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Mildura Stormwater Quality Improvement Plan 2009 - 2014

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Mildura Stormwater Quality Improvement Plan 2009

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1 INTRODUCTION

An Urban Stormwater Quality Improvement Plan (SWQIP) provides a framework for integrating stormwater quality management into Council's existing management and planning activities. In this regard, a SWQIP should provide the basis for an ongoing process aimed at protecting and enhancing receiving water values threatened by stormwater Run-off.

BMT WBM was commissioned by Mildura Rural City Council (MRCC) to review and revise their existing SWQIP (SKM, 2001a[1]). The aims of this process were to:

- review the receiving waters, receiving water values and threats to the receiving waters identified in the 2001 Plan;
- reflect the progress achieved by Council in meeting the identified priority management actions;
- identify successes and failures in the implementation of reactive management and management framework strategies;
- incorporate new knowledge and understanding of stormwater quality management issue and changes to best management practices for improving urban stormwater quality; and
- guide Council over the next implementation period for improving the environmental management of stormwater quality across its urban centres through.

1.1 Report Outline

The report structure and contents are outlined below:

Chapter 2: Discusses the evolution of stormwater management in Victoria post the completion of the initial Stormwater Quality Improvement Plan and explains the role of Mildura Rural City Council in stormwater planning;

Chapter 3: Describes the process undertaken as part of the review of the SWQIP and an overview of the internal workshops conducted;

Chapter 4: Describes the study area covered as part of the SWQIP;

[1] The now superseded Stormwater Quality Management Plan (SKM, 2001a) contains a number of inconsistencies with respect to the terminology used to describe its intent and contents. The terms " Stormwater Management Plan" (SWMP), "Urban Stormwater Quality Management Plan" and "Stormwater Quality Improvement Plan" are used interchangeably in the SKM (2001a) document. While written as part of the broader Sunraysia Drainage Strategy (SKM, 2001b), the "Management Plan for the Improvement of Urban Stormwater Quality" focuses solely on stormwater quality issues. In accordance with the project brief and the focus of the 2001 Plan, this review has been undertaken to only consider urban stormwater quality management issues in the MRCC municipality. The term "Stormwater Quality Improvement Plan" (SWQIP) has therefore been adopted to reflect the focus and scope of this report.

Chapter 5: Provides an overview of the work undertaken, to date, on the structural and non-structural tasks identified in the 2001 SWQIP;

Chapter 6: Provides an overview of the work undertaken, to date, on the management framework actions identified in the 2001 SWQIP. The chapter also provides a series of recommendations on the way forward for MRCC;

Chapter 7: Describes the receiving environments (natural and constructed) and their associated values and threats;

Chapter 8: Lists the reactive stormwater management strategies for the SWQIP;

Chapter 9: Lists the management framework improvement strategies for the SWQIP; and

Chapter 10: Provides an overview of the way forward for Mildura Rural City Council and plan implementation.

2 URBAN STORMWATER QUALITY MANAGEMENT

The impacts of urbanisation on the natural water cycle are many and varied. The most obvious is on rainfall-run-off regimes and occurs because of alterations to land surfaces. Land clearing and the construction of impervious surfaces, such as roofs and paved areas, characterise urban development. Paved surfaces serve to limit and, in most cases, prevent infiltration of rainfall and dramatically reduce the attenuation and retention of surface flows. These two outcomes result in increased surface run-off volumes, increased peak flows and reduced times to peak flow.

However in addition to altered run-off patterns, urbanisation also leads to the introduction of numerous sources of pollution that are captured in stormwater flows and delivered to downstream receiving environments, such as rivers and wetlands. Their accumulation within those environments can result in severe and sometime irreversible impacts. Stormwater pollution can not only have significant consequences for plant and animal species of the receiving environments but also lead to flow-on affects that ultimately adversely impact on local communities as well. A summary of the range of potential pollutants and their impacts is included in Table 2-1.

Table 2-1 Key Potential Stormwater Water Pollutants

Source: Adapted from (Breen and Lawrence, 2005) and (Mitchell et al., 1998)

Contaminant Classification	Contaminants	Impacts
Toxicants	Heavy metals, hydrocarbons, pesticides, ammonia	Toxic to plants and animals and ecologically detrimental to the health of all species. Many toxicants accumulate in the environment or in organisms themselves
Nutrients	Phosphorus, nitrogen, carbon	Increased plant and algal growth leading to odours, reduced available oxygen and potential for eutrophication. Some algal species can be toxic to humans and other aquatic life
Oxygen-Demanding Substances	Organic material biochemical oxygen demand, ammonia, hydrocarbons, sulphides	Decreased oxygen limits organisms' abilities to survive in water bodies. Sufficient depletion can lead to mass kills of aquatic species such as fish, and macro invertebrates
Physical Pollutants	Suspended solids	Limits sunlight penetration into the water column and decrease plant growth. Suspended particles often carry with them other pollutants sorbed onto their surface. Settling solids can smother bottom dwelling organisms and alter flow paths and regimes
Microbial Pathogens	Enteric viruses, bacteria, protozoa, helminths	Transmission of water borne diseases
Aesthetic Pollutants	Gross pollutants and litter, hydrocarbon, nuisance algal-related scums, anaerobic-related scums and odours	Influence attitudes and perceptions to and of water quality and cause short term toxicity issues
pH Altering Substances	Acidic and basic chemicals	Impacts on ecosystem health

2.1 The Evolution of Urban Stormwater Management

While this plan focuses on urban stormwater quality issues it is beneficial to briefly outline the changes that have taken place with respect to urban stormwater management in Australia, in order place stormwater quality issues in their appropriate context.

The last three decades have seen significant changes to the planning, management and delivery of urban stormwater services. While the issue of flooding remains a key concern, recognition of the impacts of urban stormwater quality and quantity on receiving environments has led to a broader focus of stormwater management and planning considerations. In more recent years drought has also become a major driver of change; it has added increased impetus to water usage efficiency and has seen the adoption of strategies such as rainwater and stormwater harvesting to meet the water demands of urban centres.

The traditional approach to urban stormwater management was to facilitate its rapid removal, via networks of efficient hydraulic structures, such as pipes, channels and culverts, to minimise flood risk to human life and property. Two distinct changes have occurred over the last thirty years in attitudes and approaches to stormwater management. The first began in the 1970's, when a shift away from the rapid removal of stormwater, from urban areas, occurred and practices such as detention, retention and recharge gained popularity. This change coincided with the emergence of the view that stormwater could be utilised as a potential resource rather than being treated as waste product.

The second change took place during the 1980's and 1990's when the impacts of stormwater pollution began to be recognised. Stormwater managers began to adopt source control measures for flow attenuation and treatment using devices such as natural or constructed ponds, Wetlands and swales.

2.1.1 Water Sensitive Urban Design

The most significant shift that has taken place in Australian stormwater management practices has been the rise and adoption of the philosophy of Water Sensitive Urban Design (WSUD).

While often implemented as individual strategies, such as constructed wetlands, swales and vegetated watercourses, WSUD in its holistic context is a planning philosophy. WSUD was developed in Western Australia in the early 1990's with the aim of integrating water cycle management with the specific consideration of the ecological impacts and resource potential of urban stormwater.

This focus of WSUD is clearly highlighted in the following summary of its published objectives, drawn from two well recognised Australian authors, Lloyd (2001) and Mouritz (2005). These objectives are as follows:

- improvement of water quality throughout urban catchments;
- restoration and/or preservation of more natural hydrological regimes in urban catchments;
- improved visual and recreational amenity of urban environments;
- the use of urban stormwater as a resource;

- minimisation of wastewater generation and the development of reuse schemes; and
- the reduction of potable water demand through demand management and substitution with alternative water source of a quality and standard commensurate with end-use.

2.2 Stormwater Quality Management Planning

Stormwater management is concerned with the development and implementation of a range of strategies to minimise the impacts of stormwater pollution and protect the values of the receiving environment. These strategies can include a range of site-specific structural and non-structural measures as well as plans, policies and procedures aimed at managing activities that could potentially alter flow patterns or pollute stormwater. Structural measures refer to physical works undertaken to either reduce the volume of stormwater generated or treat stormwater Run-off to remove pollutants. Non-structural measures include the application of a range of planning controls, management practices and education programmes to prevent stormwater pollution from being generated.

A well developed SWQIP will not only identify and address existing and potential stormwater management issues but do so in the context of the protection of receiving water values that have been defined in partnership with the community and other relevant stakeholders.

2.3 The Role of Local Government

Local government plays an important role in managing stormwater at a local and precinct level. Local government's day to day management functions with respect to land use planning, infrastructure and the provision of services provide an ideal basis for managing stormwater to achieve local and regional environmental outcomes. In this regard, stormwater management activities usually occur within local government via:

- the implementation and management of infrastructure, programs and plans specifically aimed at mitigating identified stormwater pollution threats (e.g. a gross pollutant trap); and
- ongoing day to day activities which form a part of Council's management framework including planning, coordination, communication, development approvals, policy, regulation and education.

The first of these activities can be labelled as reactive stormwater management, while the second can be labelled as pro-active. A key motivating factor for Councils to address and refine their management frameworks, with respect to improved stormwater management, is the potential for reducing the need to undertake reactive stormwater management.

3 STORMWATER MANAGEMENT REVIEW PROCESS

A key feature of the study process was the involvement and consultation with Council staff. A series of individual meetings with Council staff members, two workshops and a field visit, were central to the review MRCC's SWQIP. The workshop participants are detailed in Table 3-1.

Table 3-1 Workshop Committee Members and their Associated Roles

Workshop Participant	Role
Andrew Powell	Water Management Officer
Michael Vaughan	Infrastructure Services Co-ordinator
Mark Jenkins	Manager Environmental Services
Lee Jones	Team Leader Infrastructure Design
Malcolm Hare	Manager Health and Local Laws
Geoff Gunn	Manager Infrastructure

Internal Council involvement and commitment as part of the SWQIP's development is critical to its ultimate ability to achieve the proposed SWQIP objectives. In this regard, the Council staff members played a critical role in:

- defining receiving environmental values;
- identifying local issues relevant to stormwater management; and
- revisiting the prioritisation of values and threats, assessing risks and developing the overall strategy.

3.1 Internal Workshop 1

The key objectives of the first workshop were to:

- Discuss:
  - staff's understanding of the basic principles of stormwater pollution and management;
  - key stormwater management issues in Mildura and other urban centres;
  - Council's stormwater quality management strengths and weaknesses;
  - opportunities for improving stormwater management; and
  - the way forward for Mildura Rural City Council.

- Revisit:
  - receiving water identification;
  - receiving water values; and
  - threats to receiving waters.

In addition, general discussions on the following topics also took place:

- what individuals required from a stormwater quality improvement plan;
- where stormwater quality sits as a priority within Council;
- how individuals envisage their own use/interaction with the plan;
- what has been done in Mildura with respect to stormwater quality improvement;
- program elements that have worked well and achieved their intended goals;
- what is required for continuing to improve the management of stormwater quality, eg. permit conditions, enforcement?; and
- future directions for stormwater quality management.

All workshop participants were encouraged to provide input and openly discuss issues, enabling the study team to gain a better understanding of stormwater management within the municipality.

3.2 Internal Workshop 2

In the second workshop, the main points of discussion were:

- the breakdown of completed reactive management framework strategies;
- the revision of identified actions;
- the identification of new actions based on successes and failures;
- the next implementation period and the need to focus on Council's planning framework, education, training; and
- the future directions of stormwater management and integrated urban water management.

During the second workshop, Council members were given a list of the completed reactive management strategies and were asked to rate the importance of each, from very high to low, with respect to their own role within Council and also from the perspective of Council overall function.

3.3 Individual Meetings

Following the Steering Committee Meetings, a number of individual meetings were held with selected Council staff to gain further insight on information received during the steering committee meetings.

Further meetings were held with:

- Melanie Bell – Biodiversity Officer
- Michael Vaughan – Infrastructure Services Co-ordinator

- Sarah Nickas – Strategic Planner
- Mark Jenkins – Manager Environmental Services
- Andrew Powell – Water Management Officer

4 MILDURA RURAL CITY COUNCIL LOCALITY AND CHARACTERISTICS

4.1 Study Area

The Mildura Rural City municipality is situated in North-West Victoria. It covers approximately 10 percent of the State's total area (22,330 sq km) and has a population in excess of 50,000 people. The municipalities' landscape ranges from precious Mallee vegetation to grain farms, intensive horticulture, vibrant towns and the iconic Murray River. Figure 4-1 illustrates the municipal boundaries of the Council.

Mildura is the major urban centre within the municipality; however, there are a number of satellite townships distributed throughout the region. The City itself has two major commercial centres, the central business district, comprising the major commercial and industrial areas within the municipality, and a shopping district, located in the Fifteen Street precinct.

The major industries within the Mildura region are agriculture (15%), retail (13%), manufacturing (10%) and health and community Services (10%). The Mildura region is responsible for the production of a high percentage of Australia's agricultural produce. The region accounts for the production of approximately 95% of the Country's total dried vine fruit, 69% of it table grapes and 55% of its almonds. Other crops grown in the region include pistachios, olives, carrots, asparagus and citrus fruit.

In addition to Mildura, the SWQIP focuses on urban areas within regional Mildura and includes the townships of Merbein, Irymple, Ouyen and Red Cliffs. Table 4-1 lists these townships along with their population size.

Table 4-1 Urban Centres in Mildura and Populations

Urban Centre	Urban population*
Mildura Urban	30,016
Merbein	1,974
Irymple	5,740^
Red Cliffs	2,736
Ouyen	1,155

* Data obtained through the 2006 census data at www.censusdata.abs.gov.au

^ Population for the suburb, not urban only.

The major waterway in the Mildura region is the Murray River. In addition there are a number of significant natural Wetlands and billabongs scattered across the municipality, including Kings Billabong, Basin 12, Merbein Common, Lake Ranfurly East and Lake Hawthorn.

