



The Heart of Gippsland

Volume 1

Wellington Shire Stormwater Management Plan

Job 0801840

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Earth Tech Engineering Pty Ltd
Melbourne Office
71 Queens Road
Melbourne VIC 3004
Tel (03) 8517 9200

Earth Tech Engineering Pty Ltd
Gippsland Region
18 Breed Street
Traralgon VIC 3844
Tel (03) 5174 0066

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Earth Tech Engineering Pty Ltd
ABN 61 089 482 888
Head Office 71 Queens Road
Melbourne VIC 3004
Tel +61 3 8517 9200



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Fisher Stewart



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Executive Summary

This report forms Volume 1 (of 2) of the Wellington Shire Stormwater Management Plan (SWMP). It contains a summary of the Plan development process and resultant outcomes.

The SWMP's development has been jointly funded by the Wellington Shire Council, West Gippsland Catchment Management Authority and the Environmental Protection Authority through the Victorian Stormwater Action Program (VSAP).

Although stormwater *quantity* issues such as flooding, remain a principal concern, the **primary focus of the SWMP is improved urban stormwater quality**. This shift in attention responds to the growing concern from the community and catchment managers, for the impacts of poor urban stormwater quality on receiving water environments.

The SWMP development has been undertaken in accordance with the 'Urban Stormwater Best Practise Management Guidelines' (BPEMG) published by the CSIRO in 1999. These guidelines provide a prescriptive process which aims to protect urban stormwater quality.

Community consultation has been an integral part in the development of the SWMP, with four stages of workshops undertaken. The workshops were made up of various community members including representatives from the Council, various Government Agencies, Committees of Management, Township Associations and Special Interest Groups. The workshops drew on the local knowledge of the attendees and sought their input, comments and direction at all stages of the Plans development.

The urban areas examined in the study include the large centres of Sale, Heyfield, Maffra, Stratford, Rosedale and Yarram; together with the smaller centres of Wurruk, Dargo, Licola, Briagolong, Coongulla, Boisdale, Newry, Tinamba, Cowwarr, Loch Sport, Longford, Seaspray, Alberton and Port Albert.

Through the investigative processes of the SWMP including the workshop consultation, report review and field investigations, the SWMP examines landuse activities which threaten runoff quality in the Wellington Shire. These threats are assessed according to their risk to the ecological values and beneficial uses of the receiving waters which they may pollute. The waterways identified to be at most risk were:

- Lake Guthridge and Flooding Creek (from urban runoff in Sale);
- The Albert River (from urban runoff in Yarram);
- The Macalister River, and the Macalister Swamp (from urban runoff in Maffra);
- The Thomson River (from urban runoff in Heyfield);
- Lake Glenmaggie (from urban runoff in Coongulla); and
- Lake Reeve (from urban runoff in Seaspray).

The urban pollutant sources identified to pose the greatest stormwater quality threats were:

- Gross pollutants including litter, and sediments from commercial and residential land;
- Wide range of contaminates including sediments, nutrients and toxins from industrial discharge, and site runoff;
- Chlorinated waste water from sporting facility discharge;
- Sediments and construction waste from building site runoff and inappropriate discharge;

- **Nutrients and disease causing substances from septic and sewer leaks and spills.**

The SWMP includes an action assessment, which develops a range of reactive strategies aiming to minimise the adverse impact of poor urban stormwater quality. Actions have been selected based upon their cost/effectiveness, feasibility and multiple benefit. These strategies include a mix of structural devices in priority locations such as Gross Pollutant Traps (GPT's) and wetlands. The actions also include educational responses aimed at alerting, informing and involving the community and industry regarding their role in stormwater management.

The SWMP also examines the planning and management framework of Wellington Shire Council and the effect of its operation upon stormwater quality. The examination compares current Council practise to Best Practise Environmental Management, as set out by the BPEMG (CSIRO 1999). The key planning and management issues were found to be:

- Need for strengthening of planning tools and strategic documents, to form a statutory basis for requiring Best Practise Stormwater Management as part of permit conditions;
- Opportunity to more clearly define the referrals process including triggers for internal referrals, roles and responsibilities;
- Need for continued support for the allocation of resources for planning condition enforcement;
- Need for amendments to municipal operation procedures, incorporating Best Practise techniques;
- Opportunity for the use of educational and awareness programs, focused towards Council staff, and also toward the construction industry and the general community;
- Need for resource support of litter enforcement.

A range of Council Management Framework Strategies has been developed in response to the above issues, as a means to improve stormwater quality management across the operating functions of Council.

The Regional Rural Drainage Plan prepared by the West Gippsland Catchment Management Authority (WGCMA) in December 2000 outlines the current arrangement in regard to drainage responsibilities between the Council and the WGCMA. The Plan states that Local Government is the lead agency for drainage in urban areas and that the WGCMA is the lead agency for drainage in rural areas. The lead agency in declared irrigation areas would be Southern Rural Water. The lead agency is accountable for endeavouring to have an issue resolved, but is not necessarily the Authority responsible for works. Another Authority may be responsible for undertaking and funding the work required to resolve the issue.

Despite this, the areas of responsibility for drainage between the Catchment Management Authority and the Council are still somewhat unclear, as the boundaries between the urban and rural interface have not been determined nor agreed to. Further partnering arrangements between each organization are needed to clearly outline responsibilities.

With regard to waterway management, the West Gippsland Catchment Management Authority has responsibility for waterways designated under the Water Act 1989. However, within urban creek landscapes, the objectives of Wellington Shire with regard to aesthetic values and passive recreation may not fully coincide with the environmental

objectives of the WGCMA. Hence the two organizations will have to work in partnership to achieve a broader range of objectives.

This Stormwater Management Plan provides a way of assisting the Wellington Shire Council recognise the impacts of activities within its boundaries. The Plan provides a program to sustain and enhance the environmental values and the beneficial uses of the various receiving waters through implementing a range of strategies to address the priority issues over the coming five to ten years.

Volume 2 of the SWMP contains detailed information of the Plan's development through the four workshops held as part of the process.

Wellington Shire Council

Job 0801840

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1 Introduction

1.1 Purpose of the Stormwater Management Plan

The purpose of this Stormwater Management Plan is to protect and enhance our local waterways by improving the quality of stormwater draining from urban areas in the Wellington Shire.

The urban areas examined in the Plan include the large township centres, of Sale, Heyfield, Maffra, Stratford, Rosedale and Yarram; together with the smaller centres of Wurruk, Dargo, Licola, Briagolong, Coongulla, Boisdale, Newry, Tinamba, Cowwarr, Loch Sport, Longford, Seaspray, Alberton and Port Albert.

Twenty three waterways have been identified as direct recipients of urban stormwater runoff in Wellington Shire. These waterways are also direct recipients of the various pollutants which the stormwater contains.

To protect and enhance the waterways through improving the quality of stormwater draining from Wellington's urban areas, the Plan:

- Identifies the priority issues for management of stormwater quality in Wellington Shire;
- Presents strategies for reducing the main threats to stormwater quality; and
- Presents strategies for integrating best practice environmental management of stormwater into Council's management and planning activities.

This document (Volume 1) of the Stormwater Management Plan provides a summary of how the plan has been developed and details the recommended strategies. A second document (Volume 2) provides further details of the processes followed and the background information used to arrive at the strategies.

Note: further explanation of terminology used for the purposes of this plan is contained in Section 9 'Definitions and Abbreviations'.

1.2 The Need to Manage Stormwater Quality

Stormwater is produced on a catchment wide basis. Urban development increases the area of impervious (or sealed) surfaces within catchments. Because of the sealed surfaces and drainage pipe networks, water is transported more quickly off the urban land and into the receiving waters.

Human activities in the catchment produce many materials that find their way into the drainage systems and which may lead to poor stormwater quality. Poor water quality combined with a hydraulically efficient stormwater drainage system has resulted in progressive deterioration of the environmental values of aquatic ecosystems and their associated values in urban environments.

The impact of poor stormwater quality is becoming an important issue amongst catchment managers. This is particularly true of urban stormwater, for which Council constitutes the principal catchment manager. The negative impacts can be many and varied and include increased turbidity and suspended solid concentrations, deposition of suspended matter including litter, increased concentrations of nutrients and metals, increased numbers of micro-organisms, changes in water temperature and pH and dissolved oxygen levels.

Current Best Management Practices for our stormwater systems aims to reduce any adverse impacts on environmental and other identified values of receiving waters.

Strategies include changes to the management of activities within urban areas to improve stormwater quality through policies and procedures. Other identified changes can be through the implementation of structural treatments and educational measures to minimise pollutants being carried into the waterway environment.

2 How the Plan was Developed

2.1 The Overall Process

The approach used in developing the Stormwater Management Plan follows the process detailed in Chapter 3 (revised September 2000) of the Best Practice Environmental Management Guidelines (CSIRO, 1999).

There are a number of key elements within the process for developing a stormwater management plan. A series of four workshops were conducted to enable the issues to be brought forward, debated, and the knowledge from a range of stakeholders to be incorporated into the plan. A review of the current Council management framework in relation to stormwater quality was also undertaken.

The Plan development process also involved a risk assessment method for determining the priority risks to be managed. The main outcomes from the process are two types of strategies; reactive strategies and management framework strategies. These elements are described further in the following sections.

2.2 Stakeholder Involvement

Development of the stormwater management plan was overseen by a Steering Committee comprising representatives from the Wellington Shire Council, West Gippsland Catchment Management Authority and the Environment Protection Authority.

A Project Working Group was established, and this group was involved in four workshops throughout the study. In addition to the above Steering Committee members, this group consisted of Councillors and other Council officers (eg. engineers, planners, and technical staff), members of township associations (eg. Maffra Chamber of Commerce), members of committees of management (eg. Macalister River Parks, Flooding Creek Landcare Group, Gippsland Water Advisory Committee, Gippsland Cultural Heritage, Avon-Thomson-Macalister Improvement Management Group) and representatives from government agencies and community based groups (eg. Waterwatch).

2.3 Risk Assessment Method

In the context of the stormwater management plan, **risks** were defined as “activities within the catchment that can have an adverse impact on waterways or water bodies and their associated values”.

The method for determining risk priorities as set out by the Best Practise Environmental Management Guidelines can be summarised by the following relationship:

$$\text{Risk} = \text{Threat} \times \text{Value} \times \text{Sensitivity}$$

Where:

- ‘Threat’ is an activity in the catchment that can degrade stormwater quality and produce adverse environmental impacts, eg. sediment runoff from residential land;

- **'Value'** is a beneficial use to the community of a waterway or water body that receives stormwater flows (the receiving waters). Values cover a range of factors including environmental, amenity, cultural, stormwater and economic factors; and
- **'Sensitivity'** is a measure of how much of an impact would occur to a specific waterway value if the particular pollutants were transported there by the stormwater.

This method was used throughout the workshop process to determine the nature and location of the highest stormwater risks. The highest risks are those activities within the urban catchment that have the greatest potential to cause adverse impacts on the identified values of the receiving waters.

Therefore this risk assessment method considers highly valued waterways as precious and sets priorities to first, "save what is working" rather than just trying to "mend what is broken".

2.4 Management Framework Review

In addition to investigating practices in the general urban catchment, a further series of workshops and interviews were undertaken involving officers and staff from a cross section of Council departments. These investigated the ways in which the planning and management activities undertaken by Council can influence stormwater runoff quality.

2.5 Outcomes from the Plan

The main outcomes from the process is the development of two types of strategies. Both types of strategies aim to protect the values and the beneficial uses of the receiving waters of Wellington Shire.

Reactive management strategies are recommended for responding to the priority risks (to the receiving waters) that have been identified through the workshop process. These may be structural or non-structural measures.

Management framework strategies are recommended for improving the management and planning activities of the Council in relation to stormwater quality. These strategies will reduce stormwater pollution effects across all parts of the urban area, and assist Council in integrating Best Practise Stormwater Management as part of its ongoing planning and management activities.

3 Stormwater Management Issues in Wellington Shire

Stormwater management issues were developed for the urban areas of Wellington Shire through the risk assessment process, which as described in Section 2.3, investigates the values of the receiving waters to protect; the threats from the urban activities which may impact them; and the sensitivity of the specific value to the specific threat.

3.1 Values to be Protected

Waterways have a range of values and beneficial uses which in many cases are of very high importance to a town/regional community and ecosystem. These values can be adversely affected by polluted stormwater.

The values were categorised under the following headings:

| | |
|-------------|---|
| Environment | In-stream habitat - <i>ecological values based on water quality</i> Riparian flora and fauna – <i>quality of native on-bank vegetation and habitat support</i> |
| Amenity | Recreation – <i>public passive and active utilisation, ie fishing, walking</i> Aesthetics and Landscape – <i>beauty of water environment and surrounds</i> |
| Cultural | Aboriginal – <i>places of significance eg. ceremonial sites</i> Non-Aboriginal – <i>places of significance eg. pioneering trails</i> |
| Stormwater | Flood conveyance – <i>contribution to protection against flooding</i> Water quality treatment – <i>contribution to water quality management</i> |
| Economic | Property values – <i>land value associated with proximity to water</i> Other values – <i>other economic benefits, eg: tourism, irrigation</i> |

3.2 Receiving Waters And Values

Urban areas of Wellington Shire have networks of piped drains and small open channels that carry stormwater to the natural waterways and water bodies. Twenty three waterways and water bodies were identified as primary urban receiving waters.

The Steering Committee and the Project Working Group determined the more important values of the receiving waters, drawing on the members knowledge of local environmental features, information contained in published reports and from field investigations.

The eight receiving waters of primary importance to this stormwater management plan (resulting from the risk assessment analysis) are Lake Guthridge (Sale), Flooding Creek (Sale), Albert River (South of Yarram), Macalister River (Maffra), Macalister Swamp (Maffra), Thomson River (Heyfield), Lake Glenmaggie (Coongulla), and Lake Reeve (Seaspray).

The key values of these waterways are described below, and reflect the consensus on the relative importance of the values. More detailed descriptions of the entire list of receiving waters can be found in Volume 2 of the plan.

Lake Guthridge was formed in 1879 as an artificial lake (also with some retardation ability) out of the eastern swamp. The majority of stormwater runoff from Sale drains to Lake Guthridge, which performs settlement of coarse particles and minor contaminant removal prior to overflow into Flooding Creek and eventually the Gippsland Lakes.

It is now an attractive centrepiece of Sale and a picturesque backdrop for overlooking residences and visitors. It is surrounded by parkland and walking tracks and is fitted with picnic and barbeque facilities. It is a popular location for recreational activities including walking, cycling, game play, observation, and fishing (generally carp and eels). Historically Lake Guthridge hosted races for the Sale Rowing Club.

Because of the scenic environment and its centrality to the Sale urban area, it draws tourists and creates an identity for the town, forming an integral feature for the community.

| <u>Key Values Of Lake Guthridge</u> | |
|--|---------------|
| Value to protect | Rating |
| Recreational Amenity | High |
| Visual/Landscape Amenity | High |
| Stormwater Flood & Conveyance | High |
| Property | High |
| Economic Tourism | Very High |



Ref: Photo 1 – Lake Guthridge

Flooding Creek which flows from the north west of Sale, was modified by the construction of the Sale Canal. Flooding Creek now exists as two branches, which for the purposes of the Plan have been designated as (1) part of the Sale Canal arm, and (2) part of the Lake Guthridge arm, the former being the primary receiving water of urban runoff from north west Sale.

Although the Sale Canal arm of Flooding Creek is generally considered to be in low environmental health, sections are very highly valued by the community for its visual attractiveness, including the lookout over the Port of Sale. Fishing (although generally only carp is caught) is enjoyed by families and the waterway supports recreational boating including rowing.

The waterway also has an economic importance, derived from vessel navigability, and the generation of tourism. Flooding Creek was the original name for Sale and also contains other cultural significance relating to the Port of Sale and original jetty.

Community appreciation of the waterway environment of the Sale Canal/Port of Sale is likely to be increased with the realignment of the South Gippsland Highway, and the restoration of the Swing Bridge (estimated completion mid 2003). These works are expected to increase recreational and commercial utilisation of the waterway magnifying the importance of its appearance and ecosystem health.

| <u>Key Values Of Flooding Creek</u> | |
|--|---------------|
| Value to protect | Rating |
| Visual/Landscape Amenity | V. High |
| Non Aboriginal Cultural | High |
| Economic Tourism | Very High |



Ref: Photo 2 – Flooding Creek

The Albert River flows to the south west of the Wellington Shire, before meeting Bass Strait via Nooramunga Marine and Wildlife Reserve. It receives stormwater runoff from the large urban centre of Yarram.

Albert River has very high ecological values and supports diverse native flora and fauna in-stream and upon its banks. The lower reaches of Albert River are influenced by intertidal activity and its flows allow recreational boating, together with fishing for which Albert River is known for its abundance of fresh and salt water fish.

In addition to boating and fishing, its attractive natural setting has been enhanced with on-site car parking and boat ramp access, picnic facilities and toilets. Close to the River is located the marker where explorer McMillan first entered the area. These cultural, recreational and environmental values have also created economic benefits through tourism, with coach tours and private visitors visiting the Albert River and its surrounding features.

| <u>Key Values Of Albert River</u> | |
|--|---------------|
| Value to protect | Rating |
| In-Stream habitat | Very High |
| Riparian Flora/Fauna | High |
| Recreational Amenity | Very High |
| Visual/Landscape Amenity | High |
| Economic Tourism | High |



Ref: Photo 3 – Albert River

The Macalister River flows from the Great Dividing Range in the Wellington Shire. Regulated by Lake Glenmaggie, its path makes its way within the southern border of Maffra (receiving all of its stormwater runoff) before joining the Thomson River and eventually the Gippsland Lakes.

Despite being controlled by Lake Glenmaggie for irrigation, it contains different bed-form characteristics (pools, runs and riffles), and together with many snags and woody debris, it creates healthy habitats for many native in-stream flora and fauna. Significant native vegetation also exists on the banks of Macalister River.

The Macalister River and its surrounding areas including Macalister Park, and Macalister Swamp Reserve, provide high access to the river and contain connecting paths and picnic facilities. Recreation is also valued, including canoeing and kayaking, bicycle touring, fishing, swimming and bird watching.

The Macalister River and its surrounding features contain cultural significant attractions such as the Sugar Beet Museum, Native Police Reserve, and Cattle Saleyard site. The cultural, recreational and environmental values of Macalister River and surrounds also provide important economic benefits from tourism.

| <u>Key Values Of Macalister River</u> | |
|--|---------------|
| Value to protect | Rating |
| In-Stream habitat | High |
| Riparian Flora/Fauna | High |
| Recreational Amenity | High |
| Visual/Landscape Amenity | Very High |
| Non-Aboriginal Cultural | High |
| Economic Tourism | Very high |



Ref. Photo 4 – Macalister River

The **Macalister Swamp** is located on the north western side of Maffra. Historically the swamp was a drying area for water treatment plant sludge before it was converted to a vegetated wetland, which receives urban stormwater from the north west sub-catchment of Maffra. The swamp subsequently discharges runoff to Macalister River.

