 7.1 continued

Risk Score	Catchment	Threat	Value
32	Colac (Lake)	Upstream inflows	Riparian habitat
32	Colac (Lake)	Landfills	Riparian habitat and extraction and use
32	Apollo Bay	Commercial	Recreation
32	Rural towns	Industrial	In-stream habitat
32	Rural towns	Major roads	In-stream habitat
32	Rural towns	Septic and sewer	Riparian habitat
32	Rural towns	Pests	In-stream habitat
32	Otway towns	Industrial	In-stream habitat
32	Otway towns	Major roads	In-stream habitat
32	Otway towns	Pests	In-stream habitat

The water quality priorities can be consolidated around, a common set of threats as summarised in Table 7.2.

The implementation of strategies to address the priorities will result in improvements to urban stormwater quality throughout the Shire.

Table 7.2 Catchment priorities

Catchment	Colac	Colac	Colac	Apollo Bay	Barham River	Marengo	Coastal settlements	Rural towns	Otway towns
Waterway	Lake Colac	Deans Creek	Barongarook Creek	Ocean	Barham River	Ocean	Creek/Ocean	Various rivers	Various rivers
THREATS:									
Residential	High	High	High	High	High	High			
Industrial	Very High		High		High	High		High	High
Commercial	High		High	Very High				High	High
Major roads	High	High	High	High					
Land development		Very High	High	Very High	Very High	Very High			
Building sites		Very High	High	Very High	High	High	High		
Unstable waterways			High		High	High	Very High		
Flow modification									
Markets and events	High								
Upstream inflows	Very High	High	High	High				High	
Open space									
Landfills	Very High				High			High	
Septic and sewer		High			High		Very High	Very High	Very High
Docks and wharves				High					
Pests	High	High	High		High	High		High	High

8 Reactive strategies

Reactive management strategies have been developed to address the major threats to environmental values that were identified through the risk assessment process. The strategies contain specific actions that represent the most cost effective and feasible means of managing priority issues, and will be underpinned by more long-term management framework changes. The following provide an overview of the strategies with further details on their formulation provided in Volume 2, Section 8.

8.1 WHAT ARE THE STRATEGIES

Based on the priorities, a series of recommendation have been developed and incorporate into reactive management strategies for:

- Colac, including all urban areas at Colac and Elliminyt that drain directly to Lake Colac, Barongarook Creek or Deans Creek;
- Apollo Bay and Marengo, including all urban areas that drain into the ocean, Apollo Bay or Barham River;
- Coastal settlements (i.e. Wye River, Kennett, Separation Creek and Skenes Creek);
- Rural towns (i.e. Beeac, Birregurra and Cressy);
- Otway towns (i.e. Forrest, Gellibrand, Lavers Hill and Beech Forest).

The strategies are documented in Tables 8.2 through to 8.6.

It is recognised that there is some duplication between strategies (e.g. most refer to the need to develop and distribute educational material). It is also recognised that there are numerous actions and that it would be improbable to expect that they could all be undertaken in the first year.

In response to the above, an overall implementation programme has been developed that consolidates some of the actions, provides timelines for when actions should occur and integrates the reactive strategies with the management strategies. The programme is presented in Section 10.5.

8.2 WHAT DO THE STRATEGIES CONTAIN?

The strategies contain a range of recommendations:

- education and awareness (e.g. targeted literature, stormwater management education workshops, signage and community group consultation);
- structural treatment measures (e.g. gross pollutant traps, trash racks, grass swales, porous pavements, wetlands and sewer overflow improvements);

- planning and regulation (e.g. development standards, permit conditions, local laws and enforcement);
- source controls (e.g. improved waste collection, roof water diversion and waterway rehabilitation and revegetation, designed to control pollutants at the source);
- site specific strategies and plans (e.g. sediment and erosion control plans);
- information and data collection (e.g. to support, reinforce and supply feedback on the effectiveness of the management measures).

An initial screening process was used to select relevant options within each of the above components based on their effectiveness in addressing pollutants of concern. This identified suitable options for further evaluation. From this broad scan an assessment of the range and combination of potential options was undertaken. This process identified the advantages and disadvantages of individual options and identified indicative costs, thereby enabling the preferred options to be considered in terms of their feasibility and cost effectiveness.

The recommendations have been coded to enable cross referencing. Each recommendations has a three or four digit alphanumeric code. The first letter indicates the threat being addressed whereas the second letter indicates the type of action, as described in Table 8.1. The subsequent characters (i.e. numbers) provide an individual recommendation number.

Table 8.1 Strategy codes

Threats		Action type	
R	Residential	E	Education and awareness
I	Industrial	S	Structural treatment
C	Commercial	C	Source control
S	Septic and sewers	P	Planning and regulation
L	Landfills	M	Site management
E	Markets and events	I	Information
B	Land development and building sites		
M	Main roads		
U	Up-stream inflows		
P	Pests		
W	Unstable waterways		

EXAMPLES	
RE	Residential threat with an education and awareness recommendation
RS	Residential threat with a structural treatment recommendation
RC	Residential threat with a source control recommendation
RP	Residential threat with a planning and regulation recommendation
RM	Residential threat with site management recommendation

Table 8.2 Reactive Management Strategy 1: Colac

Strategy 1: Colac							
With Lake Colac as well as stormwater that drains into the Lake via Deans and Barongarook Creeks being under considerable pressure due to runoff from Colac, Elliminyt and surrounding rural areas, this strategy seeks to improve the quality of urban stormwater being discharged directly into the Lake. In doing so it focuses on those activities that pose the greatest risk (i.e. runoff from residential and industrial areas as well as from unsewered properties, landfills and land development) and the need to protect the important environmental, recreational, cultural and economic values of the lake.							
		Action	Cost		Responsibility	Priority	Comment
No.	Type	Description	Capital	Ongoing			
Residential runoff							
RE1	Education and awareness	Implement a community awareness campaign, including displays, workshops and education material on environmental best practice in property management (e.g. waterwise gardens, vehicle washing, appropriate disposal of garden waste, use of fertiliser on gardens, collection and disposal of dog faeces—particularly in open space areas.). Utilise EPAV, CCMA material if appropriate.	15,000	5,000	Council, CCMA, EPAV	High	Costs could be reduced—implement with other RE1 actions.
RE2	Education and awareness	Facilitate a demonstration project showing best practice in stormwater management and WSUD. Possible site includes the Lakeside Estate development or a Council site.	5,000	1,000	Council	High	Costs could be reduced—implement with other RE2 actions.
RE3	Education and awareness	Undertake drain marking in residential areas. The stenciling can build on the current drain stenciling programme and implement an awareness campaign during the stenciling programme. Opportunities to include Waterwatch as a potential partner should be investigated and included if possible.	2,000	1,000	Council, CCMA (with schools)	High	
RE4	Education and awareness	Use the local press to publicise Council's initiatives regarding stormwater management, for example notify the community of the development of the stormwater management plan, associated guidelines etc.	0	0	Council	High	No cost—undertake as part of existing Council obligations.
RE5	Education and awareness	Incorporate stormwater quality protection in Council's general environmental awareness campaigns.	0	0	Council	High	No cost—undertake as part of existing Council obligations.

Table 8.2 continued

Strategy 1: Colac							
			Cost		Response	Priority	Comment
No.	Type	Description	Capital	Ongoing			
RE6	Education and awareness	Design and develop an environmental trail around the southern end of Lake Colac highlighting the importance of the Shire's waterways and how people can protect them. Key features of the trail may include the proposed wetlands, areas along the Lake's edge, incorporating key features such as the bird sanctuary and Barongarook Creek.	65,000	5,000	Council	High	No cost to plan—budget as part of Lake Colac Management Plan.
RE8	Education and awareness	Conduct an environmental awards programme highlighting BPEM in residential areas.	5,000	5,000	Council	High	Costs could be reduced—implement with other RE8 actions.
RS1	Structural treatment measure—primary	Install additional gross pollutant traps at the at the end of the main stormwater outlets to Lake Colac.	150,000	15,000	Council	Very High	Not necessary if the outfalls are redirected towards a wetland.
RS2	Structural treatment measure—primary	Incorporate open swale grass drains in the construction and reconstruction of streets and drains. Investigate different mowing regimes for improved water treatment effectiveness and retrofitting to improve the efficiency of open swale drains for water quality treatment.	0	0	Council	High	No cost—undertake as part of existing Council obligations.
RS3	Structural treatment measure—primary	Rehabilitate and maintain the Tull Street retarding basin and outlet, incorporating softer swales to reduce downstream risks associated with increased residential development.	30,000	5,000	Council	High	
RS5	Structural treatment measure—tertiary	Subject to the results of a concept design and feasibility study, construct a wetland near the mouth of Deans Creek and Barongarook Creek.	180,000	15,000	Council	Very High	No cost to plan—budget as part of Lake Colac Management Plan.
RS6	Structural treatment measure—primary	Maintain Elliminyt retarding basin at Armstrong Street	0	0	Council	High	No cost—undertake as part of existing council obligations.

Table 8.2 continued

Strategy 1: Colac							
		Action	Cost		Responsibility	Priority	Comment
No.	Type	Description	Capital	Ongoing			
RC1	Source controls	Encourage the installation of rainwater storage and reuse tanks to reduce runoff during storm events and to conserve water.	0	0	Residents, Barwon Water	High	No cost—if implemented as part of RC1.
RC2	Source controls	Publicise the benefits of diverting roof water to grassed swales or other pre-treat options in order to reduce total flows, scouring, sediment and nutrients entering the stormwater system.	0	0	Council	High	No cost—undertake as part of existing Council obligations.
RP1	Planning and regulation	Undertake periodic audits and random inspections of 'hot spot' areas, for illegal dumping of litter and greenwaste	0	0	Council	High	No cost—undertake as part of existing Council obligations.
RP2	Planning and regulation	Amend local laws to prohibit the washing of vehicles in the street.	0		Council	High	Costs could be reduced—implement with other RP1 actions.
Industrial runoff							
IE1	Education and awareness	Implement an awareness campaign, including displays, workshops and education material relating to best practice at industrial sites for business owners/operators. (Utilise EPAV/CCMA material if appropriate). Where possible coordinate with visits undertaken by the Environmental Health Officer or with Barwon Water's trade waste inspections.	10,000	5,000	Council, EPAV, Barwon Water	Very High	Costs could be reduced—implement with other IE1 actions.
IE2	Education and awareness	Conduct an environmental awards programme highlighting businesses and industries that demonstrate a commitment to being environmentally aware, with particular focus on improving stormwater quality.	5,000	5,000	Council	Very High	Costs could be reduced—implement with other IE3 actions.
IE3	Education and awareness	Undertake a business survey, advisory audit and education campaign (for example Old Joes Creek in the City of Knox) or neighborhood improvement programme to improve stormwater discharges particularly in the Bruce Street drain catchment but throughout Colac.	50,000	5,000	Council, CCMA, EPAV	Very High	Costs could be reduced—implement with other IE3 actions.
IS1	Structural treatment measure—tertiary	Subject to the results of a concept design and feasibility study, redirect stormwater flows from central and eastern (including the Bruce Street drain) Colac via a new wetland to be developed near the mouth of Barongarook Creek.	300,000	20,000	Council, CCMA	Very High	No cost to plan—budget as part of Lake Colac Management Plan.

Table 8.2 continued

Strategy 1: Colac							
		Action	Cost		Responsibility	Priority	Comment
No.	Type	Description	Capital	Ongoing			
IC1	Source controls	Audit loading, storage and waste storage areas to ensure contaminants (i.e. spillages, litter, packages) are being handled appropriately and disposed of appropriately.	5,000	1,000	Council, owners	Very High	Costs could be avoided—implement as part of IE1 and IE3 actions.
IM1	Site management	Encourage the development of site based EMPs for key industrial sites to address stormwater, waste management, spill management etc.	0	0	Council	Very High	No cost—undertake as part of existing Council obligations.
II1	Information and data collection	Undertake ongoing monitoring of the significant outlet drains (e.g. Bruce Street drain), upstream and downstream of industrial premises.	15,000	15,000	Council, EPAV, Wastewater Barwon Water	Very High	
Septic and sewers							
SE1	Education and awareness	Implement an awareness campaign, including displays, workshops and education material for residents' with septic treatment systems regarding their maintenance responsibilities, ongoing monitoring requirements and about responsible water and waste management practices.	5,000	1,000	Council	High	Costs could be reduced—implement with other SE1 actions.
SE2	Education and awareness	Encourage connection to sewer in line with the wastewater strategy.	2,000	2,000	Council, Barwon Water	High	No cost to plan—budget as part of wastewater strategy.
SC1	Source control	Advocate either extension of reticulated sewerage system to reach unserviced properties or provision of an alternative septic disposal technique.	0	0	Council, Barwon Water	High	No cost—undertake as part of existing Council obligations.
SP1	Planning and regulation	Review permit documentation (maintain register) and carry out inspections of existing on site waste management systems and enforce maintenance requirements in permits.	0	0	Council	High	No cost—undertake as part of existing Council obligations.