Figure 4-1 Mildura City Council Locality Boundaries

Capital works, carried out as part of the previous SWQIP's management action program, have seen the development of three constructed Wetlands to address stormwater quality issues. The constructed Wetlands developed are the Etiwanda, Bob Corbould and Mildura South Wetlands.

4.2 Subcatchment Breakdown

For the purposes of this study, the region has been separated into urban centres, to simplify assessments and provide a basis for developing management strategies. Using this approach, 5 separate study subcatchments have been defined. These subcatchments and their receiving environments are identified in Table 4-1. Additionally, these subcatchment and receiving environments (data available permitting) are shown in Figure 4-2.

Table 4-2 Subcatchments Defined for the Stormwater Quality Improvement Plan

Area	Land use	Receiving Environment
Mildura	• Residential/Commercial/Industrial • Residential/Industrial • Residential • Residential Mildura South	• Direct to Murray River from urban drains • Etiwanda Wetland then to the Murray River • Bob Corbould Wetland, Lake Ranfurly • Lake Hawthorn via Mildura South Wetlands Drainage Scheme
Merbein	• Residential/Commercial/Industrial	• Flows to Merbein Common to floodplain. Water is not expected to get as far as the Murray unless there are high flows
Ouyen	• Residential/Commercial/Industrial	• Stormwater Storage basins at: ➢ Mallee Highway ➢ Basin past Saleyards ➢ Jardine Park
Red Cliffs	• Residential Commercial Light Industrial	• Stormwater is discharged mainly into Basin 12 which is a floodplain wetland. At High levels basin 12 water flows to the Murray River via pipeline.
Irymple	• Residential/Commercial/Industrial	• Lake Ranfurly[2]

[2] Proposed alterations to the existing drainage network will see the diversion of some flows currently discharge to Lake Ranfurly diverted to Lake Hawthorn via the Mildura South Drainage Scheme located adjacent to Deakin Avenue

Figure 4-2 Subcatchments and Drainage Basins

5 A REVIEW OF MRCC'S URBAN STORMWATER QUALITY MANAGEMENT PROGRAM

With the passage of six years since the completion of the first Management Plan for Water Quality Improvement, a review was initiated by Council to consider changes in the receiving water environments, actions undertaken (identified in the previous plan), and developments in other programmes that are relevant to the management of stormwater. Review and revision of the MRCC Plan for Water Quality Improvement provides an opportunity to identify additional stormwater management strategies and options that can be implemented, particularly in the context of new and emerging stormwater management techniques. It also provides the opportunity to design a new approach to integrated stormwater conservation and management that reflects the priorities of Mildura and surrounding communities.

5.1 A Management Plan for Water Quality Improvement for MRCC

The Sunraysia Drainage Strategy and Urban Stormwater Quality Improvement Plan was developed in 2001 (SKM, 2001b). As part of the production of this major document, a summary plan entitled "A Management Plan for Water Quality Improvement for Mildura Rural City Council" was prepared (SKM, 2001a). The plan identified (through a series of stakeholder workshops) a number of stormwater issues, values and activities that posed threats to stormwater quality. Using the values and threats a risk assessment and prioritisation was undertaken to prioritise stormwater management issues.

The priority management issues listed in the 2001 plan were as follows:

- *Industrial Run-off to the Murray River above Lock 11*
- *Sullage and Septic Tank Effluent from Kings Billabong Low Density Residential Zone*
- *Degraded Waterways (Murray River and Kings Billabong)*
- *Commercial Run-off from Pine Avenue Drain Lock 11*
- *Residential Run-off above Lock 11*
- *Residential Run-off below Lock 11*
- *Run-off from Urban Development Sites (all catchments)*
- *Inflows to Wargan Basins and Lakes Ranfurly and Hawthorn*
- *Sullage and Septic Tank Overflows (all catchments)*
- *Residential Run-off to Lake Ranfurly East*
- *Commercial Run-off from 15th Street Precinct to Lake Ranfurly East*
- *Road Run-off from Deakin Avenue and 15th Street Precinct to Lake Ranfurly East*

- *Industrial Run-off from Irymple*
- *Run-off from Lot Scale Construction Sites (all catchments)*
- *Rural Residential Run-off from Kings Billabong LDRZ*
- *Run-off from Open Spaces, Parks and Gardens (all catchments)*
- *Residential Run-off to Lake Hawthorn*
- *Road Run-off in Lake Hawthorn, the Murray River Below Lock 11 and Other Areas*
- *Industrial Run-off from Merbein to Murray River*
- *Residential Run-off to Bob Corbould Wetlands*

Following the identification of management issues the plan lists a set of reactive and Council management framework strategies devised to address the issues.

The strategies identified by SKM (2001) were:

1. Improve Council's planning framework to enable integrated stormwater management;
2. Improve coordination of stormwater management between Council and other relevant authorities;
3. Improve site management of construction activities;
4. Increase awareness of stormwater management and facilitate community participation in stormwater management;
5. Improve Run-off from open spaces, parks and gardens;
6. Improve sullage and septic tank effluent in low density areas;
7. Reduce road Run-off from high use areas to the Murray River; and
8. Improve site management of industrial, residential and commercial activities.

A series of management actions were developed to enable Council to implement the proposed strategies. These actions were categorised as either reactive management actions of as management framework actions. A full list of the adopted actions can be found in the SKM (2001a) Plan.

5.1.1 Stormwater Management Action Implementation

Since the adoption of the Plan for Stormwater Quality Improvement (SKM, 2001a) a number of the identified actions have been implemented. These are briefly discussed below.

5.1.1.1 Water Management Officer

Mildura Rural City Council employed a stormwater officer to implement the MRCC urban stormwater quality improvement plan. The duties undertaken by the stormwater officer have included:

- environmental assessment of new development proposals;
- implementation of stormwater education and training programmes for Council staff;
- facilitation of stormwater information sessions for industry and development groups;
- coordination of educational material, literature and guidelines for the local community and schools to raise community awareness;
- monitoring and review of the Stormwater Quality Improvement Plan implementation.

5.1.1.2 Structural Actions

With respect to implementation MRCC has made excellent progress with the of structural based management action identified in the SKM (2001a) Plan. In particular a number of major constructed wetland projects have been undertaken to improve stormwater quality prior to its discharge to receiving waters. The Etiwanda Wetlands is the largest these wetland projects undertaken. The Wetlands themselves are located on the corner of Cureton Avenue and Etiwanda Avenue. The 16 ha site receives flows from both the Etiwanda and San Mateo drains, which themselves receive Run-off from a large proportion of Mildura's industrial and commercial areas.

All gross pollutant traps listed in the SKM (2001) Plan have been installed and are listed in Table 5-1.

Table 5-1 MRCC Gross Pollutant Traps

Mildura	
• Hugh King Drive 1 (GPT01)	• Golf club drain at entrance to Mildura Landfill (GPT06)
• Hugh King Drive 2 (GPT02)	• Fourteenth Street (GPT07)
• Lock 11 (GPT03)	• Fifteenth Street (GPT08)
• Homestead (GPT04)	• Ontario Avenue (GPT11)
• Bob Corbould Wetlands(GPT05)	
Red Cliffs	
• GPT09 Red Cliffs	
Merbein	
• GPT10 Main Avenue	• GPT12 Foster Street

In conjunction with the installationof the GPTs, MRCC has set in place sound management practices for their maintenance and cleaning. These procedures have been documented in the MRCC GPTs manual (MRCC, 2005).

In addition to constructed wetland and GPT instillation the following additional structural actions, identified in the 2001 Plan, have been completed

- Drain stencilling (Attachment 1);
- The development of street and side entry pit signs;
- Incorporation of wetland treatment, grass swales and local detention systems on the Sixteenth Street drain; and
- Commenced a works programmes for rectifying bank erosion around stormwater outlets.

5.1.1.3 Non-Structural Actions

A large number of non-structural activities were recommended in the SKM (2001a) Plan, the following points summarise the actions implemented:

- Council has established long-term consultation and coordination with the EPA and NRE;
- Council, in consultation with the EPA and State Emergency Services, have updated their Emergency Response Plan to ensure the protection of the stormwater drainage systems in the event of an emergency and carry out appropriate workshops for emergency and operations staff (MRCC 2005). Council have also purchased a Stormwater Emergency Spill Response Kit;
- Site audits have been undertaken in the Etiwanda industrial catchment (MRCC 2003). The aim of the project was to improve the quality and management of discharges from commercial and industrial premises in the study area to the stormwater system. This was achieved by identifying actual or potential threats to waterway quality from commercial and industrial stormwater discharges, raising awareness among commercial and industrial proprietors of best practice management of wastewater and stormwater and thereby improve water quality. A total of 463 first round inspections were undertaken which covered a range of different types of commercial/industrial premises. Many initial visits revealed potential or actual hazards to stormwater. Approximately 20 % of premises audited had stormwater issues/concerns identified with 15 % of premises warranting a follow-up audit. The most common issue encountered related to vehicle washing (MRCC 2003);
- Implemented a Waste Management Plan to address Sullage and Septic Tank Effluent from Kings Billabong Low Density Residential Zone;
- Signs have been erected to inform the community on GPTs (Figure 5-1). Signage in strategic locations to inform the public regarding infrastructure are a great initiative. The issues with the current signs erected are mainly to do with the amount of information provided. The general public would read the sign and assume that the GPT is the solution. Information should be provided on what is coming down the drain, from what areas, other Council initiatives, what is stormwater, what are we trying to protect, and that all chemical, nutrients and oils inadvertently find their way into drains. An example of a stormwater education river sign from the City of Greater Geelong is provided in Appendix A;

Figure 5-1 Gross Pollutant Trap Education Sign

- Implemented schools programmes and commenced "The Water Pollution Fairy School Plays" (Attachment 2);
- Used television advertisements to highlight the importance of water saving and stormwater pollution;
- Prepared brochures on 'Best Practice Guidelines for Building Site Management' and 'Stop your Water Going Down the Drain (Attachment 3);
- Conducted workshops for Council staff involved in the referrals process to ensure appropriate conditions that support best practice management are incorporated into planning permits;
- Determined the applicability of different Water Sensitive Design principles given the unique characteristics in Mildura for all new developments; and
- Developed and enforced a new local law based on the Department of Infrastructure Code of Practice for the protection of Council Assets and Control of Building Sites.

5.1.1.4 Awards and Recognition

The work undertaken by MRCC to improve stormwater quality and protect receiving waters has been recognised in a number of awards:

- SIA Award for stormwater Innovation in Education – Winner 2004
- SIA Award for Stormwater Innovation in Education - Merit 2006
- Finalist Regional Achievement awards for Environment and sustainability 2006 (Ballarat)
- Tidy Towns Award 2007 for Wetlands and Water Ambassadors Mildura West School
- Semi finalist Regional Achievement Awards for Environment and Sustainability 2007 (Bendigo)
- Mildura Rural City Council Business Excellence award for Proactive Leadership in Water Management 2007

5.1.2 Identified Action Awaiting Implementation

A number of tasks identified in the SWQIP (2001a) were not completed during the 2001 – 2007 implementation period. Non-completion of these tasks was attributed to a combination of factors including time constraints, insufficient funds, coordination difficulties, ongoing relevance and communication issues.

The tasks and actions not implemented are presented in Table 5-2. During the second workshop, held as part of the review process, each participating member was asked to rate the remaining tasks from very high to low[3]. The ratings were collated and are provided in Table 5-2. The results indicate that the remaining tasks are still relevant to Council's operation and that they should be incorporated into the revised SWQIP.

Table 5-2 Revised Management Action Rankings (not completed 2001-2007)

Management Actions (Categorised by Management Issue)	Rating by Council
Generic Non-structural Measures	
1. Promote rainwater tanks and grey water use	VH-H
2. Education for residents on septic tank maintenance.	H
Industrial Run-off to the Murray River above lock 11	
3. Council to conduct site audits and inspections. Develop appropriate guidelines to help reduce stormwater impacts	VH
4. Council initiated workshops with industry to highlight best practice management	VH
5. Encourage industries and new development proposals to develop EMP's	H
6. Develop literature and guidelines targeted at industry to highlight issues associated with stormwater Run-off and identify areas where industry can help reduce stormwater impacts using best practice management	H
Road Run-off from Deakin Avenue, Seventh Street and Sturt Highway to Murray River above lock 11	
7. Liase with Vic Roads to ensure new roads and road upgrades incorporate water sensitive road design features such as grass swales and collector traps	M-H
8. Investigate options for retro fitting major highways with grass swales and detention structures	M
Sullage and Septic Tank Effluent from Kings Billabong Low Density Residential Zone	
9. Ensure future development in this zone complies with EPA guidelines for onsite wastewater systems	VH-H
10. Develop education material for residents in this zone to highlight the need for regular maintenance	H
11. Construct a wetland on the combined outfall from the rural residential area between Cooke Street and Cureton Avenue to treat sullage, septic tank overflows and surface run off to discharge to Kings Billabong	H
Degraded Waterways - Murray River and Kings Billabong	
12. Protect riparian vegetation through the establishment of a riparian vegetation protection overlay within the local planning provisions	H
13. Inspect all drainage outflows along the weir pool foreshore, assess and prepare works plan to	H

[3] The rating system used comprised the following ratings: Very High(VH), High (H), Medium (M) and Low (L)