The diverse plantings of native macrophytes and riparian vegetation once established, quickly attracted abundant wildlife, including water and bush birds, frogs, insects and small fish. Bird watching enthusiasts have utilized this successful habitat, and a bird hide constructed on site is used as an observatory. A boardwalk has also been constructed to enhance the visual attraction and recreational uses of the Reserve.

The Macalister Swamp due to the processes occurring in its flow path, including sedimentation, biological and chemical removal of contaminants, also provides effective water quality pre-treatment prior to the stormwater being discharged to Macalister River.

| <u>Key Values Of Macalister Swamp</u> | |
|--|---------------|
| Value to protect | Rating |
| In-Stream habitat | High |
| Riparian Flora/Fauna | High |
| Recreational Amenity | High |
| Visual/Landscape Amenity | High |
| Water Quality Treatment | High |



Ref. Photo 5 – Macalister Swamp

The closed upper catchments of the **Thomson River** provide relatively contaminant free water, which flow from Lake Thomson bordering Wellington Shire and Latrobe City, receiving runoff from National Park and freehold agricultural land. The first major urban centre from which the Thomson River receives stormwater runoff is Heyfield.

Around and downstream of Heyfield, the Thomson River is highly valued for its water quality and in-stream environmental values, providing healthy habitats for a range of native species. The Thomson River provides the Heyfield community with recreational swimming, fishing and cray-fishing. Further recreational activities enjoyed on the river

include rafting and boating and other passive enjoyment of the scenery and natural attractions.

The Heyfield Wetlands, which intercept much of Heyfield’s urban stormwater, provides water quality treatment prior to discharge to the Thomson River. The area also provides recreational and educational uses for the township community.

| <u>Key Values Of Thomson River</u> | |
|---|---------------|
| Value to protect | Rating |
| In-Stream habitat | High |
| Recreational Amenity | High |
| Visual/Landscape Amenity | High |

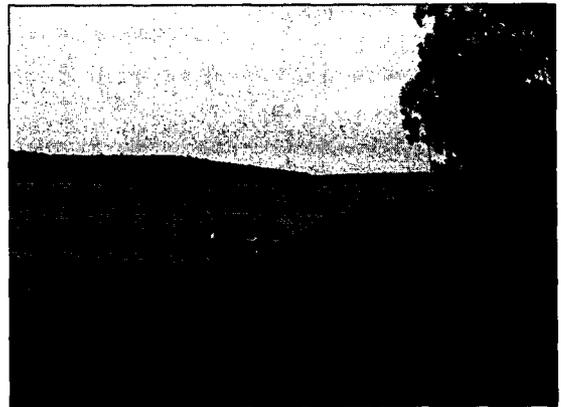


Ref: Photo 6 – Thomson River

Lake Glenmaggie situated on the Macalister River, serves the principal purpose of servicing the Macalister irrigation district. It receives urban stormwater runoff directly from the townships of Glenmaggie and Coongulla, the latter being the larger urban area.

Coongulla on Lake Glenmaggie is a popular holiday location, with the Lake used for a number of sporting activities including swimming, fishing and various types of boating. The vast lake water body also provides attractive scenery, with the water front properties considered to have prime location and attract marginally higher real estate values.

| <u>Key Values Of Lake Glenmaggie</u> | |
|---|---------------|
| Value to protect | Rating |
| Recreational Amenity | Very High |
| Visual/Landscape Amenity | Very High |
| Stormwater Conveyance | High |
| Economic Property | High |
| Economic Tourism | Very High |



Ref: Photo 7 –Lake Glenmaggie

Lake Reeve, is located along the ninety mile beach between Seaspray and the south eastern boundary of the Wellington Shire. A naturally formed lake, it is in part extensively colonised with wetland and riparian vegetation. It forms important habitats for many native fauna species and for many of them it acts as a nursery for the wider Gippsland Lakes. Lake Reeve also has been included in the international RAMSAR categorisation of the Gippsland Lakes.

| <u>Key Values Of Lake Reeve</u> | |
|--|---------------|
| Value to protect | Rating |
| In-stream Habitat | Very High |
| Riparian Flora/Fauna | Very High |
| Stormwater Conveyance | High |

Ref. Photo 8 – Lake Reeve

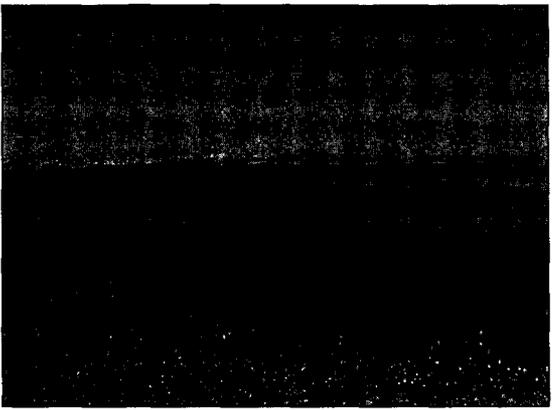


Figure 1 below illustrates a snapshot of Wellington Shire's waterways and main urban centres.

3.3 Threats to Stormwater Quality

Stormwater pollutants from urban developments originate from a variety of sources in the catchment. The most common sources include motor vehicles, construction activities, erosion and surface degradation, spills and leachates, miscellaneous surface deposits and atmospheric deposition.

The pollutants that originate from these sources are broadly grouped below according to their impact on water quality.

Gross Pollutants and Litter includes all forms of coarse solids such as urban-derived litter, vegetation and coarse sediment. Large amounts of urban debris are flushed from the catchment into the stormwater drainage system during storm events.

Gross pollutants and litter are not only visually offensive, but may also contribute to a reduction in the drainage capacity of the stormwater conveyance systems. They also form a threat to the in-stream ecosystem through a combination of physical impacts on aquatic habitats and contamination of receiving water quality, due to other pollutants that are associated with them.

Suspended Solids, which are comprised of inorganic and organic material. Sources of inorganic suspended solids include soil particles from erosion and land degradation, streets, buildings and airborne suspended matter. Sources of organic suspended solids are vegetation debris, bacteria and micro-organisms.

Suspended solids often increase turbidity in waters, which has a visual impact and also effects the penetration of light through water, with consequential impacts on water chemistry. Suspended solids are a threat to environmental values due to substances that bind themselves to sediments and use them as the medium for transportation in urban runoff. These substances include nutrients and toxins, such as phosphorous, heavy metals and organic chemicals.

Metals are present in stormwater in a wide variety including cadmium, chromium, copper, nickel, lead and zinc. Their toxic effect is dependent on their concentration levels and threshold concentrations of the waterway they enter. Common sources are vehicle wear, corrosion of metal parts, petrol additives, pesticides, fertilizers and paper. Metals are associated with severe deterioration in aquatic life health.

Toxic Organics, Oil and Surfactants are most commonly derived from transport related sources including leaks from vehicles, car washing and poor vehicle maintenance. Oils and surfactants deposited on road surfaces are washed off from road surfaces to receiving waters. These pollutants detract from the visual appeal of the waterway, together with adding to the chemical oxygen demand on the water-body, stressing the aquatic community and facilitating undesirable chemical reactions in the substrait.

Nutrients consist of natural compounds of carbon, nitrogen and phosphorous, which if excessive amounts are delivered from poorly maintained waste infrastructure, plant matter, organic waste, fertilizers, kitchen wastes and vehicle exhausts can be detrimental to aquatic health. The nutrients can promote excessive plant growth including algal blooms and low oxygen concentrations.

Micro-organisms in stormwater include faecal coliforms and specific pathogens such as Salmonella. Common sources include animal faeces and sewer overflow/septic leakage. Micro-organisms cause disease.

3.4 Sub-catchments in Wellington Shire

To identify the water quality threats from the identified urban areas, the municipality was divided into study areas based on geographic location and separation. Urban areas were defined according to the Wellington Shire's Planning Scheme and included such zones as residential, industrial, commercial, public use etc and were generally bounded by rural zones.

The geographical separation between townships produced the twenty study areas of Sale, Heyfield, Maffra, Stratford, Rosedale and Yarram, Wurruk, Dargo, Licola, Briagolong, Coongulla, Boisdale, Newry, Tinamba, Cowwarr, Loch Sport, Longford, Seaspray, Alberton and Port Albert.

To enable examination of issues specific to locations of interest within a study area, where applicable, the study areas were further divided into sub-catchments, according to hydrological boundaries for runoff-outfall and receiving environments; and land-use patterns for urban stormwater threats. The number of sub-catchments allocated per town therefore varied according to terrain, and uniformity of stormwater threats and their impacts on receiving water values.

The sub-catchments are referred to throughout the study process and they form the basis of identifying threats and formulating management strategies.

As with most towns, there is very little data or recorded information on the sources and extents of stormwater pollution within the urban area. Therefore, the assessment of threats relies on local knowledge and observations, combined with the general understanding from many urban areas of the typical pollutants carried by urban runoff.

Based on the risk assessment analysis, the threats that create the greatest risk come from sub-catchments in six towns. These towns of primary importance to the Plan are Sale, Yarram, Maffra, Heyfield, Coongulla and Seaspray. The main threats from these towns are outlined below. Discussions on the stormwater threats in the remainder of the townships examined are contained in Volume 2 of the SWMP. It was generally found that the smaller the urban development area, the lesser are the urban stormwater threats.

The outline below refers to sub-catchment names and numbers, which for the above six towns are described in Figures 2 – 7.

Table 3.1 – Main Threats to Stormwater Quality from the sub-catchments of importance.

| Town & Sub-catchment | Main threats to stormwater quality |
|---|--|
| <p><u>Sale</u></p> <p>North & West Sale (1)</p> | <p>High Threats</p> <p>Residential land runoff – large residential land use proportion in sub-catchment, generating sediment runoff from roads, houses, streets, gardens, and leaves. Nutrients and metals from sediment bound organic material, leaf litter, car washing and fertilizers. Litter dropped in sub-catchment, weeds entering waterway through drainage system.</p> <p>Industrial land runoff – number of industries present in sub-catchment. Identified sources of sediments, hydrocarbons, micro-organisms, nutrients and oxygen demanding substances.</p> <p>Commercial land runoff – high deposition of litter and gross pollutants. Particularly high proportion of floatables. Highly trafficked area with much vehicle movement, with associated discharge of vehicle</p> |

| Town & Sub-catchment | Main threats to stormwater quality |
|--|--|
| <p>Maffra</p> <p>North West Maffra (1)</p> <p>South West Maffra (2)</p> | <p>High Threats</p> <p>Residential land use – litter and gross pollutant deposition. Leaf litter and sediments. Inappropriate discharge into the stormwater system.</p> <p>High Threats</p> <p>Industrial land runoff – includes feed & grain, dairy processing, farm equipment, sheet metal work, panel-beating industries. Threat from sediments and toxic runoff into stormwater system.</p> <p>Commercial land runoff – high seasonal leaf litter load, some litter and gross pollutant generation. Inappropriate/ineffective waste management by shop keepers.</p> |
| <p>Heyfield</p> <p>Heyfield Urban (1)</p> | <p>High Threats</p> <p>Industrial land runoff – saleyard runoff inadequately treated or managed. A source of sediments, nutrients and micro-organisms. Timber industry activity produces sediments, wind blown dust and particulate matter and stormwater transported woodchips. Moulding and plaster works allow product material to spill to outside of building, allowing transport into drainage system, providing a source of toxins and solids.</p> |
| <p>Coongulla</p> <p>Coongulla Urban (1)</p> | <p>High Threats</p> <p>Septic leakage – stormwater runoff, flat grades, incapable soils, and high loading accentuates septic leakage; a source of nutrients and disease causing micro-organisms.</p> |
| <p>Seaspray</p> <p>Seaspray East (1)</p> | <p>High Threats</p> <p>Septic leakage – stormwater runoff, flat grades, incapable soils, and high loading accentuates septic leakage; a source of nutrients and disease causing micro-organisms.</p> |

3.5 Priority Stormwater Risks

The priority ranking of risks were determined using the risk assessment method described in Section 2.3 as prescribed by the Best Practice Environmental Management Guidelines. This involved allocating scores to the **values** of the receiving waters and to the **threats** from the urban catchment land uses. Scores were also allocated for the **sensitivity** of the receiving waters to each particular threat which was included in the priority determination. Section C of Volume 2 illustrates this process.

All risk combinations were then calculated and compared, with the highest scores indicating the priority stormwater risks to the receiving waters. The top ranking risks (those which scored 36 or above, out of a possible 64) are listed in order in the following table and cover the top eighteen priorities for action.

Note: According to the Best Practise Environmental Management Guidelines this Stormwater Management Plan is to focus on a around of 10 – 12 issues. Therefore no strategy formulation for the lower ranked issues is covered in this plan, however the full ranked list is provided in Volume 2.

Table 3.2 – Table of Risk Assessed Top Priority Risk Issues (PRI)

| ITEM | Threat | to Value | of Receiving Water | from Town | from Sub-catchment | Predominant pollutant | PRI Group |
|------|----------------------------------|---|--------------------|-----------|-------------------------|---|-----------|
| 1 | Residential Land Use | Visual/Landscape Other Economic Recreation In-stream Habitat | Lake Guthridge | Sale | Central & East Sale (2) | Litter, Sediments, | 1 |
| 2 | Commercial Land Use | Visual/Landscape Other Economic | Lake Guthridge | Sale | Business Sale (3) | Littering, Sediments, Hydrocarbons | 2 |
| 3 | Industrial Land Use | In-Stream Habitat Other Economic Recreation Visual/Landscape | Albert River | Yarram | Central Yarram (1) | Sediments, nutrients | 3 |
| 4 | Residential Land Use | Visual/Landscape Other Economic | Flooding Creek | Sale | North & West Sale (1) | Litter, Sediments, | 1 |
| 5 | Open Space Runoff | Visual/Landscape | Lake Guthridge | Sale | Central & East Sale (2) | Chlorine, sediments | 4 |
| 6 | Commercial Land Use | Visual/Landscape Other Economic | Flooding Creek | Sale | North & West Sale (1) | Litter, sediments | 2 |
| 7 | Commercial Land Use | Visual/Landscape Other Economic | Macalister River | Maffra | South West Maffra (2) | Litter, organic | 5 |
| 8 | Commercial Land Use | Other Economic Recreation Visual/Landscape | Albert River | Yarram | Central Yarram (1) | Litter | 3 |
| 9 | Industrial Land Use | Visual/Landscape Other Economic | Flooding Creek | Sale | North & West Sale (1) | Sediments, nutrients, other pollutants | 6 |
| 10 | Building Site Runoff (lot scale) | Visual/Landscape | Flooding Creek | Sale | North & West Sale (1) | Sediments, toxins | 7 |
| 11 | Building Site Runoff (lot scale) | Visual/Landscape Other Economic In-stream Habitat | Lake Guthridge | Sale | Central & East Sale (2) | Sediments, toxins | 7 |
| 12 | Industrial Land Use | In-Stream Habitat Recreation | Thomson River | Heyfield | Heyfield Urban (1) | Saleyard runoff, timber runoff, moulding site | 6 |
| 13 | Industrial Land Use | In-Stream Habitat Recreation Visual/Landscape Other Economic | Macalister River | Maffra | South West Maffra (2) | Stockpile & site runoff, poor management | 6 |
| 14 | Residential Land Use | In-Stream Habitat Recreation Visual/Landscape | Albert River | Yarram | Central Yarram (1) | Litter, Sediments, | 3 |
| 15 | Septic & Sewer Leakage | Recreation Property Other Economic | Lake Glenmaggie | Coongulla | Coongulla Urban (1) | Septic leakage | 8 |
| 16 | Septic & Sewer Leakage | In-Stream Habitat | Lake Reeve | Seaspray | Seaspray Urban (1) | Septic leakage | 9 |
| 17 | Septic & Sewer Leakage | Other Economic | Flooding Creek | Sale | North & West Sale (1) | Sewer, pump station failure | 10 |
| 18 | Residential Land Use | Visual/Landscape | Macalister Swamp | Maffra | North West Maffra (1) | Litter, Sediments, | 5 |

Note: A number of the issues above can be addressed utilising the same or similar strategies. These issue-items have thus been grouped together (PRI Group) to make most efficient use of reactive actions.

4 Reactive Management Strategies

Reactive management strategies have been developed to respond to the priority risks determined through the risk assessment process. There are many potential management actions that could be undertaken which were categorised as follows:

- Education and awareness
- Site specific strategies and plans
- Structural treatment measures
- Information and data collection
- Regulation and enforcement
- Source controls

The reactive management strategies consist of groups of actions. A method of selection and assessment was undertaken to arrive at the strategies and this is explained in greater detail in Volume 2.

Initially, the potential actions were screened to remove those that were clearly not applicable to managing the risk. Then a more detailed assessment was made of potential actions, considering a number of factors including cost, effectiveness, feasibility and multiple benefit. The most cost effective actions were then selected to form part of the strategies.

The reactive management strategies are presented in the following for the ten Priority Risk Issue (PRI) groups. Each group of strategies has a mixture of structural and non-structural actions. The list of strategies includes a description of each action, estimated cost (capital and on-going) and the authority(s) responsible for implementing/driving the action. Finally, it is indicated whether the action applies to a specific location or whether it is effective across all the relevant sub-catchments.

4.1 Priority Risk Issue 1

Residential Land Use Runoff in

Central & East Sale – Sub-catchment (2) ⇒ adversely affecting Lake Guthridge
North & West Sale – Sub-catchment (1) ⇒ adversely affecting Flooding Creek

Stormwater pollutants from residential land runoff from the above urban areas predominantly consist of gross pollutants and sediments, sources of visual degradation, nutrients, metals and suspended solids.