Table 8.2 continued

Strategy 1: Colac							
			Cost		Response	Priority	Comment
No.	Type	Description	Capital	Ongoing			
SP2	Planning and regulation	Avoid the approval of standard septic tanks in and adjacent to urban areas and villages. Require annual inspections of septic tanks and the reporting of results to Council.	0	0	Council	High	No cost—undertake as part of existing Council obligations.
Landfills						Very High	
LM1	Site management	Develop an Environmental Management Plan (EMP) for the disused landfill site at the edge of Lake Colac, at the end of Bruce Street.	0		Council in consultation with EPAV, DNRE	Very High	No cost—undertake as part of existing Council obligations.
LM2	Site management	Monitor surface runoff and groundwater quality around disused landfill site at the end of Bruce Street.	0	0	Council	Very High	No cost—undertake as part of existing Council obligations.
Markets and events							
EE1	Education and awareness	Implement an awareness campaign, including the preparation and distribution of material on waste management for events and known likely participants (sports clubs, residents, junior squads).	5,000	1,000	Council, event organiser	High	
EE2	Education and awareness	Prepare temporary signage indicating waste disposal practice required at event location (5 × $200).	2,000	1,000	Council	High	
EC1	Source controls	Follow up events with coordinated clean up plan (e.g. street sweeping, rapid rubbish collection, recycling containers, cigarette butt containers).	0	0	Event organiser, Council	High	No cost—undertake as part of existing Council obligations.
EM1	Site management	Develop site specific waste management plans for key events through lease arrangements with Council.	0	0	Council, event/sport organiser, Regional WMG	High	No cost—undertake as part of existing Council obligations.
EM2	Site management	Develop a site specific EMP and associated waste management plan and stormwater management plan for the saleyards.	0		Council	High	No cost—undertake as part of existing Council obligations.

Table 8.2 continued

Strategy 1: Colac							
		Action	Cost		Responsibility	Priority	Comment
No.	Type	Description	Capital	Ongoing			
EP1	Planning and regulation	Review Council's waste management strategy to include strategies to address managing waste from events, regular sporting activities etc.	0	0	Council, Regional WMG	High	No cost—undertake as part of existing Council obligations.
Land development and building sites							
BE1	Education and awareness	Implement an awareness campaign, including displays, workshops and education material for contractors and developers regarding management of stormwater. Brochures can be used as a guide for contractors when preparing Environmental Management Plans and when preparing documentation to meet quality assurance procedures. Use EPAV/CCMA material is appropriate.	5,000	1,000	Council	High	Costs could be reduced— implement with other BE1 actions.
BE2	Education and awareness	Provide temporary signs at building sites/subdivision areas highlighting stormwater/waste management and discharge points. (Estimated $200/ sign × 5)	2,000	2,000	Council	High	
BM1	Site Management	Encourage the housing and construction industry to develop a code of practice for environmental management and for control of wastes (including sediment, paints etc.) from construction sites.	0		Council	High	No cost—undertake as part of existing Council obligations.
BP1	Planning and regulation	Ensure that all subdivision permits are granted with conditions relating to sediment control. Require the application of water sensitive urban design requirements to subdivision and development permits.	0	0	Council	High	No cost—undertake as part of existing Council obligations.
BP2	Planning and regulation	Require land developers to prepare an EMP (including sediment/erosion control initiatives) for land for subdivision activities, particularly target undeveloped areas.	0	0	Council	High	No cost—undertake as part of existing Council obligations.
BP3	Planning and regulation	Introduce a Local Law and or advocate for changes to the Building Control Act to control the adverse impacts of construction activity on stormwater quality.	0		Council, BCC	High	No cost—undertake as part of existing Council obligations.

Table 8.2 continued

Strategy 1: Colac							
		Action	Cost		Responsibility	Priority	Comment
No.	Type	Description	Capital	Ongoing			
BP4	Planning and regulation	Require WSUD to be considered for all.	0	0	Council	High	No cost—undertake as part of existing Council obligations.
Major roads							
ME1	Education and awareness	Liaise with the local truck industry (e.g. trucks involved in agricultural/horticultural cartage, timber transport trucks) regarding management of loads to avoid spillages, truck maintenance to minimise contaminants accumulating on the road including engine oils, grease, air pollution deposits etc.	2,000	2,000	Council, industry representatives	High	Costs could be reduced—implement with other ME1 actions.
ME2	Education and awareness	Use the local press to publicise load spillages and the impact they are likely to have on Lake Colac (where possible use actual examples) and point out the measures that truck/vehicle owners and operators can take to minimise reoccurrence.	0	0	Council	High	Costs could be reduced—implement with other ME2 actions.
MS1	Structural treatment measures—primary	Install drainage entrance treatments/inline types (e.g. litter traps, trash racks, return flow litter baskets, circular screens) at vehicle parks close to waterways along Princes Highway.	5,000	1,000	Council, VicRoads	High	
MS2	Structural treatment measures—secondary	Install gross pollutant traps or similar devices at the Barongarook Creek crossing to collect and treat runoff from Princes Highway (possible as part of pre-treatment to a wetland).	100,000	10,000	Council, CCMA, EPAV	High	No cost to plan—budget as part of Lake Colac Management Plan.
MS3	Structural treatment measures—secondary	Install gross pollutant traps or similar devices at the Deans Creek crossing to collect and treat runoff from Princes Highway (possible as part of pre-treatment to a wetland).	100,000	10,000	Council, CCMA, EPAV	High	No cost to plan—budget as part of Lake Colac Management Plan.
MS4	Structural treatment measures—secondary	Incorporate pre-entrance treatment measures such as filter strips, grass swales, triple interceptors, porous pavements and oil and grease baffles in main road design.	0	0	Council VicRoads	High	No cost—undertake as part of existing Council obligations.

Table 8.2 continued

Strategy 1: Colac							
		Action	Cost		Responsibility	Priority	Comment
No.	Type	Description	Capital	Ongoing			
MC1	Source controls	Review existing street sweeping regime, checking to ensure that the schedule includes all hot spot areas.	0		Council	High	No cost—undertaken as part of existing Council obligations.
MP1	Planning and regulation	Council, in association with VicRoads, EPAV and the Police, need to reinforce controls with regard to speed limits, securing of loads, vehicle maintenance tyre peel offs etc.	0	0	Council, EPAV, VicRoads, Police	High	No cost—undertaken as part of existing Council obligations.
Upstream inflows							
UE1	Education and awareness	Liaise with rural property owners to reduce sediment and pollutant loads washing into creeks that pass through the towns. Use DNRE material as appropriate.	2,000	2,000	Council, DNRE CCMA	Very High	
UE2	Education and awareness	Develop with landcare/friends of groups, catchment management plans extending from the upper rural catchments through the urban areas. Seek partnerships with DNRE, CCMA, and/or Parks Victoria to facilitate plan development and implementation.	5,000	2,000	Council	Very High	
Pests							
PE1	Education and awareness	Undertake a targeted programme of weed and vermin eradication, commencing with hot spot areas. Utilise existing information available from DNRE, CCMA.	0	0	Council, CCMA, DNRE	High	No cost—undertaken as part of existing Council obligations.
PE2	Education and awareness	Implement an awareness campaign, including displays, workshops and education material targeted at property owners adjacent to creek lines. It should focus on litter control and discourage people from throwing green waste etc into waterways (as this can spread weeds).	5,000	1,000	Council	High	Costs could be reduced—implement with other PE2 actions.
Commercial land runoff							
CE1	Education and awareness	Implement an awareness campaign, including displays, workshops and education material for commercial business owners/operators regarding their responsibilities with regard to stormwater management. Target particular issues such as appropriate storage of goods, including chemicals, cigarette buts etc. Use EPAV/CCMA material if appropriate.	10,000	2,000	Council	High	No cost—undertaken as part of existing Council obligations.

Table 8.2 continued

Strategy 1: Colac							
		Action	Cost		Responsibility	Priority	Comment
No.	Type	Description	Capital	Ongoing			
CE2	Education and awareness	Undertake drain marking.	2,000	1,000	Council	High	
CS1	Structural treatment primary	Install litter traps and side entry baskets in areas of high litter.	5,000	1,000	Council, Regional WMG	High	
CC1	Source controls	Encourage traders to install cigarette butt containers and provide advice on the available and appropriate disposal options.	0	0	Traders	High	No additional cost—if implemented as part of CE2.
CC2	Source controls	Encourage banks to review ATM operations to reduce street litter.	0	0	Council	High	No additional cost—if implemented as part of CE1.
CP1	Planning and regulation	Review local laws to control the overfilling/flow of wastes from commercial bins.	0	0	Council	High	No cost— undertaken as part of existing Council obligations

Table 8.3 Reactive Management Strategy 2: Apollo Bay and Marengo

Strategy 2: Apollo Bay and Marengo							
With Apollo Bay and Marengo being a popular coastal destination, this strategy seeks to protect the important riparian habitat, recreational, landscape, cultural and economic values of the coastline by targeting those urban activities that pose the greatest risk to stormwater quality (i.e. runoff from residential, industrial and commercial areas as well as from unsewered properties, land development, building sites, major roads and upstream inflows).							
		Action	Cost		Responsibility	Priority	Comment
No.	Type	Description	Capital	Ongoing			
Residential runoff							
RE1	Education and awareness	Implement a community awareness campaign, including displays, workshops and education material on environmental best practice in property management (e.g. waterwise gardens, vehicle washing, appropriate disposal of garden waste, use of fertiliser on gardens, collection and disposal of dog faeces—particularly in open space areas). Utilise EPAV, CCMA material if appropriate.	15,000	5,000	Council, CCMA, EPAV	High	Costs could be reduced— implement with other RE1 actions.
RE2	Education and awareness	Facilitate a demonstration project showing best practice in stormwater management and WSUD.	5,000	1,000	Council	High	Costs could be reduced— implement with other RE2 actions.
RE3	Education and awareness	Undertake drain marking in residential areas. The stenciling can build on the current drain stenciling programme and implement an awareness campaign during the stenciling programme. Opportunities to include Waterwatch as a potential partner should be investigated and included if possible.	2,000	1,000	Council, CCMA (with schools)	High	
RE4	Education and awareness	Use the local press to publicise Council's initiatives regarding stormwater management, for example notify the community of the development of the stormwater management plan, associated guidelines etc.	0	0	Council	High	No cost—undertake as part of existing Council obligations.
RE5	Education and awareness	Incorporate stormwater quality protection in Council's general environmental awareness campaigns.	0	0	Council	High	No cost—undertake as part of existing Council obligations.
RE7	Education and awareness	Design and develop an environmental trail around Apollo Bay highlighting the importance of the Shire's waterways and how people can protect them.	65,000	5,000	Council	High	Costs could be reduced— implement design with RE6 for Colac.

Table 8.3 continued

Strategy 2: Apollo Bay and Marengo							
		Action	Cost		Responsibility	Priority	Comment
No.	Type	Description	Capital	Ongoing			
RE8	Education and awareness	Conduct an environmental awards programme highlighting BPEM in residential areas.	5,000	5,000	Council	High	Costs could be reduced— implement with other RE8 actions.
RS2	Structural treatment measure—primary	Incorporate open swale grass drains in the construction and reconstruction of streets and drains. Investigate different mowing regimes for improved water treatment effectiveness and retrofitting to improve the efficiency of open swale drains for water quality treatment.	0	0	Council	High	No cost—undertake as part of existing Council obligations.
RS4	Structural treatment measure—primary	Rehabilitate the stormwater outfall at Marengo to reduce erosion.	30,000	5,000	Council	High	
RC1	Source controls	Encourage the installation of rainwater storage and reuse tanks to reduce runoff during storm events and to conserve water.	0	0	Residents, Barwon Water	High	No cost—undertake as part of existing Council obligations.
RC2	Source controls	Publicise the benefits of diverting roof water to grassed swales or other pre-treat options in order to reduce total flows, scouring, sediment and nutrients entering the stormwater system.	0	0	Council	High	No cost—undertake as part of existing Council obligations.
RP1	Planning and regulation	Undertake periodic audits and random inspections of 'hot spot' areas, for illegal dumping of litter and green waste.	0	0	Council	High	No cost—undertake as part of existing Council obligations.
RP1	Planning and regulation	Amend local laws to prohibit the washing of vehicles in the street.	0		Council	High	No cost—undertake as part of existing Council obligations.

Table 8.3 continued

Strategy 2: Apollo Bay and Marengo							
		Action	Cost		Responsibility	Priority	Comment
No.	Type	Description	Capital	Ongoing			
Industrial runoff							
IE1	Education and awareness	Implement an awareness campaign, including displays, workshops and education material relating to best practice at industrial sites for business owners/operators. (Utilise EPAV/CCMA material if appropriate). Where possible coordinate with visits undertaken by the Environmental Health Officer or with Barwon Water's trade waste inspections.	10,000	5,000	Council, EPAV, Barwon Water	High	Costs could be reduced— implement with other IE1 actions.
IE2	Education and awareness	Conduct an environmental awards programme highlighting businesses and industries that demonstrate a commitment to being environmentally aware, with particular focus on improving stormwater quality.	5,000	5,000	Council	High	Costs could be avoided implement as part of IE1 action.
IC1	Source controls	Audit loading, storage and waste storage areas to ensure contaminants (i.e. spillages, litter, packages) are being handled appropriately and disposed of appropriately.	5,000	1,000	Council, owners	High	Costs could be reduced— implement with other IC1 actions.
IM1	Site management	Encourage the development of site based EMPs for key industrial sites to address stormwater, waste management, spill management etc.	0	0	Council	High	No cost—undertake as part of existing Council obligations.
II1	Information and data collection	Undertake ongoing monitoring of the significant outlet drains upstream and downstream of industrial premises.	15,000	15,000	Council, EPAV	High	

Table 8.3 continued

Strategy 2: Apollo Bay and Marengo							
		Action	Cost		Responsibility	Priority	Comment
No.	Type	Description	Capital	Ongoing			
Commercial land runoff							
CE1	Education and awareness	Implement an awareness campaign, including displays, workshops and education material for commercial business owners/operators regarding their responsibilities with regard to stormwater management. Target particular issues such as appropriate waste disposal, management of loading and unloading of materials, appropriate storage of goods, including chemicals, cigarette butts etc. Use EPAV/CCMA material if appropriate.	10,000	2,000	Council	Very High	Cost could be reduced implement with other CE1 actions.
CE2	Education and awareness	Undertake drain marking.	2,000	1,000	Council	Very High	
CS1	Structural treatment—primary	Install litter traps and side entry baskets in areas of high litter.	5,000	1,000	Council, Regional WMG	Very High	
CC1	Source controls	Encourage traders to install cigarette butt containers and provide advice on the available and appropriate disposal options.	0	0	Traders	Very High	No cost—if implemented as part of C1.
CC2	Source controls	Encourage banks to review ATM operations to reduce street litter.	0	0	Council	Very High	No cost—if implemented as part of CE2.
CP1	Planning and regulation	Review Local Laws to control the overfilling/flow of wastes from commercial bins.	0		Council	Very High	No cost—undertake as part of existing Council obligations.
Septic and sewers							
SE1	Education and awareness	Implement an awareness campaign, including displays, workshops and education material for residents' with septic treatment systems regarding their maintenance responsibilities, ongoing monitoring requirements and about responsible water and waste management practices.	5,000	1,000	Council	Very High	Costs could be avoided—incorporate with other RE1 and SE1 actions.