Management Actions (Categorised by Management Issue)	Rating by Council
rectify problem areas - audit	
14. Conduct works programmes for rectifying eroding banks around stormwater outlets	VH
Commercial Run-off from Pine Avenue Drain lock 11	
15. Conduct Workshops for Council staff and contractors involved in waste management services, street cleaning and parks and gardens management to promote the initiatives identified in the SMP across all levels of Council operations	H
Run-off from Urban Development Sites (all catchments)	
16. Require developers to prepare sediment and erosion control plans.	VH-H
17. Continue with plan to employ dedicated officer(Connell Wagner) for dealing with urban development and planning issues. Ensure this person is fully conversant with best practice stormwater management principles and best practice is being implemented in design. Update policies in regard to stormwater management to reflect best practice.	VH
Residential Run-off to Lake Ranfurly East	
18. Initiate Workshops for Council staff and contractors	M
Road Run-off from Deakin Avenue and 15th Street Precinct to Lake Ranfurly East	
19. Establish liaison with Vic Roads to ensure new roads and upgrades incorporate water sensitive urban road design features such as grass swales and collector traps	M
Industrial Run-off from Irymple	
20. Initiate workshops and information sessions with industry representatives to highlight best practice stormwater management	H
21. Develop literature and guidelines targeted at industry	H
22. Coordinate with the EPA to conduct site audits and inspections	H
23. Encourage large industries and new development proposals to develop Environmental Management Plans	H
Objective 17 - Rural Residential Run-off from Kings Billabong LDRZ	
24. Use the local media to highlight the development of the Stormwater Quality Improvement Plan	H
25. Initiate workshops for Council and contractors in regard to maintenance of new drainage systems.	H
Run-off from Open Spaces, Parks and Gardens (all catchments)	
26. Council should revise the operational and maintenance procedures for open space management in order to reduce fertiliser application rates to parks and gardens, improve water use efficiencies through improved irrigation practices and promote the use of plants with low nutrient and watering requirements. These actions are also contained within the MRCC Sustainable Water Use Plan to be implemented.	H
27. Initiate Workshops for Council staff and contractors regarding above.	H
28. Council should investigate options for re-use of stormwater for irrigating parks and gardens. Stormwater detention systems could be incorporated into new development and used for watering nature strips, parks and gardens	H
Residential Run-off to Lake Hawthorn	
29. Use the local media to highlight the Stormwater Quality Improvement Plan	H
30. Initiate workshops for Council and contractors in regard to maintenance and development of new drainage systems.	H
Objective 20 - Road Run-off in Lake Hawthorn, the Murray River Below Lock 11 and Other Area	

Management Actions (Categorised by Management Issue)	Rating by Council
31. Establish liaison with Vic Roads to ensure new roads and road upgrades incorporate water sensitive road design features such as grass swales and collector traps	M-H
32. Council should initiate workshops for emergency and operations staff	VH
33. Investigate options for retro fitting major highways with grass swales and detention structures	M-H
Objective 21 - Industrial Run-off from Merbein to Murray River	
34. Initiate workshops and information sessions with industry to highlight best practice stormwater management	H
35. Investigate the feasibility of re routing the stormwater flow to LMW treatment ponds Merbein	M-H
Objective 22 - Residential Run-off to Bob Corbould Wetlands	
36. Use the local media to highlight the development of the SMP and to launch new guidelines and brochures aimed at raising community awareness of stormwater issues Objective 21 - Industrial run-off from Merbein to Murray River.	H

6 MANAGEMENT FRAMEWORK ACTIONS

Council's management framework is concerned with the way in which it undertakes planning and management activities. This includes strategic planning, development assessment, infrastructure management, regulation and enforcement, and co-ordination and communication with internal and external stakeholders. Each of these activities has either a direct or indirect, and in many cases both, bearing on the success of Council's efforts to address and mitigate urban stormwater management issues. Consequently Council's SWQIP (SKM, 2001a) included a review of management procedures and policies as they related to stormwater management. Arising from this review was a series of management framework actions designed to improve Council's practice and consequently lead to better outcomes for the planning and management of stormwater and hence the protection of identified receiving water values.

This chapter reviews the progress on the implementation of the identified actions and sets out a pathway for the future that accounts for strategies yet to be implemented and the changes that have occurred in the time since the original plans formulation.

6.1 Management Framework Actions

The management framework actions identified in Council's SWQIP (SKM, 2001a) were grouped under eight strategy headings, relating primarily to the function or role of Council to which they apply. These were as follows:

- Roles and Responsibilities for Stormwater Management
- Strategic Planning
- Planning Referrals and Approval Processes
- Incorporate Best Practice Stormwater Management in Land Use Planning and Urban Design
- Incorporate Best Practice Stormwater Management in Council's Day to Day Operations and Management
- Education and Training
- Regulation and Enforcement
- Coordinate Best Practice Management With Other Authorities and Groups

6.1.1 Implementing Management Framework Actions

The following sections summarise progress made by MRCC on the implementation of management framework actions and reviews those awaiting execution.

6.1.1.1 Actions Implemented

The management actions implement by Council are summarised as follows.

Assign Responsibility for Stormwater Management

- Assigned responsibilities for the implementation of the MRCC Urban Stormwater Quality Management Plan to the appointed Water Management Officer.
- The Environmental Sustainability Task Team to assist in the implementation of the Stormwater Quality Improvement Plan.

Incorporate Best Practice Stormwater Management in Land Use Planning and Urban Design

- Reviewed Council policy relating to sediment and litter control on development and construction sites.
- Prepared a set of WSUD guidelines for the Mildura LGA.
- Council now requires that new development proposals and changes in land use are sympathetic to the natural and cultural environment and that any increase in stormwater run-off is minimised and treated using Wetlands, sediment traps and local detention measures prior to discharge to receiving environments.

Incorporate Best Practice Stormwater Management in Council's Day to Day Operations and Management

- Council has prepared a set comprehensive maintenance procedures and schedules for the routine inspection and maintenance of the stormwater drainage system. This includes the maintenance of devices such as GPT.
- Council has joined the Stormwater Industry Association (SIA) and purchased or obtained relevant literature and technical guidelines to assist in stormwater management.

Education and Training

- Council has facilitated training and education programmes for Council staff and emergency services to highlight requirements for the protection of stormwater quality and receiving environments under actions within the Emergency Response Plan.

Regulation and Enforcement

- Council has resourced the inspection of building and construction sites to ensure compliance with local Law 5.
- If capacity exists to implement new local laws then Council should expand Environmental Local Law No. 3 to include a new local law controlling sediment and litter on Building Construction Sites.

Coordinate Best Practice Management With Other Authorities and Groups

- The Council Water Management Officer should participate in broader regional and state based forums on stormwater management to ensure that Mildura Rural City Council remains up to date on relevant stormwater initiatives across the state.

6.1.2 Identified Action Awaiting Implementation

Table 6-1 contains a list of the identified management framework actions awaiting implementation as part of MRCC's ongoing stormwater management program. As part of this review process the ranking of each of these actions was revisited by the senior staff involved in the review process, revised ranking can be found along side each action.

Table 6-1 Management Framework Actions Awaiting Implementation

Management Framework Actions (Categorised by Management Issue)	**Ranking by Council**
Assign Responsibility for Stormwater Management	
1. Clarify roles, responsibilities and jurisdiction with regards to Stormwater Management amongst Council and agencies	M-H
2. Council along with other relevant authorities to develop and implement an urban water quality monitoring programme to determine if management actions have been effective in improving stormwater quality	H
3. Council to develop a programme to assess the effectiveness of stormwater initiatives identified in the SWQIP	H
Strategic Planning	
1. Council to amend the Mildura Planning Scheme Local Provision to include reference to the Plan for the Improvement of Urban Stormwater Quality. Specific amendments includes updates to:	
– Clause 21.01-2 Settlement -amend to encourage Water Sensitive Urban Design and best practice stormwater management for new development	H
– Clause 21.02-2 Environment - Amend to ensure that best practice stormwater management is identified as a strategy for achieving objectives within this clause	H
– Clause 21.04-7 - Amend overview to include reference to best practice stormwater management objectives and stipulate the use of Water Sensitive Urban Design principles for new drainage infrastructure	H
2. Council to identify appropriate Water Sensitive Urban Design principles for the Mildura region that can be effectively incorporated into new developments and upgrades of existing infrastructure. These principles should be disseminated to land developers for incorporation into designs for new urban development	VH
Planning referrals and approval processes	
1. Council to improve the management of the referrals process by assigning a dedicated Council Officer to manage this process	H
2. Council to coordinate with external Authorities to ensure all are familiar with the approvals and referrals process contained within Section 55 of the Planning and Environment Act 1987 and	M-H

Management Framework Actions (Categorised by Management Issue)	Ranking by Council
Clause 66 of the Mildura Planning Scheme 3. Council to ensure that all proposals where there is likely to be an increase in stormwater discharge are referred internally to the appropriate officer for assessment of potential environmental Impacts and to ensure that best practice stormwater management objectives are incorporated into the development	VH
Incorporate Best Practice Stormwater Management in Land Use Planning and Urban Design 1. Council should encourage the use of household rainwater tanks for watering gardens and investigate the feasibility of household grey water recycling for toilet flushing	H
Education and Training 1. Council to implement training and education programmes for Council staff and contractors to improve awareness of stormwater management issues roles and responsibilities	H
2. Council to facilitate workshops and information sessions for the land and building development industry to inform them of Council's requirements for best practice stormwater management and highlight the options available to developers to satisfy Council's stormwater management objectives	H
Regulation and Enforcement 1. Council to ensure sufficient resources are available to adequately inspect and enforce planning permit conditions on development sites. This requires that suitably qualified technical staff be available for regular inspections during the maintenance period	VH
Coordinate Best Practice Management With Other Authorities and Groups 1. Council to coordinate with other Authorities such as the EPA, NRE, MCMA and regional water authorities to ensure effective stormwater management across the region	H
2. Council to coordinate with other Councils and state agencies to identify opportunities for improved stormwater management and ensure a more coordinated outcome for state based projects	H
3. Council should liaise with community groups who have an interest in stormwater and environmental management and ensure they are consulted at appropriate times during the implementation of the Stormwater Quality Improvement Plan	H

6.1.3 Implementation Summary

In considering the implementation of proactive management framework actions, identified in Council's SWQIP, it can be observed that progress has been slower on those relating to Councils Management Framework than those linked to structural measures. This is perhaps not unique to MRCC; similar patterns have emerged in many Councils across Victoria and Australia. A key reason for this is that typically structural management actions are more clearly defined. Indeed the management framework actions implement by MRCC are, in the main, those that have a clearly defined task associated with them.

6.2 Council's Management Framework: The Way Forward

While completion of the remaining management framework actions is important to the overall progress of Council towards meeting its Stormwater Quality Improvement Plan objectives it will not in its own right lead to the desired outcome of a management framework and set of Council policies that clearly support the best practice management of urban stormwater across the Local Government Area.

As part of this review process a number of key strategic planning and management policies as well as planning instruments were reviewed to ascertain the level of integration of stormwater management into Councils overall management framework. These documents included:

- MRCC Urban Stormwater Quality Management Plan
- MRCC's Council Plan 2006 – 2010
- MRCC's 2025 Vision Statement
- Relevant sections of the MRCC Planning Scheme (including Clause 56.7)
- Mildura – Irymple Urban Transition Area Urban Design Guidelines, Hansen Partnership Pty Ltd, April 2007.
- Etiwanda Report for Residential Development Plan for Mildura Rural City Council January 2007
- Irymple Report for Residential Development Plan for Mildura Rural City Council January 2007
- Mildura South Strategic Framework Plan A Development Plan For The South West Of Mildura May 2007
- Nichols Point Report for Residential Development Plan For Mildura Rural City Council January 2007
- Riverside Report for Residential Development Plan for Mildura Rural City Council January 2007
- MRCC Local Law 5.
- MRCC's Sustainable Water Use Plan

What is clear from the review process is that while progress has been achieved by MRCC, it is yet to fully integrate stormwater management objectives and planning into its overall management framework. It is important to note, however, that integration is yet to be achieved many other Victorian Councils and that its incorporation is not an insignificant task.

7 RECEIVING ENVIRONMENTS VALUES AND THREATS

7.1 Receiving Environments – Natural

The Murray River and associated floodplain Wetlands are the main natural water-bodies in the region.

7.1.1 Murray River

The Murray River is the only natural waterway in the region and forms the northern boundary of the study area. The Murray River rises in the Australian Alps and flows west across riverine plains for 800km before reaching the Sunraysia Region (Figure 7-1). Downstream of Mildura, the Murray River is joined by the Darling River before turning south through South Australia. The Murray River is regulated along most of its length, and supplies water for irrigation throughout northern Victorian and southern New South Wales. Lock 11 is used to maintain the Mildura weir pool, the backwater affects from which extend past Red Cliffs. Stormwater from Mildura's commercial, industrial and residential areas is discharged to the Murray River above and below Lock 11.

Figure 7-1 Murray River

The water above lock 11 provides significant in-stream and riparian habitat and supports a range of threatened species. Parts of this system are listed on the Register of the National Estate and the Directory of Important Wetlands in Australia. The Murray River is also significant for its cultural and heritage values and there are numerous archaeological sites highlighting the links with indigenous cultures. The River environment is highly valued for its recreational, tourism and amenity values. The Murray River is the main source of water for domestic, industrial and irrigation supply.

7.1.2 Kings Billabong

Kings Billabong is a large floodplain wetland located east of Irymple. It is held at an artificially high level to facilitate water supply to the FMIT system and to prevent saline groundwater intrusions. It receives irrigation drainage water and stormwater run-off from rural residential areas. Kings Billabong does not receive any stormwater from urban areas.

As with the Murray River, Kings Billabong has significant in-stream and riparian value. There is a long record of indigenous contact with the area as well as more recent non-indigenous heritage values associated with irrigation development in the region. Kings Billabong is listed on the Directory of Important Wetlands in Australia and supports a range of threatened flora and fauna. The wetlands is a popular for recreational activities including swimming, boating fishing and camping and provides high landscape amenity to rural residential development along the west shoreline.

7.1.3 Merbein Common

Merbein Common contains a number of floodplain billabongs downstream of Lock 11. Urban stormwater from Merbein is discharged directly to the floodplain; however, run-off rarely reaches the Murray River, except during high flows.