Because a significant proportion of stormwater contaminates from these residential areas, are at least partially preventable by changes in behaviour, the responding strategies contain a strong educational component. Some of the educational strategies are to be applied over the entire municipality. The strategies also include structural measures, chosen to be the most effective for the pollutants to be removed, and the most feasible within the cost and site constraints.

| Action Number | Management Action Description | Capital cost | Ongoing Cost | Lead Agency Potential Partners | Extent |
|--|---|--------------|--|--|---|
| PRI 1-1 Note: combine with PRI 1.4 and 2-1 | Signage – Pit Stencilling Stencilling of drain pits by school groups. Incorporating competition for stencil design | \$4,000 | \$750 | Wellington Shire Council (WSC) / EPA / Waterwatch. Sale Rotary Club | Focus on areas surrounding schools and identified hot spots |
| PRI 1-2 | Guideline Development and Distribution - Calender Produce and distribute calendar for households (and businesses). Advertise the impact they have on stormwater and receiving water quality, and ways behaviour can be improved. | \$75,000 | \$0 | WSC / WGCMA / EPA. Corporate sponsors. Gippsland Water. | Wellington Shire-wide |
| PRI 1-3 | Installation of Gross Pollutant Traps Install GPT to the following nominal outfalls: - exact location pending investigation 675mm at Marley Street 675mm at Landsdown Street 1600mm at Montgomery Road 675mm at Carter Street | \$225,000 | \$4,500 | WSC. Flooding Creek Landcare Group. | Sale Site specific |
| PRI 1-4 | Expand School Education Program Develop, promote and aid delivery of primary/secondary school targeted educational programs. | \$5,000 | \$20,000 | WSC/ WGCMA/ Waterwatch. EPA. Eco-recycle. | Sale primary/ secondary schools |
| PRI 1-5 | Media Release In conjunction with the school education program, stencilling, and calendar distribution, provide activity information in local newspaper/ television with general promotion of stormwater issues. | \$1,200 | \$1,000 Allow for continued promotion | WSC. WGCMA. Waterwatch. EPA. | Wellington Shire-wide |

| Action Number | Management Action Description | Capital cost | Ongoing Cost | Lead Agency Potential Partners | Extent |
|---------------|--|--------------|--------------|---------------------------------|---|
| PRI 1-6 | <p>Wetland Investigation and Design</p> <p>Undertake necessary investigation, subsequent detailed design and associated specifications for the construction of wetland regions in strategic locations in Lake Guthridge.</p> <p>Wetland vegetation to be designed for nutrient and heavy metal stripping. Detail design shall include the optimal size and retention time, segmentation and water level variations, flood by-pass mechanisms and carp exclusion measures etc.</p> | \$100,000 | | Wellington Shire Council | Site Specific Lake Guthridge in Sale |

4.2 Priority Risk Issue 2

Commercial Land Use Runoff in

Business Sale – Sub-catchment (3) ⇒ adversely affecting Lake Guthridge
North & West Sale – Sub-catchment (1) ⇒ adversely affecting Flooding Creek

Commercial land use stormwater pollutants in the sub-catchments above include gross pollutants, with a high percentage of human litter, dropped in and around the shopping areas. Sediments, particularly those generated from street and land degradation, buildings, and airborne particulate matter are of significant concern. These commercial areas are also a source of toxic organics, oils and surfactants, mostly transport related in terms of leaks from vehicles, car washing and poor practices in vehicle maintenance. The urban pollutants degrade the visual amenity of the receiving waters, and the health of the aquatic habitat.

The strategies developed to respond to these issues, contain a balance of educational actions, aiming to inform and improve community and business behaviour towards stormwater contamination; and structural measures, aiming to prevent contaminants which enters the drainage system from being transported further into the receiving water.

| Action Number | Management Action Description | Capital cost | Ongoing Cost | Lead Agency Potential Partners | Extent |
|---|---|---------------------------------|--------------|--|--|
| PRI 2-1 Note: combine with PRI 1-1 | Signage – Pit Stencilling Stencilling of drain pits by school groups. Incorporating competition for stencil design | Included Refer to PRI 1-1 | Included | WSC / EPA / Waterwatch. Sale Rotary Club. | Sale CBD and identified hot spots |
| PRI 2-2 | Installation of Gross Pollutant Traps Install GPT to the following nominal outfalls: - exact location pending investigation 2 x 900mm at Foster/York Street 1050mm at Cunninghame Street | \$210,000 | \$4,000 | WSC. Flooding Creek Landcare Group. | Sale site specific |
| PRI 2-3 | Individual/Organization Consultation Meet with identified businesses deemed to have poor waste management or runoff quality. Review practices, advise on improvements and promote a proactive approach. | \$14,000 | \$5,000 | WSC / EPA . Eco-recycle. Sale Community Business Association. | Sale CBD |
| PRI 2-4 | Oil and Fine Sediment Trap Install trap to capture settleable solids, floatable, oil and grease from heavily trafficked area. Location pending investigation. | \$45,000 | \$1,800 | WSC. | Sale CBD site specific |

4.3 Priority Risk Issue 3

Industrial Land Use Runoff in

Central Yarram – Sub-catchment (1) ⇒ adversely affecting Albert River

Industrial land use in the above urban area contains most notably runoff from livestock saleyards, which is largely untreated. This provides a source of sediments, nutrients, toxins and disease causing substances, which have a high impact upon the in-stream habitat together with the visual landscape, recreational and tourism uses of the Albert River. (Note: PRI 3 incorporates commercial and residential land runoff in Yarram).

Commercial Land Use Runoff in

Central Yarram – Sub-catchment (1) ⇒ adversely affecting Albert River

Residential Land Use Runoff in

Central Yarram – Sub-catchment (1) ⇒ adversely affecting Albert River

Commercial and residential land use runoff, produce high levels of gross pollutants, particularly human litter and vegetation debris, which are transported to the Albert River in a storm event.

Priority Risk Issue 3 incorporates industrial, commercial and residential contaminant sources, as strategies for one can apply to others. In an integrated approach, the actions are designed to filter gross and fine contaminants, while providing a means to lower inverts of the drainage systems, to aid conveyance of stormwater to assist the prevention of flooding.

| Action Number | Management Action Description | Capital cost | Ongoing Cost | Lead Agency Potential Partners | Extent |
|---------------|---|--------------|--------------|--------------------------------------|-------------------------|
| PRI 3-1 | Individual/Organization Consultation Meet with identified industries deemed to have poor waste management or runoff quality control. Review practices and advise/enforce improvements. | \$3,000 | \$0 | WSC / EPA. Eco-recycle. | Yarram industrial areas |
| PRI 3-2 | Sedimentation Pond/Wetland Feasibility Study Investigate feasibility of sedimentation pond/wetland facility to treat industrial commercial and residential runoff, together with addressing other issues in Yarram. | \$10,000 | \$0 | WSC / WGCMA. Affected landowners. | Yarram township |
| PRI 3-3 | Sedimentation Pond/Wetland Facility Construction of sedimentation pond/wetland facility to treat industrial commercial and residential runoff, together with addressing other issues in Yarram. | \$250,000 | \$10,000 | WSC / WGCMA. Livestock Saleyards. | Yarram site specific |

| | | | | | |
|--|--|---------------------------|---------------------------|---|-------------------------------|
| PRI 3-4 | Installation of Gross Pollutant Traps Install GPT to the following outfalls: 1800mm at Western Outfall | \$130,000 | \$1,800 | WSC. | Yarram site specific |
| PRI 3-5 | Signage – Pit Stencilling Stencilling of drain pits by school groups. Incorporating competition for stencil design | \$4,000 | \$750 | WSC / EPA / Waterwatch. | Yarram CBD and around schools |
| PRI 3-6 Note: combine with PRI 1-3 | Guideline Development and Distribution - Calender Produce and distribute calendar for households (and businesses). Advertise the impact they have on stormwater and receiving water quality, and ways behaviour can be improved. | Included Refer to PRI 1-3 | Included Refer to PRI 1-3 | WSC/ WGCMA/ EPA. Corporate sponsors. Gippsland Water. | Wellington Shire-wide |
| PRI 3-7 Note: combine with PRI 1-5 | Media Release In conjunction with the school education program, stencilling, and calendar distribution, provide activity information in local newspaper/ television with general promotion of stormwater issues. | Included Refer to PRI 1-5 | Included | WSC. WGCMA. Waterwatch. EPA. | Wellington Shire-wide |

4.4 Priority Risk Issue 4

Sporting Ground Discharge in

Central & East Sale – Sub-catchment (2) ⇒ adversely affecting Lake Guthridge

Sporting ground discharge in this case, identifies the threat from Sale pool chlorinated backwash water entering Lake Guthridge through the stormwater system. Although the program for works to prevent this will shortly be underway, strategies have been set in place to ensure its execution reflecting the importance of the works to the health of the waterway.

| Action Number | Management Action Description | Capital cost | Ongoing Cost | Lead Agency Potential Partners | Extent |
|---------------|---|--------------|--------------|-----------------------------------|-----------------------|
| PRI 4-1 | Monitor Conversion Works Schedule Assign reporting responsibility to suitable Council officer to periodically monitor progress of works to Sale pools until they have been completed. | \$500 | \$0 | WSC. | Sale |
| PRI 4-2 | Media release Use local newspapers/ other mediums to issue public notice that Sale Pools have been converted, as to not discharge backwash water to Lake Guthridge - and emphasise the benefits this will have for its valued uses. | \$500 | \$0 | WSC. EPA. | Wellington Shire-wide |

4.5 Priority Risk Issue 5

Commercial Land Use Runoff in

South West Maffra – Sub-catchment (2) ⇒ adversely affecting Macalister River

Commercial land use stormwater pollutants in the above sub-catchments include gross pollutants, with a moderate percentage of human litter, dropped in and around the shopping areas. Sediments, particularly those generated from street and land degradation, buildings, and airborne particulate matter are of significant concern. These commercial areas also are a source of toxic substances, mostly transport related in terms of leaks and wear from vehicles. These urban pollutants degrade the visual amenity of the receiving waters, and the health of the aquatic habitat.

Residential Land Use Runoff in

North West Maffra – Sub-catchment (1) ⇒ adversely affecting Macalister Swamp

Residential land use runoff from the above urban area has been identified to have high gross pollutant runoff, including in particular, litter and vegetation waste, which impact on the visual amenity of the Macalister Swamp and contaminate its aquatic habitat.

Priority Risk Issue 5 considers commercial and residential land use runoff together, due to the commonality of the reactive measures. They consist of educational actions and structural measures in an effort to minimise risk to receiving water values.

| Action Number | Management Action Description | Capital cost | Ongoing Cost | Lead Agency Potential Partners | Extent |
|---------------|--|---------------------------------|--------------------------------|---|-----------------------------------|
| PRI 5-1 | Individual/Organization Consultation Meet with selected businesses deemed to have poor waste management or runoff quality. Review practices and advise on improvements. | \$7,600 | \$4000 1 year follow-up | WSC/ EPA. Maffra Chamber of Commerce. Eco-recycle. | Maffra CBD |
| PRI 5-2 | Signage – Pit Stencilling Stencilling of drain pits by school groups. Incorporating competition for stencil design. | \$4,000 | \$750 | WSC. Waterwatch. | Maffra CBD Surrounding schools |
| PRI 5-3 | Installation of Gross Pollutant Traps Install GPT to the following nominal outfalls: - exact location pending investigation. 750mm at Thomson Street. 675mm at McMahon Drive. 910mm at The Crescent. | \$140,000 | \$3,500 | WSC. | Maffra site specific |
| PRI 5-4 | Wetland development In conjunction with Macalister Park Committee of Management, design and develop wetland area for stormwater treatment and beautification, prior discharge to Macalister Park. | \$250,000 + external funding | \$6,000 | WSC. Maffra Chamber of Commerce. | Maffra site specific |

| | | | | | |
|--|--|---------------------------------|---------------------------------|---|----------------------------|
| PRI 5-5 Note: combine with PRI 1-5 | Media Release In conjunction to stencilling, calendar, and school program, provide activity information in local newspaper and television with general promotion of stormwater issues. | Included Refer to PRI 1-5 | Included | WSC. Waterwatch. | Wellington Municipality |
| PRI 5-6 Note: combine with PRI 1-3 | Guideline Development and Distribution - Calender Produce and distribute calendar for households (and businesses). Advertise the impact they have on stormwater and receiving water quality, and ways behaviour can be improved. | Included Refer to PRI 1-3 | Included Refer to PRI 1-3 | WSC/ WGCMA/ EPA. Corporate sponsors. EPA. | Wellington Shire-wide |

4.6 Priority Risk Issue 6

Industrial Land Use Runoff in

North & West Sale – Sub-catchment (1) ⇒ adversely affecting Flooding Creek
 Heyfield Urban – Sub-catchment (1) ⇒ adversely affecting Thomson River
 South West Maffra – Sub-catchment (2) ⇒ adversely affecting Macalister River

Industrial activity in the above urban areas have been identified to have a high capacity to produce poor stormwater runoff quality. The discharge of sediments, nutrients and toxins has been identified to potentially be occurring in dangerous levels. These contaminants have a dramatic effect on the health of the receiving waters and the associated beneficial uses.

The reactive strategies take an investigative framework, seeking to determine the practices which are occurring and then to use an educative approach to effect improvements.

| Action Number | Management Action Description | Capital cost | Ongoing Cost | Lead Agency Potential Partners | Extent |
|--|---|--------------|---------------------------------------|--|--|
| PRI 6-1 Note: combine with PRI 3-1 | Individual/Organization Consultation Meet with individual industries and review practices and advise on improvements (in conjunction with the EPA). Assist in the development of individual SWMP's, or environmental management plans. Consultation process is to educate and instil accountability in each industry. | \$27,000 | \$2,500 Follow up next year | WSC / EPA. | Sale, Heyfield and Maffra industrial areas |
| PRI 6-2 | Water Quality Monitoring Contribute towards a monitoring program to quantify the runoff impact of specific industry, with the primary aim of identifying sources of polluting industrial discharge. [This however need not solely look at industrial discharges] | \$18,000 | \$4,000 3 year program | WSC. Waterwatch. EPA. | Sale, Heyfield and Maffra industrial areas |

4.7 Priority Risk Issue 7

Building Site Runoff in

North & West Sale – Sub-catchment (1) ⇒ adversely affecting Flooding Creek
 Central & East Sale – Sub-catchment (2) ⇒ adversely affecting Lake Guthridge

Building sites in the above urban areas produce a range of contaminants, which are directly tipped, or washed into the drainage system in a storm even. Sediments and sediment bound toxins, organic and inorganic matter, together with litter and other gross material can be delivered in high concentrations with highly damaging effects to the appearance and health of the receiving waters.

The strategies developed to respond to this issue involve feasible structural measures to capture contaminant material. As however, this issue is so wide spread, there is the recognition that education and enforcement can be effectively used to minimise the preventable portion and this approach has been utilised in the reactive strategies.

| Action Number | Management Action Description | Capital cost | Ongoing Cost | Lead Agency Potential Partners | Extent |
|---------------|---|---------------------------------------|--------------|-----------------------------------|-----------------------|
| PRI 7-1 | <p>Enforcement / Education Program</p> <p>Develop procedures and regulatory systems to enable the enforcement of predetermined standards of runoff quality. To include a strong educational function. Provide auditors to ensure that polluting practises do not occur.</p> <p>To follow the guidance provided in the VSAP Strategic Project "Reduction of Stormwater pollution from building and construction sites".</p> | Included Refer to MFS* 2.3 and 5.2 | Included | WSC / EPA. | Wellington Shire-wide |
| PRI 7-2 | <p>Installation of Gross Pollutant Traps/Other Devices</p> <p>Allow for the inclusion into planning permits requirements for the installation, or the funding for the installation, of suitable treatment measures to capture construction and post construction runoff.</p> | Included Refer to MFS 3.1 | Included | WSC. | Wellington Shire-wide |

* MFS – Management Framework Strategies

4.8 Priority Risk Issue 8

Septic Leakage in

Coongulla Urban – Sub-catchment (1) ⇒ adversely affecting Lake Glenmaggie

Septic leakage in Coongulla occurs primarily due to incapable soils and an inadequate drainage system. Septic leakages cause undesirable levels of nutrients, disease causing substances and oxygen demanding substances, which are detrimental to the recreational, in-stream and economic benefits of the water body.

The strategies proposed aim to minimise the compounding problems where practicable. There are no short or long term plans for the sewerage of this town, as would be required to adequately mitigate this waterway risk.

| Action Number | Management Action Description | Capital cost | Ongoing Cost | Lead Agency Potential Partners | Extent |
|--|--|---------------------------|---------------------------|---|-----------------------|
| PRI 8-1 | Concept/detailed design plan for roads, drainage, and treatment Development of concept/detailed design plan and works schedule for roads and drainage, and appropriate treatment devices to treat drainage and sullage water adequately for release to Lake Glenmaggie. Based on findings from "Coongulla Drainage Strategy 1997". | \$25,000 - \$60,000 | \$0 | WSC. | Coongulla township |
| PRI 8-2 | In-Channel/Riparian Revegetation Plant filtering vegetation in and around major drainage outfalls to absorb and filter contaminants. | \$25,000 | \$1,500 | WSC / WGCMA. Landcare Groups. | Coongulla outfalls |
| PRI 8-3 | Water Quality Monitoring Review previous monitoring, and supplement by undertaking additional investigative ground and surface water monitoring to measure impact of sullage/septic leakage if necessary. | \$7,000 | \$4,000 2 year program | WSC. WGCMA. EPA. Waterwatch. | Coongulla Outfalls |
| PRI 8-4 Note: combine with PRI 1-3 | Guideline Development and Distribution - Calender Produce and distribute calendar for households (and businesses). Provide section on septic tank issues, regarding the impact their system may have on stormwater and receiving water quality, and opportunities for improvement. | Included Refer to PRI 1-3 | Included Refer to PRI 1-3 | WSC / WGCMA / EPA. Corporate sponsors. Gippsland Water. | Wellington Shire-wide |

4.9 Priority Risk Issue 9

Septic Leakage in

Seaspray Urban – Sub-catchment (1) ⇒ adversely affecting Lake Reeve (and Merriman Creek)

Septic leakage in Seaspray occurs primarily due to incapable soils, flat grades and an inadequate drainage system. Septic leakage cause infiltration of undesirable nutrients, disease causing substances, oxygen demanding substances etc. which are detrimental to the in-stream, recreational and economic benefits of the waterways.

The decision as to whether the sewerage of the town will go ahead has yet to be officially confirmed. However it is expected that in the short to medium term, this will occur. The strategies proposed aim to expedite this process and take advantage of natural cleansing systems that are available.

| Action Number | Management Action Description | Capital cost | Ongoing Cost | Lead Agency Potential Partners | Extent |
|---------------|--|--------------|--------------|---|------------------------|
| PRI 9-1 | Lobby for Sewage reticulation Lobby for the implementation for sewage reticulation. Reinforce the findings of the SWMP to strengthen reasons for its connection. | \$500 | \$0 | WSC. | Seaspray township |
| PRI 9-2 | Constructed wetland feasibility study Undertake a feasibility study for the development of the causeway, introducing advanced tertiary wetland treatment. (Note: This strategy will not be required if Seaspray is sewerage) | \$8,000 | \$0 | WSC / WGCMA. Seaspray Foreshore Committee. | Seaspray site specific |

4.10 Priority Risk Issue 10

Sewer Spillage in

North & West Sale – Sub-catchment (1) ⇒ adversely affecting Flooding Creek

Sewer spillage particularly in the above sub-catchment is of concern, where the sewerage infrastructure is old and spillage incidents have been reported at a pump station in close proximity to the Sale Canal (part of Flooding Creek). These spillages deliver pathogens, nutrients and contaminating substances that are detrimental to the in-stream, recreational and economic benefits of the receiving waterway.