Table 8.3 continued

Strategy 2: Apollo Bay and Marengo							
		Action	Cost		Responsibility	Priority	Comment
No.	Type	Description	Capital	Ongoing			
SE2	Education and awareness	Encourage connection to sewer in line with the wastewater strategy.	0	0	Council, Barwon Water	High	No cost to plan—budget as part of wastewater strategy.
SC1	Source control	Advocate either extension of reticulated sewerage system to reach unserviced properties or provision of an alternative septic disposal technique.	0	0	Council, Barwon Water	High	No cost—undertake as part of existing Council obligations.
SP1	Planning and regulation	Review permit documentation (maintain register) and carry out inspections of existing on site waste management systems and enforce maintenance requirements in permits.	0	0	Council	High	No cost—undertake as part of existing Council obligations.
SP2	Planning and regulation	Avoid the approval of standard septic tanks in and adjacent to urban areas and villages. Require annual inspections of septic tanks and the reporting of results to Council.	0	0	Council	High	No cost—undertake as part of existing Council obligations.
Land development and building sites							
BE1	Education and awareness	Implement an awareness campaign, including displays, workshops and education material for contractors and developers regarding management of stormwater. Brochures can be used as a guide for contractors when preparing Environmental Management Plans and when preparing documentation to meet quality assurance procedures. Use EPAV/CCMA material as appropriate.	5,000	1,000	Council	Very High	Costs could be reduced— implement with other PE1 actions.
BE2	Education and awareness	Provide temporary signs at building sites/subdivision areas highlighting stormwater/waste management and discharge points. (Estimated $200/sign × 5.)	2,000	2,000	Council	Very High	
BM1	Site Management	Encourage the housing and construction industry to develop a code of practice for environmental management and for control of wastes (including sediment, paints) from construction sites.	0		Council	Very High	No cost to plan—budget as part of wastewater strategy.

Table 8.3 continued

Strategy 2: Apollo Bay and Marengo							
		Action	Cost		Responsibility	Priority	Comment
No.	Type	Description	Capital	Ongoing			
BP1	Planning and regulation	Ensure that all subdivision permits are granted with conditions relating to sediment control. Require the application of water sensitive urban design requirements to subdivision and development permits.	0	0	Council	Very High	No cost to plan—budget as part of wastewater strategy.
BP2	Planning and regulation	Require land developers to prepare an EMP (including sediment/erosion control initiatives) for land for subdivision activities, particularly target undeveloped areas.	0	0	Council	Very High	No cost—undertake as part of existing Council obligations.
BP3	Planning and regulation	Introduce a Local Law and or advocate for changes to the Building Control Act to control the adverse impacts of construction activity on stormwater quality.	0		Council, BCC	Very High	No cost—undertake as part of existing Council obligations.
BP4	Planning and regulation	Require WSUP to be considered for development.	0	0	Council	Very High	No cost—undertake as part of existing Council obligations.
Major roads							
ME1	Education and awareness	Liaise with the local truck industry (e.g. trucks involved in agricultural/horticultural cartage, timber transport trucks) regarding management of loads to avoid spillages, truck maintenance to minimise contaminants accumulating on the road including engine oils, grease, air pollution deposits etc.	2,000	2,000	Council, industry representatives	High	Costs could be reduced— implement with other ME1 actions.
ME2	Education and awareness	Use the local press to publicise load spillages and the impact they are likely to have on waterways (where possible use actual examples) and point out the measures that truck/vehicle owners and operators can take to minimise reoccurrence.	0	0	Council	High	No cost—undertake as part of existing Council obligations.
MS1	Structural treatment measures—primary	Install drainage entrance treatments/inline types (e.g. litter traps, trash racks, return flow litter baskets, circular screens) at vehicle parks close to waterways.	5,000	1,000	Council, VicRoads	High	

Table 8.3 continued

Strategy 2: Apollo Bay and Marengo							
		Action	Cost		Responsibility	Priority	Comment
No.	Type	Description	Capital	Ongoing			
MS4	Structural treatment measures—secondary	Incorporate pre-entrance treatment measures such as filter strips, grass swales, triple interceptors, porous pavements and oil and grease baffles in main road design.	0	0	Council, VicRoads	High	No cost—undertake as part of existing Council obligations.
MC1	Source controls	Review existing street sweeping regime, checking to ensure that the schedule includes all hot spot areas.	2,000		Council	High	No cost—undertake as part of existing Council obligations.
MP1	Planning and regulation	Council, in association with VicRoads, EPAV and the Police, need to reinforce controls with regard to speed limits, securing of loads, vehicle maintenance, tyre peel offs etc.	0	0	Council, EPAV, VicRoads, Police	High	No cost—undertake as part of existing Council obligations.
Upstream inflows							
UE1	Education and awareness	Liaise with rural property owners to reduce sediment and pollutant loads washing into creeks that pass through the towns. Use DNRE material as appropriate.	2,000	2,000	Council, DNRE, CCMA	High	
UE2	Education and awareness	Develop with landcare/friends of groups, catchment management plans extending from the upper rural catchments through the urban areas. Seek partnerships with DNRE, CCMA, and/or Parks Victoria to facilitate plan development and implementation.	5,000	2,000	Council	High	
Pests							
PE1	Education and awareness	Undertake a targeted programme of weed and vermin eradication, commencing with hot spot areas. Utilise existing information available from DNRE, CCMA.	0	0	Council, CCMA, DNRE	High	No cost—undertake as part of existing Council obligations.
PE2	Education and awareness	Implement an awareness campaign, including displays, workshops and education material targeted at property owners adjacent to creek lines. It should focus on litter control and discourage people from throwing green waste etc into waterways (as this can spread weeds).	5,000	1,000	Council	High	Costs could be reduced— implement with other PE2 actions.

Table 8.3 continued

Strategy 2: Apollo Bay and Marengo							
		Action	Cost		Responsibility	Priority	Comment
No.	Type	Description	Capital	Ongoing			
Unstable waterways							
WE1	Education and awareness	Implement an awareness campaign, including displays, workshops and education material to land owners, particularly those with properties with waterway frontage regarding BPEM of waterways environs. Highlight issues such as minimising stock access to waterways, revegetating and fencing the riparian environment either side of the waterways. Utilise existing information from the CCMA.	5,000	2,000	Council, CMA, wastewater	Very High	
Landfills							
LM1	Site management	Develop an Environmental Management Plan (EMP) for disused landfill sites.	0	0	Council in consultation with EPAV, DNRE	High	No cost—undertake as part of existing Council obligations.

Table 8.4 Reactive Management Strategy 3: Coastal Settlements

Strategy 3: Coastal Settlements							
Urban development at Wye River, Kennett River, Separation Creek and Skenes Creek generates a number of water quality concerns as evidenced through high *E. coli* and sediment levels in the local waterways. The lack of services and poor land capability contribute to the problems. This strategy seeks to protect water quality in the coastal settlements by targeting the threats generated from unsewered properties, development and the existence of unstable waterways.							
		Action	Cost		Responsibility	Priority	Comment
No.	Type	Description	Capital	Ongoing			
Septic and sewers							
SE1	Education and awareness	Implement an awareness campaign, including displays, workshops and education material for residents' with septic treatment systems regarding their maintenance responsibilities, ongoing monitoring requirements and about responsible water and waste management practices.	5,000	1,000	Council	Very High	Costs could be avoided— implemented with other RE1 and SE1 actions.
SE2	Education and awareness	Encourage connection to sewer in line with the wastewater strategy.	2,000	2,000	Council, Barwon Water	Very High	No cost to plan—budget as part of wastewater strategy.
SC1	Source control	Advocate either extension of reticulated sewerage system to reach unserviced properties or provision of an alternative septic disposal technique.	0	0	Council, Barwon Water	Very High	No cost—undertake as part of existing Council obligations.
SC2	Source control	Advocate for the use of package treatment plants or neighbourhood waste management systems in coastal areas, depending upon the outcomes of the Coastal Community revitalisation study.	0	0	Council, Barwon Water	Very High	No cost—undertake as part of existing Council obligations.
SP1	Planning and regulation	Review permit documentation (maintain register) and carry out inspections of existing on site waste management systems and enforce maintenance requirements in permits.	0	0	Council	Very High	No cost—undertake as part of existing Council obligations.
SP2	Planning and regulation	Avoid the approval of standard septic tanks in and adjacent to urban areas and villages. Require annual inspections of septic tanks and the reporting of results to Council.	0	0	Council	Very High	No cost—undertake as part of existing Council obligations.

Table 8.4 continued

Strategy 3: Coastal Settlements							
		Action	Cost		Responsibility	Priority	Comment
No.	Type	Description	Capital	Ongoing			
Land development and building sites							
BE1	Education and awareness	Implement an awareness campaign, including displays, workshops and education material for contractors and developers regarding management of stormwater. Brochures can be used as a guide for contractors when preparing Environmental Management Plans and when preparing documentation to meet quality assurance procedures. Use EPAV/CCMA material as appropriate.	5,000	1,000	Council	High	Costs could be reduced— implement with other BE1 actions.
BE2	Education and awareness	Provide temporary signs at building sites/subdivision areas highlighting stormwater/waste management and discharge points. (Estimated $200/sign × 5).	2,000	2,000	Council	High	
BM1	Site Management	Encourage the housing and construction industry to develop a code of practice for environmental management and for control of wastes (including sediment, paints etc) from construction sites.	0		Council	High	No cost—undertake as part of existing Council obligations.
BP1	Planning and regulation	Ensure that all subdivision permits are granted with conditions relating to sediment control. Require the application of water sensitive urban design requirements to subdivision and development permits.	0	0	Council	High	No cost—undertake as part of existing Council obligations.
BP2	Planning and regulation	Require land developers to prepare an EMP (including sediment/erosion control initiatives) for land for subdivision activities, particularly target undeveloped areas.	0	0	Council	High	No cost—undertake as part of existing Council obligations.
BP3	Planning and regulation	Introduce a Local Law and or advocate for changes to the Building Control Act to control the adverse impacts of construction activity on stormwater quality.	0		Council, BCC	High	No cost—undertake as part of existing Council obligations.
BP4	Planning and regulation	Require WSUD to be considered for developments.	0	0	Council	High	No cost—undertake as part of existing Council obligations.

Table 8.4 continued

Strategy 3: Coastal Settlements							
		Action	Cost		Responsibility	Priority	Comment
No.	Type	Description	Capital	Ongoing			
Unstable waterways							
WE1	Education and awareness	Implement an awareness campaign, including displays, workshops and education material to land owners, particularly those with properties with waterway frontage regarding BPEM of waterways environs. Highlight issues such as minimising stock access to waterways, revegetating and fencing the riparian environment either side of the waterways. Utilise existing information from the CCMA.	0	2,000	Council	Very High	

Table 8.5 Reactive Management Strategy 4: Rural Townships

Strategy 4: Rural Townships							
While relatively small in size Beeac, Birregurra and Cressy all drain into important waterways (i.e. Lake Beeac, Woady Yalloak River and Barwon River) and pose a threat to the important environmental and cultural values of the waterways. This strategy seeks to protect water quality by targeting the threats posed from industrial areas as well as unsewered properties, roads, landfills and weeds.							
		Action	Cost		Responsibility	Priority	Comment
No.	Type	Description	Capital	Ongoing			
Industrial runoff							
IE1	Education and awareness	Implement an awareness campaign, including displays, workshops and education material relating to best practice at industrial sites for business owners/operators. (Utilise EPAV/CCMA material if appropriate). Where possible coordinate with visits undertaken by the Environmental Health Officer or with Barwon Water's trade waste inspections.	10,000	5,000	Council, EPAV, Barwon Water	High	Costs could be reduced— implement with other IE1 actions.
IE2	Education and awareness	Conduct an environmental awards programme highlighting businesses and industries that demonstrate a commitment to being environmentally aware, with particular focus on improving stormwater quality.	5,000	5,000	Council	High	Costs could be reduced— implement with other IE3 actions.
IE3	Education and awareness	Undertake a business survey, advisory audit and education campaign (for example Old Joes Creek in the City of Knox) or neighbourhood improvement programme to improve stormwater discharges.	50,000	5,000	Council, CCMA, EPAV	High	Costs could be reduced— implement with other IE3 actions.
IC1	Source controls	Audit loading, storage and waste storage areas to ensure contaminants (i.e. spillages, litter, packages) are being handled appropriately and disposed of appropriately.	5,000	1,000	Council, Owners	High	Costs could be avoided— implement as part of IE1 actions.
IM1	Site management	Encourage the development of site based EMPs for key industrial sites to address stormwater, waste management, spill management etc.	5,000	5,000	Council	High	No cost—undertake as part of existing Council obligations.
II1	Information and data collection	Undertake ongoing monitoring of the significant outlet drains upstream and downstream of industrial premises.	15,000	15,000	Council, EPAV, Wastewater Barwon Water	High	

Table 8.5 continued

Strategy 4: Rural Townships							
		Action	Cost		Responsibility	Priority	Comment
No.	Type	Description	Capital	Ongoing			
Septic and sewers							
SE1	Education and awareness	Implement an awareness campaign, including displays, workshops and education material for residents' with septic treatment systems regarding their maintenance responsibilities, ongoing monitoring requirements and about responsible water and waste management practices.	5,000	1,000	Council	Very High	Costs could be reduced— implement with other SE1 actions.
SE2	Education and awareness	Encourage connection to sewer in with the wastewater strategy.	2,000	2,000	Council, Barwon Water	Very High	No additional cost—budget as part of the wastewater strategy.
SC1	Source control	Advocate either extension of reticulated sewerage system to reach unserviced properties or provision of an alternative septic disposal technique.	0	0	Council, Barwon Water	Very High	No cost—undertake as part of existing Council obligations.
SP1	Planning and regulation	Review permit documentation (maintain register) and carry out inspections of existing on site waste management systems and enforce maintenance requirements in permits.	0	0	Council	Very High	No cost—undertake as part of existing Council obligations.
SP2	Planning and regulation	Avoid the approval of standard septic tanks in and adjacent to urban areas and villages. Require annual inspections of septic tanks and the reporting of results to Council.	0	0	Council	Very High	No cost—undertake as part of existing Council obligations.
Landfills							
LM1	Site management	Develop an Environmental Management Plan (EMP) for disused landfill sites.	0		Council in consultation with EPAV, DNRE	High	No cost—undertake as part of existing Council obligations.