Riverbank vegetation, billabongs and native pine cover this site. The floodplain billabongs are tourist attractions and provide for recreational activities such as, barbecues, boating, fishing, swimming and walking.

7.1.4 Basin 12

Basin 12 is a floodplain wetland that has become the main disposal basin for irrigation drainage and urban stormwater run-off from the Red Cliffs region. At high levels, Basin 12 discharges to the Murray River via pipeline.

Basin 12 provides habitat for a range of bird species and offers visual amenity for residential areas and is used for irrigation and urban stormwater drainage. Inflows to the basin appear to be declining due to improved irrigation practices.

7.1.5 Lake Hawthorn

Lake Hawthorn is a natural floodplain deflation basin lake, which fills only during very high flows such as, those of the 1956 flood (Lloyd 2007). The stormwater from residential areas of Mildura South drains to Lake Hawthorn via the Mildura South Drainage Scheme. As more irrigated land is urbanised, Lake Hawthorn will receive additional urban Run-off.

Levees adjacent to the River Murray now restrict flooding of the banks. Once an ephemeral freshwater floodplain wetland, the lake is now saline due to its use as an irrigation drainage basin and altered management practices.

Lake Hawthorn is used for a range of recreational activities that include boating, camping, swimming and fishing. Recent drought has seen the dramatic decline of water levels and the reduction of lakes amenity (Figure 7-2).

Figure 7-2 Lake Hawthorn

Lake Hawthorn is home to a variety of native fish including the endangered Murray hardyhead (*Craterocephalus fluviatilis*). Other native species include carp gudgeons (*Hypseleotris* spp.), bony herring (*Nematalosa erebi),* flathead gudgeon (*Philypnodon grandiceps),* golden perch (*Macquaria ambigua*), Australian smelt (*Retropinna semoni*) and flyspecked hardyhead (*Craterocephalus stercusmuscarum*) and is one of only four known Victorian habitats for a small native fish, the Murray hardyhead, *Craterocephalus fluviatilis*. The Murray hardyhead is declared endangered under the Victorian Flora and Fauna Guarantee (FFG) Act 1988 and the Commonwealth Environment Protection and Biodiversity Conservation (EPBC) Act 1998. Lake Hawthorn supports three turtle species and over 60 species of waterbirds have been recorded in the lake (Llyod 2007).

A management plan was developed for the lake in 2007 (Llyod 2007) which identifies stormwater as an important management issue because of its potential to create localised episodes of anoxia.

7.1.6 Lake Ranfurly

Lake Ranfurly is a large, shallow wetland on the ancestral floodplain west of Mildura (Figure 7-3). It is separated into two water-bodies by a causeway and isolated from the Murray River by levees. Lake Ranfurly East receives urban stormwater Run-off from residential, commercial and industrial areas of Irymple and residential areas of Mildura.

Lake Ranfurly provides significant habitat for many bird species, including species listed under State Government threatened species legislation. It is listed on the Directory of Important Wetlands in Australia for its significant bird habitat. While the area around Lake Ranfurly is degraded, there are opportunities for improved amenity for local residential communities. By directing urban stormwater to Lake Ranfurly, inputs to the Murray River can be reduced.

Figure 7-3 Lake Ranfurly

7.2 Receiving Environments – Constructed

Artificial drainage basins, created to provide disposal of stormwater and irrigation drainage water, are also important aquatic environments in the region. These waterways and wetlands support a diverse range of flora and fauna including many species of conservation significance. They are also the focus of recreational activities and tourism and provide significant public amenity for the Mildura community.

7.2.1 Etiwanda Wetlands

The Etiwanda Wetlands were constructed to treat all stormwater from two major urban drains in Mildura (Coleman 2006). Local residential, industrial and commercial areas, with a total catchment area of 876ha, drain to the Etiwanda Wetlands via the Etiwanda drain and the San Mateo drain. These areas previously drained to the Murray River with little treatment. The wetland covers an area of approximately 16.4ha and has been designed to remove nutrient and fine sediments. A GPT has been installed to capture large rubbish entering the system.

The Etiwanda Wetland contains a large variety of habitat suitable for bird life, including reed beds, open water areas and beaches and shallow water edges. A water quality monitoring programme is currently being designed to assess the effectiveness of the wetland for improving the stormwater quality.

Although the wetland is still in the commissioning phase, it is already home to a variety of bird species, fish and a healthy population of macroinvertebrates (Figure 7-4).

Figure 7-4 Etiwanda wetland, litter trap and overflow drain

7.2.2 Bob Corbould Wetland

Bob Corbould Wetland (formally known as Rifle Butts wetland) is a small wetland that receives urban stormwater run-off from residential areas of Mildura. Discharges from the wetland flow to Lake Ranfurly East. The wetland is totally reliant on stormwater inputs to maintain aquatic habitat values.

Bob Corbould Wetland provides a moderate level of habitat for birds and if managed appropriately, has the potential to offer high level of amenity to the community as urban development expands around the wetland. At present Council has set aside $60,000 in funds to allow for the addition of public walking tracks, bridges and interpretive signage around the wetland.

The diversion of urban stormwater to the Bob Corbould Wetlands can be used to reduce stormwater discharges to the Murray River.

7.2.3 Mildura South Drainage Scheme Wetlands

The Mildura South drainage system Wetlands are a series of constructed Wetlands that have been designed to treat stormwater from new residential developments occurring in Mildura South. The Wetlands ultimately discharge to Lake Hawthorn via a series of open channel drains. The Wetlands and associated open space will also provide greatly improved amenity and increased recreation opportunities for residents. Proposed alterations to the pipe drainage network will see some stormwater from Irymple directed to the South Mildura scheme via the Deakin Ave drain.

Figure 7-5 Mildura South Drainage System Wetlands

7.3 Values of the Receiving Environments

Receiving environment values play an important role in the development of a SWQIP. A primary objective of developing a SWQIP is the protection of these values from potential stormwater quality related threats.

Table 7-1 summarises the receiving environment values identified for the MRCC urban stormwater quality improvement plan.

Table 7-1 Receiving Value Types

Value Category	Specific Value Types	Description
Environment	Aquatic Habitat	*In-stream ecological values based on water quality, habitat quality and diversity, flora and fauna species, extent of invasion by exotic species and general in-stream condition and stability.*
	Riparian Habitat	*Waterway condition and ecological values based on extent and quality of remnant (native) vegetation, weed infestation and stability of riparian zone.*

Value Category	Specific Value Types	Description
Cultural	Cultural Heritage	*Cultural Heritage refers to sites of Aboriginal or European heritage. Site such as Aboriginal Sacred Sites or sites of Historical Importance are examples of values included as being of cultural heritage.*
Amenity	Recreational Amenity	*Public access and utilisation for active recreation involving primary contact with water. Swimming in local waterways and the bay are included as recreational amenity.*
	Visual/Landscape Amenity	*Aesthetic appreciation of the natural and built environment including consideration of natural and man made structures, landscapes and places of importance, visual access and relationships to adjacent facilities. Active and passive recreation not involving primary contact with water is also included in this value. Activities such as boating, walking, cycling are considered in this value.*
	Tourism	*The primary economic source that can be impacted by poor stormwater management resulting in loss of recreational/visual/landscape amenity and creation of public health and safety hazards.*
Hydraulic	Flood Conveyance	*Contribution to protection against flooding including consideration of waterway capacity, designated floodwalls and flood protection infrastructure (e.g. levees).*
Economic	Water supply	*The region is highly dependant on the Murray River as a source of drinking water. Water reuse is considered under economic values.*
Drainage	Flood reductions	*Receiving environments act to reduce localised flooding.*
	Salt and nutrient reductions to the Murray River	*The potential impacts that salinity and nutrient can have receiving waterways including the Murray River that is currently suffering from these issues. Nutrient inputs can increase the likelihood of an algal bloom. Increased concentrations of salinity can caused detrimental effects to in-stream biota and reduce the use of water for irrigation and drinking water.*

7.4 Summary of Values and Their Score

As part of the SWQIP review process, receiving environment values, identified in the SKM (2001a) Plan, were revisited and rating discussed to ensure that they remain current and reflective of current Council and community values. Table 7-2 summarises the revised ratings arising from the review process for each of the receiving environment identified.

Table 7-2 Summary and rating of values for each receiving environment

	Environmental		Cultural		Amenity			Economic	Drainage	
Receiving Environment	**Aquatic Habitat**	**Riparian**	**Indigenous**	**Non-indigenous**	**Recreational**	**Visual/Landscape Amenity**	**Tourism**	**Water Supply**	**Flood Reduction**	**Salt and Nutrient Reduction to Murray River**
Murray River	VH	VH	VH	VH	VH	VH	VH	VH	H	L
Kings Billabong	VH	VH	VH	VH	VH	VH	VH	H	L	M
Basin 12	H	H	M	L	M	M	L	L	H	VH
Bob Corbould	M	M	M	L	H	H	L	L	H	VH
Lake Ranfurly East	VH	H	H	L	L	H	L	L	H	M
Lake Hawthorn	VH	H	M	L	H	H	M	L	VH	VH
Etiwanda Wetland	VH	VH	L	M	VH	VH	H	H	H	H

7.5 Threats to the Receiving Environment Values

A key outcome of a SWQIP is the recommendation of strategies and actions to manage and minimise the impacts of current and/or potential threats to values of the receiving environment. For the purposes of this study, stormwater threats are defined as activities or sources of pollution potentially resulting in adverse impacts on receiving environment values. Threats have been defined across the municipality in a generic context by considering:

- Dominant land uses whose run-off contribute to stormwater pollution;
- Specific activities which may generate stormwater pollution;
- Degraded areas including land uses and waterways which may generate pollution;
- Changes in hydrologic characteristics which may lead to pollution; and
- Advice from the Steering Committee Group in relation to stormwater pollution issues.

Table7-3 summarises the range of generic stormwater threats that have been defined across the municipality, including details of the sources and types of pollutants associated with each threat and how they are generated.

Table 7-3 Generic Threat Types and Key Pollutants

Threat	Driver	Key Pollutants and Impacts
Waterway degradation	Poorly controlled recreational access, weed infestation, damage from waterway works, development encroachment, vegetation loss, and eroded and unstable riparian zones	Sediment, nutrients, oxygen depleting material
Residential Run-off	Atmospheric deposition and build-up from traffic, washing cars, fertiliser application, poor waste management (domestic refuse), dumping of residential rubbish, lawn clippings and vegetation	Increased flow, sediment, nutrients, litter, oxygen depleting material, hydrocarbons, pathogens, trace metals, pesticides
Industrial Run-off	Atmospheric deposition and build-up from traffic, poor waste management, accidental spills and illegal discharges	Increased flow, sediment, nutrients, litter, oxygen depleting materials, hydrocarbons, pathogens, trace metals, pesticides, surfactants
Commercial Run-off	Atmospheric deposition and build-up from traffic, poor waste management practices	Increased flow, sediment, nutrients, litter, oxygen depleting material, hydrocarbons, pathogens, trace metals, surfactants
Major Road / Rail Run-off	Atmospheric and vehicular deposition and accumulation and the effects of road/rail construction	Sediment, litter, trace metals and hydrocarbons
Building Site Run-off	Poor management of building site waste and materials	Sediments, nutrients, contaminants and litter
Open Space Run-off	Wash off of nutrients (fertilisers) and litter from public gardens, parks, sporting facilities, golf courses	Nutrients, litter, oxygen depleting materials
Irrigation and Rural Run-off	Poor sediment and erosion control, wash off of nutrients, weed infestation, mixing of irrigation waters with the stormwater system	Fertilisers, herbicides, sediment, nutrients, pathogens
Residential / Industrial Development	Poor sediment and erosion control, uncontrolled wash down of equipment, deposition of sediment, vehicles and spills from construction process (eg concreting)	Sediments, nutrients, contaminants and litter
Unsewered Properties	Infiltration and overflow from sewerage systems and septic tanks	Oxygen depleting material, pathogens, nutrients
Upstream Inflows	Run-off from upstream catchments, entering via creeks and waterways	Sediment, nutrients, litter, pathogens

7.6 Summary of Threats and their Rating

As part of the SKM (2001a) Plan, receiving water threats were identified and rated to quantify their relative significance for each receiving water body. The significance of a threat considers both its frequency of occurrence (e.g. how often it could potentially occur) and potential magnitude (e.g. geographic spread and pollutant load). During the SWQIP review process identified threats were discussed on a subcatchment basis and re-rated qualitatively (*low, moderate, high or very high*) by

participants on their perceived significance. Table 7-4 summarises the ratings that have been adopted for each threat within each subcatchment.

Table 7-4 Threats to the Receiving Environments from Stormwater

Threats	Receiving Waterway							
	Murray river below lock 11	Murray river above lock 11	Kings Billabong	Basin 12	Bob CorbouldBob Corbould	Lake Ranfurly	Lake Hawthorn	Etiwanda
Residential Run-off	VH	VH	H	H	VH	VH	H	H
Industrial Run-off	M	VH	na	M	M	H	L	VH
Commercial Run-off	M	VH	na	M	H	VH	L	VH
Development sites	H	H	H	L	VH	VH	V	VH
Road and highways	H	VH	M	H	H	VH	H	H
Sewerage and septic	L	L	L	L	L	L	H	L
Open spaces and parks	M	H	M	H	H	H	H	VH
Rural surface Run-off	VH	VH	H	VH	L	H	VH	L
Unstable and degraded waterways	M	H	H	M	M	M	M	M
Landfill Run-off	L	L	L	L	L	M	L	L

7.7 Priority Management Issues

The prioritisation of stormwater quality management activities is based on the identified values and threats for each of the receiving environments. Table 7-5 lists the priority management issues for each receiving environment.