Although this issue may not always be due to the interaction with urban stormwater, simple strategies have been proposed to ensure any adverse impact to the waterway is avoided.

| Action Number | Management Action Description | Capital cost | Ongoing Cost | Lead Agency Potential Partners | Extent |
|---------------|--|------------------------------|--------------|-----------------------------------|---|
| PRI 10-1 | Emergency Response Training Undertake emergency response training for sewerage and leaks and other spills. Form procedures and acquire necessary equipment. | Included Refer to MFS 4.3 | Included | WSC. EPA. | Wellington Shire-wide |
| PRI 10-2 | Management Plan Investigate existing emergency plans. If required, develop Councils management plan in conjunction with Gippsland Water, involving emergency response procedures in event of sewage pump or other failure. | \$4,000 | \$0 | WSC. Gippsland Water. | Sale township (or Wellington Shire-wide) |

5 Management Framework Review

In this section, current Council practices in stormwater management are reviewed. The Council's management framework covers the planning and management activities undertaken by Council staff that can influence the quality of stormwater runoff on both a long term and a day to day basis.

The framework includes protection of stormwater runoff quality through planning functions, including strategic planning, the development approvals process and the regulation and enforcement of these conditions. The framework also includes protection of stormwater runoff quality through source controls and other practises, including municipal operations and provision of services, education and awareness programs and enforcement mechanisms.

Emphasis on protecting stormwater quality has only become a management focus in recent years. Prior to this, the emphasis has been on conveying stormwater rapidly away from houses and streets to the local waterways often through gutters, pipes and other hard surface infrastructure, primarily to control flooding. Although the gaps between current Council processes and activity and 'Best Practice Environmental Management' (BPEM) are expressed below, Council practices were found generally to be consistent with those of Councils in other regional municipalities. These gaps can be used as a basis for highlighting stormwater issues and presenting opportunities for improved management strategies.

5.1 Stormwater Quality Protection Through Planning Controls

This section presents a review of Wellington Shire Council's planning functions and presents opportunity for changes towards best practise management in the areas of strategic planning, the development approvals process and the regulation and enforcement of these conditions.

5.1.1 Land Use Strategic Planning

A primary means of improving stormwater management processes and outcomes for Wellington Shire is by selectively controlling developments through the Council's land use and development planning framework. This framework is governed by the provisions of the *Planning and Environment Act 1987* and the *Wellington Planning Scheme*.

The Wellington Planning Scheme consists of:

- State Planning Policy Framework, zones and overlays and particular provisions.
- Local Planning Policy Framework, comprising a *Municipal Strategic Statement* and local planning policies; as well as issue-specific schedules to the standard zone and overlay controls.

The Municipal Strategic Statement (MSS) describes the role of the municipality in a regional context, sets out a broad vision for the future and links the objectives of the MSS to the Council's Corporate Plan. It also establishes objectives for land use and development and provides strategies for achieving these objectives.

Within the current MSS, there are a number of sections that provide a broad reference to objectives and strategies that provide a basis for incorporating Best Practise Stormwater Management. In many cases, the strategies are non-specific and require *strengthening* by providing greater detail regarding stormwater quality protection. This also has implications regarding the enforcement of these conditions, as the objectives and strategies do not

provide adequate *statutory means* to prescribe the incorporation of Best Practise in new developments.

5.1.2 Development Approvals Process

The development approvals process incorporates the way in which development applications are reviewed and approved. Wellington Shire planners have a scheduled meeting each week in which developments are openly discussed. During this meeting internal referrals are made to relevant planning or other departments. There are no formalised triggers that dictate if a development should be referred to a particular department (as for external referrals), but is based on the judgement of the meeting attendees and based on the application.

There is an opportunity for incorporating Best Practise Stormwater Management for development approvals by *formalising the triggers for referral* within Council to specific Council departments that have the relevant function and experience. This would include guidance as to *when* approvals should be referred for expert review and *who* should be involved in the review. This would also include incorporating a range of *checks* required to review applications specifically regarding the impact of the development application and provide guidance on the range of measures that should be taken for Best Practise Stormwater Management.

Wellington Shire Council has indicated its intention to prescribe stormwater treatment measures on new developments where relevant, such as gross pollutant traps on major outfalls to receiving waters. While such permit conditions have already been applied, amendments to the referrals and permit approvals, together with consistent amendments to the MSS and other strategic documents are now required to formalise the incorporation of Best Practise Stormwater Management.

5.1.3 Regulation and Enforcement of Planning Conditions

The regulation and enforcement of planning conditions relates to the ability to uphold the conditions of development set out in permits and statutory documents. The ability to uphold these conditions is affected by the *strength of the regulatory conditions* and the *utilisation of resources* to enforce them.

Council has identified a weakness in planning and building regulations, making it difficult to enforce Best Practise Stormwater Management. This is particularly so for construction sites, due to a lack of statutory support. This is not an issue specific to Wellington Shire, but is common throughout Victoria and would be assisted by changes to State legislation.

Historically Wellington Shire Council has not engaged officers to enforce planning conditions, primarily due to lack of inclination and lack of resources. Recently there has been a part time position created for this purpose. The results of this role have proven very effective, with many non-conformances resolved early in the development process. This position also provides avenues to keep a close track on works and follow up measures. The Council intention is understood to broaden this enforcement role into other Council areas, which is a move towards Best Practise Stormwater Management and should be encouraged by relevant funding for resources.

5.2 Stormwater Quality Protection Through Source Controls and Other Practises

This section presents a review of Wellington Shire Council's source controls and other relevant practises. It presents opportunities for changes towards best practise

management in the areas of municipal operations, provision of services, education and awareness programs, and enforcement mechanisms.

5.2.1 Municipal Operations and Provision of Services

Wellington Shire has a comparatively small operations crew, which is split into two departments, open space and infrastructure, which carry out various municipal works and services.

Wellington Shire Council itself does not undertake any **construction activity**, rather it engages contractors for the construction of roads, drains, buildings, open spaces etc. Such construction may potentially produce a wide range of stormwater pollutants from site and other runoff, including chemicals and sediments.

Best Practise Stormwater Management for construction activities includes a range of activities and practises to minimise the risk of pollutant runoff, eg. use of structural and vegetative measures, use of soil stabilisation techniques, use of site management plans, monitoring and recording of construction maintenance events.

These activities and practices can be required of contractors (which are currently not) by their inclusion into *specifications*. Such measures are not generally required as part of the Council's current construction specification. The development or amendments to asset construction and maintenance specifications or briefs, should include clauses that stipulate the need for consideration of stormwater quality Best Practise. Sample specification clauses have been developed by LGPro as Guidelines for Council.

Wellington Shire Council's municipal operations include a number of activities which impact on the quality of stormwater runoff, those of greatest impact are discussed below. The Best Practice aim for all of these is to prevent waste material from entering the stormwater drainage system.

Street sweeping (kerb and channel) of the urban areas occurs by contract at various interval frequencies. Sale and Maffra Central Business Districts (CBD's) are swept three times per week, while the other CBD's are swept once per week. The remaining urban kerb and channels are swept on a two week turn around (half one week, the other half the next). Additional sweeping can be initiated by customer demand. The primary aim of street sweeping is for aesthetics reasons and no additional programs are included for sweeping "hot spots", or to coincide with *other activities* (ie autumn leaf drop or festivals), as is recommended for Best Practise.

Maintenance of drains and pits is not carried out under a schedule or as a result of a monitoring program. It is undertaken as a result of customer demand when an issue arises. This is with the exception of a number of open drains that are regularly sprayed to prevent weed growth.

Best Practise Stormwater Management of drains and pits by comparison should be planned and coordinated to ensure excessive build up of litter, silt, leaves and other pollutants does not occur, thus minimising the flush of this material into the receiving waters. This includes monitoring accumulation rates, and identifying "hot spots" which require more frequent cleaning and collection of the waste material with care taken not to sweep waste material further into the drainage system.

Council bin design and cleaning can affect the amount of litter reaching the stormwater system. There are a range of bin types used in Wellington Shire, which are serviced on various frequencies. Many areas experience population expansion during holiday periods that places pressure on the bin placement and servicing system. The frequency for servicing is generally adjusted to meet demand, although some sections of the community

see overflowing bins as a problem. Best Practise encourages the use of bin monitoring and change of servicing frequency to suit.

Maintenance of parks, reserves and medians includes cutting operations, which for Best Practise includes removal of grass clippings, litter and debris after cutting. This is generally not undertaken, however grass is usually cut with the shute facing away from the kerb and channel. An approved safe bioactive herbicide is applied to specific areas to control flat weed.

Emergency response to a stormwater impacting incident such as spills and other pollution, is not clear to many operators. Porous absorbents for soaking up fuel and oils are available but their whereabouts or application is not commonly known. Best Practise Stormwater Management, for emergency response requires the formulation of an emergency response plan detailing the drainage system, location of ecologically sensitive areas, notification protocol for other emergency services, the Council role and the appropriate use of equipment.

5.2.2 Education and Awareness Programs

There are few formalised education and awareness programs that directly provide information on issues relating to stormwater quality. Waterwatch, as part of the West Gippsland Catchment Management Authority however, has run a number of programs including involvement with local school groups. These have included water quality monitoring and education, and stormwater pit lid stencilling – which creates a link between the drain and the waterway.

There are three areas identified as requiring particular education and awareness attention. The first area is for *Local Government staff* coming from a background of little knowledge of stormwater quality would benefit from a program to shift focus from traditional thinking, to ways of minimising the impact of urban land use on stormwater quality. This applies to the whole organization, with particular attention given to operational staff.

The second area requiring attention is the *general community*, focusing on inappropriate dumping into the stormwater system. This includes dumping of litter, oil, chemicals, grass clippings and other types of inappropriate material.

The third area requiring education and awareness programs is the *construction industry*, both small (lot scale) and large (subdivision) development. Generation of construction wastes and site runoff can be significantly reduced if the industry is aware of the effects, and alternative Best Practise procedures.

5.2.3 Source Control Enforcement

Wellington Shire Council's primary mechanism for preventing behaviour that may adversely impact on stormwater quality is the application of local laws. Wellington Shire has a limited number of local laws that can be applied in relation to stormwater and enforcement is not generally seen as the preferred avenue for dealing with stormwater problem issues.

A local law is however in place concerning animal litter and the State Litter Act can be applied, giving power for the control of both types of litter.

Generally resources are not available to issue fines or infringements for these offences, as it is often very difficult to identify and apprehend the offender. There is however an acknowledged litter issue in various places within Wellington Shire.

6 Management Framework Strategies (MFS)

Following the review of current Council practices, a number of recommendations have been made for improvements in relation to stormwater quality management. Management framework strategies are outlined in this section.

The order of implementation is proposed across the strategies, with each individual action listed as a very high, high or medium priority.

6.1 Management Framework Strategy 1 – Human resources

It is essential that Council staff are given the responsibility and are accountable for ensuring that the strategies of the management plan are implemented, and carried out effectively. Additional resources may at times be needed to implement specific aspects of the plan.

| Ref | Actions | Responsibility | Priority |
|---------|---|---|-----------|
| MFS 1.1 | Nominate a coordinator with the responsibility for implementing the strategies of the stormwater management plan. | Manager Infrastructure | Very High |
| MFS 1.2 | Form a committee of Council staff and partners to oversee and review the progress of the strategies. Committee is also to communicate with outside potential partners, engaging their support, long-term vision, and funding where possible. | Manager Infrastructure District Advisory Network | Very High |

6.2 Management Framework Strategy 2 – Planning Scheme Controls

The following strategies respond to the identification that the Wellington Shire Planning Scheme needs to be strengthened and more clearly outlined to provide a more enforceable statutory means of requiring Best Practise Stormwater management in planning permit conditions and throughout Council.

| Ref | Actions | Responsibility | Priority |
|---------|--|---|----------|
| MFS 2.1 | Amend the Municipal Strategic Statement (MSS) to specifically outline stormwater quality issues as important and requiring actions. The MSS could include a profile of Wellington Shire's urban stormwater system and give reference to the Stormwater Management Plan. This change would best occur during an overall review of the planning scheme. The MSS is to specify a long-term commitment for continual improvement to the protection and enhancement of the waters in Wellington Shire through the reactive and proactive strategies for urban runoff. Guidance for this strategy is to be aided by the VSAP Strategic Project "Model Planning Scheme Amendments & Technical Stormwater Standards and Council Training". | Director Assets Manager Development Advice & Approvals (DAA) | High |

| | | | |
|---------|--|--|--------|
| MFS 2.2 | Enforcement of planning conditions. Increased allocation of resources to audit the development construction phase. Based on the powers available through MFS 3.1 and 3.2, a Section 130 (Planning and Environmental Act 1987) planning infringement notice, or an S119 enforcement order (VCAT) may be served. The audits are to ensure Best Practise Stormwater Management conditions are incorporated into developments. Guidance for this strategy is to be aided by the VSAP Strategic Project "Reduction of stormwater pollution from building and construction sites". | Manager Development Advice & Approvals (DAA) | High |
| MFS 2.3 | Develop a policy or plan to promote and encourage the adoption of water sensitive urban design in the Shire eg impervious design of car parks, use of swale drains, sediment ponds etc. where applicable. This would be included in the Local Planning Policy Framework. | Director Assets and Operations | Medium |

6.3 Management Framework Strategy 3 – Referrals Process and Staff Awareness

Many of the opportunities for stormwater quality improvement can be made within the existing management framework. However, to achieve this, Council staff need to be aware of stormwater issues, and correct procedures need to be in place to support this improvement.

| Ref | Actions | Responsibility | Priority |
|---------|--|--------------------------------|-----------|
| MFS 3.1 | Undertake modification of the referral process for planning applications. Develop guidelines for the referral of planning applications that may require consideration of drainage and stormwater quality issues. The process is to include triggers for internal referrals, and the clarification of roles and responsibilities of officers. | Manager DAA | Very high |
| MFS 3.2 | Develop systems for referrals which assess opportunities for improved environmental performance through water sensitive urban design . This is to ensure stormwater quality/treatment design alternatives are assessed and stipulated at the referral subdivision design stage. | Manager DAA | |
| MFS 3.3 | Provide training for staff in stormwater management issues. Internal workshops should involve staff from planning, physical services, health, building services and call centre staff. Training shall highlight the shifting of the focus from traditional to best practise, ie from primarily quantity focussed, to balancing the need for adequate conveyance with protecting runoff quality. | Director Assets and Operations | Very high |
| MFS 3.4 | Council Staff induction process to be amended to cover stormwater quality aspects, where appropriate. | Director Assets and Operations | Medium |

6.4 Management Framework Strategy 4 – Municipal Operations and Provision of Services

Improvements to procedures for the maintenance of Council assets will lessen the impacts on stormwater quality across the Wellington Shire townships. The design of any new assets or upgrades should also consider best practice stormwater aspects, including monitoring of activities, and training of workers.

| Ref | Actions | Responsibility | Priority |
|---------|---|---|----------|
| MFS 4.1 | <p>Carry out a review of contract or purchase specifications for municipal services for items such as construction activities, rubbish bin type, waste collection, street sweeping etc; ensuring consistency with best practise stormwater management.</p> <p>In all cases the aim is to prevent waste material from entering the stormwater drainage system. Such contractor requirements include the use of soil stabilisation techniques, the use of structural or vegetative filters, site management plans, monitoring and recording etc. The review is to include an auditing process of contractors to ensure compliance.</p> <p>Guidance for this strategy is to be aided by the VSAP Strategic Project "Stormwater Quality Protection Contract Specifications for Construction Projects".</p> | Director Assets and Operations | High |
| MFS 4.2 | <p>Council maintenance and management program for all stormwater infrastructure to be reviewed. A scheduled <i>maintenance program is to be developed, containing activities including monitoring, identification of problem areas, planning for maintenance frequency, use of suitable machinery and techniques. Particular attention is required for the maintenance of stormwater drains and pits.</i></p> <p>The Infrastructure department must be supplied with sufficient personnel to implement these improvements.</p> | Manager Infrastructure | High |
| MFS 4.3 | <p>Develop Emergency Response information system and procedures, for a stormwater-impacting incident. This is to include the known availability of emergency equipment (ie absorbents and spill response kits), contact protocol, drainage system information etc. All relevant staff are to be trained, and their roles and responsibilities clarified.</p> | Manager Infrastructure Customer Services | High |
| MFS 4.3 | <p>The street sweeping of kerbside channels should be reviewed. The frequency of sweeping should be reviewed to <i>determine the adequacy, possible over servicing, particular problems or seasonal needs.</i> A data recording system should be established, monitoring the areas cleaned and the quantities of material collected. Adjust the cleaning programs to maximise waste collection, involving the targeting of hot spots.</p> | Manager Infrastructure | Medium |

| | | | |
|------------|---|---|--------|
| MFS 4.4 | Implement appropriate amendments to data recording system, to allow the effective tracking and transfer of information, within Council and for external users. This shall include maintenance operations undertaken, condition reports submitted, and log identified non-routine priorities etc. | Director Assets and Operations Manager Information Technology (IT) | Medium |
|------------|---|---|--------|

6.5 Management Framework Strategy 5 – Community Education and Enforcement

The general community and the construction industry have been identified as requiring particular education and awareness attention, and the following strategies are proposed in response. The use of enforcement techniques as a complementary measure is also proposed aimed at minimising preventable waste material entering the stormwater system.

| Ref | Actions | Responsibility | Priority |
|------------|--|---|----------|
| MFS 5.1 | Provide for education of the general community , focussing on the dumping of litter, oil, chemicals, grass clippings and other types of inappropriate dumping. Note: this should be incorporated into PRI 1-1, 1-3, 1-4, and 1-5, and utilise Council website and newsletters. This required an ongoing campaign. | Manager Infrastructure Manager Customer Services | High |
| MFS 5.2 | Develop and run an education program for the construction industry . Focus should be on conveying the understanding of the damage their actions can cause to waterways, and alternative best practise techniques to minimise waste conveyance. Should coincide with MFS 2.3 | Manager DAA | High |
| MFS 5.3 | Encourage developers who employ Best Practise Stormwater Management, to erect signs on construction sites , publicising and promoting the practice. | Manager DAA | Medium |
| MFS 5.4 | Develop program to be proactive in managing the incidence of excessive litter where necessary. Allocate required resources. | Manager Contracts | Medium |

7 Implementation of the Plan

The stormwater management plan contains a significant number of strategies and recommended management changes for Wellington Shire. There needs to be a commitment to ensure that these strategies are implemented and that protection and improvements to the valued waterways in Wellington Shire are achieved.

7.1 Responsibilities

It is anticipated that the involvement of the various organizations in developing the Plan will continue into the implementation phase. The main responsibility for implementation lies with Wellington Shire Council, but support is also required from the West Gippsland Catchment Management Authority and the Environment Protection Authority. Ongoing support from the community, as demonstrated through the Project Working Group, will be beneficial, particularly where strategies rely on commitment or input from stakeholders external to Council.