Table 8.5 continued

Strategy 4: Rural Townships							
		Action	Cost		Responsibility	Priority	Comment
No.	Type	Description	Capital	Ongoing			
Major roads							
ME1	Education and awareness	Liaise with the local truck industry (e.g. trucks involved in agricultural/horticultural cartage, timber transport trucks) regarding management of loads to avoid spillages, truck maintenance to minimise contaminants accumulating on the road including engine oils, grease, air pollution deposits etc.	2,000	2,000	Council, industry representatives	High	Costs could be reduced— implement with other ME1 actions.
ME2	Education and awareness	Use the local press to publicise load spillages and the impact they are likely to have and point out the measures that truck/vehicle owners and operators can take to minimise reoccurrence.	0	0	Council	High	No cost—undertake as part of existing Council obligations.
MS1	Structural treatment measures—primary	Install drainage entrance treatments/inline types (e.g. litter traps, trash racks, return flow litter baskets, circular screens) at vehicle parks close to waterways.	5,000	1,000	Council VicRoads	High	
MS4	Structural treatment measures—secondary	Incorporate pre-entrance treatment measures such as filter strips, grass swales, triple interceptors, porous pavements and oil and grease baffles in main road design.	0	0	Council	High	No cost—undertake as part of existing Council obligations.
MC1	Source controls	Review existing street sweeping regime, checking to ensure that the schedule includes all hot spot areas.	0		Council	High	No cost—undertake as part of existing Council obligations.
MP1	Planning and regulation	Council, in association with VicRoads, EPAV and the Police, need to reinforce controls with regard to speed limits, securing of loads, vehicle maintenance, tyre peel off etc.	0	0	Council, EPAV, VicRoads, Police	High	No cost—undertake as part of existing Council obligations.

Table 8.5 continued

Strategy 4: Rural Townships							
		Action	Cost		Responsibility	Priority	Comment
No.	Type	Description	Capital	Ongoing			
Pests							
PE1	Education and awareness	Undertake a targeted programme of weed and vermin eradication, commencing with hot spot areas. Utilise existing information available from DNRE, CCMA.	0	0	Council, CCMA, DNRE	High	No cost—undertake as part of existing Council obligations.
PE2	Education and awareness	Implement an awareness campaign, including displays, workshops and education material targeted at property owners adjacent to creek lines. It should focus on litter control and discourage people from throwing green waste etc into waterways (as this can spread weeds).	5,000	1,000	Council	High	Costs could be reduced— implement with other PE2 actions.
Upstream inflows							
UE1	Education and awareness	Liaise with rural property owners to reduce sediment and pollutant loads washing into creeks that pass through the towns. Use DNRE material as appropriate.	2,000	2,000	Council, CCMA, DNRE	Very High	
UE2	Education and awareness	Develop with landscare/friends of groups, catchment management plans extending from the upper rural catchments through the urban areas. Seek partnerships with DNRE, CCMA, and/or Parks Victoria to facilitate plan development and implementation.	5,000	2,000	Council	Very High	

Table 8.6 Reactive Management Strategy 5: Otway Towns

Strategy 5: Otway Towns							
While relatively small in size Forrest, Gellibrand, Lavers Hill and Beech Forest all drain into important waterways (i.e. Barwon River, Gellibrand River and various forest streams) and pose a threat to the important environmental and economic (i.e. water supply) values of the waterways. This strategy seeks to protect water quality by targeting the threats posed from industrial areas as well as unsewered properties, major roads, upstream inflows and weeds.							
		Action	Cost		Responsibility	Priority	Comment
No.	Type	Description	Capital	Ongoing			
Industrial runoff							
IE1	Education and awareness	Implement an awareness campaign, including displays, workshops and education material relating to best practice at industrial sites for business owners/operators. (Utilise EPAV/CCMA material if appropriate.) Where possible coordinate with visits undertaken by the Environmental Health Officer or with Barwon Water's trade waste inspections.	10,000	5,000	Council, EPAV, Barwon Water	High	Costs could be reduced— implement with other IE1 actions.
IE2	Education and awareness	Conduct an environmental awards programme highlighting businesses and industries that demonstrate a commitment to being environmentally aware, with particular focus on improving stormwater quality.	5,000	5,000	Council	High	Costs could be reduced— implement with other IE3 actions.
IE3	Education and awareness	Undertake a business survey, advisory audit and education campaign (for example Old Joes Creek in the City of Knox) or neighbourhood improvement programme to improve stormwater discharges.	50,000	5,000	Council, CCMA, EPAV	High	Costs could be reduced— implement with other IE3 actions.
IC1	Source controls	Audit loading, storage and waste storage areas to ensure contaminants (i.e. spillages, litter, packages) are being handled appropriately and disposed of appropriately.	5,000	1,000	Council, Owners	High	Costs could be avoided—implement as part of IE1 and IE3 actions.
IM1	Site management	Encourage the development of site based EMPs for key industrial sites to address stormwater, waste management, spill management etc.	5,000	5,000	Council	High	No cost—undertake as part of existing Council obligations.
II1	Information and data collection	Undertake ongoing monitoring of the significant outlet drains (e.g. Barongarook Creek) upstream and downstream of industrial premises.	15,000	15,000	Council, EPAV	High	

Table 8.6 continued

Strategy 5: Otway Towns							
		Action	Cost		Responsibility	Priority	Comment
No.	Type	Description	Capital	Ongoing			
Septic and sewers							
SE1	Education and awareness	Implement an awareness campaign, including displays, workshops and education material for residents' with septic treatment systems regarding their maintenance responsibilities, ongoing monitoring requirements and about responsible water and waste management practices.	5,000	1,000	Council	Very High	Costs could be reduced— implement with other SE1 actions.
SE2	Education and awareness	Encourage connection to sewer in line with the wastewater strategy.	2,000	2,000	Council, Barwon Water	Very High	No cost—budget as part of the wastewater strategy.
SC1	Source control	Advocate either extension of reticulated sewerage system to reach unserviced properties or provision of an alternative septic disposal technique.	0	0	Council, Barwon Water	Very High	No cost—undertake as part of existing Council obligations.
SP1	Planning and regulation	Review permit documentation (maintain register) and carry out inspections of existing on site waste management systems and enforce maintenance requirements in permits.	0	0	Council	Very High	No cost—undertake as part of existing Council obligations.
SP2	Planning and regulation	Avoid the approval of standard septic tanks in and adjacent to urban areas and villages. Require annual inspections of septic tanks and the reporting of results to Council.	0	0	Council	Very High	No cost—undertake as part of existing Council obligations.
Major roads							
ME1	Education and awareness	Liaise with the local truck industry (e.g. trucks involved in agricultural/horticultural cartage, timber transport trucks) regarding management of loads to avoid spillages, truck maintenance to minimise contaminants accumulating on the road including engine oils, grease, air pollution deposits etc.	2,000	2,000	Council, industry representatives	High	Costs could be reduced— implement with other ME1 actions.
ME2	Education and awareness	Use the local press to publicise load spillages and the impact they are likely to have on waterways (where possible use actual examples) and point out the measures that truck/vehicle owners and operators can take to minimise reoccurrence.	0	0	Council	High	No cost—undertake as part of existing Council obligations.

Table 8.6 continued

Strategy 5: Otway Towns							
		Action	Cost		Responsibility	Priority	Comment
No.	Type	Description	Capital	Ongoing			
MS1	Structural treatment measures—primary	Install drainage entrance treatments/inline types (e.g. litter traps, trash racks, return flow litter baskets, circular screens) at vehicle parks close to waterways.	5,000	1,000	Council, VicRoads	High	
MS4	Structural treatment measures—secondary	Incorporate pre-entrance treatment measures such as filter strips, grass swales, triple interceptors, porous pavements and oil and grease baffles in main road design.	0	0	Council, VicRoads	High	No cost—undertake as part of existing Council obligations.
MC1	Source controls	Review existing street sweeping regime, checking to ensure that the schedule includes all hot spot areas.	0		Council	High	No cost—undertake as part of existing Council obligations.
MP1	Planning and regulation	Council, in association with VicRoads, EPAV and the Police, need to reinforce controls with regard to speed limits, securing of loads, vehicle maintenance etc.	0	0	Council, EPAV, VicRoads, Police	High	No cost—undertake as part of existing Council obligations.
Pests							
PE1	Education and awareness	Undertake a targeted programme of weed and vermin eradication, commencing with hot spot areas. Utilise existing information available from DNRE, CCMA.	0	0	Council, CCMA, DNRE	High	No cost—undertake as part of existing Council obligations.
PE2	Education and awareness	Implement an awareness campaign, including displays, workshops and education material targeted at property owners adjacent to creek lines. It should focus on litter control and discourage people from throwing green waste etc into waterways (as this can spread weeds).	5,000	1,000	Council	High	Costs could be reduced— implement with other PE2 actions.

9 Management framework review

There appears to be a reasonably high level of stormwater awareness within Council, although there are a number of areas in which current management approaches could be enhanced. The following provides a summary of the management review with further details provided in Volume 2, Section 9.

9.1 WHAT ARE THE MANAGEMENT ISSUES?

9.1.1 Who is responsible for stormwater quality management?

Colac Otway Shire Council is principally responsible for the management of urban stormwater quality within the Shire, however there are a number of other stakeholder agencies (e.g. CCMA, EPAV, Barwon Water). The successful management of waterways and ongoing improvement in water quality is dependent upon a strong sense of cooperation and clear understanding of responsibilities. Commitment to shared goals and the identification of clearly articulated actions will assist an integrated approach to implementation of desirable stormwater quality outcomes.

9.1.2 What level of commitment and knowledge does Council have to stormwater management?

Council has made a clear commitment to improving urban stormwater quality in the Shire through to adoption of a stormwater policy and the development of the Colac Otway Stormwater Management Plan. While the Colac Otway Shire Corporate and Business Plan (2000–2003) does not specifically refer to stormwater quality management, it does have strategies and accompanying indicators that address some of the underlying threats affecting stormwater quality in the Shire. Council also has a number of environmental management policies and strategies (Draft Wastewater Strategy 2001, Environment Management Strategy) that are directly relevant to stormwater quality management. These strategies provide a solid base from which to achieve effective stormwater management policy.

The successful management of the waterways and an ongoing improvement in water quality will depend on Council and other stakeholders having both the commitment to protect stormwater quality and access to the knowledge that is required to ensure best practice in urban stormwater management. Council and other stakeholders need to reinforce their commitment and ensure that they have suitably trained staff to ensure that this goal is met.

9.1.3 How effective is the existing planning framework?

The Colac Otway Municipal Strategic Statement (MSS) and local provisions of the planning scheme identify best practice environmental management and conservation of natural resources as a significant issue for the Shire. The MSS provides the direction to promote the establishment of reticulated sewerage systems and improved septic tank systems where needed. It also encourages consideration of water quality standards and the maintenance of the natural condition of waterways when assessing development proposals. However, the planning scheme and Council's approval processes do not provide a detailed focus on stormwater quality management and design standards necessary to achieve a reduction in stormwater quality problems. Opportunities exist to strengthen Council's statutory and strategic planning approaches to stormwater management.

9.1.4 What regulations does council have to protect stormwater?

Council relies primarily on controls regarding litter, sediment and waste from construction sites and animal (deposition) control to address issues related to stormwater quality management. Enforcement of these controls is undertaken by local laws officers. Council undertakes limited enforcement of planning permit conditions due to a lack of monitoring.

Council also has the ability to improve individual property management of on-site waste management systems by enforcement of permit conditions. This will require both the commitment and resources necessary to investigate site problems and subsequent enforcement of permit conditions as required. Efficiencies can be achieved through cooperative programmes (e.g. with EPAV and relevant service providers), targeting problem areas or hot spots and by undertaking joint education and enforcement programmes.

9.1.5 What awareness raising programmes exist?

Education and awareness programmes can play a major role in protecting and improving water quality. There is still a reasonably lack of awareness within the community on stormwater issues, which has led to education programmes by Barwon Water, EPAV and various catchment management authorities. Developing community awareness is a key strategy as it minimises threats and activities that could pollute the Shire's waterways. In many cases simple changes in behaviour can vastly reduce stormwater pollution. While Council has displayed commitment to education and awareness, there is scope to further develop education programmes and focus on stormwater issues.

9.1.6 How active is Council in advocating change?

The Council participates in various projects designed to achieve both local and regional outcomes, however Council has not been active in stormwater quality issues. For this to change Council needs to embrace stormwater quality issues as a significant issue in the Shire, perhaps in response to increasing community or peer pressure. Should this occur then opportunities exist to enhance stormwater quality through regional initiatives and by lobbying for regional outcomes.