Table 7-5 Summary of the Priority Management Issues for Receiving Environments and the Potential Impacts

Priority Management Issue	Receiving environment	Impacts on values
1. Residential run-off	• Murray River • Basin 12 • Etiwanda • Merbein Common • Bob Corbould • Lake Ranfurly • Lake Hawthorn	*Pollutants in Run-off from residential areas can degrade the visual amenity of waterways, generate bacteria affecting swimming locations, contribute pollutants to the Murray River and potentially impact on tourism.*
2. Commercial run-off	• Murray River • Merbein Common • Basin 12 • Lake Ranfurly	*Litter, oils, food spills, nutrients and potentially bacteria can decrease the visual amenity of the waterways. Create health risks for swimmers, degrade water quality in the Murray River and adversely impact on tourism*

Priority Management Issue	Receiving environment	Impacts on values
3. Industrial run-off	• Etiwanda • Murray river • Merbein Common • Basin 12 • Lake Ranfurly	*Large industrial areas in the municipality have the potential to generate poor quality Run-off that has the most impact on visual/landscape amenity, fauna habitat and the waters of Etiwanda Wetlands and the Murray River.*
4. Development Sites	• Murray River • Etiwanda • Merbein Common • Bob Corbould • Lake Ranfurly • Lake Hawthorn	*New development sites around urban centres can increase the sediment load into receiving environments and decrease the quality of fauna habitat and aquatic ecosystems.*
5. Major road run-off	• Murray River • Basin 12 • Etiwanda • Merbein Common • Bob Corbould • Lake Ranfurly • Lake Hawthorn	*Generation of hydrocarbons and sediments from major road / rail areas will degrade in-stream habitat, the visual/landscape values of waterways, and their quality and appearance*
6. Open spaces and parks and rural surface run-off	• Murray river • Basin 12 • Etiwanda • Merbein Common • Bob Corbould • Lake Ranfurly • Lake Hawthorn	*Fertilisers and sediment from framing and open space management generate pollutants into receiving environments.*

8 STORMWATER MANAGEMENT STRATEGIES

Six priority risk issues have been identified within the urban centres of Mildura (refer Table 7.1). Each priority risk Issue relates to a specific stormwater threat that occurs within one or more urban centre of the municipality. The list of issues and their priority of importance are summarised in Table 8-1.

Table 8-1 Priority Risk Issues

Priority	Risk Issue
1	*Residential run-off to the Murray River Basin 12 Etiwanda, Merbein Common, Bob Corbould, Lake Ranfurly and Lake Hawthorn*
2	*Commercial run-off to the Murray River, Merbein Common, Basin 12 and Lake Ranfurly*
3	*Industrial run-off to the Etiwanda Wetlands, Murray river, Merbein Common, Basin 12 and Lake Ranfurly*
4	*Development Site run-off to the Murray River, Etiwanda Wetlands, Merbein Common, Bob Corbould, Lake Ranfurly and Lake Hawthorn*
5	*Major road run-off to Murray river, Basin 12, Etiwanda, Merbein Common, Bob Corbould, Lake Ranfurly and Lake Hawthorn*
6	*Open spaces and parks and rural surface run-off to the Murray Rver, Basin 12, Etiwanda, Merbein Common, Bob Corbould, Lake Ranfurly and Lake Hawthorn*

Management strategies have been derived to respond to the priority risk issues and their threats (refer Section 4.4). Each management strategy is made up of a combination of specific management elements relating to either:

- Education and awareness programs;
- Source controls;
- Site specific strategies and plans;
- Non-structural treatments;
- Structural treatments;
- Information and data collection; and
- Regulation and enforcement.

The assessment and selection of different elements as part of each strategy involved a process of opportunity assessment that considered issues relating to cost effectiveness, spatial opportunities and constraints and Council's ability to maintain each element. The key objective in formulating management strategies is to define a combination of management actions that represent the best value for money in terms of providing the highest level of environmental management at the lowest cost.

Stormwater quality management strategies have been developed for each of the 6 priority stormwater risk issues to guide Council in managing stormwater quality throughout the municipality. Each strategy provides a balance of both structural and non-structural elements and is summarised in Table 8-2 to Table 8-8. The final selection of specific management elements will be at the discretion

of Council. However, the strategy tables provide guidance on the types of measures that could be implemented to respond to the priority risk issues.

8.1 Implementation Success

BMT WBM has been working extensively with other Councils in the implementation and review of their Stormwater Quality Improvement Plans. Based on this experience we would recommend a co-ordinated approach to project implementation over the next five years. This is especially important given a large number of the recommendations listed in the following tables require extensive long-term communication with the broader community. This approach would involve creating an 'umbrella' programme under which environmental programmes would fall. An example is provided in Figure 8-1. By creating an 'umbrella' programme in this manner there is a co-ordinated approach to engaging the greater community and maintaining momentum across Council. Table 8-2 provides a list of tasks involved in the creation of an 'umbrella' programme.

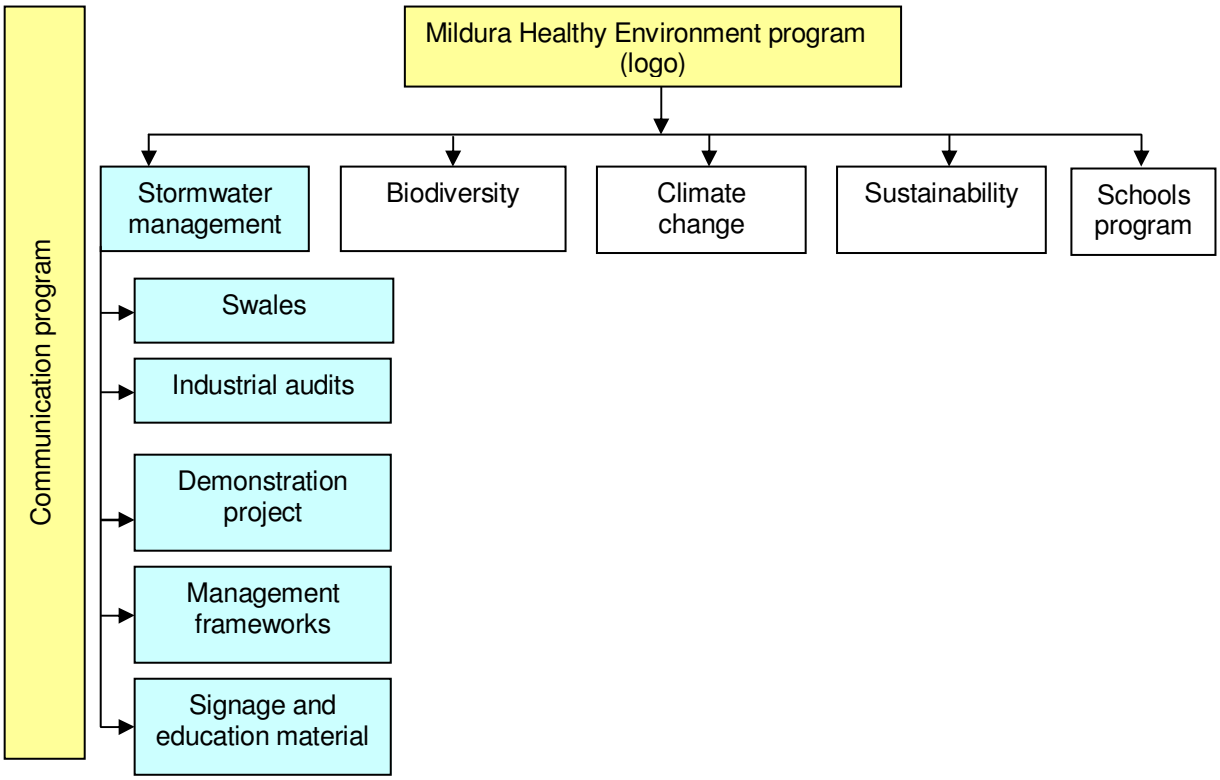

Figure 8-1 Example of Project Set up

8.2 Management Strategies

Tables 8-3 through 8-8 present the recommended management strategy and associated actions to address the priority risk issues identified in this SWQIP review. Each strategy is preceded by a summary of its key elements and its intent. Each specific element is presented in order of priority and includes a description and an estimate of costs (both established and recurrent). Established costs for structural measures have been derived from market values for purchase/construction and implementation of each device. Costs for non-structural measures are based on typical hourly rates and estimated time. Recurrent costs reflect maintenance or cleaning costs for structural measures and costs related to supporting continued programmes for other elements.

A number of the elements are common to more than one strategy and estimated cost reflects the cross subsides that will occur with their across-the-board implementation.

Table 8-2 'Umbrella' programme set up

'Umbrella' programme set up						
As discussed at the internal workshops, an 'umbrella' programme is recommended to provide a co-ordinated approach to environmental management in the municipality.						
Action Number	**Action**	**Management Action Description**	**Cost**		**Responsibility & Assistance**	**Extent of Application**
			Funding	**Year**		
U-1	Programme setup	**Internal Environmental department meeting** Discuss the new environmental programme and branding. Discuss the different programmes that can 'full under' the umbrella programme.	$0	$0	ES	Municipality
U-2	Programme setup	**Design logo** Create a logo. It is important that the logo process is interactive and represents the region covering all environmental aspects.	$4000	2008	ES	Municipality
U-4	Programme setup	**Communication Programme** Develop a communication programme. The communication programme will need to deliver the objective of changing behaviour by raising profile of MRCC, informing the public and educating the public on stormwater issues and extend to all environmental issues.	$15000	2009/2014	ES	Municipality
U-5	Programme setup	**Launch** A 'hard' launch' is required is required to launch the new programme and gain maximum momentum from the offset. A guest speaker will be required to champion the event.	$0	2008	ES	Municipality
U-6	Programme setup	**Media Release** Media Releases to general community regarding the new programme. Media releases timing and contents should be detailed in the communications strategy to ensure the community is informed about the importance of stormwater issues once a month.	Ops Budget	2009	ES	Municipality
U-7	Programme setup	**Council website** Update Council website with umbrella programme	$2000	2009	ES	Municipality
U-8	Programme setup	**Council Resources** A range of promotional materials is required to kick the programme off. These can include calico bags, drink bottles, drink holders, bin stickers etc.	$5000	2009	ES	Municipality
U-9	Programme setup	**Commitment** Encourage Councillor, senior executive and staff commitment to stormwater management. As a first step, prepare a formal presentation of the Plan to Council and then provide future reporting on the progress and implementation of the Plan to the Council. One Councillor could be identified in an ongoing liaison role. Establish performance criteria for senior executives and officers relating to the implementation of the plan and include these in performance plans.	Ops Budget	2009	ES	Municipality
U-10	Programme setup	**Education Officer** An experienced part time education officer would be beneficial to MRRC to liaise with schools groups and send extra time with industrial and commercial businesses and local residents explaining the basics of stormwater management.	$200,000	2009/2014	ES	Municipality

Table 8-3 Risk Management Strategy 1

Risk Management Strategy 1

Priority Risk Issue 1 – 1 Residential Run-off to the Murray River Basin 12 Etiwanda, Merbein Common, Bob Corbould, Lake Ranfurly and Lake Hawthorn

The strategy responds to the risk of residential Run-off within the urban centres of Mildura Rural City Council. The strategy focuses heavily of education and awareness of the community to stormwater related issues and provides opportunities for involvement in local community groups, education sessions and consultation. Due to the broad scale of the threat, it also targets individual homeowners and residents through media releases and literature distribution, whilst also encouraging good stormwater practice through the implementation of a rate rebate scheme.

Action Number	Action	Management Action Description	Cost		Responsibility & Assistance	Extent of Application
			Funding	Year		
1-1	Education and Awareness	**Demonstration Projects** Actively promote the design and implement a number of water sensitive urban design projects to address a range of priority risk issues across the entire municipality. The purpose of such projects is to show Council and stakeholders the benefits of water sensitive urban design in a number of situations and addressing a number of issues.	$100,000	2009/2014	ES,**AD**,DS,IMS	Municipality
1-2	Education and Awareness	**River and Wetland Signage** Signage at high visitation areas, such as the Murray River and each wetland. (allow 5). River signs should be constructed using materials from recycled products.	$18,000	2009/2014	ES	
1-3	Education and Awareness	**Media Release** Media Releases to general community regarding the new rules and regulations with clause 56.07.	Ops Budget	2009/2014	DS	
1-4	WSUD	**Rainwater Storage and Reuse** A technique that can be employed to reduce stormwater Run-off and consequently contaminant Run-off from the residential properties. Council could encourage residents to make use of available subsidies through State Government and local water retailers to reduce their demand for potable water. Council could lead the uptake for rainwater storage and reuse through the application of rainwater storage at Council premises and the use of recycled water on Council gardens and sporting ovals.	Ops budget	2009/2014	**ES**,DS,AD,IMS	Local
1-5	Education and Awareness	**Literature/Guideline Development and Distribution** Develop information and guidelines regarding the requirements of residential properties in relation to urban stormwater. Information could be provided about what services Council provides (rubbish collection, street sweeping) and what should be done by the residents to reduce their impact on the local stormwater (not overfilling bins, washing cars on grass, etc). Brochures can be mailed out with Council rates.	$15,000	2009/2010	**ES**,DS	Municipality
1-6	Education and Awareness	**Schools Programme** Implement a consistent schools programme with all schools. The Etiwanda Wetlands can be used an education resource. A range of schools programmes will be required to target the varying age groups. A number of Councils have developed Stormwater Management Schools Manuals that can be used as examples.	Ops budget	2009/2014	ES	
1-7	Education and Awareness	**Long Term Individual/Organisation Consultation** Liaise with landholders, developers and resident groups on how residential areas contribute to poor stormwater quality and what can be done to improve the impact on the local receiving environments. This action can be used to determine the effectiveness of education programmes and observe any resulting changes in behaviour or attitude towards stormwater management.	Ops Budget	2009/2014	ES,AD,**DS**	Municipality

Risk Management Strategy 1

Priority Risk Issue 1 – 1 Residential Run-off to the Murray River Basin 12 Etiwanda, Merbein Common, Bob Corbould, Lake Ranfurly and Lake Hawthorn

The strategy responds to the risk of residential Run-off within the urban centres of Mildura Rural City Council. The strategy focuses heavily of education and awareness of the community to stormwater related issues and provides opportunities for involvement in local community groups, education sessions and consultation. Due to the broad scale of the threat, it also targets individual homeowners and residents through media releases and literature distribution, whilst also encouraging good stormwater practice through the implementation of a rate rebate scheme.