The following roles are recommended for the implementation of the Stormwater Management Plan:

A **coordinator** appointed with the responsibility for maintaining commitment to the implementation of the stormwater management plan. It is essential that the coordinator has sufficient motivation, power/influence and funding to promote the proposed changes. It is estimated that coordinating commitments will require 20 per cent of a senior officer's time.

A **committee** of Council staff appointed to oversee and review the progress of the strategies. The committee should include a number of Council staff, preferably members from each of Engineering, Planning (Environmental, Statutory and Strategic), Local Laws, Health, Building and Councillors, where possible. The committee should also contain external members such as representatives from the WGCMA, EPA and others from the current working group. It is essential that the committee receive top-down support.

7.2 Timelines and Priorities

Implementation of the reactive and management framework strategies is expected to require a period of five to ten years. This is dependent on the level of commitment allocated to the Plan in terms of funds and resources.

Priorities have been proposed for the reactive strategies that respond to the priority risks identified for the receiving waters. Similarly, levels of priority have been proposed for the management framework strategies. Where strategies contain *groups* of action recommendations, the priority ranking is ordered to reflect their position in the implementation process. The priorities provide Council with guidance for the order of implementation.

However, it is recognised that there needs to be some flexibility to reflect the availability of funds and coordination with other activities. A number of the framework strategies would be best implemented at times when internal reviews of policies and procedures or training programs are being conducted. The reactive strategies should also allow for the full realisation of benefits of the strategies under the constraints of funding and time, taking into account the differences in the strategic approaches. For example, while it is likely that the structural protective measures will be gradually phased in over a number of years depending upon funding and budgets. The education programs should be grouped for maximum momentum for change, but continually reinforced to sustain commitment.

Therefore, it is recommended that an initial task of the implementation committee should be to develop a more detailed schedule for implementation of the strategies. This schedule could then be reviewed and updated annually in line with Council's other planning activities. For the purposes of the Stormwater Management Plan, estimates of capital and ongoing costs are considered to be indicative only. Therefore as part of the detailed schedule for implementation, a more detailed assessment update of costs will be required prior to budget allocation within Council.

7.3 Funding

The priorities have been assigned according to their cost and effectiveness. Where possible they have considered the advantages of strategies that address multiple issues, thus minimising the cost of implementation for Council. Council however will need to allocate a significant level of funds if the strategies are to be implemented successfully. If this is done, it will demonstrate Council's commitment to the process and may subsequently assist in obtaining additional funds from other sources.

The Victorian Government has allocated \$22.5 million over a three year period for improved management of stormwater quality across the State through the Victorian Stormwater Action Program. With the completion of the Wellington Shire Stormwater Management Plan, Council is in a position to apply for funds to assist in the implementation of the priority strategies identified in the plan.

Wellington Shire Council is able to apply for further funding through various government programs that are made available from time to time including:

- The Natural Heritage Trust. Commonwealth Government funds have been extended for that program which contributes to many environmental projects around the nation, generally being regional programs.
- In relation to litter issues, some funds or related programs may be available through EcoRecycle Victoria.
- Opportunities for school education programs may also be available through the Department of Education, Employment and Training under their Community Partnerships program as part of the *Science in Schools* strategy 1999 –2003.

Several of the strategies involve actions with overlapping responsibilities, such as water quality monitoring. Cost sharing with the Catchment Management Authority, Gippsland Water or other authorities should be pursued in these cases.

In addition to the various government programs, Wellington Shire contains many large industries and businesses, a number of which themselves have some contribution to urban runoff quality degradation. Many of these industries are known for their generous support of community projects. These organizations should be pursued for partnership arrangements in the protection of Wellington Shire receiving waters.

7.4 Review

A review of the priorities will not be required for a number of years, given the processes involved in preparing the current plan. However, a review in three to five years time is recommended, to consider any improvements to the receiving waters, any significant changes in the extent and type of threats to stormwater quality and achievements made through the current action program.

8 Conclusions

The Wellington Shire Stormwater Management Plan provides a framework for protecting and enhancing a number of key waterways through improvements to urban stormwater quality.

Priorities for management have been determined through a workshop process involving key staff from the Council as well as representatives from other authorities and local interest groups. The outcomes from the Plan have been determined from a broad range of inputs and the implementation of the strategies should be successful if the commitment is maintained.

The values of receiving waters, in particular Lake Guthridge, Flooding Creek, Albert River, Macalister River, Macalister Swamp, Thomson River, Lake Glenmaggie and Lake Reeve have been assessed to be most at risk from contaminants contained in Wellington Shire's urban runoff. Strategies have been developed to respond to these risks, to protect and enhance the quality of the Wellington Shires valued waterway systems.

Recommendations have also been developed for integrating best practice environmental management of stormwater into Council's management and planning activities.

The Stormwater Management Plan provides Council with the basis for obtaining external funds to support its commitment to the strategies. Primarily, the Plan sets out a framework for implementing changes that will improve the environmental conditions and protect the values of the waterways in Wellington Shire.

9 Definitions & Abbreviations

For the purpose of this Stormwater Management Plan, some terminology has been used which is context specific, and is defined below.

Outfall: *Transitory point of flow constituting the termination of the urban drainage system.*

Receiving Water: *Designated, named and un-named waterways that receive some or all of their flow from runoff from urban areas.*

Risk: *Measure of the interaction between 'value', 'threat' and 'sensitivity' regarding the impact of stormwater.*

Risk Assessment Matrix: *Tool that displays the product of 'value', 'threat' and 'sensitivity', so that the relative level of risk can be obtained.*

Sensitivity: *Measure of the magnitude of impact that would occur to a specific receiving water value if the particular stormwater threat were to eventuate.*

Study Area: *Discrete urban area consisting of a township or township groups generally bounded by areas zoned rural according to the Wellington Planning Scheme. Area for which the Wellington Shire is responsible for drainage through to their outfalls.*

Threat: *Activity in the urban area that can adversely impact on receiving water values.*

Urban: *Areas consisting, or constituting of a city or town and is distinguished from country areas by the Wellington Planning Scheme, including areas zoned residential, industrial, business public use etc and is generally bounded by area zoned rural.*

Value: *Beneficial use to the community of a waterway or water body that receives stormwater flows (the receiving waters). Values cover a range of factors including environmental, aesthetic, cultural, stormwater and economic factors.*

Waterway: *A river, creek, stream, watercourse, body of water, open channel or canal used to convey stormwater by way of regular flow whether the flow is continuous or not*

BPEMG: *"Best Practise Environmental Management Guidelines", as set out for 'Urban Stormwater' by CSIRO (1999) and (revised 2000)*

CMA: *Catchment Management Authority*

EPA: *Environmental Protection Authority*

MFS: *Management Framework Strategy*

PRI: *Priority Risk Issue*

SWMP: *Stormwater Management Plan*

VSAP: *Victorian Stormwater Action Program*

WSC: *Wellington Shire Council*

WSUD: *Water Sensitive Urban Design*

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The Heart of Gippsland

Volume 2

Wellington Shire Stormwater Management Plan

Job 0801840

June 2002

Earth Tech Engineering Pty Ltd
Melbourne Office
71 Queens Road
Melbourne VIC 3004
Tel (03) 8517 9200

Earth Tech Engineering Pty Ltd
Gippsland Region
18 Breed Street
Traralgon VIC 3844
Tel (03) 5174 0066

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Earth Tech Engineering Pty Ltd
ABN 61 089 482 888
Head Office 71 Queens Road
Melbourne VIC 3004
Tel +61 3 8517 9200



formerly
Fisher Stewart



Wellington Shire Council

Stormwater Management Plan

Volume 2

Job 0801840

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1 Introduction

The Wellington Shire Stormwater Management Plan examines the impacts of stormwater runoff in the urban areas of the Wellington Shire. These areas include the large centres of Sale, Heyfield, Maffra, Stratford, Rosedale and Yarram; together with the smaller centres of Wurruk, Dargo, Licola, Briagolong, Coongulla, Boisdale, Newry, Tinamba, Cowwarr, Loch Sport, Longford, Seaspray, Alberton and Port Albert.

The purpose of the Stormwater Management Plan is to protect and enhance the local waterways by improving the quality of stormwater draining from these urban areas.

There are twenty-three waterways that have been identified that directly receive stormwater runoff from urban Wellington Shire, each being affected to different degrees by the pollutants contained in this runoff.

The eight receiving waters of primary importance to this stormwater management plan (resulting from the risk assessment analysis) are Lake Guthridge (Sale), Flooding Creek (Sale), Albert River (South of Yarram), Macalister River (Maffra), Macalister Swamp (Maffra), Thomson River (Heyfield), Lake Glenmaggie (Coongulla), and Lake Reeve (Seaspray).

To protect and enhance the local waterways by improving the quality of stormwater draining from the urban areas in Wellington Shire, the Plan:

- identifies the priority issues for management of stormwater quality in Wellington Shire;
- presents strategies for reducing the main threats to stormwater quality; and
- presents strategies for integrating best practice environmental management of stormwater into Council's management and planning activities.

Volume 1 of the Stormwater Management Plan provides a summary of how the plan was developed and details the recommended strategies.

Volume 2 provides further details of the processes followed and the background information used to arrive at the strategies.

Development of the stormwater plan followed the detailed guidelines set out in Chapter 3 (revised 2000) of *Best Practice Environmental Management Guidelines for Urban Stormwater* (CSIRO). The project methodology is divided into four Stages consisting of a number of tasks, as shown in Figure 1.

Integral to the development of the Stormwater Management Plan were a series of four **workshops**. These workshops were conducted for three separate working groups (to cover different urban areas) allowing a wide exchange of information and the acquisition of knowledge of the stakeholders in local stormwater issues and their management.

Volume 2 provides records of the workshops and the assessment methods used to arrive at the strategies recommended in the Wellington Shire Stormwater Management Plan.

1.1 Stormwater Plan Process

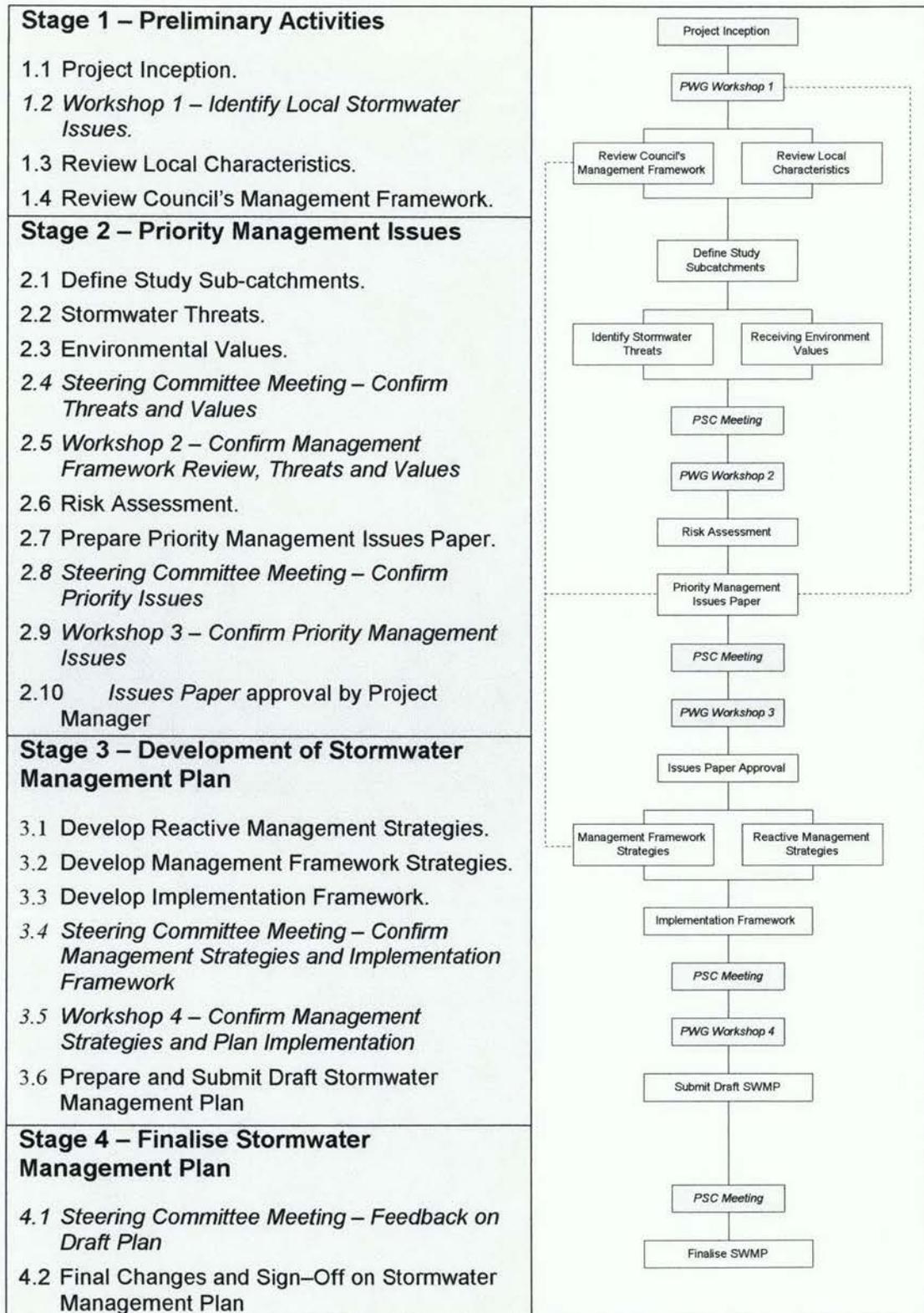


Figure 1. The Process for Formulating a Stormwater Management Plan
 (Source: Best Practice Environmental Management Guidelines, CSIRO 1999)

1.2 People Involved in the Plan's Development

1.2.1 Project Steering Committee

The Project Steering Committee oversaw the project and provided critical review of the workshop outcomes and key decisions in the plan development.

| Name | | Organization |
|-------|---------|--------------------------|
| Neil | Breeden | Wellington Shire Council |
| John | Gunawan | Earth Tech |
| Gary | Harle | Earth Tech |
| Wendy | Hayne | West Gippsland CMA |
| Tanja | Mueller | EPA Victoria |

1.2.2 Project Working Group

Two separate Project Working Groups were established to deal with stormwater issues, and the members are listed below. Not all members were able to attend the four workshops associated with the plan development for each town or groups of towns. The members attending the workshops provided information and opinions regarding the stormwater issues and assisted in the development of the plan.

Sale

Name Organization

| | | |
|---------|-------------|--|
| Linda | Barraclough | Wellington Shire Council |
| Neil | Breeden | Wellington Shire Council |
| Gordon | Cameron | Wellington Shire Council |
| Greg | Gilbert | Waterwatch |
| John | Gunawan | Earth Tech |
| Gary | Harle | Earth Tech |
| Martin | Hart | Wellington Shire Council |
| Wendy | Hayne | West Gippsland CMA |
| Bill | Henebery | Wellington Shire Councillor |
| Malcolm | Hole | Wellington Shire Councillor |
| Bill | Jackson | Maffra Chamber of Commerce |
| John | Jago | Flooding Creek Landcare Group |
| Gerald | Laughton | Gippsland Cultural Heritage |
| Natalie | Liddell | Wellington Shire Council |
| Stuart | Malcolm | Wellington Shire Council |
| Charles | McCubbin | Gippsland Water Environment Advisory Committee |
| Ron | McFarlane | Macalister River Parks |
| Tanja | Mueller | EPA Victoria |
| Bryan | Ray | Flooding Creek Landcare Group |
| John | Rule | Avon-Thomson-Macalister Improvement Management Group |
| Kevin | Young | Wellington Shire Councillor |

Yarram

| Name | Organization | |
|-------|--------------|-----------------------------|
| Neil | Breeden | Wellington Shire Council |
| John | Colbert | Private |
| Peter | Garlic | Wellington Shire Councillor |
| John | Gunawan | Earth Tech |
| Gary | Harle | Earth Tech |
| Wendy | Hayne | West Gippsland CMA |
| Brian | Lee | Wellington Shire Councillor |
| Tanja | Mueller | EPA Victoria |
| Fred | Wright | Private |

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A. Local Stormwater Issues (Workshop 1)

Workshop 1 took place in both Sale and Yarram on the 12th December 2001 involving many of the stakeholders listed in Section 1.2.2. The focus of this workshop was to provide a means to:

- Develop an understanding of the objectives of the project and the planning process;
- Reinforce the need for commitment and participation during the development of the plan and its implementation;
- Develop an understanding of local stormwater management concerns and issues, as well as current strengths and current management practices;
- Identify key people to interview in more detail;
- Identify people to collect or provide additional information required for development of the plan; and
- Identify key sites for field inspections.

As part of the development of understanding of stormwater issues, Workshop 1 focussed on stormwater threats and receiving water values. These threats and values are generically described in Figures 2 and 3 respectively.

| Threat | Cause | Key Pollutants and Impacts |
|---|---|--|
| <i>Residential Land Use Runoff</i> | 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 |
| <i>Industrial Land Use Runoff</i> | 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 |
| <i>Commercial Land Use Runoff</i> | Atmospheric deposition and build-up from traffic, poor waste management practices. | Increased flow, sediment, nutrients, litter, oxygen depleting material, hydrocarbons, pathogens, trace metals, surfactants |
| <i>Major Road Runoff</i> | Atmospheric and vehicular deposition and accumulation. | Sediment, litter, trace metals and hydrocarbons |
| <i>Residential Development</i> | Poor sediment and erosion control, uncontrolled wash down of equipment, deposition of sediment, vehicles and spills from construction process (eg. concreting). | Sediments, nutrients |
| <i>Building Site Runoff (Lot Scale)</i> | Poor management of building site waste and materials. | Sediment and litter |
| <i>Unstable and Degraded Waterways</i> | 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 |
| <i>Flow Modification</i> | Extraction of water for agricultural purposes. | Reduced flows |
| <i>Markets (Retail and Wholesale)</i> | 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 |
| <i>Upstream Inflows</i> | Runoff from upstream catchments, entering via creeks and waterways. | Sediment, nutrients, litter and pathogens |
| <i>Open Space Runoff (eg. Golf Course and Sporting Grounds)</i> | 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 |
| <i>Landfill and Contaminated Sites</i> | Runoff or leaching from landfills and contaminated sites. | Oxygen depleting material, pathogens, sediments, nutrients, litter, trace metals, hydrocarbons and toxicants |
| <i>Septic and Sewer Leakage</i> | Infiltration and overflow from sewerage systems. | Oxygen depleting material, pathogens and nutrients. |
| <i>Docks and Wharves</i> | 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 |

Table 2 – Generic Stormwater Threats

(Taken from BPEMG Revision Chapter 3 September 2000 page 11)

| Value Category | Specific Value Types | Description |
|----------------|------------------------------|---|
| Environmental | In-stream Habitat | <i>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.</i> |
| | Riparian Habitat/Flora | <i>Waterway condition and ecological values based on extent and quality of remnant (native) vegetation, weed infestation and stability of riparian zone.</i> |
| Amenity | Recreational Amenity | <i>Public access and utilisation for passive and active recreation including shared trails, 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.</i> |
| | Visual/Landscape Amenity | <i>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.</i> |
| Cultural | European Cultural Heritage | <i>Places and sites of European Heritage value, possibly including sites of pioneering significance, historical buildings and infrastructure, trails and transport routes.</i> |
| | Indigenous Cultural Heritage | <i>Places and sites of Indigenous Heritage value such as artefact scatters, landscape and places of significance (eg. relating to story telling), ceremonial sites (eg. Bora Rings), campsites and trails.</i> |
| Stormwater | Flood and Conveyance | <i>Contribution to protection against flooding including consideration of waterway capacity, designated floodways and flood protection infrastructure (eg. levees)</i> |
| | Water Quality Treatment | <i>Contribution to water quality management (incl. Stormwater). This may include existing wetlands or other infrastructure that has been developed to improve water quality.</i> |
| Economic | Property | <i>Property value associated with proximity to water. This may include values associated with visual amenity, access and amenity.</i> |
| | Other | <i>Other economic benefits associated with receiving waters (eg. navigability for port activities, tourism, or water supply for irrigation).</i> |

Table 3 – Generic Receiving Water Values

(Taken from BPEMG Revision Chapter 3 September 2000 page 13)

Workshop 1 produced a number of tables, which listed various stormwater threats, values and other areas of interest to the stormwater management plan. By encouraging group input, this exercise aided to reinforce the issues of relevance to the plan and focus attention on the process for its development.