The draft Lake Colac Management Plan identifies stormwater as an issue to be dealt with. Council and the community are committed to restoring the Lake and much of the catchment works proposed in the Colac Otway Stormwater Management Plan will be managed through the Lake Plan.

There are also opportunities to work closely with neighbouring Councils, CCMA, EPAV and service providers to achieve more effective stormwater quality outcomes.

9.1.7 Does Council's existing operations reflect best practice?

The study area has a number of stormwater treatment devices, such as a litter traps, wetlands and detention basins. Through the implementation of the Colac Otway Stormwater Management Plan, opportunities to evaluate the performance of such devices, and to identify other opportunities for their use should be investigated.

Council operates an extensive waste management and street-cleansing programme. While there is some information on the total volumes collected, the information is generally not characterised by volume and locality and as such there is only limited information to test the effectiveness of current practices. Recycling services are offered twice monthly and the provision of a hard waste collection is being investigated.

Council's open space and management policies may benefit from review in regard to the use of herbicides and fertilisers, along roadways recreation reserves etc. Chemical usage along road reserves to control weeds could be reduced through the construction of softer swales that would allow areas to be mown. There may be an opportunity to utilise grey water in some areas. Contracts tendered by Council in the future could benefit from the inclusion of best practice environmental management standards to address stormwater quality management.

9.2 WHAT ARE THE MANAGEMENT STRATEGIES?

In response to the identified issues, management strategies have been developed around the following themes:

- policy and commitment
- operations/planning and regulation
- education
- advocacy
- information.

The strategies management are presented in Tables 9.1 to 9.6.

The strategies management contain groups of recommendations aimed at improving specific elements of Council's management framework. These recommendations are based on the review of Council's management framework and aim to improve the integration of best practice stormwater management as part of Council's daily planning and management activities.

Table 9.1 Management Strategy 1: Policy and Commitment

Management Strategy 1: Policy and Commitment							
The successful management of the Shire's waterways and ongoing improvement in water quality is dependent on the various stakeholders having the will to protect water quality. The Council has already demonstrated its commitment through the preparation of the Colac Otway Stormwater Management Plan and other initiatives. This strategy seeks to reinforce this commitment and the commitment of others to ensure the effective management of urban stormwater throughout the Shire.							
		Action	Cost		Responsibility	Priority	Comment
No.	Type	Description	Capital	Ongoing			
C1	Commitment	Adopt the Colac Otway Stormwater Management Plan.	0		Council	Very High	No cost—undertake as part of existing Council obligations.
C2	Policy	Incorporate BPEM for stormwater and the Colac Otway Stormwater Management Plan in Council policies and strategies (including the Corporate Plan, environmental, planning, waste management, drainage and open space strategies).	0	0	Council	High	No cost—if implemented as part of C5.
C3	Responsibilities	Clarify stormwater management responsibilities throughout the Shire and for all of its waterways.	0		Council, CCMA	High	No cost—if implemented as part of C5.
C4	Responsibilities	Designate a Council department or position with prime responsibility for stormwater issues and the promotion/implementation of the Colac Otway Stormwater Management Plan.	0	0	Council	Very High	No cost—if implemented as part of C5.
C5	Resourcing	Appoint a stormwater officer with prime responsibilities for the implementation of the Colac Otway Stormwater Management Plan.	60,000	60,000	Council	High	
C6	Responsibilities	Integrate the recommendations of the Colac Otway Stormwater Management Plan in individual department plans.	0		Council	High	No cost—if implemented as part of C5.
C7	Coordination	Establish a committee to coordinate stormwater management between Council EPAV, CCMA and other agencies.	0	0	Council	High	No cost—undertake as part of existing Council obligations.

Table 9.1 continued

Management Strategy 1: Policy and Commitment							
		Action	Cost		Responsibility	Priority	Comment
No.	Type	Description	Capital	Ongoing			
C8	Review	Identify funding sources and apply for funds to implement the Colac Otway Stormwater Management Plan (e.g. through VSAP, NHT and AIP).	0	0	Council, EPAV, VSAP	High	No cost—undertake as part of existing Council obligations.
C9	Review	Monitor emerging trends in stormwater management, including the outcomes of strategic projects funded by VSAP and incorporate the results into Council's stormwater management procedures.	0	0	Council	High	No cost—undertake as part of existing Council obligations.
C10	Review	Review the implementation of the Colac Otway Stormwater Plan on an annual basis and if necessary amend the implementation programme to respond to contemporary requirements.	0	2,000	Council	High	

Table 9.2 Management Strategy 2: Operations

Management Strategy 2: Operations							
The operations of Council and other service authorities can have a profound impact on water quality through the provision of waste collection and effluent treatment services and construction, maintenance and cleansing activities. This strategy seeks to ensure that Council and other service providers demonstrate best practice and leadership in the protection of urban stormwater quality.							
		Action	Cost		Responsibility	Priority	Comment
No.	Type	Description	Capital	Ongoing			
O1	Contracts	Amend council contracts and operational procedures to include the requirements for best practice standards on sediment and litter control (e.g. consider the outcomes from the project being undertaken by LGPro to establish model contract provisions for Council construction activities).	0		Council	Very High	No cost—undertake as part of existing Council obligations.
O2	Waste Management	Seek synergies in managing stormwater water quality issues through waste management practices.	0	0	Council	High	No cost—undertake as part of existing Council obligations.
O3	Waste Management	Monitor recycling and hard waste collections, litter and green waste collections and material collected through street and drain cleansing processes and use the results to modify practices to increase their efficiency.	0	0	Council	High	No cost—undertake as part of existing Council obligations.
O4	Waste Management	Review bin design, placement and emptying procedures to minimise the potential for spillages.	0		Council	High	No cost—undertake as part of existing Council obligations.
O5	WSUD	Include WSUD in Council projects including car parks, open space, roads, drainage works and building sites.	0	0	Council	Very High	No direct cost—but the implementation may have a cost consequence on individual projects.
O6	EMPs	Prepare environmental management plans for Council activities, particularly construction and maintenance activities.	0	0	Council	Very High	No cost—undertake as part of existing Council obligations.
O7	EMPs	Review fertiliser, herbicide, pesticide, landscaping treatments drain maintenance, spray and swale construction to avoid the contamination of local waterways from Council maintenance activities.	0		Council	High	No cost—undertake as part of existing Council obligations.
O8	EMPs	Investigate water reuse options in Council projects.	0	0	Council	High	No direct cost—but the implementation may have a cost consequence on individual projects.

Table 9.3 Management Strategy 3: Planning and Regulation

Management Strategy 3: Planning and Regulation							
A range of regulatory tools, from the administration of the Colac Otway Planning Scheme to the implementation of Local Laws, are available to help protect urban stormwater and the environment more generally through the encouragement of water sensitive urban design, controls on development and the prosecution of polluting activities. This strategy is designed to strengthen such tools and provide Council the necessary powers to protect the quality of urban stormwater quality.							
		Action	Cost		Responsibility	Priority	Comment
No.	Type	Description	Capital	Ongoing			
P1	Planning scheme	Amend the Local Planning Policy Framework and Municipal Strategic Statement sections of the Colac Otway Planning Scheme to specifically refer to the need to protect and improve stormwater quality.	0	0	Council	Very High	No cost—if implemented when the planning scheme is next reviewed and amended.
P2	Planning scheme	Review the outcomes of the planning policy project being undertaken by the Association of Bayside Municipalities and consider including the outcomes in the Colac Otway Planning Scheme.	0		Council	High	
P3	Permit conditions	Amend Council's existing suite of standard permit conditions to include conditions relating to the protection of stormwater quality, particularly from construction, commercial and industrial premises.	0		Council	Very High	No cost—undertake as part of existing Council obligations.
P4	Planning guidelines	Provide information on water sensitive urban design for developers, residents and other interested parties.	0	0	Council	Very High	No cost—undertake as part of existing Council obligations.
P5	Planning guidelines	Require developers to incorporate WSUD into projects before they are submitted for planning approval.	0	0	Council	High	No cost—undertake as part of existing Council obligations.
P6	Planning referrals	Refer planning applications for urban infrastructure, subdivision and development to Council 'experts', CCMA, Barwon Water and or EPAV where appropriate to ensure that they meet BPEM criteria and WSUD principles.	0	0	Council, CCMA, Barwon Water, EPAV	High	No cost—undertake as part of existing Council obligations.

Table 9.3 continued

Management Strategy 3: Planning and Regulation							
		Action	Cost		Responsibility	Priority	Comment
No.	Type	Description	Capital	Ongoing			
P7	Laws	Introduce a Local Law and or advocate for changes to the Building Control Act to control the adverse impacts of construction activity on stormwater quality.	0		Council	High	No cost—undertake as part of existing Council obligations.
P8	Enforcement	Actively enforce planning permit conditions, local laws and other regulatory requirements designed to protect water quality, including a review of resourcing and requirements.	0	0	Council	Very High	No cost—undertake as part of existing Council obligations.
P9	Enforcement	Integrate enforcement procedures with education programmes and place emphasis on preventing rather than prosecuting problems.	0	0	Council	High	No cost—undertake as part of existing Council obligations.

Table 9.4 Management Strategy 4: Education and Awareness

Management Strategy 4: Education and Awareness							
With a focus on 'prevention', education and awareness programmes can play a major role in protecting and improving water quality. This strategy is designed to raise awareness of stormwater issues through general community education campaigns and targeted programmes, so that people become more aware of their actions and take positive steps to minimise their impacts on the quality of urban stormwater.							
		Action	Cost		Responsibility	Priority	Comment
No.	Type	Description	Capital	Ongoing			
E1	Council Officers	Provide opportunities for Council staff to attend stormwater management seminars or related events.	0	2,000	Council	Very High	
E2	Council Officers	Provide a programme of internal training and forums for Council staff to develop a regular exchange of technical and operational information on stormwater.	0	2,000	Council	Very High	
E3	Contractors	Require Council contractors to have an appreciation of stormwater issues and incorporate stormwater protection measures in their operating procedures.	0	0	Council	Very High	No cost—undertake as part of existing Council obligations.
E4	Community education	Incorporate BPEM for stormwater in Council's general environmental education programmes.	0	0	Council	High	No cost—undertake as part of existing Council obligations.
E5	Community education	Support community group implementation of stormwater education programmes (e.g. drain stenciling and display board by Lake Colac Committee of Management).	0	0	Council, CCMA	High	See reactive strategies for costs.
E6	Community education	Implement targeted community education programmes for residents, traders, industrialists, developers and contractors as set out in the reactive strategies.	0	0	Council	Very High	See reactive strategies for costs.

Table 9.5 Strategy 5: Advocacy and Association

Management Strategy 5: Advocacy and Association							
The successful implementation of the Colac Otway Stormwater Management Plan will hinge on a spirit of cooperation between Council, the community and various agencies. While Council will have the lead role, it will not be solely responsible for the implementation of the Colac Otway Stormwater Management Plan. This strategy seeks to develop partnerships and build upon the work being undertaken by others (e.g. CMA, MAV and EPA Victoria) to facilitate the effective implementation of the Colac Otway Stormwater Management Plan.							
		Action	Cost		Responsibility	Priority	Comment
No.	Type	Description	Capital	Ongoing			
A1	Partnerships	Seek the cooperation and commitment of other stakeholders to achieve stormwater improvements throughout the municipality.	0	0	Council	Very High	No cost—undertake as part of existing Council obligations.
A2	Partnerships	Recognise and promote effective stormwater management as a shared responsibility between Council, State government, various agencies and interest groups and the wider community.	0	0	Council	High	No cost—undertake as part of existing Council obligations.
A3	Partnerships	Promote an integrated approach to stormwater management with landowners generally responsible for on-site issues, Council for local area and municipal wide programmes and the CCMA for larger regional initiatives.	0	0	Council	High	No cost—undertaken as part of existing Council obligations.
A4	Regional networks	Work with neighbouring Councils to address regional stormwater issues (e.g. joint programmes and the management of upstream inflows).	0	0	Council	Very High	No cost—undertake as part of existing Council obligations.
A5	Regional networks	Encourage and work with the MAV to lobby State Government, EPAV and/or other CMAs and DoI to respond to common management issues (e.g. community education, planning reform, regulatory reform) and therefore avoid duplication by Council (and other Councils).	0	0	Council, State Govt., EPAV, CCMA	Very High	No cost—undertake as part of existing Council obligations.
A7	Agencies	Encourage representatives from the EPAV regional office to visit Council offices on a regular to discuss stormwater and other environmental issues.	0	0	Council, EPAV	High	No cost—undertake as part of existing Council obligations.
A8	Agencies	Implement joint and/or coordinated investigations with EPAV, in situations where events require the jurisdictional input of EPAV.	0	0	Council, EPAV	High	No cost—undertake as part of existing Council obligations.

Table 9.5 continued

Management Strategy 5: Advocacy and Association							
The successful implementation of the Colac Otway Stormwater Management Plan will hinge on a spirit of cooperation between Council, the community and various agencies. While Council will have the lead role, it will not be solely responsible for the implementation of the plan. This strategy seeks to develop partnerships and build upon the work being undertaken by others (e.g. CMA, MAV and EPA Victoria) to facilitate the effective implementation of the Colac Otway Stormwater Management Plan.							
		Action	Cost		Responsibility	Priority	Comment
No.	Type	Description	Capital	Ongoing			
A9	Works	Encourage government agencies and service providers (e.g. water, sewerage, electricity, gas and telecommunication companies) to adopt BPEM procedures and require EMPs for their projects.	0	0	Council, neighbouring Councils, CCMA	Very High	No cost—undertake as part of existing Council obligations.
A10	Statewide	Encourage EPAV and/or Melbourne Water to develop simple guidelines for best practice stormwater management for residential, commercial and industrial areas, including quality protection and on-site re-use options.	0	0	Council, MAV	Very High	No cost—undertake as part of existing Council obligations.
A11	Statewide	Encourage EPAV, Melbourne Water, Building Control Commission and the building industry to develop environmental management guidelines (including sediment and litter control) for building and construction sites.	0	0	Council, MAV	Very High	No cost—undertake as part of existing Council obligations.
A12	Statewide	Participate in strategic projects funded by VSAP and incorporate the results into Council's stormwater management procedures.	5,000	5,000	Council	High	
A13	Community groups	Liaise regularly with community groups who have an interest in environmental management issues, particularly stormwater management issues.	0	0	Council	High	No cost—undertake as part of existing Council obligations.