Action Number	Action	Management Action Description	Cost		Responsibility & Assistance	Extent of Application
			Funding	Year		
1-8	WSUD	**Stormwater Infiltration Measures** Implement stormwater infiltration measures where possible and appropriate. Stormwater infiltration measures can be implemented at the end of swales or open drains. These measures allow for the infiltration of water into the ground and remove pollutants from the stormwater. These measures can include either infiltration pits or bio-retention systems. Such measures can easily be retrofitted into existing nature strips or traffic islands.	$25,000	2009/2014	AD,ES,IMS	Local
1-9	Information and Data Collection	**Ensure an environmental monitoring programme is in place.** Liaise with the CMA to ensure continuation of agency monitoring and Council access to such data. Link with community groups and seek access to data collected by such groups. Develop an internal monitoring system to establish the types and quantities of litter and rubbish entering the stormwater system. Commence a routine water quality monitoring programme at all receiving environments. Monitor all SW pollutants (PAH, organics, hydrocarbons, metals, TSS, TP and TP). Insitu measurements should include DO, EC, pH and turbidity. Sampling should be monthly and event based.	Ops Budget	2008/2014	Melbourne Water, EPA and *Council*	Waterways
1-10	WSUD	**Swales** Implement swales where possible and appropriate. Swales can be used instead of conventional kerb and channel drainage. Swales facilitate the removal of pollutants and reduce Run-off by encouraging infiltration. Existing table drains can easily be converted into swales to achieve and increased water treatment efficiency. Along roads where no drainage has been provided, a swale can fairly easily be added (provided there is enough space), to treat the road Run-off.	$15,000	2009/2014	**AD**,ES,IMS,DS	Local

Table 8-4 Risk Management Strategy 2

Risk Management Strategy 2

Priority Risk Issue 2 – Commercial Run-off to the Murray River, Merbein Common, Basin 12 and Lake Ranfurly

This strategy has been developed to respond to commercial land use run-off in the entire municipality, which is considered to impact a number of receiving environments. The main focus of the strategy involves the community's and business owner's education and awareness, due to the broad scale of the threat. Increasing awareness about stormwater issues can be achieved through stakeholder groups and committees, consultation and guideline development. The strategy also allows for Council to become involved with the business owners by developing site specific EMP's to improve stormwater performance of individual premises. A number of Water Sensitive Urban Design techniques have been recommended to allow for stormwater treatment without comprising the character of the local region.

Action Number	Action Code	Management Action Description	Cost		Responsibility & Assistance	Extent of Application
			Funding	Year		
2-1	Education and Awareness	**Signage** Continue 'graphic' kerb site stenciling in the main commercial area to highlight linkages with the receiving environment and improve community awareness of littering impacts. Signage will need to promote the new logo.	Refer to listed strategies for details regarding cost, responsibility and extent of application.			
2-2	Education and Awareness	**Long term Individual/Organisation Consultation** Initiate a programme of information exchange with targeted individual business owners. Discuss Council's SWQIP and how they can assist by improving key waste management practices. Coordinate with Environmental Health Officers.	Refer to listed strategies for details regarding cost, responsibility and extent of application.			
2-3	Education and Awareness	**Stormwater Management Education Workshops** Conduct a series of Stormwater Management Workshops for Council Officers, business owners and personnel. Undertake 5 half day workshops with an experienced facilitator. Workshops should start with presentation on stormwater management followed by a review of operations by workshop participants and demonstration of good housekeeping practices. Use local examples.	Refer to listed strategies for details regarding cost, responsibility and extent of application.			
2-4	Education and Awareness	**Literature/Guideline Development and Distribution** Development of literature and guidelines specifically tailored towards commercial premises could be used to educate business owners of their impacts upon the local stormwater system. Requirements upon business owners in terms of stormwater treatment (ie: is an oil grease interceptor required) could be detailed in these guidelines. As with the stormwater management guidelines, significant cost savings can be achieved through the adaptation of existing resources, guidelines and related materials to make them applicable with the local setting.	$10,000	2009/2014	HTLL,**ES**,DS	Local
2-5	Strategic	**Infringement Notification and Fines** Enhance the enforcement role of EHOs via further education and training, modifying Local Laws and working more effectively with the EPA.	$15,000	2009/2014	HTLL	Local
2-6	Promotional	**Bin Sticker** Place 'umbrella programme' stickers in strategic locations.	Ops Budget	2009/2014	ES	
2-7	Promotional	**Calico Bags** Work with local supermarkets to champion the Programme and endorse the calico bags for the month of the programme launch.	Ops Budget	2009/2014	ES	

Risk Management Strategy 2

Priority Risk Issue 2 – Commercial Run-off to the Murray River, Merbein Common, Basin 12 and Lake Ranfurly

This strategy has been developed to respond to commercial land use run-off in the entire municipality, which is considered to impact a number of receiving environments. The main focus of the strategy involves the community's and business owner's education and awareness, due to the broad scale of the threat. Increasing awareness about stormwater issues can be achieved through stakeholder groups and committees, consultation and guideline development. The strategy also allows for Council to become involved with the business owners by developing site specific EMP's to improve stormwater performance of individual premises. A number of Water Sensitive Urban Design techniques have been recommended to allow for stormwater treatment without comprising the character of the local region.

Action Number	Action Code	Management Action Description	Cost		Responsibility & Assistance	Extent of Application
			Funding	Year		
2-8	WSUD	**Litter trap baskets** There are still some commercial precincts that do not have adequate trapping for litter. Litter trap baskets should be installed in heavy use commercial areas.	$20,000	2009/2014	**AD**,IMS	Local

Table 8-5 Risk Management Strategy 3

Risk Management Strategy 3

Priority Risk Issue 3 – Industrial Run-off to the Etiwanda Wetlands, Murray river, Merbein Common, Basin 12 and Lake Ranfurly

This strategy responds to the risk of industrial land use run-off within the MRCC municipality and its identified receiving environments. The strategy focuses on preventative measures through the development of guidelines, plans and site specific EMP's to reduce the impact of stormwater on the local environment. Whilst focussing on preventative measures, a number of structural measures, including filter strips and swales have also been recommended.

Action Number	Action Code	Management Action Description	Cost		Responsibility & Assistance	Extent of Application
			Funding	Year		
3-1	Audits	**Site audits at all Council owned depots and properties** Undertake site audit and inspection of Council premises to ensure best practice stormwater management is being undertaken. Council must lead by example.	$5000	2009/2010	**AD**,**IMS**,ES	
3-2	Education and Awareness	**Literature/Guideline Development and Distribution** Development of literature and guidelines specifically tailored towards industrial premises could be used to educate industry of their impacts upon the local stormwater system. Requirements upon industry in terms of stormwater treatment (ie: is an trade waste agreement required) could be detailed in these guidelines. The key ,message for the guidelines is 'your stormwater ends up in your waterways	$10,000	2009/2010	HTLL	Local
3-3	Education and Awareness	**Prepare Newsletters** Communicate with local industrial businesses on stormwater issues for the municipality. Provide ideas on products, best practice and champion selected businesses.	$5000	2009/2010	ES	
3-4	Education and Awareness	**Long Term Individual and/ Organization Consultation** Initiate a programme of consultation with individual industrial operators in high-risk industries. Discuss Council's SWQIP and how they can assist by improving waste management and sediment control practices.	Ops budget	2009/2014	HTLL,**ES**	
3-5	Education and Awareness	**Media Releases** Media releases could highlight measure being undertaken by Council to improve stormwater quality and how local industry can help.	Ops budget	2009/2009	HTLL,ES	
3-6	Audits	**Audit, Inspection and Education** Audit and Inspection of all industrial premises to ensure best practice stormwater management is being undertaken and provide opportunities for dialogue between Council, EPA and industry. The audit programme should be combined with an extensive education programme informing local business owners on what stormwater is, where it ends up and what are the detrimental effects from it.	$12,000	2009/2014	**HTLL,**ES	Local
3-7	Strategic	**Develop and Implement Site Specific EMP's** Environmental Management Plans can be developed for either sections of industry or individual sites. EMP's prescribe environmental management objectives that need to be met for the site can include other factors besides stormwater quality and quantity. Through the Victorian Stormwater Action Plan, Melbourne Water, the Land Development Industry and 3 local Councils, formulated a site EMP kit. This EMP kit can be adapted to suit the requirements of both Council and differing requirements of each site and will results in cost savings for Council.	$7,500	2009/2014	**HTLL**,ES	Local

Risk Management Strategy 3

Priority Risk Issue 3 – Industrial Run-off to the Etiwanda Wetlands, Murray river, Merbein Common, Basin 12 and Lake Ranfurly

This strategy responds to the risk of industrial land use run-off within the MRCC municipality and its identified receiving environments. The strategy focuses on preventative measures through the development of guidelines, plans and site specific EMP's to reduce the impact of stormwater on the local environment. Whilst focussing on preventative measures, a number of structural measures, including filter strips and swales have also been recommended.

Action Number	Action Code	Management Action Description	Cost		Responsibility & Assistance	Extent of Application
			Funding	Year		
3-8	Education and Awareness	**Stormwater Management Education Workshops** Education sessions for member of industry detailing how the stormwater can impact the local environment and how activities across the municipality can influence stormwater quality.	$7,500	2009/2010	ES	Local
3-9	Education and Awareness	**Signage** Development of signage for industry displaying best practice for stormwater management	$10,000	2009/2014	ES	Local
3-10	Strategic	**Spill Prevention and Containment Plans** Spill Prevention and Containment Plans can be used to ensure that any spills that occur on site are contained on site and do not enter the stormwater system. In most cases, spill prevention and containment plans will be included as part of a site Environmental Improvement Plans. However, many smaller light industrial or manufacturing sites (mechanics, spray painters, etc) may not have plans in place to deal with spill prevention and containment and consequently, spills may be entering the local stormwater system.	$25,000	2009/2010	EPA **HTLL**,ES,DS	Local
3-11	Strategic	**Infringement Notification and Fines** Fines and infringement notices to be imposed by either EPA or Council to industrial premises failing to meet licence or discharge requirements and consequently having an adverse impact upon stormwater	Ops Budget	2009/2014	HTLL	
3-12	Monitoring	**Ensure an environmental monitoring program is in place.** As per Action 1-9.	Ops Budget		ES	
3-13	Strategic	**Roof Water Diversion** Identify existing industries that buy process water and target those with large roof areas for potential water diversion and reuse.	Ops Budget	2009/2014	EPA - ES	Local

Table 8-6 Risk Management Strategy 4

Risk Management Strategy 4

Priority Risk Issue 4 – *Development Site run-off to the Murray river, Etiwanda Wetlands, Merbein Common, Bob Corbould, Lake Ranfurly and Lake Hawthorn*

This strategy responds to the risk of land and infrastructure development, which relate to broad scale land use changes or infrastructure construction, which are considered to impact on receiving environments. Educational tools, such as guidelines, signage, workshops, individual consultation and demonstration projects will improve stormwater pollution awareness and encourage industries to develop EMPs.

Action Number	Action Code	Management Action Description	Cost		Responsibility & Assistance	Extent of Application
			Funding	Year		
4-1	Education and Awareness	**Literature/ Guideline Development & Distribution** Distribute VSAP and develop additional Council specific educational literature and guidelines to major developers, outlining Council's commitment to stormwater management, WSUD principals and expectations for planning and management during construction. Council could use relevant documents produced by regional authorities such as DOI and MAV.	Refer to listed strategies for details regarding cost, responsibility and extent of application.			
4-2	Education and Awareness	**Develop and Implement Site Specific EMP's** Develop site-specific environmental management plans for key residential areas in order to manage and reduce their impact upon the stormwater. Through the Victorian Stormwater Action Plan, Melbourne Water, the Land Development Industry and 3 local Councils, formulated a site EMP kit. This EMP kit can be adapted to suit the requirements of both Council and differing requirements of each site and will results in cost savings for Council. The site specific EMP's would be most appropriate for future small, medium to large scale residential developments.	$10,000	2009/2014	and VicRoads or VicTrack ES,**HTLL**,DS	Major Roadways and Railways
4-3	WSUD	**Demonstration Project** Encourage a prominent developer to undertake a demonstration project exhibiting Best Practice in construction site management (ie. sediment and erosion control, site planning and construction practices). Publicise demonstration project and organise a study tour with other developers and Council Staff. Involve the CMA and EPA.	$25,000	2009/2011	and VicRoads or VicTrack **DS**,AD,ES	Major Roadways and Railways
4-4	WSUD	**Filter Strips** Implement filter strips where possible and appropriate. Filter strips are simply strips of vegetation or grass that stormwater flows through in order to drain to the receiving environment. Filter strips can be as simple as maintained grass strip along the roadway prior to Run-off entering the drainage system. Application of water sensitive design such as this would be subject to a range of limitations including space constraints, public safety, suitable soil composition and water quality objectives. A feasibility study would be required to assess the opportunities available.	$25,000	2009/2014	**AD**,ES and VicRoads or VicTrack	Major Roadways and Railways
4-5	Education and Awareness	**Signage** Promote and advertise demonstration project with a sign.	Ops Budget	2009/2011	AD,**DS**	
4-6	Planning	**Implement Clause 56.08** Subdivision construction poses a significant risk to the environment, which must be addressed by developers and contractors. Clause 56.08 sets out the site management requirements that must be met for residential subdivision proposals in an urban area. Clause 56.08 objectives are: • To protect drainage infrastructure and receiving waters from sedimentation and contamination. • To protect the site and surrounding area from environmental degradation or nuisance prior to and during construction of subdivision works.	Ops budget	2009/2014	DS	Municipality

Risk Management Strategy 4

Priority Risk Issue 4 – *Development Site run-off to the Murray river, Etiwanda Wetlands, Merbein Common, Bob Corbould, Lake Ranfurly and Lake Hawthorn*

This strategy responds to the risk of land and infrastructure development, which relate to broad scale land use changes or infrastructure construction, which are considered to impact on receiving environments. Educational tools, such as guidelines, signage, workshops, individual consultation and demonstration projects will improve stormwater pollution awareness and encourage industries to develop EMPs.