These tables form the basis for identifying which receiving values are highly valued to the community and in need of protection, and furthermore to identify priority for works and management activities to protect these values from activities which threaten them.

The tables produced were revised in workshop 2 and are attached in part B.

B. Stormwater Threats and Values (Workshop 2)

Workshop 2 was conducted in both Yarram and Sale on February 8th 2002. This workshop focussed on extending the information, which was obtained from the first round of workgroup meetings, and produced a completed set of receiving water values and sub-catchments threats for Wellington Shire.

The sessions concluded with a sign-off on the **scores** associated with the values and threats so that the results could be used to perform the risk assessment to follow.

Below are the notes produced from workshops 1 & 2 including the scoring assigned to the values and threats, ranging from 1 (low) to 4 (very high). The sub-catchment numbers relate to the drawings attached in Section G.

Appendix B is broken up into two parts:

B1 – Stormwater Threats & Values for the Larger Urban Centres

B2 - Stormwater Threats & Values for the Smaller Urban Centres

Wellington Shire Stormwater Management Plan - Workshop 2 Notes

Appendix B1 Stormwater Threats & Values For the Larger Urban Centres

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Larger Town Sub-catchment and Receiving Water arrangement

| Town | Sub-catchment | Receiving water (immediate) | Receiving water (secondary, tertiary..) |
|-----------|---|--|--|
| Sale | 1. North & West Sale Urban <u>Predominate land use:</u> - Residential (industrial, commercial) | 1. Flooding Creek | 1. Thomson River 2. Latrobe River 3. Various Wetlands 4. Lake Wellington |
| | 2. Central & East Sale Urban <u>Predominate land use:</u> - Residential (industrial, commercial) | 1. Lake Guthridge 2. Flooding Creek Sth | 1. Lake Guyatt 2. Flooding Creek Sth 3. Various Wetlands 4. Latrobe River 5. Lake Wellington |
| | 3. Business Sale Urban <u>Predominate land use:</u> - Commercial | 1. Lake Guthridge | 1. Lake Guyatt 2. Flooding Creek Sth 3. Various Wetlands 4. Latrobe River 5. Lake Wellington |
| | 4. Wurruk Urban <u>Predominate land use:</u> - Residential (developing) | 1. Thomson River | 1. Latrobe River 2. Various Wetlands 3. Lake Wellington |
| Heyfield | 1. Heyfield Urban <u>Predominate land use:</u> - Residential, industrial | 1. Heyfield Wetlands 2. Thomson River | 1. Latrobe River 2. Various Wetlands 3. Lake Wellington |
| Maffra | 1. North West Maffra Urban <u>Predominate land use:</u> - Residential, | 1. Macalister Swamp Reserve | 1. Macalister River 2. Thomson River 3. Latrobe River 4. Various Wetlands 5. Lake Wellington |
| | 2. South West Maffra Urban <u>Predominate land use:</u> - Residential, industrial, commercial | 1. Macalister River | 1. Thomson River 2. Latrobe River 3. Various Wetlands 4. Lake Wellington |
| | 3. East Maffra Urban <u>Predominate land use:</u> - Residential, industrial | 1. Macalister River | 1. Thomson River 2. Latrobe River 3. Various Wetlands 4. Lake Wellington |
| Stratford | 1. North Stratford Urban <u>Predominate land use:</u> - Residential | 1. Blackall Creek | 1. Avon River 2. Lake Wellington |
| | 2. South Stratford Urban <u>Predominate land use:</u> - Residential (commercial) | 1. Avon River | 2. Lake Wellington |
| Rosedale | 1. Rosedale Urban <u>Predominate land use:</u> - Residential, industrial | 1. Blind Joe Creek | 1. Latrobe River 2. Various Wetlands 3. Lake Wellington |
| Yarram | 1. Central Yarram Urban <u>Predominate land use:</u> - Commercial, Residential, Industrial | 1. Albert River via outfall drain | 1. Nooramunga Marine & Wildlife Reserve |
| | 2. North Yarram Urban <u>Predominate land use:</u> - Commercial, Industrial | 1. Tarra River | 1. Nooramunga Marine & Wildlife Reserve |

Note: Various Wetlands for Sale generally includes: Sale Common, The Heart Morass, Dowd Morass and Clydebank Morass.

Values of Receiving Waters at Sale

| | | Catchment | | Value Score | Flooding Creek (including Sale Canal) | Value Score |
|--------------------------|---|--|---|--|--|---------------|
| | | Value Category | Lake Guthridge | | | |
| Environmental | In-Stream Habitat | Water Quality | Studies indicate Lake Guthridge suffers from human accelerated eutrophication (increased input of nutrients), high turbidity, and low plant life diversity. | Moderate 2 | Oxygen concentration found to be consistently low. Visible presence of algae. Generally only carp can survive. | Low 1 |
| | | Wildlife Biodiversity | 57 bird species have been recorded (4 introduced), 3 mammal species (bats & rats) and 1 amphibian (common froglet) | | Rich habitat for birds. | |
| | | Morphological Diversity | Some depth diversity, generally most of Lake is about 1m deep and bed is of sediments. | | Sediment influx has altered the bed form to detriment of habitat. | |
| | | Non Native Species Invasion | | | Exotic weeds present | |
| | Riparian Habitat / Flora | Remnant Native Vegetation | Limited macrophyte vegetation, little diversity of surrounding on-bank vegetation. | Low 1 | Small pockets remain, some native revegetation occurs | Low 1 |
| | | Weed Infestation | | | Some weed presence, much of bank is cleared through urban areas | |
| | | Stability of Riparian zone | Evidence of bank erosion at some points | | | |
| Amenity | Recreational Amenity | Water Quality | Primary contact limited by toxic blue green algae in summer | High 3 | Not conducive to primary contact | Moderate 2 |
| | | Water Depth | Adequate for boating and swimming | | Not conducive to primary contact | |
| | | Boating | | | Sale Canal section of flooding creek, expressly used for boating. Rowing popular | |
| | | Swimming | Not Practiced – largely due to restrictions from blue green algae, bed sediments and other water quality concerns. | | None | |
| | | Fishing/ birdwatching | Annual fishing competition held. Mostly carp and eels. Birdwatching and photography are popular. | | Fishing popular for fun. Generally only carp is caught. Good bird watching available. | |
| | | Shared Trails | Walking/cycling trails ring the Lake and include exercise stations | | Little | |
| | | Access – Formal Linkages | High access is provided by vehicle, and lake is linked to other facilities such as Lake Guyatt, Fauna Park, Stevenson Park. | | Little | |
| | Facilities – Car parks, picnic areas etc. | Car parking provided, picnic facilities | Little in general. Good facilities at the Port of Sale. | | | |
| Visual/Landscape Amenity | Water Quality | Turbid appearance of the Lake detracts from its amenity. | Very High 4 | Turbid, litter present caught in reeds. | Very High 4 | |
| | Passive enjoyment | Many tables provided for passive appreciation of the Lake. Complaints are made when the water levels drop if the Lake appears too empty, ie appearance is of great importance. | | Open body provides visual enjoyment together with the activities utilized ie boating | | |

| | | Catchment Value Category | Lake Guthridge | Value Score | Flooding Creek (including Sale Canal) | Value Score |
|--------------------|-------------------------|--|---|-------------|---|-------------|
| | | Visual access | Large open body of water central to the town has high visual access. | | Sections are well open for visual access | |
| | | Natural Structures | Lake Guthridge contains an island which adds to its aesthetic appeal. | | | |
| | | Man Made Structures | | | Port of Sale jetties with boat moorings | |
| | | Relationship with other facilities | Close to CBD | | Overlooked by Port of Sale Offices. Adjoins sports fields | |
| | | Facilities – Car parks, picnic facilities | Car parking provided, picnic facilities | | Car parks provided at Port. | |
| Cultural | Non-Aboriginal | Pioneering/ Historical Significance | No known sites | Low 1 | Port of Sale Location of Original jetty | High 3 |
| | | Historical Infrastructure | | | Original Name for Sale | |
| | Aboriginal | Artefact Scatters | | Low 1 | | Low 1 |
| | | Places of significance | No known sites | | No known sites | |
| Storm Water | Flood & Conveyance | Waterway Capacity | Due to vast surface area, Lake Guthridge has the capacity to retard significant storm water | High 3 | | Moderate 2 |
| | | Designated Floodways | | | Is designated floodway, receives runoff from half of Sale township | |
| | | Flood Protection Infrastructure | Lake Guthridge is downstream of most urban flood sensitive areas, was designed for and acts as a retarding basin. | | | |
| | Water Quality Treatment | Wetland treatment capacity | Some nutrient stripping capacity is achieved with the Lakes fringing vegetation. Provides sediment removal. | Moderate 2 | Some filtering and biological treatment occurs in-stream | Low 1 |
| | | Other treatment infrastructure capacity -GPT's -Settlement Ponds | | | | |
| Economic | Property | Proximity & access to water | Many residential properties overlook the Lake | High 3 | Port of Sale offices including Cafeteria overlook waterway. Plans to develop waterside property. | Mod 2 |
| | | Visual Amenity | Open body of water is aesthetically pleasing | | Generally aesthetically pleasing | |
| | Other | Water supply for irrigation | | Very High 4 | Water use licences exist for number of applications. Forms discharge point for number of industries eg. saleyards | Very High 4 |
| | | Generation of Tourism | Water bird life attracts tourism. Lake a symbol for the Sale township | | High tourism generation by Port. | |
| | | Navigability of port activities | | | Small Port | |

Values of Receiving Waters at Sale

| | | Catchment | | Value Score | | Value Score |
|---|----------------------------------|--|---|-------------|---|-------------|
| | | Value Category | Thomson River | | Wetlands (including Lake Guyatt) | |
| Environmental | In-Stream Habitat | Water Quality | | Moderate 2 | Quality dependent on Lake Guthridge and Flooding Creek | Very High 4 |
| | | Wildlife Biodiversity | Supports a variety of water birds, native and exotic fish. Variety of aquatic vegetation and debris provide moderate habitat support. | | Excellent native wildlife. International importance due to number of migratory bird agreements, covered in RAMSAR agreement as part of Gippsland Lakes. | |
| | | Morphological Diversity | Range of water depths provide variety of habitats. Bed form generally mud. | | Shallow and deeper pools facilitate range of habitat. | |
| | | Non Native Species Invasion | Willows present | | Some exotics which compete with native species | |
| | Riparian Habitat / Flora | Remnant Native Vegetation | Large number in pockets still exist, high habitat support importance. | High 3 | Very high native remnant vegetation provides on bank habitat support | Very High 4 |
| | | Weed Infestation | Range of weeds are found on river bank. | | | |
| Stability of Riparian zone | | Banks are generally stable, where willows have been removed, their root systems have been left intact. | | | | |
| Amenity | Recreational Amenity | Water Quality | Turbidity rather high in urban areas. | High 3 | Filtered and treated biologically by wetland plants. Is supportive of wildlife, for observation. | High 3 |
| | | Water Depth | Conducive to swimming and boating activities | | | |
| | | Boating | Yes – a continuation of the Sale Canal supports many varieties of recreational boating | | None | |
| | | Swimming | Moderately popular, although water quality detracts from the appeal. | | None | |
| | | Fishing/ birdwatching | Fishing practised, however mainly carp caught. Some history of native species | | Excellent opportunity for bird watching including migratory birds. | |
| | | Shared Trails | Few | | Some walking trails provided. | |
| | | Access – Formal Linkages | | | Access is formalised | |
| | | Facilities – Car parks, picnic areas etc. | Provided along banks, caravan parks adjacent | | Parking provided is some locations. | |
| | Visual/Landscape Amenity | Water Quality | Turbid | High 3 | Has natural appeal | High 3 |
| | | Passive enjoyment | | | Aesthetics of natural swamplands are highly rated | |
| | | Visual access | High visual access | | There is good opportunity for visual access. | |
| | | Natural Structures | | | Wetland features | |
| | | Man Made Structures | | | | |
| Relationship with other facilities | | Close to roads and public land | | | | |
| Facilities – Car parks, picnic facilities | Parking and picnicking available | Parking provided is some locations. Access is formalised | | | | |

| | | Catchment | | | | |
|--------------------|----------------------------|--|--|-------------|--|-------------|
| | | Value Category | Thomson River | Value Score | Wetlands (including Lake Guyatt) | Value Score |
| Cultural | Non-Aboriginal | Pioneering/ Historical Significance | No known Sites | Low 1 | Powder Magazine | Moderate 2 |
| | | Historical Infrastructure | | | | |
| | Aboriginal | Artefact Scatters | | Low 1 | No known Sites | Low 1 |
| | | Places of significance | No known Sites | | | |
| Storm Water | Flood & Conveyance | Waterway Capacity | High conveyance capacity | High 3 | | Moderate 2 |
| | | Designated Floodways | | | | |
| | | Flood Protection Infrastructure | River highly channelised in lower reaches | | | |
| | Water Quality Treatment | Wetland treatment capacity | | Low 1 | Very useful in tertiary water purification, for the waters downstream, eg, the Gippsland Lake systems | High 3 |
| | | Other treatment infrastructure capacity -GPT's -Settlement Ponds | Little treatment facilitated. | | | |
| Economic | Property | Proximity & access to water | Caravan park is sited on bank. Some properties gain by value. | Mod 2 | Low immediate proximity of property | Low 1 |
| | | Visual Amenity | Moderate | | | |
| | Other | Water supply for irrigation | | High 3 | Tourism is generated by natural features. Powder Magazine | High 3 |
| | | Generation of Tourism | Due to boating access. Carp are caught | | | |
| | | Navigability of port activities | Supported | | | |

Notes

Threats to Stormwater Quality at Sale

| Threat | Catchment | Threat score | Central & East Sale to Lake Guthridge Sub-catchment (2) | Threat score | Business Sale Urban to Lake Guthridge Sub-catchment (3) | Threat score |
|---|---|--|--|--|---|--------------|
| | North & West Sale Urban to Flooding Creek Sub-catchment (1) | | | | | |
| Residential land Use | Fertilizer application | High Residential Area discharges in this sub-catchment Weeds entering through drainage, including inappropriate dumping Sediment runoff Car washing – surfactants into drains Littering from residential areas an identified problem. Leaf Litter | High density of residential land use. Moderate nutrient runoff measured Car washing chemicals Fertilizer application Sediment runoff Litter very visible from the residential outfalls. Leaf Litter | Very High 4 | Very little residential activity in sub-catchment | Low 1 |
| | Atmospheric deposition & build up of traffic | | | | | |
| | Lawn clippings | | | | | |
| | Poor waste management | | | | | |
| | Use of pesticides & herbicides | | | | | |
| | Poor household practice | | | | | |
| | Inappropriate discharge (eg carpet cleaners/paints/fuels) | | | | | |
| | Car washing | | | | | |
| | Residential littering | | | | | |
| | Eroding flows | | | | | |
| | Leaf litter | | | | | |
| Pet Droppings | | | | | | |
| Industrial Land Use Runoff | Poor waste management | Saleyard contribution of sediments, and also the threat of nutrients, micro-organisms and oxygen demanding substances. Site runoff from other industries seen as potentially important. Hydrocarbon runoff from poor vehicle maintenance. | Low industrial presence in sub-catchment. Some potential from site runoff and inappropriate discharge Studies reveal periodic slugs of contaminates (ie electrical conductivity) | Moderate 2 | No industrial activity in sub-catchment | Low 1 |
| | Accidental spills | | | | | |
| | Inappropriate discharge (eg Fuels /Paints) | | | | | |
| | Vehicle wash-down | | | | | |
| | Stockpile runoff | | | | | |
| | Atmospheric deposition/dust | | | | | |
| | Sediment runoff | | | | | |
| | Industrial littering | | | | | |
| | Use of chemicals/sprays | | | | | |
| | Commercial Land Use Runoff | | | | | |
| Sediment runoff from CBD | | | | | | |
| Hydrocarbon Runoff • Carparks • Service stations • Auto services | | | | | | |
| Leaf litter | | | | | | |
| Poor commercial practices • Illegal dumping • Waste generation | | | | | | |
| Road Runoff | | Road run-off (oils/sediment) | Unsealed roads (especially around saleyards) observed to produce sediments and dust with wear and use. | Road runoff from residential areas generally low potential threat | Low 1 | Limited |
| | Spillage from cartage | | | | | |
| | Sediment load from unsealed roads | | | | | |
| Residential Developments | Poor sediment & erosion control | Moderate levels of development - contaminates from poor construction practise. | Moderate levels of development - contaminates from poor construction practise. | Mod 2 | No residential development | Low 1 |
| | Uncontrolled washdown of equipment | | | | | |

| Threat | Catchment | | Threat score | Threat score | Threat score | |
|--|--|---|--------------|--|--|---|
| | North & West Sale Urban to Flooding Creek Sub-catchment (1) | Central & East Sale to Lake Guthridge Sub-catchment (2) | | | | Business Sale Urban to Lake Guthridge Sub-catchment (3) |
| Vehicle and other spills from construction process (ie concreting) | | | | | | |
| Building Site Runoff (lot scale) | Poor sediment & erosion control Uncontrolled washdown of equipment Vehicle and other spills from construction process (ie concreting) Rubbish from new building sites | Approval of 74 lot subdivision has potential to adversely impact waterways through poor construction techniques , and inappropriate site runoff treatment. Potential threat | High 3 | Includes area for possible long term development | High 3 Periodic development in commercial areas. Some threat associated with runoff controls and treatment | Moderate 2 |
| Unstable & Degraded waterways | Eroding banks / outfalls Poorly restricted stock and recreational access Weed infestation Damage from waterway works Unstable riparian zones | Generally stable outfalls | Low 1 | Banks around Lake Guthridge are eroding including around outfalls. Generally caused by wave impact. Increase turbidity. | Moderate 2 Banks around Lake Guthridge are eroding including around outfalls. Generally caused by wave impact. Increase turbidity. | Moderate 2 |
| Flow Modification | Increased Flow Channel Alteration – Weed removal Extraction of water (reduced flows) | Large urban catchment area, high percentage impervious. Number of extraction licences exist | Moderate 2 | Large urban catchment area, high percentage impervious. | Moderate 2 Large urban/commercial catchment area, mostly impervious. | Moderate 2 |
| Open Space & Sporting ground Runoff | Use of fertilizers Litter: • Skateboard park • Parklands Golf Course run-off Algal bloom Syringes Swimming Pools discharge Pet dropping | Flooding Creek commonly suffers algal blooms in summer months Skate park identified to contribute litter Passage to St Patricks Oval identified to be a high contributor of litter. | Moderate 2 | Algal blooms common. Chlorine from pool backwash and leakages. Picnic grounds source of windblown and drain transported litter | None None None None None | Low 1 |
| Landfill & Contaminated Sites | Landfill leaching (potential) Wind blown litter Sediment runoff | None | NA 0 | Discontinued landfill site. Contains leachate infiltration potential | None | NA 0 |
| Septic & sewer leakage | Sewer overflows Sewer spills Septic tank overflows | Town is sewered. Number of spill incidents recorded attributable to infrastructure blockages, including pump station failure in close proximity to Sale Canal. | High 3 | Town is sewered. Number of spill incidents recorded attributable to infrastructure blockages. | Moderate 2 Town is sewered. Number of spill incidents recorded attributable to infrastructure blockages. | Moderate 2 |