Table 9.6 Management Strategy 6: Information

Management Strategy 6: Information							
In order to monitor the success of the Colac Otway Stormwater management Plan and ensure all stakeholders continue to respond to priority issues, it is essential that Council and the greater community have access to stormwater quality in the Shire.							
		Action	Cost		Responsibility	Priority	Comment
No.	Type	Description	Capital	Ongoing			
I1	Data collection	Coordinate water quality, littering, pollution incidents and complaint data within Council.	0	0	Council, wastewater	High	No cost—undertake as part of existing Council obligations.
I2	Data collection	Monitor stormwater quality and performance of all GPT's and treatment devices and report the results in Council's environmental reporting programme (i.e. keep records of amount of litter removed (wet or dry weight, date of clean out)).	0	0	Council	High	
I3	Data collection	Make the above monitoring data and references to alternative data sources (e.g. Waterwatch) readily available to interested stakeholders.	0	0	Council	High	No cost—undertake as part of existing Council obligations.
I4	Waterwatch	Continue to support community waterwatch programmes.	5,000	5,000	Council	High	

10 Implementation plan

The implementation framework provides recommendations for effectively implementing the Colac Otway Stormwater Management Plan. It has been prepared based upon the outcomes of the management framework review, and in consultation with the Council and Project Working Group.

10.1 COORDINATION

There is the need to identify a Council department with overall responsibility for the coordination of stormwater initiatives and the implementation of the Colac Otway Stormwater Management Plan

A small implementation committee could be formed with representatives from key Council units and other stakeholders to help coordinate activities and increase the opportunity for ownership of the Colac Otway Stormwater Management Plan. The brief of the committee would be to ensure the implementation of the Plan takes place, is coordinated across relevant units of council, and provides a forum for raising issues in terms of the Colac Otway Stormwater Management Plan's implementation.

10.2 INTEGRATION

The success of this plan will be dependent on the commitment and ongoing integration of activities within Council and with relevant government agencies and service providers. The ongoing involvement of key members from those agencies currently represented on the Project Working Group, supplemented with other agencies as relevant may form a useful mechanism to ensure integration and effective implementation of the Colac Otway Stormwater Management Plan over time.

10.3 MONITORING AND REVIEW

Ultimately, the success of the Colac Otway Stormwater Management Plan can be measured through improved water quality and healthier waterways. Water quality improvement could be achieved through the use of 'end of pipe' approach such as the installation of gross pollutant traps and similar technologies adjacent to the waterways. However, such solutions fail to remove the threat and only hide poor stormwater management practices. True success will come through the removal of the threats and an emphasis on source control approaches to protect water quality.

The Colac Otway Stormwater Management Plan provides a framework for achieving more effective stormwater management. While priority actions have been identified, it is envisaged that they may change over time due to changing circumstances. Accordingly, Council and other stakeholders should review and update priority actions on an annual basis in accordance with budget planning activities and the progressive success of the Colac Otway Stormwater Management Plan.

10.4 FUNDING

A substantial funding commitment is required to successfully implement the Colac Otway Stormwater Management Plan. The Council has a number of mechanisms through which it can source internal and external funding for stormwater management within the Shire. These include levying rates, user charge schemes, government grants and partnership agreements.

Some potential sources are listed below:

- EPA Victoria is coordinating the Victorian Stormwater Action Program (VSAP), for which there is $22.5 million allocated over a three year period to improve the environmental management of urban stormwater in Victoria. Funding assistance is to be matched by local governments on a dollar for dollar basis for priority projects identified in stormwater management plans. This includes the provision of funding for structural management initiatives such as litter traps. EPA Victoria is also a source of educational material.
- EcoRecycle Victoria works with sixteen Regional Waste Management Groups, which are the key stakeholders in the delivery of most of EcoRecycle Victoria's programmes. In particular they provide a planned basis for implementing best practice in addressing waste and recycling materials.
- EcoRecycle provides a number of funding opportunities. These include:
  - finding support to develop comprehensive facilities to collect, sort, treat and dispose of residuals and implement best practice in transfer station and landfill design and operation;
  - kerb-side development programme: provides funding assistance to councils for the implementation of best practice elements for household waste reduction to landfill;
  - commercial and industrial: provides funding to support the reduction in commercial and industrial waste generated and disposed to landfill;
  - litter infrastructure: assists councils in the purchase of litter trap equipment;
  - regional education officers: employment of officers through the regional waste management groups who coordinate and promote a strategic approach to waste and litter education based on the 'Becoming Waste Wise' model;
  - resource recovery and waste management facilities: provide support funding for facilities that improve the efficiency and environmentally sustainable collection, transportation, recycling and disposal of material waste and residuals;

- public place and events: to support the development of infrastructure systems;
- sponsorships: provides some sponsorships for industry awards to encourage waste minimisation and resource management;
- litter prevention and control: provides funding to Councils for the establishment of litter prevention task forces;
- community grants: as part of Waste Wise Community Participation Programme, funding is provided to Regional Waste Management Groups to assist local initiatives by community organisations to minimise waste and litter.

- Federal and State government funding of community education programmes. Key programmes include Waterwatch Australia, Landcare and the Natural Heritage Trust.
- The *Planning and Environment Act* 1987, Part 3B, Development Contributions, provide a mechanism for local government to set up a development contributions plan for the imposition of a development infrastructure levy and or the imposition of a community infrastructure levy in relation to the development of land in the area which the plan applies. This process is applicable in new development situations only.

It is envisaged that most actions will be funded through a variety of sources. In addition to funding opportunities set out above, some of the recommendations may be implemented through community driven schemes. These include community fund raising, corporate sponsorship and in-kind contribution in the form of labour and equipment to undertake works.

Some of the government grants that could be applied to the Colac Otway Stormwater Management Plan's implementation strategies (or complimentary strategies identified by the community) would require community groups to be in the lead role in preparing applications for funding and managing the implementation of projects.

Community based strategies may be seen as advantageous to the community in terms of capacity building, incorporation and recognition of local knowledge and expertise, influence and ownership of problem identification and solutions.

10.5 PROGRAMMING

Significant cost savings could be achieved by integrating the actions and undertaking similar actions simultaneously. A suggested integrated implementation plan is presented in Table 10.1

If the actions were integrated and a part-time officer appointed to assist with the implementation of plan, then the total estimated costs to implement the plan would be in the order of:

Year 1: $A223,000

Year 2: $A290,000

Year 3: $A297,000

The above costs exclude internal Council costs and recommendations that will be funded through other programmes such as the Lake Colac Management Plan and Wastewater Strategy. They also exclude grants and partnership funding that may be available to Council.

10.6 CONCLUSION

The Colac Otway Stormwater Management Plan will assist in improving the quality of urban stormwater discharged into local waterways. It has involved a process of identifying the values of waterways and the threats that pose a risk to water quality. From these tasks, the Colac Otway Stormwater Management Plan proposes reactive and management strategies plus an implementation programme to assist Council in its delivery of better stormwater quality outcomes for the future.

Colac Otway Stormwater Management Plan
Table 10.1: Integrated Implementation Plan

Actions			Costs per catchment			Catchment							Estimated Combined Costs		Implementation				
No.	Type	Details	Capital Cost ($)	Ongoing Cost ($)	Responsibility	Colac	Apollo Bay & Marengo	Coastal Settlements	Rural Towns	Otway Towns	All Towns	Comment	Capital Cost ($)	Ongoing Cost ($)	Year 1	Year 2	Year 3	Estimated Total Cost	Council Department
Management Strategies																			
Commitment																			
C1	Commitment	Adopt the Colac Otway Stormwater Management Plan.	0		Council						Very High	No additional cost - undertake as part of existing Council obligations.	0		0			0	Corporate
C2	Policy	Incorporate BPEM for stormwater and the Colac Otway Stormwater Management Plan in Council policies and strategies (including the Corporate Plan, environmental, planning, waste management, drainage and open space strategies).	0	0	Council						High	No additional cost - if implemented as part of C5.	0	0		0	0	0	Environmental
C3	Responsibilities	Clarify stormwater management responsibilities throughout the Shire and for all of its waterways.	0		Council, CCMA						High	No additional cost - if implemented as part of C5.	0			0		0	Corporate
C4	Responsibilities	Designate a Council department or position with prime responsibility for stormwater issues and the promotion/implementation of the Colac Otway Stormwater Management Plan.	0	0	Council						Very High	No additional cost - if implemented as part of C5.	0	0	0	0	0	0	Corporate
C5	Resourcing	Appoint a stormwater officer with prime responsibilities for the implementation of the Colac Otway Stormwater Management Plan.	60,000	60,000	Council						High		60,000	60,000	60,000	60,000	60,000	180,000	Environmental
C6	Responsibilities	Integrate the recommendations of the Colac Otway Stormwater Management Plan in individual department plans.	0		Council						High	No additional cost - if implemented as part of C5.	0			0		0	Environmental, Planning, Infrastructure, Local Laws, Building.
C7	Coordination	Establish a committee to coordinate stormwater management between Council EPAV, CCMA and other agencies.	0	0	Council						High	No additional cost - undertake as part of existing Council obligations.	0	0	0	0	0	0	Environmental
C8	Review	Identify funding sources and apply for funds to implement the Colac Otway Stormwater Management Plan (e.g. through VSAP, NHT and AIP).	0	0	Council, EPAV, VSAP						High	No additional cost - undertake as part of existing Council obligations.	0	0	0	0	0	0	Environmental
C9	Review	Monitor emerging trends in stormwater management, including the outcomes of strategic projects funded by VSAP and incorporate the results into Council's stormwater management procedures.	0	0	Council						High	No additional cost - undertake as part of existing Council obligations.		0	0	0	0	0	Environmental
C10	Review	Review the implementation of the Colac Otway Stormwater Plan on an annual basis and if necessary amend the implementation program to respond to contemporary requirements.		2,000	Council						High			2,000		2,000	2,000	4,000	Environmental
	Estimated Cost:														*60,000*	*62,000*	*62,000*	*184,000*	
Operations																			
O1	Contracts	Amend council contracts and operational procedures to include the requirements for best practice standards on sediment and litter control (e.g. Consider the outcomes from the project being undertaken by LGPro to establish model contract provisions for Council construction activities etc.)	0		Council						Very High	No additional cost - undertake as part of existing Council obligations.	0		0			0	Infrastructure

O2	Waste Management	Seek synergies in managing stormwater water quality issues through waste management practices.	0	0	Council						High	No additional cost - undertake as part of existing Council obligations.		0		0		0	Infrastructure
O3	Waste Management	Monitor recycling and hard waste collections, litter and green waste collections and material collected through street and drain cleansing processes and use the results to modify practices to increase their efficiency	0	0	Council						High	No additional cost - undertake as part of existing Council obligations.		0		0		0	Infrastructure
O4	Waste Management	Review bin design, placement and emptying procedures to minimise the potential for spillages.	0		Council						High	No additional cost - undertake as part of existing Council obligations.		0		0		0	Infrastructure
O5	WSUD	Include WSUD in Council projects including carparks, open space, roads, drainage works and building sites.	0	0	Council						Very High	No direct cost - but the implementation may have a cost consequence on individual projects.		0	0			0	Infrastructure
O6	EMPs	Prepare environmental management plans for Council activities, particularly construction and maintenance activities.	0	0	Council						Very High	No additional cost - undertake as part of existing Council obligations.		0	0			0	Infrastructure
O7	EMPs	Review fertiliser, herbicide, pesticide, landscape treatments, drain maintenance, spraying and swale construction to avoid the contamination of local waterways from Council maintenance activities.	0		Council						High	No additional cost - undertake as part of existing Council obligations.		0		0	0	0	Infrastructure
O8	EMPs	Investigate water reuse options in Council projects.	0	0	Council						High	No direct cost - but the implementation may have a cost consequence on individual projects.		0		0	0	0	Infrastructure
	Estimated Cost:														*0*	*0*	*0*	*0*	
Planning and regulation																			
P1	Planning scheme	Amend the Local Planning Policy Framework and Municipal Strategic Statement sections of the Colac Otway Planning Scheme to specifically refer to the need to protect and improve stormwater quality.	0		Council						Very High	No additional cost - if implemented when the planning scheme is next reviewed and amended.	0		0			0	Planning
P2	Planning scheme	Review the outcomes of the planning policy project being undertaken by the Association of Bayside Municipalities and consider the including the outcomes in the Colac Otway Planning Scheme.	5,000		Council						High		5,000			5,000		5,000	Planning
P3	Permit conditions	Amend Council's existing suite of standard permit conditions to include conditions relating to the protection of stormwater quality, particularly from construction, commercial and industrial premises.	0		Council						Very High	No additional cost - undertake as part of existing Council obligations.	0		0			0	Planning
P4	Planning guidelines	Provide information on water sensitive urban design for developers, residents and other interested parties.	0	0	Council						Very High	No additional cost - undertake as part of existing Council obligations.	0	0	0	0	0	0	Planning