Action Number	Action Code	Management Action Description	Cost		Responsibility & Assistance	Extent of Application
			Funding	Year		
		• To encourage the reuse of materials from the site and recycled materials in the construction of subdivisions where practicable. Standard C26 requires that: A subdivision application must describe how the site will be managed prior to and during the construction period and may set out requirements for managing: • Erosion and sediment • Dust • Run-off • Litter, concrete and other construction wastes • Chemical contamination • Vegetation and natural features planned for retention.				
4-7	Strategic	**All Council staff** All Council staff are to report poor waste practices on building sites to the Water Management Officer Many Council staff travel during working hours and this ensures greater areas are covered and Bylaw officers can follow up on specific complaints. All Council vehicles are to have reporting forms located in them.	Ops Budget	2009/2014	All MRCC Branches	Municipality
4-8	WSUD	**Swales** Implement swales where possible and appropriate. Swales can be used instead of conventional kerb and channel drainage. Swales facilitate the removal of pollutants and reduce Run-off by encouraging infiltration. Application of water sensitive design such as this would be subject to a range of limitations including space constraints, public safety, suitable soil composition and water quality objectives. A feasibility study would be required to assess the opportunities available.	$20,000	2009/2014	`	Major Roadways and Railways

Table 8-7 Risk Management Strategy 5

Risk Management Strategy 5

Priority Risk Issue 5 – *Major road Run-off to Murray river, Basin 12, Etiwanda, Merbein Common, Bob Corbould, Lake Ranfurly and Lake Hawthorn*

The strategy responds to the run-off that occurs from major road/rail infrastructure within the municipality. This strategy focuses predominately with structural treatments to ensure poor quality stormwater does not enter local waterways. However, the strategy also provides for interactions between both Vicroads and Victrack to develop and implement some site specific EMP's.

Action Number	Action Code	Management Action Description	Cost		Responsibility & Assistance	Extent of Application
			Funding	Year		
5-1	Strategic	**Develop and Implement Site Specific EMP's** Environmental Management Plans can be developed for sections of roadway or railway (eg Deakin Rd). Such plans include details of how contaminants are collected and disposed of (tyre shreds, glass, metal, etc), sediment control (from gravel verges) and the collection and treatment of stormwater Run-off. Through the Victorian Stormwater Action Programme, Melbourne Water, the Land Development Industry and 3 local Councils, formulated a site EMP kit. This EMP kit can be adapted to suit the requirements of both Council and differing requirements of each site and will results in cost savings for Council. A process would need to be undertaken to identify and prioritise pollution hotspots along the road and rail network within the municipality.	*$10,000*	2009/2010	**HTLL**,ES VicRoads or VicTrack	Major Roadways and Railways
5-2	WSUD	**Stormwater Infiltration Measures** Implement stormwater infiltration measures where possible and appropriate. Stormwater infiltration measures can be implemented at the end of swales or open drains. These measures allow for the infiltration of water into the ground and remove pollutants from the stormwater. Stormwater infiltration measures can include either infiltration pits or bio-retention systems. Bioretention pits could be installed at Deaking Ave.	*$25,000*	2009/2014	**AD**,ES,IMS VicRoads or VicTrack	Major Roadways and Railways
5-3	WSUD	**Filter Strips** Implement filter strips where possible and appropriate. Filter strips are simply strips of vegetation or grass that stormwater flows through in order to drain to the receiving environment. Filter strips can be as simple as maintained grass strip along the roadway prior to Run-off entering the drainage system. Application of water sensitive design such as this would be subject to a range of limitations including space constraints, public safety, suitable soil composition and water quality objectives. A feasibility study would be required to assess the opportunities available.	*$25,000*	2009/2014	**AD**,ES VicRoads or VicTrack	Major Roadways and Railways
5-4	WSUD	**Swales** Implement swales where possible and appropriate. Swales can be used instead of conventional kerb and channel drainage. Swales facilitate the removal of pollutants and reduce Run-off by encouraging infiltration. Application of water sensitive design such as this would be subject to a range of limitations including space constraints, public safety, suitable soil composition and water quality objectives. A feasibility study would be required to assess the opportunities available.	$0	2009/2014	VicRoads or VicTrack	Major Roadways and Railways

Table 8-8 Risk Management Strategy 6

Action Number	Action Code	Management Action Description	Cost		Responsibility & Assistance	Extent of Application
			Funding	Year		
Risk Management Strategy 6 **Priority Risk Issue 6 –** *Open spaces and parks and Rural surface Run-off to the Murray river, Basin 12, Etiwanda, Merbein Common, Bob Corbould, Lake Ranfurly and Lake Hawthorn* *The strategy responds to the management of open spaces and parks.*						
6-1	Strategic	**Maintenance Procedures** Council should revise the operational and maintenance procedures for open space management in order to reduce fertiliser application rates to parks and gardens, improve water use efficiencies through improved irrigation practices and promote the use of plants with low nutrient and watering requirements	Ops Budget	2009/2014	ES	Municipality
6-2	WSUD	**Workshops** Initiate Workshops for Council staff and contractors	$5,000	2009/2014	**ES**,CS	Municipality
6-3	WSUD	**Filter Strips** Implement filter strips where possible and appropriate. Filter strips are simply strips of vegetation or grass that stormwater flows through in order to drain to the receiving environment. Filter strips can be as simple as maintained grass strip along the roadway prior to run-off entering the drainage system. Application of water sensitive design such as this would be subject to a range of limitations including space constraints, public safety, suitable soil composition and water quality objectives. A feasibility study would be required to assess the opportunities available.	$25,000	2009/2014	AD**,ES**	Municipality
6-4	WSUD	**Stormwater re-use** Council should continue to investigate options for re-use of stormwater for irrigating parks and gardens. Stormwater detention systems could be incorporated into new development and used for watering nature strips, parks and gardens	Ops Budget	2009/2014	**ES**,AD	Municipality

RESPONSIBILITY / ASSISTANCE LEGEND

CS – CORPORATE SERVICES *1MS – INFRASTRUCTURE MAINTENANCE SERVICES*

DS- DEVELOPMENT SERVICES *HTLL- HEALTH TRAFFIC AND LOCAL LAWS*

ES- ENVIRONMENTAL SERVICES

AD – ASSET DEVELOPMENT

The bolded text indicates the responsible lead branch for the action.

9 MANAGEMENT FRAMEWORK IMPROVEMENT STRATEGIES

With respect to meeting Council long-term stormwater management goals and objectives and moving towards Council's 2025 vision, the process of integrating urban stormwater management into MRCC's management framework is essential. The path forward for achieving the integration can be viewed as a three-stage process. The remaining management framework actions all fit within the scope of this process and should be seen as a sub set of the task necessary to achieve SWQIP integration.

The initial phase would entail a comprehensive review of all management framework policies and planning instruments to ensure that Council's SWQIP is integrated into each of these items as the appropriate reference for stormwater management. In addition the SWQIP will need to be revised to ensure that it appropriately supports each of these policies and instruments in articulating Councils objectives, standards and where appropriate, quantifiable and measurable targets for the objectives. As part of this process roles and responsibilities for the implementation of policies and or the assessment of planning applications should be defined and these responsibilities clearly articulated in both the relevant documents and position descriptions of those roles.

Tasks

Encourage Councillor, senior executive and staff commitment to stormwater quality management. As a first step, prepare a formal presentation of the Plan to Council and then provide future reporting on the progress and implementation of the Plan to the Council. One Councillor could be identified in an ongoing liaison role. Establish performance criteria for senior executives and officers relating to the implementation of the Plan and include these in performance plans.
Review existing general policy statements and other documents. Existing policies such as the City Plan, maintenance and construction manuals, landscape design guidelines, industrial land management guidelines and so on should be reviewed and updated to include specific reference to the water bodies and stormwater and to incorporate linkages between policies. Ensure clear linkages between strategies and encourage a focus on catchment-wide strategies rather than a localised approach.
Review Mildura Rural City Council Planning Scheme Add a local policy to Clause 21 regarding stormwater management and review other local policies in the scheme to ensure their consistency in controlling stormwater impacts. This policy should also deal with realising opportunities to reuse stormwater, and establishing a contribution scheme to allow offsets for stormwater pollution loads from development sites.
Establish the mechanism by which the stormwater quality management plan is to be implemented and reviewed. Include reference to the Stormwater Quality Improvement Plan in the City Plan and provide reporting of the implementation of the Plan's actions in the City's Annual Report. Entrust the Water Management Officer and/or an ongoing working group with formulating an implementation and review strategy, and report annually to Council on stormwater initiatives, developments and plan implementation .Actions are to be incorporated into Branch Plans and Performance Development Plans.

The second phase would ostensibly be an internal training and capacity building process to ensure that relevant staff are equipped with the appropriate level of understanding and the skills necessary to

carry out their defined responsibilities. This capacity building exercise should also aim to facilitate communication between all sections of Council with which stormwater management and planning responsibilities lie.

Tasks

Increase WSUD expertise within those sections of Council most involved in implementing it through training, mentoring, information provision and recruitment. The priority sections of Council are Urban Planning and Development and Capital Works and Assets, and these areas should have officers trained in WSUD. Organise site visits for officers to demonstrate examples of positive and negative stormwater management techniques and outcomes. Provide an ongoing training programme in relation to stormwater and ensure that new Council officers are provided with training upon commencement. Establish linkages with other organisations and course providers such as the MAV Clearwater Programme. Include reference to stormwater in Council's staff induction programme.
Train Council officers in local stormwater quality management issues. Aimed at informing a broad cross-section of Council on stormwater issues and the plan, instigate workshops or information sessions to promote the Stormwater Quality Improvement Plan. Prepare guidelines for assessment of stormwater issues and general procedures manuals for relevant Council departments. Ensure all staff have a clear understanding of the function and extent of responsibility of each Council department and the relationship between each department. Ensure staff understand their responsibilities in relation to stormwater, particularly outdoor and maintenance staff.
Encourage cross-Council linkages. Encourage the formulation of multi-disciplinary work teams to consider large development/subdivision applications and other issues as necessary. Investigate the potential for other cross-Council linkages to be established. Encourage the sharing of information between Council departments through the Environmental Sustainability Task Team .

The final, and perhaps most problematic stage, is that of external party education and capacity building. All parties, such as developers, engineers, and contractors, operating within the Mildura LGA will require education and training on what a clearly defined set of stormwater management goals and practices means for their operations. In addition they will require support and guidance on the practices that must be undertaken to comply with the revised policies and updated planning instruments. This can be combined in with the communication strategy and demonstration project.

Tasks

Provide adequate resources to enforce local regulations. Review the staff requirements associated with enforcement and allocate appropriate resources as required. Resourcing should be revisited should significant changes occur to planning permit conditions and WSUD requirements in the Planning Scheme. Training of enforcement officers should be undertaken and emphasise Council's priorities and policy approach to stormwater. Encourage proactive enforcement, ie regular site visits and meetings rather than responding to complaints.
Encourage positive changes in behaviour in developers, builders and business owners. Identify best practice measures and/or design standards for application by business owners and publish and publicise these through forums most appropriate to the community sector. Include the obligations of these groups and the regulatory requirements that they are required to meet. Investigate potential for providing incentives to meet certain standards. This programme should include publicity and information sheets as well as face to face contact via site visits, public workshops and so on.

Implement combined enforcement/education programmes.

Use Council's enforcement officers (eg planning, local laws, environmental health) collectively on-site, eg. visiting commercial centres, industrial premises, development sites etc. Undertake programmes in conjunction with EPA and officers from adjoining municipalities where land use precincts cross municipal boundaries.

10 PLAN IMPLEMENTATION AND REVIEW

The ultimate success of the Stormwater Quality Improvement Plan will be dependent on Council's ability to implement the recommendations of the plan and progressively review its effectiveness. This chapter provides recommendations and a framework to assist Council with the implementation and ongoing review of the plan.

10.1 The Way Forward

It is important that the approach to implementation reflects the recommendations made in the plan and builds on the commitment that has already been fostered from the involvement of key stakeholders in the development of the plan.

To enable the implementation of these actions it is proposed that Council clearly define internal roles for specific individuals and Council Departments. The following individual and group roles are recommended in this regard:

- **Water Management Officer(WMO)** – it is considered essential that Council identify an individual within the organisation (or create a position) who is assigned the specific responsibility of coordinating stormwater management activities. The person in this position would be responsible for coordinating the implementation of specific actions associated with risk management strategies and management framework strategies. This would form part of the current Water Management Officer role.
- **Stormwater Management Implementation Committee (SMIC)** – a committee of between 4 to 6 people should be formed to oversee and coordinate the progressive implementation of the Reactive Management Strategies and Management Framework Strategies. This committee should be made up of internal Council Officers from different departments within Council, with Executive level representation. The committee would liaise with the Water Management Officer, providing support and guidance where necessary. The committee would also participate in budget programming to ensure that stormwater management activities were appropriately funded. It is envisaged that the committee would initially meet on a monthly basis with the Water Management Officer to review progress on the implementation of activities. The SMIC would also report every 6 months to the PRG on implementation progress.