Threats to Stormwater Quality at Sale/Wurruk

| | Catchment Threat | Wurruk Urban to Thomson River Sub-catchment (1) | Threat Score |
|--|---|---|--------------|
| Residential land Use | Fertilizer application | Small residential population. | Low 1 |
| | Atmospheric deposition & build up of traffic | This sub-catchment includes land zoned for future development. | |
| | Lawn clippings | Use of household fertilizers and detergents may contribute nutrients to receiving waters. | |
| | Poor waste management | | |
| | Use of pesticides & herbicides | Seasonal leaf litter introduces an organic load to the receiving water. | |
| | Poor household practice | | |
| | Inappropriate discharge (eg carpet cleaners/paints/fuels) | | |
| | Car washing | | |
| | Residential littering | | |
| | Eroding flows | | |
| | Leaf litter | | |
| | Pet Droppings | | |
| | Industrial Land Use Runoff | Poor waste management | |
| Accidental spills | | Small threat of chemical and sediment site runoff. | |
| Inappropriate discharge (eg Fuels /Paints) | | | |
| Vehicle wash-down | | Number of exposed industrial yards. | |
| Stockpile runoff | | | |
| Atmospheric deposition/dust | | | |
| Sediment runoff | | | |
| Industrial littering | | | |
| Use of chemicals/sprays | | | |
| Commercial Land Use Runoff | Litter: <ul style="list-style-type: none"> • CBD • Carparks • Street Bins (open tops & skips) • Businesses | Small commercial district, equip with street bins produces very small amounts of litter. | Low 1 |
| | Sediment runoff from CBD | Some sediment production from commercial areas. | |
| | Hydrocarbon Runoff <ul style="list-style-type: none"> • Carparks • Service stations • Auto services | | |
| | Leaf litter | | |
| | Poor commercial practices <ul style="list-style-type: none"> • Illegal dumping • Waste generation | | |
| | | | |
| Road Runoff | Road run-off (oils/sediment) | Low volume travel through local network, good quality roads. | Low 1 |
| | Spillage from cartage | Includes high volume highway | |
| | Sediment load from unsealed roads | | |
| Residential Developm | Poor sediment & erosion control | Low level of development at present. | Low 1 |
| | Uncontrolled washdown of equipment | | |

| | Catchment Threat | Wurruk Urban to Thomson River Sub-catchment (1) | Threat Score |
|-------------------------------------|--|---|--------------|
| | Vehicle and other spills from construction process (ie concreting) | | |
| Building Site Runoff (lot scale) | Poor sediment & erosion control | Low development in sub-catchment. Area includes that planned for future development | Moderate 2 |
| | Uncontrolled washdown of equipment | | |
| | Vehicle and other spills from construction process (ie concreting) | | |
| | Rubbish from new building sites | | |
| Unstable & Degraded waterways | Eroding banks / outfalls | Banks of outfalls generally stable. | Low 1 |
| | Poorly restricted stock and recreational access | | |
| | Weed infestation | | |
| | Damage from waterway works | | |
| | Unstable riparian zones | | |
| Flow Modification | Increased Flow | Small impervious catchment | Low 1 |
| | Channel Alteration – Weed removal | | |
| | Extraction of water (reduced flows) | | |
| Open Space & Sporting ground Runoff | Use of fertilizers | Few areas of impact | Low 1 |
| | Litter: <ul style="list-style-type: none"> • Skateboard park • Parklands | | |
| | Golf Course run-off | | |
| | Algal bloom | | |
| | Syringes | | |
| | Swimming Pools discharge | | |
| | Pet dropping | | |
| Landfill & Contaminated Sites | Landfill leaching (potential) | None | NA 0 |
| | Wind blown litter | | |
| | Sediment runoff | | |
| Septic & sewer leakage | Sewer overflows | Town is sewered, with relatively new infrastructure. A few incidents are recorded, related to infrastructure failure. | Low 1 |
| | Sewer spills | | |
| | Septic tank overflows | | |

Values of Receiving Waters at Heyfield

| | | Catchment | Thomson River | Value Score | Heyfield Wetlands | Value Score |
|---|--------------------------|--|---|-------------|--|-------------|
| | | Value Category | | | | |
| Environmental | In-Stream Habitat | Water Quality | | High 3 | Consisting of urban runoff from Heyfield township. | High 3 |
| | | Wildlife Biodiversity | Supports a variety of water birds, native and exotic fish and freshwater crayfish. Variety of aquatic vegetation and debris provide moderate habitat support. | | Supportive of variety of species of swamp vegetation, waterer birds, amphibians etc. | |
| | | Morphological Diversity | Range of water depths provide variety of habitats. Bed form generally mud. | | Man made, fairly uniform habitat. | |
| | | Non Native Species Invasion | Many willows have been removed however some persist dropping their seasonal leaf litter load. | | | |
| | Riparian Habitat / Flora | Remnant Native Vegetation | Few remnant, however, CMA and Landcare groups have began revegetation program. | Moderate 2 | | Low 1 |
| | | Weed Infestation | Range of weeds are found on river bank. | | | |
| Stability of Riparian zone | | Banks are generally stable, where willows have been removed, their root systems have been left intact. | Banks are stable | | | |
| Amenity | Recreational Amenity | Water Quality | Conducive to contact | High 3 | Not conducive to contact. | High 3 |
| | | Water Depth | Conducive to contact | | Possible for small boating activities. | |
| | | Boating | Rafting and other small boating activities. | | ? | |
| | | Swimming | Informal swimming hole popular. | | No swimming, water quality not conducive | |
| | | Fishing/ bird watching | Good fishing can be found | | Bird life in wetland provides high access enjoyment for birdwatchers. Teaches about the benefits of wetland systems. | |
| | | Shared Trails | Some | | Number of walking paths and boardwalks. | |
| | | Access – Formal Linkages | Few | | Signage provided | |
| | | Facilities – Car parks, picnic areas etc. | Few | | Parking available near by. Open spaces abutting for active recreation. | |
| | Visual/Landscape Amenity | Water Quality | | High 3 | | High 3 |
| | | Passive enjoyment | River provides visually enjoyable scenery | | Open water body provides visual appeal | |
| | | Visual access | Limited visual access | | Overlooked by saleyards and school etc, it is in view of vehicles entering the town. | |
| | | Natural Structures | | | | |
| | | Man Made Structures | | | Hand-railed boardwalks | |
| | | Relationship with other facilities | Forms entrance to town from the south. Close to CBD and other parks | | Close to school and CBD | |
| Facilities – Car parks, picnic facilities | | | | | | |

| | | Catchment | | | | |
|--------------------|----------------------------|--|--|-------------|--|-------------|
| | | Value Category | Thomson River | Value Score | Heyfield Wetlands | Value Score |
| Cultural | Non-Aboriginal | Pioneering/ Historical Significance | Bridge crossing of national pioneering significance | Mod 2 | No known sites | Low 1 |
| | | Historical Infrastructure | | | | |
| | Aboriginal | Artefact Scatters | | Low 1 | No known sites | Low 1 |
| | | Places of significance | No known sites | | | |
| Storm Water | Flood & Conveyance | Waterway Capacity | High capacity to convey stormwater. Level generally controlled by Cowwarr wear upstream. | Moderate 2 | | Low 1 |
| | | Designated Floodways | | | | |
| | | Flood Protection Infrastructure | | | | |
| | Water Quality Treatment | Wetland treatment capacity | | Low 1 | Wetland provides sediment and toxicant removal through its flow path. | High 3 |
| | | Other treatment infrastructure capacity -GPT's -Settlement Ponds | Few treatment means | | Litter screen operates at main inflow into wetland and covers majority of CBD. | |
| Economic | Property | Proximity & access to water | Limited | Low 1 | Distant to most residencies | Low 1 |
| | | Visual Amenity | Limited | | May have minor benefits | |
| | Other | Water supply for irrigation | Stock watering | Moderate 2 | Provides a centrepiece for the township. Provides educational opportunity regarding benefits of wetlands. | Moderate 2 |
| | | Generation of Tourism | | | | |
| | | Navigability of port activities | | | | |

Notes

Threats to Stormwater Quality at Heyfield

| Catchment | | Heyfield Urban to Thomson River & Heyfield Wetlands Sub-catchment (1) | Threat Score |
|----------------------------|---|--|---------------|
| Threat | | | |
| Residential land Use | Fertilizer application | Small residential population. | Medium 2 |
| | Atmospheric deposition & build up of traffic | Majority of litter is intercepted before discharge, by litter trap. | |
| | Lawn clippings | | |
| | Poor waste management | Use of household fertilizers may contribute nutrients to receiving waters. | |
| | Use of pesticides & herbicides | | |
| | Poor household practice | School yard in close proximity may be a source of wind blown litter | |
| | Inappropriate discharge (eg carpet cleaners/paints/fuels) | | |
| | Car washing | | |
| | Residential littering | | |
| | Eroding flows | | |
| | Leaf litter | | |
| | Pet Droppings | | |
| Industrial Land Use Runoff | Poor waste management | Saleyards are in very close proximity to wetlands. Unsealed yards a contributor of sediments . Threat of release of saleyard wastes . | High 3 |
| | Accidental spills | | |
| | Inappropriate discharge (eg Fuels /Paints) | | |
| | Vehicle wash-down | Timber industry, contains site of stockpiled material, sprayed for fire prevention. Sediment and organic runoff from stockpiles, dust and mud transport from machines have a high polluting potential. Woodchips consistently found in drains downstream of sawmill. | |
| | Stockpile runoff | | |
| | Atmospheric deposition/dust | | |
| | Sediment runoff | | |
| | Industrial littering | Moulding and Plaster works allow moulding material to spill out to outside of the building, allowing its transport into the drainage system. | |
| | Use of chemicals/sprays | | |
| Commercial Land Use Runoff | Litter: <ul style="list-style-type: none"> • CBD • Carparks • Street Bins (open tops & skips) • Businesses | Small commercial district, equip with street bins produces very small amounts of litter . Some sediment production from commercial areas. | Moderate 2 |
| | Sediment runoff from CBD | | |
| | Hydrocarbon Runoff <ul style="list-style-type: none"> • Carparks • Service stations • Auto services | Small hydrocarbon runoff from street parking area | |
| | Leaf litter | | |
| | Poor commercial practices <ul style="list-style-type: none"> • Illegal dumping • Waste generation | | |
| Residential Road Runoff | Road run-off (oils/sediment) | Low volume travel, good quality roads | Low 1 |
| | Spillage from cartage | | |
| | Sediment load from unsealed roads | | |
| Residential Development | Poor sediment & erosion control | Low level of development | Low 1 |
| | Uncontrolled washdown of equipment | | |

| | Catchment Threat | Heyfield Urban to Thomson River & Heyfield Wetlands Sub-catchment (1) | Threat Score |
|-------------------------------------|--|---|--------------|
| | Vehicle and other spills from construction process (ie concreting) | | |
| Building Site Runoff (lot scale) | Poor sediment & erosion control | Low development in sub-catchment, some potential for development | Low 1 |
| | Uncontrolled washdown of equipment | | |
| | Vehicle and other spills from construction process (ie concreting) | | |
| | Rubbish from new building sites | | |
| Unstable & Degraded waterways | Eroding banks / outfalls | Banks of outfalls generally stable. Many drains contain weeds/vegetation which may produce sediment and chemical contaminants after they are cleaned/maintained. | Low 1 |
| | Poorly restricted stock and recreational access | | |
| | Weed infestation | | |
| | Damage from waterway works | | |
| | Unstable riparian zones | | |
| Flow Modification | Increased Flows | Large urban catchment, moderate percentage impervious | Moderate 2 |
| | Channel Alteration – Weed removal | | |
| | Extraction of water (reduced flows) | | |
| Open Space & Sporting ground Runoff | Use of fertilizers | Sports field is close to wetlands, is seldom used or fertilized. | Low 1 |
| | Litter: • Skateboard park • Parklands | | |
| | Golf Course run-off | | |
| | Algal bloom | | |
| | Syringes | | |
| | Swimming Pools discharge | | |
| | Pet dropping | | |
| Landfill & Contaminated Sites | Landfill leaching (potential) | None | NA 0 |
| | Wind blown litter | | |
| | Sediment runoff | | |
| Septic & sewer leakage | Sewer overflows | Town is sewered. Some spills caused by tree root infiltration. | Mod 2 |
| | Sewer spills | | |
| | Septic tank overflows | | |

Values of Receiving Waters at Maffra

| | | Catchment | | | | |
|----------------------------|---|--|---|---|--|--------|
| | | Value Category | Macalister River | | Macalister Swamp Reserve | |
| Environmental | In-Stream Habitat | Water Quality | High quality water. High turbidity. Water level often reduced to minimum environmental flows from Lake Glenmaggie upstream. | High 3 | Entirely dependant on urban runoff contribution | High 3 |
| | | Wildlife Biodiversity | Range of native fauna species present including platypus. Abundant aquatic habitat, snags and woody debris for habitat support. | | Swamp reserve supports vast diversity of water birds, frogs and small fish. Much aquatic vegetation for habitat support. | |
| | | Morphological Diversity | Bed-form generally consist of mud and fine organics, depth is fairly uniform. | | Man made structure, some open water and shallow systems. Island exists for a protected habitat. | |
| | | Non Native Species Invasion | | | Number of weeds have invaded swampland | |
| | Riparian Habitat / Flora | Remnant Native Vegetation | Significant native vegetation exists | High 3 | No remnant vegetation, although the area has been extensively planted with native reeds, shrubs and trees. | High 3 |
| | | Weed Infestation | Low – high removal of willows, ongoing maintenance. | | Willow and other reeds have been quick to take hold, weed removal programs exist. | |
| Stability of Riparian zone | | Banks are generally stable | Banks are stable | | | |
| Amenity | Recreational Amenity | Water Quality | Water can be turbid. | High 3 | Good visual quality, some traces of oil visible | High 3 |
| | | Water Depth | Allows contact activities. | | | |
| | | Boating | Non motorised usage including from Secondary College Outdoor Education Programs | | None | |
| | | Swimming | River provides good swimming when water clarity conditions are suitable. | | None | |
| | | Fishing/ bird watching | Fishing is popular | | Extensive capacity for bird watching. Bird hide has been constructed and attracts many rare birds. | |
| | | Shared Trails | Rail Trail, Howett Bicycle Trail. Connects Swamp to perimeter walk. | | | |
| | | Access – Formal Linkages | Linkages to Macalister Park. | | Access is provided by road close to the commercial areas. | |
| | Facilities – Car parks, picnic areas etc. | Number of open spaces which provide BBQ and picnic facilities. Car parking provided in close proximity to river. | Car parking and boardwalks are provided. | | | |
| Visual/Landscape Amenity | Water Quality | Muddy in appearance | Very High 4 | Good visual quality | High 3 | |
| | Passive enjoyment | 10 sets of tables, loop walking track with bridges. | | | | |
| | Visual access | Good access from Macalister Park | | Well provided to the restricted site | | |
| | Natural Structures | Ana-branch of river, billabongs in original course of river. | | | | |
| | Man Made Structures | Canoe launching ramp | | Bird hide facilitates observation of bird life. | | |

| | | Catchment | | | |
|--------------------|-------------------------|--|---|-------------|--|
| | | Value Category | Macalister River | | Macalister Swamp Reserve |
| | | Relationship with other facilities | Adjoins Macalister Park, Beet Museum and Rail Trail. | | Adjoins the Macalister River |
| | | Facilities – Car parks, picnic facilities | Number of open spaces which provide BBQ and picnic facilities, include Macalister park. Car parking provided in close proximity to river. | | Car parking and boardwalks are provided. |
| Cultural | Non-Aboriginal | Pioneering/ Historical Significance | Site of Native police Reserve. Source of water to John Carpenter four mill 1866. Cattle Saleyards, some redgum post and rail fencing remains. | High 3 | No known sites |
| | | Historical Infrastructure | Sugar Beet Museum | | |
| | Aboriginal | Artefact Scatters | | Low 1 | No known sites |
| | | Places of significance | Massacre site | | |
| Storm Water | Flood & Conveyance | Waterway Capacity | High conveyance capacity. Weir is used to control level, for irrigation and industrial extraction. | Moderate 2 | |
| | | Designated Floodways | | | |
| | | Flood Protection Infrastructure | | | |
| | Water Quality Treatment | Wetland treatment capacity | | Moderate 2 | High sediment separation and vegetative water treatment provided by wetland system |
| | | Other treatment infrastructure capacity -GPT's -Settlement Ponds | Quality treatment from reedbeds | | |
| Economic | Property | Proximity & access to water | Number of developing properties exists in close proximity | Mod 2 | Some benefits to property |
| | | Visual Amenity | Limited | | Limited |
| | Other | Water supply for irrigation | | Very High 4 | Bird watching supports tourism. Educational useage |
| | | Generation of Tourism | Surrounding parks and attractions draw many visitors per year, ie coach tours to the Museum, through travellers stopover. Family reunions. | | |
| | | Navigability of port activities | Canoe and Kayak touring. Maffra to Lake Glenmaggie. Beach launch at Bell Bird Corner. | | |