P5	Planning guidelines	Encourage developers to incorporate WSUD into projects before they are submitted for planning approval.	0	0	Council						High	No additional cost - undertake as part of existing Council obligations.		0		0		0	Planning
P6	Planning referrals	Refer planning applications for urban infrastructure, subdivision and development to Council 'experts', CCMA, Barwon Water and or EPAV, where appropriate, to ensure that they meet BPEM criteria and WSUD principles.	0	0	Council, CCMA, Barwon Water, EPAV						High	No additional cost - undertake as part of existing Council obligations.		0		0		0	Planning
P7	Laws	Introduce a Local Law and or advocate for changes to the Building Control Act to control the adverse impacts of construction activity on stormwater quality.	0		Council						High	No additional cost - undertake as part of existing Council obligations.	0			0		0	Local Laws
P8	Enforcement	Actively enforce planning permit conditions, local laws and other regulatory requirements designed to protect water quality, including a review of resourcing and requirements.	0	0	Council						Very High	No additional cost - undertake as part of existing Council obligations.		0	0	0	0	0	Planning
P9	Enforcement	Integrate enforcement procedures with education programs and place emphasis on preventing rather than prosecuting problems.	0	0	Council						High	No additional cost - undertake as part of existing Council obligations.		0		0	0	0	Environmental
	Estimated Cost:														*0*	*5,000*	*0*	*5,000*	
Education and training																			
E1	Council Officers	Provide opportunities for Council staff to attend stormwater management seminars or related events.		2,000	Council						Very High			2,000	2,000	2,000	2,000	6,000	Environmental
E2	Council Officers	Provide a program of internal training and forums for Council staff to develop a regular exchange of technical and operational information on stormwater.		2,000	Council						Very High			2,000	2,000	2,000	2,000	6,000	Environmental
E3	Contractors	Require Council contractors to have an appreciation of stormwater issues and incorporate stormwater protection measures in their operating procedures.	0	0	Council						Very High	No additional cost - undertake as part of existing Council obligations.		0	0	0	0	0	Environmental
E4	Community education	Incorporate BPEM for stormwater in Council's general environmental education programs.	0	0	Council						High	No additional cost - undertake as part of existing Council obligations.		0		0	0	0	Environmental
E5	Community education	Support community group implementation of stormwater education programs (e.g. drain stencilling and display board by Lake Colac Committee of Management and Apollo Bay Landcare).	0	0	Council						High	See reactive strategies for costs.		0		0	0	0	Environmental
E6	Community education	Implement targeted community education programs for residents, traders, industrialists, developers and contractors as set out in the reactive strategies.	0	0	Council						Very High	See reactive strategies for costs.		0	0	0	0	0	Environmental
	Estimated Cost:														*4,000*	*4,000*	*4,000*	*12,000*	
Advocacy and association																			
A1	Partnerships	Seek the cooperation and commitment of other stakeholders to achieve stormwater improvements throughout the municipality.	0	0	Council						Very High	No additional cost - undertake as part of existing Council obligations.	0	0	0	0	0	0	Environmental
A2	Partnerships	Recognise and promote effective stormwater management as a shared responsibility between Council, State government, various agencies and interest groups and the wider community.	0	0	Council						High	No additional cost - undertake as part of existing Council obligations.		0		0	0	0	Environmental

A3	Partnerships	Promote an integrated approach to stormwater management with landowners generally responsible for on-site issues, Council for local area and municipal wide programs and the CCMA for larger regional initiatives.	0	0	Council						High	No additional cost - undertake as part of existing Council obligations.	0	0		0	0	0	Environmental
A4	Regional networks	Work with neighbouring Councils to address regional stormwater issues (e.g. joint programs and the management of upstream inflows).	0	0	Council						Very High	No additional cost - undertake as part of existing Council obligations.	0	0	0	0	0	0	Environmental
A5	Regional networks	Encourage and work with the MAV to lobby State Government, EPAV and/or other CMAs and DoI to respond to common management issues (e.g. community education, planning reform, regulatory reform etc) and therefore avoid duplication by Council (and other Councils).	0	0	Council, State Govt., EPAV, CCMA, DoI						Very High	No additional cost - undertake as part of existing Council obligations.	0	0	0	0	0	0	Environmental
A7	Agencies	Encourage representatives from EPAV regional office to spend at least one day a fortnight at Council offices to discuss stormwater and other environmental issues.	0	0	Council, EPAV						High	No additional cost - undertake as part of existing Council obligations.		0		0	0	0	Environmental
A8	Agencies	Implement joint and/or coordinated investigations with EPAV.	0	0	Council, EPAV						High	No additional cost - undertake as part of existing Council obligations.		0		0	0	0	Local Laws
A9	Works	Encourage government agencies and service providers (e.g. water, sewerage, electricity, gas and telecommunication companies) to adopt BPEM procedures and require EMPs for their projects.	0	0	Council, neighbouring Councils, CCMA						Very High	No additional cost - undertake as part of existing Council obligations.	0	0	0	0	0	0	Environmental
A10	Statewide	Encourage EPAV to develop simple guidelines for best practice stormwater management for residential, commercial and industrial areas, including quality protection and on-site re-use options.	0	0	Council, MAV						Very High	No additional cost - undertake as part of existing Council obligations.	0	0	0	0	0	0	Environmental
A11	Statewide	Encourage EPAV, Melbourne Water, Building Control Commission and the building industry to develop environmental management guidelines (including sediment and litter control) for building and construction sites.	2,000	1,000	Council, MAV						Very High	No additional cost - undertake as part of existing Council obligations.	0	0	0	0	0	0	Environmental
A12	Statewide	Participate in strategic projects funded by VSAP and incorporate the results into Council's stormwater management procedures.	5,000	5,000	Council						High		5,000	5,000		5,000	5,000	10,000	Environmental
A13	Community groups	Liaise regularly with community groups who have an interest in environmental management issues, particularly stormwater management issues.	0	0	Council						High	No additional cost - undertake as part of existing Council obligations.	0	0		0	0	0	Environmental
	Estimated Cost:														*0*	*5,000*	*5,000*	*10,000*	
Information																			
I1	Data collection	Coordinate water quality, littering, pollution incidents and complaint data within Council.	0	0	Council						High	No additional cost - undertake as part of existing Council obligations.	0	0		0	0	0	Environmental
I2	Data collection	Monitor stormwater quality and performance of all GPT's and treatment devices and report the results in Council's environmental reporting program. (i.e. Keep records of amount of litter removed (wet or dry weight, date of clean out etc).	0	0	Council						High	No additional cost - undertake as part of existing Council obligations.	0	0		0	0	0	Environmental

I3	Data collection	Make the above monitoring data and references to alternative data sources (e.g. Streamwatch) readily available to interested stakeholders.	0	0	Council						High	No additional cost - undertake as part of existing Council obligations.	0	0		0	0	0	Environmental
I4	Waterwatch	Continue to support community waterwatch programs.	5,000	5,000	Council						High		5,000	5,000		5,000	5,000	10,000	Environmental
	Estimated Cost:														*0*	*5,000*	*5,000*	*10,000*	
	Estimated Cost Of All Management Strategies														***64,000***	***81,000***	***76,000***	***221,000***	
Reactive Strategies																			
Residential runoff																			
RE1	Education and awareness	Implement a community awareness campaign, including displays, workshops and education material on environmental best practice in property management (e.g. waterwise gardens, vehicle washing, appropriate disposal of garden waste, use of fertiliser on gardens, collection & disposal of dog faeces - particularly in open space areas etc). Utilise EPAV, CCMA material if appropriate.	15,000	5,000	Council, CCMA, EPAV	High	High					Costs could be reduced - implement with other RE1 actions.	20,000	5,000	20,000	5,000	5,000	30,000	Environmental
RE2	Education and awareness	Facilitate a demonstration project showing best practice in stormwater management and WSUD. Possible site includes the Lakeside Estate development or a Council site.	5,000	1,000	Council	High	High					Costs could be reduced - implement with other RE2 actions.	5,000	1,000		5,000	1,000	6,000	Environmental
RE3	Education and awareness	Undertake drain marking in residential areas. The stencilling can build on the current drain stencilling program and implement an awareness campaign during the stencilling program. Opportunities to include Waterwatch as a potential partner should be investigated and included if possible.	2,000	1,000	Council, CCMA (with schools)	High	High									4,000	2,000	6,000	Environmental
RE4	Education and awareness	Use the local press to publicise Council's initiatives regarding stormwater management, for example notify the community of the development of the stormwater management plan, associated guidelines etc.	1,000	1,000	Council	High	High					No additional cost - undertake as part of existing Council obligations.	0	0	0	0	0	0	Environmental
RE5	Education and awareness	Incorporate stormwater quality protection in Council's general environmental awareness campaigns.	0	0	Council	High	High					No additional cost - undertake as part of existing Council obligations.	0	0	0	0	0	0	Environmental
RE6	Education and awareness	Design and develop an environmental trail around the southern end of Lake Colac highlighting the importance of the Shire's waterways and how people can protect them. Key features of the trail may include the proposed wetlands, areas along the Lake's edge, incorporating key features such as the bird sanctuary and Barongarook Creek.	65,000	5,000	Council	High						No additional cost - budget as part of the Lake Colac Management Plan.	0	0		0		0	Environmental
RE7	Education and awareness	Design and develop an environmental trail around Apollo Bay highlighting the importance of the Shire's waterways and how people can protect them.	65,000	5,000	Council		High					Costs could be reduced - implement design with RE6 for Colac.	65,000	5,000		15,000	50,000	65,000	Environmental
RE8	Education and awareness	Conduct an environmental awards program highlighting BPEM in residential areas.	5,000	5,000	Council	High	High					Costs could be reduced - implement with other RE8 actions.	5,000	5,000		15,000	50,000	65,000	Environmental
RS1	Structural treatment measure - primary	Install additional gross pollutant traps at the at the end of the main stormwater outlets to Lake Colac.	150,000	15,000	Council	Very High						Not necessary if the outfalls are redirected towards a wetland.	0	0			0	0	Infrastructure

RS2	Structural treatment measure - primary	Incorporate open swale grass drains in the construction and reconstruction of streets and drains. Investigate different mowing regimes for improved water treatment effectiveness and retrofitting to improve the efficiency of open swale drains for water quality treatment.	0	0	Council	High	High					No additional cost - undertake as part of existing Council obligations.	0	0	0	0	0	0	Infrastructure
RS3	Structural treatment measure - primary	Rehabilitate and maintain the Tulloh Street retarding basin and outlet, incorporating softer swales to reduce downstream risks associated with increased residential development.	30,000	5,000	Council	High							30,000	5,000		30,000	5,000	35,000	Infrastructure
RS4	Structural treatment measure - primary	Rehabilitate the stormwater outfall at Marengo to reduce erosion.	30,000	5,000	Council		High						30,000	5,000		30,000	5,000	35,000	Infrastructure
RS5	Structural treatment measure - Tertiary	Subject to the results of a concept design and feasibility study, construct a wetland near the mouth of Deans Creek and Barongarook Creek.	180,000	15,000	Council	Very High						No additional cost - budget as part of the Lake Colac Management Plan.	0	0	0	0	0	0	Infrastructure
RS6	Structural treatment measure - Primary	Maintain Elliminyt retarding basion at Armstrong Street.	0	0	Council	High							0	0	0	0	0	0	Infrastructure
RC1	Source controls	Encourage the installation of rainwater storage and reuse tanks to reduce runoff during storm events and to conserve water.	0	0	Residents, Barwon Water	High	High					No additional cost - undertake as part of existing Council obligations.	0	0	0	0	0	0	Environmental
RC2	Source controls	Publicize the benefits of diverting roof water to grassed swales or other pre-treat options in order to reduce total flows, scouring, sediment and nutrients entering the stormwater system.	0	0	Council	High	High					No additional cost - undertake as part of existing Council obligations.	0	0	0	0	0	0	Environmental
RP1	Planning and regulation	Undertake periodic audits and random inspections of 'hot spot' areas, for illegal dumping of litter and green waste.	0	0	Council	High	High					No additional cost - undertake as part of existing Council obligations.	0	0	0	0	0	0	Local Laws
RP2	Planning and regulation	Amend local laws to prohibit the washing of vehicles in the street.	0		Council	High	High					No additional cost - undertake as part of existing Council obligations.	0			0		0	Local Laws
	Estimated Cost:														*20,000*	*104,000*	*118,000*	*242,000*	
Industrial runoff																			
IE1	Education and awareness	Implement an awareness campaign, including displays, workshops and education material relating to best practice at industrial sites for business owners/operators. (Utilise EPAV/CCMA material if appropriate). Where possible coordinate with visits undertaken by the Environmental Health Officer or with Barwon Water's trade waste inspections.	10,000	5,000	Council, EPAV, Barwon Water	Very High	High		High	High		Costs could be reduced - implement with other IE1 actions.	15,000	5,000	15,000	5,000	5,000	25,000	Environmental
IE2	Education and awareness	Conduct an environmental awards program highlighting businesses and industries that demonstrate a commitment to being environmentally aware, with particular focus on improving stormwater quality.	5,000	5,000	Council	Very High	High		High	High		Costs could be reduced - implement with other IE3 actions.	5,000	5,000	5,000	5,000	5,000	15,000	Environmental
IE3	Education and awareness	Undertake a business survey, advisory audit and education campaign (for example Old Joes Creek in the City of Knox) or neighbourhood improvement program to improve stormwater discharges.	50,000	5,000	Council, CCMA, EPAV	Very High	High		High	High		Costs could be reduced - implement with other IE3 actions.	50,000	10,000	50,000	10,000	10,000	70,000	Environmental