10.2 Implementation Monitoring and Review Process

As part of the development of a detailed implementation schedule, Council should identify specific milestones and objectives that enable benchmarking and review of the implementation process. These milestones should relate to:

- achieving improvements in specific receiving values which are currently threatened; and/or
- reductions in specific risks; and
- The identification of these milestones should reflect the priority of the specific risk.

Performance of the Stormwater Quality Improvement Plan in achieving the key milestones should be based on an annual review of specific Risks. This review should consider:

- changes to the magnitude and exposure of specific threats in accordance with the implementation of management measures; and
- improvements to the quality of receiving values associated with implementation of management measures.

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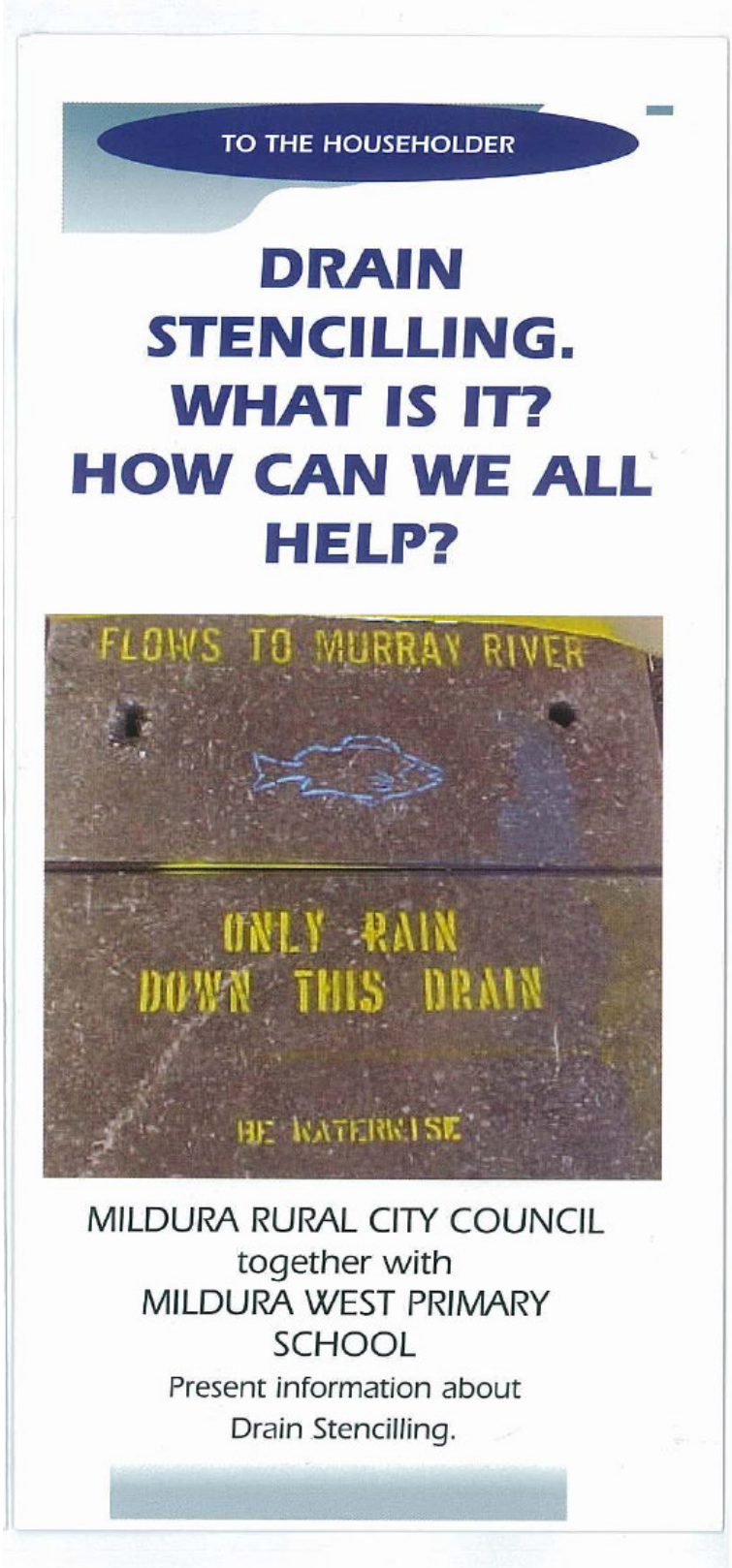
ATTACHMENT 1



ATTACHMENT 2

MRCC

ENVRIONMENTAL EDUCTION PROGRAM

Mildura Rural City Council

MILDURA RURAL CITY

STORMWATER - Andrew Powell

National Water Week, Stormwater Ambassador Program, Drain Stenciling, Interactive Presentations, GPT's and Wetlands
Phone : (03) 5018 8455
Email:andrewp@mildura.vic.gov.au

WASTE - Karen Grant

Landfill Site Tours, School Recycling Program and Clean-up Australia Day
Phone: (03) 5018 8476
Email: karen.grant@mildura.vic.gov.au

Creating Environmental Opportunities for your School

WASTE - Andrea Collins (MRWMG)

Waste Wise School Program
Phone: (03) 5018 8403
Email: andrea.collins@mildura.vic.gov.au

BIODIVERSITY - Melanie Bell

Arbor Week and National Tree Day, Biodiversity Month, Weedbuster Week, School Nursery Network, School Rehabilitation and Protection Projects, School Plant Program
Phone: (03) 5018 8454
Email: melanieb@mildura.vic.gov.au

PARKS AND GARDENS WATER CONSERVATION - Trevor Watts

Water Efficient Plants, Sub Surface Drip Irrigation, Site Visits, Belar Nursery Tours.
Phone: (03) 5018 8459
Email: trevorw@mildura.vic.gov.au

Mildura Rural City Council

Join Rock, our well known bizarre "Glam" Rock era reject, as he battles against the Alien forces from the Planet Enviro. Rock is given 24 hours to prove to the invading Aliens Cremlon and Zelkar that earthlings are intelligent and actually care about saving water and care for the environment. With a little bit of help from Mother Nature and friends we follow his exploits to save Water and the environment before Earth is totally destroyed.

What is a wetland

A wetland is an area of land which is intermittently or permanently inundated by shallow water. As stormwater passes through it acts as a natural filter, improving water quality through biological and chemical processes

Wetland Features

- Wetlands are an attractive landscape feature
- Habitat for native wildlife
- Potential source for reusable water
- Source of recreation and education
- Improve the water quality of receiving waters

Wetland Components

Wetlands are divided into three zones

Inlet Zone - A deep pond area pre- treated with GPTS enabling larger particles to settle and sink

Macrophyte Zone - Contains emergent and submerged plants that collect contaminants as the water flows through them

Open water Water Zone - this is a shallow area that allows time for finer particles to settle and sink to the bed and for sunlight to kill bacteria

A constructed wetland in its early stages

Notice the use of rock and stone embankments and the systematic planting of emergent plants that will later become fully established to provide maximum treatment to stormwater inflows

A small Wetland within a residential subdivision

A fully established Wetland

Wetlands can be utilised as an education resource

ATTACHMENT 3

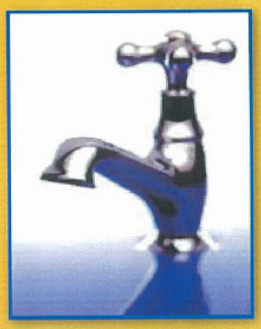
Mildura Rural City Council

Water saving hints for the home

Mildura Rural City Council now have a Sustainable Water Use Plan- a positive step towards saving water for the community. The key objective is to reduce water consumption across all MRCC assets and operations by a minimum of 15% over the next 5 years. Here is how you can help reduce water use in your home.

In the bathroom

- Try cutting your shower time to five minutes.
- A water saving shower head can save up to 180 litres per day.
- Turn off the tap when cleaning teeth. A running tap uses 15 to 20 litres per minute.
- Try saving the shower water before it gets hot, then use it on the garden.



www.savewater.com.au

Artwork courtesy of Mildura Weekly

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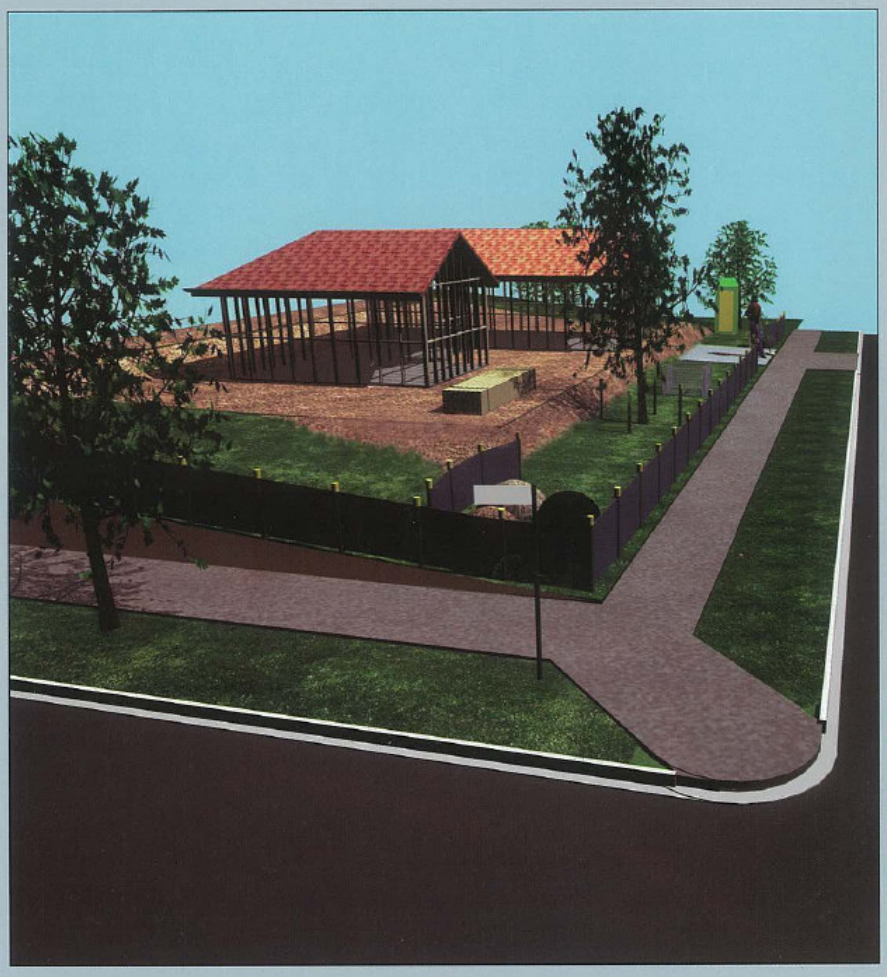
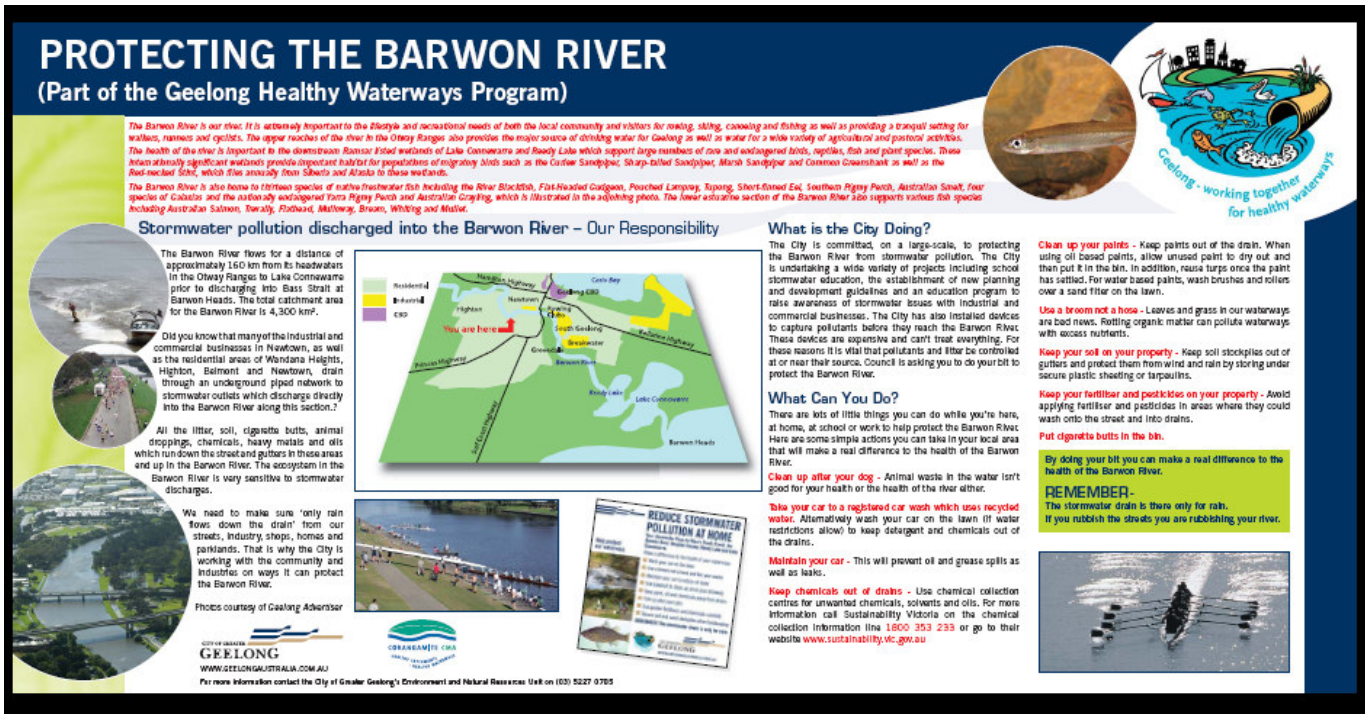
Best Practice Guidelines
for Building Site Management



Mildura Rural City Council

APPENDIX A: RIVER SIGN EXAMPLE



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