Threats to Stormwater Quality at Maffra

| Threat | Catchment | Threat Score | Threat Score | Threat Score | Threat Score | |
|---|---|---|--|---|---|--|
| | North West Maffra Urban to Macalister Swamp Reserve Sub-catchment (1) | | | | | South West Maffra Urban to Macalister River Sub-catchment (2) |
| Residential land Use | Fertilizer application | Predominantly residential land use. Litter is contributed from residential areas. Nutrients in sediments and leaf litter contained in urban runoff. Inappropriate discharge. | High 3 | Sub-catchment a good mix of residential, commercial and industrial land uses. Nutrients in sediments and leaf litter contained in urban runoff. Litter generated Car washing, direct to drains Inappropriate discharge. | Moderate 2 | Predominantly residential, some large farmland blocks in zoning. Litter is contributed from residential areas. Nutrients in sediments and leaf litter contained in urban runoff. Inappropriate discharge. |
| | Atmospheric deposition & build up of traffic | | | | | |
| | Lawn clippings | | | | | |
| | Poor waste management | | | | | |
| | Use of pesticides & herbicides | | | | | |
| | Poor household practice | | | | | |
| | Inappropriate discharge (eg carpet cleaners/paints/fuels) | | | | | |
| | Car washing | | | | | |
| | Residential littering | | | | | |
| | Eroding flows | | | | | |
| | Leaf litter | | | | | |
| Pet Droppings | | | | | | |
| Industrial Land Use Runoff | Poor waste management | No industrial use in this sub-catchment | Low 1 | This sub-catchment contains such industries as feed & grain, dairy processor, farm equipment etc. Also includes small, concentrated industrial activity. Includes sheet metal works, stockfeed, panel beating. Stockpile runoff a potential threat to stormwater systems. | High 3 | Small industrial use. |
| | Accidental spills | | | | | |
| | Inappropriate discharge (eg Fuels /Paints) | | | | | |
| | Vehicle wash-down | | | | | |
| | Stockpile runoff | | | | | |
| | Atmospheric deposition/dust | | | | | |
| | Sediment runoff | | | | | |
| | Industrial littering | | | | | |
| | Use of chemicals/sprays | | | | | |
| | Commercial Land Use Runoff | | | | | |
| Sediment runoff from CBD | | | | | | |
| Hydrocarbon Runoff • Carparks • Service stations • Auto services | | | | | | |
| Leaf litter | | | | | | |
| Poor commercial practices • Illegal dumping • Waste generation | | | | | | |
| Road Runoff | | Road run-off (oils/sediment) | Low volume travel, good quality roads, wide reserves | Low 1 | Some evidence of transported mud from vehicles in industrial zones | Moderate 2 |
| | Spillage from cartage | | | | | |
| | Sediment load from unsealed roads | | | | | |

| Threat | Catchment | North West Maffra Urban to Macalister Swamp Reserve Sub-catchment (1) | Threat Score | South West Maffra Urban to Macalister River Sub-catchment (2) | Threat Score | East Maffra Urban to Macalister River Sub-catchment (3) | Threat Score |
|-------------------------------------|--|---|--------------|--|--------------|--|--------------|
| | | | | | | | |
| Residential Developments | Poor sediment & erosion control | Low level of development | Low 1 | Small level of development | Low 1 | Some small scale residential building occurring. May contribute a range of construction site pollutants, and poor runoff quality treatment | Moderate 2 |
| | Uncontrolled washdown of equipment | | | | | | |
| | Vehicle and other spills from construction process (ie concreting) | | | | | | |
| Building Site Runoff (lot scale) | Poor sediment & erosion control | Low development in sub-catchment | Low 1 | Low development in sub-catchment | Low 1 | Low development in sub-catchment | Low 1 |
| | Uncontrolled washdown of equipment | | | | | | |
| | Vehicle and other spills from construction process (ie concreting) | | | | | | |
| | Rubbish from new building sites | | | | | | |
| Unstable & Degraded waterways | Eroding banks / outfalls | Banks of outfalls generally stable | Low 1 | Number of outfall drains, generally in stable condition. Unstable area around weir. | Moderate 2 | Number of outfall drains, generally in stable condition | Low 1 |
| | Poorly restricted stock and recreational access | | | | | | |
| | Weed infestation | | | | | | |
| | Damage from waterway works | | | | | | |
| | Unstable riparian zones | | | | | | |
| Flow Modification | Increased Flows | Large urban catchment, high percentage impervious | Mod 2 | Large urban catchment, high percentage impervious. Seasonal changes in water level, weir controlled. | Mod 2 | Large urban catchment, high percentage impervious | Mod 2 |
| | Channel Alteration – Weed removal | | | | | | |
| | Extraction of water (reduced flows) | | | | | | |
| Open Space & Sporting ground Runoff | Use of fertilizers | Sports facilities may generate small amounts of litter and nutrients. | Low 1 | Few open spaces to contribute pollutants | Low 1 | Few open spaces to contribute pollutants. Some hobby farm practise. | Low 1 |
| | Litter: • Skateboard park • Parklands | | | | | | |
| | Golf Course run-off | | | | | | |
| | Algal bloom | | | | | | |
| | Syringes | | | | | | |
| | Swimming Pools discharge | | | | | | |
| | Pet dropping | | | | | | |
| Landfill & Contamin | Landfill leaching (potential) | None | NA 0 | None | NA 0 | None | NA 0 |
| | Wind blown litter | | | | | | |
| | Sediment runoff | | | | | | |
| Septic & sewer leakage | Sewer overflows | Town is sewered. Instances of spills attributed to tree roots. | Moderate 2 | Town is sewered. Instances of spills attributed to tree roots. | Moderate 2 | Small area subject to flooding. Area is on septic system which in flood may transport contaminates to stormwater. | Moderate 2 |
| | Sewer spills | | | | | | |
| | Septic tank overflows | | | | | | |

Values of Receiving Waters at Stratford

| | | Catchment | | | | |
|---|--------------------------|---|--|-------------|---|-------------|
| | | Value Category | Avon River | Value Score | Blackall Creek | Value Score |
| Environmental | In-Stream Habitat | Water Quality | | High 3 | Has been known in the past for grey water problems. | Moderate 2 |
| | | Wildlife Biodiversity (variety/abundance) | Supports a variety of native fish, birds and other fauna species. Contains a variety of aquatic plant life | | Stagnant or low flows. Observable over activity of algal growth. Variety of in-stream vegetation. | |
| | | Land form Diversity (pools, runs, riffles.. rock bed, mud bed...) | Stream bed primarily consists of river pebble and stone. | | | |
| | | Introduced Species Invasion | | | | |
| | Riparian Habitat / Flora | Remnant Native Vegetation | Fair on bank habitat support provided by native vegetation | Moderate 2 | Fair on bank native vegetation. Generally a good riparian vegetation buffer zone. | Moderate 2 |
| | | Weed Infestation | | | | |
| Stability of Riparian zone | | | Has been observed to be susceptible to instability | | | |
| Amenity | Recreational Amenity | Water Quality | Clear, and conducive to contact. | Very High 4 | Not generally considered to be conducive to contact | Low 1 |
| | | Water Depth | Varies, some parts depth is great enough for boating & swimming | | | |
| | | Boating | | | | |
| | | Swimming | Swimming is popular around Apex Park. Open spaces on riverside | | Generally only at the merge with the Avon. | |
| | | Fishing/ bird watching | Fishing popular | | Little observable vantage points for bord watching. | |
| | | Shared Trails | | | Limited | |
| | | Access – Formal Linkages | Road access to river side | | Generally poor access in the urban area | |
| | | Facilities – Car parks, picnic areas etc. | Car park at Apex Park adjoining Avon River. Contains play equipment and BMX track. | | Limited | |
| | Visual/Landscape Amenity | Water Quality | Clear. | Very High 4 | Stagnant, algal covered. | Moderate 2 |
| | | Passive enjoyment | Visually attractive | | Limited | |
| | | Visual access | Sweeping views can be gained from a number of vantage points in Stratford. Of particular interest is the full view gained which crossing the town entry/exit bridge. | | Limited | |
| | | Natural Structures | | | | |
| | | Man Made Structures | | | | |
| | | Relationship with other facilities | Close to CBD. Forms boundary of township. | | Forms the boundary to the urban area. Merrick Street adjoins creek | |
| Facilities – Car parks, picnic facilities | | Car parks, picnic and play areas provided | Some open spaces exist between residences and the Blackall Creek. | | | |

| | | Catchment | | Value Score | Value Score | |
|--------------------|-------------------------|--|---|-------------|--|----------------|
| | | Value Category | Avon River | | | Blackall Creek |
| Cultural | Non-Aboriginal | Pioneering/ Historical Significance | No known sites | 2 | No known sites | 1 |
| | | Historical Infrastructure | | Mod | | Low |
| | Aboriginal | Artefact Scatters | | 1 | | 1 |
| | | Places of significance | Contains The Knob Recreational Reserve, downstream of the township. | Low | No known sites | Low |
| Storm Water | Flood & Conveyance | Waterway Capacity | Very high flood receiving capacity. | High 3 | Very high flood receiving capacity, with steep banks in its lower reaches. | 2 |
| | | Designated Floodways | | | | |
| | | Flood Protection Infrastructure | | | | |
| | Water Quality Treatment | Wetland treatment capacity | Low | 1 | Low | 1 |
| | | Other treatment infrastructure capacity -GPT's -Settlement Ponds | | | | |
| Economic | Property | Proximity & access to water | Some properties gain small benefits to property values gained from vantage points. | Mod 2 | Limited | 1 |
| | | Visual Amenity | High for property | | Moderate | |
| | Other | Water supply for irrigation | Upstream irrigation use. | High 3 | Little. | 1 |
| | | Generation of Tourism | Important for tourist purposes, town promoted as 'Stratford on the Avon'. It is also popular for gemstone mining. | | | |
| | | Navigability of port activities | | | | |

Threats to Stormwater Quality at Stratford

| Threat | Catchment | | Threat Score | | |
|----------------------------|--|--|--------------|---|------------|
| | North Stratford Urban to Blackall Creek Sub-catchment (1) | South Stratford Urban to Avon River Sub-catchment (2) | | | |
| Residential land Use | Fertilizer application | Sub-catchment is primarily residential, with a number of outfalls to Blackall Creek. Household chemical usage on flood plain has potential to be carried through to the creek in flood. Inappropriate discharge to drainage system. Drainage can produce eroding flows | Moderate 2 | High proportion of residential land use in this sub-catchment. Household chemical usage on flood plain has potential to be carried through to the creek in flood. Inappropriate discharge to drainage system. | Moderate 2 |
| | Atmospheric deposition & build up of traffic | | | | |
| | Lawn clippings | | | | |
| | Poor waste management | | | | |
| | Use of pesticides & herbicides | | | | |
| | Poor household practice | | | | |
| | Inappropriate discharge (eg carpet cleaners/paints/fuels) | | | | |
| | Car washing | | | | |
| | Residential littering | | | | |
| | Eroding flows | | | | |
| | Leaf litter | | | | |
| Pet Droppings | | | | | |
| Industrial Land Use Runoff | Poor waste management | No industrial activity in this sub-catchment. | Low 1 | Includes industries such as fabricators, plumbers, earth movers, stock feeds, masonry products. Many of which have real potential for stormwater contamination from site runoff , and inappropriate discharge . | Moderate 2 |
| | Accidental spills | | | | |
| | Inappropriate discharge (eg Fuels /Paints) | | | | |
| | Vehicle wash-down | | | | |
| | Stockpile runoff | | | | |
| | Atmospheric deposition/dust | | | | |
| | Sediment runoff | | | | |
| | Industrial littering | | | | |
| | Use of chemicals/sprays | | | | |
| Commercial Land Use Runoff | Litter: <ul style="list-style-type: none"> • CBD • Carparks • Street Bins (open tops & skips) • Businesses | Very small commercial area use in sub-catchment | Low 1 | Small commercial land use area. Some generation of litter identified. | Moderate 2 |
| | Sediment runoff from CBD | | | | |
| | Hydrocarbon Runoff <ul style="list-style-type: none"> • Carparks • Service stations • Auto services | | | | |
| | Leaf litter | | | | |
| | Poor commercial practices <ul style="list-style-type: none"> • Illegal dumping • Waste generation | | | | |
| | | | | | |
| Road Runoff | Road run-off (oils/sediment) | Lightly travelled road system, generally good quality roads. | Low 1 | Low trafficked local roads system. Sub-catchment includes highway. | Low 1 |
| | Spillage from cartage | | | | |
| | Sediment load from unsealed roads | | | | |
| Residential Developments | Poor sediment & erosion control | Limited development | Low 1 | Little development | Low 1 |
| | Uncontrolled washdown of equipment | | | | |

| Threat | Catchment | | Threat Score | Threat Score |
|--|--|--|--------------|--------------|
| | North Stratford Urban to Blackall Creek Sub-catchment (1) | South Stratford Urban to Avon River Sub-catchment (2) | | |
| Vehicle and other spills from construction process (ie concreting) | | | | |
| Building Site Runoff (lot scale) | Poor sediment & erosion control Uncontrolled washdown of equipment Vehicle and other spills from construction process (ie concreting) Rubbish from new building sites | Limited development | Low 1 | Low 1 |
| Unstable & Degraded waterways | Eroding banks / outfalls Poorly restricted stock and recreational access Weed infestation Damage from waterway works Unstable riparian zones | Overland discharge to Blackall Creek produces scouring and saturation. May contribute to high sediment loads and channel alteration. Some willow removal has occurred . | High 3 | Moderate 2 |
| Flow Modification | Increased Flows Channel Alteration – Weed removal Extraction of water (reduced flows) | Large urban catchment, high percentage impervious | Moderate 2 | Moderate 2 |
| Open Space & Sporting ground Runoff | Use of fertilizers Litter: • Skateboard park • Parklands Golf Course run-off Algal bloom Syringes Swimming Pools discharge Pet dropping | Little contribution. | Low 1 | Moderate 2 |
| Landfill & Contaminated Sites | Landfill leaching (potential) Wind blown litter Sediment runoff | None | NA 0 | NA 0 |
| Septic & sewer leakage | Sewer overflows Sewer spills Septic tank overflows | History of grey water problem, town is now sewered. Few spills have been recorded. | Mod 2 | Mod 2 |

Values of Receiving Waters at Rosedale

| | | Catchment | | Value Score | | Value Score | |
|---|--------------------------|---|--|---|---|-------------------------------------|---------------|
| | | Value Category | Blind Joes Creek | | Latrobe River | | |
| Environmental | In-Stream Habitat | Water Quality | | Moderate 2 | Large catchment, including urban and rural land. Degraded water quality consistent with its make up of urban and rural land. | Moderate 2 | |
| | | Wildlife Biodiversity (variety/abundance) | Low marsh areas of creek contain abundant aquatic vegetation, and support a variety of water bird species. | | Limited habitat support for wildlife. Some native species are present. Little aquatic vegetation. | | |
| | | Land form Diversity (pools, runs, riffles.. rock bed, mud bed...) | Mix of section width and depths, much of lower sections of stream has been channelised, most of bed is mud and silt. | | Majority of the River system is made up of runs, although there are a range of backwater billabongs and pools which evolve with rise and fall of water level. Many sticks and debris available for habitat support. | | |
| | | Introduced Species Invasion | | | Carp generally out-compete in this environment | | |
| | Riparian Habitat / Flora | Remnant Native Vegetation | Patches contain native vegetation. Very little downstream of Rosedale | Moderate 2 | Few natives, small riparian zone. | Low 1 | |
| | | Weed Infestation | Abundant in channel vegetation chokes waterway | | Willow present. | | |
| | | Stability of Riparian zone | In many areas grazing has left banks unstable. | | | | |
| | Amenity | Recreational Amenity | Water Quality | Not conducive to primary contact | Low 1 | High turbidity | Moderate 2 |
| | | | Water Depth | Generally low, some locations of up to 1 metre. | | Deep, fast flowing | |
| | | | Boating | None | | Some boating activity is available. | |
| Swimming | | | None | Swimming is generally discouraged due to underwater snags and strong currents. | | | |
| Fishing/ bird watching | | | Some good bird watching available, although not generally utilised. | Some fishing, limited bird watching | | | |
| Shared Trails | | | Limited | Limited. | | | |
| Access – Formal Linkages | | | Limited | Formal access is provided by road to small number of locations close by to Rosedale. | | | |
| Facilities – Car parks, picnic areas etc. | | | Limited | Some car park, and picnic facilities are available. Open space adjoins River to support non contact recreation. | | | |
| Visual/Landscape Amenity | | Water Quality | Generally of degraded appearance | Low 1 | High colour (mud) | Moderate 2 | |
| | | Passive enjoyment | Limited | | | | |
| | | Visual access | Limited, although most prominent through centre of township. | | Latrobe River backs on to the grazing plains and provides a visually attractive landscape. | | |
| | | Natural Structures | | | | | |
| | | Man Made Structures | | | | | |
| | | | | | | | |

| | | Catchment | | | |
|-------------|-------------------------|--|---|-------------|--|
| | | Value Category | Blind Joes Creek | Value Score | Latrobe River |
| | | Relationship with other facilities | | | Provided |
| | | Facilities – Car parks, picnic facilities | | | |
| Cultural | Non-Aboriginal | Pioneering/ Historical Significance | No known sites | Low 1 | No known sites |
| | | Historical Infrastructure | | | Low 1 |
| | Aboriginal | Artefact Scatters | | Low 1 | |
| | | Places of significance | No known sites | Low 1 | No known sites |
| Storm Water | Flood & Conveyance | Waterway Capacity | Creek is part of a flood plain. Much of creek has been channelised with lower flood capacity. | Low 1 | High |
| | | Designated Floodways | | Low 1 | High 3 |
| | | Flood Protection Infrastructure | | | |
| | Water Quality Treatment | Wetland treatment capacity | Some treatment provided by in-stream processes. | Low 1 | |
| | | Other treatment infrastructure capacity -GPT's -Settlement Ponds | | Low 1 | Low 1 |
| Economic | Property | Proximity & access to water | Generally little economic benefit | Low 1 | Farming properties abut |
| | | Visual Amenity | | | Mod 2 |
| | Other | Water supply for irrigation | Stock watering | Moderate 2 | Main river system. Transfers runoff to Gippsland Lakes. Stock watering |
| | | Generation of Tourism | | | |
| | | Navigability of port activities | | | |