IS1	Structural treatment measure - Tertiary	Subject to the results of a concept design and feasibility study, redirect stormwater flows from central and eastern Colac (including the Bruce Street drain) via a new wetland to be developed near the mouth of Barongarook Creek.	300,000	20,000	Council, CCMA	Very High						No additional cost - budget as part of the Lake Colac Management Plan.	0	0	0	0	0	0	Infrastructure
IC1	Source controls	Audit loading, storage and waste storage areas to ensure contaminants (i.e. spillages, litter, packages etc) are being handled appropriately and disposed of appropriately.	0	1,000	Council, Owners	Very High	High		High	High		Costs could be avoided if implemented as part of other IE1 and IE2 actions.	0	0	0	0	0	0	Local Laws
IM1	Site management	Encourage the development of site based EMP's for key industrial sites to address stormwater, waste management, spill management etc.	0	0	Council	Very High	High		High	High		No additional cost - undertake as part of existing Council obligations.	0	0	0	0	0	0	Environmental
II1	Information and data collection	Undertake ongoing monitoring of the significant outlet drains (e.g. Bruce Street drain) upstream and downstream of industrial premises.	15,000	15,000	Council, EPAV, Barwon Water	Very High	High		High	High			15,000	15,000	15,000	15,000	15,000	45,000	Environmental
	Estimated Cost:														*85,000*	*35,000*	*35,000*	*155,000*	
Commercial land runoff																			
CE1	Education and awareness	Implement an awareness campaign, including displays, workshops and education material for commercial business owners/operators regarding their responsibilities with regard to stormwater management. Target particular issues such as appropriate waste disposal, management of loading and unloading of materials, appropriate storage of goods, including chemicals, cigarette butts etc. Use EPAV/CCMA material if appropriate.	10,000	2,000	Council		High						10,000	2,000		10,000	2,000	12,000	Environmental
CE2	Education and awareness	Undertake drain marking.	2,000	1,000	Council		High						2,000	1,000		2,000	1,000	3,000	Environmental
CS1	Structural treatment - primary	Install litter traps and side entry baskets in areas of high litter.	5,000	1,000	Council, Regional WMG		High						5,000	1,000		5,000	1,000	6,000	Infrastructure
CC1	Source controls	Encourage traders to install cigarette butt containers and provide advice on the available and appropriate disposal options.	0	0	Traders		High					No additional cost - if implemented as part of CE1.	0	0	0	0	0	0	Environmental
CC2	Source controls	Encourage banks to review ATM operations to reduce street litter.	0	0	Council		High					No additional cost - if implemented as part of CE2.	0	0	0	0	0	0	Environmental
CP1	Planning and regulation	Review Local Laws to control the overfilling/flow of wastes from commercial bins.	0		Council		High					No additional cost - undertake as part of existing Council obligations.	0			0		0	Local Laws
	Estimated Cost:														*0*	*17,000*	*4,000*	*21,000*	
Septic and sewers																			
SE1	Education and awareness	Implement an awareness campaign, including displays, workshops and education material for residents' with septic treatment systems regarding their maintenance responsibilities, ongoing monitoring requirements and about responsible water and waste management practices.	5,000	1,000	Council	High	High	Very High	Very High	Very High		Costs could be reduced - implement with other SE1 actions.	15,000	5,000	15,000	5,000	5,000	25,000	Environmental
SE2	Education and awareness	Encourage connection to sewer in line with the Waste Water Strategy.	2,000	2,000	Council, Barwon Water	High	High	Very High	Very High	Very High		No additional cost - budget as part of the Waste Water Strategy.	0	0	0	0	0	0	Environmental
SC1	Source Control	Advocate either extension of reticulated sewerage system to reach unserviced properties or provision of an alternative septic disposal technique.	0	0	Council, Barwon Water	High	High	Very High	Very High	Very High		No additional cost - undertake as part of existing Council obligations.	0	0	0	0	0	0	Infrastructure

SC2	Source Control	Advocate for the use of package treatment plants or neighbourhood waste management systems in coastal areas, depending upon the outcomes of the Coastal Community revitalisation study.	0	0	Council, Barwon Water			Very High				No additional cost - undertake as part of existing Council obligations.	0	0	0	0	0	0	Infrastructure
SP1	Planning and regulation	Review permit documentation (maintain register) and carry out inspections of existing on site waste management systems and enforce maintenance requirements in permits.	0	0	Council	High	High	Very High	Very High	Very High		No additional cost - undertake as part of existing Council obligations.	0	0	0	0	0	0	Planning
SP2	Planning and regulation	Avoid the approval of standard septic tanks in and adjacent to urban areas and villages. Require annual inspections of septic tanks and the reporting of results to Council.	0	0	Council	High	High	Very High	Very High	Very High		No additional cost - undertake as part of existing Council obligations.	0	0	0	0	0	0	Planning
	Estimated Cost:														*15,000*	*5,000*	*5,000*	*25,000*	
Landfills																			
LM1	Site management	Develop an Environmental Management Plan (EMP) for disused landfill sites (e.g. at the edge of Lake Colac).	0		Council in consultation with EPAV, DNRE	Very High			High			No additional cost - undertake as part of existing Council obligations.	0		0	0		0	Infrastructure
LM2	Site management	Monitor surface runoff and groundwater quality around disused landfill site at the end of Bruce Street.	15,000	15,000		Very High							15,000	15,000	15,000	15,000	15,000	45,000	Infrastructure
	Estimated Cost:														*15,000*	*15,000*	*15,000*	45,000	
Markets and events																			
EE1	Education and awareness	Implement an awareness campaign, including the preparation and distribution of material on waste management for events and known likely participants (sports clubs, residents, junior squads).	0	0	Council, event organiser	High						No additional cost - undertake as part of existing Council obligations.	0	0		0	0	0	Environmental
EE2	Education and awareness	Prepare temporary signage indicating waste disposal practice required at event location (5 x $200).	2,000	1,000	Council	High							2,000	1,000		2,000	1,000	3,000	Environmental
EC1	Source controls	Follow up events with coordinated clean up plan (for example, street sweeping, rapid rubbish collection, recycling containers, cigarette butt containers etc).	0	0	Event organiser, Council	High						No additional cost - undertake as part of existing Council obligations.	0	0		0	0	0	W
EM1	Site management	Develop site specific waste management plans for key events through lease arrangements with Council.	0	0	Council, event / sport organiser, Regional WMG	High						No additional cost - undertake as part of existing Council obligations.	0	0	0	0	0	0	Environmental
EM2	Site management	Develop a site specific EMP and associated waste management plan and stormwater management plan for the saleyards.	0		Council	High						No additional cost - undertake as part of existing Council obligations.	0		0			0	Infrastructure
EP1	Planning and regulation	Review Council's waste management strategy to include strategies to address managing waste from events, regular sporting activities etc.	0	0	Council, Regional WMG	High						No additional cost - undertake as part of existing Council obligations.	0	0	0	0	0	0	Infrastructure
	Estimated Cost:														*0*	*2,000*	*1,000*	*3,000*	
Land development and building sites																			
BE1	Education and awareness	Implement an awareness campaign, including displays, workshops and education material for contractors and developers regarding management of stormwater. Brochures can be used as a guide for contractors when preparing Environmental Management Plans and when preparing documentation to meet quality assurance procedures. Use EPAV/CCMA material as appropriate.	5,000	1,000	Council	High	Very High	High				Costs could be reduced - implement with other BE1 actions.	10,000	5,000	10,000	5,000	5,000	20,000	Environmental

BE2	Education and awareness	Provide temporary signs at building sites/subdivision areas highlighting stormwater/waste management and discharge points. (Estimated $200/sign x 5)	2,000	2,000	Council	High	Very High	High					5,000	2,000	5,000	2,000	2,000	9,000	Planning
BM1	Site Management	Encourage the housing and construction industry to develop a code of practice for environmental management and for control of wastes (including sediment, paints etc) from construction sites.	0		Council	High	Very High	High				No additional cost - undertake as part of existing Council obligations.	0	0	0	0	0	0	Planning
BP1	Planning and regulation	Ensure that all subdivision permits are granted with conditions relating to sediment control Require the application of water sensitive urban design requirements to subdivision and development permits.	0	0	Council	High	Very High	High				No additional cost - undertake as part of existing Council obligations.	0	0	0	0	0	0	Planning
BP2	Planning and regulation	Require land developers to prepare an EMP (including sediment/erosion control initiatives) for land for subdivision activities, particularly larget undeveloped areas.	0	0	Council	High	Very High	High				No additional cost - undertake as part of existing Council obligations.	0	0	0	0	0	0	Planning
BP3	Planning and regulation	Introduce a Local Law and or advocate for changes to the Building Control Act to control the adverse impacts of construction activity on stormwater quality.	0		Council, BCC	High	Very High	High				No additional cost - undertake as part of existing Council obligations.	0		0			0	Local Laws
BP4	Planning and regulation	Requires WSUD to be considered for developments.	0	0	Council	High	Very High	High				No additional cost - undertake as part of existing Council obligations.	0	0	0	0	0	0	Planning
	Estimated Cost:														*15,000*	*7,000*	*7,000*	*29,000*	
Major roads																			
ME1	Education and awareness	Liaise with the local truck industry (e.g. trucks involved in agricultural/horticultural cartage, timber transport trucks etc) regarding management of loads to avoid spillages, truck maintenance to minimise contaminants accumulating on the road including engine oils, grease, air pollution deposits etc.	2,000	2,000	Council, industry representativ es	High	High		High	High		Costs could be reduced - implement with other ME1 actions.	5,000	2,000	5,000	2,000	2,000	9,000	Environmental
ME2	Education and awareness	Use the local press to publicize load spillages and the impact they are likely to have on waterways (where possible use actual examples) and point out the measures that truck/vehicle owners and operators can take to minimise reoccurrence.	0	0	Council	High	High		High	High		No additional cost - undertake as part of existing Council obligations.	0	0	0	0	0	0	Environmental
MS1	Structural treatment measures - primary	Install drainage entrance treatments/inline types (e.g. litter traps, trash racks, return flow litter baskets, circular screens etc) at vehicle parks close to waterways along Princes Highway, Colac-Lavers Hill Road and Colac-Forrest Road which carry a substantial amount of traffic (20 @ $250).	5,000	1,000	Council, Vic Roads	High	High		High	High			15,000	5,000			15,000	15,000	Infrastructure
MS2	Structural treatment measures - secondary	Install gross pollutant traps or similar devices at the Barongarook Creek crossing to collect and treat runoff from Princes Highway.	100,000	10,000	CCMA, EPAV, Council	High						No additional cost - budget as part of the Lake Colac Management Plan.	0	0		0	0	0	Infrastructure
MS3	Structural treatment measures - secondary	Install gross pollutant traps or similar devices at the Deans Creek crossing to collect and treat runoff from Princes Highway.	100,000	10,000	CCMA, EPAV, Council	High						No additional cost - budget as part of the Lake Colac Management Plan.	0	0			0	0	Infrastructure
MS4	Structural treatment measures - secondary	Incorporate pre-entrance treatment measures such as filter strips, grass swales, triple interceptors, porous pavements and oil and grease baffles in main road design.	0	0	Council, VicRoads	High	High		High	High		No additional cost - undertake as part of existing Council obligations.	0	0	0	0	0	0	Infrastructure

MC1	Source controls	Review existing street sweeping regime, checking to ensure that the schedule includes all hot spot areas.	2,000		Council	High	High		High	High		Costs could be reduced - implement with other MP1 actions.	2,000		2,000			2,000	Infrastructure
MP1	Planning and regulation	Council, in association with VicRoads, EPAV and the Police, need to reinforce controls with regard to speed limits, securing of loads, vehicle maintenance, tyre peel offs etc.	0	0	Council, EPAV, Vic Roads, Police	High	High		High	High		No additional cost - undertake as part of existing Council obligations.	0	0	0	0	0	0	Local Laws
	Estimated Cost:														*7,000*	*2,000*	*17,000*	26,000	
Upstream inflows																			
UE1	Education and awareness	Liaise with rural property owners to reduce sediment and pollutant loads washing into creeks that pass through the towns. Use DNRE material as appropriate.	2,000	2,000	Council, DNRE, CCMA	Very High	High			High			5,000	2,000		5,000	2,000	7,000	Environmental
UE2	Education and awareness	Develop with landcare/friends of groups, catchment management plans extending from the upper rural catchments through the urban areas. Seek partnerships with DNRE, CCMA, and/or Parks Victoria to facilitate plan development and implementation.	5,000	2,000	Council	Very High	High			High			15,000	5,000		15,000	5,000	20,000	Environmental
	Estimated Cost:														*0*	*20,000*	*7,000*	*27,000*	
Pests																			
PE1	Education and awareness	Undertake a targeted program of weed and vermin eradication, commencing with hot spot areas. Utilise existing information available from DNRE, CCMA.	0	0	Council, CCMA, DNRE	High	High		High	High		No additional cost - undertake as part of existing Council obligations.	0	0			0	0	Environmental
PE2	Education and awareness	Implement an awareness campaign, including displays, workshops and education material targeted at property owners adjacent to creek lines. It should focus on litter control and discourage people from throwing green waste etc into waterways as this can spread weeds..	5,000	1,000	Council	High	High		High	High		Costs could be reduced - implement with other PE2 actions.	10,000	2,000			10,000	10,000	Environmental
	Estimated Cost:														*0*	*0*	*10,000*	10,000	
Unstable waterways																			
WE1	Education and awareness	Implement an awareness campaign, including displays, workshops and education material to land owners, particularly those with properties with waterway frontage regarding BPEM of waterways environs. Highlight issues such as minimising stock access to waterways, revegetating and fencing the riparian environment either side of the waterways. Utilise existing information from the CCMA.		2,000	Council, CCMA, Water Watch			Very High						2,000	2,000	2,000	2,000	6,000	Environmental
	Estimated Cost:														*2,000*	*2,000*	*2,000*	*6,000*	
Estimated Cost Of All Reactive Strategies															***159,000***	***209,000***	***221,000***	***589,000***	
Estimated Cost Of All Management Strategies															***64,000***	***81,000***	***76,000***	***221,000***	
Estimated Cost of All Strategies															***223,000***	***290,000***	***297,000***	***810,000***	